



California American Water - Monterey
511 Forest Lodge Road, Suite 100
Pacific Grove, CA 93950
amwater.com

May 6, 2020

Mr. John Forsythe
California Public Utilities Commission
Energy Division
505 Van Ness Avenue
San Francisco, CA 94102

**Re: Monterey Peninsula Water Supply Project – Notice to Proceed Request No. 3 (NTPR-3)
Carmel Valley Pump Station**

Dear Mr. Forsythe,

In April 2012, California American Water (CalAm) filed an application (A.12-04-019) with the California Public Utilities Commission (CPUC). This filing was made to the CPUC for the Monterey Peninsula Water Supply Project (MPWSP). The MPWSP is intended to secure replacement water supplies for CalAm's Monterey District in conformance with legal decisions affecting existing supplies from both the Carmel River and the Seaside Groundwater Basin. On January 13, 2017, the CPUC as the California Environmental Quality Act (CEQA) lead agency, and the Monterey Bay National Marine Sanctuary (MBNMS) as the National Environmental Policy Act (NEPA) lead agency, published the MPWSP Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The CPUC and MBNMS published the MPWSP Final EIR/EIS on March 30, 2018. On September 13, 2018, the CPUC certified the combined EIR/EIS, approved a modified (6.4 million gallon per day [mgd]) Project, adopted settlement agreements, and issued a Certificate of Public Convenience and Necessity (Decision 18-09-017). The modified Project, which was referred to as "Alternative 5a" in the Final EIR/EIS, consists of the construction and operations of a reduced size 6.4 mgd plant (compared with the 9.6 mgd for the originally proposed project). Decision 18-09-017, the Final EIR/EIS, and its Mitigation Monitoring and Reporting Plan (MMRP) can be accessed at:

https://www.cpuc.ca.gov/environment/info/esa/mpwsp/comms_n_docs.html

NOTICE TO PROCEED REQUEST PURPOSE

This Notice to Proceed Request (NTPR) covers the construction and operation of the Carmel Valley Pump Station ("Pump Station"). The proposed project is located on a 4-acre vacant site owned by CalAm at 26530 Rancho San Carlos Road, near the intersection of Rancho San Carlos Road and Carmel Valley Road in Carmel Valley, California. This component of the MPWSP consists of the construction of a 764-square-foot booster pump station enclosed in a concrete masonry unit with the pumping capacity of 3 mgd (2,100 gpm) and the grading of 36 cubic yards of cut and 943 cubic yards of fill, totaling a net of 907 cubic yards. A 50 kW (68 hp) portable diesel-fuel powered generator would be stored onsite for use in the event of a power outage. Additionally, an inlet and outlet pipe would be installed to connect the Pump Station to the existing 30-inch transmission main in Carmel Valley Road. Furthermore, an existing well on the property would be demolished

and abandoned in conformance with Monterey County standards and a well abandonment permit will be obtained prior to the issuance of the construction permit.

The construction of the Pump Station would improve CalAm's ability to convey water to the Monterey Peninsula cities by providing additional pressure to move water over the Segunda Grade. The extent of these improvements were described in Decision 18-09-17 and its supporting documentation. This NTPR documents current and future compliance with applicable Final EIR/EIS mitigation measures associated with anticipated pre-construction, construction and post-construction/operational activities (see **Appendices A-1, A-2 & A-3**). This NTPR is provided to the CPUC, so they may review and provide authorization to CalAm to initiate construction of the MPWSP Carmel Valley Pump Station, as described below.

CONSTRUCTION ACTIVITIES

The project area applicable to this NTPR is shown in **Appendix B-1 (Project Location Map)**. Access to the project site would be provided via Rancho San Carlos Road. All work under this NTPR would be performed exclusively in the area shown in **Appendix B-2 (Construction Footprint Map)**. Construction activities include the following:

- Pre-construction surveys and site preparation activities such as vegetation removal, site grading to create a level work area, and trenching to lay the inlet and outlet pipeline to Carmel Valley Road.
- Once site preparation is complete, construction activities would include pouring concrete footing for foundations; assembling and installing piping, pumps, and electrical equipment; building concrete enclosures and roofs; and performing finish work such as paving, landscaping, and fencing the perimeter of the pump station site. Additionally, an existing well located on the property be demolished.
- Construction of the Carmel Valley Pump Station would result in approximately 40,000 square feet (or 0.9 acre) of temporary disturbance, and 1,300 square feet (0.03 acre) of permanent disturbance.

CONSTRUCTION EQUIPMENT

The proposed construction would require the following equipment: excavator, backhoe, air compressor, boom truck or small crane, generator, concrete pump truck, paving equipment, flatbed truck, pavers and rollers, welding equipment, and a Baker tank. For a complete list of construction equipment, please refer to **Appendix C-1**.

CONSTRUCTION SCHEDULE

The construction activities described above are anticipated to take approximately six months with initial work commencing in July 2020 and finishing in January 2021. Construction equipment associated with this project component would typically operate for eight hours a day. However, at times, workers and equipment could be on-site up to 12-hours per day. Thus, typical work window hours of operation would be within 7:00AM and 7:00PM, Monday through Friday.

MITIGATION MEASURE TRACKING AND REPORTING

During the execution of the scope of work under NTPR-3, CalAm would implement all applicable mitigation measures as identified by the CPUC in Decision 18-09-17 to the extent that those mitigation measures are applicable to the Carmel Valley Pump Station. **Appendix A** of this NTPR identifies all mitigation measures and notes compliance with all pre-construction mitigation measures, as cited in the MPWSP Final EIR, which are applicable to the Carmel Valley Pump Station. In addition, pursuant to the requirements of the MMRP, a

number of technical reports/plans must be prepared. **Appendix C** includes all of the applicable technical reports and plans that are applicable to the Carmel Valley Pump Station.

For mitigation tracking, qualified professionals will prepare daily monitoring compliance logs with observations and survey results in the field. Daily compliance logs will be summarized in a monthly report to be submitted to the regulatory agencies upon their request. The monthly summary monitoring report will provide information regarding the worker awareness training, surveys, and any observed special-status species, including any accidental injuries or fatalities. The results of pre-construction surveys will be documented prior to the start of construction activities within the timeframes identified in each applicable mitigation measure.

Annual summaries will also be provided. A sample monitoring report is provided in the project's Mitigation Monitoring, Compliance, and Reporting Plan (MMCRP) document.

PROJECT CONTACTS

The following table contains the names and contact information for key contacts for the Carmel Valley Pump Station project component. A full set of contact information for all key individuals and field monitors is provided as an appendix to the MMCRP submitted to the CPUC.

Name	Title	Organization	E-mail	Phone
Tim O'Halloran	CalAm Project Manager	CalAm	Tim.Ohalloran@amwater.com	Office: (831) 646-3291 Cell: (831) 320-1384
Tyler Potter	CalAm Compliance Project Manager	DD&A	TPotter@ddaplanning.com	Office: (831) 373-4341 Cell: (831) 915-4633
Matt Johnson	Lead Biologist	DD&A	MJohnson@ddaplanning.com	Office: (831) 373-4341 Cell: (831) 917-3242
Peter Taormina	Contractor	MPE	PeterTaormina@gmail.com	Office: (831) 384-4081 Cell: 831-277-6112
Scott Myers	Construction Manager	H2O Urban Solutions (H2Ou)	scott@h2ourban.com	Office: (800) 215-1950 Cell: (916) 869-2957

CalAm respectfully requests authorization of this NTPR. If you have any questions or require additional information, please do not hesitate to contact me. As always, thank you in advance for your time and we look forward to working with you on this project.

Sincerely,

Tim O'Halloran
Project Manager
California American Water

APPENDICES

Appendix A – Tables of Mitigation Measures Identified in Approved MMRP

Appendix B – Various Project Maps and Drawings

Appendix C – Technical Plans, Reports, and other Documentation

Appendix A

Tables of Mitigation Measures Identified in the FEIR/EIS MMRP

A-1: Pre-Construction FEIR/EIS Mitigation Measures

A-2: During Construction FEIR/EIS Mitigation Measures

A-3: Post-Construction/Operational FEIR/EIS Mitigation Measures

Appendix A-1
Pre-Construction FEIR/EIS Mitigation Measures

Pre-Construction FEIR/EIS Mitigation Measures
Carmel Valley Pump Station

MM #	Condition Name	Status	Status Detail
4.6-1a	Retain a Lead Biologist to Oversee Implementation of Protective Measures	Complete	CalAm previously submitted documentation demonstrating compliance with this measure as part of NTPR-1. CalAm has retained a Lead Biologist consistent with the requirements of this mitigation measure. No further documentation is warranted at this stage.
4.6-1b	Construction Worker Environmental Awareness Training and Education Program	Complete	Video completed for WEAT presentation; CalAm previously submitted a copy of the training transcript/DVD as part of previous NTPR submittals. All construction personnel associated with this NTPR will undergo the construction WEAT program prior to the start of construction. Names of all personnel who attended the training with signed acknowledgement forms will be submitted to the CPUC following the pre-construction training.
4.6-1c	General Avoidance and Minimization Measures	On-going	CalAm has retained a Lead Biologist that will be responsible for overseeing on-going monitoring in connection with construction-related activities. On-site biological monitors will be present during construction consistent with the requirements of this mitigation measure. In addition, a list of General Avoidance and Minimization Measures is included as Appendix C-3 and a Stormwater Pollution and Prevention Plan (SWPPP) is included as Appendix B-4 .
4.6-1i	Avoidance and Minimization Measures for Nesting Birds	Scheduled	Pre-construction surveys to be completed prior to construction and submitted to the CPUC following completion of the surveys.
4.6-1k	Avoidance and Minimization Measures for Monterey Dusky-Footed Woodrat	Scheduled	Pre-construction surveys to be completed prior to construction and submitted to the CPUC following completion of the surveys.
4.6-1l	Avoidance and Minimization Measures for Special-Status Bats	Scheduled	Characterization of habitat for special-status bat species was conducted by biologists for the MPWSP from August 6-8, 2018 and July 9-10, 2019, to coincide with summer maternity season. Pre-construction surveys to be completed prior to construction and submitted to the CPUC following completion of the surveys.
4.6-1m	Avoidance and Minimization Measures for Native Stand of Monterey Pine	Scheduled	Pre-construction surveys to be completed prior to construction and submitted to the CPUC following completion of the surveys. No tree removal is proposed, though tree protection methods will be implemented.
4.6-1n	Habitat Mitigation and Monitoring Plan	Scheduled	The Habitat Monitoring and Mitigation Plan will be submitted to the CPUC prior to the start of construction.
4.6-1o	Avoidance and Minimization Measures for California Red-Legged Frog and California Tiger Salamander	Scheduled	Pre-construction surveys will be completed prior to the start of construction. The survey results will be submitted to the CPUC following completion of the surveys. In addition, a relocation plan will be submitted to the USFWS and CDFW for approval prior to the start of construction.

MM #	Condition Name	Status	Status Detail
4.6-2b	Avoid, Minimize, and Compensate for Construction Impacts to Sensitive Communities and Environmentally Sensitive Habitat Areas (ESHA)	N/A	The Carmel Valley Pump Station is located outside of the California Coastal Zone. Therefore, the Carmel Valley Pump Station project site is not located in an Environmentally Sensitive Habitat Area, nor does it contain any sensitive communities. Therefore, this mitigation measure is not applicable.
4.6-3	Avoid, Minimize, and or Mitigate Impacts to Wetlands	N/A	AECOM previously conducted a survey of the Carmel Valley Pump Station, as well as other project components, as part of the Jurisdictional Delineation (AECOM, 2018), and no jurisdictional wetlands were identified as part of that analysis. Therefore, no additional measures are required to satisfy the mitigation measure.
4.6-4	Compliance with Local Tree Ordinances	N/A	No tree trimming or tree removal proposed.
4.7-2a	Health and Safety Plan	Complete	An Accident Prevention and Safety Program and Site-Specific Safety Plan is included as Appendix C-5 .
4.7-2b	Soil and Groundwater Management Plan	Complete	A Soil and Groundwater Management Plan is included as Appendix C-6 .
4.9-1	Traffic Control and Safety Assurance Plan	Complete	A Traffic Control Plan is included as Appendix C-11 .
4.9-6	Roadway Rehabilitation Program	On-going	Contractor/CalAm to prepare pre-construction photos and videos to be georeferenced and submitted upon request.
4.9-C	Construction Traffic Coordination Plan	Complete	A Traffic Control Plan is included as Appendix C-11 .
4.10-1a	Equipment with High-Tiered Engine Standards	Complete	A Construction Equipment and Vehicle Efficiency Plan is included as Appendix C-7 .
4.10-1b	Idling Restrictions	Complete	A Construction Equipment and Vehicle Efficiency Plan is included as Appendix C-7 .
4.10-1c	Construction Fugitive Dust Control Plan	Complete	A Fugitive Dust Control Plan is included as Appendix C-8 .
4.10-1e	Off-site Mitigation Program	N/A	No off-site mitigation program required.
4.11-1	GHG Emissions Reductions Plan	N/A	This mitigation measure is related to the Desalination Plant; therefore, this mitigation measure is not applicable.
4.12-1a	Neighborhood Notice and Construction Disturbance Coordinator	Complete	MPE has designated a Neighborhood Notice and Construction Disturbance Coordinator as part of the Noise Management Plan, which is included as Appendix C-9 .
4.12-1b	General Noise Controls or Construction Equipment and Activities	Complete	A Noise Management Plan is included as Appendix C-9 .
4.12-1c	Noise Control Plan for Nighttime Pipeline Construction	Complete	A Noise Management Plan is included as Appendix C-9 .
4.13-1a	Locate and Confirm Utility Lines	Complete	The Carmel Valley Pump Station Construction Drawings highlight underground utilities and are included as Appendix B-3 . Additionally, CalAm and MPE will coordinate with the affected utilities and will submit a USA Utility Clearance ticket to the CPUC prior to the start of construction.

MM #	Condition Name	Status	Status Detail
4.-13-1b	Coordinate Final Construction Plans with Affected Utilities	Complete	CalAm will coordinate with the affected utilities prior to the start of construction.
4.13-1c	Safeguard Employees from Potential Accidents Related to Underground Utilities	Complete	An Accident Prevention and Safety Program and Site-Specific Safety Plan is included as Appendix C-5 .
4.-13-1d	Emergency Response Plan	Complete	An Accident Prevention and Safety Program and Site-Specific Safety Plan is included as Appendix C-5 .
4.13-1e	Notify Local Fire Departments	Complete	The requirements of this mitigation measure are in the Carmel Valley Pump Station Construction Specifications included as Appendix C-2 . Additionally, correspondence with MCRFD will be submitted to the CPUC prior to the start of construction.
4.13-2	Construction Waste Reduction and Recycling Plan	Complete	A Construction Waste Reduction and Recycling Plan is included as Appendix C-10 .
4.14-1	Maintain Clean and Orderly Construction Sites	On-going	This is an on-going mitigation measure that will be monitored during construction.
4.14-2	Site-Specific Nighttime Lighting Measures	N/A	There will be no nighttime pre-construction activities during this project component; therefore, this mitigation measure is not applicable.
4.15-2b	Inadvertent Discovery of Cultural Resources	On-going	AECOM has prepared an Archaeological Monitoring Program that was previously submitted to the CPUC and is included as an attachment to the MMCRP and is available upon request.
4.18-1	Construction Equipment and Vehicle Efficiency Plan	Complete	A Construction Equipment and Vehicle Efficiency Plan is included as Appendix C-7 .

Appendix A-2
During Construction FEIR/EIS Mitigation Measures

Construction FEIR/EIS Mitigation Measures
Carmel Valley Pump Station

MM #	Condition Name	Status	Status Detail
4.6-1a	Retain a Lead Biologist to Oversee Implementation of Protective Measures	Complete	CalAm previously submitted documentation demonstrating compliance with this measure as part of NTPR-1. CalAm has retained a Lead Biologist consistent with the requirements of this mitigation measure. No further documentation is warranted at this stage.
4.6-1c	General Avoidance and Minimization Measures	On-going	CalAm has retained a Lead Biologist that will be responsible for overseeing on-going monitoring in connection with construction-related activities. On-site biological monitors will be present during construction consistent with the requirements of this mitigation measure. In addition, a list of General Avoidance and Minimization Measures is included as Appendix C-3 and a Stormwater Pollution and Prevention Plan (SWPPP) is included as Appendix B-4 .
4.6-1i	Avoidance and Minimization Measures for Nesting Birds	Scheduled	Pre-construction surveys will be completed prior to construction and submitted to the CPUC following completion of the surveys. The results of the pre-construction surveys will inform whether it is necessary to implement this mitigation measure during construction.
4.6-1k	Avoidance and Minimization Measures for Monterey Dusky-Footed Woodrat	Scheduled	Pre-construction surveys will be completed prior to construction and submitted to the CPUC following completion of the surveys. The results of the pre-construction surveys will inform whether it is necessary to implement this mitigation measure during construction.
4.6-1l	Avoidance and Minimization Measures for Special-Status Bats	Scheduled	Pre-construction surveys will be completed prior to construction and submitted to the CPUC following completion of the surveys. The results of the pre-construction surveys will inform whether it is necessary to implement this mitigation measure during construction.
4.6-1o	Avoidance and Minimization Measures for California Red-Legged Frog and California Tiger Salamander	Scheduled	Pre-construction surveys will be completed prior to construction and submitted to the CPUC following completion of the surveys. The results of the pre-construction surveys will inform whether it is necessary to implement this mitigation measure during construction.
4.6-2b	Avoid, Minimize, and Compensate for Construction Impacts to Sensitive Communities and Environmentally Sensitive Habitat Areas (ESHA)	N/A	The Carmel Valley Pump Station project site is not located in an Environmentally Sensitive Habitat Area, nor does it contain any sensitive communities. Therefore, this mitigation measure is not applicable.
4.6-3	Avoid, Minimize, and or Mitigate Impacts to Wetlands	N/A	AECOM previously conducted a survey of the Carmel Valley Pump Station, as well as other project components, as part of the Jurisdictional Delineation (AECOM, 2018), and no jurisdictional wetlands were identified as part of that analysis. Therefore, no additional measures are required to satisfy the mitigation measure.
4.6-4	Compliance with Local Tree Ordinances	N/A	No tree trimming or tree removal proposed.

MM #	Condition Name	Status	Status Detail
4.7-2a	Health and Safety Plan	Complete	An Accident Prevention and Safety Program and Site-Specific Safety Plan is included as Appendix C-5 .
4.7-2b	Soil and Groundwater Management Plan	Complete	A Soil and Groundwater Management Plan is included as Appendix C-6 .
4.9-1	Traffic Control and Safety Assurance Plan	Complete	A Traffic Control Plan is included as Appendix C-11 .
4.9-C	Construction Traffic Coordination Plan	Complete	A Traffic Control Plan is included as Appendix C-11 .
4.10-1a	Equipment with High-Tiered Engine Standards	Complete	A Construction Equipment and Vehicle Efficiency Plan is included as Appendix C-7 .
4.10-1b	Idling Restrictions	Complete	A Construction Equipment and Vehicle Efficiency Plan is included as Appendix C-7 .
4.10-1c	Construction Fugitive Dust Control Plan	Complete	A Fugitive Dust Control Plan is included as Appendix C-8 .
4.10-1e	Off-site Mitigation Program	N/A	No off-site mitigation program required.
4.12-1a	Neighborhood Notice and Construction Disturbance Coordinator	Complete	MPE has designated a Neighborhood Notice and Construction Disturbance Coordinator as part of the Noise Management Plan, which is included as Appendix C-9 .
4.12-1b	General Noise Controls or Construction Equipment and Activities	Complete	A Noise Management Plan is included as Appendix C-9 .
4.12-1c	Noise Control Plan for Nighttime Pipeline Construction	Complete	A Noise Management Plan is included as Appendix C-9 .
4.12-3	Vibration Reduction Measures	Complete	A Noise Management Plan is included as Appendix C-9 .
4.13-1a	Locate and Confirm Utility Lines	Complete	The Carmel Valley Pump Station Construction Drawings highlight underground utilities and are included as Appendix B-3 . Additionally, CalAm and MPE will coordinate with the affected utilities and will submit a USA Utility Clearance ticket to the CPUC prior to the start of construction.
4.13-1b	Coordinate Final Construction Plan with Affected Utilities	Complete	CalAm will coordinate with the affected utilities prior to the start of construction.
4.13-1c	Safeguard Employees from Potential Accidents Related to Underground Utilities	Complete	An Accident Prevention and Safety Program and Site-Specific Safety Plan is included as Appendix C-5 .
4.13-1d	Emergency Response Plan	Complete	An Accident Prevention and Safety Program and Site-Specific Safety Plan is included as Appendix C-5 .
4.13-1e	Notify Local Fire Departments	Complete	The requirements of this mitigation measure are in the Carmel Valley Pump Station Construction Specifications included as Appendix C-2 . Additionally, correspondence with MCRFD will be submitted to the CPUC prior to the start of construction.
4.13-1f	Ensure Prompt Reconnection of Utilities	Complete	An Accident Prevention and Safety Program and Site-Specific Safety Plan is included as Appendix C-5 .

MM #	Condition Name	Status	Status Detail
4.13-2	Construction Waste Reduction and Recycling Plan	Complete	A Construction Waste Reduction and Recycling Plan is included as Appendix C-10 .
4.14-1	Maintain Clean and Orderly Construction Sites	On-going	This is an on-going mitigation measure that will be monitored during construction.
4.14-2	Site-Specific Nighttime Lighting Measures	Complete	A Noise Management Plan, which covers nighttime construction activities, is included as Appendix C-9 .
4.15-2b	Inadvertent Discovery of Cultural Resources	On-going	AECOM has prepared an Archaeological Monitoring Program that was previously submitted to the CPUC and is included as an attachment to the MMCRP and is available upon request.
4.15-4	Inadvertent Discovery of Human Remains	On-going	AECOM has prepared an Archaeological Monitoring Program that was previously submitted to the CPUC and is included as an attachment to the MMCRP and is available upon request.
4.18-1	Construction Equipment and Vehicle Efficiency Plan	Complete	A Construction Equipment and Vehicle Efficiency Plan is included as Appendix C-7 .

Appendix A-3

Post-Construction/Operational FEIR/EIS Mitigation Measures

Post-Construction/Operational Mitigation Measures
Carmel Valley Pump Station Site

MM #	Condition Name	Status	Status Detail
4.6-1o	Avoidance and Minimization Measures for California Red-legged Frog and California Tiger Salamander	Scheduled	Pre-construction surveys will be completed prior to construction and submitted to the CPUC following completion of the surveys. The results of the pre-construction surveys will inform whether it is necessary to implement this mitigation measure during construction.
4.6-3	Avoid, Minimize, and or Mitigate Impacts to Wetlands	N/A	AECOM previously conducted a survey of the Carmel Valley Pump Station, as well as other project components, as part of the Jurisdictional Delineation (AECOM, 2018), and no jurisdictional wetlands were identified as part of that analysis. Therefore, no additional measures are required to satisfy the mitigation measure.
4.9-6	Roadway Rehabilitation Plan	On-going	Contractor/CalAm to prepare pre-construction photos and videos to be georeferenced and submitted upon request.
4.11-1	GHG Emissions Reductions Plan	N/A	This mitigation measure is related to the Desalination Plant; therefore, this is not applicable.

Appendix B

Various Project Maps and Drawings

B-1: Project Location Map

B-2: Construction Footprint Map

B-3: Carmel Valley Pump Station Construction Drawings

B-4: Carmel Valley Pump Station Stormwater Pollution Prevention Plan (SWPPP)

Appendix B-1
Project Location Map



Title:

Location Map

Date: 3-13-2020

Scale: 1 inch = 5 miles

Project: 2016-64



Monterey | San Jose
Denise Duffy and Associates, Inc.

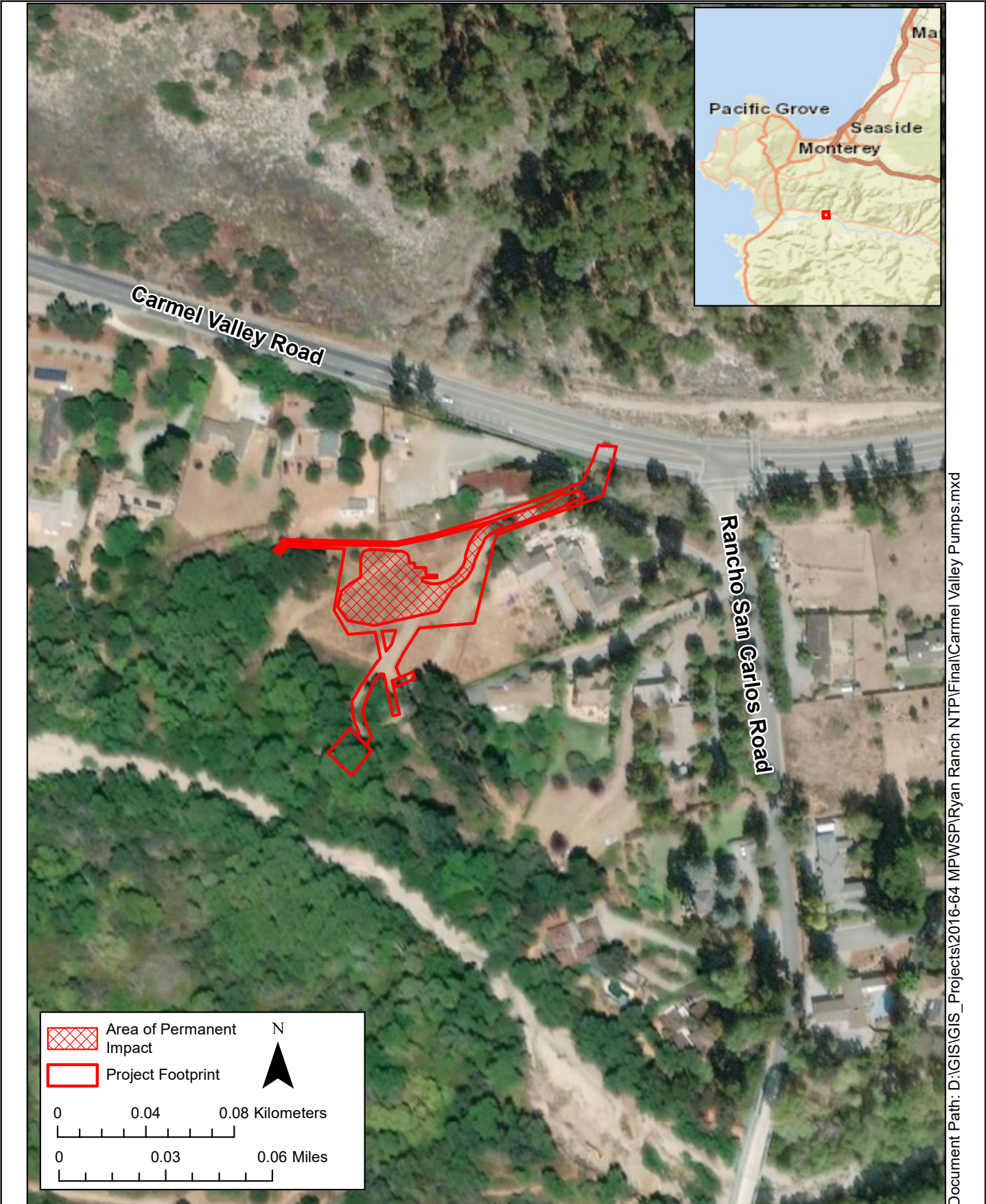
Environmental Consultants Resource Planners

947 Cass Street, Suite 5
Monterey, CA 93940
(831) 373-4341

Exhibit

B-1

Appendix B-2
Construction Footprint Map



Appendix B-3

Carmel Valley Pump Station Construction Drawings



CALIFORNIA
AMERICAN WATER

CARMEL VALLEY PUMP STATION

26530 RANCHO SAN CARLOS RD, CARMEL, CA

MONTEREY PENINSULA WATER SUPPLY PROJECT (MPWSP)

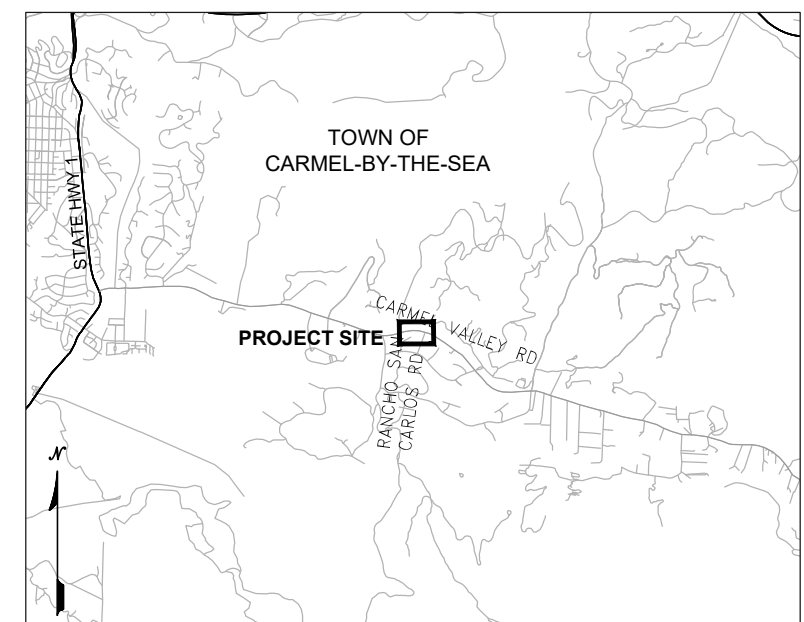
GENERAL	
SHEET NO.	TITLE
GO0	COVER SHEET
GO1	GENERAL NOTES

CIVIL	
SHEET NO.	TITLE
C01	GENERAL CIVIL NOTES
C02	SITE PLAN
C03	GRADING PLAN
C03.1	GRADING SECTIONS
C04	PIPING PLAN AND PROFILE
C05	CIVIL DETAILS (1 OF 2)
C06	CIVIL DETAILS (2 OF 2)
C07	DEMOLITION PLAN

STRUCTURAL	
SHEET NO.	TITLE
S01	GENERAL STRUCTURAL NOTES
S02	FOUNDATION AND ROOF FRAMING PLAN
S03	ELEVATIONS
S04	DETAILS AND SECTIONS (1 OF 2)
S05	DETAILS AND SECTIONS (2 OF 2)

MECHANICAL	
SHEET NO.	TITLE
M01	GENERAL MECHANICAL NOTES
M01.1	SYSTEM HYDRAULICS
M01.2	SCHEMATIC DIAGRAM
M01.3	VENTILATION SYSTEM SCHEMATIC
M02	LIST OF MATERIALS
M03	PUMP STATION PLAN
M04	PUMP STATION SECTION
M05	ABOVE GRADE BYPASS PIPING PLAN
M06	PLAN & MISC DETAILS
M07	MISC DETAILS
M08	VALVE DETAILS

ELECTRICAL	
SHEET NO.	TITLE
EL01	SYMBOLS AND DRAWING LIST
EL02	ELECTRICAL ABBREVIATIONS
EL03	SITE PLAN
EL04	SINGLE LINE DIAGRAM
EL05	STATION ELECTRICAL PLAN
EL06	PUMP STATION SECTION AND VFD PANEL ELEVATION
EL07	VFD SCHEMATIC WIRING DIAGRAMS
EL08	SCADA CONTROL PANEL ELEVATION
EL09	LIGHTING AND GROUNDING PLAN
EL10	CONDUIT AND GROUNDING DETAILS
EL11	CONDUIT, LUMINAIRE, AND CABLE SCHEDULE
EL12	PLC I/O LIST
I01	INSTRUMENTATION LEGEND AND ABBREVIATIONS
I02	PROCESS INSTRUMENTATION DIAGRAM



100% PROGRESS SET
NOT FOR CONSTRUCTION

AECOM
OCTOBER 2019

I:\Projects\Legacy\IE\CAW_Design\6100_CAD\Pump_Stations\Carmel_Valley_Pump_Station\CAD\SHEETS\G01_GENERAL_NOTES.dwg MeekeF Oct 15, 2019 -- 11:08am

GENERAL NOTES:

1. DIMENSIONS TAKE PRECEDENCE OVER GENERAL NOTES, TYPICAL, DETAILS AND SCALED DETAILS.
2. THE EXISTING UNDERGROUND UTILITIES SHOWN IN PLAN DRAWINGS ARE FOR INFORMATION ONLY. CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF ALL EXISTING UTILITIES. CONTRACTOR SHALL POTHOLE EXISTING PIPELINES TO VERIFY THE HORIZONTAL AND VERTICAL ALIGNMENT PRIOR TO PERFORMING EARTHWORK ADJACENT TO SAID PIPELINES. CONTACT UNDERGROUND SERVICE ALERT (USA) AT (800) 227-2600 PRIOR TO CONSTRUCTION.
3. CALIFORNIA AMERICAN WATER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY AND COMPLETENESS OF UTILITY INFORMATION. THE CONTRACTOR SHALL EXECISE CAUTION WHILE EXCAVATING AND SHALL PROTECT ALL EXISTING SERVICES FROM DAMAGE DUE TO HIS OPERATIONS. SUPPORT EXISTING UTILITIES THAT ARE EXPOSED DUE TO CONSTRUCTION ACTIVITIES.
4. UTILITY LATERALS, SUCH AS WATER, GAS AND SEWER LATERALS, ARE GENERALLY NOT SHOWN. IF THEY ARE DISPLAYED, LOCATIONS ARE APPROXIMATE AND CONTRACTOR SHALL LOCATE AND PROTECT UTILITY LATERALS.
5. A PORTION OF THE SUBJECT PARCEL IS WITHIN THE FLOODWAY OF THE CARMEL RIVER PER THE FLOOD INSURANCE RATE MAP PANEL NO. 06053C 0340G (EFFECTIVE 04/02/2009). BASE FLOOD ELEVATION IS 61± FT.

SURVEY NOTES:

1. ELEVATION ON THESE DRAWINGS ARE BASED ON NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88) AT NATIONAL GEODETIC SURVEY (NGS) BENCHMARK PID GU4116 DESIGNATED 941 3450M TIDAL WITH ELEVATION OF 11.70 FEET.
2. COORDINATES WERE PROCESSED FROM THE PUBLISHED DATUM FOR THE CONTROL STATION (NAD 83(2011) EPOCH 2010.00) TO A MORE CURRENT DATUM (NAD 83(2011) EPOCH 2014.25) USING THE HORIZONTAL TIME-DEPENDANT POSITIONING (HTDP) TOOL PROVIDED BY NGS ON THEIR WEB SITE.
3. BASIS OF BEARING - BEARINGS ARE BASED ON THE MERIDIAN OF THE CALIFORNIA STATE PLAN COORDINATE SYSTEM, ZONE 4, NAD 83 (2011), EPOCH 2014.25. THEY ARE DERIVED FROM NATIONAL GEODETIC SURVEY CONTINUOUSLY OPERATING REFERENCE STATIONS (NGS CORS) DATA PROCESSED USING HORIZONTAL TIME-DEPENDANT POSITIONING (HTDP) FROM NAD 83(2011) EPOCH 2010.00 TO NAD 83 (2011) EPOCH 2014.25.
4. CORS STATIONS UTILIZED WERE ELKHORN SLOUGH (D17526 DESIGNATION - ELKHRNSLGH2005 CORS ARP), SANTA LUCIA (DH3876 DESIGNATION - SANTALUCIACN2004 CORS ARP) AND HOPKINS (DN7560 DESIGNATION - HDPKINSSTNCN2006 CORS ARP).
5. TOPOGRAPHY DATA SOURCE: THE TOPOGRAPHY SHOWN IS A COMPILATION OF AERIAL PHOTOGRAMMETRY PREPARED BY GEOWING AND CONVENTIONAL GROUND SURVEYING PREPARED BY POLARIS CONSULTING IN AUGUST 2015.
6. PROPERTY BOUNDARY INFORMATION SHOWN FOR APN 015-251-030, THE CAL-AM (CALIFORNIA-AMERICAN WATER COMPANY) PROPERTY, WAS COMPILED BY POLARIS CONSULTING BASED ON RECORD DRAWINGS AND FOUND MONUMENTED PROPERTY CORNERS ON AUGUST 2015.
7. IMAGERY SOURCE: AERIAL PHOTOGRAMMETRY PREPARED BY GEOWING (AUGUST 2015) & USGS EARTHSTAR GEOGRAPHICS (MICROSOFT CORPORATION).

ABBREVIATIONS:

AB	AGGREGATE BASE	EX.	EXISTING	OH	OVERHEAD
AC	ASPHALT CONCRETE	FF	FINISH FLOOR	PIV	POST INDICATOR VALVE
APPROX	APPROXIMATELY	FG	FINISH GRADE	PL	PROPERTY LINE
ARV	AIR RELEASE VALVE	FL	FLOW LINE	PRV	PRESSURE REDUCING VALVE
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS	FLG	FLANGE	PS	PUMP STATION
AV & ARV	AIR/VACCUUM & AIR RELEASE VALVE	FT	FOOT OR FEET	PSI	POUNDS PER SQUARE INCH
BM	BENCH MARK	G	GAS	PVC	POLYVINYL CHLORIDE
BO	BLOW OFF	GALV	GALVANIZED	PVMT	PAVEMENT
BV	BUTTERFLY VALVE	GPM	GALLONS PER MINUTE	R/W	RIGHT OF WAY
CAW	CALIFORNIA AMERICAN WATER	GRD	GRADE	S =	SLOPE EQUALS
C/L	CENTERLINE	GRND	GROUND	SD	STORM DRAIN
CLR	CLEARANCE	GV	GATE VALVE	SPECS	SPECIFICATIONS
CON	CONDUIT	HWL	HIGH WATER LEVEL	SS	SANITARY SEWER
CONC	CONCRETE	ID	INSIDE DIAMETER	STA	STATION
CU	CUBIC	IN	INCH OR INCHES	STD	STANDARD
CVPS	CARMEL VALLEY PUMP STATION	INV	INVERT ELEVATION	TDH	TOTAL DYNAMIC HEAD
DI	DUCTILE IRON	LF	LINEAL FEET	TELE	TELEPHONE, COMMUNICATION
DIA, Ø	DIAMETER	LWL	LOW WATER LEVEL	TEMP	TEMPORARY
DWG	DRAWING	MAX	MAXIMUM	TYP	TYPICAL
E	ELECTRIC	MJ	MECHANICAL JOINT	UTIL	UTILITY
EA	EACH	MH	MANHOLE	V, VERT	VERTICAL
ECP	EROSION CONTROL PLAN	MIN	MINIMUM	VIF	VERIFY IN FIELD
EGL	ENERGY GRADE LINE	N	NORTH	W	WATER
EL	ELEVATION	(N)	NEW	WW	WATER VALVE
EOP	EDGE OF PAVEMENT	NIC	NOT INCLUDED IN CONTRACT		
EW	EACH WAY	NTS	NOT TO SCALE		
		OC	ON CENTER		
		OD	OUTSIDE DIAMETER		
		OG	ORIGINAL GROUND		

UTILITY CONTACTS FOR PROJECT AREA					
AGENCY	TYPE	CONTACT	TITLE	PHONE	EMAIL
AT&T	COMMUNICATIONS	JANICE COMASKEY	ADMIN MANAGER CONSTRUCTION & ENGINNERING	(408) 635-8781	jc4363@att.com
CALIFORNIA AMERICAN WATER	WATER	DONALD MONETTE	ASSISTANT ENGINEERING MANAGER	(831) 646-3290	donald.monette@camwater.com
COMCAST	COMMUNICATIONS	MARK ROSE	CABLE CONTRACTOR	(831) 633-2392	mark.rose@cablecomllc.net
COUNTY OF MONTEREY	SEWER AND STORM DRAIN	CHAD ALINIO	CIVIL ENGINEER	(831) 755-4937	alinioacs@co.monterey.ca.us
PG&E	GAS AND ELECTRIC	KATRINA LOPEZ		(831) 784-3581	k1hc@pge.com
MONTEREY PENINSULA WATER MANAGEMENT OFFICE	WATER	JOE OLIVER	WATER RESOURCES MANAGER	(831) 658-5600	joe@mpwmd.dst.ca.us
MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY	SEWER AND RECYCLED WATER	JENNIFER GONZALES	ENGINEERING MANAGER	(831) 883-6172	jennifer@mrwpca.com

100% PROGRESS SET
NOT FOR CONSTRUCTION

REVISIONS	CARMEL VALLEY PUMP STATION	
	GENERAL NOTES	
	CALIFORNIA AMERICAN WATER	
	AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612 CALIFORNIA AMERICAN WATER DRAWN BY L.TAM PROJECT ENG'R L.TAM APPROVED C. SMITH DATE: SEPTEMBER 2018 PROJECT 60424498 USE DIMENSIONS ONLY SCALE AS SHOWN	
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES		G01

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CIVIL ON-SITE IMPROVEMENTS:

SITE LAYOUT:

1. SPECIAL REQUIREMENTS

INSPECTION AND CERTIFICATION: THE CONTRACTOR SHALL INSPECT GRADES AT THE COMPLETION OF EACH GRADING OPERATION TO INSURE THAT GRADES ARE AS SHOWN AND ARE WITHIN THE SPECIFIED TOLERANCES. AT THE COMPLETION OF THE WORK OF THE CONTRACT THE CONTRACTOR SHALL CERTIFY THAT THE GRADING AND LAYOUT WORK COMPLIES WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

EXCAVATING, GRADING AND FILLING:

1. SPECIAL REQUIREMENTS

SITE CONDITIONS: A SOILS INVESTIGATION REPORT PREPARED BY THE DESIGN BUILD ENTITY. THE DESIGN BUILD ENTITY IS PRESUMED TO HAVE VISITED THE SITE AND TO HAVE FAMILIARIZED HIMSELF WITH THE EXISTING SITE CONDITIONS AND THE CONTENTS OF THE SOILS INVESTIGATION REPORT. NO ALLOWANCE WILL BE MADE FOR ANY UNFAVORABLE CONDITIONS OR EVENT WHICH MIGHT HAVE BEEN FORESEEN FROM A THOROUGH EXAMINATION OF THE SITE AND/OR SOILS REPORT OF THE WORKING CONDITIONS. NO RESPONSIBILITY IS ASSUMED FOR THE CONDITIONS OF THE SITE OTHER THAN AT THE TIME OF THE INVESTIGATION AS SHOWN IN THE REPORT. THE CONTRACTOR SHALL ACCEPT THE SITE IN ITS PRESENT CONDITION.

PROTECTION: COMPLY WITH ALL APPLICABLE SAFETY REGULATIONS IN FORCE AT PLACE OF BUILDING. PROTECT ALL STRUCTURES, IMPROVEMENTS, LANDSCAPING, FENCES, OF THIS AND ADJOINING AREAS EXERCISING UTMOST CARE DURING OPERATIONS OF THIS SCOPE OF WORK. DAMAGE DONE SHALL BE RECTIFIED AT THE CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER, OWNER'S REPRESENTATIVE, AND AUTHORITIES HAVING JURISDICTION. MAINTAIN SAFE PEDESTRIAN AND VEHICULAR TRAFFIC.

DUST CONTROL: THE CONTRACTOR SHALL DAMPEN THE AREA OF GRADING AND TAKE OTHER MEASURES AS REQUIRED TO PREVENT RAISING OF DUST AND TRANSPORTATION OF SAME INTO BUILDING AND ONTO ADJACENT PROPERTIES DURING GRADING OPERATIONS. ADDITIONALLY, THE CONTRACTOR SHALL BE REQUIRED TO COMPLY WITH ANY DUST CONTROL ORDINANCE IN FORCE AT THE PLACE OF WORK.

DRAINAGE: THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING DRAINAGE DURING PROGRESS OF WORK TO PREVENT WATER FROM ACCUMULATING ON THE SITE OR FROM RUNNING ONTO ADJACENT PROPERTY, PROVIDING NECESSARY TEMPORARY DRAINAGE AS REQUIRED TO PREVENT THE SAME. KEEP EXCAVATIONS FREE FROM WATER PROVIDING PUMPS OR DIVERSION CHANNELS AS REQUIRED.

UNUSUAL CONDITIONS: NO WORK SHALL BE DONE IN EXCESSIVELY COLD, WET OR OTHERWISE UNFAVORABLE WEATHER. NOR SHALL WORK BE DONE OVER SOFT, SPONGY, OR EXCESSIVELY ROCKY AREAS WITHOUT FURTHER INSTRUCTIONS.

EXISTING UTILITIES: WHERE EXISTING UTILITIES NOT SHOWN ON THE DRAWING ARE ENCOUNTERED, SUPPORT, SHORE UP, PROTECT THEM AND IMMEDIATELY NOTIFY THE ENGINEER. ALLOW ENTRANCE OPPORTUNITY AND AMPLE TIME FOR CONTINUANCE AND/OR RELOCATION OF SUCH SERVICES. NO ALLOWANCE WILL BE MADE FOR ANY DOWN TIME AS THE RESULT OF A STOPPAGE OF WORK FOR A UTILITY RELOCATION OR A REROUTING OF A PROPOSED UTILITY.

2. MATERIALS

FILL MATERIALS: ALL FILL MATERIAL MUST COMPLY WITH THE REQUIREMENTS OF THE SOILS REPORT. MATERIALS SHALL BE A SOIL OR ROCK MIXTURE FREE FROM ORGANIC MATTER OR OTHER DELETERIOUS SUBSTANCES MEETING SOILS REPORT REQUIREMENTS.

3. EXECUTION

GENERAL: THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SATISFACTORY COMPLETION OF ALL EARTHWORK IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SOIL REPORT.

SITE CLEARING AND GRUBBING: REMOVE AND DISPOSE OFF SITE ALL WEEDS, BUSHES (INCLUDING ROOT BALLS), GARBAGE, CONCRETE AND ASPHALT RUBBLE AS WELL AS ANY OTHER DEBRIS AND DELETERIOUS OBSTRUCTIONS DUG UP DURING EARTHWORK OPERATIONS. SEE SOILS REPORT.

STRIPPING: AFTER CLEARING, THE SITE SHALL BE STRIPPED TO A DEPTH AS REQUIRED IN THE SOILS REPORT TO REMOVE SURFACE VEGETATION AND ORGANIC LADEN TOP SOIL. A SUFFICIENT AMOUNT OF MATERIAL SHALL BE STOCKPILED FOR LATER USE AS TOPSOIL. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SELECTION OF THE STOCKPILE LOCATION. THE RESULTANT EXCESS MATERIAL SHALL BE DISPOSED OF OFF-SITE BY THE CONTRACTOR.

ROUGH GRADING: BRING ALL AREAS TO PROPER GRADE WITH APPROPRIATE ALLOWANCES FOR FINISH MATERIALS AND FINISH ELEVATIONS.

PREPARATION AND FILL: SEE SOILS REPORT FOR FILL PREPARATION REQUIREMENTS (NOTE KEYWAYS AND BENCHES AS REQUIRED).

FINAL GRADES: THE FINISH APPEARANCE OF ALL GRADING WORK SHALL BE TRIM, NEAT, FREE OF HOLLOWES OR HUMMOCKS AND CLOUDS GREATER THAT 1-1/2" IN ANY DIRECTION. FINAL GRADE TOLERANCES AS FOLLOWS:

- BUILDING PAD, CONCRETE PAVING AREAS: ±0.04 FEET.
- GENERAL SITE GRADES: ±0.05 FEET.

THE FINAL GRADE AT BUILDING PAD AND CONCRETE PAVING SHALL BE MADE JUST PRIOR TO THE INSTALLATION OF PAVING MATERIALS. IT IS THE INTENT OF THE FINISH GRADING AT ALL EXTERIOR LOCATIONS ADJACENT TO TO THE BUILDING AND AT ALL EXTERIOR CONCRETE AND PAVING AREAS TO DIRECT THE SURFACE WATER AWAY FROM THE BUILDING AND TOWARD THE DISCHARGE FACILITIES SHOWN ON THE DRAWINGS. IF THE CONTRACTOR OBSERVES THAT THE

FINAL GRADING WILL NOT ACHIEVE THIS RESULT HE SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL NOT PROCEED WITH THIS WORK UNTIL SO DIRECTED BY THE ENGINEER. THE FINAL GRADING PERFORMED UNDER THIS SECTION OF THE SPECIFICATIONS WITHIN AREAS TO RECEIVE LANDSCAPING SHALL ALLOW FOR A MINIMUM OF 6" OF TOPSOIL MATERIAL. TOPSOIL PLACEMENT AND LANDSCAPE MOUNDING SHALL BE PERFORMED BY THE GRADING CONTRACTOR IN COORDINATION WITH THE LANDSCAPE CONTRACTOR.

WATER SERVICE:

1. SPECIAL REQUIREMENTS

REGULATIONS: ANY AND ALL WORK FALLING WITHIN PUBLIC PROPERTY SHALL MEET THE REQUIREMENTS OF THE GOVERNING PUBLIC AGENCY HAVING JURISDICTION OVER THIS PROPERTY. MATERIALS AND INSTALLATION METHODS DESCRIBED HEREIN SHALL BE MODIFIED TO COMPLY WITH THESE REQUIREMENTS.

CONNECTION TO EXISTING WATER MAINS: PRIOR TO LAYING ANY PIPE, THE CONTRACTOR SHALL VERIFY THE ELEVATIONS OF THE WATER MAIN TO WHICH PIPES INSTALLED ARE TO CONNECT AND THE EXISTING UTILITIES TO WHICH PIPES INSTALLED ARE TO CROSS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO INSTALL WATER SERVICES SHOWN ON THE DRAWINGS REGARDLESS OF WHETHER OR NOT EXISTING INVERT ELEVATIONS SHOWN ARE CORRECT. IF CONFLICTS DO EXIST, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY AND SHALL NOT PROCEED WITH WORK UNTIL INSTRUCTIONS ARE RECEIVED. THE CONTRACTOR SHALL ALLOW AMPLE TIME FOR RESOLUTION OF CONFLICTS.

ASPHALT CONCRETE:

1. SPECIAL REQUIREMENTS

REFERENCE DOCUMENTS: ALL REFERENCES CONTAINED HEREIN ARE MADE TO "STANDARD SPECIFICATIONS, STATE OF CALIFORNIA, BUSINESS AND TRANSPORTATION AGENCY, DEPARTMENT OF TRANSPORTATION" LATEST EDITION.

PROTECTION: THIS CONTRACTOR SHALL PROVIDE NECESSARY SAFETY DEVICES IN ORDER THAT THIS WORK SHALL NOT BE A HAZARD AND TAKE ALL NECESSARY PRECAUTIONS TO MAINTAIN SAFE PEDESTRIAN AND VEHICULAR TRAFFIC. WORK DAMAGED OR REMOVED DUE TO WORK OF THE CONTRACTOR SHALL BE REPAIRED AND REPLACED BY THE CONTRACTOR IN AN APPROVED MANNER AND AT NO EXTRA COST TO THE OWNER.

2. MATERIALS

AGGREGATE BASE: SHALL BE CLASS II AGGREGATE BASE SECTION 26, STANDARD SPECIFICATION.

ASPHALTIC CONCRETE: SHALL BE IN ACCORDANCE WITH SECTION 39, STANDARD SPECIFICATIONS, AND SHALL BE TYPE B ASPHALT CONCRETE USING AR4000 PAVING ASPHALT.

SEAL COAT: ASPHALT FOG SEAL, SS-1 ASPHALT EMULSION.

3. APPLICATION

SUBGRADE: SUBGRADE SURFACE SHALL BE FINE-GRADED WITH APPROPRIATE ALLOWANCE FOR FINISH MATERIAL WITH TOLERANCE OF ±.05'.

AGGREGATE BASE: AGGREGATE BASE SHALL BE SPREAD AND COMPACTED IN ACCORDANCE WITH SECTION 26 EXCEPT THAT BLADE MIXING WILL BE ALLOWED AT THE JOB SITE.

PAINT BINDER: APPLY SPECIFIED ASPHALT EMULSION TO VERTICAL SURFACES OF CONSTRUCTION JOINTS, PORTLAND CEMENT CURBS, GUTTERS AND SIMILAR CONSTRUCTION WHICH ABUT ASPHALTIC CONCRETES. APPLICATION SHALL BE APPROXIMATELY 0.10 GALLONS PER SQUARE YARD OF SURFACE.

ASPHALTIC CONCRETE: SPREAD AND COMPACT IN ACCORDANCE WITH SECTION 39, STANDARD SPECIFICATIONS.

SURFACE SMOOTHNESS: THE SURFACE OF ASPHALTIC CONCRETE, AFTER ROLLING, SHALL BE EVEN AND SMOOTH, SHALL HAVE A UNIFORM TEXTURE WITH NO VOIDS, ROCK POCKETS, OR RAVELING, SHALL BE FREE OF ROLLER MARKS OR OTHER IRREGULARITIES, AND SHALL VARY NOT MORE THAN 1/4" FROM A 10' - 0" STRAIGHT EDGE PLACED IN ANY DIRECTION ON THE SURFACE. PAVING SHALL BE EVEN WITH OR SLIGHTLY BELOW TOP OF ADJACENT CONCRETE SLABS AND SET 1/4" ABOVE CONCRETE GUTTERS.

DRAINAGE: IT IS THE INTENT THAT SURFACE WATER DRAIN AWAY FROM BUILDINGS AND TOWARD DRAINAGE STRUCTURES. FLOOD FINISHED SURFACE WITH WATER TO DETERMINE ADEQUACY OF SURFACE DRAINAGE. INADEQUATE DRAINAGE DUE TO FAULTY PAVING WILL BE CORRECTED TO THE ENGINEER'S SATISFACTION.

SEAL COAT: THE FINISHED SURFACE SHALL BE FOG SEALED WITH SEALER NO SOONER THAN 24 HOURS AFTER PAVEMENT IS LAID. APPLY SEALER AT THE RATE OF 0.05 TO 0.10 GALLONS PER SQUARE YARD.

4. CLEAN-UP: BEFORE THE FINAL INSPECTION OF THE WORK, THE CONTRACTOR SHALL CLEAN THE SURFACED AREAS OF ALL RUBBISH, EXCESS MATERIAL AND EQUIPMENT. ALL PARTS OF THE WORK SHALL BE LEFT IN A NEAT AND PRESENTABLE CONDITION. CLEAN STAINS AND SPATTERING FROM ADJACENT SURFACES.

CONCRETE CURB AND GUTTER:

1. MATERIALS

CONCRETE, SIDEWALKS, CURBS AND GUTTERS: CONCRETE CURB AND GUTTER, VERTICAL CURB, AND SIDEWALKS SHALL CONFORM WITH THE COUNTY OF MONTEREY SPECIFICATIONS WITH THE FOLLOWING ADDITIONS. ALL CURB AND GUTTER SHALL BE CONSTRUCTED AT DIMENSIONS AND MODIFIED CROSS SLOPE AS SHOWN ON THE PLANS.

2. INSTALLATION

THE INSTALLATION SHALL CONFORM WITH THE CONTRACT SPECIFICATIONS.

3. CLEAN-UP: CLEAN UP ALL DEBRIS RESULTING FROM THIS SCOPE OF WORK.

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REVISIONS

CARMEL VALLEY
PUMP STATION
CIVIL
GENERAL CIVIL NOTES

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE, SUITE 400
OAKLAND, CALIFORNIA 94612

AECOM



DRAWN BY E. MEEKS
PROJECT ENG'R J. HYMAN
APPROVED C. SMITH

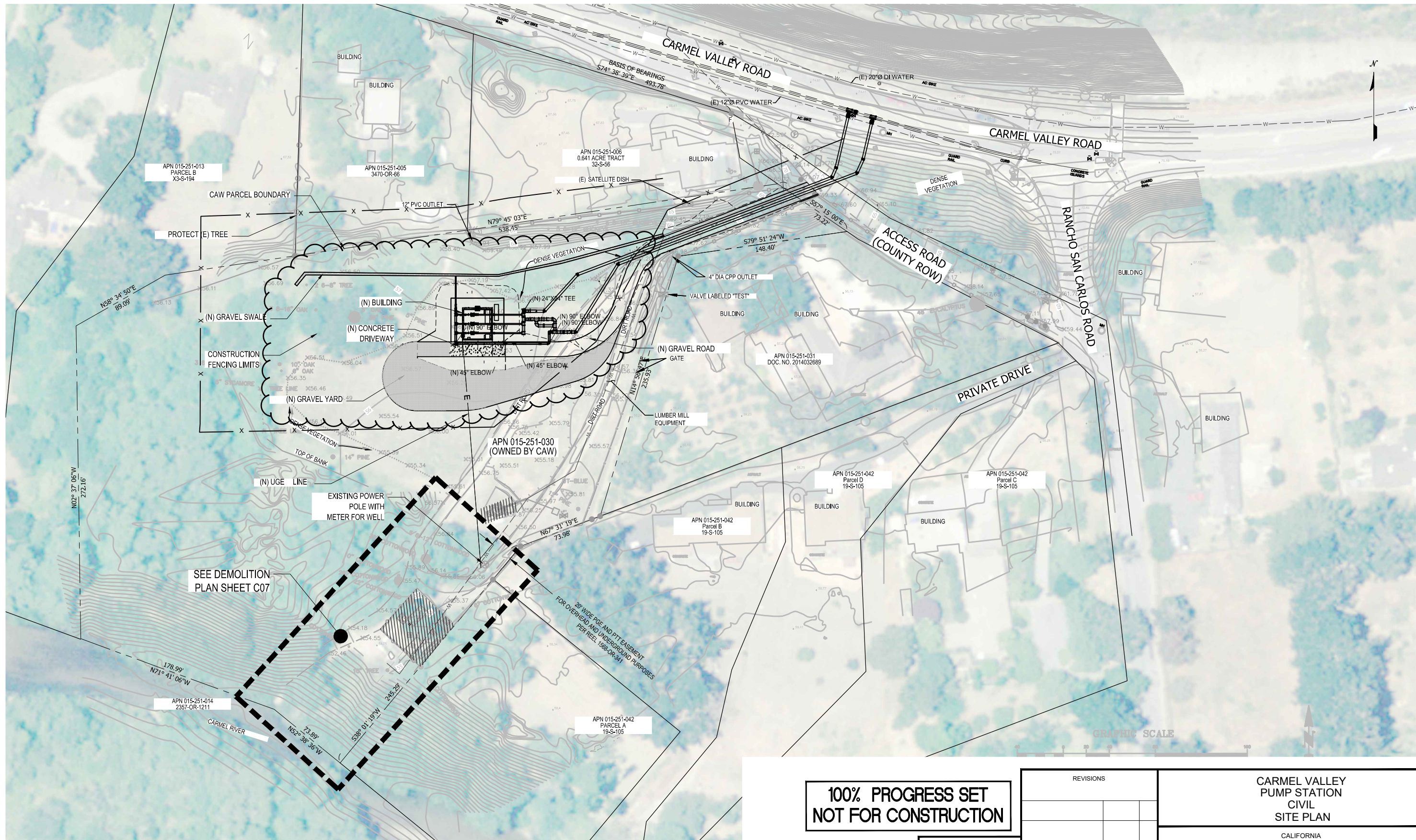
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PROJECT 60424498

USE DIMENSIONS ONLY
SCALE AS SHOWN

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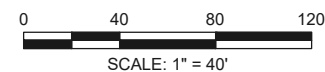
I:\Projects\Legacy\IE\CAW_Design\26818629\6000_Design\6100_CAD\Pump Stations\Carmel Valley Pump Station\CAD\Sheets\C02 SITE PLAN.dwg MeeksF Oct 15, 2019 - 2:03pm



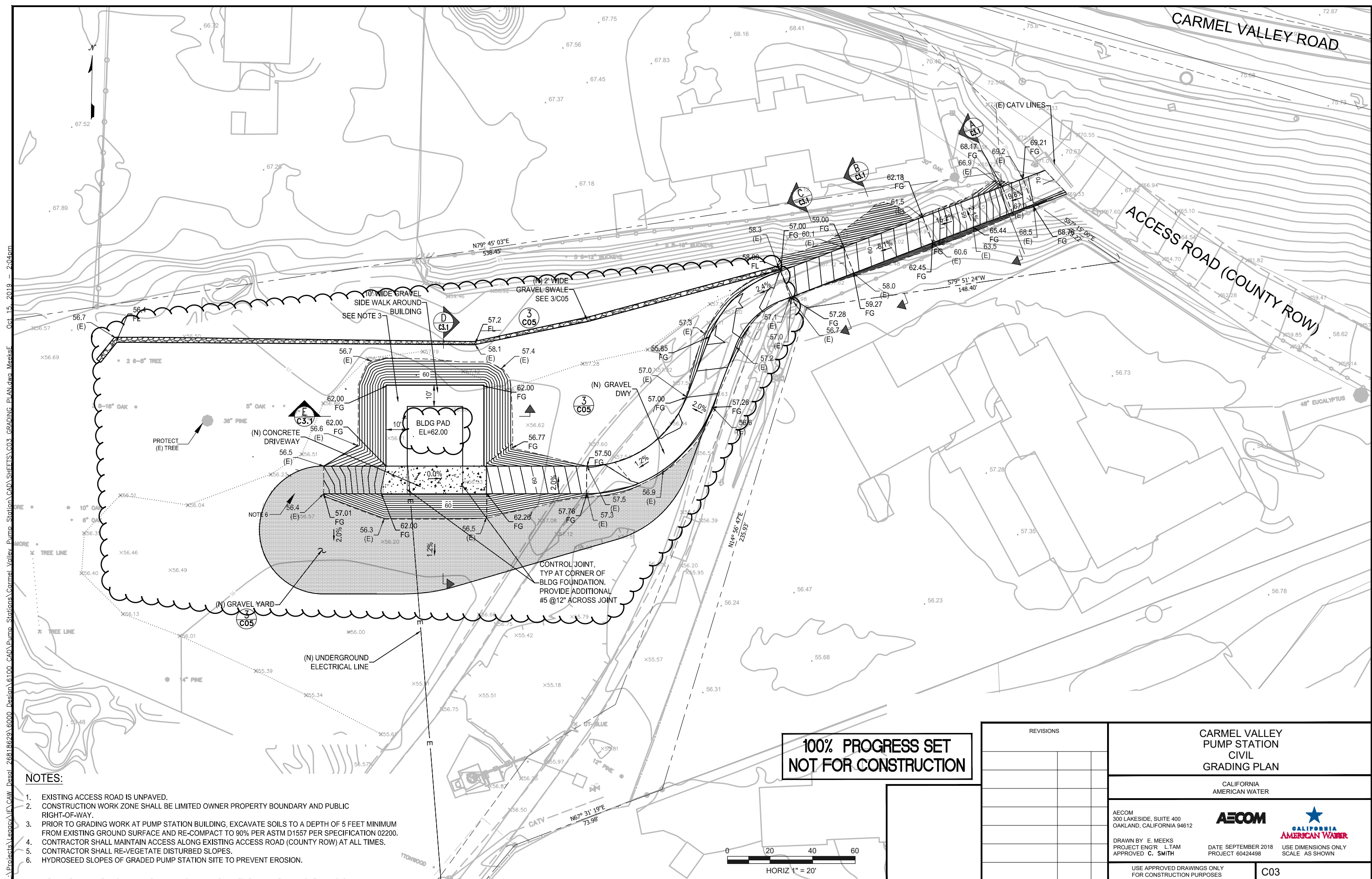
PROPERTY SETBACKS	
FRONT	316 FEET
SIDE	58 FEET
REAR	350 FEET
CARMEL VALLEY ROAD	270 FEET

SITE PLAN
1"=40'

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REVISIONS		CARMEL VALLEY PUMP STATION CIVIL SITE PLAN	
		CALIFORNIA AMERICAN WATER	
		AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612	
		DRAWN BY E. MECKS PROJECT ENG'R L. TAM APPROVED C. SMITH	
		DATE: SEPTEMBER 2018 PROJECT 60489016	
		USE DIMENSIONS ONLY SCALE AS SHOWN	
		USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
		C02	



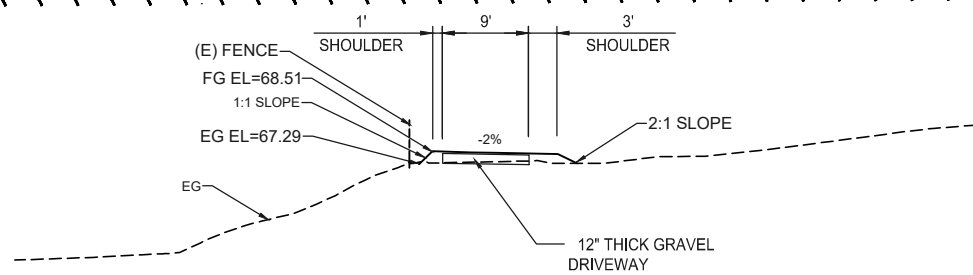
NOTES:

1. EXISTING ACCESS ROAD IS UNPAVED.
2. CONSTRUCTION WORK ZONE SHALL BE LIMITED OWNER PROPERTY BOUNDARY AND PUBLIC RIGHT-OF-WAY.
3. PRIOR TO GRADING WORK AT PUMP STATION BUILDING, EXCAVATE SOILS TO A DEPTH OF 5 FEET MINIMUM FROM EXISTING GROUND SURFACE AND RE-COMPACT TO 90% PER ASTM D1557 PER SPECIFICATION 02200.
4. CONTRACTOR SHALL MAINTAIN ACCESS ALONG EXISTING ACCESS ROAD (COUNTY ROW) AT ALL TIMES.
5. CONTRACTOR SHALL RE-VEGETATE DISTURBED SLOPES.
6. HYDROSEED SLOPES OF GRADED PUMP STATION SITE TO PREVENT EROSION.

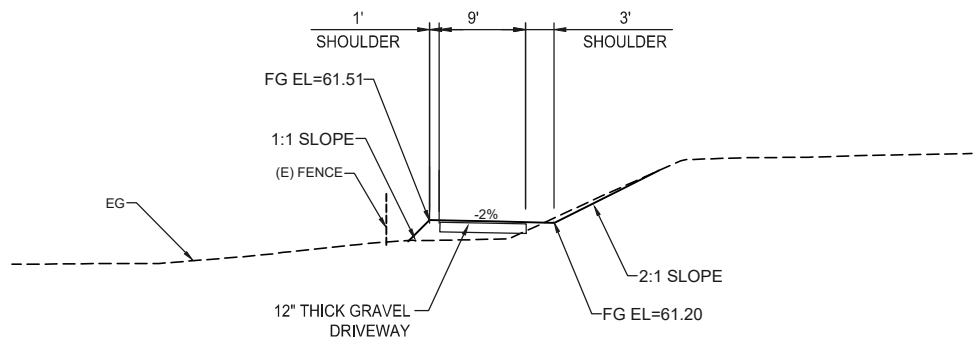
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NOT FOR CONSTRUCTION

REVISIONS			CARMEL VALLEY PUMP STATION CIVIL GRADING PLAN CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612   DRAWN BY: E. MEEKS PROJECT ENGR: LTAM APPROVED: C. SMITH DATE: SEPTEMBER 2018 PROJECT 60424498 USE DIMENSIONS ONLY SCALE: AS SHOWN	
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	C03

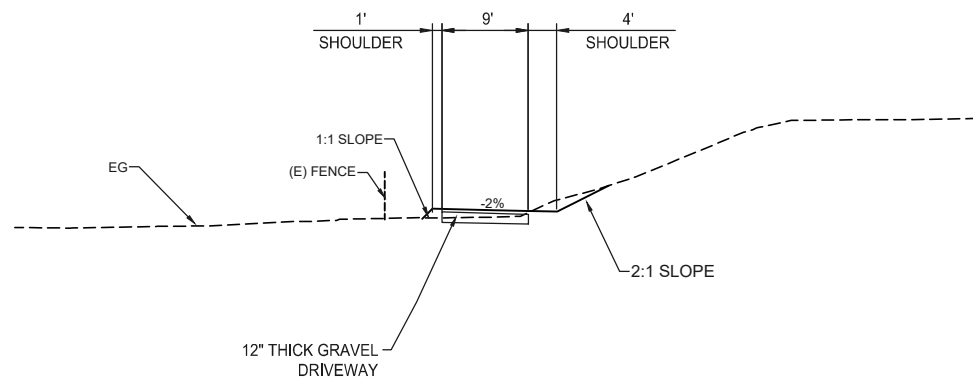
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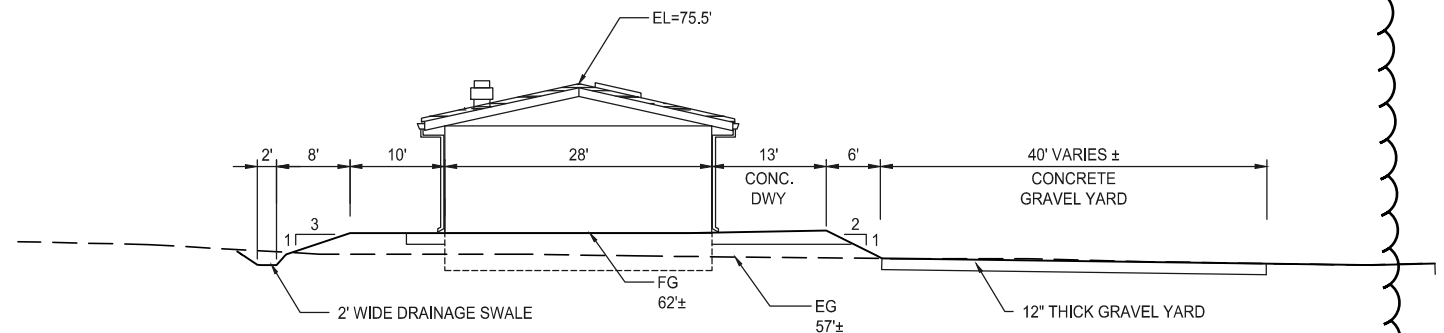
DRIVEWAY SECTION A
SCALE: 1"=10'



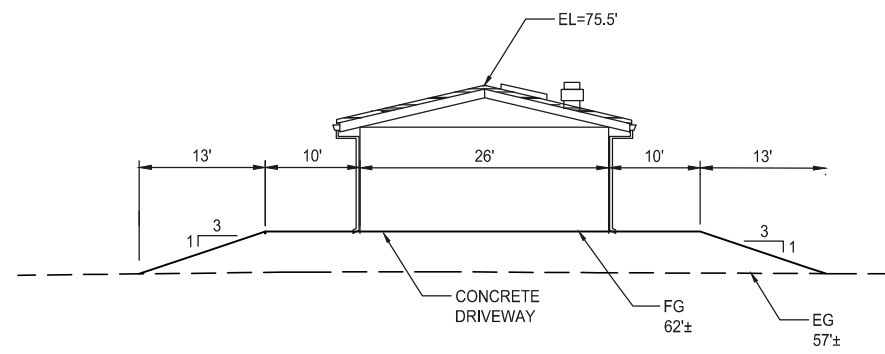
DRIVEWAY SECTION B
SCALE: 1"=10'



DRIVEWAY SECTION C
SCALE: 1"=10'

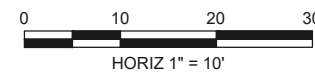


PUMP STATION PAD SECTION D
SCALE: 1"=10'



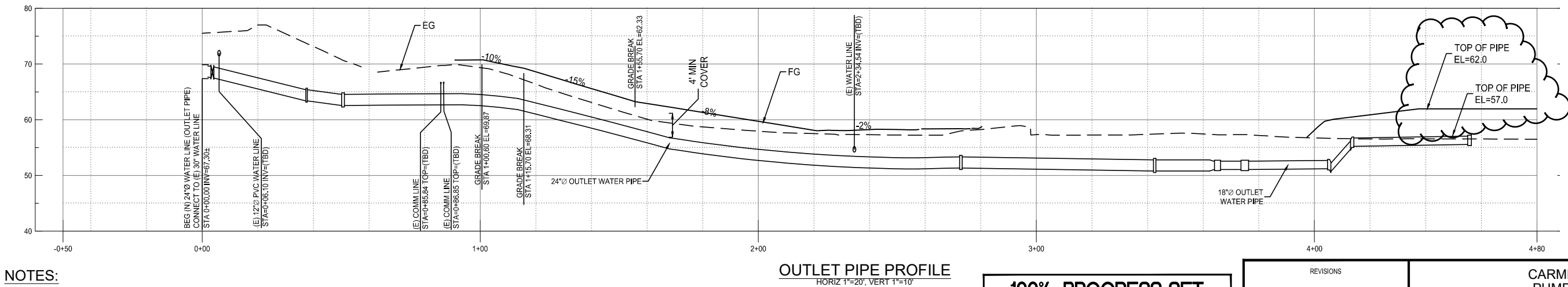
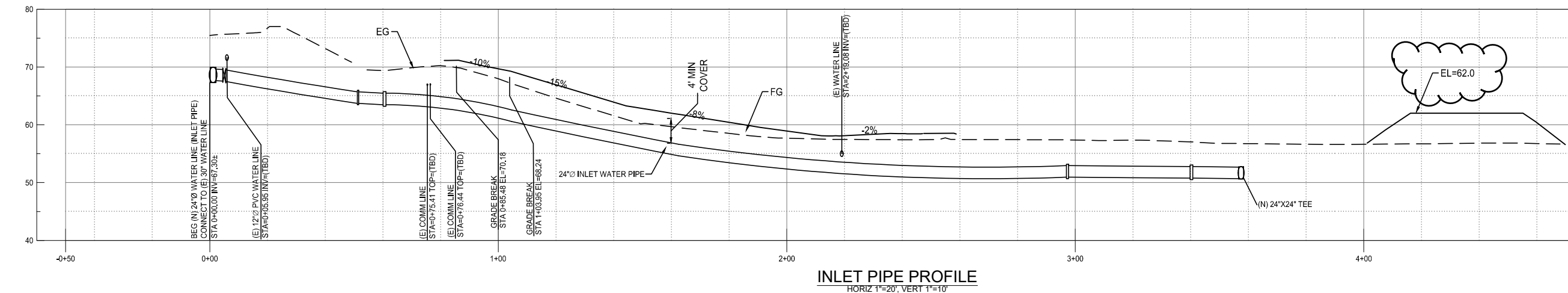
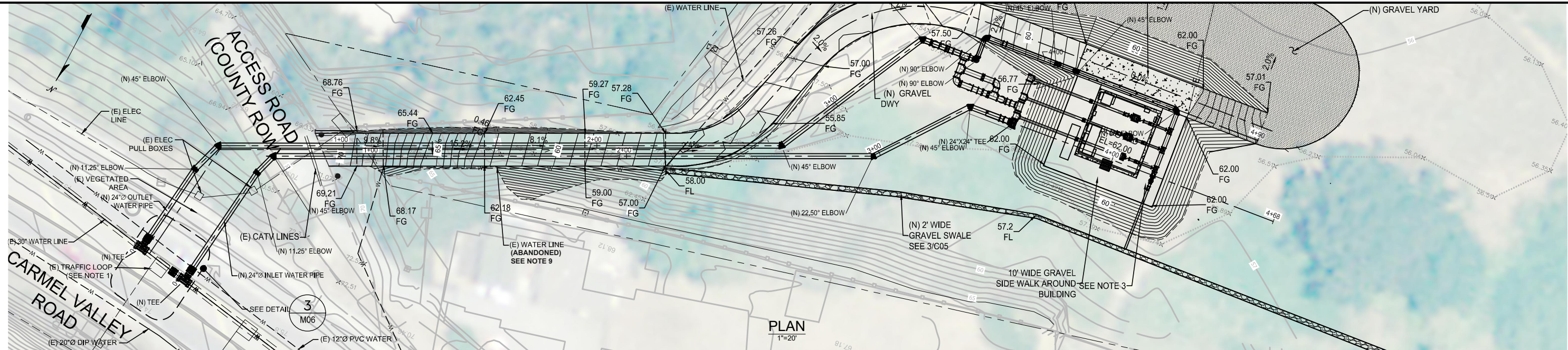
PUMP STATION PAD SECTION E
SCALE: 1"=10'

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REVISIONS			CARMEL VALLEY PUMP STATION CIVIL GRADING DETAILS	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612	 
			DRAWN BY E. MEEKS PROJECT ENG'R L.TAM APPROVED C. SMITH	DATE: SEPTEMBER 2018 PROJECT 60424498 USE DIMENSIONS ONLY SCALE AS SHOWN
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
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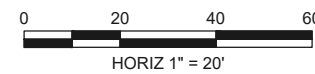
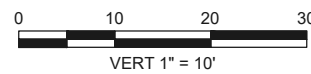
I:\Projects\Legacy\JEA\CAW_Design\6100_CAD\Pump Stations\Carmel Valley Pump Station\CAD\SHEETS\C04 UTILITY PLAN & PROFILE.dwg Meeksf Oct 15, 2019 10:46am



NOTES:

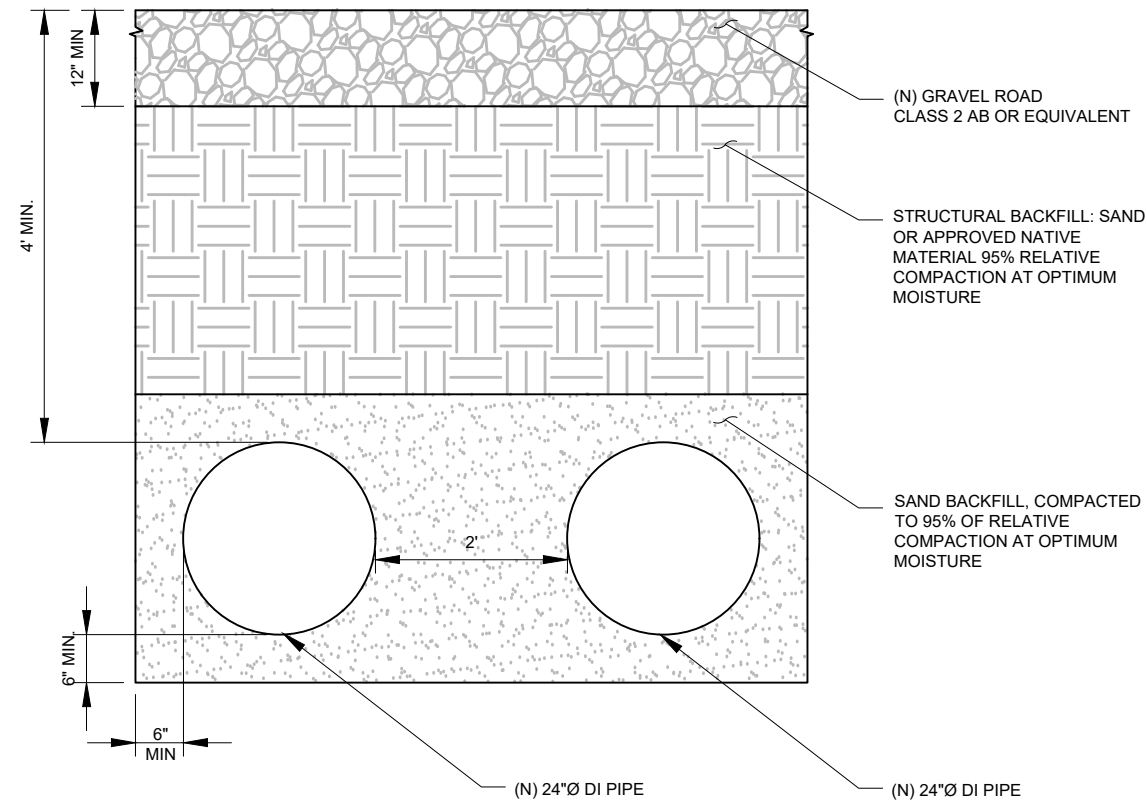
1. PROTECT (E) TRAFFIC LOOP IN PLACE. LOOPS SHALL BE REPLACED PER COUNTY OF MONTEREY STANDARDS IF DAMAGED.
2. COORDINATE TIE IN TO EXISTING 30" AND SHUTDOWN WITH CAW.
3. COORDINATE TRAFFIC CONTROL ON CARMEL VALLEY ROAD WITH COUNTY OF MONTEREY PUBLIC WORKS FOR TIE-IN AND PIPING INSTALLATION.
4. RESTORE PAVEMENT, STRIPING AND MARKINGS ON CARMEL VALLEY ROAD TO EXISTING CONDITIONS PER COUNTY OF MONTEREY STANDARDS.
5. CONTRACTOR SHALL MAINTAIN ACCESS ALONG COUNTY ROW AT ALL TIMES.
6. REVEGETATE SLOPE ALONG PIPELINE ALIGNMENT NEXT TO CARMEL VALLEY ROAD.
7. POT HOLE AND FIELD VERIFY DIMENSIONS, LOCATION AND MATERIAL OF (E) 12" WATER AND (E) 30" WATER PRIOR TO PURCHASE/FABRICATION OF MATERIALS.
8. MAINTAIN MINIMUM 1' VERTICAL CLEARANCE FOR CROSSING EXISTING UTILITIES.
9. DEMO AND REMOVE (E) WATER LINE AS NEEDED TO INSTALL (N) PIPING. CAP ENDS OF DEMO'ED PIPE.

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NOT FOR CONSTRUCTION



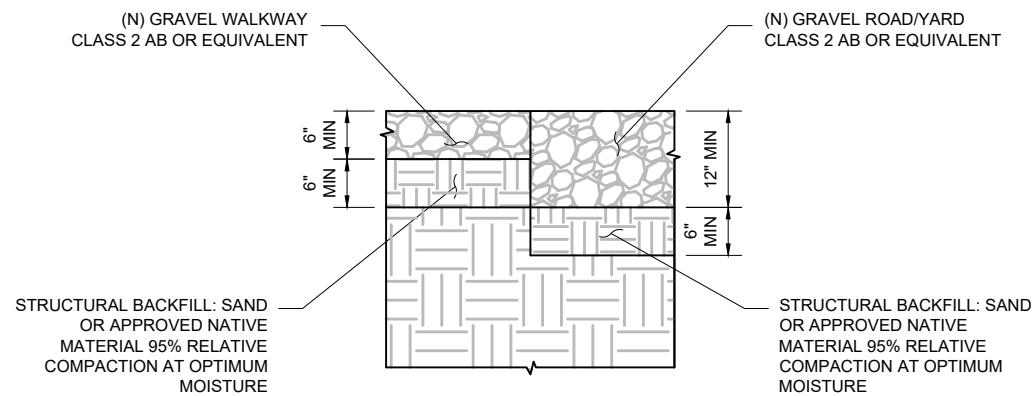
REVISIONS		CARMEL VALLEY PUMP STATION CIVIL PIPING PLAN AND PROFILES	
		CALIFORNIA AMERICAN WATER	
		AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612	
		DRAWN BY E. MEEKS PROJECT ENGR L.TAM APPROVED C. SMITH	
		DATE: SEPTEMBER 2018 PROJECT 60424498	
		USE DIMENSIONS ONLY SCALE AS SHOWN	
		USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
		C04	

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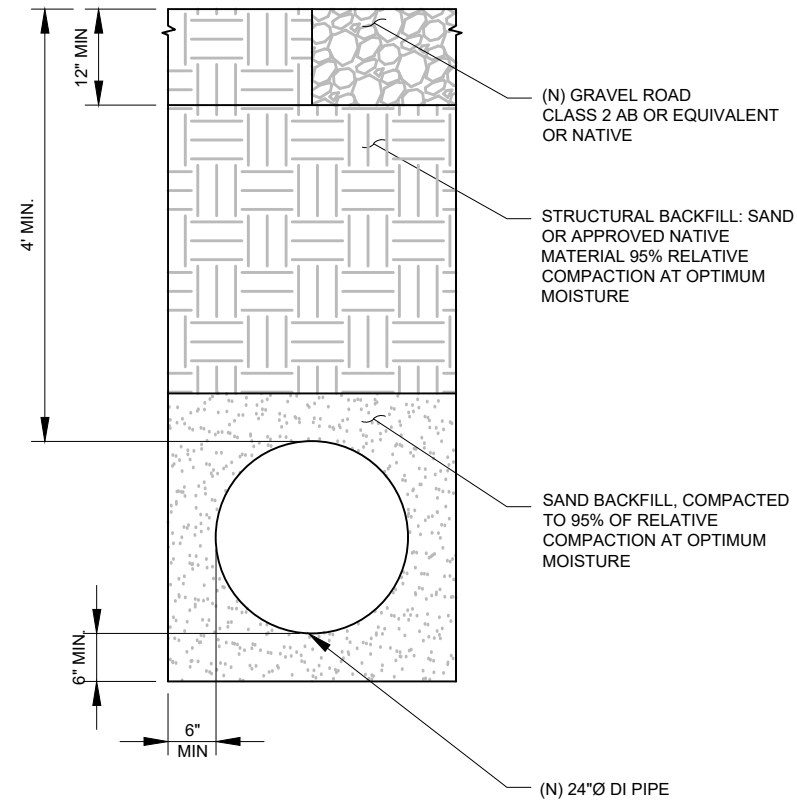
PARALLEL PIPE TRENCH DETAILS
SCALE: NTS

1
-



GRAVEL ROAD/YARD AND WALKWAY DETAIL
SCALE: NTS

3
-



SINGLE PIPE TRENCH DETAILS
SCALE: NTS

2
-

NOTES:

- ALL (N) PIPES SHALL BE INSTALLED WITH 10 GA. STRANDED COATED TRACER WIRE DUCT APED TO THE TOP-CENTER OF PIPE AT 10-FT INTERVALS.
- ALL WATER PIPES SHALL HAVE PLASTIC WARNING TAPE MARKED "WATER" INSTALLED AT TOP OF PIPE ZONE.

100% PROGRESS SET
NOT FOR CONSTRUCTION

0 2 4 6
SCALE: 1" = 2'-0"

REVISIONS

CARMEL VALLEY
PUMP STATION

CIVIL DETAILS

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR., SUITE 400
OAKLAND, CALIFORNIA 94612

AECOM



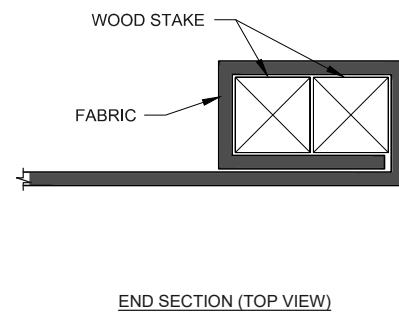
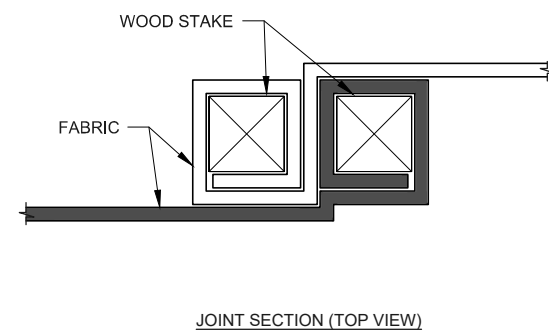
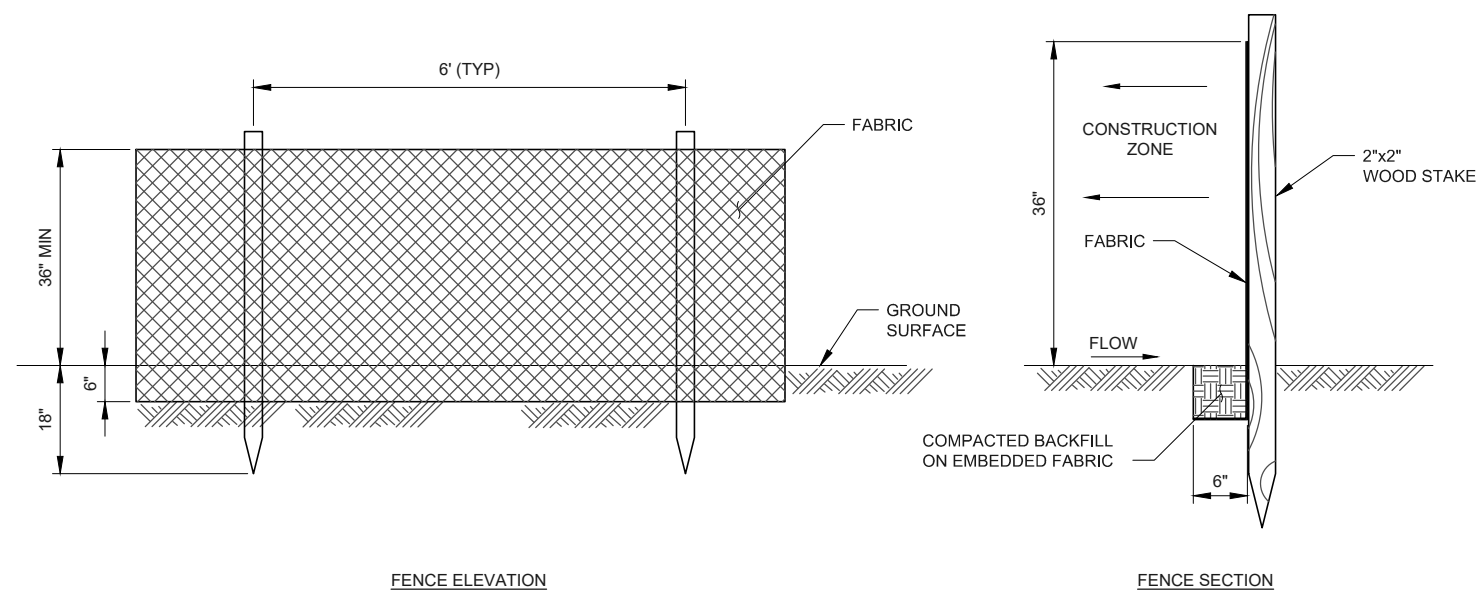
DRAWN BY L.TAM
PROJECT ENG'R L.TAM
APPROVED C. SMITH

DATE: SEPTEMBER 2018
PROJECT

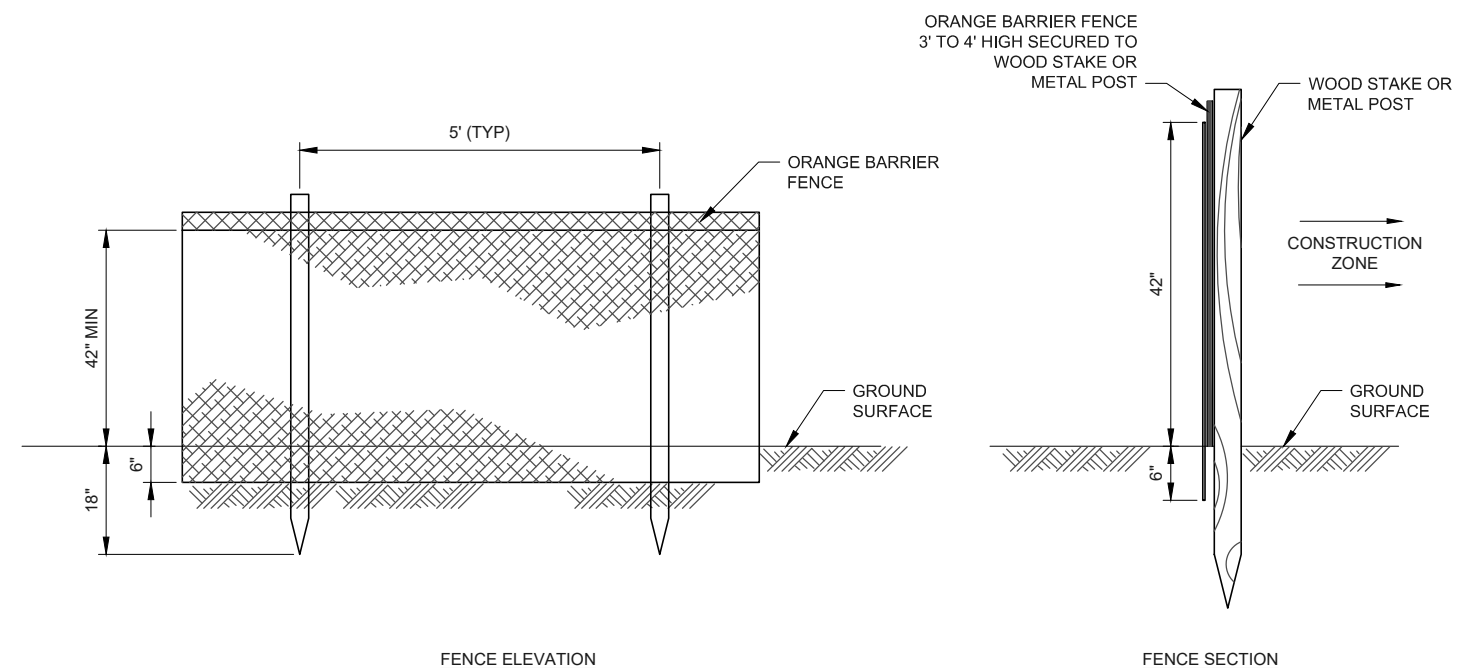
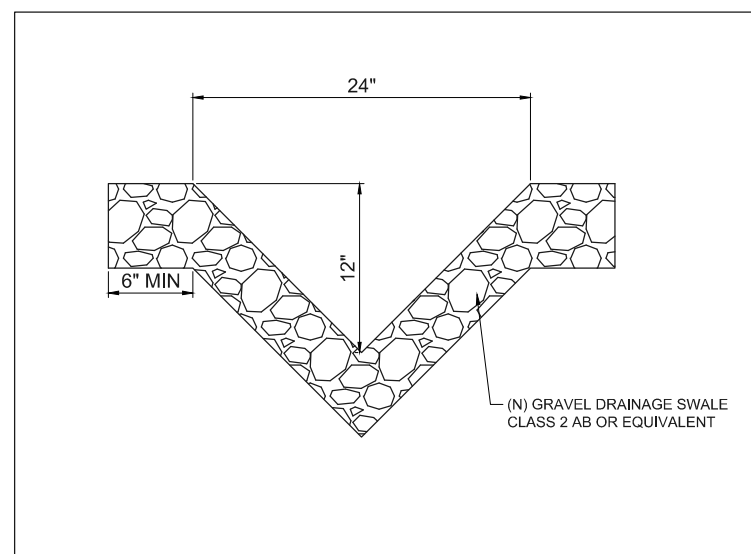
USE DIMENSIONS ONLY
SCALE: AS SHOWN

USE APPROVED DRAWINGS ONLY
FOR CONSTRUCTION PURPOSES

C05



SILT FENCE DETAIL
SCALE:NTS



ORANGE BARRIER FENCE DETAIL
SCALE:NTS

NOTES

1. STAKES TO OVERLAP & FENCE FABRIC TO FOLD AROUND EACH STAKE ONE FULL TURN. SECURE FABRIC TO STAKE WITH 4 STAPLES.
2. STAKES SHALL BE DRIVEN TIGHTLY TOGETHER TO PREVENT POTENTIAL FLOW THROUGH OF SEDIMENT AT JOINT. THE TOPS OF THE STAKES SHALL BE SECURED WITH WIRE.
3. FOR END STAKE, FENCE SHALL BE FOLDED AROUND TWO STAKES ONE FULL TURN & SECURED WITH 4 STAPLES.
4. STAKE DIMENSIONS ARE NOMINAL.
5. CONTRACTOR SHALL PLACE SILT FENCE AND ORANGE BARRIER FENCE ALONG PERIMETER OF LIMITS OF WORK AS SHOWN IN THESE DRAWINGS AND IN ACCORDANCE WITH THE SPECIFICATIONS.
6. PLACE ORANGE BARRIER FENCE AT DRIP LINE OF ALL TREES WITHIN LIMITS OF WORK.
7. PLACE ORANGE BARRIER FENCE AROUND SPECIAL PLANT COMMUNITIES PER SPEC SECTION 01062.

**100% PROGRESS SET
NOT FOR CONSTRUCTION**

REVISIONS

**CARMEL VALLEY
PUMP STATION
CIVIL
DETAILS (2 OF 2)**

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR., SUITE 400
OAKLAND, CALIFORNIA 94612

DRAWN BY L.TAM
PROJECT ENGR L.TAM
APPROVED

DATE: SEPTEMBER 2018
PROJECT

USE DIMENSIONS ONLY
SCALE

USE APPROVED DRAWINGS ONLY
FOR CONSTRUCTION PURPOSES

C06

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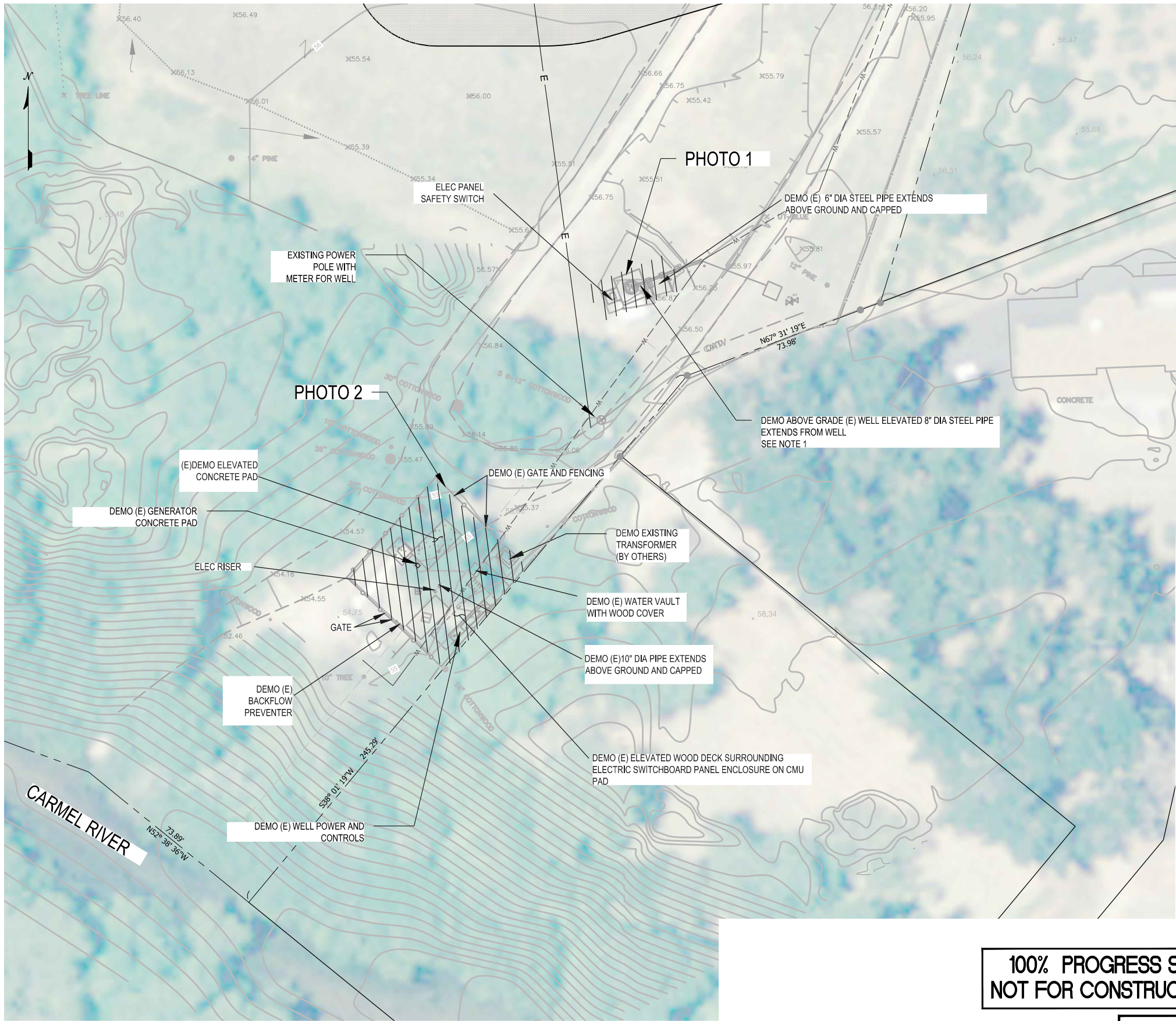
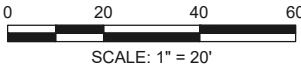


PHOTO 1



PHOTO 2

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NOT FOR CONSTRUCTION



NOTES:

1. AFTER EQUIPMENT DEMO, ABANDON WELL IN COMPLIANCE WITH COUNTY AND LOCAL REGULATORY STANDARDS. OWNER WILL OBTAIN PERMIT.

DEMOLITION PLAN
1"=20'

REVISIONS			CARMEL VALLEY PUMP STATION CIVIL DEMOLITION PLAN	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612	
			DRAWN BY E. MEEKS PROJECT ENG'R L. TAM APPROVED C. SMITH	
			DATE: SEPTEMBER 2018 PROJECT 60489016	
			USE DIMENSIONS ONLY SCALE AS SHOWN	
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
			C07	

GENERAL STRUCTURAL NOTES:

GENERAL:	2016 CALIFORNIA BUILDING CODE (CBC), BASED ON THE 2015 INTERNATIONAL BUILDING CODE (IBC) AND REFERENCED STANDARDS IN ACCORDANCE WITH CH. 35.		
LOADING:	ASCE 7-10 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES		
SEISMIC:			
S _s :	1.005		
S ₁ :	0.559		
RISK CATEGORY:	III		
SEISMIC DESIGN CATEGORY:	D		
IMPORTANCE FACTOR:	1.0		
R:	5.0	(SPECIAL REINFORCED MASONRY SHEAR WALLS)	
Ω _e :	2.5		
C _e :	3.5		
NON-STRUCTURAL SEISMIC:	F _r	FORCE PER CODE	

SNOW:
THE DESIGN SNOW LOAD IN THIS REGION IS ZERO

WIND:	
RISK CATEGORY:	III
V _{ultimate} :	110 mph
V _{basic} :	85 mph
EXPOSURE:	C

FLOOD:	
DESIGN FLOOD ELEVATION:	61.0 FT
COASTAL DESIGNATION:	NONCOASTAL A-ZONE

GEOTECHNICAL:
REFER TO THE GEOTECHNICAL REPORT TITLED, "GEOTECHNICAL INVESTIGATION FOR RANCHO SAN CARLOS PUMP STATION" DATED SEPTEMBER 2015 FOR SPECIFIC METHODS AND MORE DETAILS.
DEAD + LIVE BEARING: 1500 psf
WIND OR SEISMIC BEARING: 2000 psf
SLIDING COEFFICIENT: 0.35
LATERAL BEARING: 300 ps/ft

- THE CONTRACTOR SHALL EXAMINE THE STRUCTURAL DRAWINGS AND SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES IN ELEVATIONS, DIMENSIONS, AND SITE CONDITIONS BEFORE PROCEEDING WITH ANY WORK. OMISSIONS AND CONFLICTS BETWEEN THE VARIOUS ELEMENTS OF THE DRAWINGS SHALL BE RESOLVED WITH THE ENGINEER/ARCHITECT PRIOR TO START OF WORK.
- THE DRAWINGS REPRESENT THE COMPLETED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES AND MEANS NECESSARY TO PROTECT PERSONS AND THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO BRACING, SHORING, ETC. OBSERVATION VISITS BY THE ARCHITECT OR ENGINEER DO NOT INCLUDE REVIEW OF THESE MEASURES.
- NOTES AND DETAILS ON THE STRUCTURAL DRAWINGS TAKE PRECEDENCE OVER THESE STANDARD STRUCTURAL NOTES. TYPICAL DETAILS SHALL BE USED WHENEVER APPLICABLE.
- ALL WORK NOT DETAILED OR NOTED SHALL BE CONSTRUCTED IN ACCORDANCE WITH OTHER SIMILAR WORK SHOWN ON THE DRAWINGS AND TYPICAL DETAILS. SPECIFIC DIMENSIONS GIVEN IN DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS. DRAWINGS SHALL NOT BE SCALED FOR CONSTRUCTION PURPOSES.
- NO PIPES OR DUCTS SHALL BE PLACED IN STRUCTURAL MEMBERS UNLESS SPECIFICALLY DETAILED OR APPROVED BY THE ENGINEER.
- REFER TO MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS FOR THE FOLLOWING:
 - PIPE RUNS, SLEEVES, HANGERS, TRENCHES, ALL SLAB OPENINGS, ETC. EXCEPT AS SHOWN OR NOTED ON STRUCTURAL DRAWINGS.
 - ELECTRICAL CONDUIT, BOXES, OUTLETS.
 - CONCRETE INSERTS FOR ELECTRICAL, MECHANICAL, AND PLUMBING FIXTURES.
 - SIZE AND LOCATION OF MACHINE AND EQUIPMENT BASES, ANCHOR BOLTS ETC.
- ASTM REFERENCES ARE FOR LATEST REVISIONS AND ISSUE, UNLESS OTHERWISE NOTED.
- CONTRACTOR SHALL INVESTIGATE THE SITE DURING CLEARING AND EXCAVATION FOR UNSUITABLE CONDITIONS, UNCONSOLIDATED AND UNDOCUMENTED FILLS, BURIED STRUCTURES, UTILITIES, M.E.C., ETC., AND SHALL IMMEDIATELY NOTIFY THE ARCHITECT/ENGINEER OF ANY SITE CONDITIONS NOT REFLECTED ON THE DRAWINGS OR DIFFERENT FROM MAXIMUM OR MINIMUM DIMENSIONS NOTATED, INCLUDING CONFLICT IN GRADES, ADVERSE SOIL CONDITIONS, GROUND WATER PRESENT, DEEPENED FOOTINGS, UNCOVERED AND UNEXPECTED UTILITY LINES, ETC.
- CONSTRUCTION MATERIALS SHALL BE SPREAD OUT IF PLACED ON STRUCTURAL MEMBERS SUCH THAT THE LOADING DOES NOT EXCEED THE DESIGN LIVE LOADS PER THE DESIGN CRITERIA ON THIS SHEET. PROVIDE SHORING AND BRACING WHERE DESIGN STRENGTH HAS NOT BEEN ATTAINED OR STRUCTURE IS NOT COMPLETE.
- THE CONTRACTOR SHALL DETERMINE THE LOCATION OF UTILITY SERVICES IN AREAS TO BE EXCAVATED BEFORE BEGINNING EXCAVATION. EXERCISE EXTREME CAUTION IN EXCAVATING AND TRENCHING.

FOUNDATIONS:

- REFER RO GEOTECHNICAL ENGINEERING DOCUMENTS BY PACIFIC CREST ENGINEERING INC.
 - GEOTECHNICAL INVESTIGATION FOR RANCHO SAN CARLOS PUMP STATION, RANCHOR SAN CARLOS ROAD, MONTEREY COUNTY, CALIFORNIA DATED SEPTEMBER 2015.
- EXCAVATIONS SHALL BE SHORED TO PREVENT SUBSIDENCE OR DAMAGE TO ADJACENT EXISTING STRUCTURES, STREETS, UTILITIES, AND WHERE INDICATED IN THE DRAWINGS.
- ALL FOUNDATION ROCK AND SOIL SURFACES SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER OR THEIR DESIGNEE AS INDICTED IN THE STATEMENT OF SPECIAL INSPECTIONS.
- BACKFILL SHALL NOT BE PLACED AGAINST WALLS UNTIL THE WALL, BOTTOM SLAB AND TOP SLAB HAVE ALL ATTAINED 100 PERCENT OF THEIR DESGIN STRENGTH AND THE ENGINEER HAS ACCEPTED THE CONDITION OF THE CONCRETE SURFACES, WHICH WILL BE COVERED.

WELDING:

- WELDING SHALL CONFORM TO THE CURRENT EDITION OF THE MATERIAL SPECIFIC CODE OF THE AMERICAN WELDING SOCIETY (AWS).
- FOR STRUCTURAL STEEL CONFORM TO AWS D1.1 (STRUCTURAL WELDING) AND AWS D1.8 (SEISMIC SUPPLEMENT) AS APPROPRIATE.
- WELDS FOUND TO BE DEFECTIVE OR THAT HAVE BEEN REJECTED BY THE ENGINEER, SPECIAL INSPECTOR OR CWI SHALL BE REPAIRED IN ACCORDANCE WITH THE APPROPRIATE AWS CODE AND RE-INSPECTED AND WHEN REQUIRED, RETESTED.
- USE INTERMITTENT WELDS AT FIELD WELDS OR EMBED PLATES AND ANGLES TO AVOID SPALLING OR CRACKING OF THE EXISTING CONCRETE.
- BUTT JOINT WELDS SHALL BE COMPLETE JOIN PENETRATION (CJP), UNLESS INDICATED OTHERWISE.
- POWER BRUSH OR GRIND CLEAN ALL WELDS PRIOR TO COATING.
- SHOP WELDING FOR STRUCTURAL ITEMS NOT SEISMICALLY DETAILED MAY BE INSPECTED BY A CERTIFIED WELD INSPECTOR (CWI). REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND DOCUMENTATION OF THIS INSPECTION.
- USE E70XX WELD ELECTRODES AT ALL WELDED STEEL CONNECTIONS.

MASONRY:

- HOLLOW CONCRETE MASONRY UNITS SHALL BE LIGHT WEIGHT, WITH A MINIMUM COMPRESSIVE STRENGTH OF F'm = 1,500 PSI.
- MORTAR FOR REINFORCED CONCRETE MASONRY SHALL CONFORM TO ASTM C270, TYPE M, AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2,500 PSI, AT 28-DAYS.
- GROUT FOR REINFORCED CONCRETE MASONRY SHALL BE NORMAL WEIGHT AND CONFORM TO ASTM C476, AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2,000 PSI AT 28-DAYS.
- THE ASSEMBLED PRISM STRENGTH OF CONCRETE MASONRY STRUCTURES SHALL BE 1,500 PSI, AT 28-DAYS.
- ALL WALLS SHALL BE GROUTED SOLID.
- CONTRACTOR SHALL SUBMIT THE PROPOSED GROUT PROCEEDURE SHOWING THE METHODS OF EITHER LOW LIFT OR HIGH LIFT PROCEDURES AND THE DETAILS ASSOCIATED WITH THE PROPOSED METHOD. WHERE THE GROUT PLACEMENT HEIGHT IS NOT FULL HEIGHT, THE NEXT LIFT OF GROUT SHALL KEY A MINIMUM OF 1 ½ INCHES INTO THE CMU UNIT AT THE BOTTOM OF THE NEXT LIFT.
- ANCHOR BOLTS IN THE FACE OF 8 INCH CMU BLOCKS SHALL HAVE A MINIMUM EMBEDMENT OF 5 INCHES, WITH A HEAVY HEX HEAD AT THE ANCHOR END IN THE CMU, AND SHALL BE GROUTED SOLID INCLUDING A ONE INCH CLEAR ANNULAR SPACE BETWEEN THE CMU FACE SHELL AND THE BOLT.
- ALL CMU WORK REQUIRES PERIODIC SPECIAL INSPECTION.
- CONTRACTOR SHALL COORDINATE ALL DOWEL PLACEMENT BETWEEN CONCRETE AND CMU BETWEEN THE CONCRETE SUBCONTRACTOR AND THE CMU SUBCONTRACTOR. DOWELS FROM CONCRETE SHALL MATCH THE SIZE AND SPACING OF THE CMU WALL REINFORCING.
- LAPS FOR CMU REINFORCING SHALL NOT BE LESS THAT 48 BAR DIAMETERS OR LESS THAN GREATER LAP LENGTHS SHOWN ON THE DRAWINGS.
- DETAILING AND SPACING OF REINFORCEMENT SHALL BE AS SHOWN ON THE DRAWINGS BUT NOT LESS THAN WHAT IS REQUIRED BY CBC FOR SEISMIC DESIGN CATEGORY D.

FORMWORK, SHORING, AND BRACING:

- STRUCTURES SHOWN ON THE DRAWINGS HAVE BEEN DESIGNED FOR STABILITY UNDER FINAL AND FULLY CONSTRUCTED CONDITIONS ONLY; DESIGN SHOWN DOES NOT INCLUDE NECESSARY COMPONENTS OR EQUIPMENT FOR STABILITY OF THE STRUCTURES, DURING CONSTRUCTION. CONTRACTOR IS RESPONSIBLE FOR ALL WORK RELATING TO CONSTRUCTION ERECTION METHODS, BRACING, SHORING, RIGGING, GUYS, SCAFFOLDING, FORMWORK, AND OTHER WORK AIDS REQUIRED TO SAFELY PERFORM THE WORK SHOWN.
- TEMPORARY SHORING SHALL REMAIN IN PLACE UNTIL ELEVATED CONCRETE FLOOR AND SLABS HAVE REACHED 100 PERCENT OF THE 28 DAY DESIGN STRENGTH AS DETERMINED BY TEST CYLINDER BREAKS, OR OTHER MEANS APPROVED BY THE ENGINEER.

REINFORCEMENT STEEL:

- REINFORCING BARS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF A615, GRADE 60, DEFORMED BARS.
- LAP SPLICE LENGTH SCHEDULE AND STD HOOK LENGTH:

	F'C = 4,000PSI		
	BASIC LAP	TOP BAR LAP*	STD HOOK
#4.....	22 IN.	30 IN.	11 IN.
#5.....	28 IN.	36 IN.	14 IN.
#6.....	33 IN.	44 IN.	17 IN.
#7.....	48 IN.	62 IN.	20 IN.

*TOP BAR LAPS OCCUR IN HORIZONTAL BARS OF FOOTINGS, SLABS AND WALLS WHERE MORE THAN ONE FOOT OF WET CONCRETE IS PLACED BELOW THE GIVEN REINFORCEMENT BAR.

- CONCRETE COVER:

UNLESS OTHERWISE NOTED, CONCRETE COVERAGE OF REINFORCING BARS SHALL BE AS FOLLOWS:

3" - ALL BARS WHERE CONCRETE IS DEPOSITED DIRECTLY AGAINST EARTH

2" - FOR #6 AND LARGER BARS WHERE CONCRETE IS EXPOSED TO EARTH AND/OR WEATHER BUT DEPOSITED AGAINST FORMS

1-1/2" - FOR #5 AND SMALLER BARS FOR SLABS, WALLS, BEAMS, COLUMNS AND EXTERIOR SURFACES EXPOSED TO EARTH OR WEATHER BUT DEPOSITED AGAINST FORMS.
- ALL REINFORCING STEEL AND EMBEDMENTS TO BE HELD SECURELY IN PLACE PRIOR TO PLACING CONCRETE. PROVIDE SUFFICIENT SUPPORTS TO ALLOW WORKING ON REINFORCEMENT. NO BRICK OR POROUS MATERIAL SHALL BE USED TO SUPPORT REINFORCING.

CONCRETE:

- CONCRETE SHALL DEVELOP THE FOLLOWING MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS (MINIMUM F'c) WHEN TESTED IN ACCORDANCE WITH ASTM C39.

ALL CONCRETE.....4000 PSI U.N.O.
- PORTLAND CEMENT SHALL CONFORM TO ASTM C-150 TYPE II LOW ALKALI.
- PROJECTING CORNERS OF FOUNDATION SHALL BE FORMED WITH A 3/4" CHAMFER.
- PRIOR TO PLACING CONCRETE, THE CONTRACTOR SHALL ENSURE THAT ALL EMBEDMENTS, INCLUDING ANCHOR BOLTS, ARE PROPERLY LOCATED AND SECURELY POSITIONED IN PLACE.
- SUBMIT LOCATION PLAN FOR ALL PROPOSED JOINTS NOT INDICATED ON DRAWINGS FOR APPROVAL PRIOR TO WORK.
- NON-SHRINK GROUT SHALL HAVE A MIN. 6000 PSI COMPRESSIVE STRENGTH.
- DIMENSIONAL TOLERANCE FOR ALL CONCRETE WORK SHALL BE WITHIN ±1/8" OF DIMENSION SHOWN ON DRAWINGS. TOP OF FOOTING ELEVATIONS SHALL BE WITHIN ±1/16 OF ELEVATIONS SHOWN ON DRAWINGS U.O.N.
- WHERE CONCRETE IS TO BE CAST AGAINST EXISTING CONCRETE, PREPARE THE SURFACE OF EXISTING CONCRETE AS FOLLOWS, UNLESS NOTED OTHERWISE:
 - CHIP OR SCARIFY SURFACE AS REQUIRED TO REMOVE ALL SPALLED, SEVERELY CRACKED, DETERIORATED, LOOSE, OR UNSOUND MATERIAL.
 - CHIP OR SCARIFY ANY AREA AS REQUIRED TO REMOVE OFFSETS WHICH WOULD CAUSE AN ABRUPT CHANGE IN THICKNESS OF THE NEW CONCRETE. TAPER EDGES TO HAVE NO SQUARE SHOULDERS AT THE PERIMETER OF A CAVITY.
 - SAND-BLAST OR WATER-BLAST ALL SURFACES TO RECEIVE NEW CONCRETE TO MINIMUM 1/4" AMPLITUDE TO REMOVE ALL DIRT, PAINT, GREASE, FRACTURED CONCRETE, OIL, OR OTHER SUBSTANCES THAT COULD INTERFERE WITH THE BOND OF THE NEWLY PLACED CONCRETE. CLEAN FORMS AND REINFORCING OF DRIPPINGS. CLEAR AWAY DEBRIS BY COMPRESSED AIR.
 - WET THE SURFACE UNTIL IT IS DAMP, BUT WITHOUT VISIBLE FREE WATER.
- PRIOR TO DRILLING EXISTING CONCRETE FOR REBAR DOWELS, ADHESIVE ANCHORS OR ANCHOR BOLTS, SCAN AND LOCATE ALL EXISTING REBAR. DO NOT CUT OR DAMAGE EXISTING REBAR.

WOOD:

- ALL WOOD DESIGN AND CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE PROVISIONS OF "THE NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION", LATEST EDITION.
- FRAMING LUMBER SHALL BE DOUGLAS FIR (UNLESS NOTED OTHERWISE) AND AS FOLLOWS OR BETTER:

2X4 STUDS GRADE NO. 2
2X6 OR LARGER STUDS..... GRADE NO. 2
PLATES GRADE NO. 2
2X AND 4X BEAMS..... GRADE NO. 1
- WHERE NOT OTHERWISE SHOWN ON PLANS, ALL NAILING OR SCREWING SHALL BE AS INDICATED IN THE BUILDING CODE. ALL SHEATHING MUST BE NAILED. ADHESIVES SHALL NOT BE USED IN PLACE OF NAILING.
- METAL CONNECTORS TO BE PROVIDED BY 'SIMPSON STRONG-TIE' OR EQUIVALENT.
- APA RATED OSB MAY ONLY BE USED IN LIEU OF PLYWOOD WITH PRIOR APPROVAL FROM AECOM.
- ALL SHEATHING SHALL CONFORM TO AMERICAN PLYWOOD ASSOCIATION (APA) DESIGN SPECIFICATIONS, LATEST EDITION. SHEATHING SHALL BE CONTINUOUS OVER THREE ADJACENT SPANS MINIMUM.
- ROOF SHEATHING SHALL BE 23/32" (3/4" NOMINAL) STRUC 1 APA RATED SHEATHING. EXPOSURE 1, 48/24. ALL ROOF SHEATHING SHALL BE FASTENED TO SUPPORTING MEMBERS W/6d COMMON NAILS AT 4" O.C. AT DIAPHRAGM BOUNDARIES, 6" O.C. AT OTHER PANEL EDGES, AND 12" O.C. FOR FIELD NAILING. U.N.O.
- SHEATHING PANELS SHALL SPAN THE STRENGTH RATING PERPENDICULAR TO THE SUPPORTING TRUSSES. SHEATHING PANELS SHALL SPAN A MINIMUM OF TWO SUPPORT TRUSS SPACES. PANEL ENDS SHALL BE STAGGERED. PROVIDE 4 FEET BY 10 FEET PANELS AS REQUIRED AT ENDS OF ROWS OF PANELS. ALL EDGE JOINTS OF PANELS SHALL BE CENTERED OVER 3X WIDE FRAMING AS A MINIMUM. SHEATHING PANELS SHALL BE MANUFACTURED USING EXTERIOR TYPE GLUE. SUBMIT THE PROPOSED SHEATHING PANEL DATA AND PLAN ARRANGEMENT.
- ALL FRAMING SUPPORTING SHEATHING PANELS SHALL HAVE THE SUPPORT FACE FLUSH WITH THE BOTTOM OF PANEL BY SHAPING THE SUPPORT FACE OR SLOPING THE MEMBER TO MATCH THE PANEL SLOPE AS INDICATED ON THE DRAWINGS. DETAILS SHOWING SHAPED MEMBERS SHALL BE SHAPED.
- FRAMING CONNECTIONS NOT USING METAL CONNECTORS SHALL BE PER 2016 TABLE 2304.10.1 FASTENING SCHEDULE AS A MINIMUM BUT NOT LESS THAN CALLED OUT ON THE DRAWINGS.
- METAL CONNECTORS SHALL BE FASTENED PER THE ICC EVALUATION REPORT FOR THE FASTENER TO DEVELOP THE MAXIMUM BEARING, SHEAR, UPLIFT CAPACITIES OF THE CONNECTOR AS INDICATED IN THE ICC EVALUATION REPORT FOR THAT CONNECTOR.

FABRICATED WOOD TRUSS:

- WOOD TRUSSES SHALL BE DESIGNED, FABRICATED AND INSTALLED PER 2016 CBC SECTION 2303.4 AND IN ACCORDANCE WITH THE TRUSS PLATE INSTITUTE TPI 1 – 2014 AS MODIFIED BY CBC.
- TRUSSES SHALL BE DESIGNED BASED ON 24 INCHES ON CENTER TRUSS SPACING AND SHALL HAVE THE CHORD AND WEB THICKNESS AS REQUIRED BY DESIGN.
- THE TRUSS TOP CHORD SHALL BE DESIGNED FOR CONCENTRATED LOADS FROM EDGE BLOCKING AT 24 INCHES ON CENTER ON BOTH SIDES OF THE TRUSS THAT MAY OCCUR AT ANY LOCATION ALONG THE TOP CHORD.
- SEE THE LOAD DIAGRAMS ON THE DRAWINGS FOR GRAVITY AND LATERAL DESIGN LOADS.
- BEARING OF THE TRUSSES ON THE WALL TOP PLATE SHALL BE DESIGNED AND DETAILED FOR A COMPLETE BEARING WITHOUT NOTCHING OR REDUCING THE EXTENDED TOP CHORD.
- THE CONTRACTOR SHALL FURNISH AND INSTALL FINAL BRACING AND ANCHORAGE OF BRACING AS REQUIRED BY THE TRUSS DESIGN AND AS INDICATED ON THESE DRAWINGS.
- THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE SAFE HANDLING, ERECTION AND BRACING OF WOOD TRUSSES DURING INSTALLATION AND SHALL CONFORM TO THE GUIDELINES PUBLISHED BY THE TPI AND INSTRUCTIONS BY THE JOIST MANUFACTURER. CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AND SHORING AS REQUIRED DURING CONSTRUCTION.
- THE TRUSS DESIGN SHALL BE BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF CALIFORNIA AND QUALIFIED TO PERFORM DESIGN AND SHOP DRAWINGS FOR THE TRUSSES ALONG WITH SUPPORTING CALCULATIONS. SEE 2016 CBC SECTION 2303.4.1.4. AS A MINIMUM THE SUBMITTED TRUSS DESIGN DRAWINGS SHALL INCLUDE INFORMATION STATED IN 2016 CBC SECTION 2304.4.1.1. SUBMITTED DRAWINGS AND CALCULATIONS SHALL BE SEALED AND SIGNED BY THE PROFESSIONAL ENGINEER IN RESPONSIBLE CHARGE OF THE TRUSS DESIGN.

STRUCTURAL ABBREVIATIONS

CL	CENTER LINE	HT	HEIGHT
AB	ANCHOR BOLT	LLH	LONG LEG HORIZONTAL
ADH	ADHESIVE	LLV	LONG LEG VERTICAL
ALT	ALTERNATE	MAX	MAXIMUM
B.PL	BASE PLATE	MFR	MANUFACTURER
BB	BOTTOM BRACE	MIN	MINIMUM
BLDG	BUILDING	(N)	NEW
BOT	BOTTOM	NS	NON SHRINK
BOS	BOTTOM OF STEEL	NTS	NOT TO SCALE
BS	BOTH SIDES	OC	ON CENTER
CIDH	CAST IN DRILLED HOLE	OH	OPPOSITE HAND
CL	CENTER LINE	OPNG	OPENING
CLR	CLEAR	OPP	OPPOSITE
CMU	CONCRETE MASONRY UNIT	OR	OUTSIDE RADIUS
COL	COLUMN	PL	PLATE
CONT	CONTINUOUS	PLCS	PLACES
COR	CONTRACTING OFFICER'S...	PS	PIPE SUPPORT
CXN	CONNECTION	REINF	REINFORCING
DBL	DOUBLE	REQD	REQUIRED
DET	DETAIL	SAD	SEE ARCHITECTURAL DWG
DFE	DESIGN FLOOD ELEVATION	SIM	SIMILAR
DWL	DOWEL	SPEC	SPECIFICATION
DWG	DRAWING	SPC	SPACING
(E)	EXISTING	STL	STEEL
EA	EACH	SYMM	SYMMETRICAL
EF	EACH FACE	T&B	TOP AND BOTTOM
EL	ELEVATION	TBM	TEMPORARY BENCH MARK
EMBED	EMBEDMENT	THK	THICK, THICKNESS
EQ	EQUAL	TO	TOP OF
EW	EACH WAY	TOF	TOP OF FOOTING
EOR	ENGINEER OF RECORD	TOC	TOP OF CONCRETE
FS	FAR SIDE	TYP	TYPICAL
FIN FLR	FINISH FLOOR	UNO	UNLESS NOTED OTHERWISE
FT	FEET	VERT	VERTICAL
FTG	FOOTING	VIF	VERIFY IN FIELD
GA	GAUGE	WWF	WELDED WIRE FABRIC
GALV	GALVANIZED	W.P.	WORK POINT
GL	GRIDLINE	W/	WITH
HK	HOOK		
H.R.	HAND RAIL		
HORIZ	HORIZONTAL		
IR	INSIDE RADIUS		
IN	INCH / INCHES		

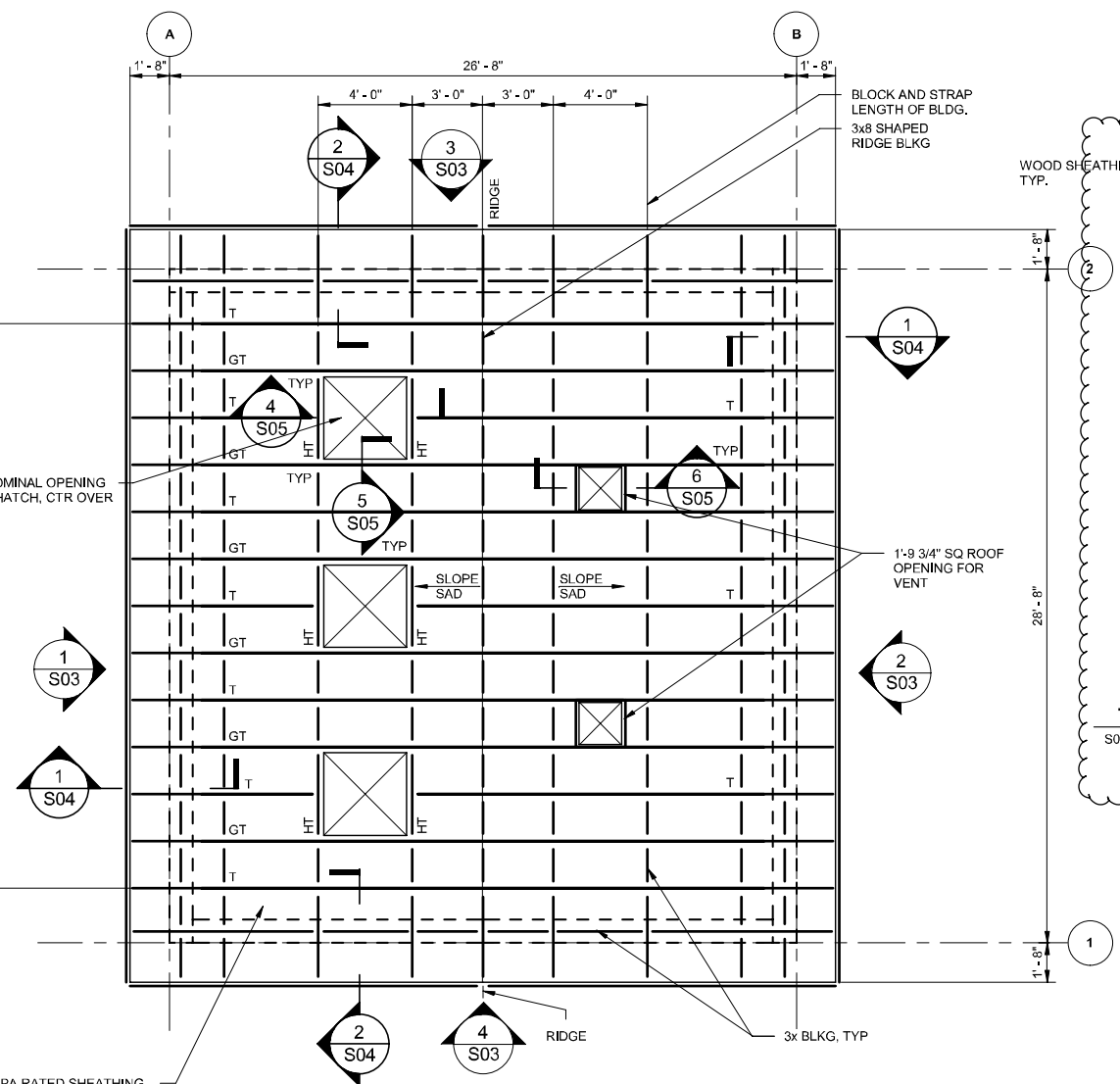
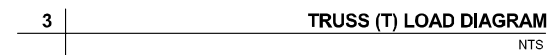
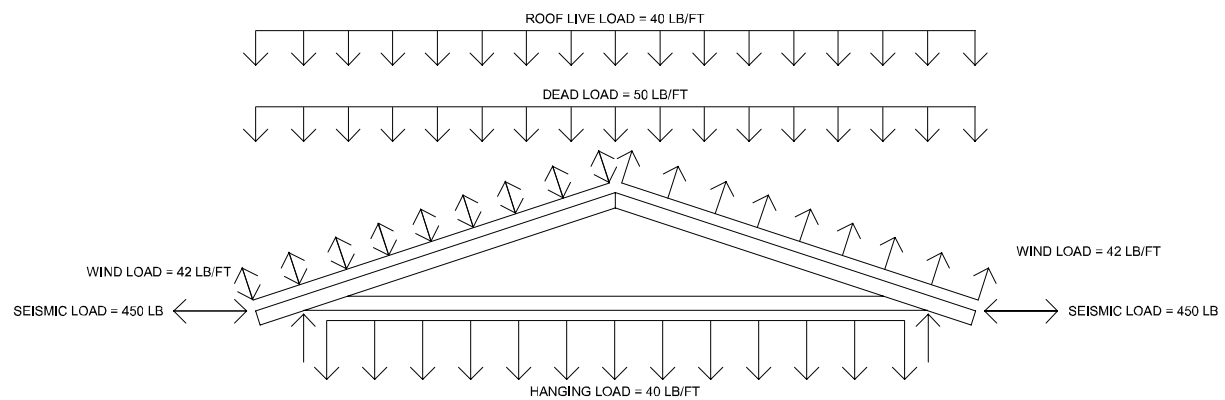
100% PROGRESS SET
NOT FOR CONSTRUCTION

CARMEL VALLEY PUMP STATION
GENERAL STRUCTURAL NOTES

CALIFORNIA
AMERICAN WATER

AECOM 300 LAKESIDE DR., SUITE 400 OAKLAND, CA 94612		AECOM		CALIFORNIA AMERICAN WATER	
DRAWN BY	D. RAMOS	DATE:	2/28/2019	USE DIMENSIONS ONLY SCALE 12" = 1'-0"	
DESIGNED BY	P. JACOBS				
REVIEWED BY	T. ZIMMERMAN	PROJECT:	60489016		
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES				S01	

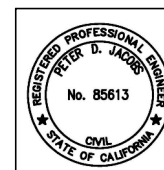
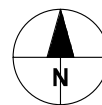


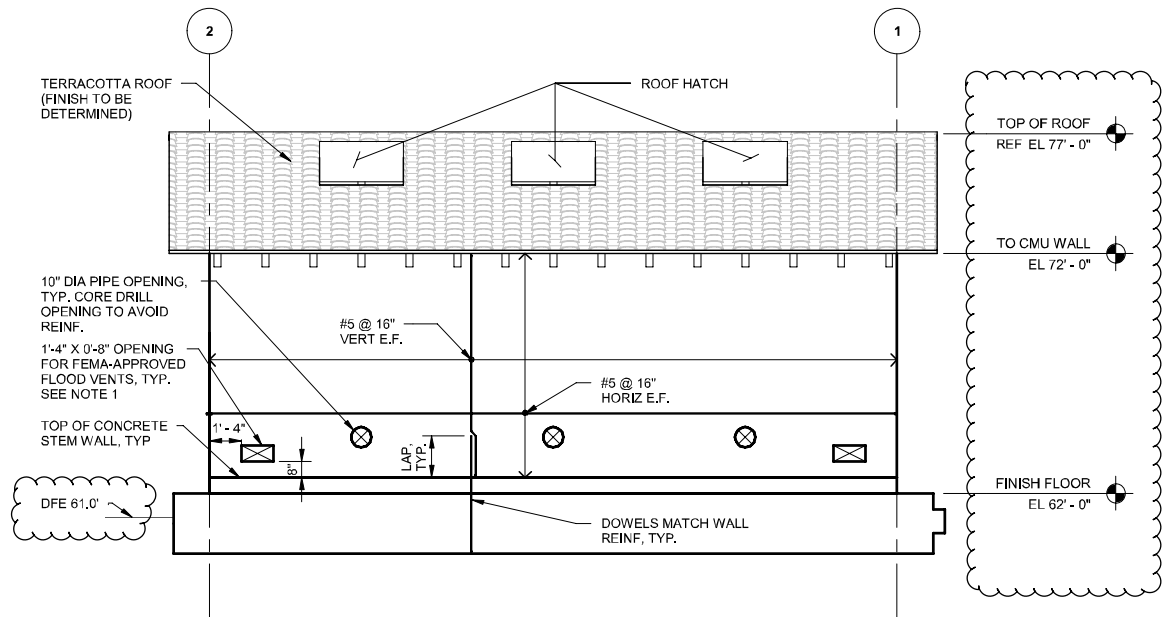


ROOF SHEATHING SHALL BE 23/32" (3/4" NOMINAL) APA RATED SHEATHING, EXPOSURE 1, STRUCTURAL 1 EXTERIOR GLUE, 48/24 SPAN RATING W/ STRENGTH AXIS PERPENDICULAR TO SUPPORTS. ALL ROOF SHEATHING SHALL BE FASTENED TO SUPPORTING MEMBERS W/ 10d COMMON NAILS @ 4' OC AT DIAPHRAGM BOUNDARIES. ALL OTHER NAILING SHALL USE 8d COMMON NAILS @ 6' OC AT ALL OTHER PANEL EDGES AND 12' OC FOR FIELD NAILING. UNO, ALL PANEL EDGES TO BE BLOCKED W/ 3x MIN.

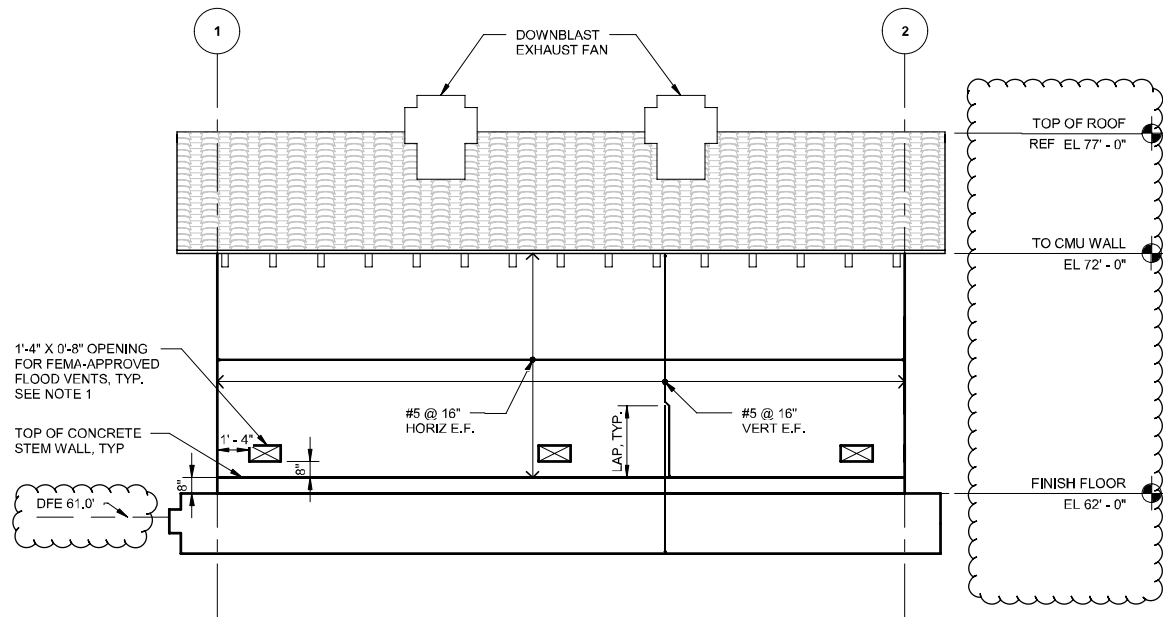
**100% PROGRESS SET
NOT FOR CONSTRUCTION**

REVISIONS				CARMEL VALLEY PUMP STATION FOUNDATION AND ROOF FRAMING PLAN			
				CALIFORNIA AMERICAN WATER			
				AECOM 300 LAKESIDE DR., SUITE 400 OAKLAND, CA 94612  			
				DRAWN BY: D. RAMOS DESIGNED BY: P. JACOBS REVIEWED BY: T. ZIMMERMAN DATE: 2/28/2019 PROJECT: 60489016			
				USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES		S02	

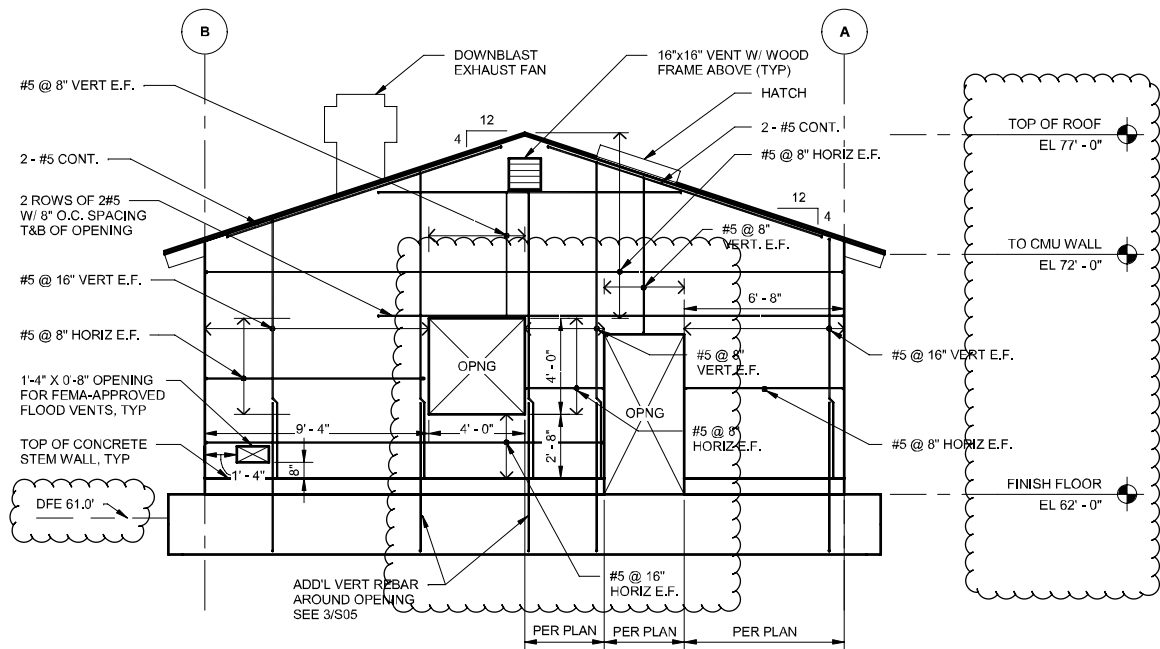




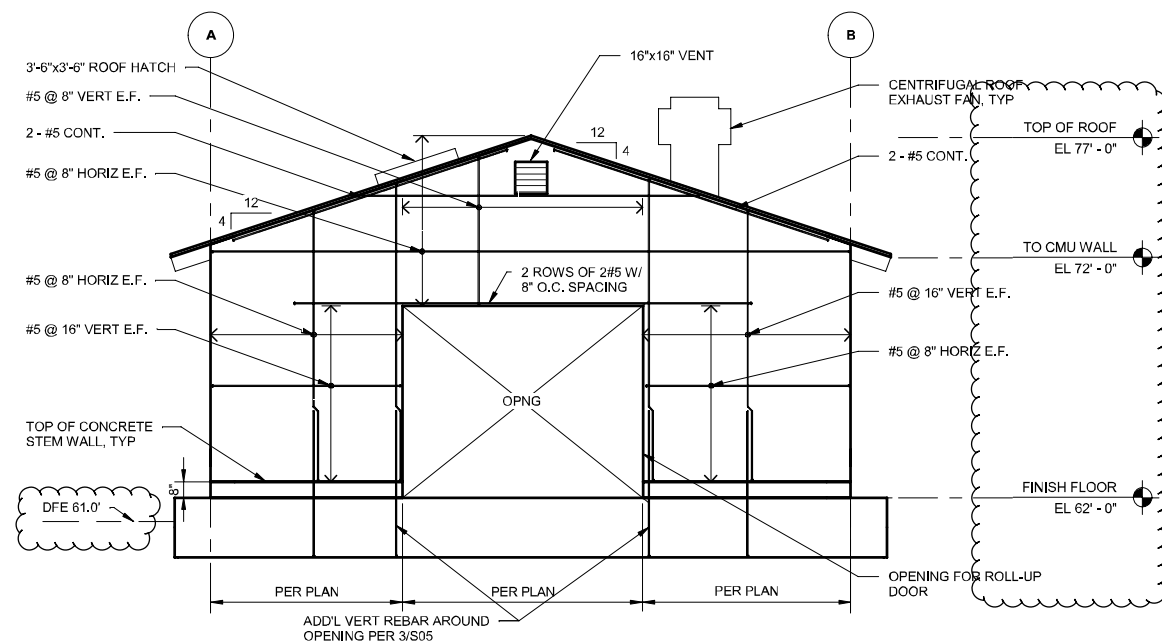
1
S02
WEST EXTERIOR WALL ELEVATION
Scale: 1/4" = 1'-0"



2
S02
EAST EXTERIOR WALL ELEVATION
Scale: 1/4" = 1'-0"



3
S02
NORTH EXTERIOR WALL ELEVATION
Scale: 1/4" = 1'-0"



4
S02
SOUTH EXTERIOR WALL ELEVATION
Scale: 1/4" = 1'-0"

**100% PROGRESS SET
NOT FOR CONSTRUCTION**

**CARMEL VALLEY PUMP STATION
ELEVATIONS**

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR., SUITE 400
OAKLAND, CA 94612

AECOM

CALIFORNIA
AMERICAN WATER

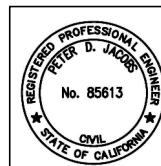
DRAWN BY: D. RAMOS
DESIGNED BY: P. JACOBS
REVIEWED BY: T. ZIMMERMAN

DATE: 2/28/2019
PROJECT: 60489016

USE DIMENSIONS ONLY
SCALE: As indicated

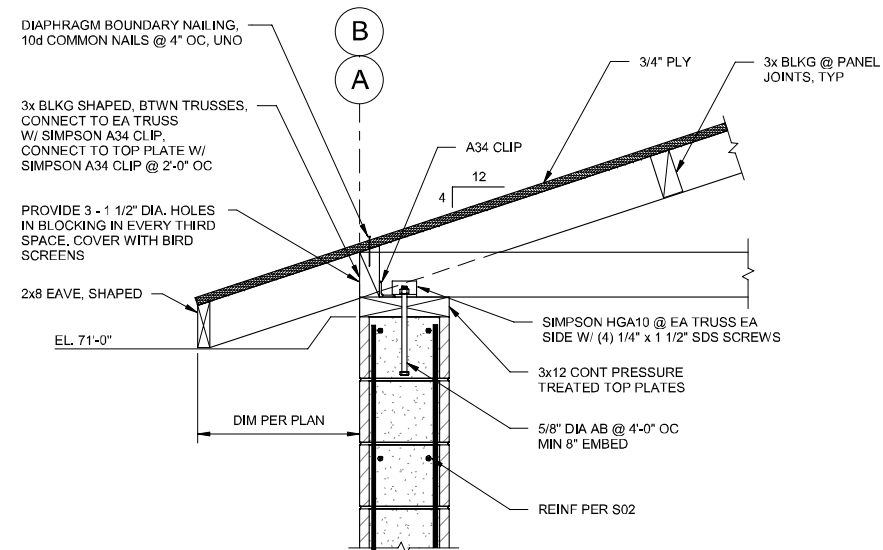
USE APPROVED DRAWINGS ONLY
FOR CONSTRUCTION PURPOSES

S03

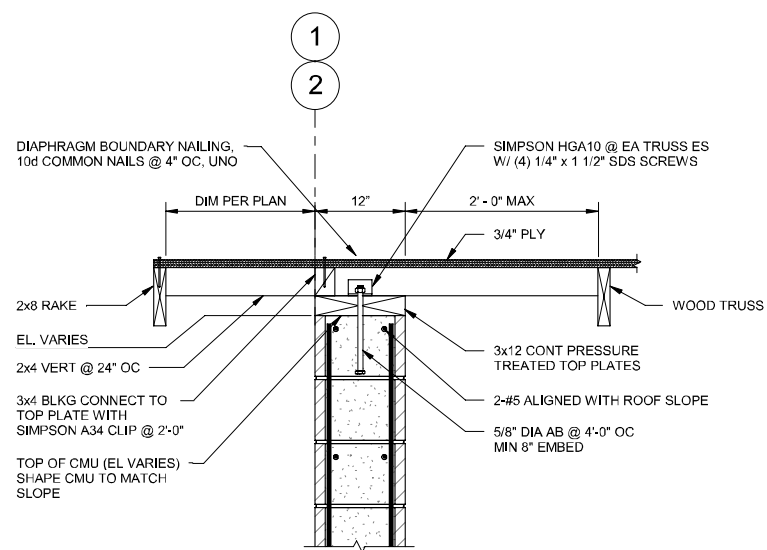


SHEET NOTES:

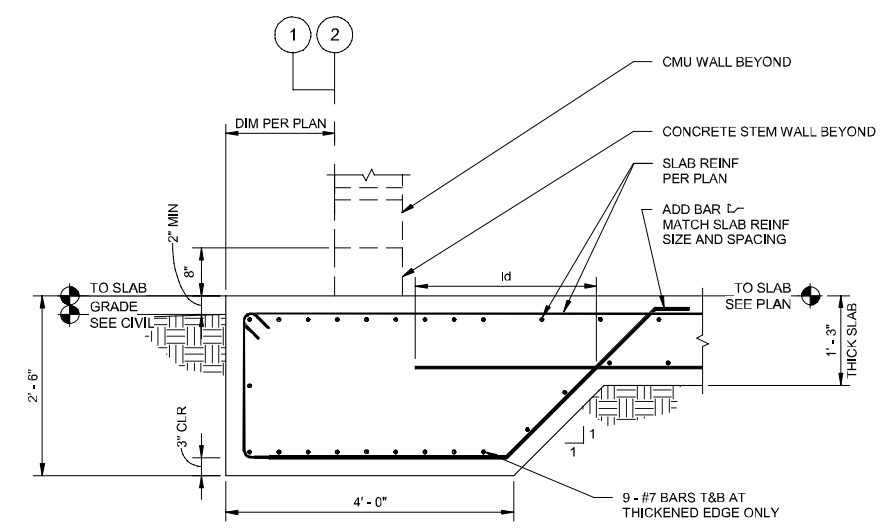
1. AT LOCATION OF FLOOD VENT OPENING, INCREASE SPACING TO 24" MAX. TOTAL NUMBER OF BARS IN WALL TO REMAIN THE SAME.



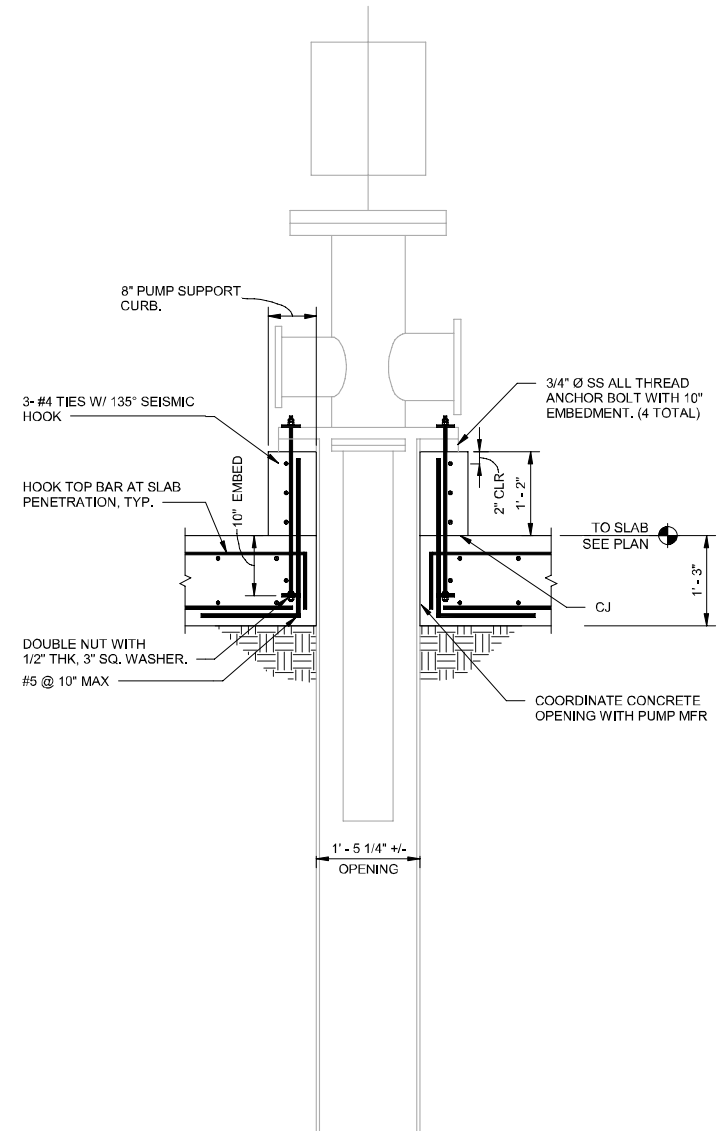
1 SECTION
S02 NTS



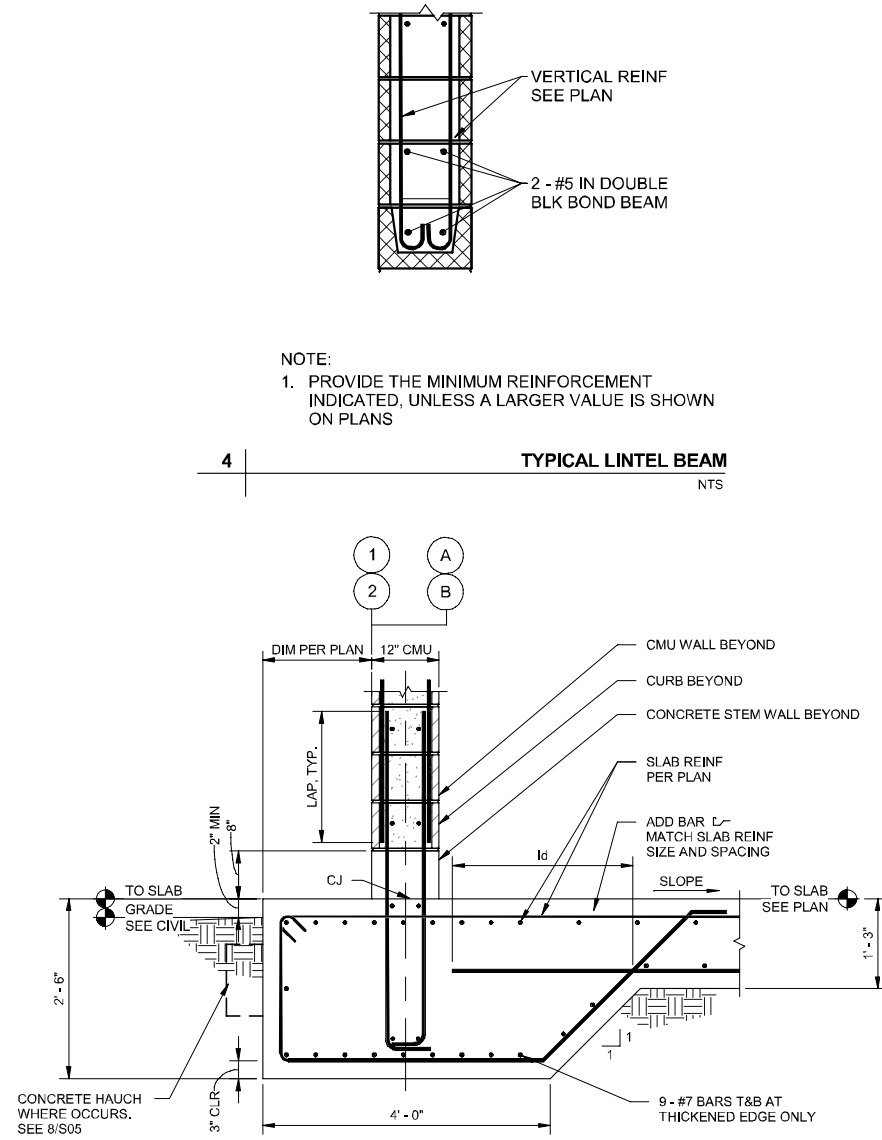
2 SECTION
S02 Scale: 1\"/>



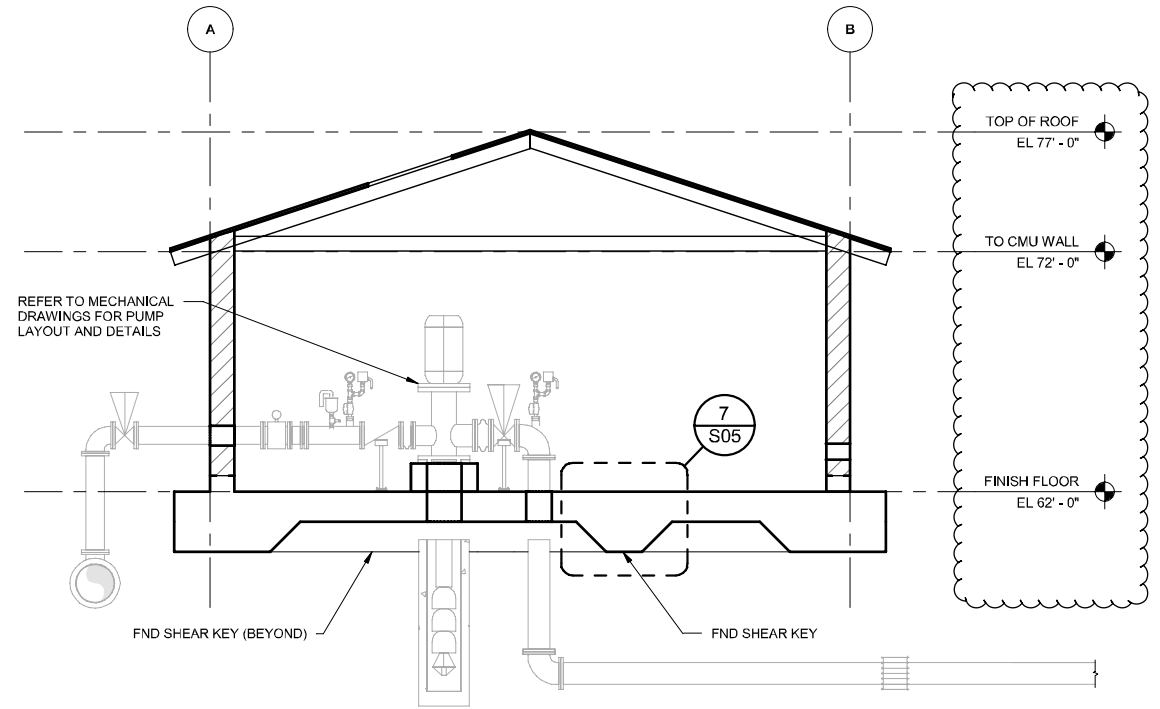
6 WALL SECTION AT OPENING
Scale: 3/4\"/>



3 PUMP ANCHORAGE SECTION
S02 Scale: 3/4\"/>



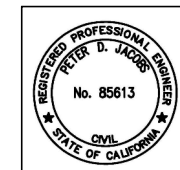
5 TYPICAL WALL SECTION
S02 Scale: 3/4\"/>



7 SECTION
S05 Scale: 1/4\"/>

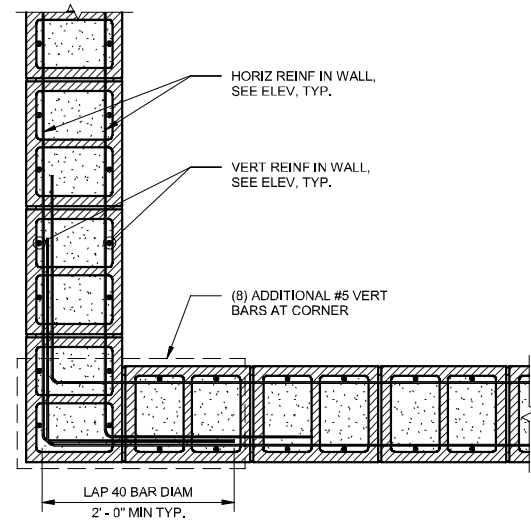
**100% PROGRESS SET
NOT FOR CONSTRUCTION**

**CARMEL VALLEY PUMP STATION
DETAILS AND SECTIONS**

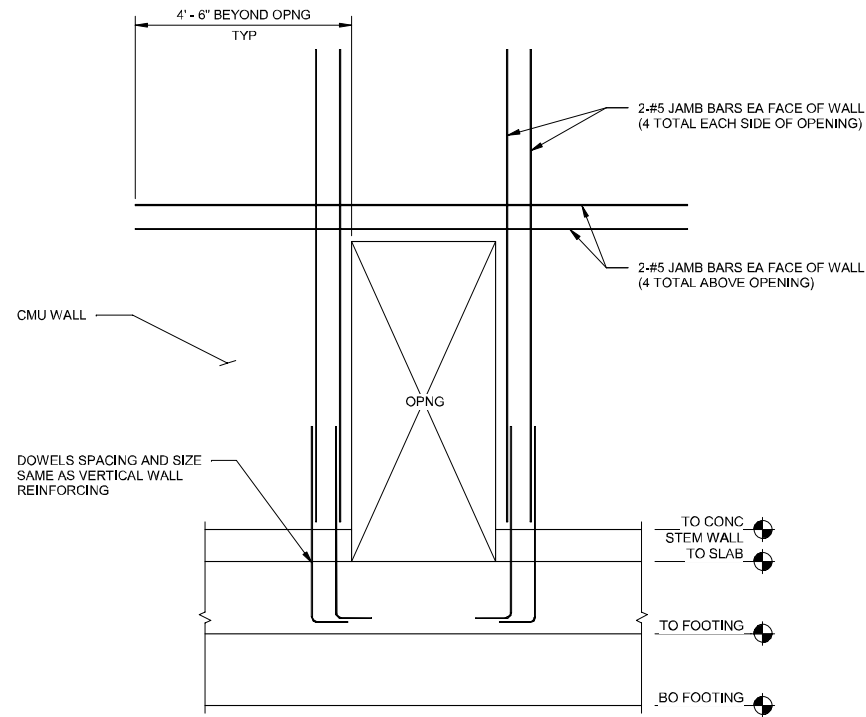


REVISIONS	

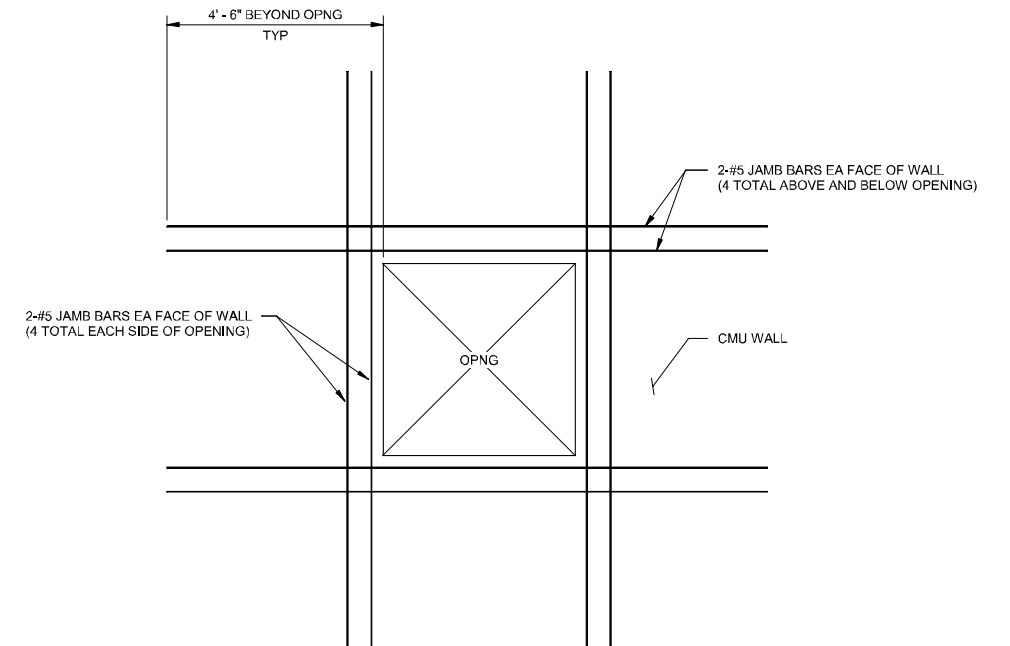
CALIFORNIA AMERICAN WATER	
AECOM 300 LAKESIDE DR., SUITE 400 OAKLAND, CA 94612	AECOM CALIFORNIA AMERICAN WATER
DRAWN BY: D. RAMOS DESIGNED BY: P. JACOBS REVIEWED BY: T. ZIMMERMAN	DATE: 2/28/2019 PROJECT: 60489016 USE DIMENSIONS ONLY SCALE: As indicated
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
S04	



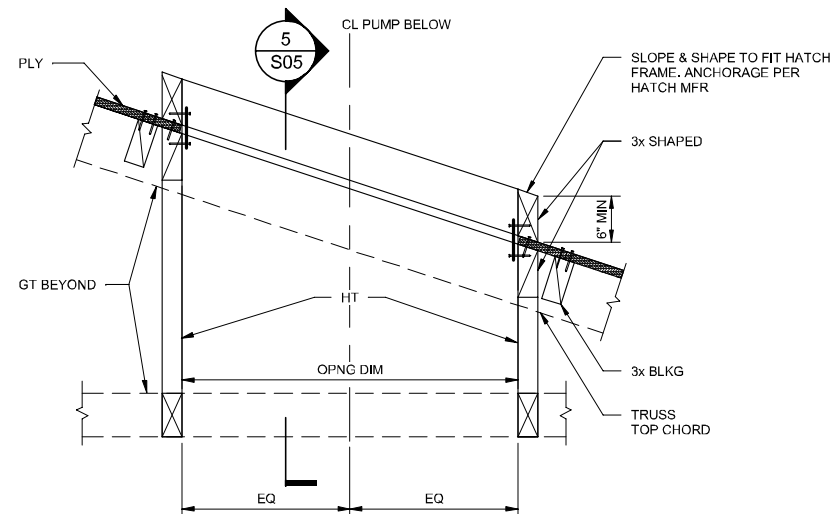
1 TYPICAL CMU CORNER REINFORCING
NTS



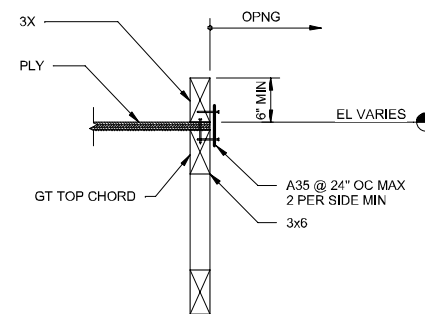
2 TYPICAL CMU DOOR OPENING REINFORCING
NTS



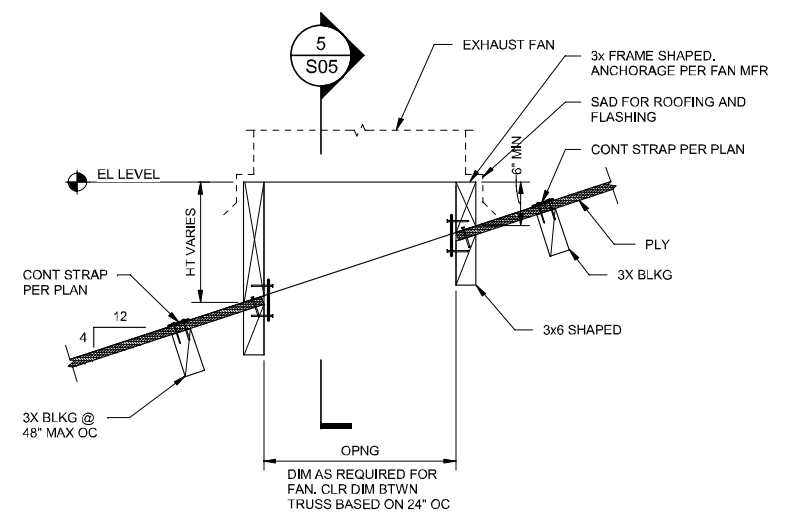
3 TYPICAL CMU WALL OPENING REINFORCING
NTS



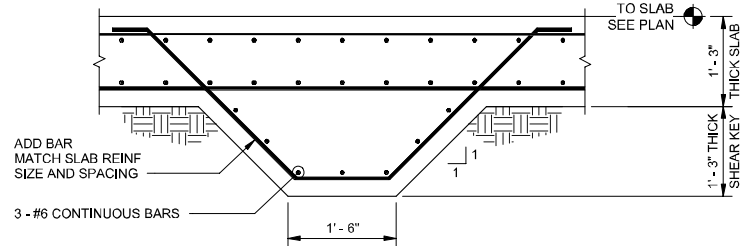
4 SECTION AT HATCH
S02 Scale: 1" = 1'-0"



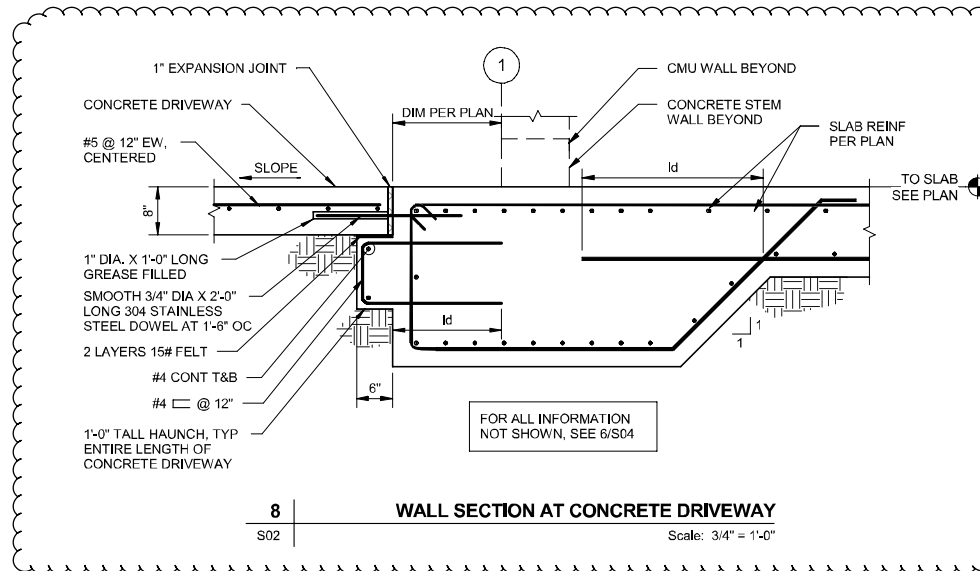
5 SECTION
S02 Scale: 1" = 1'-0"



6 SECTION AT EXHAUST FAN
S02 Scale: 1" = 1'-0"



7 SECTION AT SHEAR KEY
S04 Scale: 3/4" = 1'-0"



8 WALL SECTION AT CONCRETE DRIVEWAY
S02 Scale: 3/4" = 1'-0"

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NOT FOR CONSTRUCTION

CARMEL VALLEY PUMP STATION DETAILS AND SECTIONS

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR., SUITE 400
OAKLAND, CA 94612

AECOM

CALIFORNIA
AMERICAN WATER

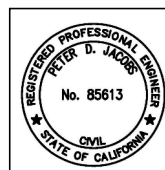
DRAWN BY: D. RAMOS
DESIGNED BY: P. JACOBOS
REVIEWED BY: T. ZIMMERMAN

DATE: 2/28/2019
PROJECT: 60489016

USE DIMENSIONS ONLY
SCALE: As indicated

USE APPROVED DRAWINGS ONLY
FOR CONSTRUCTION PURPOSES

S05



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NOTES:

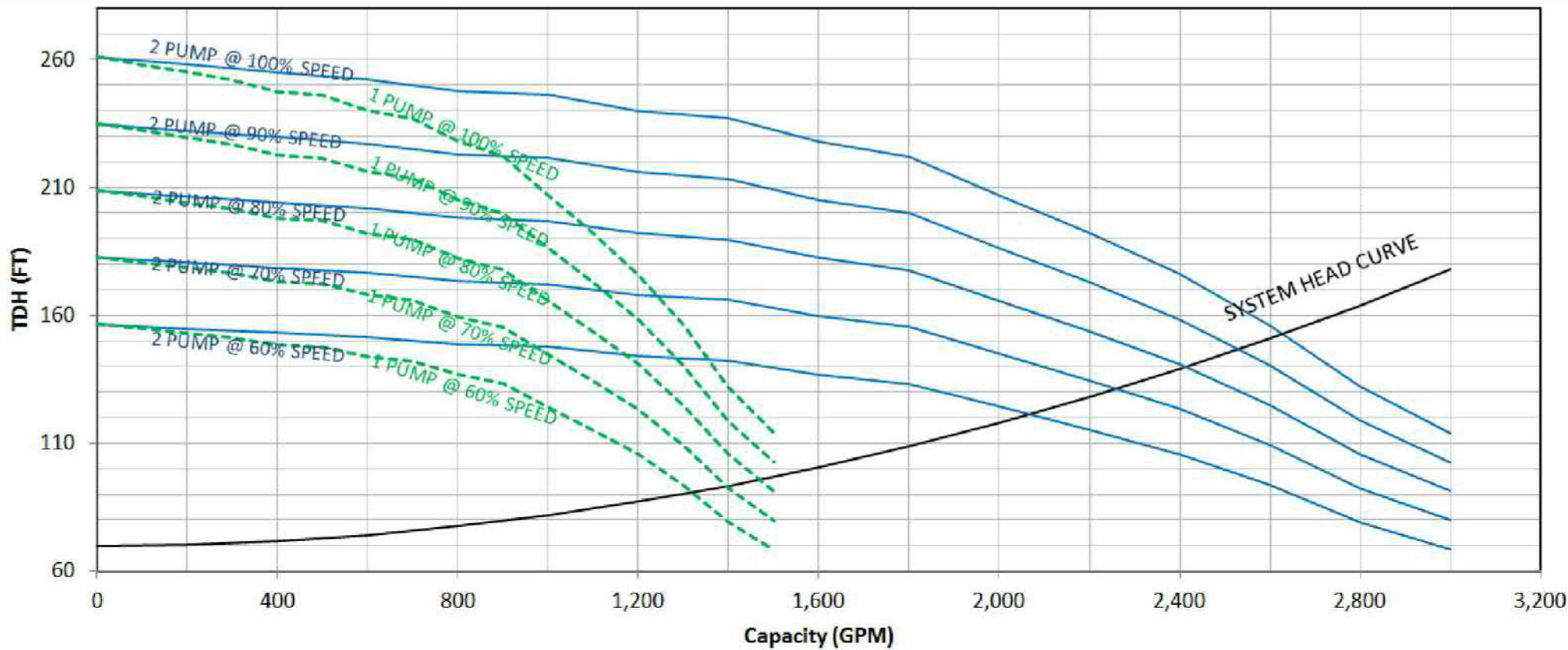
1. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS AND LAYOUT PIPELINES PRIOR TO ORDERING MATERIALS.
2. REMOVE VEGETATION AS REQUIRED FOR INSTALLATION. PROTECT EXISTING TREES IN PLACE. OBTAIN COUNTY PERMIT AND APPROVAL PRIOR TO REMOVAL OF ANY TREES.
3. EXCAVATE AND REMOVE (E) PIPELINE AND FITTINGS WHEN NECESSARY FOR NEW INSTALLATION; OTHERWISE, ABANDON (E) PIPELINE AND FITTINGS IN PLACE AND PLUG AND CAP WITH GROUT MIX.
4. ALL BURIED JOINTS AND CONNECTIONS SHALL BE RESTRAINED.
5. ALL EXPOSED JOINTS AND CONNECTIONS SHALL BE FLANGED.

ABBREVIATIONS:

ALT	ALTITUDE
CFM	CUBIC FEET PER MINUTE
CV	CONTROL VALVE
CVPS	CARMEL VALLEY PS
DI	DUCTILE IRON
EL	ELEVATION
FF	FINISH FLOOR
FT	FEET
GPM	GALLON PER MINUTE
HP	HORSEPOWER
HWL	HIGH WATER LEVEL
LWL	LOW WATER LEVEL
N.C.	NORMALLY CLOSED
NO.	NUMBER
N.O.	NORMALLY OPEN
P	PUMP
PS	PUMP STATION
PVC	POLYVINYL CHLORIDE
RD	ROAD
RPM	REVOLUTION PER MINUTE
TDH	TOTAL DYNAMIC HEAD
VFD	VARIABLE FREQUENCY DRIVE

SYMBOLS:

	GATE VALVE, GV
	BUTTERFLY VALVE, BFV
	BALL VALVE, BV
	CHECK VALVE, CKV
	AIR VACUUM/AIR RELEASE VALVE
	CONTROL VALVE, CV
	FLEXIBLE JOINT
	RESTRAINED COUPLING
	REDUCER
	FLOW METER, FM
	PRESSURE GAUGE
	PRESSURE TRANSDUCER
	ELECTRIC VALVE OPERATOR
	FAN
	VERTICAL TURBINE PUMP IN CAN
	LOUVER
	FLEXIBLE EXPANSION JOINT



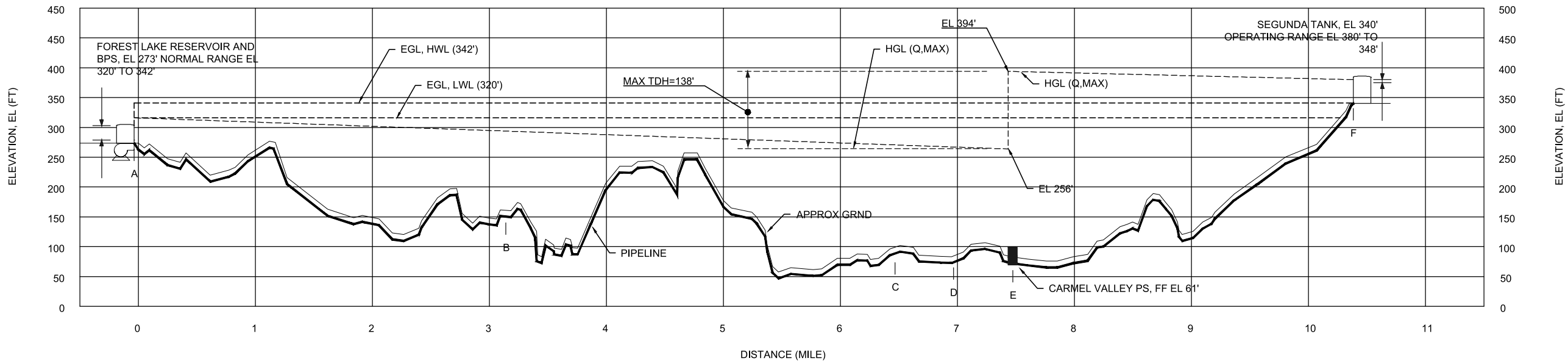
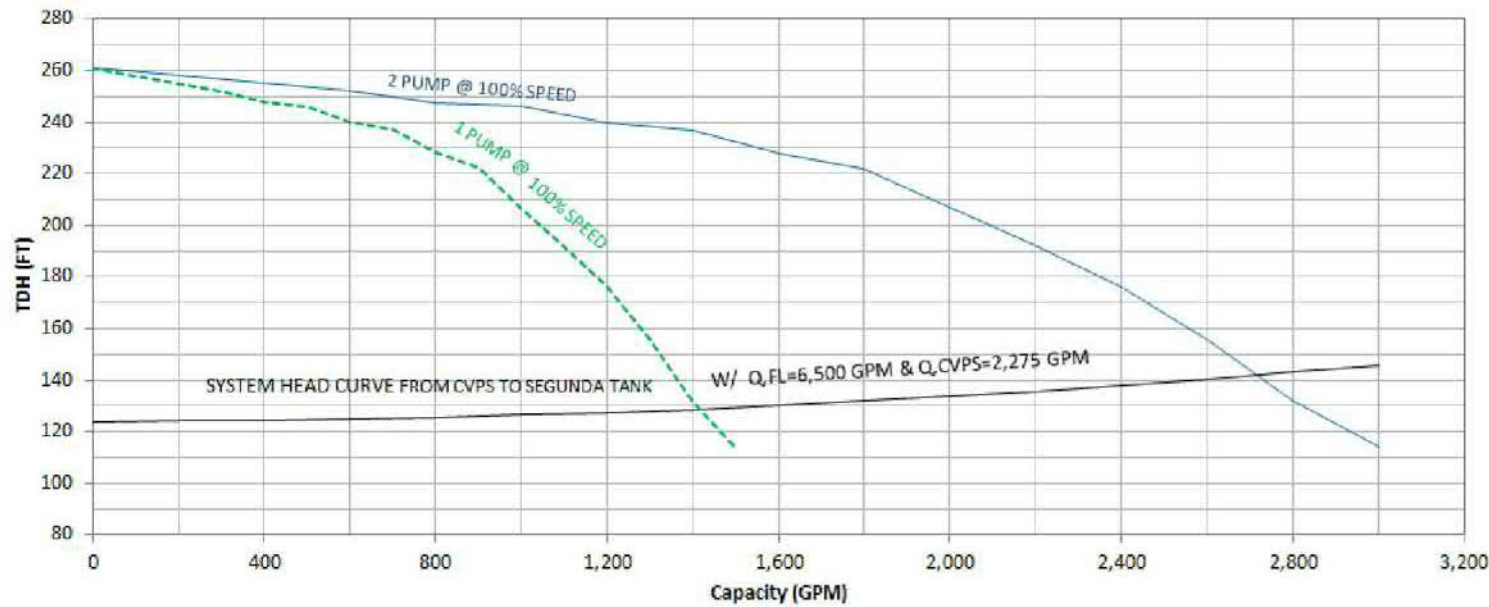
PUMP & SYSTEM HEAD CURVES
SCALE: NTS

1
-

100% PROGRESS SET
NOT FOR CONSTRUCTION

REVISIONS			CARMEL VALLEY PUMP STATION MECHANICAL GENRAL NOTES, ABBREVIATIONS & LEGENDS		
			CALIFORNIA AMERICAN WATER		
			AECOM 300 LAKESIDE DR, SUITE 400 OAKLAND, CALIFORNIA 94612		
			DRAWN BY LK PROJECT ENG'R LT APPROVED C. SMITH		
			DATE: SEPTEMBER 2018 PROJECT 60424498		
			USE DIMENSIONS ONLY SCALE AS SHOWN		
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES			M01		

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POINT	DESCRIPTION
A	FOREST LAKE RESERVOIR
B	PEBBLE BEACH
C	CRISPIN PS
D	MESA PS
E	CARMEL VALLEY PS
F	SEGUNDA TANK

POINT	MAXIMUM FLOWS	
	GPM	MGD
Q,AB	6,500	9.36
Q,BC	4,940	7.11
Q,CD	2,795	4.03
Q,DE	2,275	3.28
Q,EF	2,275	3.28

DELTA STATIC HEAD (FT)				
			SEGUNDA TANK EL	
			HWL	LWL
			380'	348'
FOREST LAKE RES EL + BPS	HWL	242'	38'	6'
	LWL	320'	60'	28'

100% PROGRESS SET
NOT FOR CONSTRUCTION

REVISIONS

CARMEL VALLEY
PUMP STATION
MECHANICAL
SYSTEM HYDRAULICS

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR, SUITE 400
OAKLAND, CALIFORNIA 94612

AECOM

CALIFORNIA
AMERICAN WATER

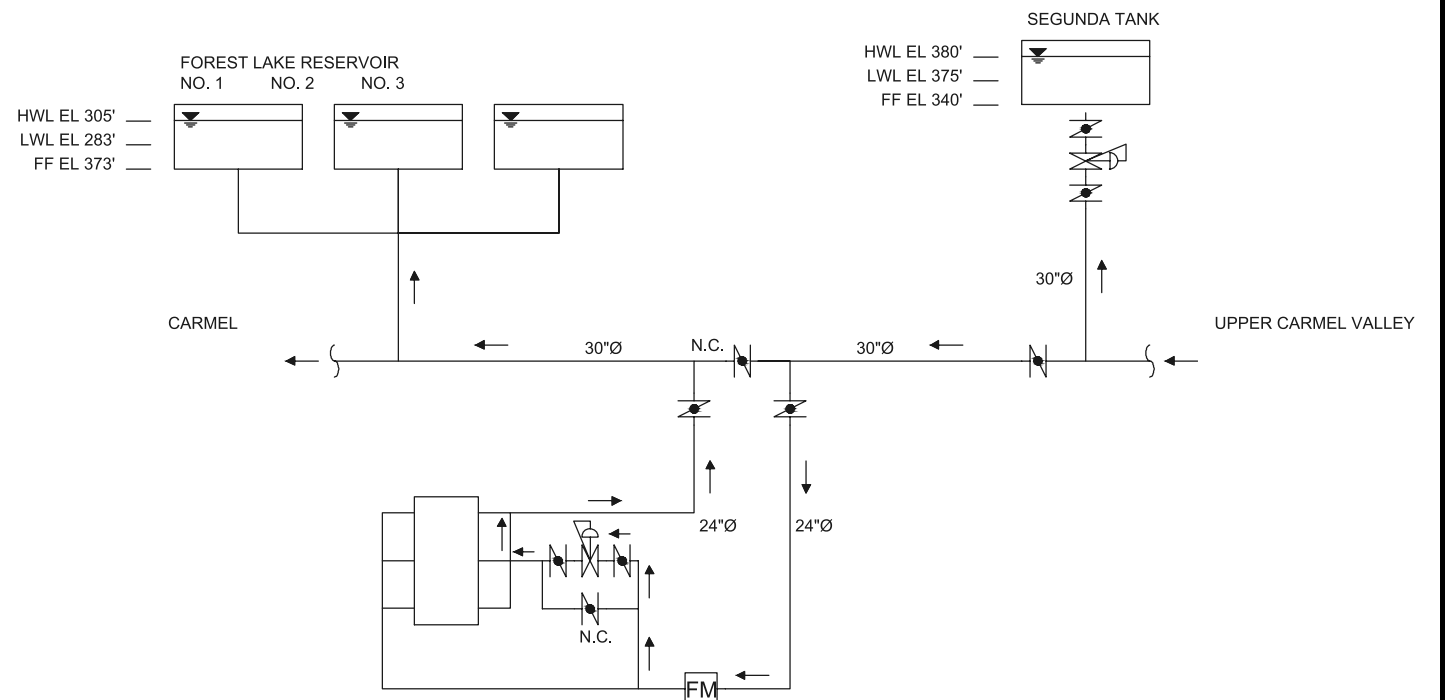
DRAWN BY LK
PROJECT ENG'R CS
APPROVED C. SMITH

DATE: SEPTEMBER 2018
PROJECT 60424498

USE DIMENSIONS ONLY
SCALE AS SHOWN

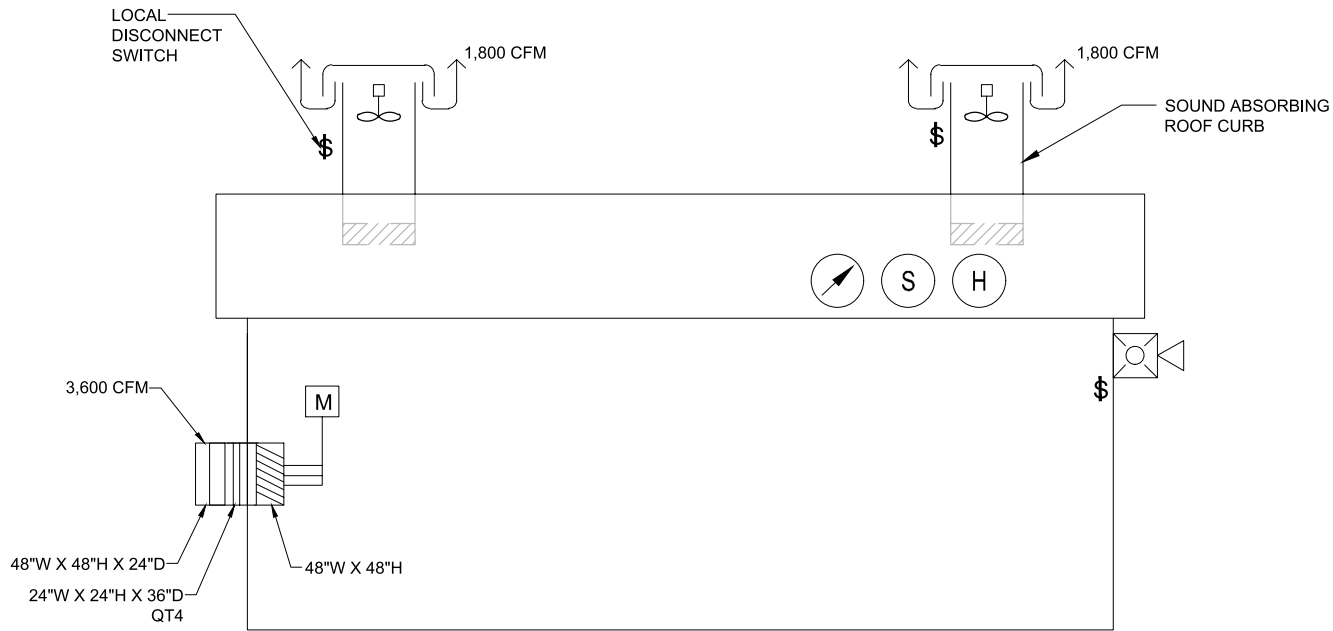
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FOR CONSTRUCTION PURPOSES

M01.1


$$\frac{2}{-}$$


M1.2 SCHEMATIC DIAGRAM

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VENTILATION SYSTEM SCHEMATIC
SCALE: NTS

SYMBOLS:

- ACOUSTIC LOUVER
- SILENCER
- MOTORIZED LOUVER
- SWITCH
- CEILING MOUNTED THERMOMETERS
- CEILING MOUNTED SMOKE DETECTOR
- CEILING MOUNTED HEAT DETECTOR
- EXTERIOR FIRE ALARM AND STROBE
- DOWN BLAST EXHAUST

NOTES:

1. ROOF HATCHES NOT SHOWN FOR CLARITY.

100% PROGRESS SET
NOT FOR CONSTRUCTION

REVISIONS			CARMEL VALLEY PUMP STATION MECHANICAL VENTILATION SYSTEM SCHEMATIC	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 Lakeside Dr., Suite 400 OAKLAND, CALIFORNIA 94612	
			DRAWN BY LK PROJECT ENG'R CS APPROVED C. SMITH	DATE APRIL 2018 PROJECT 60424498 USE DIMENSIONS ONLY SCALE AS SHOWN
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	M01.3

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PUMPS

ITEM	DESCRIPTION	MODEL OR APPROVED EQUAL	QT
P300 P400 P500	VERTICAL TURBINE PIPE , OPEN LINE SHAFT W/ BOWL ASSEMBLY, COLUMN ASSEMBLY, SUCTION CAN, DISCHARGE HEAD & DRIVER. 1,200 GPM @ 178 FT TDH. 75 HP MOTOR	GOULD MODEL 12CMC W/ 3 STAGE	3

PIPING

ITEM	DESCRIPTION	MODEL OR APPROVED EQUAL	QT
-	PIPING, DI, CLASS 150, 30"	TYLER, US PIPE	LOT
-	PIPING, DI, CLASS 200, 24"	TYLER, US PIPE	LOT
-	PIPING, DI, CLASS 250, 18"	TYLER, US PIPE	LOT
-	PIPING, DI, CLASS 350, 10"	TYLER, US PIPE	LOT
-	PIPING, DI, CLASS 350, 8"	TYLER, US PIPE	LOT

FITTINGS

ITEM	DESCRIPTION	MODEL OR APPROVED EQUAL	QT
E1	ELBOW, 90 DEG, DI, 24"	TYLER, US PIPE	6
E2	ELBOW, 90 DEG, DI, 18"	TYLER, US PIPE	3
E3	ELBOW, 90 DEG, DI, 10"	TYLER, US PIPE	3
E4	ELBOW, 90 DEG, DI, 8"	TYLER, US PIPE	7
E5	ELBOW, 11.25 DEG, DI, 18"	TYLER, US PIPE	1
T1	TEE, REDUCING, DI, 30"X30"X24"	TYLER, US PIPE	2
T2	TEE, REDUCING, DI, 24"X24"X24"	TYLER, US PIPE	4
T3	TEE, REDUCING, DI, 24"X24"X10"	TYLER, US PIPE	3
T4	TEE, REDUCING, DI, 18"X18"X8"	TYLER, US PIPE	4
R1	REDUCER, DI, 24"X18"	TYLER, US PIPE	1
-	BLIND FLANGE, DI, 24"	TYLER, US PIPE	1
-	BLIND FLANGE, DI, 24"	TYLER, US PIPE	1

VALVES

ITEM	DESCRIPTION	MODEL OR APPROVED EQUAL	QT
BF1	BUTTERFLY VALVE, RUBBER SEATED, 30"	MUELLER LINESEAL SERIES	1
BF2	BUTTERFLY VALVE, RUBBER SEATED, 24"	MUELLER LINESEAL SERIES	5
CK1	CHECK VALVE, RESILIENT SEATED, 8"	AMERICAN SERIES 2100	3
GV1	GATE VALVE, RESILIENT SEATED, 10"	MUELLER 2360 SERIES	3
GV2	GATE VALVE, RESILIENT SEATED, 8"	MUELLER 2360 SERIES	4
PRV100	PRESSURE RELIEF & SURGE ANTICIPATOR VALVE, 8"	CLA-VAL MODEL 52-03	1
CV1	COMBINATION RATE OF FLOW, BACK PRESSURE AND SOLENOID SHUTOFF CONTROL VALVE	CLA-VAL MODEL 43G-03BPKC D/S	1

APPURTENANCES

ITEM	DESCRIPTION	MODEL OR APPROVED EQUAL	QT
CU1	COUPLING W/ AWWA M11 HARNESS RESTRAINT, 30"	ROMAC STYLE 400	1
CU2	COUPLING W/ AWWA M11 HARNESS RESTRAINT, 24"	ROMAC STYLE 501	2
CU3	COUPLING W/ AWWA M11 HARNESS RESTRAINT, 10"	ROMAC STYLE 501	3
DS1	DISMANTLING JOINT, 24"	ROMAC STYLE DJ400	3
DS2	DISMANTLING JOINT, 8"	ROMAC STYLE DJ400	3
EX2	EXPANSION JOINT, ELASTOMERIC, 10"	REDFLEX J-1 WIDE ARCH	3
EX3	EXPANSION JOINT, ELASTOMERIC, 8"	REDFLEX J-1 WIDE ARCH	3
FE600	FLOW METER, ELECTROMAGNETIC, 24"	SPARLING TIGERMAG EP FM656	1
FE300 FE400 FE500	FLOW METER, ELECTROMAGNETIC, 8"	SPARLING TIGERMAG EP FM656	3

VENTILATION

ITEM	DESCRIPTION	MODEL OR APPROVED EQUAL	QT
F1 F2	FAN, EXHAUST, ROOF DOWNBLAST, DIRECT DRIVE, 2,087 CFM AT 0.5 IN WG, 665 RPM W/SS BIRD SCREEN ROOF CURB, SOUND ABSORBING DAMPER, STAINLESS STEEL, ELECTRIC ACTUATED, FAIL CLOSE	GREENHECK MODEL G070 GREENHECK GPF GREENHECK SEVCD-23	2 2 2
LV1	LOUVER, ACOUSTIC, 48"W X 48" H X 24"D STAINLESS STEEL SOUND ATTENUATOR, 24"W X 24"H X 36"D GALVANIZED STEEL BIRD SCREEN, 1" X 1", WELDED, STAINLESS STEEL, 85% OPEN AREA DAMPER, STAINLESS STEEL, ELECTRIC ACTUATED, FAIL CLOSE	IAC ACOUSTICS NOISHIELD ACOUSTIC LOUVER MODEL SL-24 COMMERCIAL ACOUSTIC MODEL HP-EE MCNICHOLS COMPANY GREENHECK SEVCD-23	1 4 1 1

100% PROGRESS SET
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REVISIONS

CARMEL VALLEY
PUMP STATION
MECHANICAL
LIST OF MATERIALS

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR, SUITE 400
OAKLAND, CALIFORNIA 94612

AECOM



DRAWN BY LK
PROJECT ENG'R LT
APPROVED C. SMITH

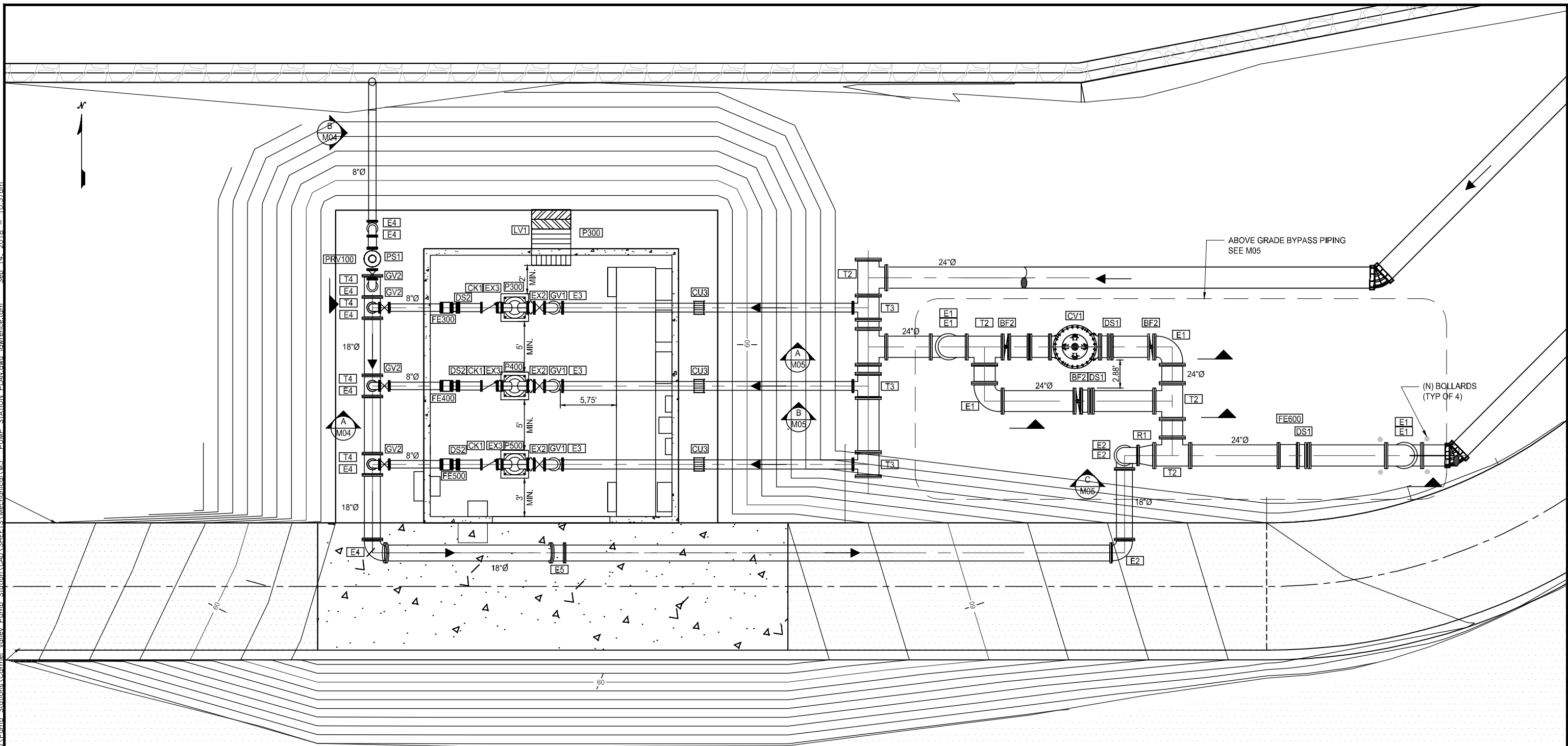
DATE: SEPTEMBER 2018
PROJECT 60424498

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M02

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NOTES:

- SEE LIST OF MATERIALS ON M02 FOR EQUIPMENT LABELS.

PLAN
SCALE: 1"=5'

1
-

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REVISIONS

NO.	DESCRIPTION	DATE

CARMEL VALLEY
PUMP STATION
MECHANICAL
PUMP STATION PLAN

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR., SUITE 400
OAKLAND, CALIFORNIA 94612

AECOM



DRAWN BY LK
PROJECT ENGR LT
APPROVED C. SMITH

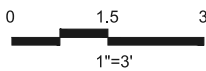
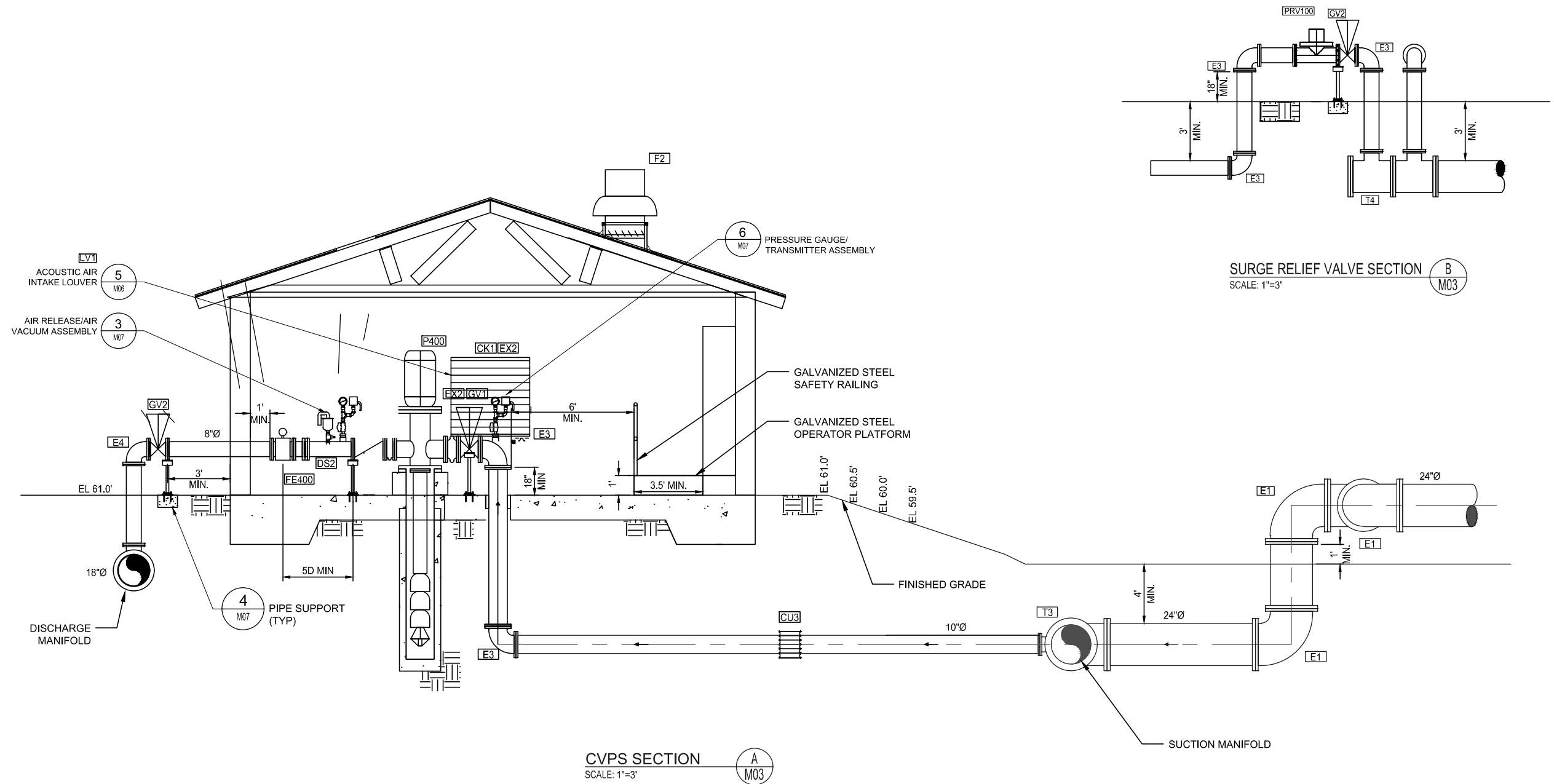
DATE: SEPTEMBER 2018
PROJECT 60424498

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SCALE AS SHOWN

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M03

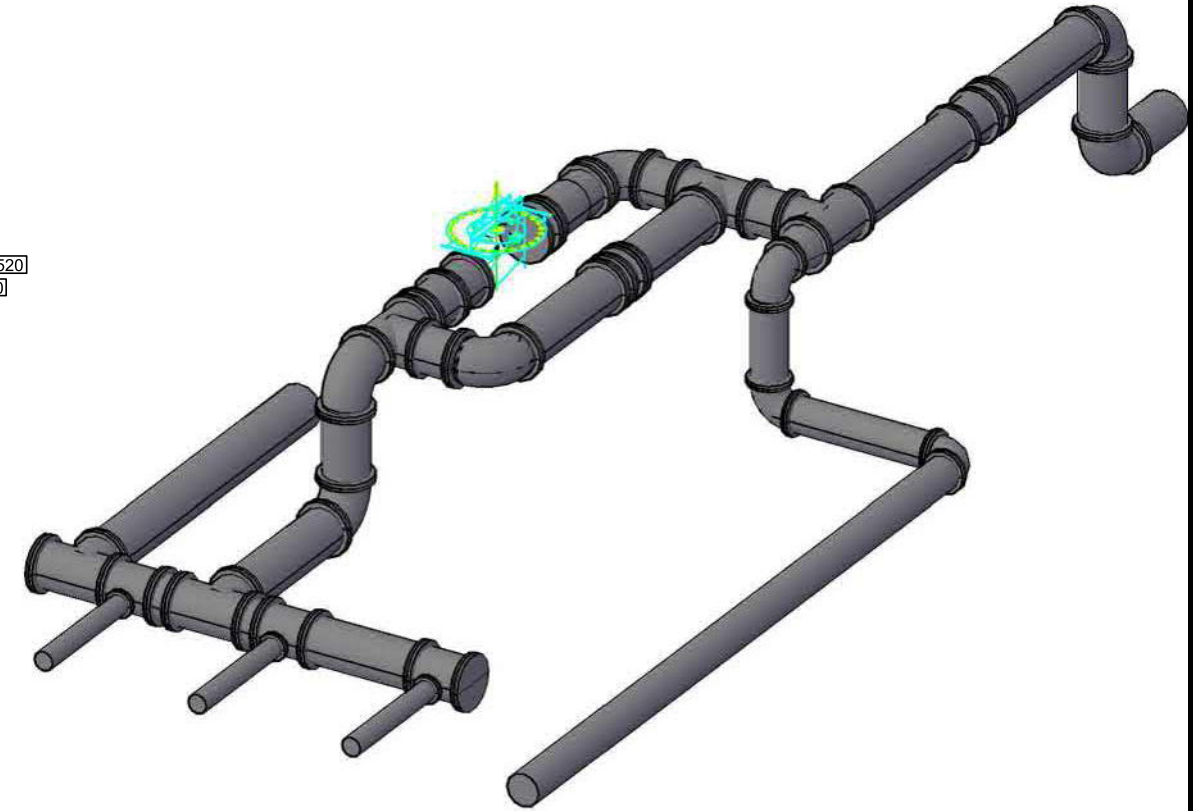
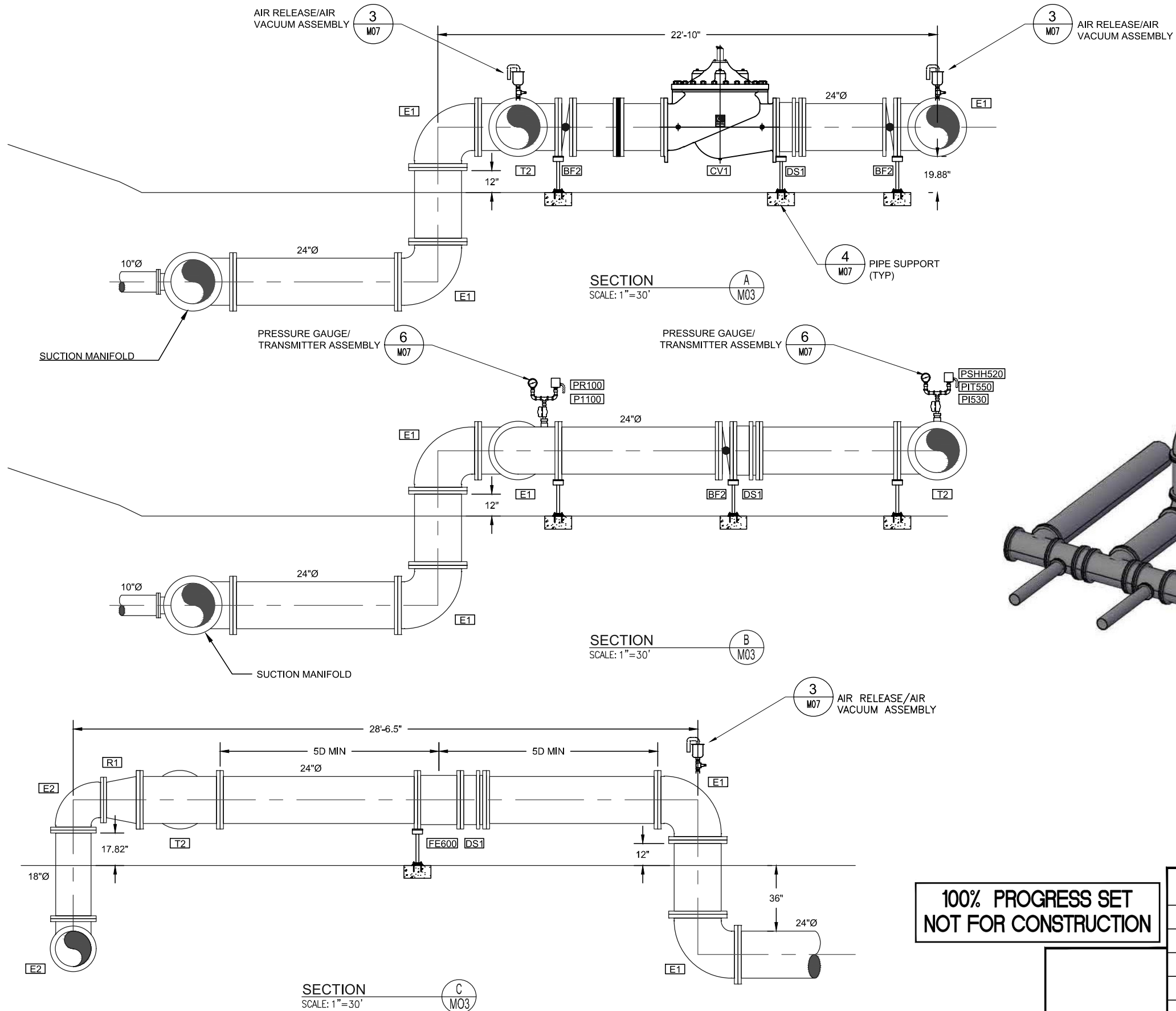
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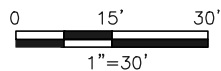
REVISIONS			CARMEL VALLEY PUMP STATION MECHANICAL PUMP STATION SECTIONS	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE DR, SUITE 400 OAKLAND, CALIFORNIA 94612	
			DRAWN BY LK PROJECT ENG'R LT APPROVED C. SMITH	
			DATE: SEPTEMBER 2018 PROJECT 60424498	
			USE DIMENSIONS ONLY SCALE AS SHOWN	
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
			M04	

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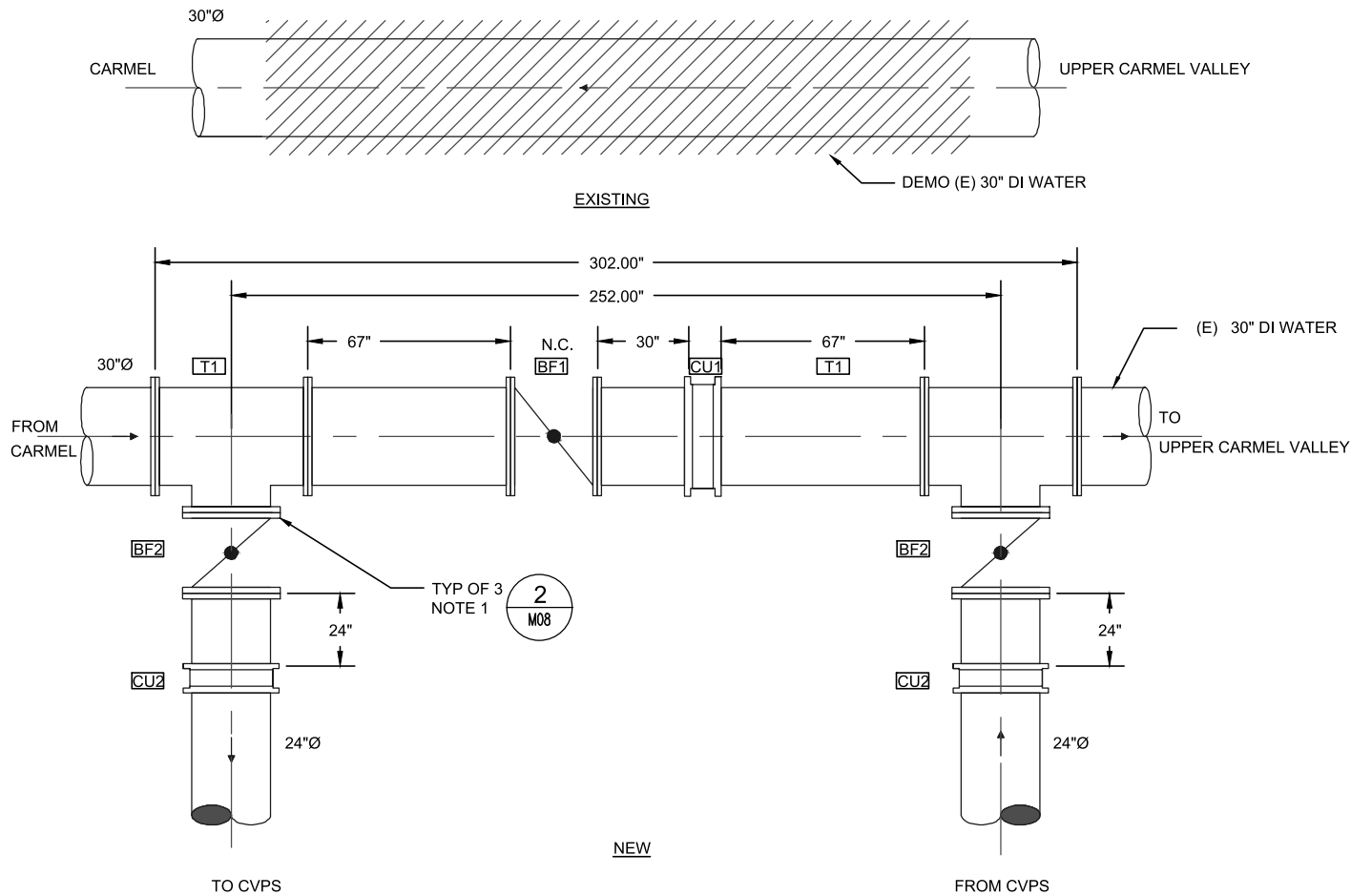
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REVISIONS			CARMEL VALLEY PUMP STATION MECHANICAL ABOVE GRADE BYPASS PIPING		
			CALIFORNIA AMERICAN WATER		
			AECOM 300 LAKESIDE DR, SUITE 400 OAKLAND, CALIFORNIA 94612		
			DRAWN BY LK PROJECT ENG'R LT APPROVED C. SMITH		
			DATE: SEPTEMBER 2018 PROJECT 60424498		
			USE DIMENSIONS ONLY SCALE AS SHOWN		
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES			M05		

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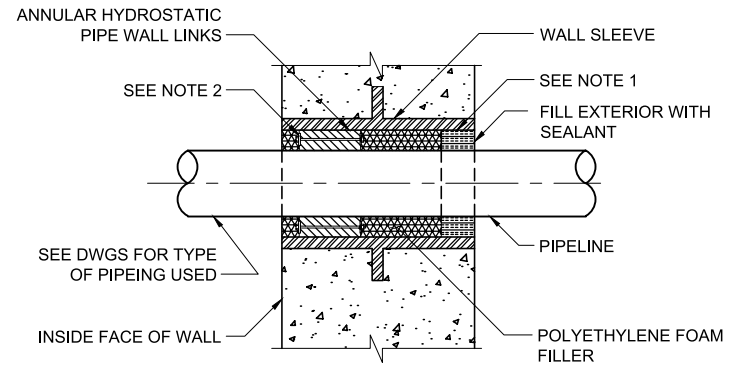


- NOTE:
1. ADDITIONAL PIPE SPOOL PIECE MAY BE USED AT TEE TO FACILITATE CONSTRUCTION OF BFV BYPASS. SPOOL LENGTH SHALL BE <3 FEET.

CARMEL VALLEY RD PLAN

SCALE: 1"=30'

3
C04



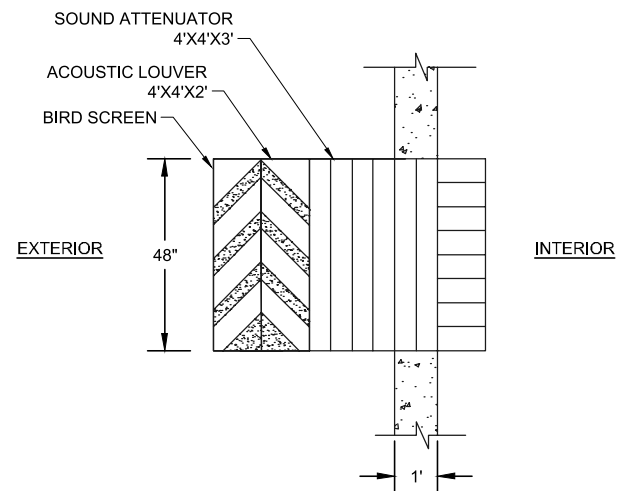
NOTE:

1. FOR A WALL THICKNESS GREATER THAN 12" LINK SEAL SHALL BE USED ON BOTH THE BUILDING AND SOIL SIDE.
2. ALL BOLT HEADS FOR LINK SEAL SHALL FACE INSIDE OF THE BUILDING OR STRUCTURE.

FLOOR/WALL PIPELINE PENETRATION

SCALE: NTS

1
-



ACOUSTIC AIR

INTAKE LOUVER

SCALE: NTS

5
-

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NOT FOR CONSTRUCTION

REVISIONS

CARMEL VALLEY
PUMP STATION
MECHANICAL
PLAN & MISC DETAILS

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR, SUITE 400
OAKLAND, CALIFORNIA 94612

AECOM



DRAWN BY LK
PROJECT ENG'R LT
APPROVED C. SMITH

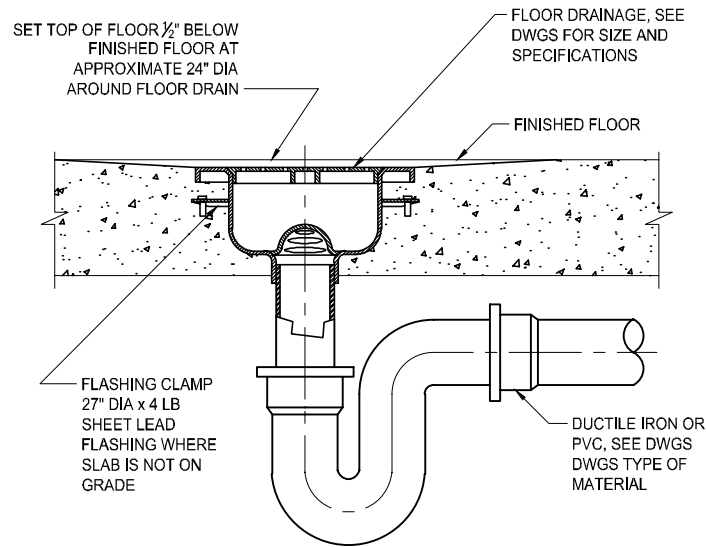
DATE: SEPTEMBER 2018
PROJECT 60424498

USE DIMENSIONS ONLY
SCALE AS SHOWN

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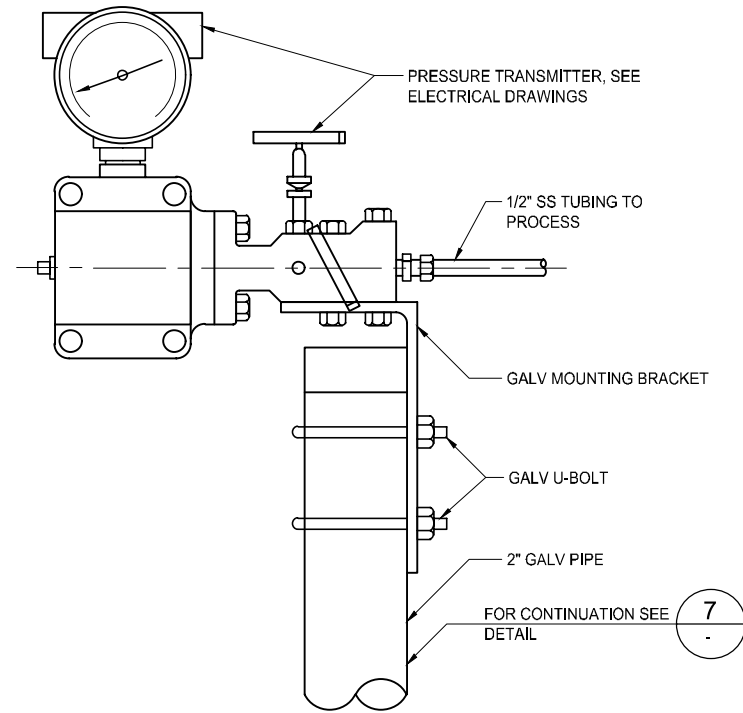
M06

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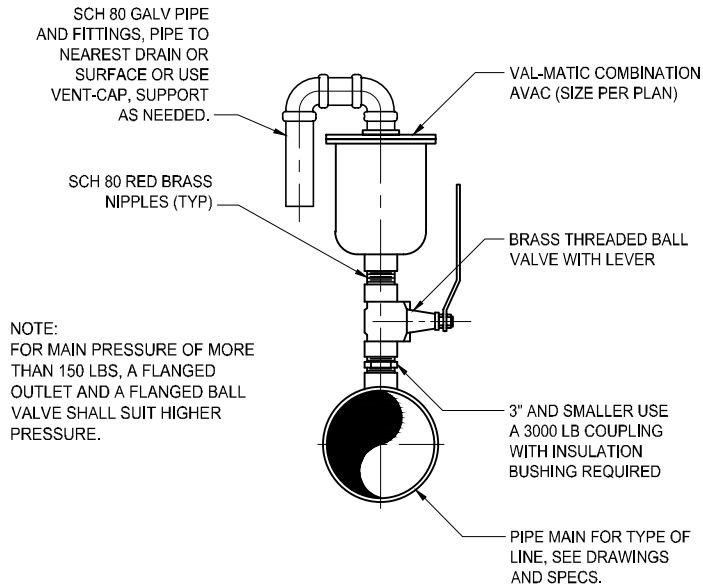
FLOOR DRAIN
SCALE: NTS

1



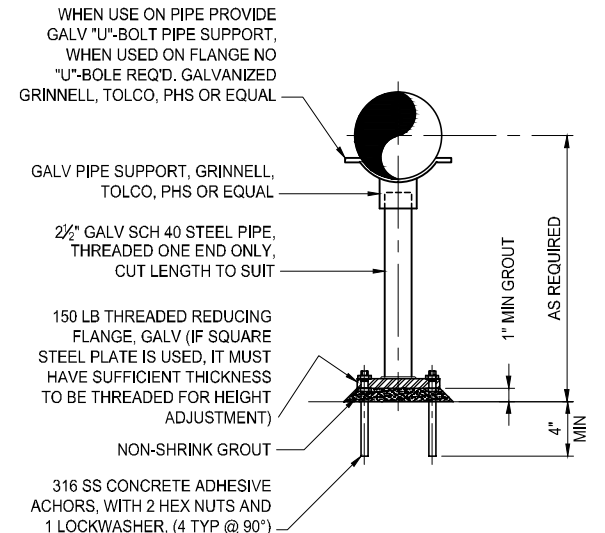
**INSTRUMENTATION
MOUNTING DETAIL**
SCALE: NTS

2



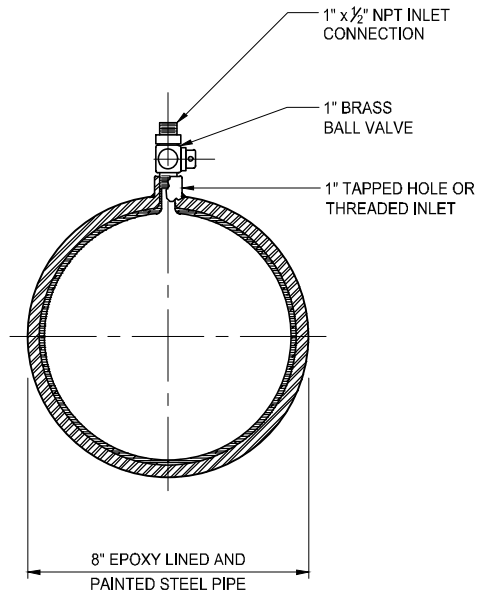
**AIR VACUUM/
AIR RELEASE ASSEMBLY**
SCALE: NTS

3



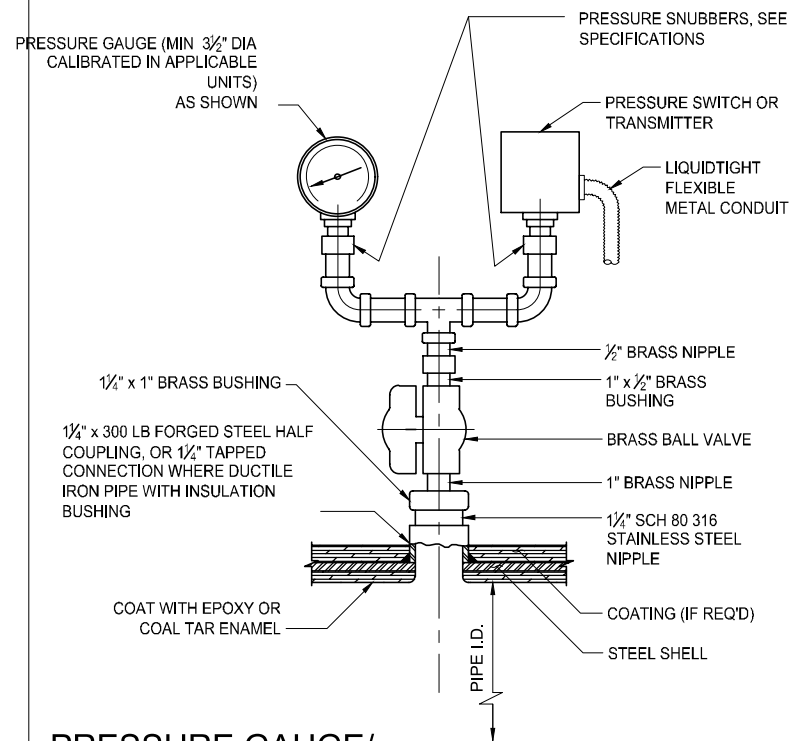
PIPE SUPPORT
SCALE: NTS

4



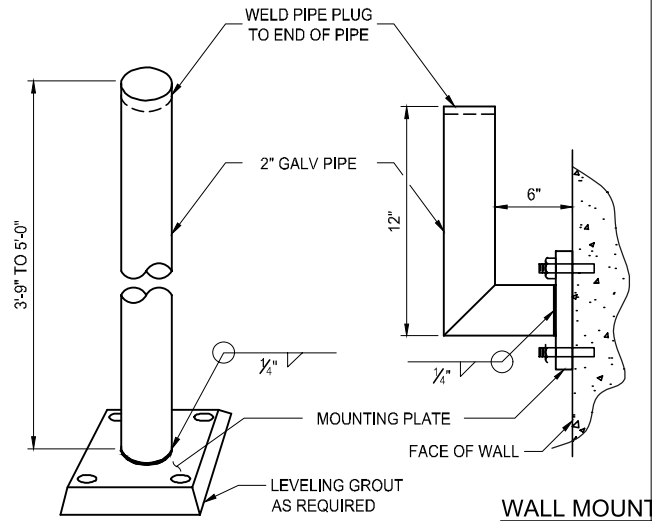
SAMPLE PORT
SCALE: NTS

5



**PRESSURE GAUGE/
TRANSMITTER ASSEMBLY WITH SEAL**
SCALE: NTS

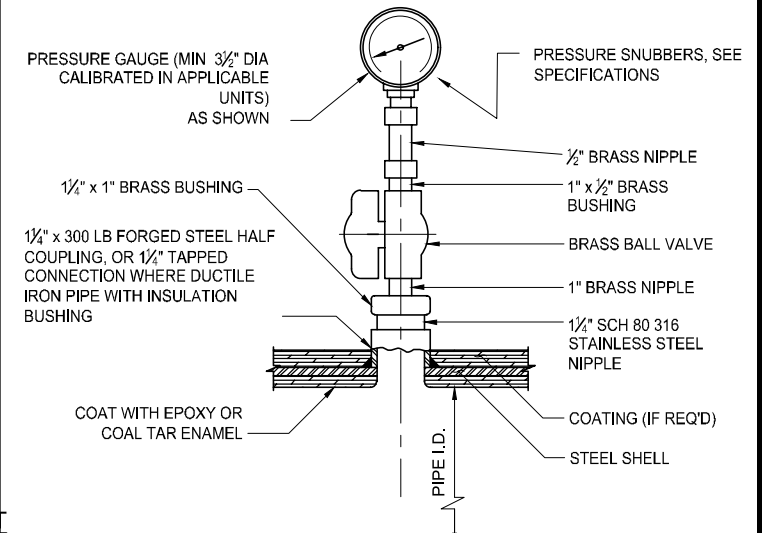
6



FLOOR STAND / WALL MOUNT
SCALE: NTS

7

- NOTE:
- TYPICAL MOUNTING PLATE: 6" x 6" x 3/16" WITH FOUR 5/16" BOLT HOLES.
 - PROVIDE FOUR 2" x 5/16" CAPSULE ANCHOR BOLTS.



**PRESSURE GAUGE
ASSEMBLY WITH SEAL**
SCALE: NTS

8

**100% PROGRESS SET
NOT FOR CONSTRUCTION**

REVISIONS

CARMEL VALLEY
PUMP STATION
MECHANICAL
MISC DETAILS

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE DR, SUITE 400
OAKLAND, CALIFORNIA 94612

AECOM

**CALIFORNIA
AMERICAN WATER**

DRAWN BY LK
PROJECT ENG'R LT
APPROVED C. SMITH

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M07

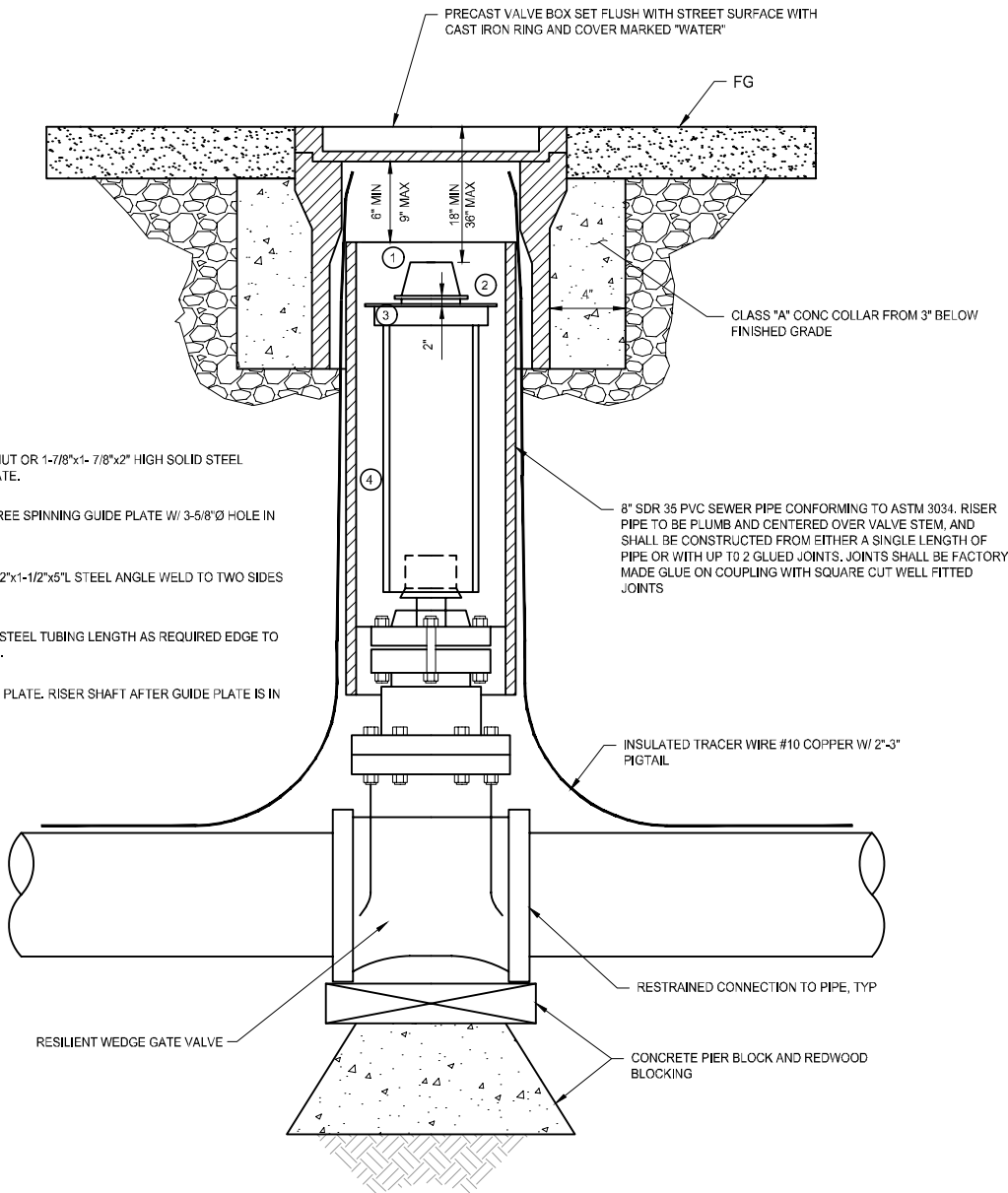
L:\Projects\Legacy\IE\CAW_Desal_26818629\6000 Design\6100 CAD\Pump Stations\Carmel Valley Pump Station\CAD\DETAILS\M8_VALVE DETAILS.dwg lawrence.tam Sep 14, 2018 10:54am

STEM EXTENSION FABRICATION NOTES:

1. ALL WELDS TO RISER SHAFT SHALL BE FILLET WELD ALL AROUND AS SPECIFIED BELOW.
2. ALL STEEL REQUIRED FOR RISER FABRICATION SHALL BE STRUCTURAL STEEL PER ASTM A36.

PARTS LIST:

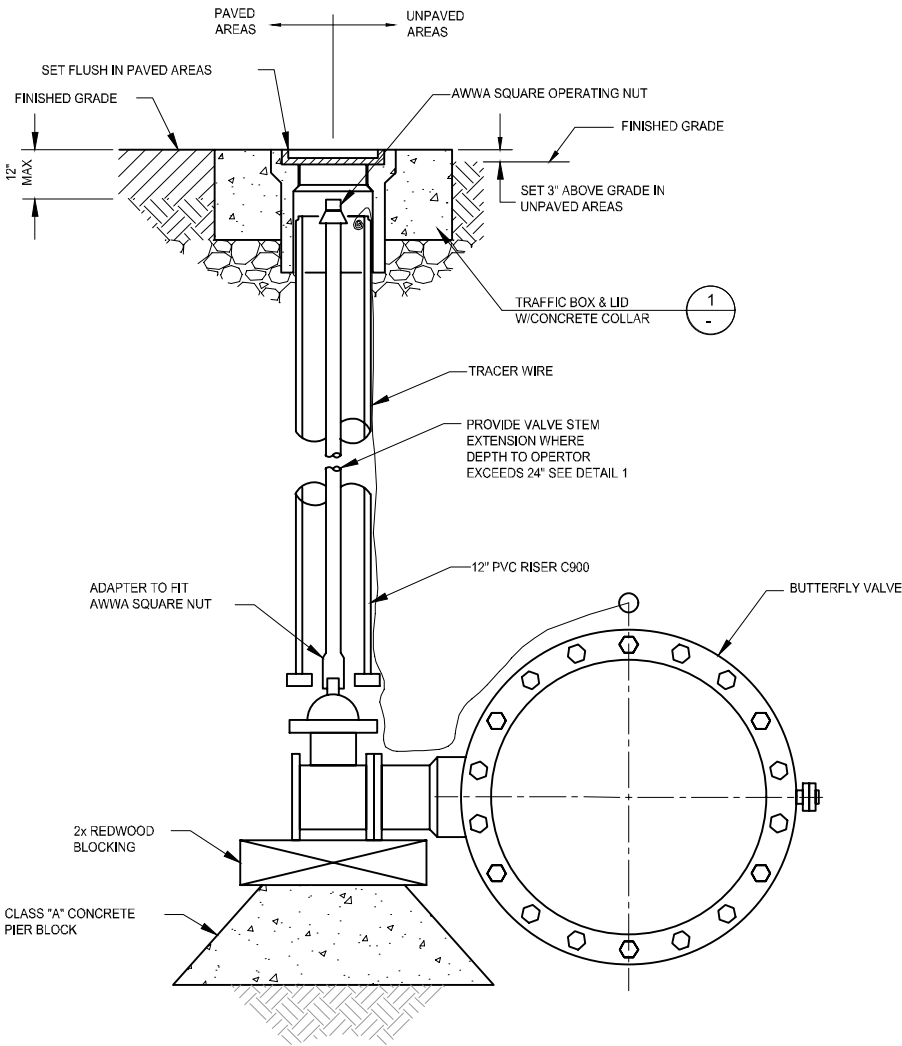
- 1 VALVE OPERATING NUT OR 1-7/8"x1- 7/8"x2" HIGH SOLID STEEL WELDED TO TOP PLATE.
- 2 3/16" THK x 7-1/2"Ø FREE SPINNING GUIDE PLATE W/ 3-5/8"Ø HOLE IN CENTER.
- 3 TWO 3/16"x1-1/2"x1-1/2"x1-1/2"x5"L STEEL ANGLE WELD TO TWO SIDES OF RISER SHAFT.
- 4 2-1/2"x3/16" SQUARE STEEL TUBING LENGTH AS REQUIRED EDGE TO WELD TO TOP PLATE.
- 5 3"x3"x1/4" STEEL TOP PLATE. RISER SHAFT AFTER GUIDE PLATE IS IN PLACE.



VALVE NOTES:

1. ALL EXTERNAL BOLTS AND NUTS ON VALVES SHALL BE 304 STAINLESS STEEL AND THE ENTIRE VALVE SHALL BE WRAPPED TIGHTLY WITH POLYETHYLENE FILM HELD SECURELY WITH ADHESIVE TAPE.
2. IF VALVE IS INSTALLED SO THAT THE TOP OF THE OPERATING NUT IS LESS THAN 30" BELOW FINISHED GRADE, THE VALVE STEM RISER IS NOT REQUIRED.

TYPICAL VALVE INSTALLATION, 12 INCHES AND SMALLER
SCALE: NTS



NOTES:

1. PROVIDE PROTECTIVE COATING TO EXTERIOR SURFACE OF VALVE BODY. WRAP WITH WAX TAPE WRAPPING SYSTEM.
2. INSTALL 4-IN BYPASS LINE AROUND EACH BVV.
- a. USE 4-IN AWWA RESILIENT WEDGE GATE VALVE INSTALLED PER DETAIL 1.
- b. USE STAINLESS STEEL THREADED OUTLET TAPPING SLEEVE ON DI PIPE. USE HDPE IPS MOLDED BRANCH SADDLE, PRESSURE CLASS 200 AWWA COMPLIANT ON HDPE PIPE (REQUIRES SPECIAL HEATERS AND EQUIPMENT TO INSTALL). LOCATE SADDLES MIN 1-FT FROM BVV. INSTALL 4-IN CORP STOP ON SERVICE SADDLES.
- c. INSTALL 4-IN PVC SCH. 80 PIPE BETWEEN 4-IN CORP AND 4IN GATE VALVE ON EACH SIDE IN CONFORMANCE WITH CAW STANDARD DRAWING No. 8A FOR A 4-IN WATER SERVICE.

TYPICAL VALVE INSTALLATION, LARGER THAN 12 INCHES
SCALE: NTS



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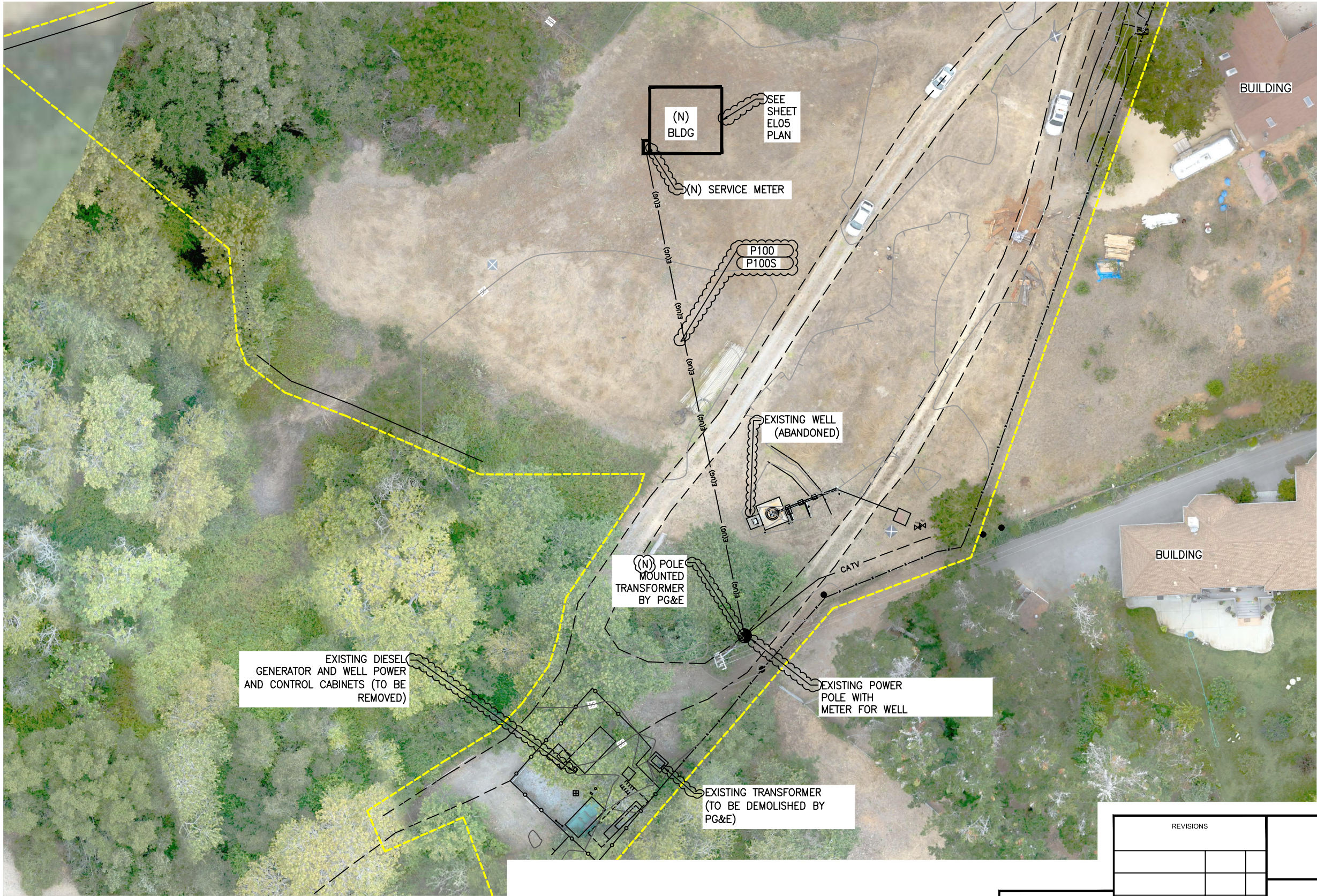
REVISIONS			CARMEL VALLEY PUMP STATION MECHANICAL VALVE DETAILS	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE DR, SUITE 400 OAKLAND, CALIFORNIA 94612	 
			DRAWN BY LK PROJECT ENG'R LT APPROVED C. SMITH	DATE: SEPTEMBER 2018 PROJECT 60424498 USE DIMENSIONS ONLY SCALE AS SHOWN
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES			M08	

ELECTRICAL ABBREVIATIONS									
A	AMP	(E)	EXISTING	L-B	LINE-BUS	RAC	RIGID ALUMINUM CONDUIT		
AAP	ALARM ANNUNCIATOR PANEL	E	ELECTRICAL	L-G	LINE-GROUND	R - X	RESISTOR OR POTENTIOMETER NO. X		
ABAN	ABANDON	E/G	EMERGENCY GENERATOR	L1, L2, L3	LIGHTING PANEL BRANCH CIRCUIT	RECPT	RECEPTACLE		
ABCB	AIR BLAST CIRCUIT BREAKER	E.C.	ELECTRICAL CONTRACTOR	LA	LIGHTNING ARRESTOR	REV	REVERSE		
ABS	ABSOLUTE	EM	EMERGENCY	LB	POUND	RF	RADIO FREQUENCY		
ABSW	AIR BREAK SWITCH	EMF	ELECTROMOTIVE FORCE	LBL	LABEL	RH	RELATIVE HUMIDITY		
ABT	AIR BLAST TRANSFORMER	EMT	ELECTRICAL METALLIC TUBING	LC	LIGHTING CONTACTOR	RM - X	REMOTE MODULE NO. X		
AC	ALTERNATING CURRENT	EN	ENERGIZED	LCP- X	LOCAL CONTROL PANEL NO. X	RS	RAPID START		
ACB	AIR CIRCUIT BREAKER	ENAM	ENAMEL	LDR	LOADING RELAY	RVAT	REDUCED VOLTAGE AUTO TRANSFORMER		
ACK	ACKNOWLEDGE	ENCL	ENCLOSURE	LEL	LOWER EXPLOSIVE LIMIT	RVNR	REDUCED VOLTAGE NON-REVERSING		
ACP - X	AREA/AUXILIARY CONTROL PANEL NO. X	ENG	ENGINE	LL	LEAD-LAG LOAD REACTOR	RVSS	REDUCED VOLTAGE SOLID STATE		
ACTR	ACTUATOR	ENT	ELECTRICAL NON-METALLIC TUBING	LLCO	LOW LEVEL CUT-OFF	RWL	ROADWAY LIGHT		
ADDL	ADDITIONAL	EP	EXPLOSION PROOF	LOR	LOCAL-OFF-REMOTE	S	SHIELD		
ADDM	ADDENDUM	ESD	EMERGENCY STOP DEPRESSED	LOS	LOCK-OUT STOP	S/A	SURGE ARRESTER		
AF	AMP FRAME	ESR	EMERGENCY STOP RELAY	LP	LIGHT POLE	SD	SMOKE DETECTOR		
AFC	AUTOMATIC FREQUENCY CONTROL	ETM	ELAPSED TIME METER	LP - X	LIGHTING PANEL NO. X	SDBC	SOFT DRAWN BARE COPPER		
AHC	AUTO-HOLD-CLOSED	FA	FIRE ALARM	LR	LATCHING RELAY LINE REACTOR	SEC	SECOND		
AHJ	AUTHORITY HAVING JURISDICTION	FACP	FIRE ALARM CONTROL PANEL	LRA	LOCKED ROTOR AMPS	S-F	SLOWER-FASTER		
AHM	AMPERE HOUR METER	FBO	FURNISHED BY OTHERS	LS	LIMIT SWITCH	SFL	SUB FEED LUGS		
AIC	AMP INTERRUPTING CAPACITY	FC	FOOTCANDLE / FAIL CLOSED	LTG	LIGHTING	SIG	SIGNAL		
AM	AMMETER	FDR	FEEDER	LV	LOW VOLTAGE	SLT	SEALTIGHT LIQUIDTIGHT FLEXBLE CONDUIT		
AMB	AMBIENT	FLA	FULL LOAD AMPS	LVL	LEVEL	SM	SURFACE MOUNTED		
ANN	ANNUNCIATOR	FLP	FAIL TO LAST POSITION	M-X	MOTOR CONTROLLER NO. X	SP	SINGLE POLE		
ANT	ANTENNA	FLUOR	FLUORESCENT	MA	MILLIAMPERE	SPD	SURGE PROTECTIVE DEVICE		
APU	AUXILIARY POWER UNIT	FLX	FLEXIBLE CONDUIT	MAN	MANUAL	SPDT	SINGLE POLE DOUBLE THROW		
ARM	ARMORED CABLE	FM	FREQUENCY MODULATION / FLOOR MOUNTED	MATV	MASTER ANTENNA TELEVISION SYSTEM	SPST	SINGLE POLE SINGLE THROW		
AS	AMMETER SWITCH	FO	FIBER OPTIC	MAX	MAXIMUM	SPKR	SPEAKER		
ASU	AIR SUPPLY UNIT	FOPP	FIBER OPTIC PATCH PANEL	MC	MODULATE-CLOSE	S-S	START-STOP		
ASYM	ASYMMETRICAL	F-O-S	FAST-OFF-SLOW	MCA	MOTOR CIRCUIT AMPS	SS	SOLID STATE		
AT	AMP TRIP	F-O-S-A	FAST-OFF-SLOW-AUTO	MCB	MAIN CIRCUIT BREAKER	SSC	SUPERVISORY SET POINT CONTROL		
ATO	AUTOMATIC THROW OVER	F-O-S-R	FAST-OFF-SLOW-REMOTE	MCC - X	MOTOR CONTROL CENTER NO. X	STB	SHORTING TERMINAL BLOCK		
ATP	AMMETER TEST POINT	FP - X	FIELD PANEL NO. X	MCP	MOTOR CIRCUIT PROTECTOR	SV	SOLENOID VALVE		
ATS	AUTOMATIC TRANSFER SWITCH	FRC	FIBERGLASS RIGID CONDUIT	MCS	MOLDED CASE SWITCH	SW	SWITCH		
AUTO XFMR	AUTOMATIC TRANSFORMER	FREQ	FREQUENCY	MD	MOTION DETECTOR	SWBD	SWITCHBOARD		
AUX	AUXILIARY	FREQ	FREQUENCY	MERC	MERCURY VAPOR	SWGR	SWITCHGEAR		
AWG	AMERICAN WIRE GAGE	FS	FLOAT SWITCH	M/G	MOTOR GENERATOR	SYM	SYMBOL		
B	BELL	FUSE	FUSED SWITCH	MGO	MAGNETICALLY OPERATED	SYS	SYSTEM		
BAT	BATTERY	FU SW	FUSED SWITCH	MH	MANHOLE, MOUNTING HEIGHT	TACH	TACHOMETER		
BCT	BUSHING CURRENT TRANSFORMER	FUT	FUTURE	MLO	MAIN LUGS ONLY	TB - X	TERMINAL BLOCK - UNIT X		
BDCT	BUS DIFFERENTIAL CURRENT TRANSFORMER	FVNR	FULL VOLTAGE NON-REVERSING	MM	MULTIMETER	TC	THERMOCOUPLE/TIME CLOCK/TRAY CABLE		
BHP	BRAKE HORSEPOWER	FVR	FULL VOLTAGE REVERSING	MO	MANUALLY OPERATED	TD	TEMPERATURE DETECTOR RELAY		
BKR	BREAKER	FWD	FORWARD	MOD	MOTOR OPERATED DAMPER	TDR	TIME DELAY RELAY		
BPD	BUSHING POTENTIAL DEVICE	G	GROUND / EQUIPMENT GROUND	MOT	MOTOR	TE	TOTALLY ENCLOSED		
BRF	BELOW RAISED FLOOR	GEN	GENERATOR	MOV	METAL OXIDE VARISTOR	TEFC	TOTALLY ENCLOSED FAN COOLED		
C	CONDUIT	GRC	GALVANIZED RIGID CONDUIT	MPR	MOTOR PROTECTION RELAY	TEMP	TEMPORARY		
C-A-M	COMPUTER-AUTO-MANUAL	GFCI	GROUND FAULT CIRCUIT INTERRUPTER (RECEPTACLE)	MS-X	MOTOR STARTER NO. X	TENV	TOTALLY ENCLOSED NON-VENTILATED		
CB	CIRCUIT BREAKER	GFI	GROUND FAULT INTERRUPTER (BREAKER)	MSP	MOTOR STARTING PANEL	TERM	TERMINAL		
CC	CONTROL CABLE	GFR	GROUND FAULT RELAY	MT	EMPTY	TJB	TERMINAL JUNCTION BOX		
CCS	CENTRAL CONTROL SYSTEM	GS	GOVERNOR SWITCH	MTO	MANUAL THROW OVER	TM	THERMAL MAGNETIC		
CCT	CONTROL CIRCUIT TRANSFORMER	H	HOT-LEG	MTR-X	MOTOR NO. X	TOT	TOTAL		
CCTV	CLOSED CIRCUIT TELEVISION	HF	HIGH FREQUENCY	MTS	MANUAL TRANSFER SWITCH	TP	TWISTED PAIR		
CCW	COUNTER CLOCKWISE	Hg	MERCURY	MV	MEGAVOLT	TS	TEMPERATURE SWITCH		
CFP	CHEMICAL FEED PUMP	HID	HIGH INTENSITY DISCHARGE	MVA	MEGAVOLT-AMPERES	TS1W	TWO SPEED CONSEQUENT POLE, ONE WINDING		
CKT	CIRCUIT	HO	HIGH OUTPUT	MW	MEGAWATT	TS2W	TWO SPEED SEPARATE WINDING		
C-M	COMPUTER MANUAL	H-O-A	HAND-OFF-AUTO	MWH	MOTOR WINDING HEATER	TSTAT	THERMOSTAT		
CO	CUT OFF SWITCH	H-O-R	HAND-OFF-REMOTE	N	NEUTRAL / NORTH / NITROGEN	TU or TURB	TURBIDITY		
COAX	COAXIAL CABLE	HORIZ	HORIZONTAL	(N)	NEW	TYP	TYPICAL		
COEF	COEFFICIENT	HP	HORSEPOWER	NC	NORMALLY CLOSED	UG or (UG)	UNDERGROUND		
COM	COMMON	HPF	HIGH POWER FACTOR	NCTO	NORMALLY CLOSED TIMED OPEN	UHF	ULTRA HIGH FREQUENCY		
COMM	COMMUNICATION	HPS	HIGH PRESSURE SODIUM	NEC	NATIONAL ELECTRICAL CODE	UNG	UNGROUND		
CPT	CONTROL POWER TRANSFORMER	HR	HOUR	NEG	NEGATIVE	UON	UNLESS OTHERWISE NOTED		
CP - X	CONTROL PANEL DESIGNATION X	HS	HAND OPERATED SELECTOR SWITCH	NEUT	NEUTRAL	UPS	UNINTERRUPTABLE POWER SUPPLY		
CR - X	CONTROL RELAY DESIGNATION X	HSTAT	HUMIDISTAT	NFC	NONMETALLIC FLEXIBLE CONDUIT	UVR	UNDER VOLTAGE RELAY		
CS	CONTROL SWITCH	HV	HIGH VOLTAGE	NIC	NOT IN CONTRACT	V	VOLT		
CT	CURRENT TRANSFORMER	HVAC	HEATING/VENTILATION/AIR CONDITIONING	N-J	NORMAL-JOG	VA	VOLT AMPERE		
CTC	CURRENT TRANSFORMER CABINET	HZ	HERTZ	NL	NIGHT LIGHT	VAR	VARMETER		
CTRL	CONTROL	IC	INTERRUPTING CAPACITY	NO	NORMALLY OPEN	VB	VACUUM BREAKER		
CV	CONTROL VALVE	I/C	INSTANTENOUS/CONTINUOUS LOAD	NOTC	NORMALLY OPEN TIMED CLOSED	VCO	VOLTAGE CONTROLLED OSCILLATOR		
CW	CLOCKWISE / COOL WHITE	IGN	IGNITION	NP	NAMEPLATE	VCP	VENDOR CONTROL PANEL		
CWX	COOL WHITE DELUXE	IJB	INSTRUMENT JUNCTION BOX	O	OPEN OR OPENED	VEL	VELOCITY		
DC	DIRECT CURRENT	IMC	INTERMEDIATE METAL CONDUIT	O-C	OPEN-CLOSE	VFD	VARIABLE FREQUENCY DRIVE		
DCS	DISTRIBUTED CONTROL SYSTEM	INCAND	INCANDESCENT	O-C-A	OPEN-CLOSE-AUTO	VHF	VERY HIGH FREQUENCY		
DCU - X	DISTRIBUTED CONTROL UNIT NO. X	INST	INSTANTANEOUS	OCB	OIL CIRCUIT BREAKER	VHO	VERY HIGH OUTPUT		
DD	DELAY UPON DE-ENERGIZING	INSTR	INSTRUMENT	OCR	OIL CIRCUIT RECLOSER	VM	VOLTMETER		
DE	DELAY UPON ENERGIZING	INT	INTERLOCK	OH	OVERHEAD	VP	VAPORPROOF		
DEEN	DE-ENERGIZE	INTERCOM	INTERCOMMUNICATION	OHGW	OVERHEAD GUY WIRE	VR	VOLTAGE REGULATOR		
DEMO	DEMOLITION	IW#	IN WALL (#-INCHES AFF OR AFG)	OL	OVERLOAD RELAY	VS	VOLTMETER SWITCH		
DEV	DEVIATION	IWP	IN WALL WEATHERPROOF	O-O	ON-OFF	VT	VOLTAGE TRANSFORMER		
DISC	DISCONNECT SWITCH	JB	JUNCTION BOX	O-O-A	ON-OFF-AUTO	VTP	VOLTAGE TEST POINT		
DIV	DIVISION	K	KEY INTERLOCK	O-O-R	ON-OFF-REMOTE	W	WATT / WEST / WIRE		
DM	DEMAND METER	KA	KILOAMP	OPT	OPTIONAL	WH	WATTHOUR		
DPDT	DOUBLE POLE DOUBLE THROW	KV	KILOVOLT	O-R	OFF-REMOTE	WHD	WATTHOUR DEMAND METER		
DPST	DOUBLE POLE SINGLE THROW	KVA	KILOVOLT AMPERE	O-S-C	OPEN-STOP-CLOSE	WHM	WATTHOUR METER		
DS	DOOR SWITCH	KVAR	KILOVAR (REACTANCE)	P	POLE	WM	WATTMETER		
DW	DELUXE WHITE	KW	KILOWATT	PA	PUBLIC ADDRESS	WT	WATER TIGHT		
DX	DIRECT EXPANSION	KWD	KILOWATT DEMAND	PB	PUSHBUTTON / PULL BOX	WP	WEATHER PROOF		
		KWH	KILOWATT HOUR	PCP - X	PUMP CONTROL PANEL NO. X	XFMR	TRANSFORMER		
				PCS	PVC COATED GALVANIZED STEEL CONDUIT	ZS	POSITION SWITCH		
				PCM	PROCESS CONTROL MODULE				
				PE	PHOTOCELL				
				PF	POWER FACTOR				
				PFCC	POWER FACTOR CORRECTION CAPACITOR				
				PFR	PHASE FAILURE RELAY				
				PH	PHASE				
				PNL	PANEL				
				PPX	POWER PANEL NO. X				
				PRI	PRIMARY				
				PS	PRESSURE SWITCH				
				PT	POTENTIAL TRANSFORMER				
				PTT	PUSH-TO-TEST				
				PVC	POLYVINYL CHLORIDE RIGID PLASTIC CONDUIT				
				PWR	POWER				

NOTES:
1. REFER TO OTHER DRAWINGS FOR ADDITIONAL ABBREVIATIONS.

100% PROGRESS SET
NOT FOR CONSTRUCTION

REVISIONS			CARMEL VALLEY PUMP STATION ELECTRICAL	
			ELECTRICAL ABBREVIATIONS	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612	
			DRAWN BY K. LEE PROJECT ENG'R S.KHALSA APPROVED	
			DATE OCTOBER 2019 PROJECT 60489016	
			USE DIMENSIONS ONLY SCALE AS SHOWN	
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES			EL02	



GENERAL ELECTRICAL NOTES:

1. ELECTRICAL WORK SHALL MEET CALIFORNIA ELECTRICAL CODE REQUIREMENTS. SERVICE ENTRANCE SHALL MEET PACIFIC GAS AND ELECTRIC (PG&E) REQUIREMENTS. CONFIRM CONSTRUCTION METHODS AND INSPECTIONS WITH AHJ. ANY CONFLICTS WITH THE DESIGNS AS SHOWN SHALL BE RESOLVED BY THE ENGINEER.
2. EXISTING ELECTRICAL SERVICE TO WELL IS NO LONGER NEEDED.
3. CONTRACTOR SHALL SECURE ALL ELECTRICAL PERMITS AND CONFIRM REQUIREMENTS WITH OWNER.
4. ELECTRICAL EQUIPMENT ARRANGEMENTS ARE DIAGRAMMATIC. CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY FINAL LOCATION AND ROUTING TO CONNECT EQUIPMENT AS PROVIDED. MINOR CHANGES IN WORK DUE TO EXISTING CONDITIONS SHALL BE MADE WITHOUT ADDITIONAL COST TO THE OWNER.
5. CONTRACTOR SHALL MARK PROPOSED WORK LOCATIONS. AT LEAST 5 DAYS PRIOR TO ANY UNDERGROUND WORK, CONTRACTOR SHALL CALL UNDERGROUND SERVICE ALERT AT 811 FOR LOCATING AND MARKING UTILITIES IN THE AREAS OF THE WORK.
6. CONTRACTOR SHALL SECURE SITE EACH NIGHT. CONSTRUCTION SITE SECURITY SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

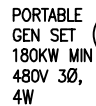
SHEET NOTES:

1. NEW SERVICE REQUESTED AT NORTH END OF PARCELO 400A, 3 PHASE, 480V.
2. EXISTING SERVICE (METER #1009506329) NO LONGER NEEDED.
3. EXISTING XFMR (#1144) IS NO LONGER NEEDED.

ELECTRICAL SITE PLAN
1"=20'

**100% PROGRESS SET
NOT FOR CONSTRUCTION**

REVISIONS			CARMEL VALLEY PUMP STATION ELECTRICAL	
			SITE PLAN	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612	
			DRAWN BY K. LEE PROJECT ENGR L. TAM APPROVED	
			DATE OCTOBER 2019 PROJECT 60489016	
			USE DIMENSIONS ONLY SCALE AS SHOWN	
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
			EL03	



LOAD SUMMARY				
				480V
LOAD	DESCRIPTION	HP/KVA	VOLTAGE	AMPS
1	PUMP 300	75	480	96
2	PUMP 400	75	480	96
3	PUMP 500 (STANDBY ONLY)	75	480	- -
4	LIGHTING	0.3	120	0.6
5	RECEPTACLES	1.1	120	2.3
6	SCADA PANEL	0.9	120	1.9
7	EXHAUST FANS	2 x 1/3	120	3.6
	TOTAL AMPS			200.4

1. SEE SITE PLAN FOR GENERAL ELECTRICAL NOTES.
2. ELECTRICAL SERVICE AND METERING PANEL DRAWINGS SHALL BE SUBMITTED TO OWNER AND PG&E FOR REVIEW AND APPROVAL BEFORE PLACING EQUIPMENT ORDER.
3. CONTRACTOR TO CONFIRM SERVICE CONDUIT SIZE AND ROUTING WITH PG&E. PROVIDE SERVICE CONDUIT AND TRENCH CONSTRUCTION IN ACCORDANCE WITH PG&E REQUIREMENTS.
4. CONTRACTOR SHALL PROVIDE SERVICE METER PANEL IN ACCORDANCE WITH PG&E METER REQUIREMENTS.
5. AUTOMATIC TRANSFER SWITCH, RATED 400A, 480V, 3 POLE, SHALL BE NEMA 12, CONTACTOR TYPE. SEE SPECIFICATIONS.
6. CONTRACTOR SHALL PROVIDE STRUCTURAL DESIGN FOR ALL ELECTRICAL PANELS AND PROPOSED PANEL MOUNTING METHODS, INCLUDING SEISMIC AND OVERTURNING CALCULATIONS.
7. CONDUITS SHALL BE PVC, SCHEDULE 40, BELOW GRADE AND RIGID GALVANIZED STEEL ABOVE GRADE WITH PVC COATED GRS SWEEPS WHERE TRANSITIONING FROM BELOW GRADE OR CONCRETE TO ABOVE GRADE OR FLOOR. PROVIDE LIQUIDTIGHT FLEXIBLE METAL CONDUIT FOR FINAL CONNECTIONS TO FIELD DEVICES (E.G., MOTORS, FLOW METER, TRANSMITTERS). SEE SPECIFICATIONS FOR COMPLETE CONDUIT AND CONDUCTOR REQUIREMENTS.
8. CONTRACTOR SHALL PROVIDE SEPARATE CONDUITS FOR EACH VFD POWER CIRCUIT AND CONTROL DEVICES WITH SHIELDED POWER CONDUCTORS. ONLY TWO PUMPS WILL RUN AT ONE TIME.
9. MAIN 480V BREAKER SHALL BE SOLID STATE ADJUSTABLE TRIP, SQUARE D POWERPACT L-FRAME, MICROLOGIC TRIP UNIT. Isd, Ir, And Ii SETTINGS SHALL BE SET BY CONTRACTOR FROM SHORT CIRCUIT STUDY RESULTS.
10. CAW POWER QUALITY METER SHALL BE SEL-735#0104, HORIZONTAL, FOUR WIRE WYE, AND SHALL INCLUDE 128MB OF MEMORY, 120V AC POWER SUPPLY, AND COPPER ETHERNET PORT. PROVIDE CAT 6 COMMUNICATIONS TO SCADA PANEL.

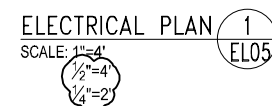
POWER CONDUIT SCHEDULE

NUMBER	SIZE	FILL (CU WIRE)	FROM	TO
P100	5"	BY PG&E	T-100	UTILITY METER
P100S	5"	MT	T-100	UTILITY METER
P101	4"	3#500KCMIL, #1/0 NEUT, #1/0 GND	UTILITY METER	MAIN BKR
P102	4"	3#500KCMIL, #1/0 NEUT, #1/0 GND	MAIN BKR	ATS
P103	4"	3#500KCMIL, #1/0 NEUT, #1/0 GND	GEN SET	ATS
P104	4"	3#500KCMIL, #1/0 NEUT, #1/0 GND	ATS	MAIN POWER PANEL
P105	2"	3#1/0 #6 GND	MAIN POWER PANEL	VFD-P1
P106	2"	3#1/0 #6 GND	MAIN POWER PANEL	VFD-P2
P107	3/4"	3#10 #12 GND	MAIN POWER PANEL	T-200
P108	2"	3#1/0 #6 GND	MAIN POWER PANEL	VFD-P3
P109	2"	4#1/0 #6 GND	T-200	LP-1
P111	2 1/2"	1-3/C#2/0 SHIELDED #6 GND	VFD-310	P300
P112	2 1/2"	1-3/C#2/0 SHIELDED #6 GND	VFD-410	P400
P113	2 1/2"	1-3/C#2/0 SHIELDED #6 GND	VFD-510	P500

REVISIONS			CARMEL VALLEY PUMP STATION ELECTRICAL	
			SINGLE LINE DIAGRAM	
			CALIFORNIA AMERICAN WATER	
			 	
AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612			DRAWN BY <u>K. LEE</u> PROJECT ENGR "S. KHALSA" APPROVED C. SMITH	
			DATE <u>OCTOBER 2019</u> PROJECT <u>60469916</u>	
			USE DIMENSIONS ONLY SCALE AS SHOWN	
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
			EL04	

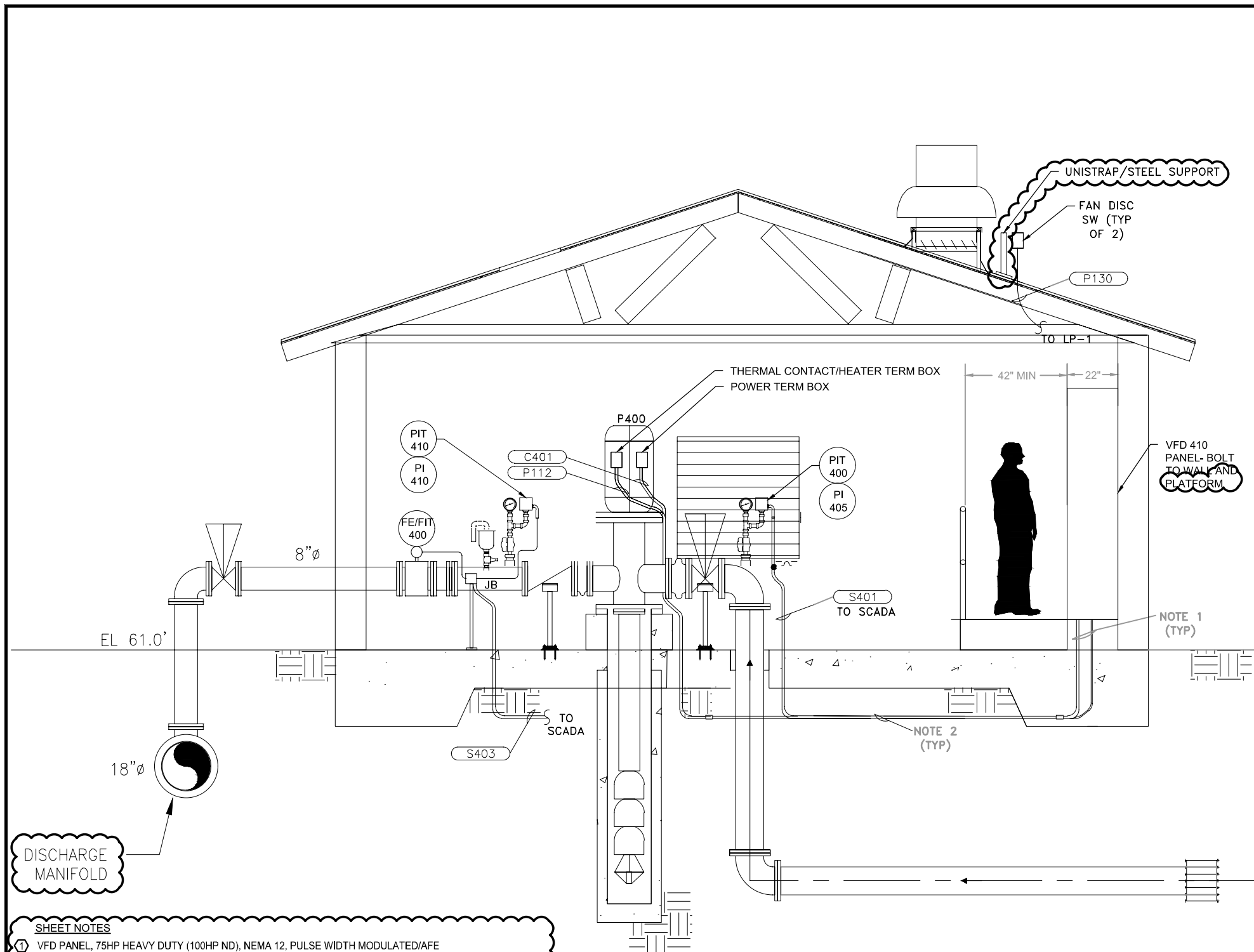
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1. CONDUITS SMALLER THAN 2" DIAMETER SHALL BE PVC SCHEDULE 40, WITH PVC SCHEDULE 80 SWEEP RADIUS HORIZONTAL BENDS AND PVC COATED RGS RACEWAY SWEEP RADIUS BENDS FOR VERTICAL TRANSITIONS TO ABOVE GRADE OR CONCRETE SURFACE.
2. PROVIDE 5" THICK CONCRETE PROTECTIVE POUR WITH 10 x 10 WWF OVER TOP OF SCREENED BACKFILL FOR PHYSICAL PROTECTION OF DUCTBANKS WITH VEHICULAR WHEEL LOADING.
3. WHERE CROSSING ROADWAYS OR DRIVES, CONDUIT WORK TO BE REINFORCED, CONCRETE ENCASED, EXTENDED A MINIMUM OF 10' ON EITHER SIDE OF PAVEMENT.
4. SEE SHEET EL11 FOR CONDUIT AND CABLE SCHEDULE.



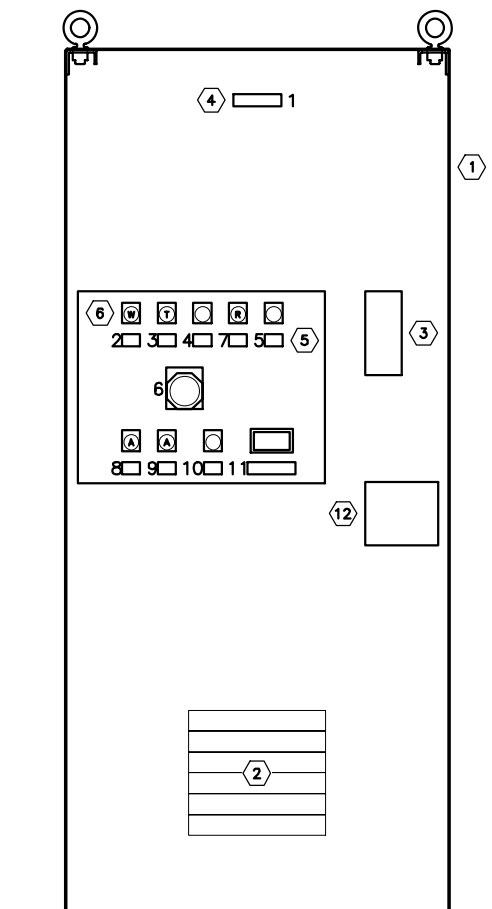
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REVISIONS			CARMEL VALLEY PUMP STATION ELECTRICAL		
STATION ELECTRICAL PLAN			CALIFORNIA AMERICAN WATER		
AECOM 300 LAKESIDE DR., SUITE 400 OAKLAND, CALIFORNIA 94612					
DRAWN BY: C. LEE PROJECT ENGR SK APPROVED			DATE: OCTOBER 21/9 PROJECT: 60489016		
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES			USE DIMENSIONS ONLY SCALE AS SHOWN		
EL05			EL05		



- SHEET NOTES**
- VFD PANEL, 75HP HEAVY DUTY (100HP ND), NEMA 12, PULSE WIDTH MODULATED/AFE (SEE SPECIFICATIONS), MOUNTED TO WALL AND PLATFORM
 - VENTILATION WITH SCREEN. SIDES AND REAR PANEL ALSO VENTILATED
 - VFD DISPLAY/KEYPAD, FULL NUMERIC, HIM FOR DRIVE, BY VENDOR
 - NAMEPLATE, 4"W X 1 1/2"H, WITH SS SCREW MOUNTING (SEE NAMEPLATE LEGEND)
 - NAMEPLATE, 1 1/2"W X 1"H, BLACK WITH WHITE LETTERS, TYPICAL
 - CONTROL DEVICES: INDICATING LIGHT, LED, PUSH-TO-TEST, COLOR AS NOTED; HOA SWITCH; MOMENTARY PUSHBUTTONS
- INTERNAL DEVICES, NOT SHOWN, INCLUDING:**
- INCOMING LINE BREAKER
 - CONTROL POWER TRANSFORMER
 - VFD AND WIRING
 - SEL-849 RELAY
 - LINE REACTOR, 3% OR AS MANUFACTURER RECOMMENDED, BOTTOM PANEL MOUNT
 - PLASTIC WIRE DUCT, NON-CONDUCTING/LOW EMF ON POWER WIRING
 - CIRCUIT BREAKERS, DIN RAIL MOUNT
 - POWER SUPPLY, 24V (IF REQUIRED)
 - TERMINAL BLOCKS
 - RELAYS, DIN RAIL MOUNT

- CONDUIT NOTES**
- ABOVE GRADE CONDUIT SHALL BE PVC COATED RGS.
 - BELOW SLAB/GRADE CONDUIT SHALL BE PVC SCH 40. SEE SHEET NOTES ON EL05.

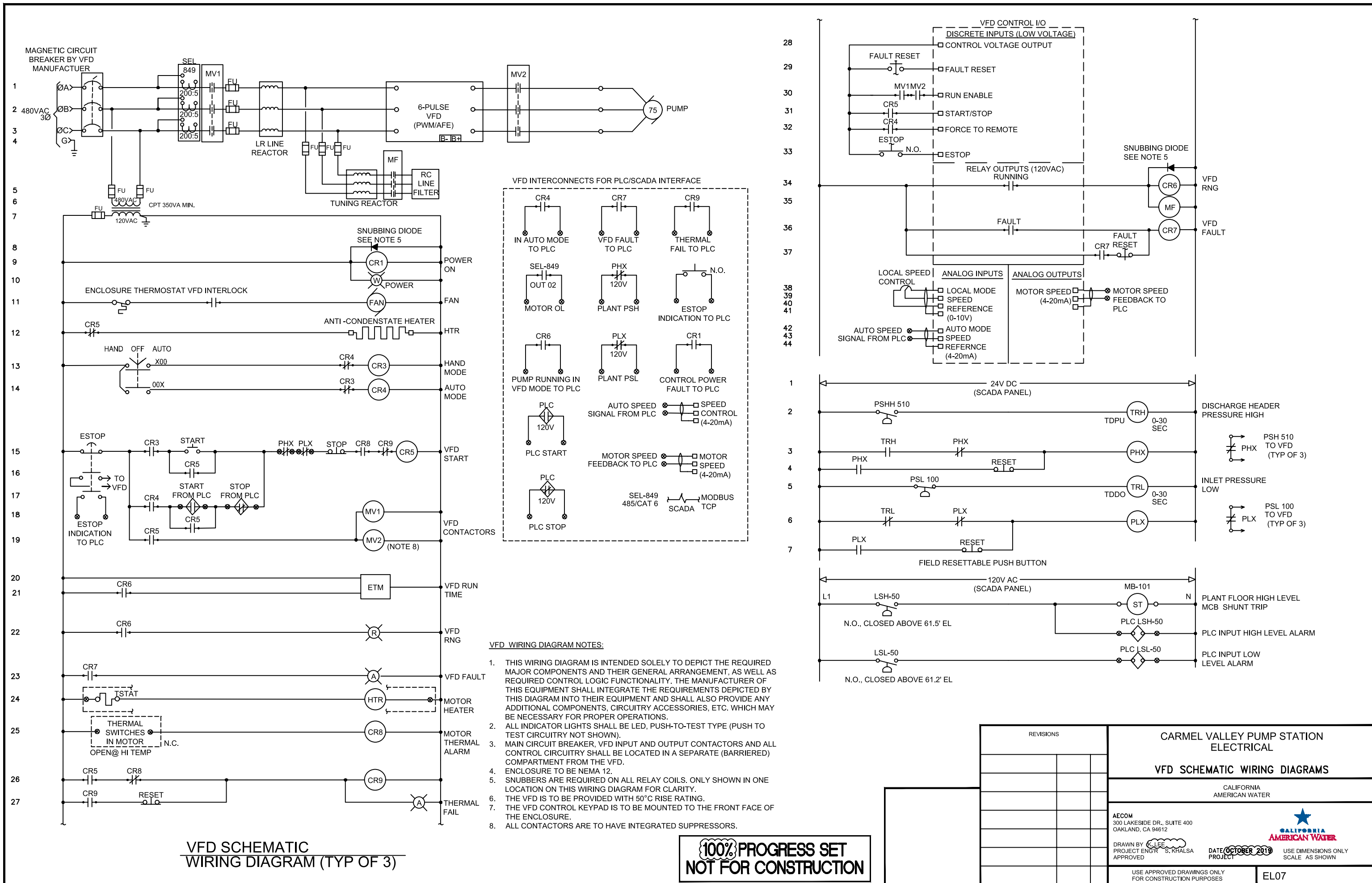


2 VFD PANEL ELEVATION (TYP OF 3)
SCALE: NTS

NAMEPLATE LEGEND		
NUMBER	ENGRAVING	LIGHT/COLOR DEVICE NOTE
1	VFD XXX CONTROL PANEL	2"H x 5" W NAMEPLATE
2	CONTROL POWER ON	WHITE LIGHT
3	VFD XXX HAND-OFF-AUTO	ESCUTCHEON
4	START DRIVE	BLACK PUSHBUTTON
5	STOP DRIVE	RED PUSHBUTTON
6	EMERGENCY OFF	RED MUSHROOM, PULL TO RESET
7	VFD XXX RUNNING	RED LIGHT
8	VFD XXX FAULT	AMBER LIGHT
9	MOTOR THERMAL FAILURE	AMBER LIGHT
10	THERMAL FAULT/RESE	BLACK PUSHBUTTON
11	ELAPSED TIME METER	
12	CAUTION - 480V PANEL FED FROM MDP-1	3" x 7" NAMEPLATE ORANGE, BLACK LETTERS

REVISIONS		CARMEL VALLEY PUMP STATION ELECTRICAL	
		PUMP STATION SECTION AND VFD PANEL ELEVATION	
		CALIFORNIA AMERICAN WATER	
		AECOM 300 LAKESIDE DR., SUITE 400 OAKLAND, CALIFORNIA 94612	
		DRAWN BY: K. LEE PROJECT ENGR: SK APPROVED:	
		DATE: OCTOBER 2019 PROJECT: 60489016	
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		EL06	

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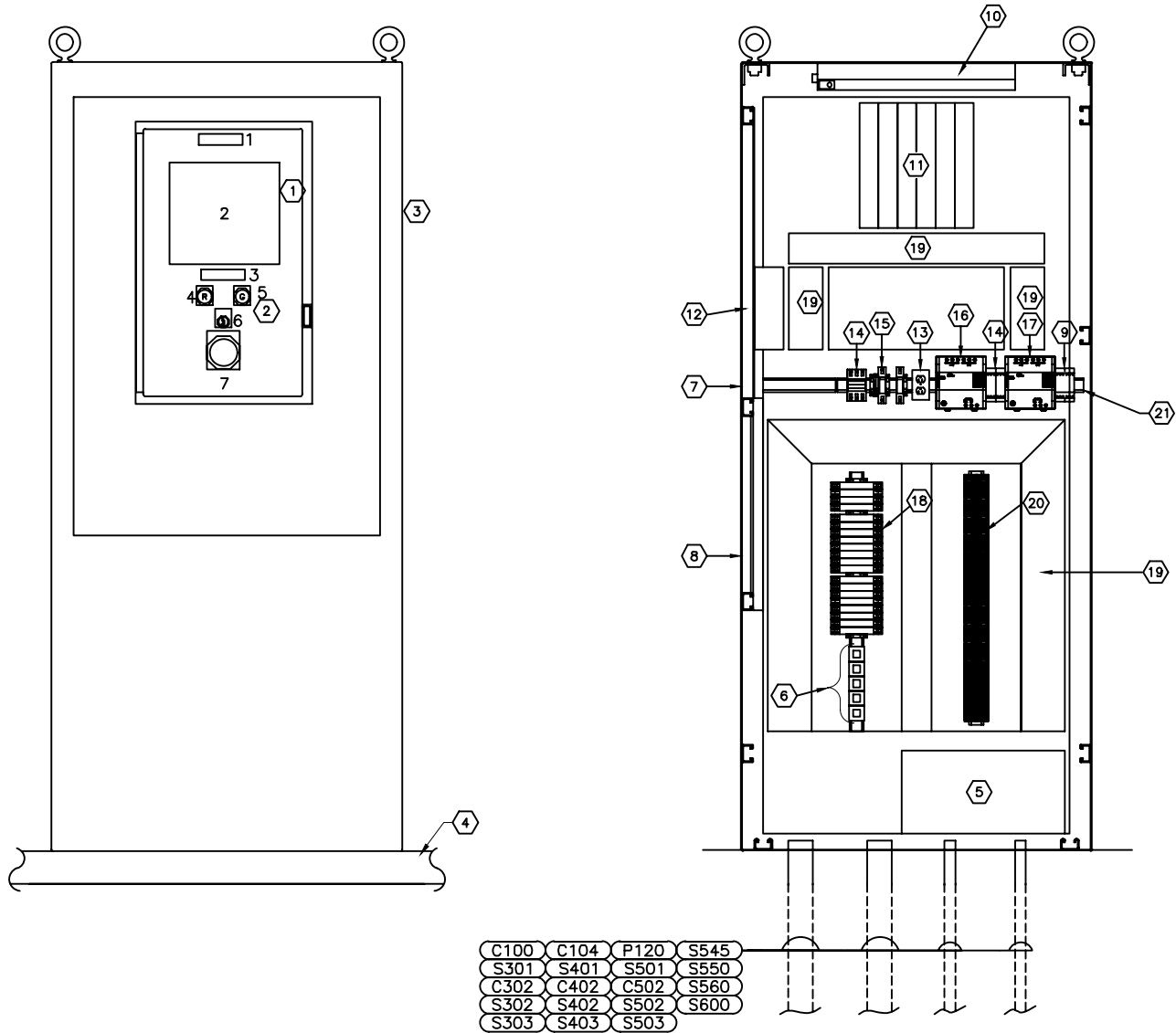


VFD SCHEMATIC WIRING DIAGRAM (TYP OF 3)

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REVISIONS				CARMEL VALLEY PUMP STATION ELECTRICAL	
				VFD SCHEMATIC WIRING DIAGRAMS	
				CALIFORNIA AMERICAN WATER	
				AECOM 300 LAKESIDE DR., SUITE 400 OAKLAND, CA 94612	
				DRAWN BY: K. LEE PROJECT ENGR: S. KHALSA APPROVED: [Signature]	
				DATE: OCTOBER 2019 PROJECT: [Blank]	
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				EL07	

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1 SCADA - INNER PANEL DOOR
SCALE: 1-1/2" = 1'-0"

2 SCADA - INTERIOR DEVICES
SCALE: 1-1/2" = 1'-0"

NAMEPLATE LEGEND	
DEVICE	ENGRAVING
1. NAMEPLATE	CVPS SCADA
2. DIGITAL DISPLAY	-
3. NAMEPLATE	SYSTEM STATUS
4. RED INDICATING LIGHT	FAULT
5. GREEN INDICATING LIGHT	NORMAL
6. KEY OPERATED SWITCH	LOCAL-OFF-REMOTE
7. RED PUSHBUTTON	ESTOP

0' 2' 6' 1'
1-1/2" = 1'-0"

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GENERAL NOTES

1. DEVICE LAYOUT ON BACK PANEL DETAIL IS PROVIDED TO ILLUSTRATE LAYOUT PHILOSOPHY. CONTRACTOR IS TO BUILD PANEL ACCORDING TO INFORMATION PROVIDED IN CONTROL SCHEMATICS AND SPECIFICATIONS.
2. QUANTITIES SHOWN ARE REPRESENTATIVE ONLY. CONTRACTOR IS REQUIRED TO ENSURE APPROPRIATE QUANTITIES ARE FURNISHED.
3. CONTRACTOR SHALL WIRE VFD AND WHM MONITORING SIGNALS INTO PLC, INCLUDING VOLTAGE, POWER AND CURRENT READINGS, AND DOOR INTRUSION ALARMS.
4. PROVIDE UL-508A LISTED/LABELED PANEL ASSEMBLY BY SUPPLIER.

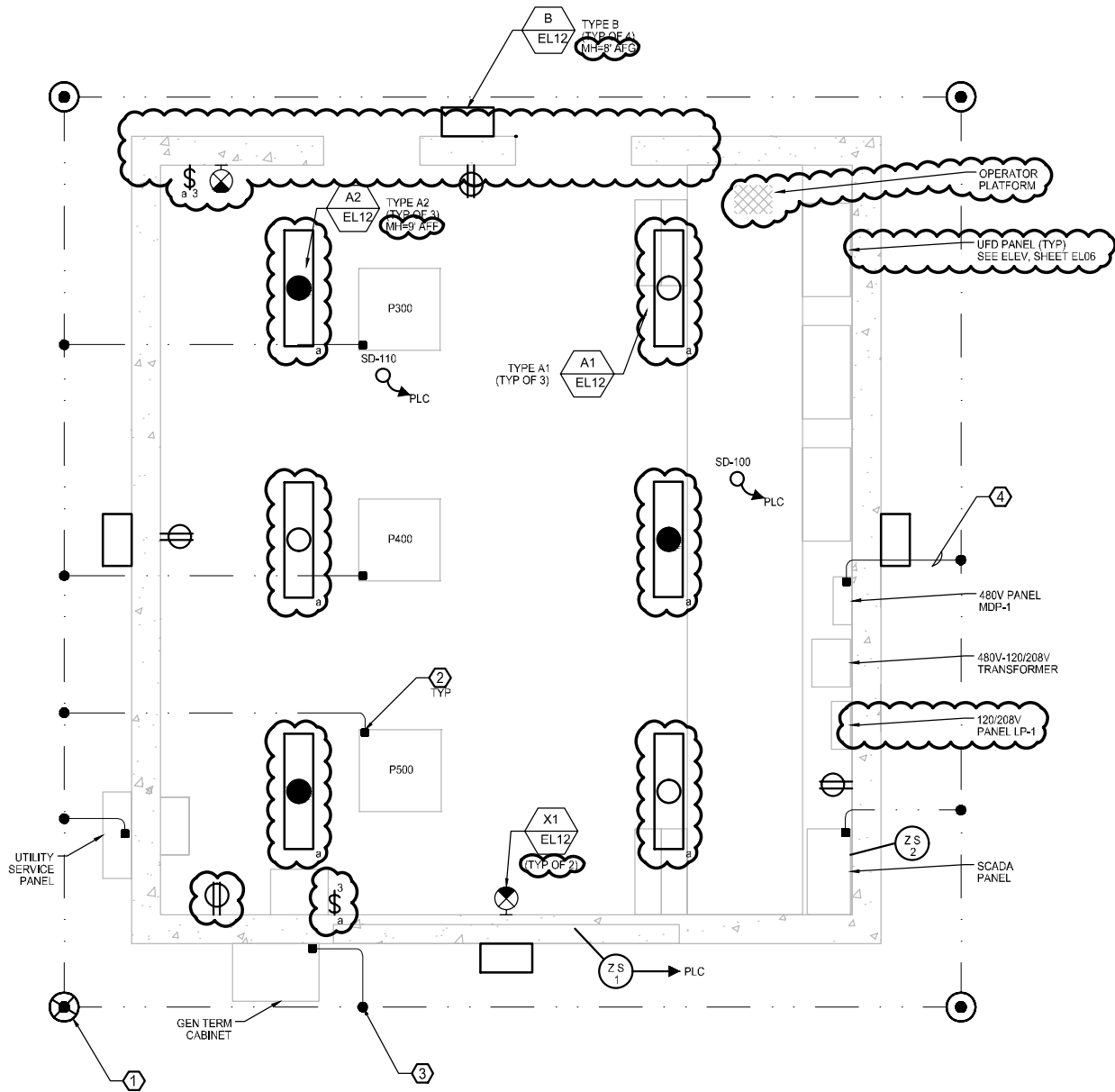
SHEET NOTES

- 1 CONTROL DISPLAY WITH PLC AND SUPERVISORY CONTROL.
- 2 CONTROL DEVICES SHALL BE 30MM SIZE.
- 3 PROVIDE NEMA 12, NOMINAL 78"H, 18"D, AND 36"W SCADA PANEL, WITH INNER SWING DOOR FOR CONTROLS, POWER STEPDOWN TRANSFORMER, DC POWER SUPPLIES, PLC FOR REMOTE I/O AND CONTROL, ETHERNET SWITCH AND CELLULAR LINK TO CAW.
- 4 CONNECTED TO GALVANIZED STEEL PLATFORM. DETAILED PLATFORM DESIGN AND CALCULATIONS BY CONTRACTOR BASED ON FINAL PANEL DIMENSIONS AND WEIGHT.
- 5 UPS. SEE SPECIFICATIONS
- 6 INTERPOSING RELAYS, DIN RAIL MOUNTED
- 7 SIDE PANEL
- 8 FOLD-DOWN TABLE ON DOOR
- 9 TONE BUZZER, INTERMITTENT
- 10 ENCLOSURE LIGHT (WITH DOOR SWITCH, TYP of 2)
- 11 PLC I/O. SEE CONTROL DESCRIPTION AND SHEET EL13 I/O LIST.
- 12 SIERRA WIRELESS, GX 450 CELLULAR.
- 13 DUPLEX RECEPTACLE FED FROM UPS
- 14 CIRCUIT BREAKERS, DIN RAIL MOUNTED, TYPICAL
- 15 SPD, DIN RAIL MOUNTED
- 16 POWER SUPPLY, 24VDC, DIN RAIL MOUNTED
- 17 POWER SUPPLY, 12VDC, DIN RAIL MOUNTED
- 18 RELAYS, DIN RAIL MOUNTED, TYPICAL
- 19 PLASTIC WIRE DUCT (TYPICAL LAYOUTS)
- 20 TERMINAL BLOCKS
- 21 DIN RAIL, TYPICAL

REVISIONS			CARMEL VALLEY PUMP STATION ELECTRICAL	
			SCADA CONTROL PANEL ELEVATION	
			CALIFORNIA AMERICAN WATER	
			AECOM 1333 BROADWAY, SUITE 800 OAKLAND, CALIFORNIA 94612	
			DRAWN BY K. LEE PROJECT ENG'R SK HALSO APPROVED C. SMITH	
			DATE/OCTOBER 2019 PROJECT 60424498	
			USE DIMENSIONS ONLY SCALE AS SHOWN	
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
			EL08	

- GENERAL NOTES**
1. SEE SHEET EL02 FOR GENERAL SITE NOTES AND
 2. SEE SHEET EL12 FOR LIGHTING FIXTURE SCHEDULE.
 3. SEE SPECIFICATIONS FOR ADDITIONAL LIGHTING REQUIREMENTS.

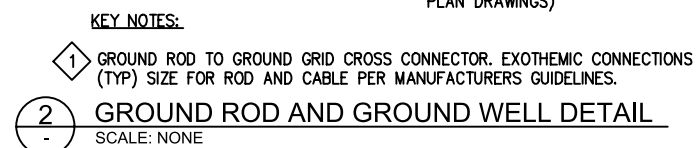
- SHEET NOTES**
- 1 PROVIDE GROUND ROD AND GROUND BOX ON CORNERS. SEE DETAILS 4 AND 5, SHEET EL10
 - 2 GROUND ALL EQUIPMENT. PROVIDE GROUND CONNECTION FROM BUILDING GROUND GRID TO ALL MAJOR EQUIPMENT AS SHOWN BY GROUND PAD OR GROUND PIGTAIL.
 - 3 EXOTHERMIC WELD TO GROUND GRID (TYPICAL).
 - 4 GROUNDING PIGTAIL TO MAJOR EQUIPMENT, #2 TYPICAL, UON.



BUILDING POWER,LIGHTING AND GROUNDING PLAN PLAN 1
SCALE:1"=3" EL09

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REVISIONS			CARMEL VALLEY PUMP STATION ELECTRICAL	
			LIGHTING AND GROUNDING PLAN	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE DR., SUITE 400 OAKLAND, CALIFORNIA 94612	
			DRAWN BY C. LEE PROJECT ENGINEER SK APPROVED	
			DATE: OCTOBER 2019 PROJECT: 60489016	
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			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	EL09



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CONDUIT AND CABLE SCHEDULE

CONDUIT NUMBER	CONDUIT		CABLE FILL	ROUTING
	SIZE (INCH)	QTY / SIZE		
C100	1	4#14, #14 GND	PLANT LEVEL SWITCHES TO SCADA PANEL	
P100	5	PULLWIRE, CABLE BY PG&E	XFMR POLE TO SERVICE METER PANEL	
P100S	5	PULLWIRE, SPARE	XFMR POLE TO SERVICE METER PANEL	
C101	1	8#14, #12 GND	ATS CONTROL TO GEN TERM CAB	
S101	1	1 CAT 6	ATS PQM/WHM TO SCADA PANEL	
P101	4	3#500KCML, 1#1/0 NEUT, 1#1/0 GND	UTILITY METER TO MAIN BREAKER	
C102	1	8#14, #12 GND	ATS TO SCADA, STATUS, PQM 120V	
P102	4	3#500KCML, 1#1/0 NEUT, 1#1/0 GND	MAIN BREAKER TO ATS	
P103	4	3#500KCML, 1#1/0 NEUT, 1#1/0 GND	GEN SET TERM CAB TO ATS	
P104	4	3#500KCML, 1#1/0 NEUT, 1#1/0 GND	ATS TO MDP-1	
C104	1	6#14, #14GND (2 SPARE)	MAIN BREAKER TO SCADA PANEL (TRIP)	
P105	2	3#1/0, #6 GND	MDP-1 TO VFD 310	
P106	2	3#1/0, #6 GND	MDP-1 TO VFD 410	
P107	3/4	3#10, #12 GND	MDP-1 TO T-200	
P108	2	3#1/0, #6 GND	MDP-1 TO VFD 510	
P109	2	3#1/0, #6 NEUT, #6 GND	T-200 TO LP-1	
P111	2 1/2	1-3/C#2/0 SHLD VFD CABLE, #6 GND	VFD 310 TO P300, BELDEN CAT #29530 (TYP)	
P112	2 1/2	1-3/C#2/0 SHLD VFD CABLE, #6 GND	VFD 410 TO P400	
P113	2 1/2	1-3/C#2/0 SHLD VFD CABLE, #6 GND	VFD 510 TO P500	
P120	3/4	4#12, #12 GND	LP-1 TO SCADA PANEL, 120V	
P130	3/4	4#12, #12 GND	LP-1 TO EXH FAN 1 AND 2	
C301	1	4#14, #12 GND	MOTOR 300 TO VFD 310 (120V)	
S301	1	1TSP#18	INLET PIT 300 TO SCADA PANEL	
C302	1	8#14, #12 GND	VFD 310 TO SCADA, 120V CONTROL	
S302	2	16#14, 2TSP#18, CAT 6, #12 GND	VFD 310 TO SCADA, 24V DC CONTROL/SIGNAL	
S303	1	1TSP#18, FIT CABLE (MFR) #12 GND	P300 DISCHARGE INSTR TO SCADA	
C401	1	4#14, #12 GND	MOTOR 400 TO VFD 410 (120V)	
S401	1	1TSP#18	INLET PIT 400 TO SCADA	
C402	1	8#14, #12 GND	VFD 410 TO SCADA, 120V CONTROL	
S402	2	16#14, 2TSP#18, CAT 6, #12 GND	VFD 410 TO SCADA, 24V DC CONTROL/SIGNAL	
S403	1	1TSP#18, FIT CABLE (MFR) #12 GND	P400 DISCHARGE INSTR TO SCADA	
C501	1	4#14, #12 GND	MOTOR 500 TO VFD 510 (120V)	
S501	1	1TSP#18	INLET PIT 500 TO SCADA	
C502	1	8#14, #12 GND	VFD 510 TO SCADA, 120V CONTROL	
S502	2	16#14, 2TSP#18, CAT 6, #12 GND	VFD 510 TO SCADA, 24V DC CONTROL/SIGNAL	
S503	1	1TSP#18, FIT CABLE (MFR) #12 GND	P500 DISCHARGE INSTR TO SCADA	
S545	1	6#14, 1TSP#18, #12 GND (2 SPARE)	PLANT DISCHARGE PSHH 520/PIT550 AND PSL100 TO SCADA	
S550	1	2#14, 1TSP #18, #12GND	PSHH520, PIT550 TO JB	
S560	1	6#14, #12GND	CV-1 TO SCADA	
S600	1	FIT CABLE (MFR)	DISCHARGE FIT 600 TO SCADA	

NOTES:

- ALL CONDUCTORS CU UNLESS NOTED AL.
- DOOR SWITCHES, SMOKE DETECTORS AND LIGHTING CIRCUITS NOT SCHEDULED. PROVIDE AS SHOWN OR NOTED ON PLANS.

LUMINAIRE SCHEDULE

SYMBOL	TYPE	DESCRIPTION	MANUFACTURER & CATALOG NO.		LAMPS	MOUNTING	VOLTS	WATTS
	A1	4' LED ACRYLIC WRAPAROUND, SURFACE CEILING MOUNTED, LOW VOLTAGE DIMMING BALLAST	ACUITY ST5 2 28T5 MVOLT GEB95S	"OR EQUAL"	LED 3500K, CRI 80	PENDANT	120	50.1
	A2	SAME AS 'A1' EXCEPT WITH BATTERY PACK	ACUITY ST5 2 28T5 MVOLT EL14	"OR EQUAL"	LED 3500K, CRI 80	PENDANT	120	50.1
	B	EXTERIOR LED OUTDOOR CUT-OFF TYPE AREA , ALUMINUM HOUSING, GASKETED AGAINST BUGS & WEATHERPROOF, WALL MOUNT , TYPE IV DISTRIBUTION, INTEGRAL MOTION SENSOR SWITCH, 0-10V DIMMING BALLAST	LITHONIA DSXW2 LED 30C 1000 40K DMG T4M MVOLT PIR - DDBXD	"OR EQUAL"	INTEGRAL LEDs	WALL	120	109
	X1	SINGLE FACE EXIT SIGN. UNIVERSAL MOUNT, GREEN LETTER WITH DIRECTIONAL ARROW(S), WITH BATTERY PACK	ISO RL-EM-R-WH	"OR EQUAL"	LED	UNIVERSAL	120	3

KEY NOTES:

- ① SEE LIGHTING PLANS FOR MOUNTING HEIGHTS

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REVISIONS

CARMEL VALLEY PUMP STATION
ELECTRICAL

CONDUIT, LUMINAIRE, AND CABLE SCHEDULE

CALIFORNIA
AMERICAN WATER

AECOM
300 LAKESIDE, SUITE 400
OAKLAND, CALIFORNIA 94612

AECOM



DRAWN BY K. LEE
PROJECT ENGR S. KHALSA
APPROVED C. SMITH

DATE OCTOBER 2019
PROJECT 60489016

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EL11

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CVPS SCP PLC, TABLE 17300 – 1: PLANT PLC I/O

I/O Type/ POINT #	Signal Level	Device #	TCP Modbus Register (See Dwg. Sheet Note 1)	I/O POINT DESCRIPTION
				DATA CABLE (CAT 6)
MB	Modbus	PWR 100	Multiple	PLANT POWER METER (SEL 735)
MB	Modbus	SEL-8491	Multiple	VFD 310 MMR (SEL 849)
MB	Modbus	SEL-8492	Multiple	VFD 410 MMR
MB	Modbus	SEL-8493	Multiple	VFD 510 MMR
MB	Modbus	SW GX-450	Multiple	PLC TO RADIO
				DISCRETE I/O
DI1	Contact	SD-100		SMOKE DETECTOR 100
DI2	Contact	SD-110		SMOKE DETECTOR 110
DI3	Switch Contact	PSL-100		PLANT INLET PRESSURE LOW (PLX)
DI4	Switch Contact	PSHH-520		PLANT OUTLET PRESSURE HIGH (PHX)
DI5	Switch Contact	ZS1		MAIN ENTRANCE DOOR SWITCH
DI6	Switch Contact	ZS2		SCP ENCLOSURE DOOR SWITCH
DI7	Switch Contact	ESTOP		EMERGENCY STOP, VFD-310
DI8	Switch Contact	ESTOP		EMERGENCY STOP, VFD-410
DI9	Switch Contact	ESTOP		EMERGENCY STOP, VFD-510
DI10	Aux Contact	MB-101A		MAIN BREAKER CLOSED
DI11	Switch Contact	LSH-50		PLANT WATER HIGH
DI12	Switch Contact	LSL-50		PLANT WATER LOW
DI13	Relay Contact	CR4		VFD310 AUTO MODE
DI14	Relay Contact	CR7		VFD310 FAULT
DI15	Relay Contact	CR9		M310 THERMAL FAIL
DI16	Relay Contact	CR1		M310 CONTROL POWER FAIL
DI17	Relay Contact	CR6		VFD310 RNG VFD MODE
DI18	Relay Contact	CR4		VFD410 AUTO MODE
DI19	Relay Contact	CR7		VFD410 FAULT
DI20	Relay Contact	CR9		M410 THERMAL FAIL

AI – ANALOG INPUT
AO – ANALOG OUTPUT
CP – CONTROL PANEL
DI – DISCRETE INPUT
DO – DISCRETE OUTPUT
IL – INDICATING LIGHT
I/O – INPUT/OUTPUT
LS – LIMIT SWITCH
PB – PUSHBUTTON
SCP – SCADA CONTROL PANEL
SD – SMOKE DETECTOR

DI21	Relay Contact	CR1		M410 CONTROL POWER FAIL
DI22	Relay Contact	CR6		VFD410 RNG VFD MODE
DI23	Relay Contact	CR4		VFD510 AUTO MODE
DI24	Relay Contact	CR7		VFD510 FAULT
DI25	Relay Contact	CR9		M510 THERMAL FAIL
DI26	Relay Contact	CR1		M510 CONTROL POWER FAIL
DI27	Contact	CR6		VFD510 RNG VFD MODE
DI28	Relay Contact	Z53		DOOR SWITCH
DI29	Contact	-		SPARE
DI30	Contact	-		SPARE
DI31	Contact	-		SPARE
DI32	Contact	-		SPARE
DO1	Relay Contact	- -		PLC START VFD310
DO2	Relay Contact	- -		PLC STOP VFD310
DO3	Relay Contact	- -		PLC START VFD410
DO4	Relay Contact	- -		PLC STOP VFD410
DO5	Relay Contact	- -		PLC START VFD510
DO6	Relay Contact	- -		PLC STOP VFD510
DO7	Relay Contact			SPARE
DO8	Relay Contact			SPARE
				ANALOG I/O
AI1	120V input	PFR 100		AC POWER FAIL (MAIN SERVICE)
AI2	120V input	PFR 200		AC POWER FAIL (UPS IN SCP)
AI3	120V input			SPARE
AI4	120V input			SPARE
AI5	4-20mA	LIT 100		REMOTE – FOREST LAKE RSVR LEVEL
AI6	4-20mA	PIT300		M300 INLET PRESSURE
AI7	4-20mA	FIT300		M300 DISCHARGE FLOW
AI8	4-20mA	PIT310		M300 DISCHARGE PRESSURE
AI9	4-20mA	PIT400		M400 INLET PRESSURE
AI10	4-20mA	FIT400		M300 DISCHARGE FLOW
AI11	4-20mA	PIT410		M400 DISCHARGE PRESSURE

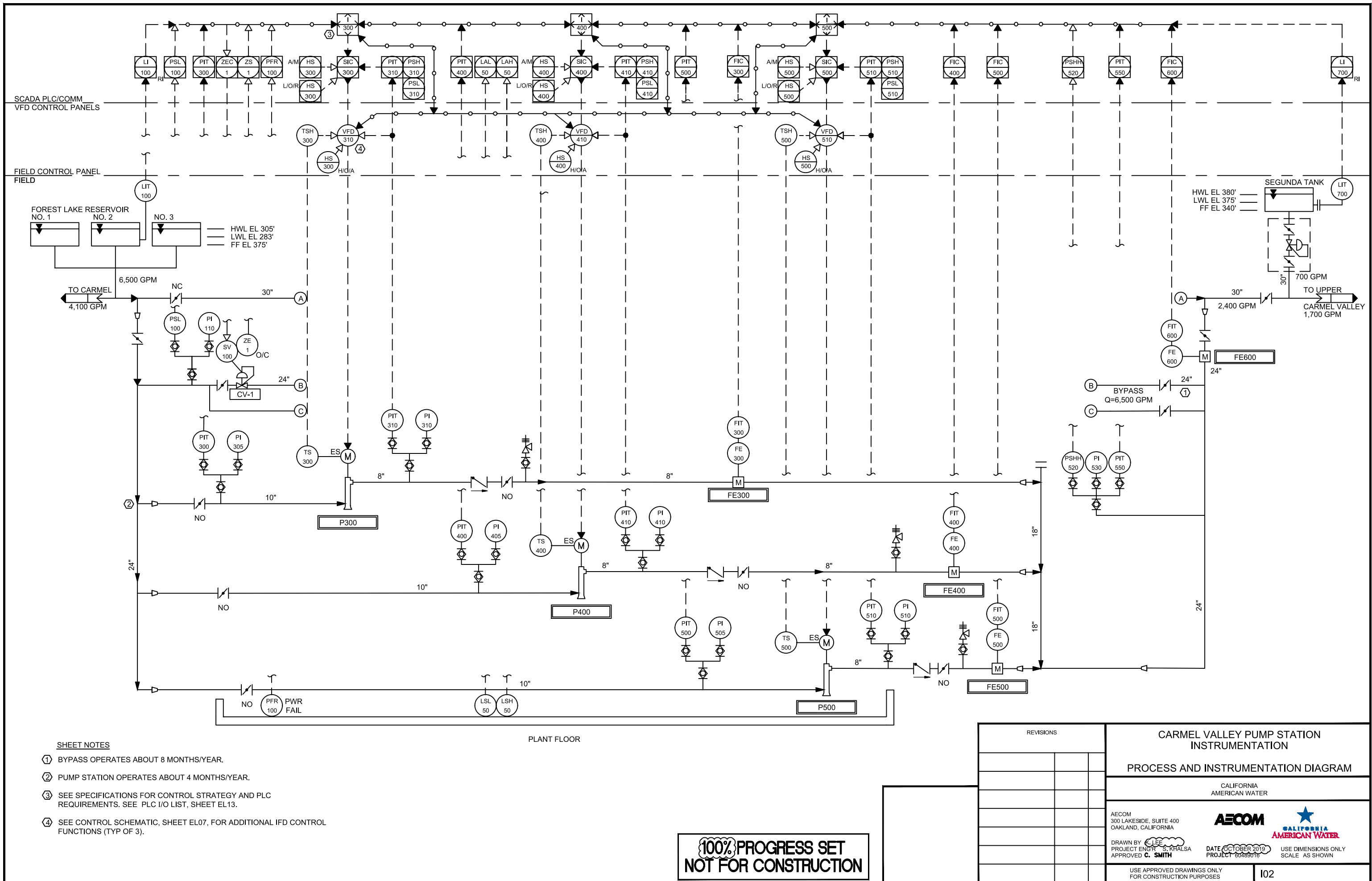
AI12	4-20mA	PIT500		M500 INLET PRESSURE
AI13	4-20mA	FIT500		M500 DISCHARGE FLOW
AI14	4-20mA	PIT510		M500 DISCHARGE PRESSURE
AI15	4-20mA	VFD310		VFD310 SPEED (%)
AI16	4-20mA	VFD410		VFD410 SPEED (%)
AI17	4-20mA	VFD510		VFD510 SPEED (%)
AI18	4-20mA	PIT550		PLANT DISCHARGE PRESSURE
AI19	4-20mA	FIT600		PLANT DISCHARGE FLOW
AI20	4-20mA	LIT 700		REMOTE - SEGUNDA TANK LEVEL
AI21	4-20mA			SPARE
AI22	4-20mA			SPARE
AI23	4-20mA			SPARE
AI24	4-20mA			SPARE
AO1	4-20mA	VFD310		VFD SPEED OUTPUT CONTROL
AO2	4-20mA	VFD410		VFD SPEED OUTPUT CONTROL
AO3	4-20mA	VFD410		VFD SPEED OUTPUT CONTROL
AO4	4-20mA			SPARE
AO5	4-20mA			SPARE
AO6	4-20mA			SPARE
AO7	4-20mA			SPARE
AO8	4-20mA			SPARE

SHEET NOTES

- 1 REFER TO CAW SCADA STANDARDS, ATTACHMENT C, FOR SEL MODBUS MONITORING POINTS AND TCP REGISTERS (TYPICAL FOR SEL-735 AND SEL-849 DEVICES).
- 2 REFER TO DIVISION 13 SPECIFICATIONS FOR INSTRUMENTATION, PLC, AND CONTROL PANEL REQUIREMENTS.
- 3 REFER TO P&ID, SHEET I02, FOR DEVICE WIRING AND SCHEMATIC OF CONTROL FUNCTIONS. SEE CONTROL STRATEGIES IN SPECIFICATIONS FOR LOGIC AND INTERNAL PLC VARIABLES

100% PROGRESS SET
NOT FOR CONSTRUCTION

REVISIONS			CARMEL VALLEY PUMP STATION ELECTRICAL	
			PLC I/O LIST	
			CALIFORNIA AMERICAN WATER	
			AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA 94612	
			DRAWN BY K. LEE PROJECT ENGR S. KHALSA APPROVED C. SMITH	
			DATE OCTOBER 2019 PROJECT 60489016	
			USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	
			EL12	



SHEET NOTES

- ① BYPASS OPERATES ABOUT 8 MONTHS/YEAR.
- ② PUMP STATION OPERATES ABOUT 4 MONTHS/YEAR.
- ③ SEE SPECIFICATIONS FOR CONTROL STRATEGY AND PLC REQUIREMENTS. SEE PLC I/O LIST, SHEET EL13.
- ④ SEE CONTROL SCHEMATIC, SHEET EL07, FOR ADDITIONAL IFD CONTROL FUNCTIONS (TYP OF 3).

100% PROGRESS SET
NOT FOR CONSTRUCTION

REVISIONS			CARMEL VALLEY PUMP STATION INSTRUMENTATION	
NO.	DESCRIPTION	DATE	PROCESS AND INSTRUMENTATION DIAGRAM	
			CALIFORNIA AMERICAN WATER	
AECOM 300 LAKESIDE, SUITE 400 OAKLAND, CALIFORNIA			DRAWN BY: C. LEE PROJECT ENGR: S. KHALSA APPROVED: C. SMITH	
DATE: OCTOBER 2019 PROJECT: 60489016			USE DIMENSIONS ONLY SCALE: AS SHOWN	
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES			102	

Appendix B-4

Carmel Valley Pump Station Stormwater Pollution Prevention Plan (SWPPP)

STORMWATER POLLUTION PREVENTION PLAN

MPWSP Carmel Valley Pump Station

RISK LEVEL 2

WDID# _____

Legally Responsible Person [LRP]:

California American Water
511 Forest Lodge Road, Suite 100
Pacific Grove, CA 93950
Timothy P. Ohalloran, Engineering Manager - Coastal Division
(831) 646-3291

Contractor:

Monterey Peninsula Engineering (MPE)
192 Healy Avenue
Marina, CA 93933
Joshua Riley, Project Manager
(951) 315-8079

Project Address:

26530 Rancho San Carlos Road
Carmel, CA 93923

Qualified SWPPP Practitioner (QSP):

Joseph Taormina, QSP #26622
(731) 277-6118

SWPPP Prepared by:

Incompli, Inc.
85 Argonaut, Ste 210
Aliso Viejo, CA 92656
Patricia C. Castillo, QSD/QSP/CPESC/QISP
(800) 677-3718

SWPPP Preparation Date:

10/21/2019

Estimated Project Dates:

<u>Start of Construction</u>	<u>Completion of Construction</u>
1/1/2020	1/1/2021

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Qualified SWPPP Developer

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: MPWSP Carmel Valley Pump Station
Project Number/ID: _____
WDID#: _____

“This Stormwater Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Orders No. 2009-009-DWQ as amended by 2010-0014-DWQ and 2012-006-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below.”



QSD's Signature

Patricia C. Castillo

QSD's Name

QSD/QSP/CPESC/QISP

QSD's Title

10/16/2019

Date

(800) 677-3718

QSD's Telephone Number

Legally Responsible Person

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: MPWSP Carmel Valley Pump Station

Project Number/ID: _____

WDID#: _____

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

California American Water

Legally Responsible Person [Organization]

Signature of Authorized Representative of Legally
Responsible Person

Timothy P. Ohalloran

Name of Authorized Representative of Legally
Responsible Person

Date

(831) 646-3291

Telephone Number

Amendment Log

Project Name: MPWSP Carmel Valley Pump Station

Project Number/ID: _____

WDID#: _____

Amendment No.	Date	Brief Description of Amendment, include Section and Page Number:	Prepared and Approved By:
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#

See Appendix D for copies of Amendments.

Section 1 SWPPP Requirements

1.1 INTRODUCTION

The MPWSP Carmel Valley Pump Station comprises approximately a total of 1.46 acres and is located in the City of Carmel, California. The project is owned by California American Water and is being developed by Monterey Peninsula Engineering (MPE). The project's location is shown on the Site Map in Appendix B.

The project site is located in the County of Monterey, California, in the jurisdiction of the Central Coast Water Quality Control Board (Region 3). A vicinity map can be found in Attachment B. It shows the site boundaries and primary geographical features of the site; locations of surface water bodies; general surface water flows; and anticipated discharge locations for runoff.

This Stormwater Pollution Prevention Plan (SWPPP) is designed to comply with California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ as amended in 2010 and 2012 (NPDES No. CAS000002) issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the SWPPP Template provided on the California Stormwater Quality Association Stormwater Best Management Practice Handbook Portal: Construction (CASQA, 2012). In accordance with the General Permit, Section XIV, this SWPPP is designed to address the following:

1. Pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
2. Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
3. Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard;
4. Calculations and design details as well as BMP controls are complete and correct;
5. Identify and provide methods to implement a Rain Event Action Plan (REAP)

1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Stormwater Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);

3. Site Map;
4. Annual Fee;
5. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal); and
6. SWPPP.

Site Maps can be found in Appendix B. A copy of the submitted PRDs shall also be kept in Appendix C along with the Waste Discharge Identification (WDID) confirmation.

1.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The discharger shall make the SWPPP available at the construction site during working hours (see Section 7.5 of Construction Site Monitoring Program for working hours) while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone. (CGP Section XIV.C) The plans for the SWPPP are shown in Appendix B.

The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP AMENDMENTS

The SWPPP should be revised when:

- If there is a General Permit violation.
- When there is a reduction or increase in total disturbed acreage (General Permit Section II Part C).
- BMPs do not meet the objectives of reducing or eliminating pollutants in stormwater discharges.

Additionally, the SWPPP shall be amended when:

- There is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- When there is a change in the project duration that changes the project's risk level; or
- When deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1.1 can be field determined by the QSP. All other changes shall be made by the QSD as formal amendments to the SWPPP.

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;

- The original BMP proposed, if any; and
- The new BMP proposed.

Amendment shall be logged at the front of the SWPPP and certification kept in Appendix D. The SWPPP text shall be revised, replaced, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

Table 1.1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP ⁽¹⁾	Check changes that can be field located or field determined by QSP
Increase quantity of an Erosion or Sediment Control Measure	<i>X</i>
Relocate/Add stockpiles of stored materials	<i>X</i>
Relocate or add toilets	<i>X</i>
Relocate vehicle storage and/or fueling locations	<i>X</i>
Relocate areas for waste storage	<i>X</i>
Relocate water storage and/or water transfer location	<i>N/A</i>
Changes to access points (entrance/exits)	<i>X</i>
Change type of Erosion or Sediment Control Measure	<i>X</i>
Changes to location of erosion or sediment control	<i>X</i>
Minor changes to schedule or phases	<i>X</i>
Changes in construction materials	<i>X</i>
<i>(1) Any field changes not identified for field location or field determination by QSP must be approved by QSD</i>	

1.5 RETENTION OF RECORDS

Paper or electronic records of documents required by this SWPPP shall be retained for a minimum of three years from the date generated or date submitted, whichever is later, for the following items:

- Site Inspections
- Compliance Certifications
- Discharge Reports

- Approved SWPPP document and amendments

These records shall be available at the Site until construction is complete. Records assisting in the determination of compliance with the General Permit shall be made available within a reasonable time, to the Regional Water Board, State Water Board or U.S. Environmental Protection Agency (EPA) upon request. Requests by the Regional Water Board for retention of records for a period longer than three years shall be adhered to.

1.6 REQUIRED NON-COMPLIANCE REPORTING

If a General Permit discharge violation occurs, the QSP shall immediately notify the LRP. The LRP shall include information on the violation with the Annual Report. Corrective measures will be implemented immediately following identification of the discharge or written notice of non-compliance from the Regional Water Board. Discharges and corrective actions must be documented and include the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.
- The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

Reporting requirements for Numeric Action Levels (NALs) exceedances are discussed in Section 7.7.2.7.

1.7 ANNUAL REPORT

The General Permit requires that permittees prepare, certify, and electronically submit an Annual Report no later than September 1st of each year. Reporting requirements are identified in Section XVI of the General Permit. Annual reports will be filed in SMARTS and in accordance with information required by the on-line forms.

1.8 CHANGES TO PERMIT COVERAGE

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when: a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, shall be logged at the front of the SWPPP and certification of SWPPP amendments are to be kept in Appendix D. Updated PRDs submitted electronically via SMARTS can be found in Appendix E.

1.9 NOTICE OF TERMINATION

A Notice of Termination (NOT) must be submitted electronically by the LRP via SMARTS to terminate coverage under the General Permit. The NOT must include a final Site Map and representative photographs of the project site that demonstrate final stabilization has been achieved. The NOT shall be submitted within 90 days of completion of construction. The Regional Water Board will consider a construction site complete when the conditions of the General Permit, Section II.D have been met.

Section 2 Project Information

2.1 PROJECT AND SITE DESCRIPTION

2.1.1 Site Description

The MPWSP Carmel Valley Pump Station Project is comprised of approximately 1.46 acres and is located in 26530 Rancho San Carlos Road in the City of Carmel, California. The project area is about 4 miles east of Highway 1. The project is located at latitude 36.538986° and longitude - 121.872501°. The project site is identified on the Site Map in Appendix B.

2.1.2 Existing Conditions

The project work is located on an unpaved lot. The site is bounded by Carmel Canyon Rd. to the north, Rancho San Carlos Rd. to the east, residential houses to the south, and undeveloped land to the west. The project site is located in a residential area of the City of Carmel. There are no known contaminants at the site.

2.1.3 Existing Drainage

The project site is relatively level with a slope towards the south. The site elevation ranges from about 55 feet to about 68 feet above mean sea level (msl). Stormwater drains to the south through a drainage system. Existing site topography, drainage patterns, and stormwater conveyance systems are shown in Appendix B.

The site does not drain directly or indirectly into a receiving water body currently impaired by sediment.

2.1.4 Geology and Groundwater

There are no geotechnical or hydrology reports available regarding the geology and depths of groundwater for this specific project.

2.1.5 Project Description

The project will include a pump station building containing the pumps, and electrical equipment at the existing San Carlos Well Site located at 26530 Rancho San Carlos Rd, Carmel, CA, 93923. The pump station building will be built using CMU split face block construction and a wood truss roof system. The pump station will be approximately 28 feet wide by 26 feet long.

Below is a list of the major features of the pump station building:

- Three vertical turbine pumps.
- Pump piping and valves.
- Security - intrusion alarms at exterior doors.
- PLC and SCADA controls

Other site improvements will include:

- Site grading and drainage.
- 10 foot wide gravel access road from San Carlos Ranch Road to the pump station building.
- Gravel utility yard.
- Transmission piping, fitting, and valving to and from the pump station building and the existing 30-inch transmission main in Carmel Valley Road.
- Bio retention swales

2.1.6 Developed Condition

Post construction surface drainage will be directed to the east through stormwater conveyance systems and will discharge directly into the public storm drain system owned by the City of Carmel. Post construction drainage patterns and conveyance systems are presented in Appendix B.

Table 2.1 Construction Site Estimates

Construction site area	1.46	acres
Percent impervious before construction	0	%
Runoff coefficient before construction	0.25	
Percent impervious after construction	19	%
Runoff coefficient after construction	0.38	

2.2 PERMITS AND GOVERNING DOCUMENTS

In addition to the General Permit, the following documents have been taken into account while preparing this SWPPP:

- Regional Water Board Requirements
- Basin Plan Requirements
- Contract Documents

2.3 STORMWATER RUN-ON FROM OFFSITE AREAS

There is no anticipated offsite run-on to this construction site because of an existing stormwater conveyance system to prevent on-site flow. There are no up-gradient drainage areas within the project limits.

2.4 FINDINGS OF THE CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 2.

The risk level was determined through the use of a site-specific analysis. The risk level is based on project duration, location, proximity to impaired receiving waters and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix C.

Table 2.2 and Table 2.3 summarize the sediment risk factors and document the sources of information used to derive the factors.

Table 2.2 Summary of Sediment Risk

RUSLE Factor	Value	Method for establishing value
R	54.27	EPA Calculator
K	0.2	SMARTS GIS Files
LS	6.59	SMARTS GIS Files
Total Predicted Sediment Loss (tons/acre)		71.52786
Overall Sediment Risk Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre		☐ Low ☒ Medium ☐ High

Risk Level 2 sites are subject to both the narrative effluent limitations and numeric effluent standards. The narrative effluent limitations require stormwater discharges associated with construction activity to minimize or prevent pollutants in stormwater and authorized non-stormwater through the use of controls, structures and best management practices. Discharges from Risk Level 2 site are subject to NALs for pH and turbidity shown in Table 2-4. This SWPPP has been prepared to address Risk Level 2 requirements (General Permit Attachment D).

Table 2.4 Numeric Action Levels		
Parameter	Unit	Numeric Action Level Daily Average
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5
Turbidity	NTU	250 NTU

The project is within the Carmel River Hydrologic Unit. The contractor will understand the importance that all unauthorized discharges from the site must/shall be prevented. Drainage inlets shall be protected and/or plugged to prevent any sediment or hazardous material from entering during construction operations. The site does not drain directly or indirectly into a receiving water body impaired by sediment.

2.5 CONSTRUCTION SCHEDULE

The site sediment risk was determined based on construction taking place between 1/1/2020 and 1/1/2021. Modification or extension of the schedule (start and end dates) may affect risk determination and permit requirements. The LRP shall contact the QSD if the schedule changes during construction to address potential impact to the SWPPP. The estimated schedule for planned work can be found in Appendix F.

2.6 POTENTIAL CONSTRUCTION ACTIVITY AND POLLUTANT SOURCES

Appendix G includes a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to stormwater runoff.

The anticipated activities and associated pollutants were used in Section 3 to select the Best Management Practices for the project. Location of anticipated pollutants and associated BMPs are shown on the Site Map in Appendix B.

For sampling requirements for non-visible pollutants associated with construction activity please refer to Section 7.7.1. For a full and complete list of onsite pollutants, refer to the Material Safety Data Sheets (MSDS), which are retained onsite at the construction trailer.

2.7 IDENTIFICATION OF NON-STORMWATER DISCHARGES

Non-stormwater discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-stormwater discharges that do not cause erosion or carry other pollutants.

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit and listed in the SWPPP, or authorized under a separate NPDES permit, are prohibited.

Non-stormwater discharges that are authorized from this project site include the following:

- Discharges from fire-fighting activities;
- Fire hydrant flushings;
- Waters used to wash vehicles where detergents are not used;
- Water used to control dust in accordance with Part 3.1.B;
- Potable water including uncontaminated water line flushings;
- Routine external building wash down that does not use detergents;

- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
- Uncontaminated air conditioning or compressor condensate;
- Uncontaminated ground water or spring water;
- Foundation or footing drains where flows are not contaminated with process materials such as solvents;
- Uncontaminated excavation dewatering;
- Landscape irrigation.

These authorized non-stormwater discharges will be managed with the stormwater and non-stormwater BMPs described in Section 3 of this BMP Implementation Plan and will be minimized by the Project Manager.

Activities at this site that may result in unauthorized non-stormwater discharges include:

- Vehicle and equipment cleaning, fueling and maintenance operations;
- Vehicle and equipment wash water, including concrete washout water;
- Slurries from concrete cutting and coring operations, PCC grinding or AC grinding operations;
- Slurries from concrete or mortar mixing operations;
- Slurries from drilling or boring operations;
- Blast residue from high-pressure washing of structures or surfaces;
- Wash water from cleaning painting equipment;
- Runoff from dust control applications of water or dust palliatives;
- Sanitary and septic wastes;
- Chemical leaks and/or spills of any kind including but not limited to petroleum, paints, cure compounds, etc.

Section 3 Best Management Practices

3.1 SCHEDULE FOR BMP IMPLEMENTATION

The BMP Implementation Schedule is included in Appendix F. Schedule may change due to unforeseen events. The Contractor shall keep current copies of updated schedule as part of this SWPPP in Appendix F.

3.2 EROSION AND SEDIMENT CONTROL

Erosion and sediment controls are required by the General Permit to provide effective reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from the Project Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

3.2.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in stormwater runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

1. Preserve existing vegetation where required and when feasible.
2. The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.
3. Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
4. Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.
5. Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

The following temporary erosion control BMP selection table indicates the BMPs that shall be implemented to control erosion on the construction site. Fact Sheets for temporary erosion control BMPs are provided in Appendix H.

Table 3.1 Erosion Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement ⁽¹⁾	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	X		
EC-2	Preservation of Existing Vegetation	✓		X	Not anticipated at this time
EC-3	Hydraulic Mulch	✓ ⁽²⁾		X	Not anticipated at this time
EC-4	Hydroseed	✓ ⁽²⁾	X		
EC-5	Soil Binders	✓ ⁽²⁾		X	Not anticipated at this time
EC-6	Straw Mulch	✓ ⁽²⁾		X	Not anticipated at this time
EC-7	Geotextiles and Mats	✓ ⁽²⁾		X	
EC-8	Wood Mulching	✓ ⁽²⁾		X	Not anticipated at this time
EC-9	Earth Dike and Drainage Swales	✓ ⁽³⁾	X		
EC-10	Velocity Dissipation Devices			X	
EC-11	Slope Drains			X	Not anticipated at this time
EC-12	Stream Bank Stabilization			X	Not anticipated at this time
EC-14	Compost Blankets	✓ ⁽²⁾		X	Not anticipated at this time
EC-15	Soil Preparation-Roughening			X	Not anticipated at this time
EC-16	Non-Vegetated Stabilization	✓ ⁽²⁾		X	
WE-1	Wind Erosion Control	✓	X		Not anticipated at this time
Alternate BMPs Used:					If used, state reason:
⁽¹⁾ Applicability to a specific project shall be determined by the QSD. ⁽²⁾ The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements. ⁽³⁾ Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting.					

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. The narrative in the body of the SWPPP prevails over guidance in the Fact Sheets.

EC-1, Scheduling

The contractor shall sequence construction activities with the installation of both soil stabilization and sediment control measure BMPs to reduce the discharge of sediment and pollutants to storm drain facilities or watercourses. The contractor shall create a schedule detailed enough to show major activities sequences with the implementation of construction site BMPs.

EC-4, Hydroseeding

Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, which temporarily protects exposed soils from erosion by water and wind.

The contractor will apply hydro seeding per plan on disturbed soil areas requiring temporary protection until permanent vegetation is established or disturbed soil areas that must be re-disturbed following an extended period of inactivity. The contractor prior to application will roughen the slope; fill area or area to be seeded with the furrows trending along the contours. Rolling with a crimping or punching type roller or track walking is required on all slopes prior to hydroseeding. Track walking shall only be used where other methods are impractical. The contractor will avoid overspray onto the traveled roadway, sidewalks, lined drainage channels, and existing vegetation.

EC-9, Earth Dikes and Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. No more than 5 acres may drain to a temporary drainage swale. Place drainage swales above or below, not on, a cut or fill slope. Swale bottom width should be at least 2 ft. Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent. Do not operate construction vehicles across a swale unless a stabilized crossing is provided. Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

WE-1, Wind Erosion Control

Potable water shall be applied to disturbed soil areas of the project site to control dust and maintain optimum moisture levels for compaction. The water will be applied using water trucks.

Wind Erosion Control and Water Conservation Practices BMPs will be implemented to provide dust control and prevent discharges from dust control activities and water supply

equipment. Water application rates will be minimized as necessary to prevent runoff and ponding and water equipment leaks will be repaired immediately.

During windy conditions (forecast or actual wind conditions of approximately 25 mph or greater), dust control will be applied to DSAs, including haul roads to adequately control wind erosion.

3.2.2 *Sediment Controls*

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

The following sediment control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix H.

Table 3.2 Temporary Sediment Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement ⁽¹⁾	BMP Used		If not used, state reason
			YES	NO	
SE-1	Silt Fence	✓ ⁽²⁾⁽³⁾	X		
SE-2	Sediment Basin			X	Not anticipated at this time
SE-3	Sediment Trap			X	Not anticipated at this time
SE-4	Check Dams			X	Not anticipated at this time
SE-5	Fiber Rolls	✓ ⁽²⁾⁽³⁾		X	Not anticipated at this time
SE-6	Gravel Bag Berm	✓ ⁽³⁾		X	Not anticipated at this time
SE-7	Street Sweeping	✓	X		
SE-8	Sandbag Barrier			X	Not anticipated at this time
SE-9	Straw Bale Barrier			X	Not anticipated at this time
SE-10	Storm Drain Inlet Protection	✓ RL2&3	X		
SE-11	ATS			X	Not anticipated at this time
SE-12	Temporary Silt Dike			X	Not anticipated at this time
SE-13	Compost Sock and Berm	✓ ⁽³⁾		X	Not anticipated at this time
SE-14	Biofilter Bags	✓ ⁽³⁾		X	Not anticipated at this time
TC-1	Stabilized Construction Entrance and Exit	✓		X	Not anticipated at this time
TC-2	Stabilized Construction Roadway			X	Not anticipated at this time
TC-3	Entrance Outlet Tire Wash			X	Not anticipated at this time
Alternate BMPs Used:					If used, state reason:
⁽¹⁾ Applicability to a specific project shall be determined by the QSD ⁽²⁾ The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements ⁽³⁾ Risk Level 2 & 3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope					

These temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

SE-1, Silt Fence

To be installed along the perimeter of the project where there is potential for run-off. A silt fence is a temporary barrier of semi-permeable fabric designed to intercept and slow the flow of sediment laden sheet flow runoff. Silt fencing ponds storm water allowing sediment to settle and releases filtered water slowly. Silt fences can be constructed along the perimeter of the site or along streams and channels. They can be constructed below the toe of exposed and erodible slopes; down slope of exposed soil areas and around temporary soil stockpiles.

SE-10, Drain Inlet Protection

Storm drain inlet protection will be used at all storm drain inlets within the project limits.

Temporary devices constructed around storm drain inlets are used to filter the stormwater being discharged by ponding sediment-laden runoff and increasing settling time. Drain inlet protection shall be placed away from pedestrian and vehicle traffic. Locations of drain inlets are shown on the Water Pollution Control Drawings in Attachment B. The contractor shall inspect drain inlet locations. Protection must be installed before commencing work.

3.3 *NON-STORMWATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT*

3.3.1 *Non-Stormwater Controls*

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-stormwater discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-stormwater BMPs is based on the list of construction activities with a potential for non-stormwater discharges identified in Section 2.7 of this SWPPP.

The following non-stormwater control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary non-stormwater control BMPs are provided in Appendix H.

Table 3.3 Temporary Non-Stormwater BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement ⁽¹⁾	BMP Used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓		X	Not anticipated at this time
NS-2	Dewatering Operation			X	Not anticipated at this time
NS-3	Paving and Grinding Operation		X		
NS-4	Temporary Stream Crossing			X	Not anticipated at this time
NS-5	Clear Water Diversion			X	Not anticipated at this time
NS-6	Illicit Connection- Illegal Discharge Connection	✓	X		
NS-7	Potable Water Irrigation Discharge Detection			X	Not anticipated at this time
NS-8	Vehicle and Equipment Cleaning	✓		X	Not anticipated at this time
NS-9	Vehicle and Equipment Fueling	✓	X		
NS-10	Vehicle and Equipment Maintenance	✓	X		
NS-11	Pile Driving Operation			X	Not anticipated at this time
NS-12	Concrete Curing		X		
NS-13	Concrete Finishing		X		
NS-14	Material and Equipment Use Over Water			X	Not anticipated at this time
NS-15	Demolition Removal Adjacent to Water			X	Not anticipated at this time
NS-16	Temporary Batch Plants			X	Not anticipated at this time
Alternate BMPs Used:			If used, state reason:		
⁽¹⁾ Applicability to a specific project shall be determined by the QSD					

Non-stormwater BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

NS-3, Paving and Grinding Operations

The contractor shall perform paving and grinding operations throughout the project site. Do not allow water or concrete slurry from sawcutting or grinding operations to enter the storm drains. Cover all storm drain inlets prior to these operations. Residue from sawcutting or grinding operations shall be picked up by means of a vacuum. Noticeable tracked material shall be removed to prevent sediment and grindings from entering drainage systems. Drip protection will be placed under equipment when not in use. All equipment will be staged on level ground with drip protection.

NS-6, Illicit Connection-Illegal Discharge Connection

The project site will be inspected regularly during the construction work for illicit connections or illegal dumping or discharge. If any evidence of dumping or discharge is found, report to the Resident Engineer at the time of discovery.

NS-9, Vehicle and Equipment Fueling

Most construction vehicles will be fueled offsite. When necessary, NS-9 will be used on all vehicles that cannot be fueled offsite. If fueling or maintenance must be done onsite, activities must be performed on level ground in areas protected from stormwater run-on and runoff.

NS-10, Vehicle and Equipment Maintenance

Most construction vehicles will be stored offsite but NS-10 will be utilized for all equipment that must be stored onsite. Plastic Sheeting will be placed under equipment that is not in use.

NS-12, Concrete Curing

Curing compound sealed containers and sprayers are to be placed in secondary containment. Do not overspray chemical curing compound. Minimize the drift by spraying as close to the concrete as possible. Cover drainage inlets before applying the curing compound.

NS-13, Concrete Finishing

Contractor will collect and dispose of water and solid waste from high-pressure water blasting and will also ensure that drainage inlets within 50 feet are covered before sandblasting. The contractor will minimize drift of dust and blast material by keeping the nozzle close to the surface of the concrete. The contractor will also inspect concrete finishing containment structures for damage before each day of use and before predicted precipitation. Remove liquid and solid waste from containment structures after each work shift.

3.3.2 **Materials Management and Waste Management**

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into stormwater discharges. The amount and type of construction materials to be utilized at the Site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into stormwater discharges.

Materials and waste management pollution control BMPs shall be implemented to minimize stormwater contact with construction materials, wastes and service areas; and to prevent materials and wastes from being discharged off-site. The primary mechanisms for stormwater contact that shall be addressed include:

- Direct contact with precipitation
- Contact with stormwater run-on and runoff
- Wind dispersion of loose materials
- Direct discharge to the storm drain system through spills or dumping
- Extended contact with some materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into stormwater.

A list of construction activities is provided in Section 2.6. The following Materials and Waste Management BMP selection table indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix H.

Table 3.4 Temporary Materials Management BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement (1)	BMP Used		If not used, state reason
			YES	NO	
WM-01	Material Delivery and Storage	✓	X		
WM-02	Material Use	✓	X		
WM-03	Stockpile Management	✓	X		
WM-04	Spill Prevention and Control	✓	X		
WM-05	Solid Waste Management	✓	X		
WM-06	Hazardous Waste Management		X		
WM-07	Contaminated Soil Management			X	Not anticipated at this time
WM-08	Concrete Waste Management	✓	X		
WM-09	Sanitary-Septic Waste Management	✓	X		
WM-10	Liquid Waste Management			X	Not anticipated at this time
Alternate BMPs Used:				If used, state reason:	
(1) Applicability to a specific project shall be determined by the QSD.					

Material management BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. The narrative in the body of the SWPPP prevails over guidance in the Fact Sheets.

WM-1, Material Delivery and Storage

The contractor may establish a staging and storage area. The contractor shall utilize this area for storage of materials and stockpiling. Secondary containment shall be provided for any hazardous chemicals. Construction materials shall be brought onsite when needed to complete construction operations. Employees shall be trained on proper material delivery and storage practices. The contractor shall implement delivery and storage primarily during unloading and handling of materials onsite. Spill clean-up materials, Material Safety Data Sheets, a material inventory, and emergency contact numbers shall be maintained and stored kept on site.

WM-2, Material Use

The contractor shall use materials in accordance to Manufacture's specifications to avoid misuse. Spill kits, absorbent pads, drip pans, Material Safety Data Sheets, a material inventory, and emergency contact numbers shall be maintained onsite. The contractor shall provide Material Safety Data Sheets (MSDS) to the Resident Engineer and shall be readily available upon request.

WM-3, Stockpile Management

Water pollution control practices must be implemented within 72 hours of stockpiling material or before a forecasted storm event. Stockpiles of asphalt concrete pavement (rubberized hot mix asphalt and cold plane) must be covered with plastic sheeting and surrounded with perimeter control, such as gravel bags. Sediment and other debris must not enter the storm drains and watercourses.

WM-4, Spill Prevention and Control

Throughout the project duration, the contractor will implement spill and leak prevention procedures for chemicals and hazardous substances when encountered on the jobsite. The project foreman will keep a spill and clean up kit in his truck at all times to allow for quick clean-up of all spills or leaks. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed.

WM-5, Solid Waste Management

Throughout the project duration, the contractor will load solid wastes such as litter, trash, or debris accumulated on the jobsite directly into disposal containers for off-site removal. Waste disposal containers will be covered at the end of every business day and during rain events. The containers will be watertight dumpsters. Dumpsters and trash receptacles will also be placed in

locations where workers eat lunch. Dumpster will not be allowed to be washed out at the job sites. Solid waste management practices will be performed per the plans and specifications.

WM-6, Hazardous Waste Management

Throughout the project limits, shall the contractor encounter hazardous waste management during the course of the project WM-6 practices will be implemented. The WPC Manager must oversee and enforce hazardous waste management practices. Minimize the production of hazardous materials and hazardous waste at the job site. Furnish containers with adequate storage volume at convenient locations for hazardous waste collection. Do not overfill hazardous waste containers. Do not mix hazardous waste. Do not allow potentially hazardous waste to accumulate on the ground. Store containers of dry waste that are not watertight on pallets. Store hazardous waste away from storm drains, watercourses, moving vehicles, and equipment.

WM-8, Concrete Waste Management

The contractor will implement concrete waste management in accordance with contract documents. Concrete waste management will be implemented in the staging areas and during concrete removal within the project limits. The concrete washout will be furnished, maintained, and moved as necessary during the project. The washout must be a watertight container and have sufficient capacity to contain all concrete generated by removal activities. Concrete washouts must be placed at least 50 feet away from drainage facilities and receiving. Employees, subcontractors, and suppliers shall be fully educated on the concrete waste management techniques.

WM-9, Sanitary-Septic Waste Management

Portable toilets shall be located and maintained at appropriate locations for the duration of the project or until no longer needed. Weekly maintenance shall be provided and wastes shall be disposed offsite. The toilets shall be located away from concentrated flow paths and traffic flow. Secondary containment, such as plastic sheeting with berm, is to be placed under the portable toilets. Portable sanitary facilities must be placed at least 50 feet away from storm drains, receiving waters, and flow lines. Portable toilets shall be inspected daily and maintained weekly.

3.4 POST CONSTRUCTION STORMWATER MANAGEMENT MEASURES

Post construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after construction is completed.

This site is located in an area subject to a Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permit approved Stormwater Management Plan.

☐ Yes ☒ No

Post construction runoff reduction requirements have been satisfied through the MS4 program, this project is exempt from provision XIII A of the General Permit.

Table 3.5 Post Construction Impervious Area

Impervious Condition	Acreage of Impervious Area
Roofed	0.275
Non-roofed	0.02

Section 4 BMP Inspection, Maintenance, and Rain Event Action Plans

4.1 BMP INSPECTION AND MAINTENANCE

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP inspection checklist must be filled out for inspections and maintained on-site with the SWPPP. The inspection checklist includes the necessary information covered in Section 7.6. A blank inspection checklist can be found in Appendix I. Completed checklists shall be kept in CSMP Attachment 2 “Monitoring Records.

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72 hours of identified deficiencies and associated amendments to the SWPPP shall be prepared by the QSD.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Factsheets in Appendix H.

4.2 RAIN EVENT ACTION PLANS

The Rain Event Action Plans (REAP) is written document designed to be used as a planning tool by the QSP to protect exposed portions of project sites and to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures. These measures are intended to reduce the amount of sediment and other pollutants that could be generated during the rain event. It is the responsibility of the QSP to be aware of precipitation forecast and to obtain and print copies of forecasted precipitation from NOAA’s National Weather Service Forecast Office.

The SWPPP includes REAP templates but the QSP will need to customize them for each rain event. Site-specific REAP templates for each applicable project phase can be found in Appendix J. The QSP shall maintain a paper copy of completed REAPs in compliance with the record retention requirements Section 1.5 of this SWPPP. Completed REAPs shall be maintained in Appendix J.

The QSP will develop an event specific REAP 48 hours in advance of a precipitation event forecast to have a 50% or greater chance of producing precipitation in the project area. The REAP will be onsite and be implemented 24 hours in advance of any the predicted precipitation event. At minimum, the REAP will include the following site and phase-specific information:

1. Site Address;
2. Calculated Risk Level (2);
3. Site Stormwater Manager Information including the name, company and 24-hour emergency telephone number;
4. Erosion and Sediment Control Provider information including the name, company and 24-hour emergency telephone number;
5. Stormwater Sampling Agent information including the name, company, and 24-hour emergency telephone number;
6. Activities associated with each construction phase;

7. Trades active on the construction site during each construction phase;
8. Trade contractor information; and
9. Recommended actions for each project phase.

Section 5 Training

Appendix L identifies the QSPs for the project. To promote stormwater management awareness specific for this project, periodic training of job-site personnel shall be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed.

The QSP shall be responsible for providing this information at the meetings, and subsequently completing the training logs shown in Appendix K, which identifies the site-specific stormwater topics covered as well as the names of site personnel who attended the meeting. Tasks may be delegated to trained employees by the QSP provided adequate supervision and oversight is provided. Training shall correspond to the specific task delegated including: SWPPP implementation; BMP inspection and maintenance; and record keeping.

Documentation of training activities (formal and informal) is retained in SWPPP Appendix K.

Section 6 Responsible Parties and Operators

6.1 RESPONSIBLE PARTIES

Approved Signatories who are responsible for SWPPP implementation and have authority to sign permit-related documents are listed below. Written authorizations from the LRP for these individuals are provided in Appendix L. The Approved Signatories assigned to this project are:

Name	Title	Phone Number
Timothy P. Ohalloran	Engineering Manager - Coastal Division	(831) 646-3291

QSPs identified for the project are identified in Appendix L. The QSP shall have primary responsibility and significant authority for the implementation, maintenance and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Implementing all elements of the General Permit and SWPPP, including but not limited to:
 - Ensuring all BMPs are implemented, inspected, and properly maintained;
 - Performing non-stormwater and stormwater visual observations and inspections;
 - Performing non-stormwater and storm sampling and analysis, as required;
 - Performing routine inspections and observations;
 - Implementing non-stormwater management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than stormwater are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee, but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate with the Contractor(s) to assure all of the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the General Permit and approved plans at all times.
- Notifying the LRP or Authorized Signatory immediately of off-site discharges or other non-compliance events.

6.2 CONTRACTOR LIST

All contractors and subcontractors will be notified of the requirement for storm water

management measures during the project. A list of contractors will be maintained and included in the SWPPP. If subcontractors change during the project, the list will be updated accordingly. The subcontractor notification letter and log is included in the SWPPP as Appendix M. Subcontractors will be required to provide documentation of the training of their personnel, and subcontractor personnel will be required to attend tailgate training sessions during the project.

Contractor:

Name: Peter Taormina
Title: Project Manager
Company: Monterey Peninsula Engineering
Address: 192 Healy Avenue
Marina, CA 93933
Phone Number: (831) 277-6114
Phone Number (24/7): (831) 277-6114

Section 7 Construction Site Monitoring Program

7.1 PURPOSE

This Construction Site Monitoring Program was developed to address the following objectives:

1. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
2. To determine whether immediate corrective actions, additional Best Management Practices (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges;
3. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

7.2 APPLICABILITY OF PERMIT REQUIREMENTS

This project has been determined to be a Risk Level 2 project. The General Permit identifies the following types of monitoring as being applicable for a Risk Level 2 project.

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-stormwater discharges;
- Sampling and analysis of construction site runoff for pH and turbidity;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable; and
- Sampling and analysis of non-stormwater discharges when applicable.

7.3. WEATHER AND RAIN EVENT TRACKING

Visual monitoring, inspections, and sampling requirements of the General Permit are triggered by a qualifying rain event. The General Permit defines a qualifying rain event as any event that produces ½ inch of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate qualifying storm events.

7.3.1 Weather Tracking

The QSP should daily consult the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. These forecasts can be obtained at <http://www.srh.noaa.gov/>. Weather reports should be printed and maintained with the SWPPP in CSMP Attachment 1 “Weather Reports”.

7.3.2 Rain Gauges

The QSP shall install rain gauge(s) on the project site. Locate the gauge in an open area away from obstructions such as trees or overhangs. Mount the gauge on a post at a height of 3 to 5 feet with the gauge extending several inches beyond the post. Make sure that the top of the gauge is

level. Make sure the post is not in an area where rainwater can indirectly splash from sheds, equipment, trailers, etc.

The rain gauge(s) shall be read daily during normal site scheduled hours. The rain gauge should be read at approximately the same time every day and the date and time of each reading recorded. Log rain gauge readings in CSMP Attachment 1 “Weather Records”. Follow the rain gauge instructions to obtain accurate measurements.

Once the rain gauge reading has been recorded, accumulated rain shall be emptied and the gauge reset.

7.4 MONITORING LOCATIONS

Monitoring locations are shown on the Site Maps in Appendix B. Monitoring locations are described in the Sections 7.6 and 7.7.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

7.5 SAFETY AND MONITORING EXEMPTIONS

Safety practices for sample collection will be in accordance with the latest version of the contractor’s Health and Safety Manual. A summary of the safety requirements that apply to sampling personnel is provided below.

- Contractor’s Health and Safety Plan, latest version.

This project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site business hours.

Scheduled site business hours are: 8:00 am to 5:00 pm.

If monitoring (visual monitoring or sample collection) of the site is unsafe because of the dangerous conditions noted above, then the QSP shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in CSMP Attachment 2 “Monitoring Records”.

7.6 VISUAL MONITORING

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.

Table 7.1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.3.

Table 7.1 Summary of Visual Monitoring and Inspections

Type of Inspection	Frequency
<i>Routine Inspections</i>	
BMP Inspections	Weekly ¹
BMP Inspections – Tracking Control	Daily
Non-Stormwater Discharge Observations	Quarterly during Daylight hours
<i>Rain Event Triggered Inspections</i>	
Site Inspections Prior to a Qualifying Event	Within 48 hours of a qualifying rain event ²
BMP Inspections During an Extended Storm Event	Every 24-hour period of rain event ³
Site Inspections Following a Qualifying Event	Within 48 hours of qualifying event ²
¹ Most BMPs must be inspected weekly; those identified below must be inspected more frequently. ² Inspections are only required during scheduled site operating hours. Note however, these inspections are required daily regardless of the amount of precipitation. ³ Inspections are required during scheduled site operating hours regardless of the amount of precipitation on any given day.	

7.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of the Construction General Permit.

7.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

7.6.1.2 Non-Stormwater Discharge Observations

Each drainage area will be inspected for the presence of or indications of prior unauthorized and authorized non-stormwater discharges. Inspections will record:

- Presence or evidence of any non-stormwater discharge (authorized or unauthorized);
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

7.6.2 Rain-Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a qualifying rain event; following a qualifying rain event, and every 24-hour period during a qualifying rain event. Pre-rain inspections will be conducted after consulting NOAA and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

7.6.2.1 Visual Observations Prior to a Forecasted Qualifying Rain Event

Within 48-hours prior to a qualifying event a stormwater visual monitoring site inspection will include observations of the following locations:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly implemented;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

BMP inspections and visual monitoring will be triggered by a NOAA quantitative predicted forecast (QPF) that indicates ½-inch or more of rain will occur in the project area.

7.6.2.2 BMP Inspections During an Extended Storm Event

During an extended rain event, BMP inspections will be conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

If the construction site is not accessible during the rain event, the visual inspections shall be performed at all relevant outfalls, discharge points, downstream locations. The inspections should record any projected maintenance activities.

7.6.2.2 Visual Observations Following a Qualifying Rain Event

Within 48 hours following a qualifying rain event (0.5 inches of rain) a stormwater visual monitoring site inspection is required to observe:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly designed, implemented, and effective;
- Need for additional BMPs;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- Discharge of stored or contained rain water.

7.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP.

The name(s) and contact number(s) of the site visual monitoring personnel are listed below and their training qualifications are provided in Appendix K.

Assigned inspector: Joseph Taormina Contact phone: (831) 384-4081

Alternate inspector: Contact phone:

Stormwater observations shall be documented on the *Visual Inspection Field Log Sheet* (see CSMP Attachment 3 “Example Forms”). BMP inspections shall be documented on the site-specific BMP inspection checklist. Any photographs used to document observations will be referenced on stormwater site inspection report and maintained with the Monitoring Records in Attachment 2.

The QSP shall within 3 days of the inspection submit copies of the completed inspection report to Timothy P. Ohalloran.

The completed reports will be kept in CSMP Attachment 2 “Monitoring Records”.

7.6.4 Visual Monitoring Follow-Up and Reporting

Correction of deficiencies identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated and completed as soon as possible.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will be initiated within 72 hours of identification and be completed as soon as possible. When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes.

Deficiencies identified in site inspection reports and correction of deficiencies will be tracked on the *Inspection Field Log Sheet* or *BMP Inspection Report* and shall be submitted to the QSP and shall be kept in CSMP Attachment 2 “Monitoring Records”.

The QSP shall within 3 days of the inspection submit copies of the completed *Inspection Field Log Sheet* or *BMP Inspection Report* with the corrective actions to Timothy P. Ohalloran.

Results of visual monitoring must be summarized and reported in the Annual Report.

7.6.5 Visual Monitoring Locations

The inspections and observations identified in Sections 7.6.1 and 7.6.2 will be conducted at the locations identified in this section.

BMP locations are shown on the Site Maps in SWPPP Appendix B.

There are 2 drainage areas on the project site and the contractor’s yard, staging areas, and storage areas. Drainage area(s) are shown on the Site Maps in Appendix B and Table 7.2 identifies each drainage area by location.

Table 7.2 Site Drainage Areas

Location No.	Location
1	Pump Station construction area
2	Demolition Area
	***Additional locations will be field determined by the QSP according to stage of construction and/or unforeseen construction activities that require it. Visual monitoring will occur across entire site

There are no stormwater storage or containment area(s) are on the project site.

Table 7.3 Stormwater Storage and Containment Areas

Location No.	Location
N/A	Not Applicable to Project
	***Additional locations will be field determined by the QSP according to stage of construction and/or unforeseen construction activities that require it. Visual monitoring will occur across entire site

There is one 2 discharge locations on the project site. Site stormwater discharge location(s) are shown on the Site Maps in Appendix B and Table 7.4 identifies each stormwater discharge location.

Table 7.4 Site Stormwater Discharge Locations

Location No.	Location
D-1	Near Station Pump Area
D-2	Near Demolition Area
	***Additional locations will be field determined by the QSP according to stage of construction and/or unforeseen construction activities that require it. Visual monitoring will occur across entire site

7.7 WATER QUALITY SAMPLING AND ANALYSIS

7.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Stormwater Runoff Discharges

This Sampling and Analysis Plan for Non-Visible Pollutants describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in stormwater runoff discharges from the project site.

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

The following construction materials, wastes, or activities, are identified in Section 2.6, and are considered potential sources of non-visible pollutants to stormwater discharges from the project. Storage, use, and operational locations are shown on the Site Maps in Appendix B.

- Discharges associated with illegal dumping/discharging by others not associated with the project;
- Wind erosion control watering discharges;
- Fueling discharges;
- Vehicle and equipment maintenance discharges;
- Concrete operations;
- Landscaping operations;
- Striping and painting operations;
- Demolition activities;
- Grading operations;
- Utility operations;
- Paving, grinding, and sawcutting operations;
- General building construction;
- Sanitary and septic waste management;
- General waste and site litter;
- Spills, and
- Material use and waste discharges

The following existing site features, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Locations of existing site features contaminated with non-visible pollutants are shown on the Site Maps.

- There are no existing site features that are potential sources of non-visible pollutants

The following soil amendments have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil and will be used on the project site. Locations of soil amendment application are shown on the Site Maps in Appendix B.

- There are no soil amendments that will be used on the project with the potential to change the chemical properties, or erosion resistance of the soil and will be used on the project site.

The project has the potential to receive stormwater run-on from the following locations with the potential to contribute non-visible pollutants to stormwater discharges from the project. Locations of such run-on to the project site are shown on the Site Maps.

- None

7.7.1.1 Sampling Schedule

Samples for the potential non-visible pollutant(s) and a sufficiently large unaffected background sample shall be collected during the first two hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during the site's scheduled hours and shall be collected regardless of the time of year and phase of the construction.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during site inspections conducted prior to or during a rain event.

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by temporary cover and containment that prevents stormwater contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leakage, or spill is observed, (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- A construction activity, including but not limited to those in Section 2.6, with the potential to contribute non-visible pollutants (1) was occurring during or within 24 hours prior to the rain event, (2) BMPs were observed to be breached, malfunctioning, or improperly implemented, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Stormwater runoff from an area contaminated by historical usage of the site has been observed to combine with stormwater runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

7.7.1.2 Sampling Locations

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence or use; accessibility for sampling, and personnel safety. Planned non-visible pollutant sampling locations are shown on the Site Maps in Appendix B include the locations identified in Table 7.5 through 7.6.

One sampling location(s) on the project site and the contractor's yard have been identified for the collection of samples of runoff from planned material and waste storage areas and areas where non-visible pollutant producing construction activities are planned.

Table 7.5 Non-Visible Pollutant Sample Locations – Contractors' Yard

Sample Location Number	Sample Location Description
NV-1	Contractors Equipment Staging Area
	***Additional locations will be field determined by the QSP according to stage of construction and/or unforeseen construction activities that require it. Visual monitoring will occur across entire site

One sampling location(s) has been identified for the collection of an uncontaminated sample of runoff as a background sample for comparison with the samples being analyzed for non-visible pollutants. This location(s) was selected such that the sample will not have come in contact with the operations, activities, or with disturbed soils areas.

Table 7.6 Non-Visible Pollutant Sample Locations – Background (Unaffected Sample)

Sample Location Number	Sample Location Description
BG-1	Location Outside Project Limits
	***Additional locations will be field determined by the QSP according to stage of construction and/or unforeseen construction activities that require it. Visual monitoring will occur across entire site

7.7.1.3 Monitoring Preparation

Non-visible pollutant samples will be collected by:

Contractor ☒ Yes ☐ No

Consultant ☐ Yes ☒ No
 Laboratory ☐ Yes ☒ No

Samples on the project site will be collected by the following contractor sampling personnel:

Name/Telephone Number: Joseph Taormina, (831) 277-6118

Alternate(s)/Telephone Number:

An adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available on the project site prior to a sampling event. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, clean powder-free nitrile gloves, sample collection equipment, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, and *Effluent Sampling Field Log Sheets* and Chain of Custody (CoC) forms, which are provided in CSMP Attachment 3 “Example Forms”.

7.7.1.4 Analytical Constituents

Table 7.11 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Table 7.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Pollutant Source	Pollutant	Water Quality Indicator Constituent
Asphalt Products	Asphalt concrete, cold mix, asphalt emulsion	Visually observable, no samples required
Cleaning products	Solvents, TSP	VOCs Phosphate
Landscaping Products	Lime, Gypsum, Pesticides, Organic fertilizers	pH, Pesticide, Nitrate
Stored Vehicle Fluids	Battery acid in stored batteries	pH
Sanitary Waste	Bacteria, pathogens, sanitary wastes	Nutrients, BOD, Total/Fecal coliform
Grading/Earthwork	Gypsum / Lime amendments, Contaminated soil	pH, constituents specific to known contaminants, check with Lab

Table 7.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Pollutant Source	Pollutant	Water Quality Indicator Constituent
Concrete/Masonry Work	Curing compounds, sealant (methyl methacrylate)	SVOC, VOCs, pH

7.7.1.5 Sample Collection

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations shown on the Site Maps in Appendix B or in the locations determined by observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in the Table, "Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants" provided in Section 7.7.1.6. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.1.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in the Table 7.12.

Samples will be analyzed by:

Laboratory Name: Monterey Bay Analytical Services
Address: 4 Justin Court, Suite D
City, State Zip: Monterey, CA 93940
Telephone Number: (831) 375-6227
ELAP Cert 2385

Samples will be delivered to the laboratory by:

Driven by Contractor ☒ Yes ☐ No
Picked up by Laboratory Courier ☐ Yes ☒ No
Shipped ☐ Yes ☒ No

Table 7.12 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time
pH	EPA 150.1	500 ml	PE or glass	4 degrees C	0.1 pH Unit	15 minutes
OCPs	EPA 8081	1 liter	PE or glass	4 degrees C	3ppb	7 days
Pesticides/PCBs	EPA 8081A/8082	1 liter	PE or glass	4 degrees C	Per Lab	Per Lab
Phosphate	EPA 365.3	1 liter	PE or glass	4 degrees C	0.1 mg/L	2 days
Nitrate	EPA 300.0	1 liter	PE or glass	4 degrees C	1 mg/L	2 days
VOCs-Solvents	EPA 8260B	3 x 40 mL	VOA-glass	Store at 4°C, HCl to pH<2	1 µg/L	14 Days
COD	EPA 410.4	1 x 250 mL	Glass-Amber	Store at 4°C, H2SO4 to pH<2	5 mg/L	28 days
SVOCs	EPA 8260B	3 x 40 mL	Glass-Amber	Store at 4° C	10 pg/L	7 days
Metals (Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Se, Na, Th, Va, Zn)	EPA 6010B/7470A	1 x 250 mL	Polypropylene	Store at 4°C, HNO3 to pH<2	0.1 mg/L	6 months
Notes: °C – Degrees Celsius BOD – Biochemical Oxygen Demand COD – Chemical Oxygen Demand DO – Dissolved Oxygen EPA – Environmental Protection Agency HCl – Hydrochloric Acid HNO3 – Nitric Acid L – Liter mg/L – Milligrams per Liter µg/L – Micrograms per Liter mL – Milliliter PCB – Polychlorinated Biphenyl SVOC – Semi-Volatile Organic Compound SM – Standard Method H2SO4 – Sulfuric Acid VOA – Volatile Organic Analysis VOC – Volatile Organic Compound						

7.7.1.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results.

Runoff/downgradient results shall be compared with the associated upgradient/unaffected results and any associated run-on results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

The General Permit prohibits the storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board and other agencies as required by 40 C.F.R. §§ 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be reported in the Annual Report.

7.7.2 Sampling and Analysis Plan for pH and Turbidity in Stormwater Runoff Discharges

Sampling and analysis of runoff for pH and turbidity is required for this project. This Sampling and Analysis Plan describes the strategy for monitoring turbidity and pH levels of stormwater runoff discharges from the project site and run-on that may contribute to an exceedance of a Numeric Action Level (NAL).

Samples for turbidity will be collected from all drainage areas with disturbed soil areas and samples for pH will be collected from all drainage areas with a high risk of pH discharge.

7.7.2.1 Sampling Schedule

Stormwater runoff samples shall be collected for turbidity from all qualifying rain events that result in a discharge from the project site. At minimum, turbidity samples will be collected from each site discharge location draining a disturbed area. A minimum of three samples will be collected per day of discharge during a qualifying event. Samples should be representative of the total discharge from the project each day of discharge during the qualifying event. Typically, representative samples will be spaced in time throughout the daily discharge event.

Stored or collected water from a qualifying storm event when discharged shall be tested for turbidity and pH (when applicable). Stored or collected water from a qualifying event may be sampled at the point it is released from the storage or containment area or at the site discharge location.

Run-on samples shall be collected whenever the QSP identifies that run-on has the potential to contribute to an exceedance of a NAL.

7.7.2.2 Sampling Locations

The project does not receive run-on with the potential to exceed NALs.

7.7.2.3 Monitoring Preparation

Turbidity and pH samples will be collected and analyzed by:

Contractor ☒ Yes ☐ No

Consultant ☐ Yes ☒ No

Laboratory ☐ Yes ☒ No

Samples on the project site will be collected by the following contractor sampling personnel:

Name/Telephone Number: Joseph Taormina, (831) 277-6118

Alternate(s)/Telephone Number: _____

An adequate stock of monitoring supplies and equipment for monitoring turbidity and will be available on the project site prior to a sampling event. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, field meters, extra batteries; clean powder-free nitrile gloves, sample collection equipment, appropriate sample containers, paper towels, personal rain gear, and *Effluent Sampling Field Log Sheets* and CoC forms provided in CSMP Attachment 3 “Example Forms”.

The contractor will obtain and maintain the field testing instruments, as identified in the section for analyzing samples in the field by contractor sampling personnel.

7.7.2.4 Field Parameters

Samples shall be analyzed for the constituents indicated in the table below “Sample Collection, and Analysis for Monitoring Turbidity and pH.”

Table 7.15 Sample Collection and Analysis for Monitoring Turbidity and pH

Parameter	Test Method	Minimum Sample Volume ⁽¹⁾	Sample Collection Container Type	Detection Limit (minimum)
Turbidity	Field meter/probe with calibrated portable instrument	500 mL	Polypropylene or Glass (Do not collect in meter sample cells)	1 NTU
pH	Field meter/probe with calibrated portable instrument or calibrated pH test kit	100 mL	Polypropylene	0.2 pH units

Table 7.15 Sample Collection and Analysis for Monitoring Turbidity and pH

Parameter	Test Method	Minimum Sample Volume ⁽¹⁾	Sample Collection Container Type	Detection Limit (minimum)
Notes: ¹ Minimum sample volume recommended. Specific volume requirements will vary by instrument; check instrument manufacturer instructions. L – Liter mL – Milliliter NTU – Nephelometric Turbidity Unit				

7.7.2.5 Sample Collection

Samples of discharge shall be collected at the designated runoff and run-on sampling locations shown on the Site Maps in Appendix B. Run-on samples shall be collected within close proximity of the point of run-on to the project.

Only personnel trained in water quality sampling and field measurements working under the direction of the QSP shall collect samples.

7.7.2.6 Field Measurements

Samples collected for field analysis, collection, analysis and equipment calibration shall be in accordance with the field instrument manufacturer's specifications.

Immediately following collection, samples for field analysis shall be tested in accordance with the field instrument manufacturer's instructions and results recorded on the *Effluent Sampling Field Log Sheet*.

The field instrument(s) listed in Table 7.16 will be used to analyze the following constituents:

Table 7.16 Field Instruments

Field Instrument (Manufacturer and Model)	Constituent
pH Meter	pH
Turbidity Meter	Turbidity
Rain Gauge	Rain

The manufacturers' instructions are included in CSMP Attachment 4 "Field Meter Instructions". Field sampling staff shall review the instructions prior to each sampling event and follow the instructions in completing measurement of the samples.

- The instrument(s) shall be maintained in accordance with manufacturer's instructions.
- The instrument(s) shall be calibrated before each sampling and analysis event.
- Maintenance and calibration records shall be maintained with the SWPPP.

The QSP may authorize alternate equipment provided that the equipment meets the Construction General Permit's requirements and the manufacturers' instructions for calibration and use are added to CSMP Attachment 4 "Field Meter Instructions".

7.7.2.7 Data Evaluation and Reporting

Numeric Action Levels

This project is subject to NALs for pH and turbidity (Table 7.17). Compliance with the NAL for pH and turbidity is based on a weighted daily average. Upon receiving the field log sheets, the QSP shall immediately calculate the weighted arithmetic average of the pH and turbidity samples to determine if the NALs, shown in the table below, have been exceeded.

Table 7.17 Numeric Action Levels

Parameter	Unit	Daily Average
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5
Turbidity	NTU	250 NTU

The QSP shall within 2 days of the sample collection submit copies of the completed *Effluent Sampling Field Log Sheets* to the LRP.

In the event that the pH or turbidity NAL is exceeded, the QSP shall immediately notify LRP and investigate the cause of the exceedance and identify corrective actions.

Exceedances of NALs shall be electronically reported to the State Water Board by the LRP through the SMARTs system within 10 days of the conclusion of the storm event. If requested by the Regional Board, a NAL Exceedance report will be submitted. The NAL Exceedance Report must contain the following information:

- Analytical method(s), method reporting unit(s), and MDL(s) of each parameter;
- Date, place, time of sampling, visual observation, and/or measurements, including precipitation; and
- Description of the current BMPs associated with the sample that exceeded the NAL and the proposed corrective actions taken.

7.7.3 Additional Monitoring Following an NEL Exceedance

This project is not subject to NELs.

7.7.4 Sampling and Analysis Plan for Non-Stormwater Discharges

This Sampling and Analysis Plan for non-stormwater discharges describes the sampling and analysis strategy and schedule for monitoring pollutants in authorized and unauthorized non-stormwater discharges from the project site in accordance with the requirements of the Construction General Permit.

Sampling of non-stormwater discharges will be conducted when an authorized or unauthorized non-stormwater discharge is observed discharging from the project site. In the event that

non-stormwater discharges run-on to the project site from offsite locations, and this run-on has the potential to contribute to a violation of a NAL, the run-on will also be sampled.

The stormwater discharges from construction activities have the potential to result in an unplanned (unauthorized) non-stormwater discharge if BMPs fail. These activities are listed in Section 200.5.

7.7.4.1 Sampling Schedule

Samples of authorized or unauthorized non-stormwater discharges shall be collected when they are observed.

7.7.4.2 Sampling Locations

Samples shall be collected from the discharge point of the construction site where the non-stormwater discharge is running off the project site. Site discharge locations are shown on the Site Maps in SWPPP Appendix B and include the locations identified below.

1 sampling location(s) on the project site and the contractor's yard have been identified where non-stormwater discharges may runoff from the project site.

Table 7.20 Non-stormwater Discharge Sample Locations

Sample Location Number	Sample Location
NV-1	Contractors Equipment Staging Area
	***Additional locations will be field determined by the QSP according to stage of construction and/or unforeseen construction activities that require it. Visual monitoring will occur across entire site

7.7.4.3 Monitoring Preparation

Non-stormwater discharge samples will be collected by:

Contractor ☒ Yes ☐ No
 Consultant ☐ Yes ☒ No
 Laboratory ☐ Yes ☒ No

Samples on the project site will be collected by the following contractor sampling personnel:

Name/Telephone Number: Joseph Taormina, (831) 277-6114

Alternate(s)/Telephone Number:

An adequate stock of monitoring supplies and equipment for monitoring non-stormwater discharges will be available on the project site. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Personnel trained in sampling will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited

to, clean powder-free nitrile gloves, sample collection equipment, field meters, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, and *Effluent Sampling Field Log Sheets* and CoC forms provided in CSMP Attachment 3 “Example Forms”.

The contractor will obtain and maintain the field testing instruments, as identified in the section for analyzing samples in the field by contractor sampling personnel.

7.7.4.4 Analytical Constituents

All non-stormwater discharges that flow through a disturbed area shall, at minimum, be monitored for turbidity.

All non-stormwater discharges that flow through an area where they are exposed to pH altering materials shall be monitored for pH.

The QSP shall identify additional pollutants to be monitored for each non-stormwater discharge incident based on the source of the non-stormwater discharge. If the source of an unauthorized non-stormwater discharge is not known, monitoring for pH, turbidity, MBAS, TOC, and residual chlorine or chloramines is recommended to help identify the source of the discharge.

Non-stormwater discharge run-on shall be monitored, at minimum, for pH and turbidity. The QSP shall identify additional pollutants to be monitored for each non-stormwater discharge incident based on the source of the non-stormwater discharge. If the source of an unauthorized non-stormwater discharge is not known, monitoring for pH, turbidity, MBAS, TOC, and residual chlorine or chloramines is recommended to help identify the source of the discharge.

Table 7.21 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Table 7.21 Potential Non-Stormwater Discharge Pollutants and Water Quality Indicator Constituents

Pollutant Source	Pollutant	Water Quality Indicator Constituent
Disturbed Areas	Sediment	Turbidity
Concrete Work	pH	pH
Sanitary Waste	Bacteria, pathogens, sanitary wastes	Nutrients, BOD, Total/Fecal coliform
Grading/Earthwork	Gypsum / Lime amendments, Contaminated soil	pH, Constituents specific to known contaminants, check with Lab

7.7.4.5 Sample Collection

Samples shall be collected at the discharge locations where the non-stormwater discharge is leaving the project site. Potential discharge locations are shown on the Site Maps in Appendix B.

Grab samples shall be collected and preserved in accordance with the methods identified in Table 7.22. Only personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7

7.7.4.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in Table 7.22.

7.7.4.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results.

Turbidity and pH results shall be evaluated for compliance with NALs as identified in Section 7.7.2.7.

Runoff results shall also be evaluated for the constituents suspected in the non-stormwater discharge. Should the runoff sample indicate the discharge of a pollutant which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

Non-storm water discharge results shall be submitted with the Annual Report.

The General Permit prohibits the non-storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board.

Table 7.22 Sample Collection, Preservation and Analysis for Monitoring Pollutants in Non-Stormwater Discharges

Constituent	Analytical Method	Minimum Sample Volume	Sample Bottle	Sample Preservation	Reporting Limit	Maximum Holding Time
VOCs-Solvents	EPA 8260B	3 x 40 mL	VOA-glass	Store at 4°C, HCl to pH<2	1 µg/L	14 days
SVOCs	EPA 8270C	1 x 1 L	Glass-Amber	Store at 4°C	10 µg/L	7 days
Pesticides/PCBs	EPA 8081A/8082	1 x 1 L	Glass-Amber	Store at 4°C	01 µg/L	7 days
Herbicides	EPA 8151A	1 x 1 L	Glass-Amber	Store at 4°C	Check Lab	7 days
BOD	EPA 405.1	1 x 500 mL	Polypropylene	Store at 4°C	1 mg/L	48 hours
COD	EPA 410.4	1 x 250 mL	Glass-Amber	Store at 4°C, H ₂ SO ₄ to pH<2	5 mg/L	28 days
DO	SM 4500-O G	1 x 250 mL	Glass-Amber	Store at 4°C	Check Lab	8 hours
pH	Field test with calibrated portable instrument	1 x 100 mL	Polypropylene	None	Unit less	15 minutes
Alkalinity	SM 2320B	1 x 250 mL	Polypropylene	Store at 4°C	1 mg/L	14 days
Metals (Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Se, Na, Th, Va, Zn)	EPA 6010B/7470A	1 x 250 mL	Polypropylene	Store at 4°C, HNO ₃ to pH<2	0.1 mg/L	6 months
Metals (Chromium VI)	EPA 7199	1 x 500 mL	Polypropylene	Store at 4°C	1.0µg/L	24 hours
Notes: °C – Degrees Celsius BOD – Biochemical Oxygen Demand COD – Chemical Oxygen Demand DO – Dissolved Oxygen EPA – Environmental Protection Agency HCl – Hydrochloric Acid HNO ₃ – Nitric Acid L – Liter mg/L – Milligrams per Liter µg/L – Micrograms per Liter mL – Milliliter PCB – Polychlorinated Biphenyl SVOC – Semi-Volatile Organic Compound SM – Standard Method H ₂ SO ₄ – Sulfuric Acid VOA – Volatile Organic Analysis VOC – Volatile Organic Compound						

7.7.5 Sampling and Analysis Plan for Other Pollutants Required by the Regional Water Board

The Regional Water Board has not specified monitoring for additional pollutants.

7.7.6 Training of Sampling Personnel

Sampling personnel shall be trained to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring program (SWAMP) 2008 Quality Assurance Program Plan (QAPrP). Training records of designated contractor sampling personnel are provided in Appendix K.

7.7.7 Sample Collection and Handling

7.7.7.1 Sample Collection

Samples shall be collected at the designated sampling locations shown on the Site Maps and listed in the preceding sections. Samples shall be collected, maintained and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPrP).

Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water). Do not decontaminate laboratory provided sample containers;
- Do not smoke during sampling events;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

- i. For small streams and flow paths, simply dip the bottle facing upstream until full.

- ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
- iii. For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
- iv. Avoid collecting samples from ponded, sluggish or stagnant water.
- v. Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should never be dipped into the stream, but filled indirectly from the collection container.

SSC samples should be taken as a normal grab sample, where the bottle is submerged facing upstream and filled. SSC samples need to be collected in a separate bottle because the analysis requires the entire volume of the bottle. Do not collect in a larger container and partition into the laboratory sample container.

7.7.7.2 Sample Handling

Turbidity and pH measurements must be conducted immediately. Do not store turbidity or pH samples for later measurement.

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Sealed containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the *Effluent Sampling Field Log Sheet*; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

Laboratory Name:	Monterey Bay Analytical Services
Address:	4 Justin Court, Suite D
City, State Zip:	Monterey, CA 93940
Telephone Number:	(831) 375-6227
ELAP Cert	2385

7.7.7.3 Sample Documentation Procedures

All original data documented on sample bottle identification labels, *Effluent Sampling Field Log Sheet*, and CoCs shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the *Effluent Sampling Field Log Sheet*.

Sample documentation procedures include the following:

Sample Bottle Identification Labels: Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location.

Field Log Sheets: Sampling personnel shall complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

Chain of Custody: Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the sample(s) is turned over to the testing laboratory or courier.

7.8 ACTIVE TREATMENT SYSTEM MONITORING

An Active Treatment System (ATS) will be deployed on the site?

☐ Yes ☒ No

This project does not require a project specific Sampling and Analysis Plan for an ATS because deployment of an ATS is not planned.

7.9 BIOASSESSMENT MONITORING

This project is not subject to bioassessment monitoring because it is not a Risk Level 3 project.

7.10 WATERSHED MONITORING OPTION

This project is not participating in a watershed monitoring option.

7.11 QUALITY ASSURANCE AND QUALITY CONTROL

An effective Quality Assurance and Quality Control (QA/QC) plan shall be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

7.11.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. A Visual Inspection Field Log, an Effluent Sampling Field Log Sheet are included in Attachment 3 “Example Forms”.

7.11.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed previously, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

7.11.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in CSMP Attachment 3 “Example Forms”.

7.11.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC will be conducted for this project:

- ☒ Field Duplicates at a frequency of 5 percent or 1 duplicate minimum per sampling event (Required for all sampling plans with field measurements or laboratory analysis)
- ☐ Equipment Blanks at a frequency of [Insert frequency required by method] (Only needed if equipment used to collect samples could add the pollutants to sample)
- ☐ Field Blanks at a frequency of [Insert frequency required by method] (Only required if sampling method calls for field blanks)
- ☐ Travel Blanks at a frequency of [Insert frequency required by method] (Required for sampling plans that include VOC laboratory analysis)

7.11.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

7.11.4.3 Equipment Blanks

Equipment blanks provide verification that equipment has not introduced a pollutant into the sample. Equipment blanks are typically collected when:

- New equipment is used;
- Equipment that has been cleaned after use at a contaminated site;
- Equipment that is not dedicated for surface water sampling is used; or
- Whenever a new lot of filters is used when sampling metals.

7.11.4.3 Field Blanks

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ionized water field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.

7.11.4.4 Travel Blanks

Travel blanks assess the potential for cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. De-ionized water blanks are taken along for the trip and held unopened in the same cooler with the VOC samples.

7.11.5 Data Verification

After results are received from the analytical laboratory, the QSP shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.
Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP should especially note data that is an

order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.

- Check laboratory QA/QC results.
EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate.
Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:

- Check field logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent; Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the field logs; and
- Review notations of any errors and actions taken to correct the equipment or recording errors.

7.12 RECORDS RETENTION

All records of stormwater monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least three years from date of submittal or longer if required by the Regional Water Board.

Results of visual monitoring, field measurements and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;

- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections; and
- NAL Exceedance Reports

CSMP Attachment 1: Weather Reports

CSMP Attachment 2: Monitoring Records

CSMP Attachment 3: Example Forms

Rain Gauge Log Sheet				
Construction Site Name: MPWSP Carmel Valley Pump Station				
WDID #:				
Date (mm/dd/yy)	Time (24-hr)	Initials	Rainfall Depth (Inches)	Notes:

Risk Level 2 Visual Inspection Field Log Sheet						
Date and Time of Inspection:				Report Date:		
Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater
Site Information						
Construction Site Name: MPWSP Carmel Valley Pump Station						
Construction stage and completed activities:					Approximate area of exposed site:	
Weather and Observations						
Date Rain Predicted to Occur:				Predicted % chance of rain:		
Estimate storm beginning: _____ (date and time)		Estimate storm duration: _____ (hours)		Estimate time since last storm: _____ (days or hours)		Rain gauge reading: _____ (inches)
Observations: If yes identify location						
Odors		Yes ☐ No ☐				
Floating material		Yes ☐ No ☐				
Suspended Material		Yes ☐ No ☐				
Sheen		Yes ☐ No ☐				
Discolorations		Yes ☐ No ☐				
Turbidity		Yes ☐ No ☐				
Site Inspections						
Outfalls or BMPs Evaluated			Deficiencies Noted			
(add additional sheets or attached detailed BMP Inspection Checklists)						
Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:			
Corrective Actions Identified (note if SWPPP/REAP change is needed)						
Inspector Information						
Inspector Name:				Inspector Title:		

Risk Level 2 Effluent Sampling Field Log Sheets			
Construction Site Name: MPWSP Carmel Valley Pump Station		Date:	Time Start:
Sampler:			
Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant
Field Meter Calibration			
pH Meter ID No./Desc.: Calibration Date/Time:		Turbidity Meter ID No./Desc.: Calibration Date/Time:	
Field pH and Turbidity Measurements			
Discharge Location Description	pH	Turbidity	Time
Grab Samples Collected			
Discharge Location Description	Sample Type	Time	
Additional Sampling Notes:			
Time End:			

NAL or NEL Exceedance Evaluation Summary Report		Page ____ of ____
Project Name	MPWSP Carmel Valley Pump Station	
Project WDID		
Project Location	26530 Rancho San Carlos Road	
Date of Exceedance		
Type of Exceedance	NAL Daily Average ☐ pH ☐ Turbidity NEL Daily Average ☐ pH ☐ Turbidity ☐ Other (specify) _____	
Measurement or Analytical Method	☐ Field meter (Sensitivity: _____) ☐ Lab method (specify) _____ (Reporting Limit: _____) (MDL: _____)	
Calculated Daily Average	☐ pH _ pH units ☐ Turbidity ____ NTU	
Rain Gauge Measurement	_____ Inches	
Compliance Storm Event	_____ inches (5-year, 24-hour event)	
Visual Observations on Day of Exceedance		

NAL or NEL Exceedance Evaluation Summary Report		Page ____ of ____
Description of BMPs in Place at Time of Event		
Initial Assessment of Cause		
Corrective Actions Taken (deployed after exceedance)		
Additional Corrective Actions Proposed		
Report Completed By	 (Print Name, Title)	
Signature		

CHAIN-OF-CUSTODY

DATE:

Lab ID:

DESTINATION LAB: ATTN: ADDRESS: Office Phone: Cell Phone:							REQUESTED ANALYSIS					Notes:		
SAMPLED BY:														
Contact:														
Project Name														
Client Sample ID	Sample Date	Sample Time	Sample Matrix	Container										
				#	Type	Pres.								
SENDER COMMENTS:							RELINQUISHED BY							
							Signature:							
							Print:							
							Company:							
							Date:				TIME:			
LABORATORY COMMENTS:							RECEIVED BY							
							Signature:							
							Print:							
							Company:							
							Date:				TIME:			

CSMP Attachment 4: Field Meter Instructions

CSMP Attachment 5: Supplemental Information

Section 8 References

- State Water Resources Control Board (2009). Order 2009-0009-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities. Available on-line at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.
- State Water Resources Control Board (2010). Order 2010-0014-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities. Available on-line at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.
- State Water Resources Control Board (2012). Order 2010-0006-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities. Available on-line at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

Appendix A: Calculations

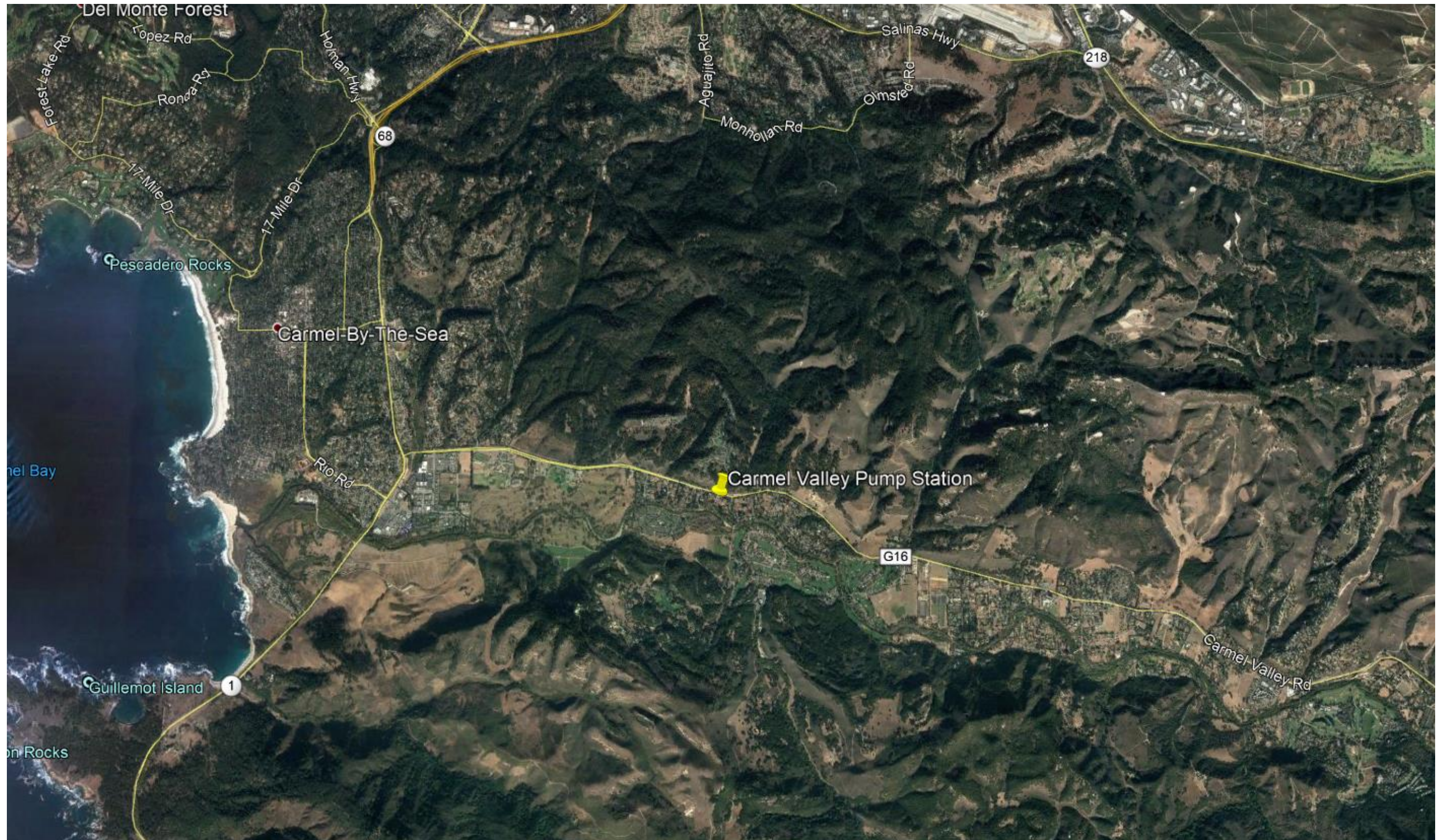
Computation Sheet for Determining Runoff Coefficients

Total Site Area	=	1.46	Acres	(A)
Existing Site Conditions				
Impervious Site Area ¹	=	0.0	Acres	(B)
Impervious Site Area Runoff Coefficient ^{2,4}	=	0.95		(C)
Pervious Site Area ³	=	1.46	Acres	(D)
Pervious Site Area Runoff Coefficient ⁴	=	0.25		(E)
Existing Site Area Runoff Coefficient	$\frac{(B \times C) + (D \times E)}{(A)}$	=	0.25	(F)
Proposed Site Conditions (after construction)				
Impervious Site Area ¹	=	0.2774	Acres	(G)
Impervious Site Area Runoff Coefficient ^{2,4}	=	0.95		(H)
Pervious Site Area ³	=	1.1826	Acres	(I)
Pervious Site Area Runoff Coefficient ⁴	=	0.25		(J)
Proposed Site Area Runoff Coefficient	$\frac{(G \times H) + (I \times J)}{(A)}$	=	0.38	(K)

1. Includes paved areas, areas covered by buildings, and other impervious surfaces.
2. Use 0.95 unless lower or higher runoff coefficient can be verified.
3. Includes areas of vegetation, most unpaved or uncovered soil surfaces, and other pervious areas.
4. Refer to local Hydrology Manual for typical C values.

Appendix B: Site Maps

VICINITY MAP

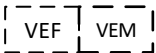


WATER POLLUTION CONTROL DRAWINGS (WPCDs)
Carmel Valley Pump Station
CARMEL, CA
FOR
Monterey Peninsula Engineering

BMP IMPLEMENTATION NOTES:

- 1. IMPLEMENT WM-1, DURING ALL MATERIAL DELIVERY AND STORAGE, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 2. IMPLEMENT WM-3, STOCKPILE MANAGEMENT USING PLASTIC SHEETING, AND SURROUND WITH SEDIMENT CONTROL, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 3. IMPLEMENT WM-4, SPILL PREVENTION AND CONTROL DURING ALL ACTIVITIES, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 4. IMPLEMENT WM-5, SOLID WASTE MANAGEMENT, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 5. IMPLEMENT WM-6, HAZARDOUS WASTE MANAGEMENT, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 7. IMPLEMENT WM-9, SANITARY/SEPTIC WASTE MANAGEMENT, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 8. IMPLEMENT NS-3, PAVING AND GRINDING OPERATIONS, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 9. IMPLEMENT NS-9, ALL VEHICLE AND EQUIPMENT FUELING, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 10. IMPLEMENT NS-10, VEHICLE EQUIPMENT AND MAINEANCE, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 11. IMPLEMENT WM-8,CONCRETE WASTE MANAGEMENT, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 12. INSTALL SE-1, SILT FENCE, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 13. IMPLEMENT SE-7, STREET SWEEPING, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 14. INSTALL SE-10, DRAIN INLET PROTECTION, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 15. INSTALL EC-, HYDROSEED, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 16. INTALL EC-9, EARTH DIKE AND DRAINAGE SWALES, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS
- 17. INSTALL WE-1, WIND EROSION CONTROL, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS

BMP LEGEND:

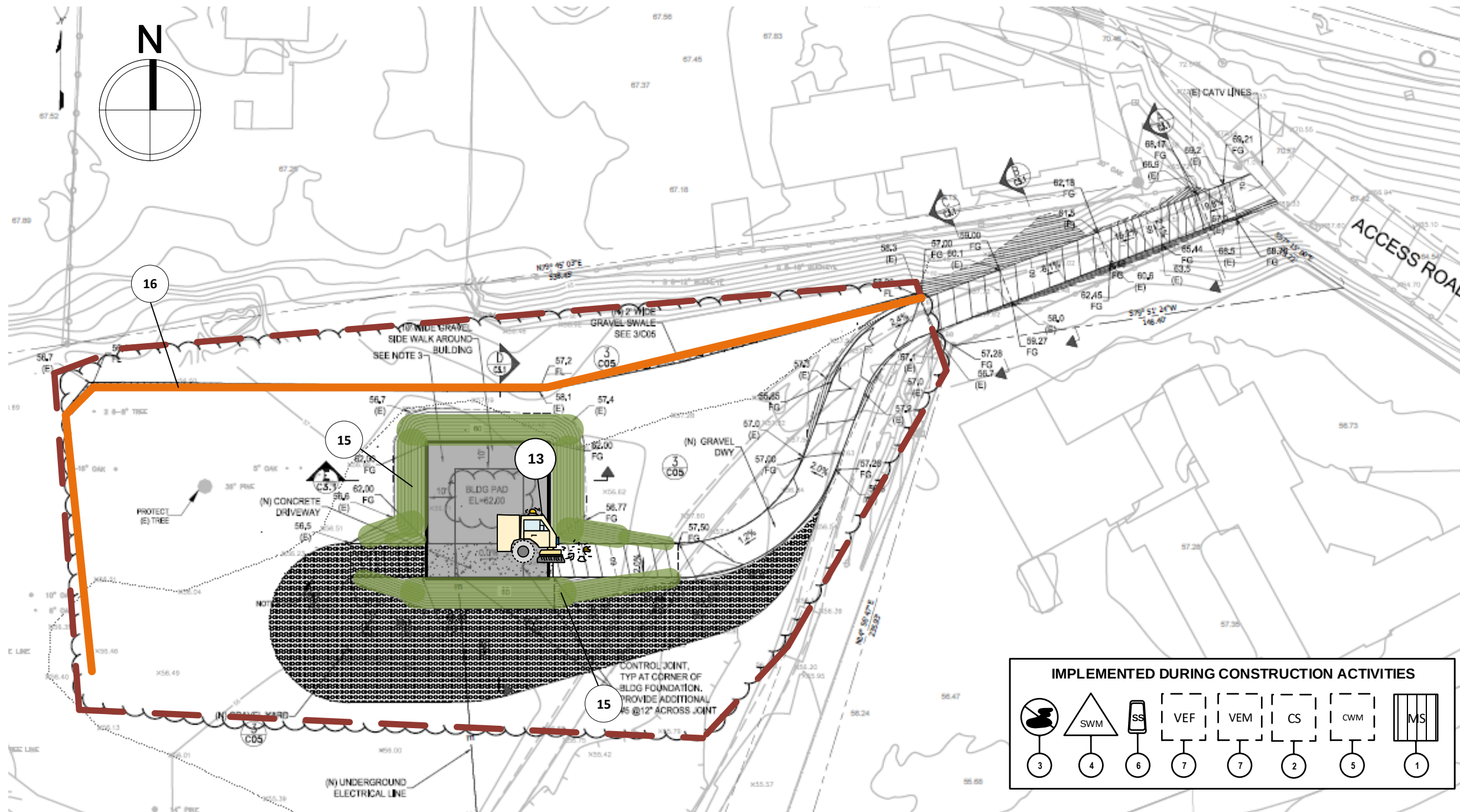
	WM-1 MATERIAL DELIVERY
	WM-3 STOCKPILE MANAGEMENT
	WM-4 SPILL PREVENTION AND CONTROL
	WM-5 SOLID WASTE MANAGEMENT
	WM-9 SANITARY/SEPTIC WASTE MANAGEMENT
	NS-9 VEHICLE AND EQUIPMENT FUELING/NS-10 VEHICLE AND EQUIPMENT MAINTENANCE
	WM-8 CONCRETE WASTE MANAGEMENT
	NS- PAVING AND GRINDING OPERATIONS
	SE-1 SILT FENCE
	SE-7 STREET SWEEPING
	SE-10 STORM DRAIN INLET
	EC-4 HYDROSEEDING
	EC-9 EARTH DIKE AND DRAINAGE SWALE
	WORK AREA

WATER POLLUTION CONTROL NOTES:

- 1. THE INFORMATION ON THESE DRAWINGS ARE ACCURATE FOR WATER POLLUTION CONTROL PURPOSES ONLY.
- 2. THE INFORMATION ON THESE PLANS IS INTENDED TO BE USED AS A GUIDELINE FOR THE CONTRACTOR AND SUBCONTRACTORS TO INSTALL WATER POLLUTION CONTROL DEVICES AT GENERAL LOCATIONS THROUGHOUT THE SITE.
- 3. FIELD CONDITIONS MAY NECESSITATE MODIFICATIONS TO THESE DRAWINGS.
- 4. PERMANENT EROSION CONTROL WILL BE INSTALLED AS AREAS ARE DETERMINED TO BE SUBSTANTIALLY COMPLETE.
- 5. LOCATIONS OF HAZ MAT STORAGE AND CONCRETE WASHOUT MAY CHANGE PER GENERAL CONTRACTOR REQUIREMENTS.
- 6. USE IN CONJUNCTION WITH WATER POLLUTION CONTROL PLAN.

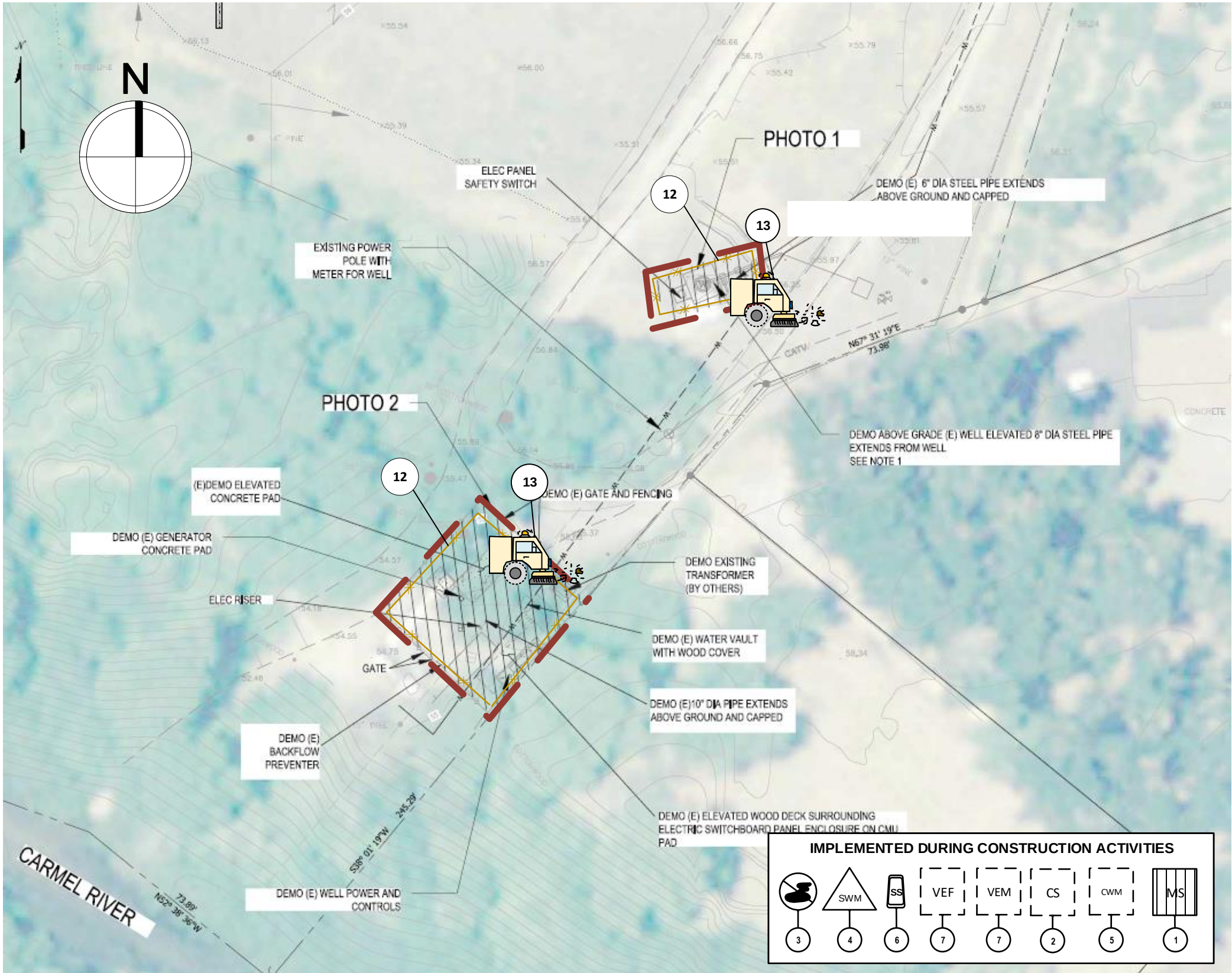
IMPLEMENT BMPS DURING PROJECT DURATION:

- EC-1 – SCHEDULING
- EC-4- HYDROSEEDING
- EC-9- EARTH DIKE AND DRAINAGE SWALE
- WE-1 – WIND EROSION CONTROL
- NS-1 – WATER CONSERVATION PRACTICES
- NS-3- PAVING AND GRINDING OPERATIONS
- NS-6 – ILLICIT/ILLEGAL DISCHARGE CONNECTION
- NS- 9- VEHICLE AND EQUIPMENT FUELING
- NS-10- VEHICLE AND EQUIPMENT MAINTENACE
- WM-1 – MATERIAL DELIVERY
- WM-2 – MATERIAL USE
- WM-3 – STOCKPILE MANAGEMENT
- WM-4 – SPILL PREVENTION AND CONTROL
- WM-5 – SOLID WASTE MANAGEMENT
- WM-6- HAZARDOUS WASTE MANAGEMENT
- WM-9 – SANITARY/SEPTIC WASTE MANAGEMENT



- BMP IMPLEMENTATION NOTES:**
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 12. INSTALL SE-1, SILT FENCE, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
 13. IMPLEMENT SE-7, STREET SWEEPING, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
 14. INSTALL SE-10, DRAIN INLET PROTECTION, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
 15. INSTALL EC-, HYDROSEED, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
 16. INTALL EC-9, EARTH DIKE AND DRAINAGE SWALES, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
 17. INSTALL WE-1, WIND EROSION CONTROL, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.

REV.	DATE	DESCRIPTION	Owner: California American Water 511 Forest Lodge Rd. Suite 100 Pacific Grove, CA 93950	Carmel Valley Pump Station WATER POLLUTION CONTROL DRAWINGS (WPCD)	incompl<i>i</i>	DATE: 12/2018	SHEET 3 OF 4
						SCALE: NTS	
						APPROVED P CASTILLO	



BMP IMPLEMENTATION NOTES:

- 1. IMPLEMENT WM-1, DURING ALL MATERIAL DELIVERY AND STORAGE, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 2. IMPLEMENT WM-3, STOCKPILE MANAGEMENT USING PLASTIC SHEETING, AND SURROUND WITH SEDIMENT CONTROL, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 3. IMPLEMENT WM-4, SPILL PREVENTION AND CONTROL DURING ALL ACTIVITIES, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 4. IMPLEMENT WM-5, SOLID WASTE MANAGEMENT, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 5. IMPLEMENT WM-6, HAZARDOUS WASTE MANAGEMENT, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 7. IMPLEMENT WM-9, SANITARY/SEPTIC WASTE MANAGEMENT, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 8. IMPLEMENT NS-3, PAVING AND GRINDING OPERATIONS, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 9. IMPLEMENT NS-9, ALL VEHICLE AND EQUIPMENT FUELING, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 10. IMPLEMENT NS-10, VEHICLE EQUIPMENT AND MAINTENANCE, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 11. IMPLEMENT WM-8, CONCRETE WASTE MANAGEMENT, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 12. INSTALL SE-1, SILT FENCE, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 13. IMPLEMENT SE-7, STREET SWEEPING, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 14. INSTALL SE-10, DRAIN INLET PROTECTION, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 15. INSTALL EC-, HYDROSEED, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 16. INTALL EC-9, EARTH DIKE AND DRAINAGE SWALES, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.
- 17. INSTALL WE-1, WIND EROSION CONTROL, PER THE BMP MANUAL AND PLANS AND SPECIFICATIONS.

REV.	DATE	DESCRIPTION	Owner: California American Water 511 Forest Lodge Rd. Suite 100 Pacific Grove, CA 93950	Carmel Valley Pump Station WATER POLLUTION CONTROL DRAWINGS (WPCD)		DATE: 12/2018	SHEET 4 OF 4
						SCALE: NTS	
						APPROVED P CASTILLO	

Appendix C: Permit Registration Documents

	A	B	C
1	Sediment Risk Factor Worksheet		Entry
2	A) R Factor		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	R Factor Value		54.27
6	B) K Factor (weighted average, by area, for all site soils)		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	K Factor Value		0.2
10	C) LS Factor (weighted average, by area, for all slopes)		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	LS Factor Value		6.59
14			
15	Watershed Erosion Estimate (=R_xK_xLS) in tons/acre		71.52786
16	Site Sediment Risk Factor		Medium
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

Receiving Water (RW) Risk Factor Worksheet		Entry
A. Watershed Characteristics		yes/no
A.1. Does the disturbed area discharge (either directly or indirectly) to a 303(d)-listed waterbody impaired by sediment (For help with impaired waterbodies please visit the link below) or has a USEPA approved TMDL implementation plan for sediment ? http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml OR		Yes
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml		
Region 1 Basin Plan Region 2 Basin Plan Region 3 Basin Plan Region 4 Basin Plan Region 5 Basin Plan Region 6 Basin Plan Region 7 Basin Plan Region 8 Basin Plan Region 9 Basin Plan		

Score

High

Combined Risk Level Matrix			
<u>Receiving Water Risk</u>	<u>Sediment Risk</u>		
	Low	Medium	High
	Low	Level 1	Level 2
High	Level 2		Level 3

Project Sediment Risk: **Medium**

Project RW Risk: **High**

Project Combined Risk: **Level 2**

Appendix D: SWPPP Amendment Certifications

SWPPP Amendment No. _____

Project Name: MPWSP Carmel Valley Pump Station

Project Number: _____

**Qualified SWPPP Developer's Certification of the
Stormwater Pollution Prevention Plan Amendment**

“This Stormwater Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Order No. 2009-009-DWQ as amended by 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below.”

_____ QSD's Signature	_____ Date
_____ Patricia C. Castillo	_____ 23104
_____ QSD Name	_____ QSD Certificate Number
_____ QSD/QSP/CPESC/QISP	_____ (800) 677-3718
_____ Title and Affiliation	_____ Telephone
_____ 85 Argonaut, Ste 210 Aliso Viejo, CA 92656	_____ phernandez@incompli.com
_____ Address	_____ Email

Appendix E: Submitted Changes to PRDs

Log of Updated PRDs

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, with revisions and amendments recorded in Appendix C. Updated PRDs submitted electronically via SMARTS can be found in this Appendix.

This appendix includes all of the following updated PRDs (check all that apply):

- ☐ Revised Notice of Intent (NOI);
- ☐ Revised Site Map;
- ☐ Revised Risk Assessment;
- ☐ New landowner's information (name, address, phone number, email address); and
- ☐ New signed certification statement.

California American Water

Legally Responsible Person [Organization]

Signature of Legally Responsible Person or Approved
Signatory

Timothy P. Ohalloran

Name of Legally Responsible Person or Approved
Signatory

Date

(831) 646-3291

Telephone Number

Appendix F: Construction Schedule

Appendix G: Construction Activities, Materials Used, and Associated Pollutants

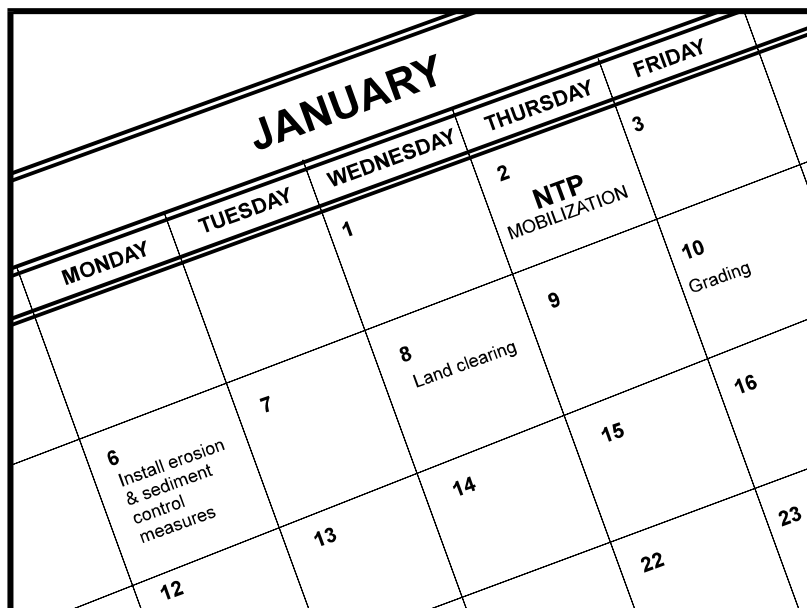
Table G.a POLLUTANTS ASSOCIATED WITH CONSTRUCTION ACTIVITIES

General Work Activity/ Products with Potential Stormwater Pollutants	Specific Work Activity/Products with Potential Stormwater Pollutants	Pollutant Categories
Adhesives	• Adhesives, glues, resins, epoxy synthetics, PVC cement • Caulks, sealers, putty, sealing agents and • Coal tars (naphtha, pitch)	Oil and Grease, Synthetic Organics ¹
Asphalt Paving	• Hot and cold mix asphalt	Oil and Grease
Cleaners	• Polishes (metal, ceramic, tile) • Etching agents • Cleaners, ammonia, lye, caustic sodas, bleaching agents and chromate salts	Metals, Synthetic Organics
Concrete and Masonry	• Cement and brick dust • Colored chalks • Concrete curing compounds • Glazing compounds • Surfaces cleaners • Saw cut slurries • Tile cutting	Metals, Synthetic Organics
Drywall	• Saw-cutting drywall	Metals
Framing and Carpentry	• Sawdust, particle board dust, and treated woods • Saw cut slurries	Metals, Synthetic Organics
Heating, Ventilation, Air Conditioning	• Demolition or construction of air condition and heating systems	Metals, Synthetic Organics
Insulation	• Demolition or construction involving insulation, venting systems	Metals, Synthetic Organics
Liquid waste	• Wash waters • Irrigation line testing/flushing	Metals, Synthetic Organics
Painting	• Paint thinners, acetone, methyl ethyl ketone, stripper paints, lacquers, varnish, enamels, turpentine, gum spirit, solvents, dyes, stripping pigments and sanding	Metals, Synthetic Organics
Planting and Vegetation Management	• Vegetation control (pesticides/herbicides) • Planting • Plant maintenance • Vegetation removal	Nutrients, Metals, Synthetic Organics
Plumbing	• Solder (lead, tin), flux (zinc chloride), pipe fitting • Galvanized metal in nails, fences, and electric wiring	Metals, Synthetic Organics
Removal of Existing Structures	• Demolition of asphalt, concrete, masonry, framing, roofing, metal structures.	Metals, Oil and Grease, Synthetic Organics
Roofing	• Flashing • Saw cut slurries (tile cutting) • Shingle scrap and debris	Metals, Oil and Grease, Synthetic Organics

Table G.a POLLUTANTS ASSOCIATED WITH CONSTRUCTION ACTIVITIES

General Work Activity/ Products with Potential Stormwater Pollutants	Specific Work Activity/Products with Potential Stormwater Pollutants	Pollutant Categories
Sanitary Waste	• Portable toilets • Disturbance of existing sewer lines.	Nutrients
Solid Waste	• Litter, trash and debris • Vegetation	Gross Pollutants
Utility Line Testing and Flushing	• Hydrostatic test water • Pipe flushing	Synthetic Organics
Vehicle and Equipment Use	• Equipment operation • Equipment maintenance • Equipment washing • Equipment fueling	Oil and Grease
¹ Synthetic Organics are defined in Table 1.2 of the CASQA <i>Stormwater BMP Handbook Portal: Construction</i> as adhesives, cleaners, sealants, solvents, etc. These are generally categorized as VOCs or SVOCs.		

*Appendix H: CASQA Stormwater BMP Handbook Portal:
Construction Fact Sheets*



Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
 - Erosion control BMPs
 - Sediment control BMPs
 - Tracking control BMPs
 - Wind erosion control BMPs
 - Non-stormwater BMPs
 - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
 - Sequence trenching activities so that most open portions are closed before new trenching begins.
 - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
 - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

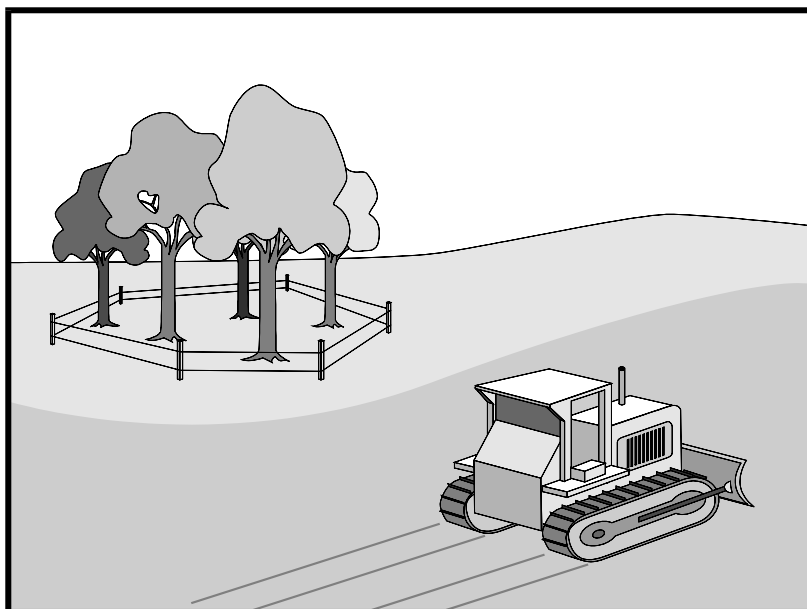
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☐ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Preservation Of Existing Vegetation EC-2

Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
 - Orange colored plastic mesh fencing works well.
 - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Preservation Of Existing Vegetation EC-2

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of \$10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
 - Fertilize stressed or damaged broadleaf trees to aid recovery.
 - Fertilize trees in the late fall or early spring.

Preservation Of Existing Vegetation EC-2

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.
- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

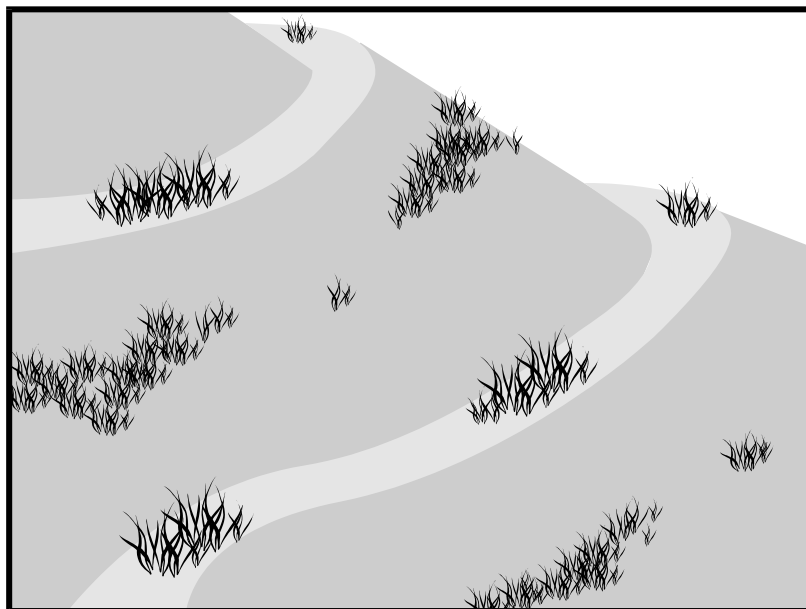
References

County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching
- EC-14 Compost Blanket
- EC-16 Non-Vegetative Stabilization

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Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
 - Straw mulch (see Straw Mulch EC-6)
 - Rolled erosion control products (see Geotextiles and Mats EC-7)
 - Application of Compost Blanket (see Compost Blanket EC-14)

Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.

- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).
- This BMP consists of a mixture of several constituents (e.g., fibers/mulches, tackifiers, and other chemical constituents), some of which may be proprietary and may come pre-mixed by the manufacturer. The water quality impacts of these constituents are relatively unknown and some may have water quality impacts due to their chemical makeup. Additionally these constituents may require non-visible pollutant monitoring. Refer to specific chemical properties identified in the product Material Safety Data Sheet; products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to factsheet EC-05 for further guidance on selecting soil binders.

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- | | |
|---|----------------------------------|
| - Soil conditions | - Maintenance requirements |
| - Site topography and exposure (sun/wind) | - Sensitive adjacent areas |
| - Season and climate | - Water availability |
| - Vegetation types | - Plans for permanent vegetation |

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS), Resource Conservation Districts and Agricultural Extension Service can provide information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.
- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
 - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
 - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as \$1,900 per acre for flat slopes and stable soils, to \$4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	\$1,900-\$4,000

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).

Inspection and Maintenance

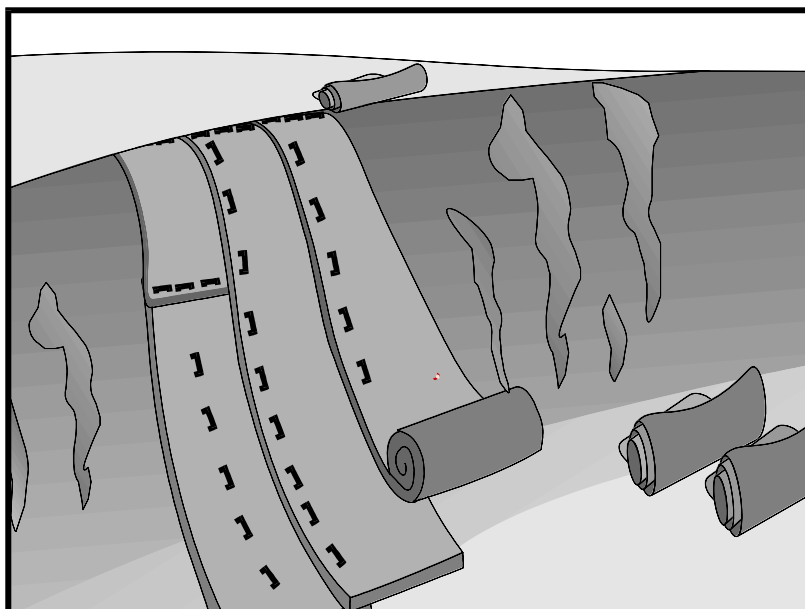
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.



Description and Purpose

Matings, or Rolled Erosion Control Products (RECPs), can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high and vegetation will be slow to establish. Matings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-4 Hydroseeding

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- Channels with flows exceeding 3.3 ft/s
- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies

Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until more environmentally friendly measures, such as seeding and mulching, may be installed.
 - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
 - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting.
- RECPs may have limitations in extremely windy climates. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

Implementation

Material Selection

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.
- The following natural and synthetic RECPs are commonly used:

Geotextiles

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.
- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).
- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

- **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd², ± 10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd². Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd². Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd². Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.
- **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than 1/4 in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips,

which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding/Planting

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots shall be installed as required by the manufacturer.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd². Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 1/2 staples/yd². Check manufacturer's specifications to determine if a higher density staple pattern is required.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement mat (TRM))

Installation should be in accordance with the manufacturer's recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake 1/2-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre (2004) ¹	Estimated Cost per Acre (2009) ²
Biodegradable	Jute Mesh	\$6,000-\$7,000	\$6,600-\$7,700
	Curled Wood Fiber	\$8,000-\$10,500	\$8,800-\$11,050
	Straw	\$8,000-\$10,500	\$8,800-\$11,050
	Wood Fiber	\$8,000-\$10,500	\$8,800-\$11,050
	Coconut Fiber	\$13,000-\$14,000	\$14,300-\$15,400
	Coconut Fiber Mesh	\$30,000-\$33,000	\$33,000-\$36,300
	Straw Coconut Fiber	\$10,000-\$12,000	\$11,000-\$13,200
Non-Biodegradable	Plastic Netting	\$2,000-\$2,200	\$2,200-\$2,220
	Plastic Mesh	\$3,000-\$3,500	\$3,300-\$3,850
	Synthetic Fiber with Netting	\$34,000-\$40,000	\$37,400-\$44,000
	Bonded Synthetic Fibers	\$45,000-\$55,000	\$49,500-\$60,500
	Combination with Biodegradable	\$30,000-\$36,000	\$33,000-\$39,600

1. Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).

2. 2009 costs reflect a 10% escalation over year 2004 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.

References

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Guides for Erosion and Sediment Controls in California, USDA Soils Conservation Service, January 1991.

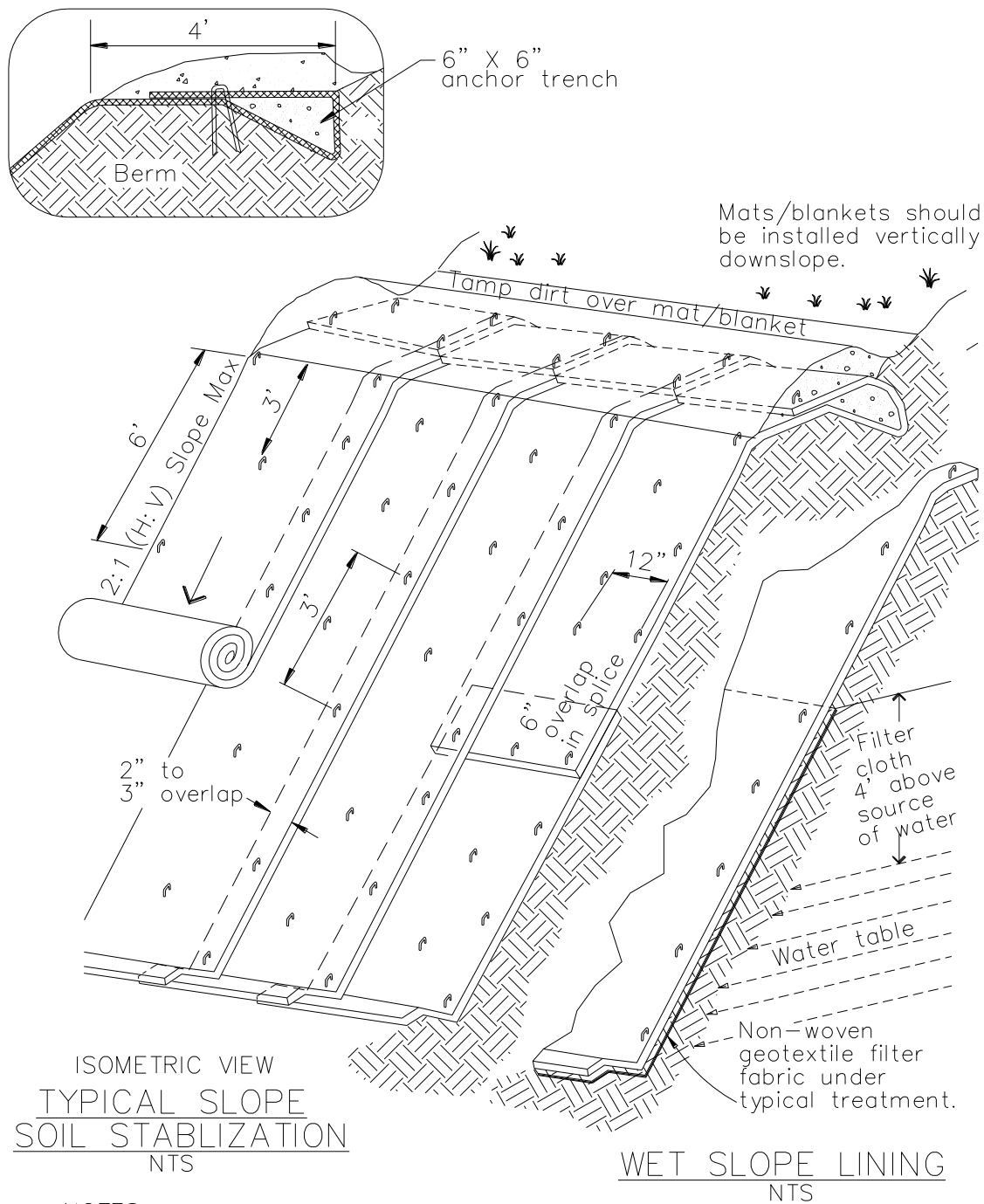
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Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

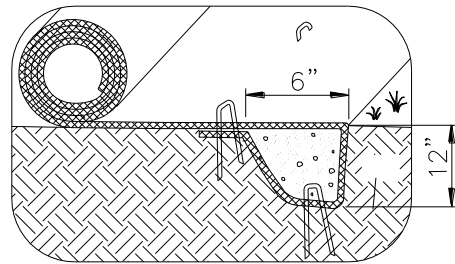
Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



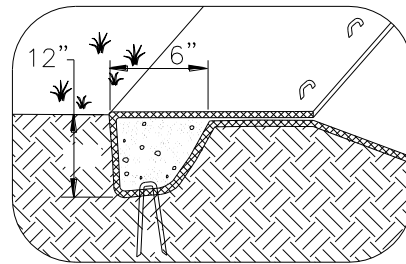
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

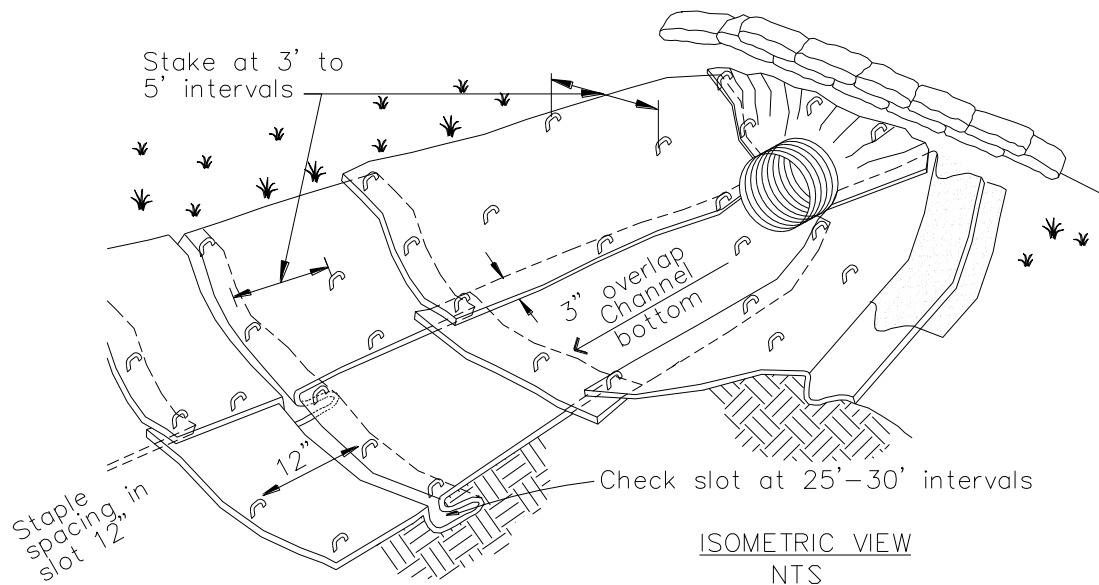
TYPICAL INSTALLATION DETAIL



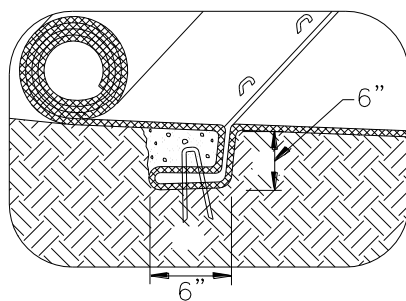
INITIAL CHANNEL ANCHOR TRENCH
NTS



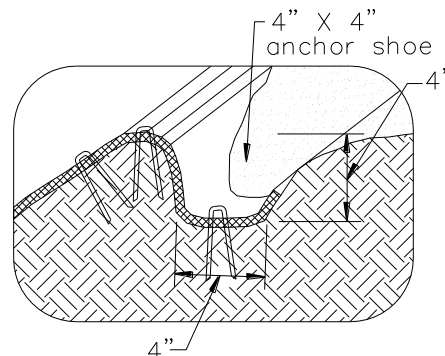
TERMINAL SLOPE AND CHANNEL
ANCHOR TRENCH
NTS



ISOMETRIC VIEW
NTS



INTERMITTENT CHECK SLOT
NTS

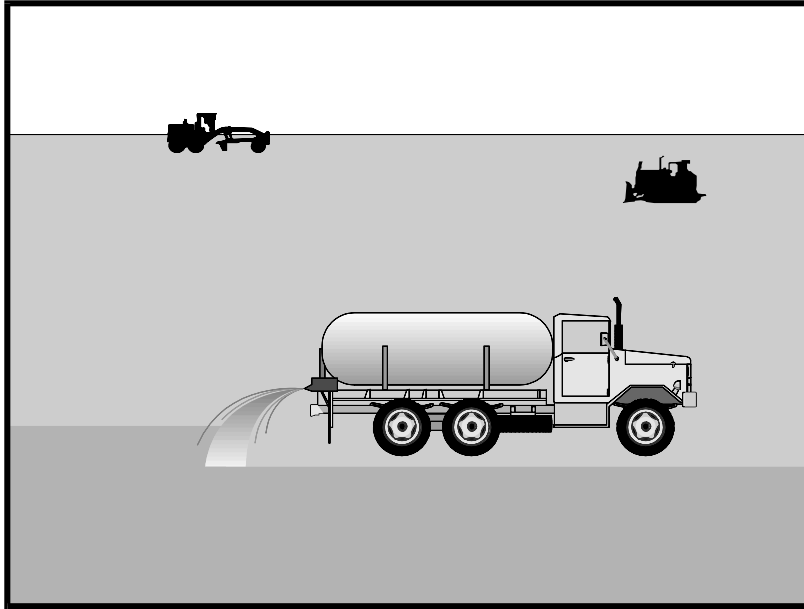


LONGITUDINAL ANCHOR TRENCH
NTS

NOTES:

1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL



Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

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- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montmorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Tracking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

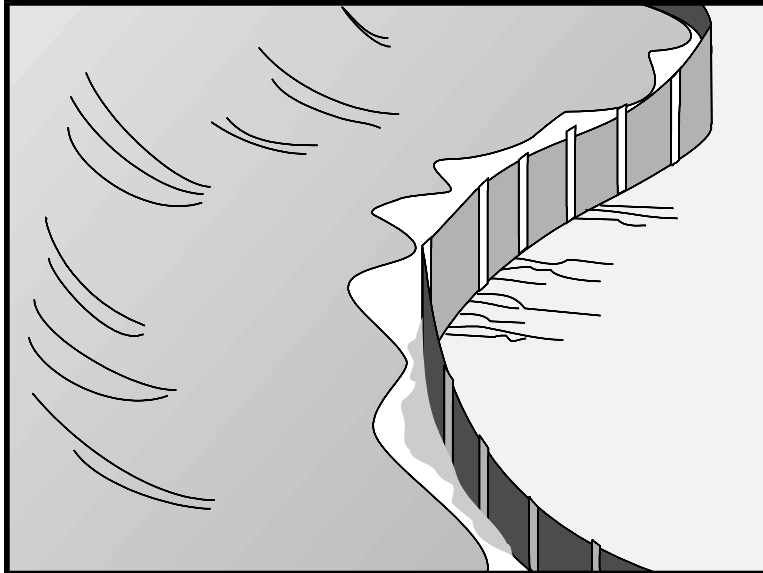
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Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment (coarse sediment)	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm SE-12 Manufactured Linear Sediment Controls
- SE-13 Compost Socks and Berms
- SE-14 Biofilter Bags

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Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft² of ponding area should be provided for every acre draining to the fence.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)
- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb- 100-feet of silt fence per 10,000 square feet of disturbed area.) (EPA 2012)

- The maximum length of slope draining to any point along the silt fence should be 100 ft per foot of silt fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-Hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
 - Fabric is reinforced with wire backing or additional support.
 - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.
- Wooden stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the

thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts instead of wood stakes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy-duty wire staples at least 1 in. long. The mesh should extend into the trench.
- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.
- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with native material and compacted.
- Construct the length of each reach so that the change in base elevation along the reach does not exceed $\frac{1}{3}$ the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of $\frac{1}{3}$ and a maximum of $\frac{1}{2}$ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
 - Ease of installation (most often done with a 2 person crew).
 - Minimal soil disturbance.
 - Better level of compaction along fence, less susceptible to undercutting
 - Uniform installation.
- Limitations:
 - Does not work in shallow or rocky soils.
 - Complete removal of geotextile material after use is difficult.
 - Be cautious when digging near potential underground utilities.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is \$7 per linear foot based on vendor research. Range of cost is \$3.50 - \$9.10 per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height.
- Silt fences should be left in place until the upgradient area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.

- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

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Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Monitoring Data on Effectiveness of Sediment Control Techniques, Proceedings of World Water and Environmental Resources Congress, Barrett M. and Malina J. 2004.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

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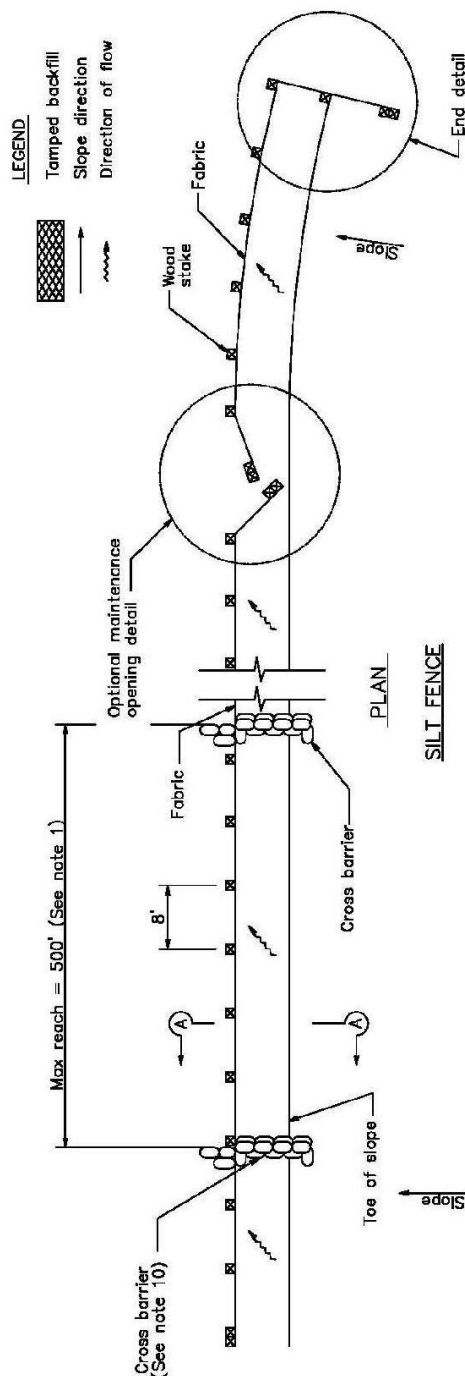
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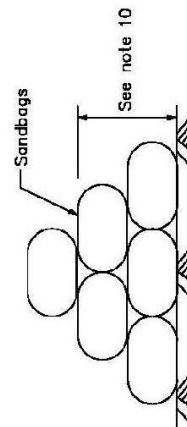
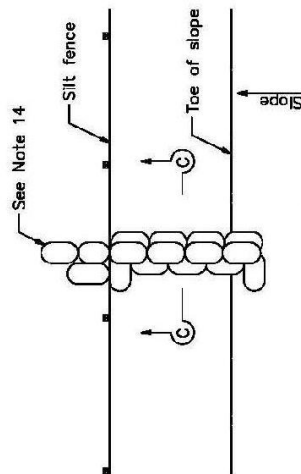
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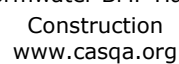
SILT FENCE

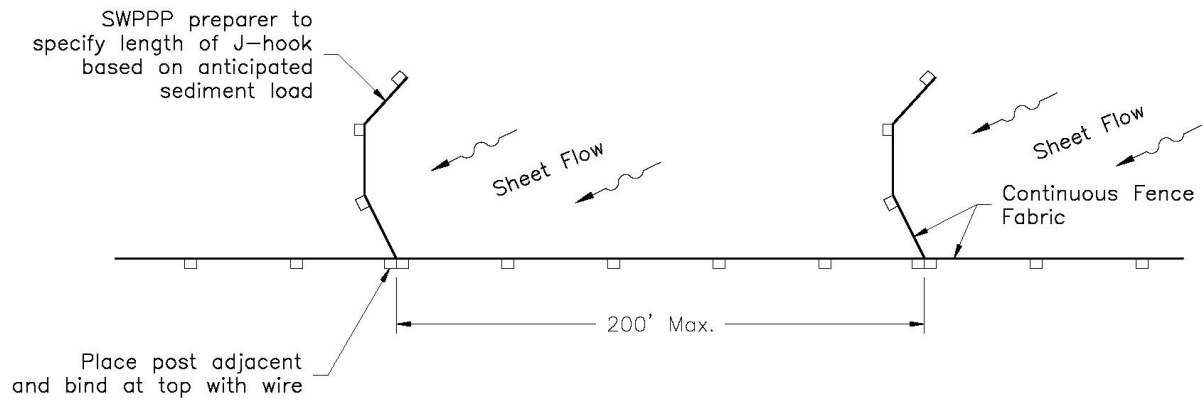
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed $\frac{1}{3}$ the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of $\frac{1}{3}$ and a maximum of $\frac{1}{2}$ the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3-4 bags to cross barrier on downstream side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.



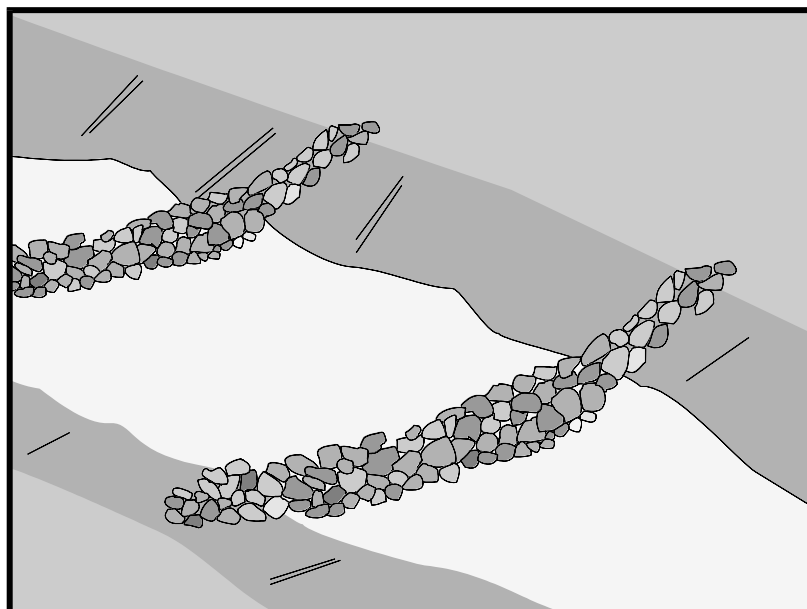
SE-1





Plan

J-HOOK



Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- To act as a grade control structure.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-12 Manufactured Linear Sediment Controls
- SE-14 Biofilter Bags

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Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity should be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a “permanent” ditch or swale being constructed early and used as a “temporary” conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, either:

- Don’t use check dams. Consider alternative BMPs, or.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see “Spacing Between Check Dams” detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of

the ditch or swale (see “Typical Rock Check Dam” detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

Log check dams are usually constructed of 4 to 6 in. diameter logs, installed vertically. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see “Gravel Bag Check Dam” detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer’s instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.

Materials

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.
- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.
- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.
- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.
- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Upper rows of gravel and sand bags shall overlap joints in lower rows.
- Fiber rolls should be trenched in, backfilled, and firmly staked in place.
- Install along a level contour.
- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

Costs

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

References

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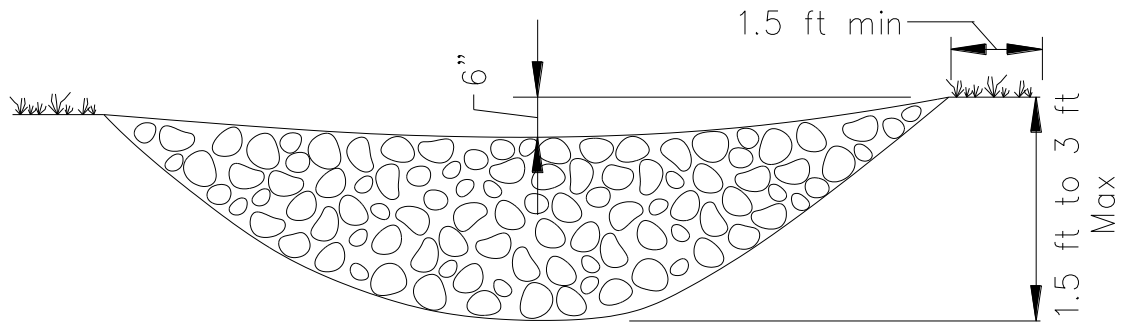
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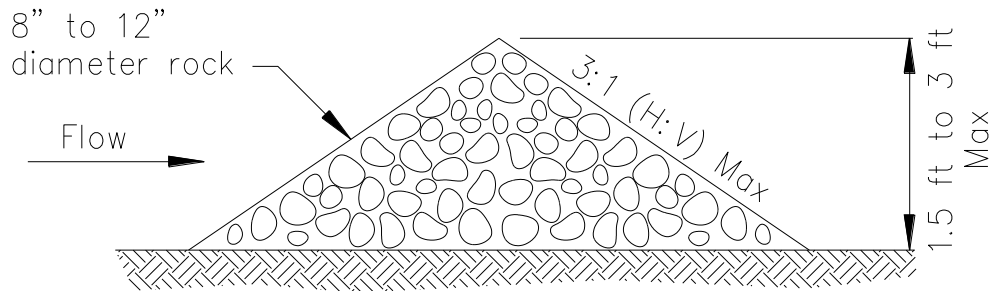
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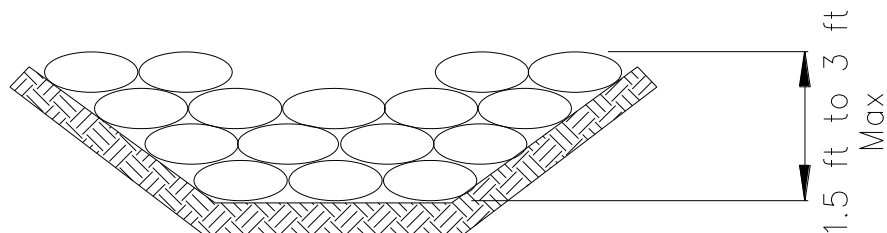


ELEVATION

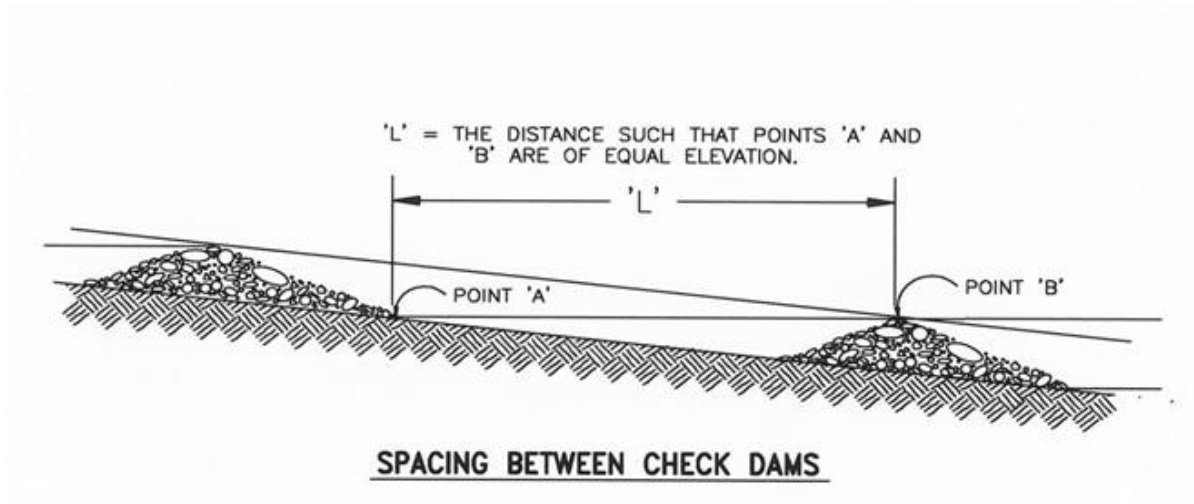


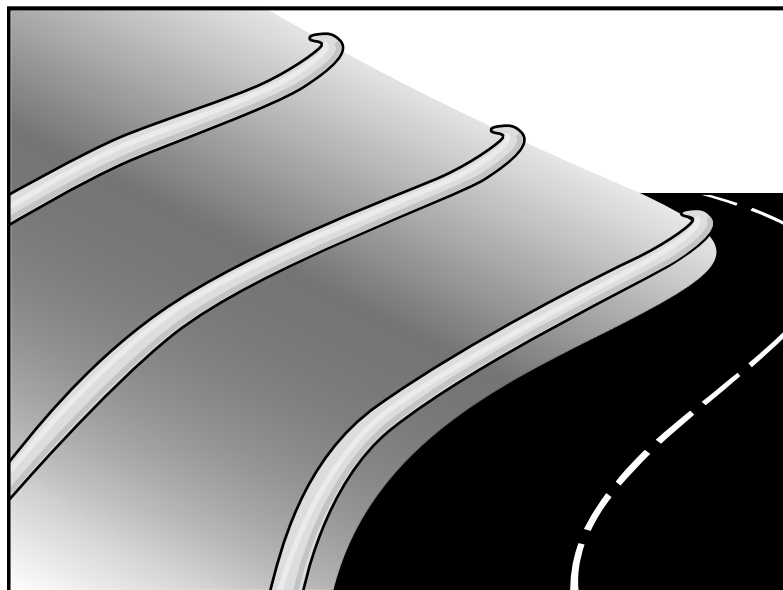
TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE



GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE





Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

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Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-1 Silt Fence
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-12 Manufactured Linear Sediment Controls
- SE-14 Biofilter Bags

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- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
 - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
 - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
 - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be $\frac{1}{4}$ to $\frac{1}{3}$ of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
 - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
 - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from \$20 - \$30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-\$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

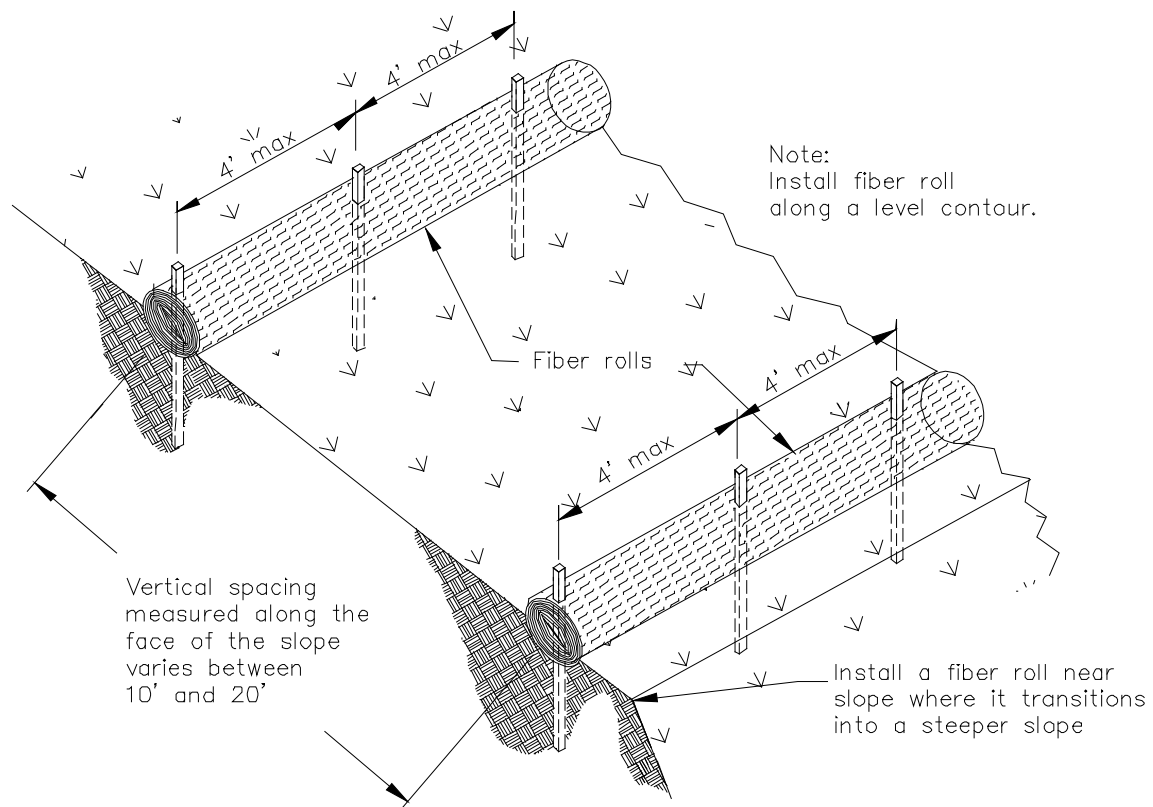
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

References

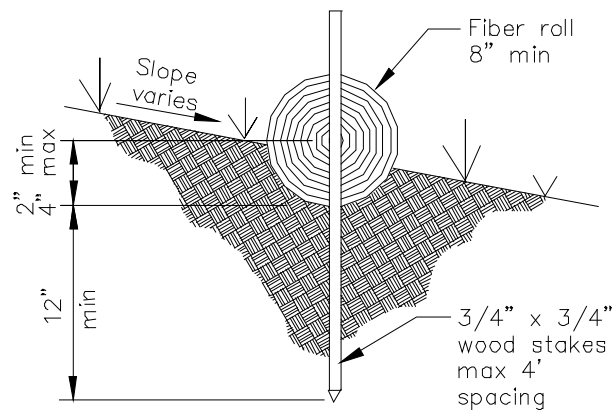
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



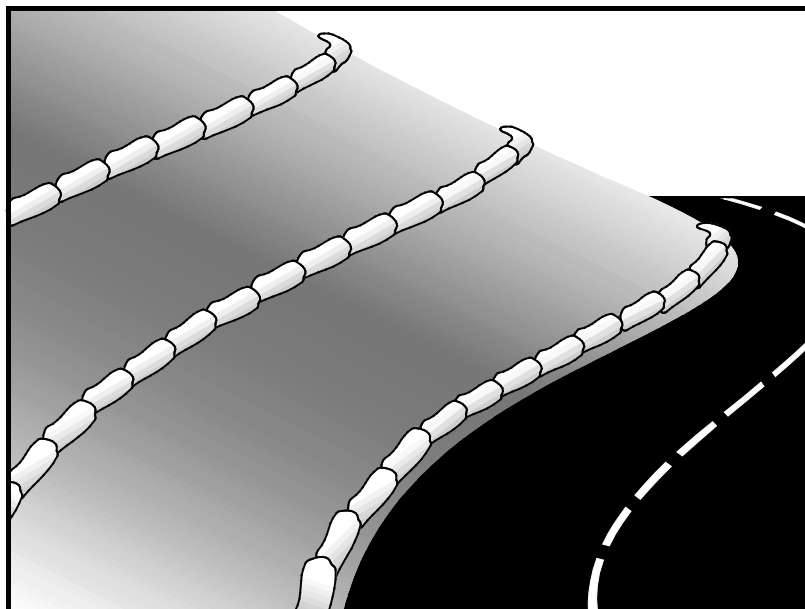
TYPICAL FIBER ROLL INSTALLATION

N.T.S.



ENTRENCHMENT DETAIL

N.T.S.



Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
 - Below the toe of slopes and erodible slopes
 - As sediment traps at culvert/pipe outlets
 - Below other small cleared areas
 - Along the perimeter of a site
 - Down slope of exposed soil areas
 - Around temporary stockpiles and spoil areas
 - Parallel to a roadway to keep sediment off paved areas
 - Along streams and channels
- As a linear erosion control measure:
 - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
 SE-5 Fiber Roll
 SE-8 Sandbag Barrier
 SE-12 Temporary Silt Dike
 SE-14 Biofilter Bags

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- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
 - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
 - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
 - Height = 18 in. maximum
 - Top width = 24 in. minimum for three or more layer construction
 - Top width = 12 in. minimum for one or two layer construction
 - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
 - Height = 12 in. maximum
 - Top width = 24 in. minimum for three or more layer construction.
 - Top width = 12 in. minimum for one or two layer construction.
 - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- **Bag Material:** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd², Mullen burst strength exceeding 300 lb/in² in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- **Bag Size:** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- **Fill Material:** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. \$2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace gravel bags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

None

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- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from \$58/hour (3 yd³ hopper) to \$88/hour (9 yd³ hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

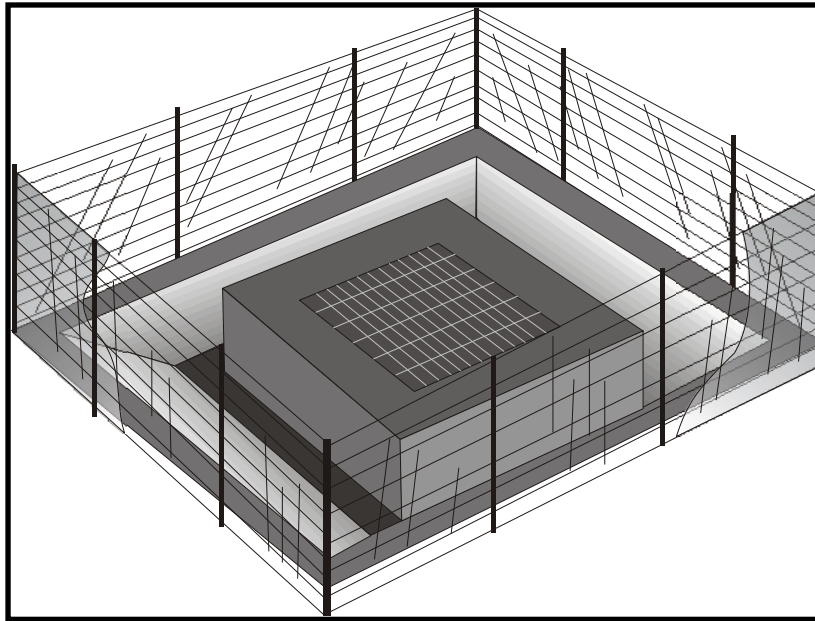
Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.



Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

- Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-1 Silt Fence
- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-14 Biofilter Bags
- SE-13 Compost Socks and Berms

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other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
 - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
 - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.
- Seven types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.

- Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
 - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
 - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
 - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
 - Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
 - Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
 - Compost Socks: Allow filtered run-off to pass through the compost while retaining sediment and potentially other pollutants (SE-13). Appropriate for flows under 1.0 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
 - Provide area around the inlet for water to pond without flooding structures and property.
 - Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
 - Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- **DI Protection Type 1 - Silt Fence** - Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.
 1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
 2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
 3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
 4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.
- **DI Protection Type 2 - Excavated Drop Inlet Sediment Trap** - Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd³/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.
 - **DI Protection Type 3 - Gravel bag** - Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.
 1. Construct on gently sloping street.
 2. Leave room upstream of barrier for water to pond and sediment to settle.
 3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.
 4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.
 - **DI Protection Type 4 – Block and Gravel Filter** - Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.
 1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.
 2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
 3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
 4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.
 - **DI Protection Type 5 – Temporary Geotextile Insert (proprietary)** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- **DI Protection Type 6 - Biofilter bags** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.
 1. Construct in a gently sloping area.
 2. Biofilter bags should be placed around inlets to intercept runoff flows.
 3. All bag joints should overlap by 6 in.
 4. Leave room upstream for water to pond and for sediment to settle out.
 5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.
- **DI Protection Type 7 – Compost Socks** – A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence). Compost socks should conform to specification detailed in SE-13, Compost Socks and Berms.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is \$200 per inlet.
- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from \$50-75 plus installation, but costs can exceed \$100. This cost does not include maintenance.
- See SE-13 for Compost Sock cost information.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

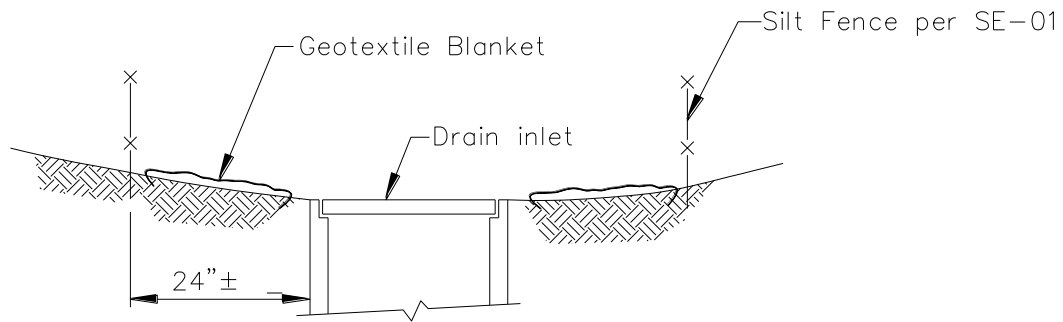
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.
 - Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

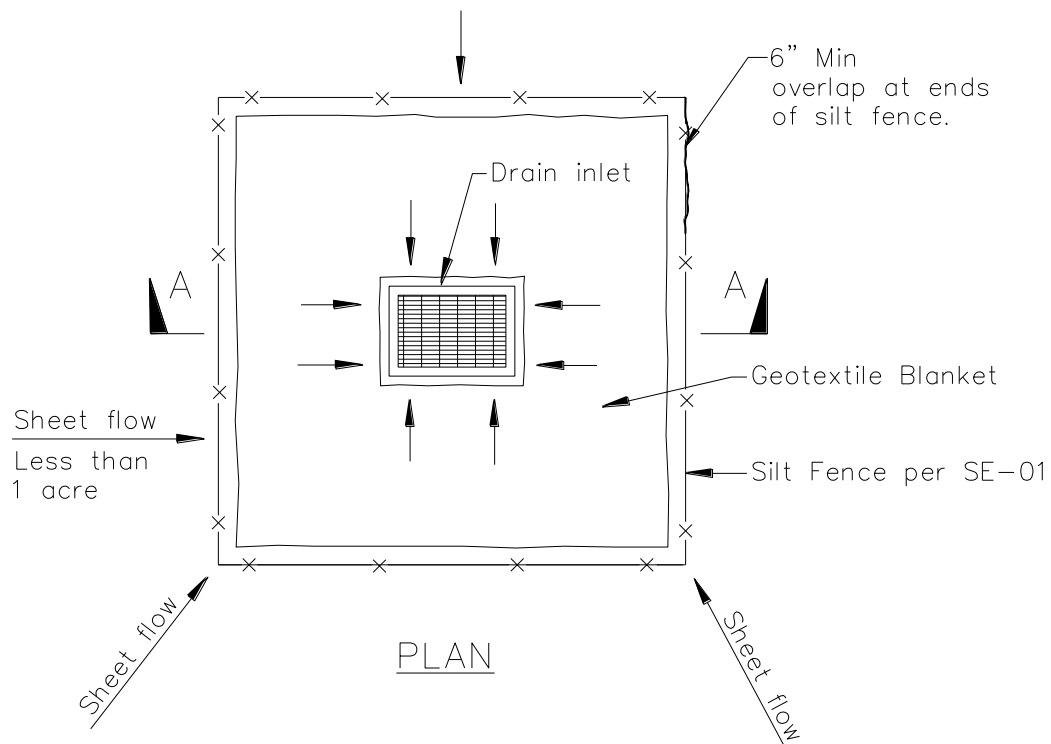
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Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



SECTION A-A

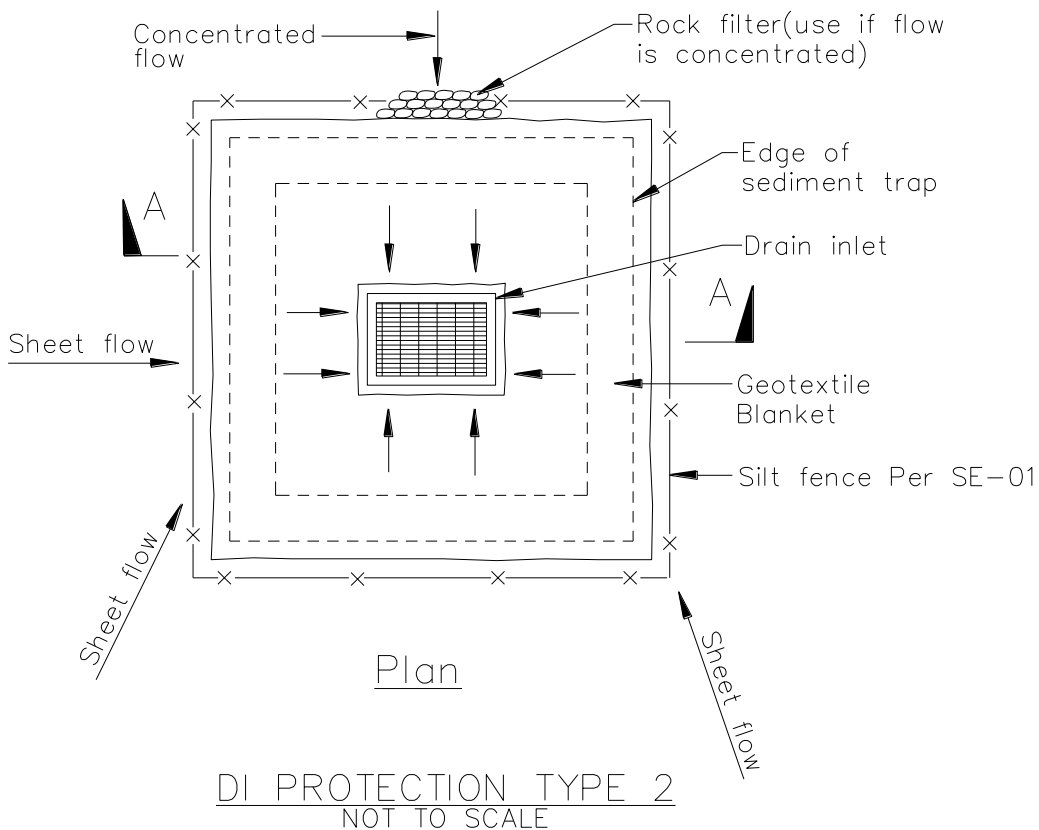
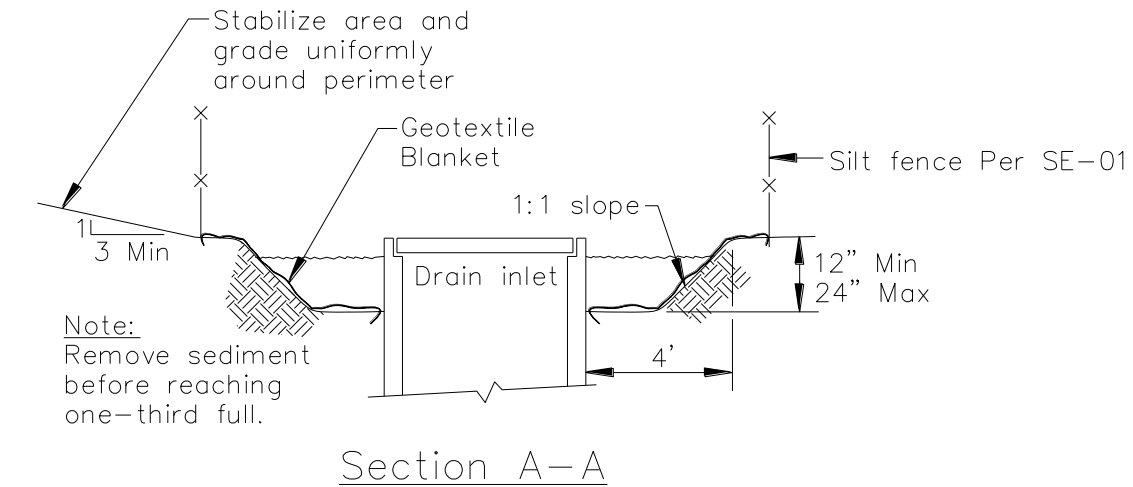


PLAN

DI PROTECTION TYPE 1
NOT TO SCALE

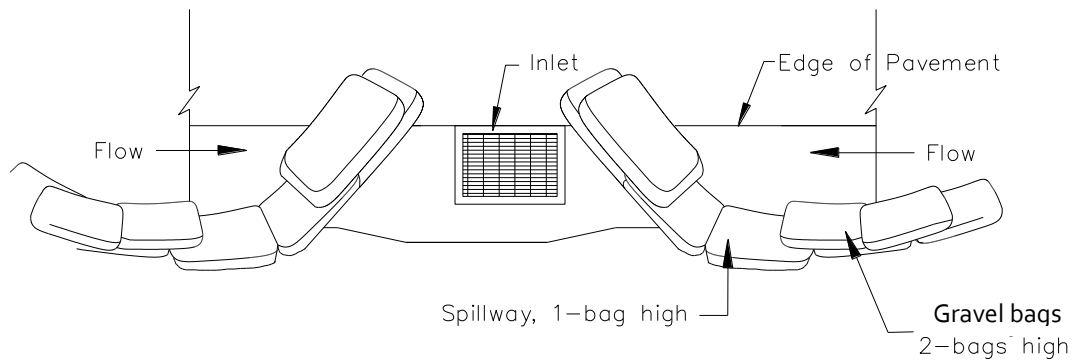
NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.

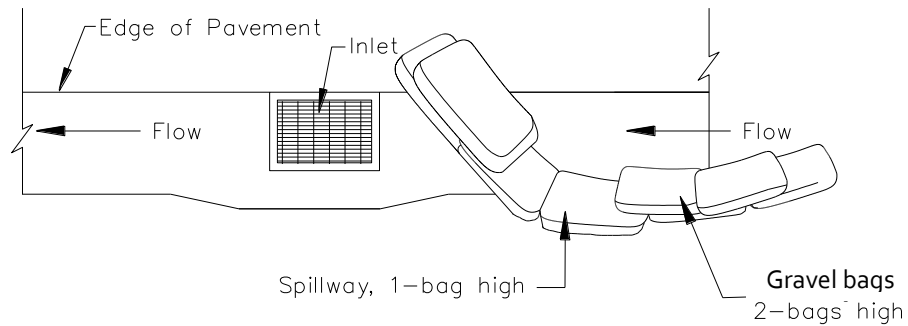


Notes

1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

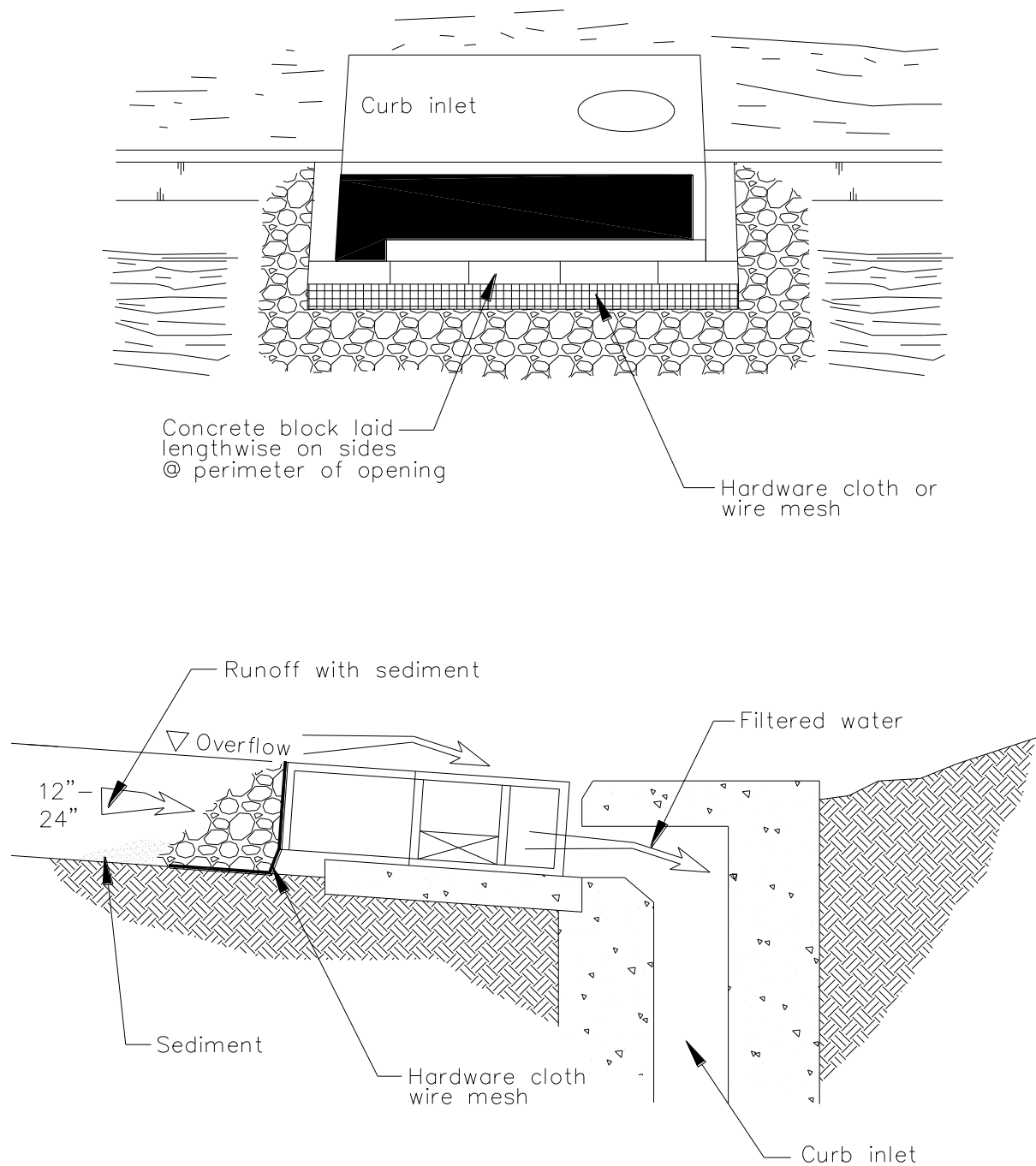


TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

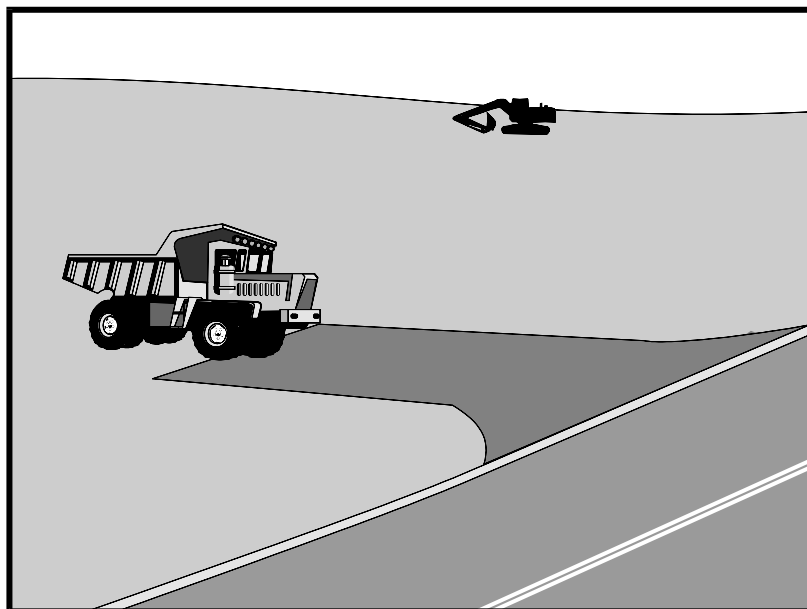
1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.
6. Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.

DI PROTECTION TYPE 3
NOT TO SCALE



DI PROTECTION — TYPE 4
NOT TO SCALE

Stabilized Construction Entrance/Exit TC-1



Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Stabilized Construction Entrance/Exit TC-1

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

Stabilized Construction Entrance/Exit TC-1

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from \$1,200 to \$4,800 each, averaging \$2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from \$1,200 - \$6,000 each, averaging \$3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stabilized Construction Entrance / Exit TC-1

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

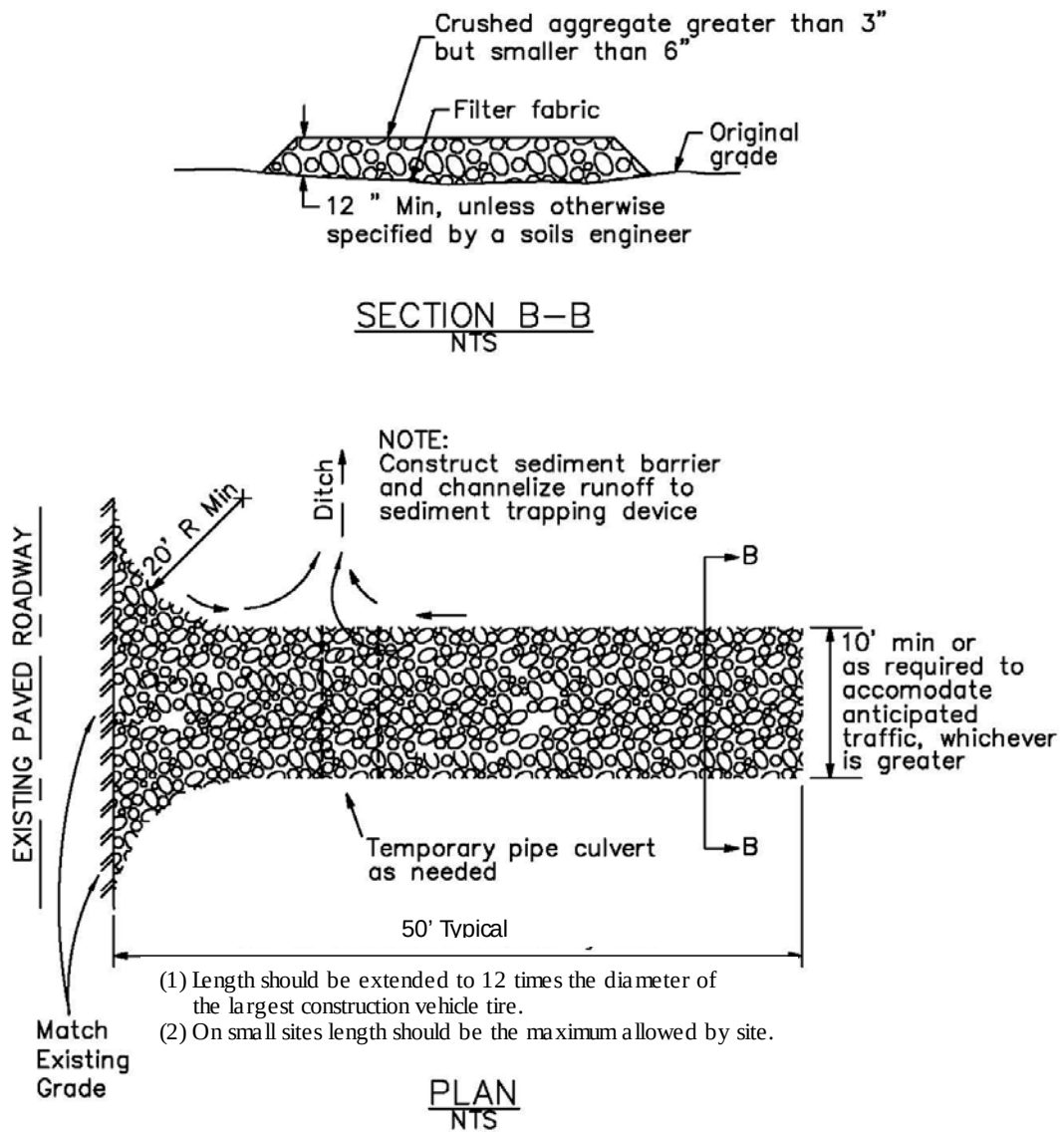
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

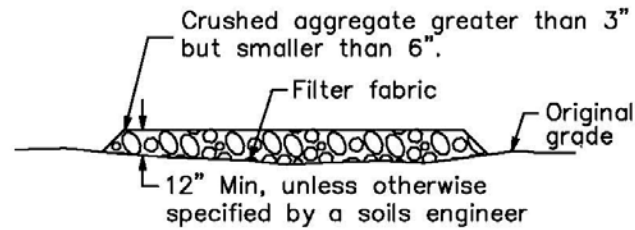
Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

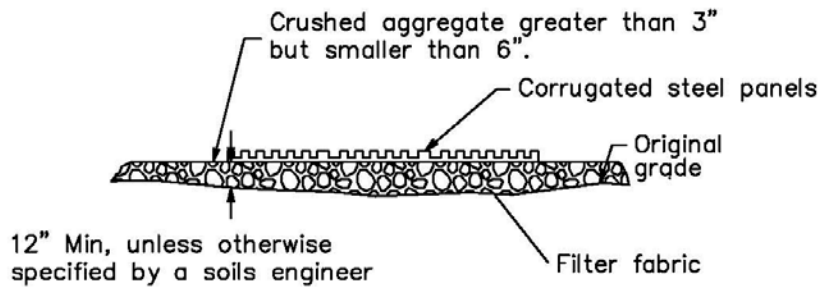
Stabilized Construction Entrance/Exit TC-1



Stabilized Construction Entrance/Exit TC-1

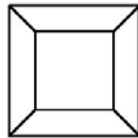


SECTION B-B
NTS

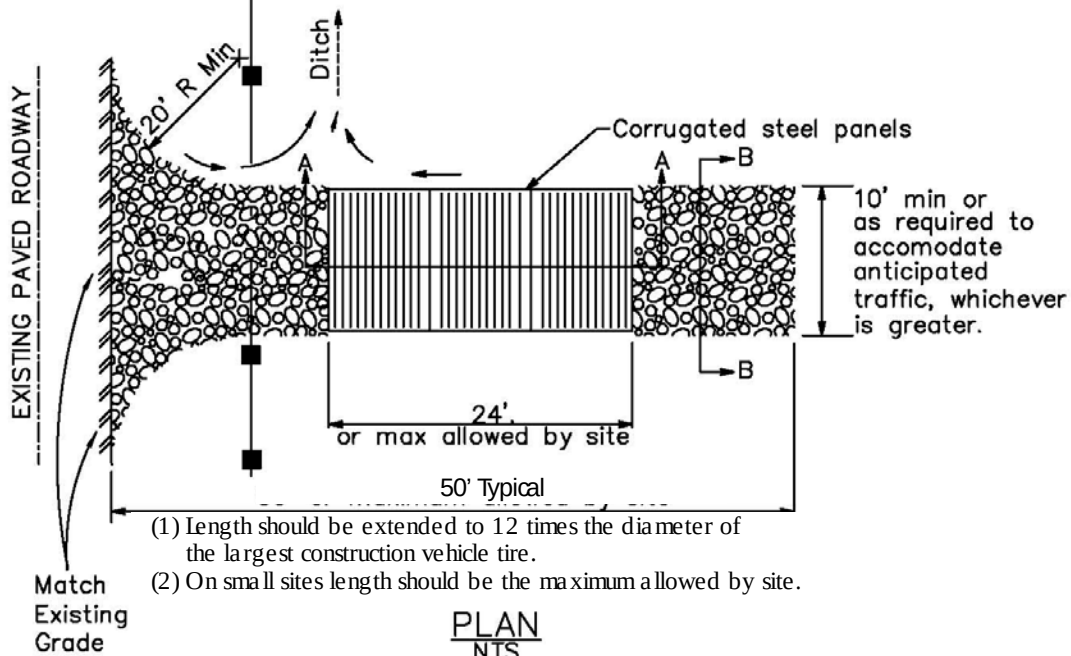


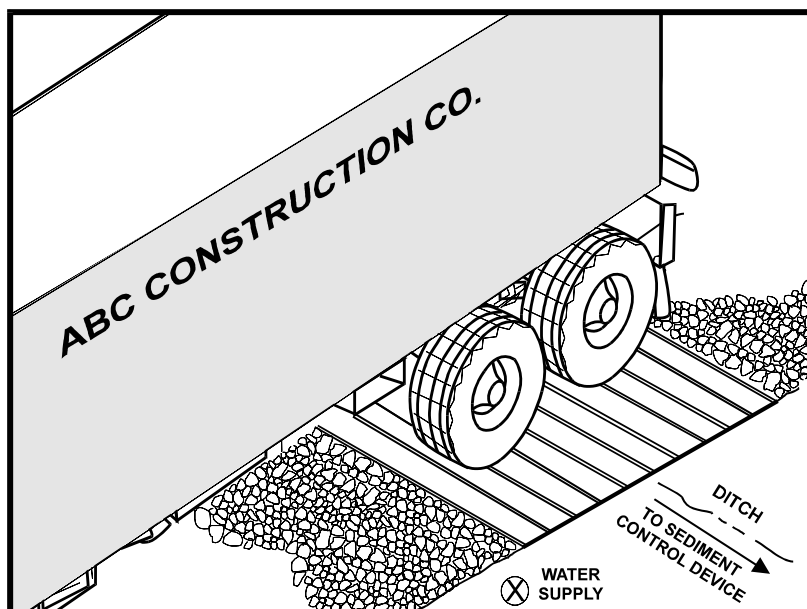
SECTION A-A
NOT TO SCALE

NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device



Sediment trapping device





Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and undercarriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

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- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

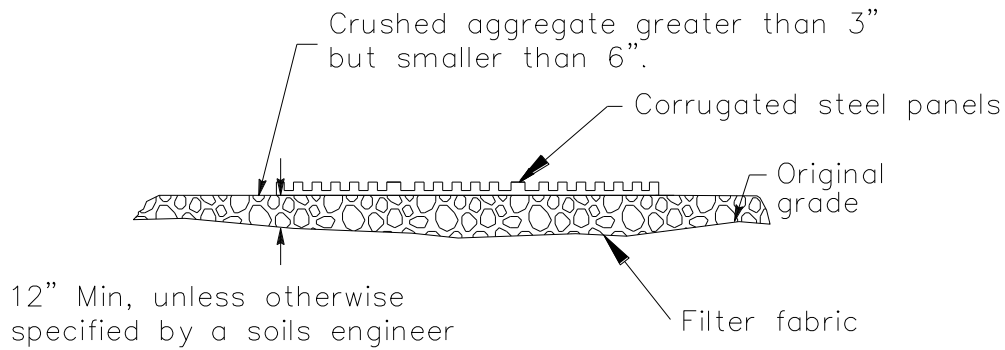
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

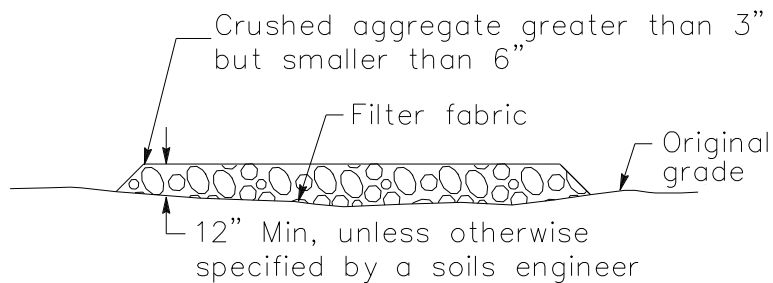
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

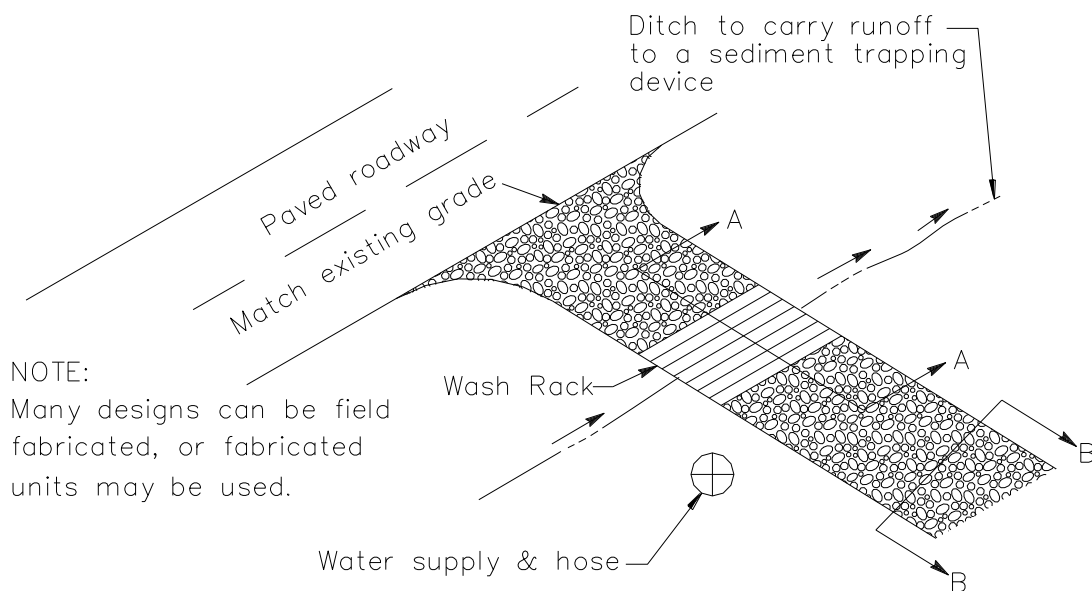
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



SECTION A-A
NOT TO SCALE



SECTION B-B
NTS



TYPICAL TIRE WASH
NOT TO SCALE



Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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- Direct construction water runoff to areas where it can soak into the ground or be collected and reused.
- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

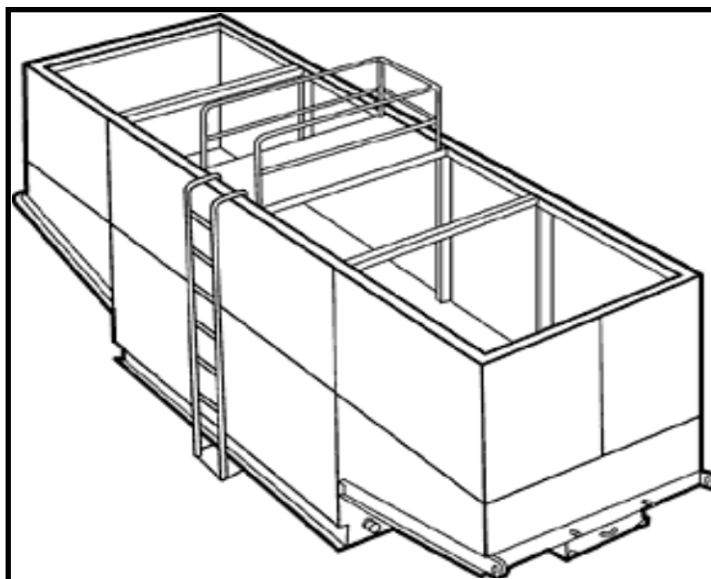
The cost is small to none compared to the benefits of conserving water.

Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occurring.
- Repair water equipment as needed to prevent unintended discharges.
 - Water trucks
 - Water reservoirs (water buffalos)
 - Irrigation systems
 - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location to proceed with construction work or to provide vector control.

The General Permit incorporates Numeric Action Levels (NAL) for turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Discharges from dewatering operations can contain high levels of fine sediment that, if not properly treated, could lead to exceedances of the General Permit requirements or Basin Plan standards.

The dewatering operations described in this fact sheet are not Active Treatment Systems (ATS) and do not include the use of chemical coagulations, chemical flocculation or electrocoagulation.

Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area to facilitate construction.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

- SE-5: Fiber Roll
- SE-6: Gravel Bag Berm

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precipitation (stormwater) from depressed areas at a construction site.

Stormwater mixed with non-stormwater should be managed as non-stormwater.

Limitations

- Dewatering operations will require, and should comply with applicable local and project-specific permits and regulations. In some areas, all dewatering activities, regardless of the discharge volume, require a dewatering permit.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this fact sheet primarily address sediment. Other secondary pollutant removal benefits are discussed where applicable.
- The controls detailed in this fact sheet only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Avoid dewatering discharges where possible by using the water for dust control.

Implementation

- A Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP).
- Regional Water Quality Control Board (RWQCB) Regions may require notification and approval prior to any discharge of water from construction sites.
- The destination of discharge from dewatering activities will typically determine the type of permit required for the discharge. For example, when discharging to a water of the U.S., a dewatering permit may be required through the site's governing RWQCB. When discharging to a sanitary sewer or Municipal Separate Storm Sewer System (MS4), a permit may need to be obtained from the owner of the sanitary sewer or MS4 in addition to obtaining an RWQCB dewatering permit. Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges should not cause erosion at the discharge point. Appropriate BMPs should be implemented to maintain compliance with all applicable permits.
- Maintain dewatering records in accordance with all local and project-specific permits and regulations.

Sediment Treatment

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The sediment particle size and permit or receiving water limitations on sediment or turbidity are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. Use of other enhanced treatment methods (i.e., introduction of chemicals or electric current to enhance flocculation and removal of sediment) must comply with: 1) for storm drain or surface water discharges, the requirements for Active Treatment Systems (see SE-11); or 2) for sanitary sewer discharges, the requirements of applicable sanitary sewer discharge permits.

Sediment Basin (see also SE-2)

Description:

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3) and have a designed outlet structure.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, silt, some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Temporary sediment basins should be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outlet, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap (See also SE-3)

Description:

- A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2) and do not have a designed outlet (but do have a spillway or overflow).

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

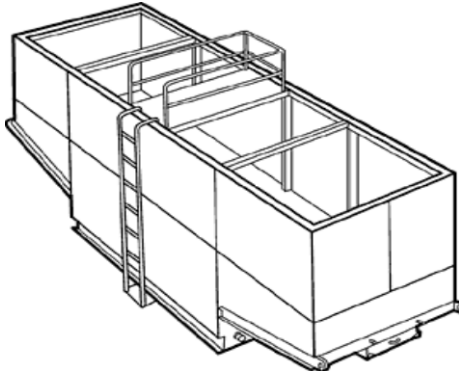
Implementation:

- Excavation and construction of related facilities is required.
- Trap inlets should be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Weir Tanks



Description:

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.
- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by a licensed waste disposal company.

Dewatering Tanks



Description:

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

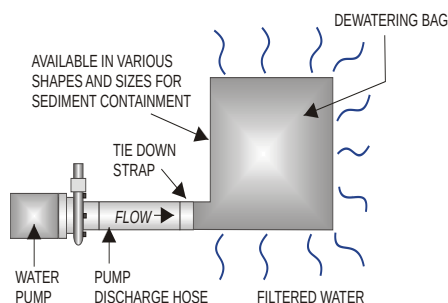
Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by licensed waste disposal company.

Gravity Bag Filter



Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, silt, and fines). Some metals are removed with the sediment.

Implementation:

- Water is pumped into one side of the bag and seeps through the top, bottom, and sides of the bag.
- Place filter bag on pavement or a gravel bed or paved surface. Avoid placing a dewatering bag on unprotected bare soil. If placing the bag on bare soil is unavoidable, a secondary barrier should be used, such as a rock filter bed placed beneath and beyond the edges of the bag to, prevent erosion and capture sediments that escape the bag.
- Perimeter control around the downstream end of the bag should be implemented. Secondary sediment controls are important especially in the initial stages of discharge, which tend to allow fines to pass through the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier (as applicable) is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- Caution should be taken when removing and disposing of the bag, to prevent the release of captured sediment
- Properly dispose of the bag offsite. If sediment is removed from the bag prior to disposal (bags can potentially be reused depending upon their condition), dispose of sediment in accordance with the general maintenance procedures described at the end of this BMP Fact Sheet.

Sand Media Particulate Filter



Description:

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Venders generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Pressurized Bag Filter



Description:

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Cartridge Filter



Description:

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Costs

- Sediment control costs vary considerably depending on the dewatering and sediment treatment system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from \$360 per month for a 1,000 gallon tank to \$2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

Inspection and Maintenance

- Inspect and verify that dewatering BMPs are in place and functioning prior to the commencement of activities requiring dewatering.
- Inspect dewatering BMPs daily while dewatering activities are being conducted.

- Inspect all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Sample dewatering discharges as required by the General Permit.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants should be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

References

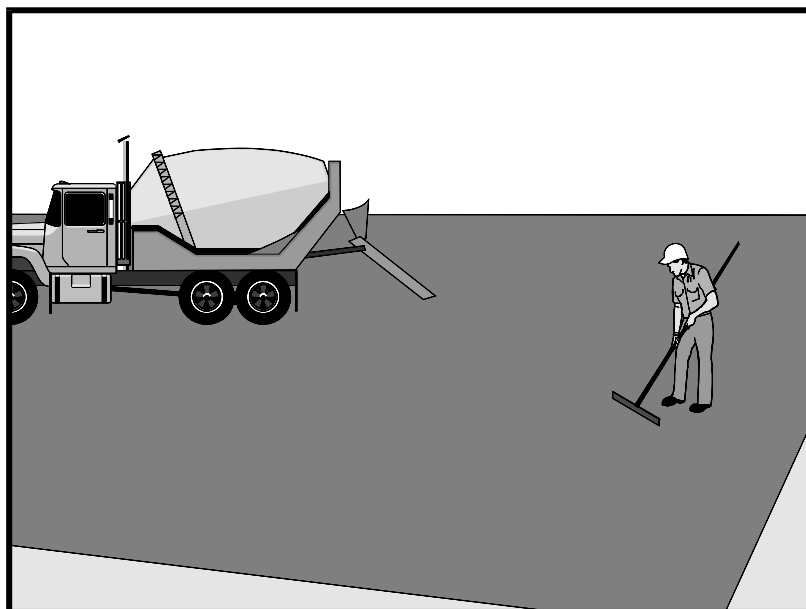
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Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runoff and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.

Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

None

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Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runoff (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
 - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of) or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
 - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:
 - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.
 - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).
- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.
- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.
- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

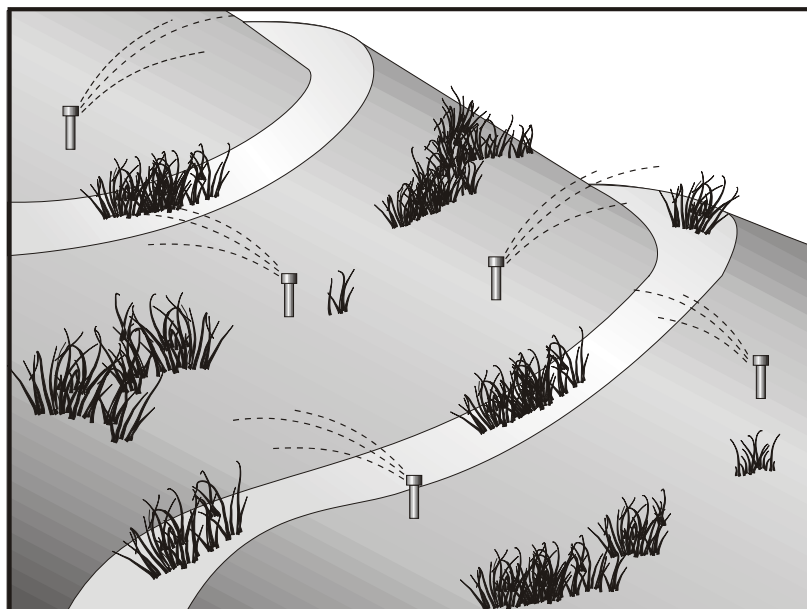
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ **Primary Objective**
- ☒ **Secondary Objective**

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	
Metals	☒
Bacteria	
Oil and Grease	
Organics	☒

Potential Alternatives

None

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- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

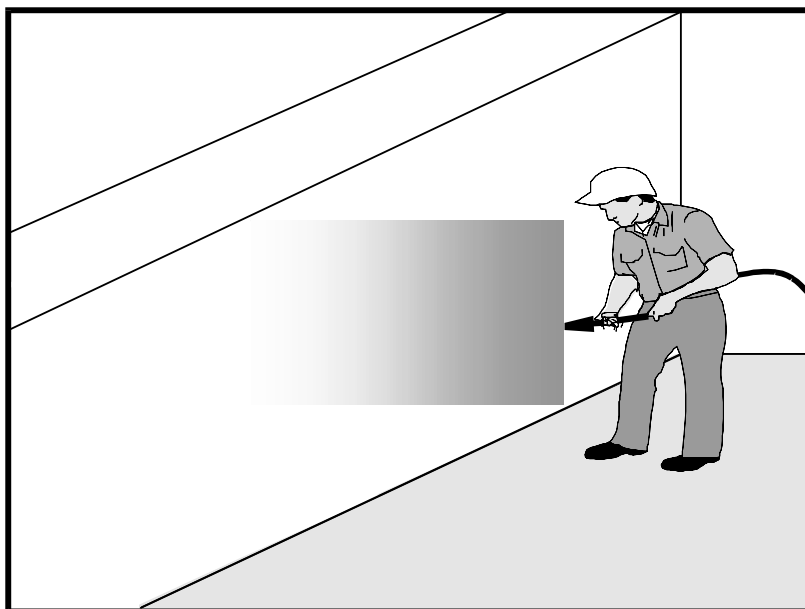
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

None

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Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

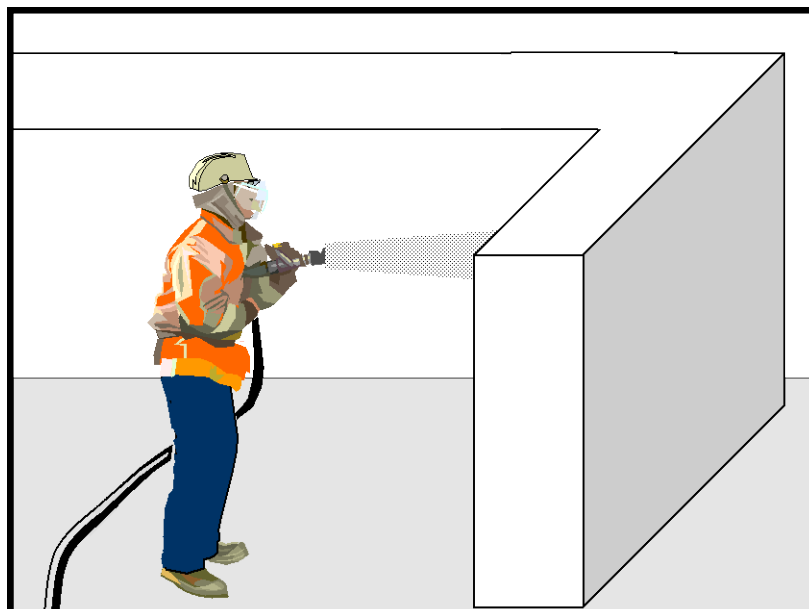
References

Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	☒
Bacteria	
Oil and Grease	
Organics	☒

Potential Alternatives

None

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Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

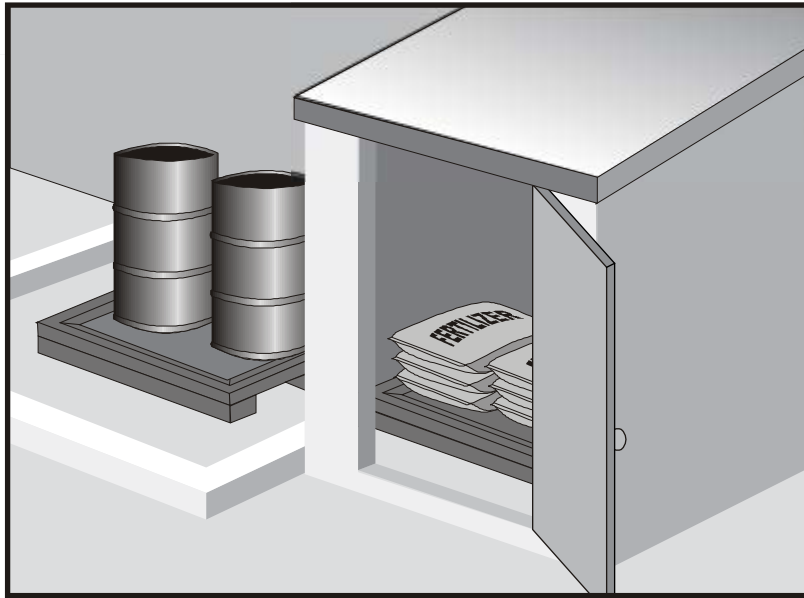
- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None

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- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
 - Avoid transport near drainage paths or waterways.
 - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
 - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

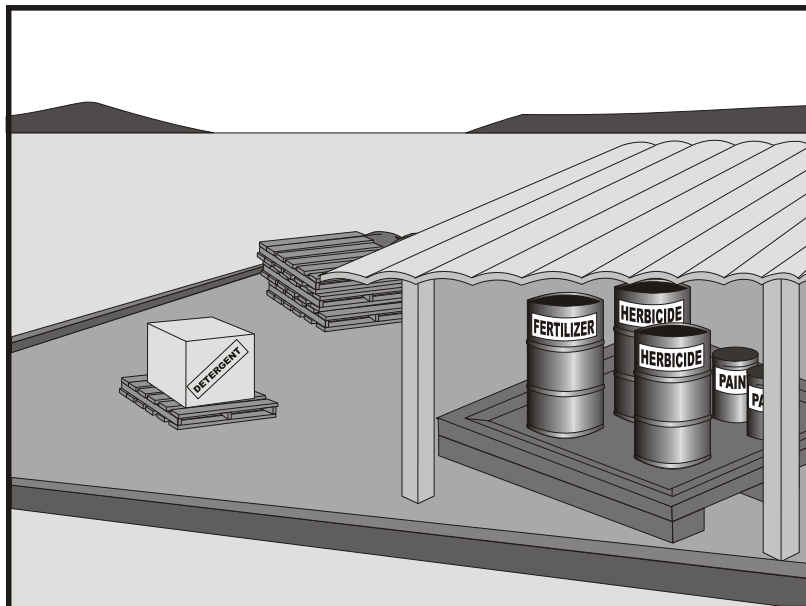
References

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Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None

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Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
 - Do not treat soil that is water-saturated or frozen.
 - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
 - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
 - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
 - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
 - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
 - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
 - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

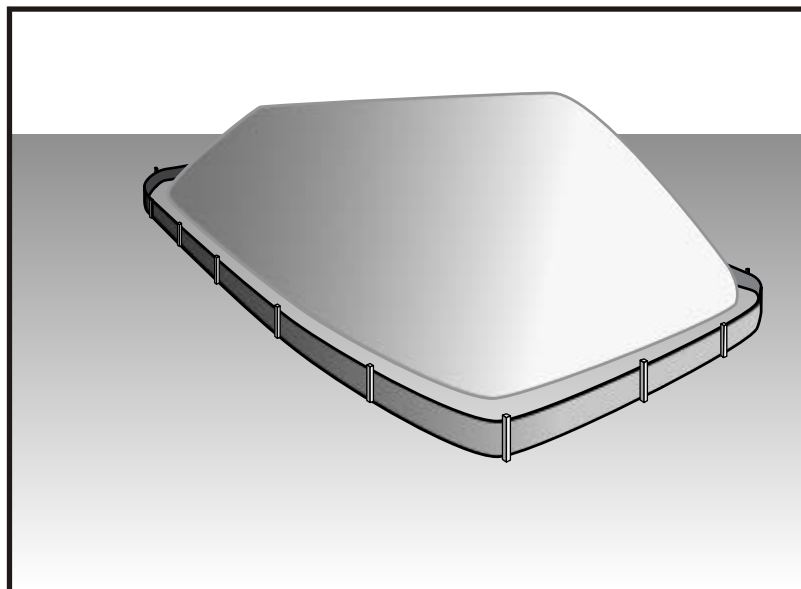
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP-2005-0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006. Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called “cold mix” asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ **Primary Category**
- ☒ **Secondary Category**

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None

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- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- After 14 days of inactivity, a stockpile is non-active and requires further protection described below. All stockpiles are required to be protected as non-active stockpiles immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runoff using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

A stockpile is considered non-active if it either is not used for 14 days or if it is scheduled not to be used for 14 days or more. Stockpiles need to be protected immediately if they are not scheduled to be used within 14 days. Non-active stockpiles of the identified materials should be protected as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of “cold mix”

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate)

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

A stockpile is active when it is being used or is scheduled to be used within 14 days of the previous use. Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of “cold mix” and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

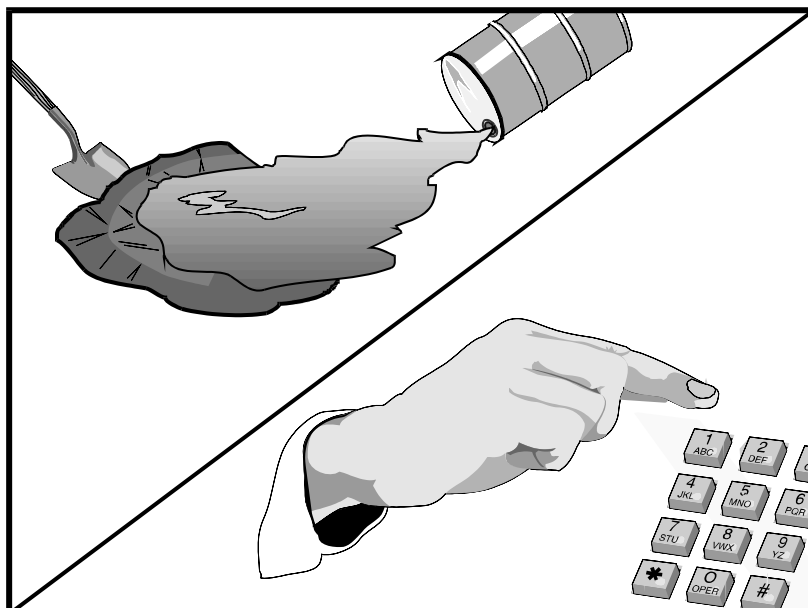
For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.



Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None

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- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a “significant spill” is for each material they use, and what is the appropriate response for “significant” and “insignificant” spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor’s superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runoff during rainfall to the extent that it doesn’t compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
 - Contain the spread of the spill.
 - Recover spilled materials.
 - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
 - Contain spread of the spill.
 - Notify the project foreman immediately.
 - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
 - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
 - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
 - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
 - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
 - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
 - Notification should first be made by telephone and followed up with a written report.
 - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
 - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

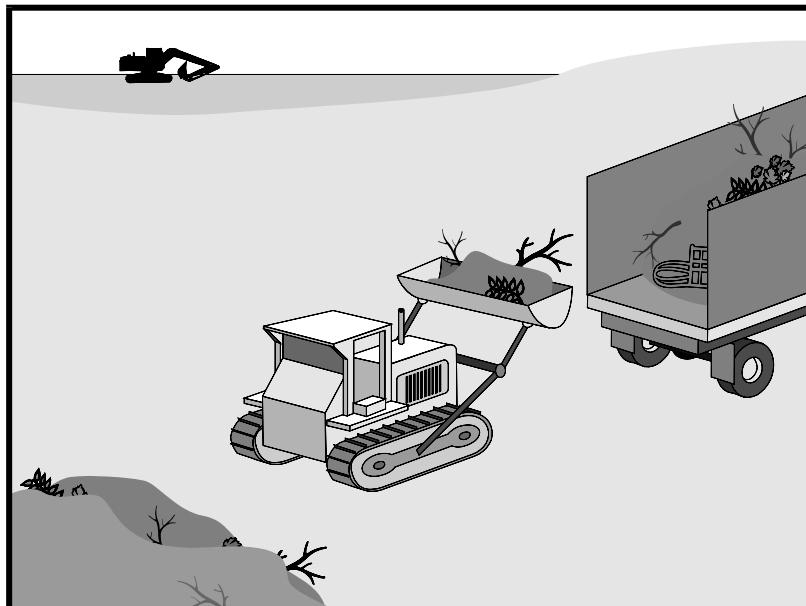
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ **Primary Objective**
- ☒ **Secondary Objective**

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None

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- Highway planting wastes, including vegetative material, plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runoff should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

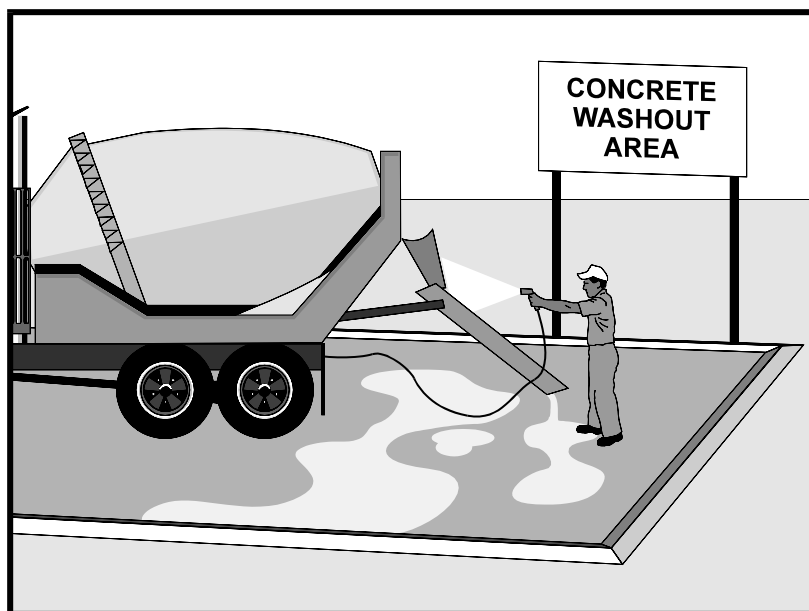
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.
- Concrete trucks and other concrete-coated equipment are washed onsite.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	☒
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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- Mortar-mixing stations exist.
- Stucco mixing and spraying.
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
 - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
 - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
 - Washouts shall be implemented in a manner that prevents leaching to underlying soils. Washout containers must be water tight and washouts on or in the ground must be lined with a suitable impervious liner, typically a plastic type material.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.
- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
 - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
 - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
 - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
 - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a “roll-off”; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
 - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
 - Lath and flagging should be commercial type.
 - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..
- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-Off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

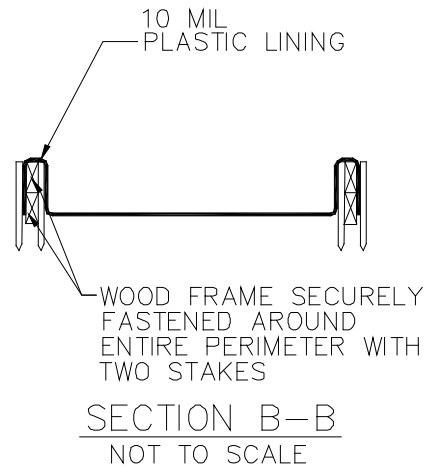
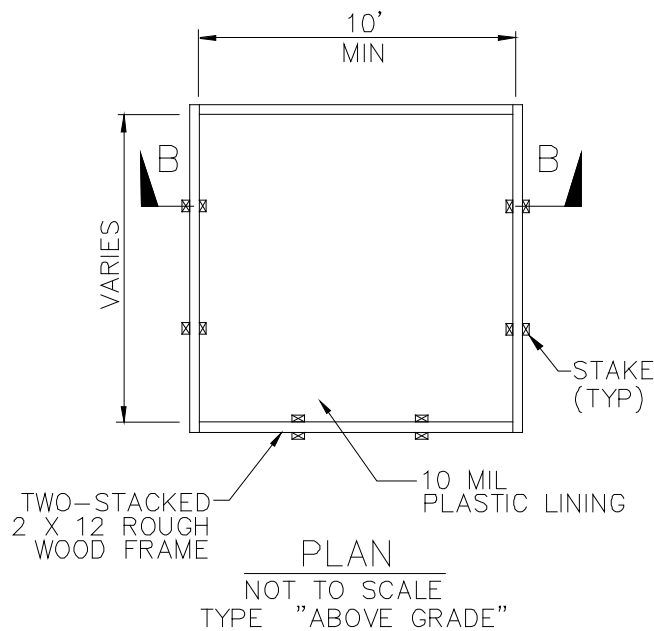
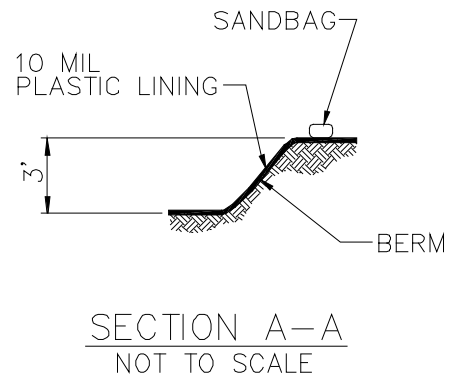
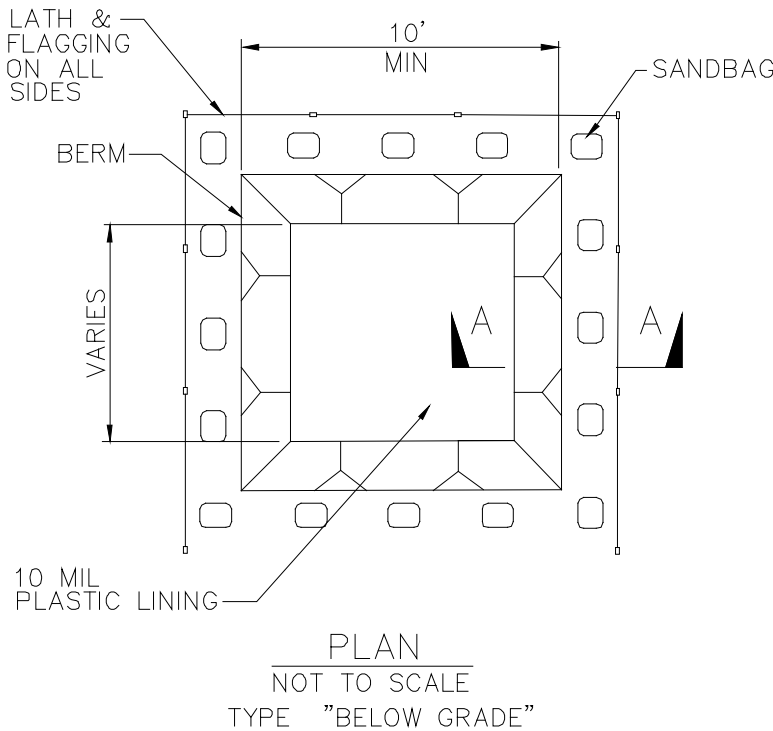
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

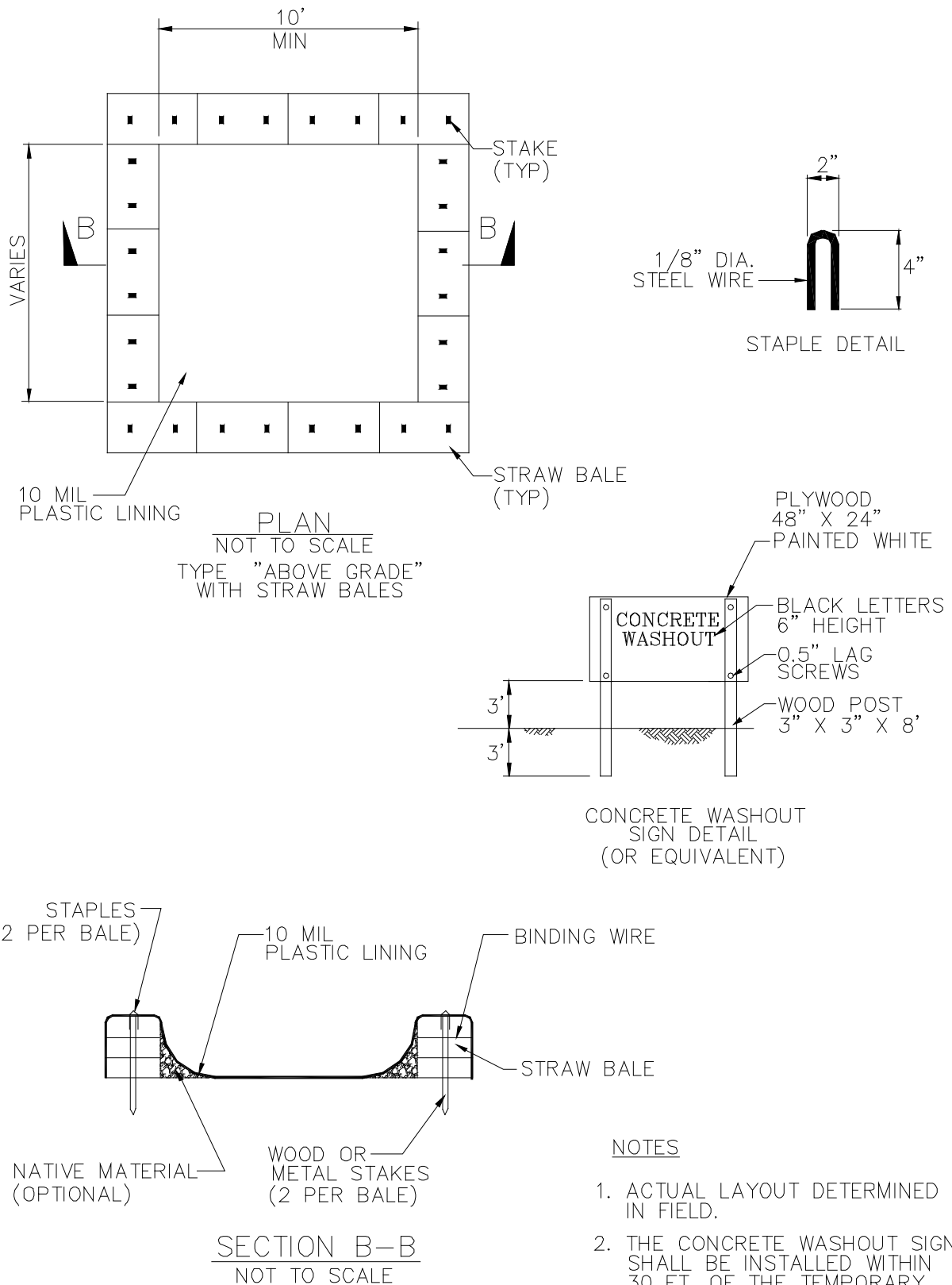
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

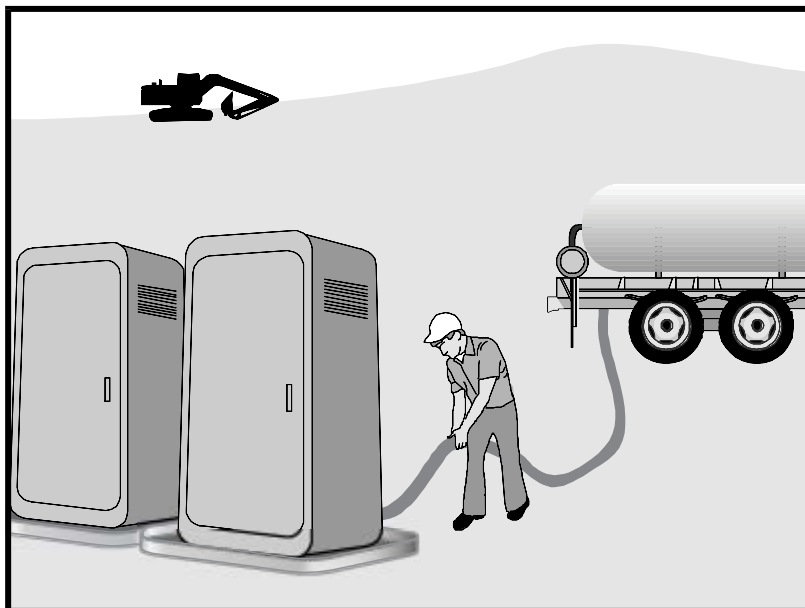


NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



Sanitary / Septic Waste Management WM-9



Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	
Nutrients	☒
Trash	☒
Metals	
Bacteria	☒
Oil and Grease	
Organics	☒

Potential Alternatives

None

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Sanitary / Septic Waste Management WM-9

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Sanitary / Septic Waste Management WM-9

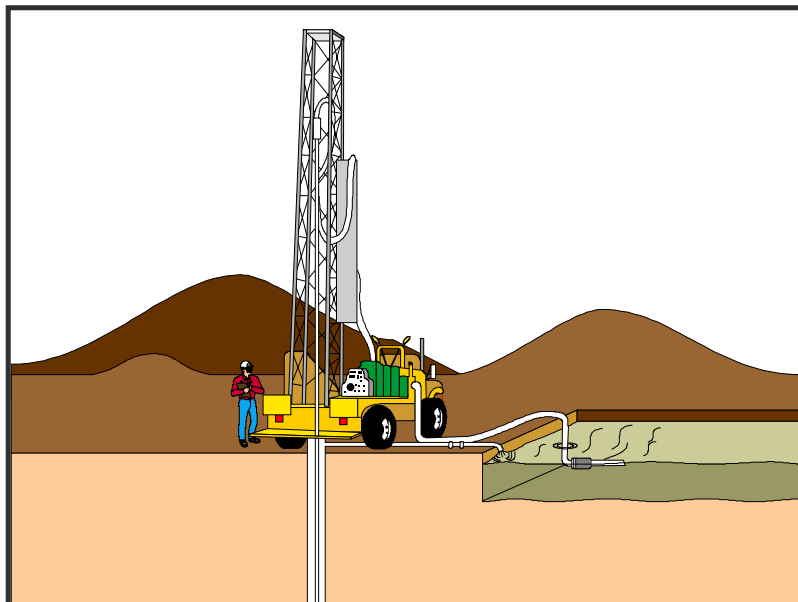
Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ **Primary Objective**
- ☒ **Secondary Objective**

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

None

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concrete slurry residue (WM-8, Concrete Waste Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.
- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.
- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.
- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.
- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.
- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.
- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.
- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.
- Inspect containment areas and capturing devices and repair as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Appendix I: BMP Inspection Form

BMP INSPECTION REPORT

Date and Time of Inspection:		Date Report Written:		
Inspection Type: (Circle one)	Weekly <i>Complete Parts I, II, III and IV</i>	Pre-Storm <i>Complete Parts I, II, III, IV and VII</i>	During Rain Event <i>Complete Parts I, II, III, IV, and VII</i>	Post-Storm <i>Complete Parts I, II, III, IV and V</i>
Part I. General Information				
Site Information				
Construction Site Name: MPWSP Carmel Valley Pump Station				
Construction stage and completed activities:			Approximate area of site that is exposed:	
Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:	
Weather				
Estimate storm beginning: (date and time)		Estimate storm duration: (hours)		
Estimate time since last storm: (days or hours)		Rain gauge reading and location: (in)		
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain with 48-hrs or greater between events)? (Y/N) If yes, summarize forecast:				
Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.				
Inspector Information				
Inspector Name:			Inspector Title:	
Signature:			Date:	

Part II. BMP Observations. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level _____ Sites	Failures or other short comings (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Construction Materials			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
Good Housekeeping for Waste Management			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and with no apparent for leaks and spills			
Equipment is in place to cover waste disposal containers at the end of business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available onsite			
Washout areas (e.g., concrete) are contained appropriately to prevent discharge or infiltration into the underlying soil			
Good Housekeeping for Vehicle Storage and Maintenance			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			
Part II. BMP Observations Continued. Describe deficiencies in Part III.			

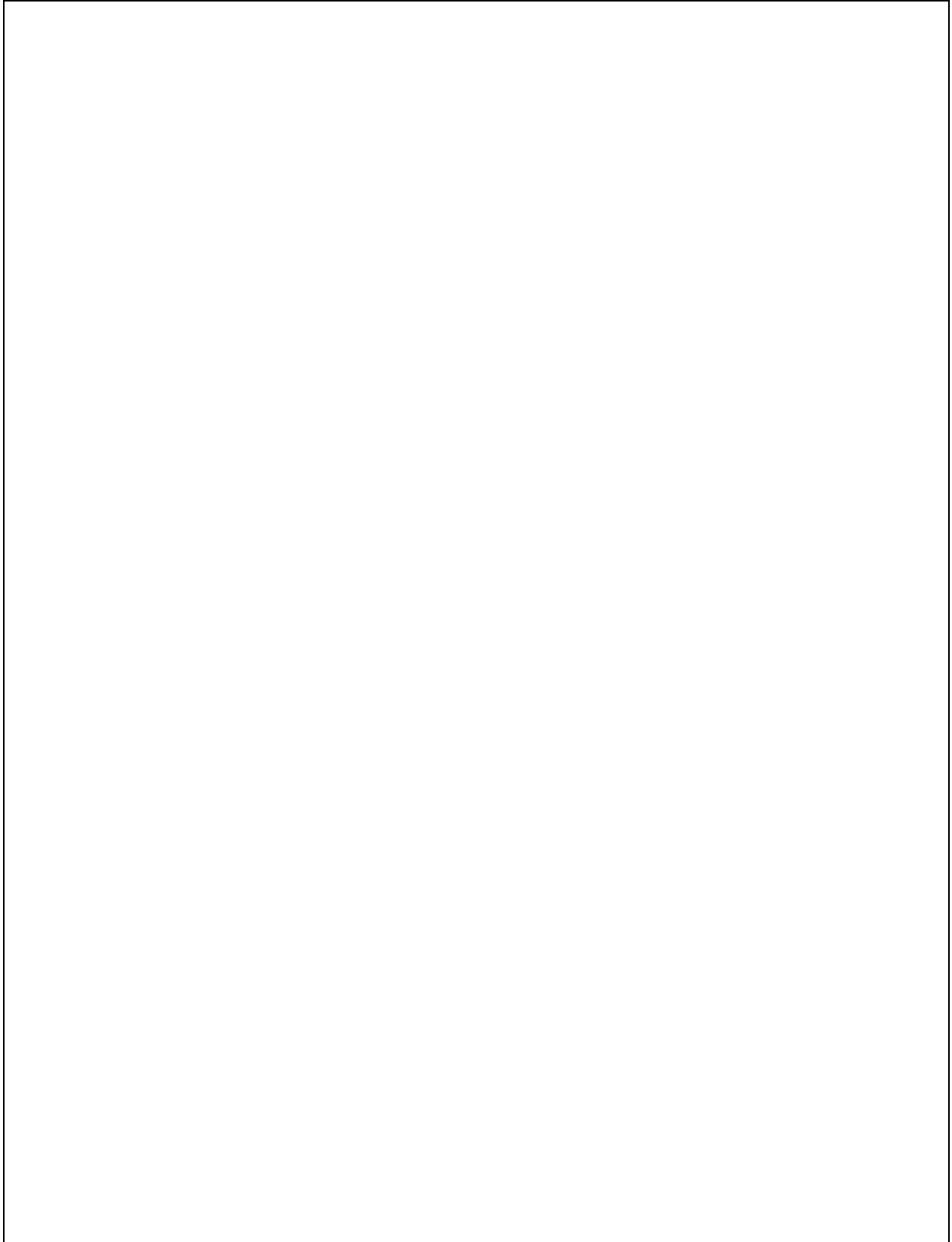
Minimum BMPs for Risk Level ____ Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
Non-Stormwater Management			
Non-Stormwater discharges are properly controlled			
Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Run-On and Run-Off Controls			
Run-on to the site is effectively managed and directed away from all disturbed areas.			
Other			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			

Part III. Descriptions of BMP Deficiencies			
Deficiency	Repairs Implemented: Note - Repairs must begin within 72 hours of identification and, complete repairs as soon as possible.		
	Start Date	Action	
1.			
2.			
3.			
4.			
Part IV. Additional Pre-Storm Observations. Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).			
			Yes, No, N/A
Do stormwater storage and containment areas have adequate freeboard? If no, complete Part III.			
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.			
Notes:			
Are stormwater storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.			
Notes:			
Part V. Additional During Storm Observations. If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.			
Outfall, Discharge Point, or Other Downstream Location			
Location	Description		

Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Part VI. Additional Post-Storm Observations. Visually observe (inspect) stormwater discharges at all discharge locations within two business days (48 hours) after each qualifying rain event, and observe (inspect) the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.	
Discharge Location, Storage or Containment Area	Visual Observation
Part VII. Additional Corrective Actions Required. Identify additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.	
Required Actions	Implementation Date

Appendix J: Project Specific Rain Event Action Plan Template

[illegible]



Attach a printout of the weather forecast from the NOAA website to the REAP.

I certify under penalty of law that this Rain Event Action Plan (REAP) will be performed in accordance with the General Permit by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____

Date: _____

Qualified SWPPP Practitioner

Trade or Activity	Suggested action(s) to perform / item(s) to review prior to rain event
☐ Information & Scheduling	☐ Inform trade supervisors of predicted rain ☐ Check scheduled activities and reschedule as needed ☐ Alert erosion/sediment control provider ☐ Alert sample collection contractor (if applicable) ☐ Schedule staff for extended rain inspections (including weekends & holidays) ☐ Check Erosion and Sediment Control (ESC) material stock ☐ Review BMP progress map ☐ Other: _____ ☐ _____ ☐ _____
☐ Material storage areas	☐ Material under cover or in sheds (ex: treated woods and metals) ☐ Perimeter control around stockpiles ☐ Other: _____ ☐ _____ ☐ _____
☐ Waste management areas	☐ Dumpsters closed ☐ Drain holes plugged ☐ Recycling bins covered ☐ Sanitary stations bermed and protected from tipping ☐ Other: _____ ☐ _____ ☐ _____
☐ Trade operations	☐ Exterior operations shut down for event (e.g., no concrete pours or paving) ☐ Soil treatments (e.g.: fertilizer) ceased within 24 hours of event ☐ Materials and equipment (ex: tools) properly stored and covered ☐ Waste and debris disposed in covered dumpsters or removed from site ☐ Trenches and excavations protected ☐ Perimeter controls around disturbed areas ☐ Fueling and repair areas covered and bermed ☐ Other: _____ ☐ _____ ☐ _____
☐ Site ESC BMPs	☐ Adequate capacity in sediment basins and traps ☐ Site perimeter controls in place ☐ Catch basin and drop inlet protection in place and cleaned ☐ Temporary erosion controls deployed ☐ Temporary perimeter controls deployed around disturbed areas and stockpiles ☐ Roads swept; site ingress and egress points stabilized ☐ Other: _____ ☐ _____ ☐ _____
☐ Concrete rinse out area	☐ Adequate capacity for rain ☐ Wash-out bins covered ☐ Other: _____ ☐ _____ ☐ _____
☐ Spill and drips	☐ All incident spills and drips, including paint, stucco, fuel, and oil cleaned ☐ Drip pans emptied ☐ Other: _____ ☐ _____ ☐ _____

Appendix K: Training Reporting Form

Trained Contractor Personnel Log

Stormwater Management Training Log and Documentation

Project Name: MPWSP Carmel Valley Pump Station

WDID #:

Stormwater Management Topic: (check as appropriate)

- | | |
|--|---|
| ☐ Erosion Control | ☐ Sediment Control |
| ☐ Wind Erosion Control | ☐ Tracking Control |
| ☐ Non-Stormwater Management | ☐ Waste Management and Materials Pollution Control |
| ☐ Stormwater Sampling | |

Specific Training Objective: _____

Location: _____

Date: _____

Instructor: _____

Telephone: _____

Course Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

As needed, add proof of external training (e.g., course completion certificates, credentials for QSP, QSD).

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD) AND QUALIFIED SWPPP PRACTITIONER (QSP)

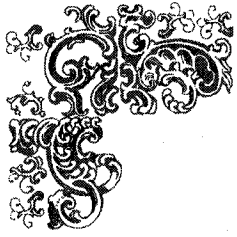
Patricia C. Castillo

Mar 19, 2018 - Jun 14, 2020

Certificate # 23104



**California Stormwater Quality Association and
California Construction General Permit Training Team**



The CPESC® Application Review Committee
certifies that

Patricia Connie Hernandez

Subscribes to the Code of Conduct and Ethics and has met the requirements
established by the CPESC Council as a

**Certified Professional in Erosion
and Sediment Control™**

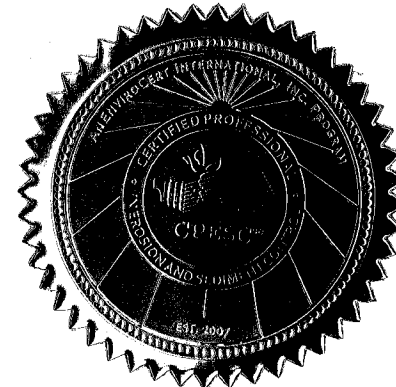
An EnviroCert International, Inc. Program

Certification Number: 6975

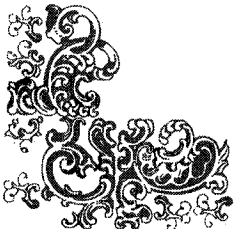
Certification Date: June 1, 2012


Chair, CPESC Council


CPESC Program Coordinator



The CPESC Program was established in 1982.



Appendix L: Responsible Parties

Authorization of Approved Signatories

Project Name: MPWSP Carmel Valley Pump Station

WDID #:

Name of Personnel	Project Role	Company	Signature	Date

Legally Responsible Person's Signature

Date

Timothy P. Ohalloran,
Engineering Manager - Coastal Division

(831) 646-3291

Legally Responsible Person

Name and Title

Telephone Number

Identification of QSP

Project Name: MPWSP Carmel Valley Pump Station

WDID #:

The following are QSPs associated with this project

Name of Personnel ⁽¹⁾	Company	Date
Joseph Taormina	Monterey Peninsula Engineering (MPE)	10/16/2019

(1) If additional QSPs are required on the job site add additional lines and include information here

Authorization of Data Submitters

Project Name: MPWSP Carmel Valley Pump Station

WDID #:

Name of Personnel	Project Role	Company	Signature	Date

Approved Signatory's Signature

Date

Timothy P. Ohalloran,
Engineering Manager - Coastal Division

(831) 646-3291

Approved Signatory

Name and Title

Telephone Number

Appendix M: Contractors and Subcontractors

Project Name: MPWSP Carmel Valley Pump Station

Project Number:

Location: 26530 Rancho San Carlos Road,
Carmel, CA 93923

SUBCONTRACTOR COMPANY	ADDRESS	PHONE NUMBER
Darrel Varni Electric, Inc.	12 Parkwood Dr. Watsonville, CA 95076	(831) 761-2288
Harry Williams Construction	2699 East Lake Ave. Watsonville, CA 95076	(831) 761-1655

Appendix N: Construction General Permit



Linda S. Adams
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Arnold Schwarzenegger
Governor

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I. BACKGROUND

A. History

In 1972, the Federal Water Pollution Control Act (also referred to as the Clean Water Act [CWA]) was amended to provide that the discharge of pollutants to waters of the United States from any point source is unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The 1987 amendments to the CWA added Section 402(p), which establishes a framework for regulating municipal and industrial storm water discharges under the NPDES Program. On November 16, 1990, the U.S. Environmental Protection Agency (USEPA) published final regulations that established storm water permit application requirements for specified categories of industries. The regulations provide that discharges of storm water to waters of the United States from construction projects that encompass five or more acres of soil disturbance are effectively prohibited unless the discharge is in compliance with an NPDES Permit. Regulations (Phase II Rule) that became final on December 8, 1999 lowered the permitting threshold from five acres to one acre.

While federal regulations allow two permitting options for storm water discharges (Individual Permits and General Permits), the State Water Board has elected to adopt only one statewide General Permit at this time that will apply to most storm water discharges associated with construction activity.

On August 19, 1999, the State Water Board reissued the General Construction Storm Water Permit (Water Quality Order 99-08-DWQ). On December 8, 1999 the State Water Board amended Order 99-08-DWQ to apply to sites as small as one acre.

The General Permit accompanying this fact sheet regulates storm water runoff from construction sites. Regulating many storm water discharges under one permit will greatly reduce the administrative burden associated with permitting individual storm water discharges. To obtain coverage under this General Permit, dischargers shall electronically file the Permit Registration Documents (PRDs), which includes a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other compliance related documents required by this General Permit and mail the appropriate permit fee to the State Water Board. It is expected that as the storm water program develops, the Regional Water Quality Control Boards (Regional Water Boards) may issue General Permits or Individual Permits containing more specific permit provisions. When this occurs, this General Permit will no longer regulate those dischargers.

B. Legal Challenges and Court Decisions

1. Early Court Decisions

Shortly after the passage of the CWA, the USEPA promulgated regulations exempting most storm water discharges from the NPDES permit requirements. (See 40 C.F.R. § 125.4 (1975); see also *Natural Resources Defense Council v. Costle* (D.C. Cir. 1977) 568 F.2d 1369, 1372 (*Costle*); *Defenders of Wildlife v. Browner* (9th Cir. 1999) 191 F.3d 1159, 1163 (*Defenders of Wildlife*).) When environmental groups challenged this exemption in federal court, the District of Columbia Court of Appeals invalidated the regulation, holding that the USEPA “does not have authority to exempt categories of point sources from the permit requirements of [CWA] § 402.” (*Costle*, 568 F.2d at 1377.) The *Costle* court rejected the USEPA’s argument that effluent-based storm sewer regulation was administratively infeasible because of the variable nature of storm water pollution and the number of affected storm sewers throughout the country. (*Id.* at 1377-82.) Although the court acknowledged the practical problems relating to storm sewer regulation, the court found the USEPA had the flexibility under the CWA to design regulations that would overcome these problems. (*Id.* at 1379-83.) In particular, the court pointed to general permits and permits based on requiring best management practices (BMPs).

During the next 15 years, the USEPA made numerous attempts to reconcile the statutory requirement of point source regulation with the practical problem of regulating possibly millions of diverse point source discharges of storm water. (See *Defenders of Wildlife*, 191 F.3d at 1163; see also Gallagher, Clean Water Act in Environmental Law Handbook (Sullivan, edit., 2003) p. 300 (Environmental Law Handbook); Eisen, *Toward a Sustainable Urbanism: Lessons from Federal Regulation of Urban Storm Water Runoff* (1995) 48 Wash. U.J. Urb. & Contemp. L.1, 40-41 [Regulation of Urban Storm Water Runoff].)

In 1987, Congress amended the CWA to require NPDES permits for storm water discharges. (See CWA § 402(p), 33 U.S.C. § 1342(p); *Defenders of Wildlife*, 191 F.3d at 1163; *Natural Resources Defense Council v. USEPA* (9th Cir. 1992) 966 F.2d 1292, 1296.) In these amendments, enacted as part of the Water Quality Act of 1987, Congress distinguished between industrial and municipal storm water discharges. With respect to industrial storm water discharges, Congress provided that NPDES permits "shall meet all applicable provisions of this section and section 1311 [requiring the USEPA to establish effluent limitations under specific timetables]." (CWA § 402(p)(3)(A), 33 U.S.C. § 1342(p)(3)(A); see also *Defenders of Wildlife*, 191 F.3d at 1163-64.)

In 1990, USEPA adopted regulations specifying what activities were considered "industrial" and thus required discharges of storm water associated with those activities to obtain coverage under NPDES permits. (55 Fed. Reg. 47,990 (1990); 40 C.F.R. § 122.26(b)(14).) Construction activities, deemed a subset of the industrial activities category, must also be regulated by an NPDES permit. (40 C.F.R. § 122.26(b)(14)(x)). In 1999, USEPA issued regulations for "Phase II" of storm water regulation, which required most small construction sites (1-5 acres) to be regulated under the NPDES program. (64 Fed. Reg. 68,722; 40 C.F.R. § 122.26(b)(15)(i).)

2. Court Decisions on Public Participation

Two recent federal court opinions have vacated USEPA rules that denied meaningful public review of NPDES permit conditions. On January 14, 2003, the Ninth Circuit Court of Appeals held that certain aspects of USEPA's Phase II regulations governing MS4s were invalid primarily because the general permit did not contain express requirements for public participation. (*Environmental Defense Center v. USEPA* (9th Cir. 2003) 344 F.3d 832.) Specifically, the court determined that applications for general permit coverage (including the Notice of Intent (NOI) and Storm Water Management Program (SWMP)) must be made available to the public, the applications must be reviewed and determined to meet the applicable standard by the permitting authority before coverage commences, and there must be a process to accommodate public hearings. (*Id.* at 852-54.) Similarly, on February 28, 2005, the Second Circuit Court of Appeals held that the USEPA's confined animal feeding operation (CAFO) rule violated the CWA because it allowed dischargers to write their own nutrient management plans without public review. (*Waterkeeper Alliance v. USEPA* (2d Cir. 2005) 399 F.3d 486.) Although neither decision involved the issuance of construction storm water permits, the State Water Board's Office of Chief Counsel has recommended that the new General Permit address the courts' rulings where feasible¹.

¹ In *Texas Independent Producers and Royalty Owners Assn. v. USEPA* (7th Cir. 2005) 410 F.3d 964, the Seventh Circuit Court of Appeals held that the USEPA's construction general permit was not required to provide the public with the opportunity for a public hearing on the Notice of Intent or Storm Water Pollution Prevention Plan. The Seventh Circuit briefly discussed why it agreed with the Ninth Circuit's dissent in *Environmental Defense Center*, but

The CWA and the USEPA's regulations provide states with the discretion to formulate permit terms, including specifying best management practices (BMPs), to achieve strict compliance with federal technology-based and water quality-based standards. (*Natural Resources Defense Council v. USEPA* (9th Cir. 1992) 966 F.2d 1292, 1308.) Accordingly, this General Permit has developed specific BMPs as well as numeric action levels (NALs) in order to achieve these minimum federal standards. In addition, the General Permit requires a SWPPP and REAP (another dynamic, site-specific plan) to be developed but has removed all language requiring the discharger to implement these plans – instead, the discharger is required to comply with specific requirements. By requiring the dischargers to implement these specific BMPs and NALs, this General Permit ensures that the dischargers do not “write their own permits.” As a result this General Permit does not require each discharger’s SWPPP and REAP to be reviewed and approved by the Regional Water Boards.

This General Permit also requires dischargers to electronically file all permit-related compliance documents. These documents include, but are not limited to, NOIs, SWPPPs, annual reports, Notice of Terminations (NOTs), and numeric action level (NAL) exceedance reports. Electronically submitted compliance information is immediately available to the public, as well as the Regional Water Quality Control Board (Regional Water Board) offices, via the Internet. In addition, this General Permit enables public review and hearings on permit applications when appropriate. Under this General Permit, the public clearly has a meaningful opportunity to participate in the permitting process.

generally did not discuss the substantive holdings in *Environmental Defense Center* and *Waterkeeper Alliance*, because neither court addressed the initial question of whether the plaintiffs had standing to challenge the permits at issue. However, notwithstanding the Seventh Circuit's decision, it is not binding or controlling on the State Water Board because California is located within the Ninth Circuit.

C. Blue Ribbon Panel of Experts and Feasibility of Numeric Effluent Limitations

In 2005 and 2006, the State Water Board convened an expert panel (panel) to address the feasibility of numeric effluent limitations (NELs) in California's storm water permits. Specifically, the panel was asked to address:

"Is it technically feasible to establish numeric effluent limitations, or some other quantifiable limit, for inclusion in storm water permits? How would such limitations or criteria be established, and what information and data would be required?"

"The answers should address industrial general permits, construction general permits, and area-wide municipal permits. The answers should also address both technology-based limitations or criteria and water quality-based limitations or criteria. In evaluating establishment of any objective criteria, the panel should address all of the following:

The ability of the State Water Board to establish appropriate objective limitations or criteria;

How compliance determinations would be made;

The ability of dischargers and inspectors to monitor for compliance; and

The technical and financial ability of dischargers to comply with the limitations or criteria."

Through a series of public participation processes (State Water Board meetings, State Water Board workshops, and the solicitation of written comments), a number of water quality, public process and overall program effectiveness problems were identified. Some of these problems are addressed through this General Permit.

D. Summary of Panel Findings on Construction Activities

The panel's final report can be downloaded and viewed through links at www.waterboards.ca.gov or by clicking [here](#)².

The panel made the following observations:

"Limited field studies indicate that traditional erosion and sediment controls are highly variable in performance, resulting in highly variable turbidity levels in the site discharge."

"Site-to-site variability in runoff turbidity from undeveloped sites can also be quite large in many areas of California, particularly in more arid regions with less natural vegetative cover and steep slopes."

² http://www.waterboards.ca.gov/stormwtr/docs/numeric/swpanel_final_report.pdf

“Active treatment technologies involving the use of polymers with relatively large storage systems now exist that can provide much more consistent and very low discharge turbidity. However, these technologies have as yet only been applied to larger construction sites, generally five acres or greater. Furthermore, toxicity has been observed at some locations, although at the vast majority of sites, toxicity has not occurred. There is also the potential for an accidental large release of such chemicals with their use.”

“To date most of the construction permits have focused on TSS and turbidity, but have not addressed other, potentially significant pollutants such as phosphorus and an assortment of chemicals used at construction sites.”

“Currently, there is no required training or certification program for contractors, preparers of soil erosion and sediment control Storm Water Pollution Prevention Plans, or field inspectors.”

“The quality of storm water discharges from construction sites that effectively employ BMPs likely varies due to site conditions such as climate, soil, and topography.”

“The States of Oregon and Washington have recently adopted similar concepts to the Action Levels described earlier.”

In addition, the panel made the following conclusions:

“It is the consensus of the Panel that active treatment technologies make Numeric Limits technically feasible for pollutants commonly associated with storm water discharges from construction sites (e.g. TSS and turbidity) for larger construction sites. Technical practicalities and cost-effectiveness may make these technologies less feasible for smaller sites, including small drainages within a larger site, as these technologies have seen limited use at small construction sites. If chemical addition is not permitted, then Numeric Limits are not likely feasible.”

“The Board should consider Numeric Limits or Action Levels for other pollutants of relevance to construction sites, but in particular pH. It is of particular concern where fresh concrete or wash water from cement mixers/equipment is exposed to storm water.”

“The Board should consider the phased implementation of Numeric Limits and Action Levels, commensurate with the capacity of the dischargers and support industry to respond.”

E. How the Panel’s Findings are Used in this General Permit

The State Water Board carefully considered the findings of the panel and related public comments. The State Water Board also reviewed and considered the comments regarding statewide storm water policy and the reissuance of the Industrial General Permit. From the input received the State Water Board identified some permit and program performance gaps that are addressed in this General Permit. The Summary of Significant Changes (below) in this General Permit are a direct result of this process.

F. Summary of Significant Changes in This General Permit

The State Water Board has significant changes to Order 99-08-DWQ. This General Permit differs from Order 99-08-DWQ in the following significant ways:

Rainfall Erosivity Waiver: this General Permit includes the option allowing a small construction site (>1 and <5 acres) to self-certify if the rainfall erosivity value (R value) for their site's given location and time frame compute to be less than or equal to 5.

Technology-Based Numeric Action Levels: this General Permit includes NALs for pH and turbidity.

Risk-Based Permitting Approach: this General Permit establishes three levels of risk possible for a construction site. Risk is calculated in two parts: 1) Project Sediment Risk, and 2) Receiving Water Risk.

Minimum Requirements Specified: this General Permit imposes more minimum BMPs and requirements that were previously only required as elements of the SWPPP or were suggested by guidance.

Project Site Soil Characteristics Monitoring and Reporting: this General Permit provides the option for dischargers to monitor and report the soil characteristics at their project location. The primary purpose of this requirement is to provide better risk determination and eventually better program evaluation.

Effluent Monitoring and Reporting: this General Permit requires effluent monitoring and reporting for pH and turbidity in storm water discharges. The purpose of this monitoring is to evaluate whether NALs and NELs for Active Treatment Systems included in this General Permit are exceeded.

Receiving Water Monitoring and Reporting: this General Permit requires some Risk Level 3 and LUP Type 3 dischargers to monitor receiving waters and conduct bioassessments.

Post-Construction Storm Water Performance Standards: this General Permit specifies runoff reduction requirements for all sites not covered by a Phase I or Phase II MS4 NPDES permit, to avoid, minimize and/or mitigate post-construction storm water runoff impacts.

Rain Event Action Plan: this General Permit requires certain sites to develop and implement a Rain Event Action Plan (REAP) that must be designed to protect all exposed portions of the site within 48 hours prior to any likely precipitation event.

Annual Reporting: this General Permit requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. The primary purpose of this requirement is to provide information needed for overall program evaluation and public information.

Certification/Training Requirements for Key Project Personnel: this General Permit requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements.

Linear Underground/Overhead Projects: this General Permit includes requirements for all Linear Underground/Overhead Projects (LUPs).

II. RATIONALE

A. General Permit Approach

A general permit for construction activities is an appropriate permitting approach for the following reasons:

1. A general permit is an efficient method to establish the essential regulatory requirements for a broad range of construction activities under differing site conditions;
2. A general permit is the most efficient method to handle the large number of construction storm water permit applications;
3. The application process for coverage under a general permit is far less onerous than that for individual permit and hence more cost effective;
4. A general permit is consistent with USEPA's four-tier permitting strategy, the purpose of which is to use the flexibility provided by the CWA in designing a workable and efficient permitting system; and
5. A general permit is designed to provide coverage for a group of related facilities or operations of a specific industry type or group of industries. It is appropriate when the discharge characteristics are sufficiently similar, and a standard set of permit requirements can effectively provide environmental protection and comply with water quality standards for discharges. In most cases, the general permit will provide sufficient and appropriate management requirements to protect the quality of receiving waters from discharges of storm water from construction sites.

There may be instances where a general permit is not appropriate for a specific construction project. A Regional Water Board may require any discharger otherwise covered under the General Permit to apply for and obtain an Individual Permit or apply for coverage under a more specific General Permit. The Regional Water Board must determine that this General Permit does not provide adequate assurance that water quality will be protected, or that there is a site-specific reason why an individual permit should be required.

B. Construction Activities Covered

1. Construction activity subject to this General Permit:

Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or sale of one or more acres of disturbed land surface.

Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to USEPA regulations, such as dairy barns or food processing facilities.

Construction activity associated with LUPs including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete

and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.³

Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction⁴ (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction projects that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the project.

2. Linear Underground/Overhead Projects (LUPs) subject to this General Permit:

Underground/overhead facilities typically constructed as LUPs include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water, wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Water Quality Order 2003-0007-DWQ regulated construction activities associated with small LUPs that resulted in land disturbances greater than one acre, but less than five acres. These projects were considered non-traditional construction projects. Attachment A of this Order now regulates all construction activities from LUPs resulting in land disturbances greater than one acre.

3. Common Plan of Development or Sale

USEPA regulations include the term “common plan of development or sale” to ensure that acreage within a common project does not artificially escape the permit requirements because construction activities are phased, split among smaller parcels, or completed by different owners/developers. In the absence of an

³ Pursuant to the Ninth Circuit Court of Appeals’ decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the USEPA’s petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

⁴ A construction site that includes a dredge and/or fill discharge to any water of the United States (e.g., wetland, channel, pond, or marine water) requires a CWA Section 404 permit from the U.S. Army Corps of Engineers and a CWA Section 401 Water Quality Certification from the Regional Water Board or State Water Board.

exact definition of “common plan of development or sale,” the State Water Board is required to exercise its regulatory discretion in providing a common sense interpretation of the term as it applies to construction projects and permit coverage. An overbroad interpretation of the term would render meaningless the clear “one acre” federal permitting threshold and would potentially trigger permitting of almost any construction activity that occurs within an area that had previously received area-wide utility or road improvements.

Construction projects generally receive grading and/or building permits (Local Permits) from local authorities prior to initiating construction activity. These Local Permits spell out the scope of the project, the parcels involved, the type of construction approved, etc. Referring to the Local Permit helps define “common plan of development or sale.” In cases such as tract home development, a Local Permit will include all phases of the construction project including rough grading, utility and road installation, and vertical construction. All construction activities approved in the Local Permit are part of the common plan and must remain under the General Permit until construction is completed. For custom home construction, Local Permits typically only approve vertical construction as the rough grading, utilities, and road improvements were already independently completed under the a previous Local Permit. In the case of a custom home site, the homeowner must submit plans and obtain a distinct and separate Local Permit from the local authority in order to proceed. It is not the intent of the State Water Board to require permitting for an individual homeowner building a custom home on a private lot of less than one acre if it is subject to a separate Local Permit. Similarly, the installation of a swimming pool, deck, or landscaping that disturbs less than one acre that was not part of any previous Local Permit are not required to be permitted.

The following are several examples of construction activity of less than one acre that would require permit coverage:

- a. A landowner receives a building permit(s) to build tract homes on a 100-acre site split into 200 one-third acre parcels, (the remaining acreage consists of streets and parkways) which are sold to individual homeowners as they are completed. The landowner completes and sells all the parcels except for two. Although the remaining two parcels combined are less than one acre, the landowner must continue permit coverage for the two parcels.
- b. One of the parcels discussed above is sold to another owner who intends to complete the construction as already approved in the Local Permit. The new landowner must file Permit Registration Documents (PRDs) to complete the construction even if the new landowner is required to obtain a separate Local Permit.
- c. Landowner in (1) above purchases 50 additional one half-acre parcels adjacent to the original 200-acre project. The landowner seeks a Local Permit (or amendment to existing Local permit) to build on 20 parcels while leaving the remaining 30 parcels for future development. The landowner must amend PRDs to include the 20 parcels 14 days prior to commencement of construction activity on those parcels.

C. Construction Activities Not Covered

1. Traditional Construction Projects Not Covered

This General Permit does not apply to the following construction activity:

- a. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

- b. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.
- c. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.
- d. Discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction projects in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit. Construction projects within the Lahontan region must also comply with the Lahontan Region Project Guideline for Erosion Control (R6T-2005-0007 Section), which can be found at http://www.waterboards.ca.gov/lahontan/Adopted_Orders/2005/r6t_2005_0007.pdf
- e. Construction activity that disturbs less than one acre of land surface, unless part of a larger common plan of development or the sale of one or more acres of disturbed land surface.
- f. Construction activity covered by an individual NPDES Permit for storm water discharges.
- g. Landfill construction activity that is subject to the Industrial General Permit.
- h. Construction activity that discharges to Combined Sewer Systems.
- i. Conveyances that discharge storm water runoff combined with municipal sewage.
- j. Discharges of storm water identified in CWA § 402(l)(2), 33 U.S.C. § 1342(l)(2).

2. Linear Projects Not Covered

- a. LUP construction activity does not include linear routine maintenance projects. Routine maintenance projects are projects associated with operations and maintenance activities that are conducted on existing lines and facilities and within existing right-of-way, easements, franchise agreements, or other legally binding agreements of the discharger. Routine maintenance projects include, but are not limited to projects that are conducted to:
 - i. Maintain the original purpose of the facility or hydraulic capacity.
 - ii. Update existing lines⁵ and facilities to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity.
 - iii. Repairing leaks.

⁵Update existing lines includes replacing existing lines with new materials or pipes.

Routine maintenance does not include construction of new⁶ lines or facilities resulting from compliance with applicable codes, standards, and regulations.

Routine maintenance projects do not include those areas of maintenance projects that are outside of an existing right-of-way, franchise, easements, or agreements. When a project must secure new areas, those areas may be subject to this General Permit based on the area of disturbed land outside the original right-of-way, easement, or agreement.

- b. LUP construction activity does not include field activities associated with the planning and design of a project (e.g., activities associated with route selection).
- c. Tie-ins conducted immediately adjacent to “energized” or “pressurized” facilities by the discharger are not considered construction activities where all other LUP construction activities associated with the tie-in are covered by an NOI and SWPPP of a third party or municipal agency.

3. EPA’s Small Construction Rainfall Erosivity Waiver

EPA’s Storm Water Phase II Final Rule provides the option for a Small Construction Rainfall Erosivity Waiver. This waiver applies to small construction sites between 1 and 5 acres, and allows permitting authorities to waive those sites that do not have adverse water quality impacts.

Dischargers eligible for this waiver are exempt from Construction General Permit Coverage. In order to obtain the waiver, the discharger must certify to the State Water Board that small construction activity will occur only when the rainfall erosivity factor is less than 5 (“R” in the Revised Universal Soil Loss Equation). The period of construction activity begins at initial earth disturbance and ends with final stabilization. Where vegetation will be used for final stabilization, the date of installation of a practice that provides interim non-vegetative stabilization can be used for the end of the construction period. The operator must agree (as a condition waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization as defined in the General Permit have been met. If use of this interim stabilization eligibility condition was relied on to qualify for the waiver, signature on the waiver with a certification statement constitutes acceptance of and commitment to complete the final stabilization process. The discharger must submit a waiver certification to the State Board prior to commencing construction activities.

USEPA funded a cooperative agreement with Texas A&M University to develop an online rainfall erosivity calculator. Dischargers can access the calculator from EPA’s website at: www.epa.gov/npdes/stormwater/cgp. Use of the calculator allows the discharger to determine potential eligibility for the rainfall erosivity waiver. It may also be useful in determining the time periods during which construction activity could be waived from permit coverage.

⁶New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

D. Obtaining and Terminating Permit Coverage

The appropriate Legally Responsible Person (LRP) must obtain coverage under this General Permit. To obtain coverage, the LRP or the LRP's Approved Signatory must file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

To obtain coverage under this General Permit, LRPs must electronically file the PRDs, which include a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other documents required by this General Permit, and mail the appropriate permit fee to the State Water Board. It is expected that as the storm water program develops, the Regional Water Boards may issue General Permits or Individual Permits that contain more specific permit provisions. When this occurs, this General Permit will no longer regulate those dischargers that obtain coverage under Individual Permits.

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

The application requirements of the General Permit establish a mechanism to clearly identify the responsible parties, locations, and scope of operations of dischargers covered by the General Permit and to document the discharger's knowledge of the General Permit's requirements.

This General Permit provides a grandfathering exception to existing dischargers subject to Water Quality Order No. 99-08-DWQ. Construction projects covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at Risk Level 1. LUP projects covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage at LUP Type 1. The Regional Water Boards have the authority to require Risk Determination to be performed on projects currently covered under Water Quality Order No. 99-08-DWQ and 2003-0007-DWQ where they deem necessary.

LRPs must file a Notice of Termination (NOT) with the Regional Water Board when construction is complete and final stabilization has been reached or ownership has been transferred. The discharger must certify that all State and local requirements have been met in accordance with this General Permit. In order for construction to be found complete, the discharger must install post-construction storm water management measures and establish a long-term maintenance plan. This requirement is intended to ensure that the post-construction conditions at the project site do not cause or contribute to direct or indirect water quality impacts (i.e., pollution and/or hydromodification) upstream and downstream. Specifically, the discharger must demonstrate compliance with the post-construction standards set forth in this General Permit (Section XIII). The discharger is responsible for all compliance issues including all annual fees until the NOT has been filed and approved by the local Regional Water Board.

E. Discharge Prohibitions

This General Permit authorizes the discharge of storm water to surface waters from construction activities that result in the disturbance of one or more acres of land, provided that the discharger satisfies all permit conditions set forth in the Order. This General Permit prohibits the discharge of pollutants other than storm water and non-storm water discharges authorized by this General Permit or another NPDES permit. This General Permit also prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges. In addition, this General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the nine Regional Water Boards. Discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural BMPs. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction projects. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water dewatering, and other discharges not subject to a separate general NPDES permit adopted by a region. Therefore this General Permit authorizes such discharges provided they meet the following conditions.

These authorized non-storm water discharges must:

1. be infeasible to eliminate;
2. comply with BMPs as described in the SWPPP;
3. filter or treat, using appropriate technology, all dewatering discharges from sedimentation basins;
4. meet the NALs for pH and turbidity; and
5. not cause or contribute to a violation of water quality standards.

Additionally, authorized non-storm water discharges must not be used to clean up failed or inadequate construction or post-construction BMPs designed to keep materials onsite. Authorized non-storm water dewatering discharges may require a permit because some Regional Water Boards have adopted General Permits for dewatering discharges.

This General Permit prohibits the discharge of storm water that causes or threatens to cause pollution, contamination, or nuisance.

F. Effluent Standards for All Types of Discharges

1. Technology-Based Effluent Limitations

Permits for storm water discharges associated with construction activity must meet all applicable provisions of Sections 301 and 402 of the CWA. These provisions require controls of pollutant discharges that utilize best available technology economically achievable (BAT) for toxic pollutants and non conventional pollutants and best conventional pollutant control technology (BCT) for conventional pollutants. Additionally, these provisions require controls of pollutant discharges to reduce pollutants and any more stringent controls necessary to meet water quality standards. The USEPA has already established such limitations, known as effluent limitation guidelines (ELGs), for some industrial categories. This is not the case with construction discharges. In instances where there are no ELGs the permit writer is to use best professional judgment (BPJ) to establish requirements that the discharger must meet using BAT/BCT technology. This General Permit contains only narrative effluent limitations and does not contain numeric effluent limitations, except for Active Treatment Systems (ATS).

Order No. 2009-0009-DWQ, as originally adopted by the State Water Board on September 2, 2009, contained numeric effluent limitations for pH (within the range of 6.0 and 9.0 pH units) and turbidity (500 NTU) that applied only to Risk Level 3 and LUP Type 3 construction sites. The State Water Board adopted the numeric effluent limitations as technology-based effluent limitations based upon its best professional judgment. The California Building Industry Association, the Building Industry Legal Defense

Foundation, and the California Business Properties Association (petitioners) challenged Order No. 2009-0009-DWQ in *California Building Industry Association et al. v. State Water Resources Control Board*. On December 27, 2011, the Superior Court issued a judgment and writ of mandamus. The Superior Court ruled in favor of the State Water Board on almost all of the issues the petitioners raised, but the Superior Court invalidated the numeric effluent limitations for pH and turbidity for Risk Level 3 and LUP Type 3 sites because it determined that the State Water Board did not have sufficient BMP performance data to support those numeric effluent limitations. Therefore, the Superior Court concluded that the State Water Board did not comply with the federal regulations that apply to the use of best professional judgment. In invalidating the numeric effluent limitations, the Superior Court also suspended two ancillary requirements (a compliance storm event provision and receiving water monitoring at Risk Level 3 and LUP Type 3 sites that violated the numeric effluent limitations) that related solely to the invalidated numeric effluent limitations.

As a result of the Superior Court's writ of mandamus, this Order no longer contains numeric effluent limitations for pH and turbidity, except for ATS. In addition, as a result of the Superior Court's writ of mandamus, the receiving water monitoring requirements for Risk Level 3 and LUP Type 3 sites were suspended until the State Water Board amended this Order to restore the receiving water monitoring requirements. As amended, this Order now requires Risk Level 3 and LUP Type 3 Dischargers with direct discharges to surface waters to conduct receiving water monitoring whenever their effluent exceeds specified receiving water monitoring triggers. The receiving water monitoring triggers were established at the same levels as the previous numeric effluent limitations (effluent pH outside the range of 6.0 and 9.0 pH units or turbidity exceeding 500 NTU). In restoring the receiving water monitoring requirements, the State Water Board determined that it was appropriate to require receiving water monitoring for these types of sites with direct discharges to surface waters that exceeded the receiving water monitoring triggers under any storm event scenarios, because these sites represent the highest threat to receiving water quality. An exceedance of a receiving water monitoring trigger does not constitute a violation of this General Permit. These receiving water monitoring requirements take effect on the effective date of the amendment to this Order.

BAT/BCT technologies not only include passive systems such as conventional runoff and sediment control, but also treatment systems such as coagulation/flocculation using sand filtration, when appropriate. Such technologies allow for effective treatment of soil particles less 0.02 mm (medium silt) in diameter. The discharger must install structural controls, as necessary, such as erosion and sediment controls that meet BAT and BCT to achieve compliance with water quality standards. The narrative effluent limitations constitute compliance with the requirements of the CWA.

Because the permit is an NPDES permit, there is no legal requirement to address the factors set forth in Water Code sections 13241 and 13263, unless the permit is more stringent than what federal law requires. (See *City of Burbank v. State Water Resources Control Bd.* (2005) 35 Cal.4th 613, 618, 627.) None of the requirements in this permit are more stringent than the minimum federal requirements, which include technology-based requirements achieving BAT/BCT and strict compliance with water quality standards. The inclusion of numeric effluent limitations (NELs) in the permit for Active Treatment Systems does not cause the permit to be more stringent than current federal law. NELs and best management practices are simply two different methods of achieving the same federal requirement: strict compliance with state water quality standards. Federal law authorizes both narrative and numeric effluent limitations to meet state water quality standards. The use of NELs to achieve compliance with water quality standards is not a more stringent requirement than the use of BMPs. (State Water Board Order No. WQ 2006-0012 (*Boeing*).) Accordingly, the State Water Board does not need to take into account the factors in Water Code sections 13241 and 13263.

The State Water Board has concluded that the establishment of BAT/BCT will not create or aggravate other environmental problems through increases in air pollution, solid waste generation, or energy consumption.—While there may be a slight increase in non-water quality impacts due to the implementation of additional monitoring or the construction of additional BMPs, these impacts will be negligible in comparison with the construction activities taking place on site and would be justified by the water quality benefits associated with compliance.

pH Receiving Water Monitoring Trigger

Given the potential contaminants, the minimum standard method for control of pH in runoff requires the use of preventive measures such as avoiding concrete pours during rainy weather, covering concrete and directing flow away from fresh concrete if a pour occurs during rain, covering scrap drywall and stucco materials when stored outside and potentially exposed to rain, and other housekeeping measures. If necessary, pH-impaired storm water from construction sites can be treated in a filter or settling pond or basin, with additional natural or chemical treatment required to meet pH limits set forth in this permit. The basin or pond acts as a collection point and holds storm water for a sufficient period for the contaminants to be settled out, either naturally or artificially, and allows any additional treatment to take place. The State Water Board considers these techniques to be equivalent to BCT. In determining the pH concentration trigger for discharges, the State Water Board used BPJ to set these limitations.

The chosen trigger was established by calculating three standard deviations above and below the mean pH of runoff from highway construction sites⁷ in California. Proper implementation of BMPs should result in discharges that are within the range of 6.0 to 9.0 pH Units.

Turbidity Receiving Water Monitoring Trigger

The Turbidity receiving water monitoring trigger of 500 NTU is a technology-based trigger and was developed using three different analyses aimed at finding the appropriate threshold to set the technology-based limit to ensure environmental protection, effluent quality and cost-effectiveness. The analyses fell into three, main types: (1) an ecoregion-specific dataset developed by Simon et. al. (2004)⁸; (2) Statewide Regional Water Quality Control Board enforcement data; and (3) published, peer-reviewed studies and reports on in-situ performance of best management practices in terms of erosion and sediment control on active construction sites.

A 1:3 relationship between turbidity (expressed as NTU) and suspended sediment concentration (expressed as mg/L) is assumed based on a review of suspended sediment and turbidity data from three gages used in the USGS National Water Quality Assessment Program:

USGS 11074000 SANTA ANA R BL PRADO DAM CA
USGS 11447650 SACRAMENTO R A FREEPORT CA
USGS 11303500 SAN JOAQUIN R NR VERNALIS CA

The receiving water monitoring trigger represents staff determination that the trigger value is the most practicable based on available data. The turbidity receiving water monitoring trigger represents a bridge between the narrative effluent limitations and receiving water limitations. To support this receiving water monitoring trigger, State Water Board staff analyzed construction site discharge information (monitoring data, estimates) and receiving water monitoring information.

Since the turbidity receiving water monitoring trigger represents an appropriate threshold level expected at a site, compliance with this value does not necessarily represent compliance with either the narrative effluent limitations (as enforced through the BAT/BCT standard) or the receiving water limitations. In the San Diego region, some inland surface waters have a receiving water objective for turbidity equal to 20 NTU. Obviously a discharge up to, but not exceeding, the turbidity receiving water monitoring trigger of

⁷ Caltrans Construction Sites Runoff Characterization Study, 2002. Available at: <http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-02-055.pdf>.

500 NTU may still cause or contribute to the exceedance of the 20 NTU standard. Most of the waters of the State are protected by turbidity objectives based on background conditions.

Table 1 - Regional Water Board Basin Plans, Water Quality Objectives for Turbidity

REGIONAL WATER BOARD	WQ Objective	Background/Natural Turbidity	Maximum Increase
1	Based on background	All levels	20%
2	Based on background	> 50 NTU	10%
3	Based on background	0-50 JTU 50-100 JTU > 100 JTU	20% 10 NTU 10%
4	Based on background	0-50 NTU > 50 NTU	20% 10%
5	Based on background	0-5 NTU 5-50 NTU 50-100 NTU >100 NTU	1 NTU 20% 10 NTU 10%
6	Based on background	All levels	10%
7	Based on background	N/A	N/A
8	Based on background	0-50 NTU 50-100 NTU >100 NTU	20% 10 NTU 10%
9	Inland Surface Waters, 20 NTU All others, based on background	 0-50 NTU 50-100 NTU >100 NTU	 20% 10 NTU 10%

Table 2 shows the suspended sediment concentrations at the 1.5 year flow recurrence interval for the 12 ecoregions in California from Simon et. al (2004).

Table 2 - Results of Ecoregion Analysis

Ecoregion	Percent of California Land Area	Median Suspended Sediment Concentration (mg/L)
1	9.1	874
4	0.2	120
5	8.8	35.6
6	20.7	1530
7	7.7	122
8	3.0	47.4
9	9.4	284
13	5.2	143
14	21.7	5150
78	8.1	581
80	2.4	199
81	3.7	503
Area-weighted average		1633

If a 1:3 relationship between turbidity and suspended sediment is assumed, the median turbidity is 544 NTU.

The following table is composed of turbidity readings measured in NTUs from administrative civil liability (ACL) actions for construction sites from 2003 - 2009. This data was derived from the complete listing of construction-related ACLs for the six year period. All ACLs were reviewed and those that included turbidimeter readings at the point of storm water discharge were selected for this dataset.

Table 3 – ACL Sampling Data taken by Regional Water Board Staff

WDID#	Region	Discharger	Turbidity (NTU)
5S34C331884	5S	Bradshaw Interceptor Section 6B	1800
5S05C325110	5S	Bridalwood Subdivision	1670
5S48C336297	5S	Cheyenne at Browns Valley	1629
5R32C314271	5R	Grizzly Ranch Construction	1400
6A090406008	6T	El Dorado County Department of Transportation, Angora Creek	97.4
5S03C346861	5S	TML Development, LLC	1600
6A31C325917	6T	Northstar Village	See Subdata Set

Subdata Set - Turbidity for point of storm water runoff discharge at Northstar Village

Date	Turbidity (NTU)	Location
10/5/2006	900	Middle Martis Creek
11/2/2006	190	Middle Martis Creek
01/04/2007	36	West Fork, West Martis Creek
02/08/2007	180	Middle Martis Creek
02/09/2007	130	Middle Martis Creek
02/09/2007	290	Middle Martis Creek
02/09/2007	100	West Fork, West Martis Creek
02/10/2007	28	Middle Martis Creek
02/10/2007	23	Middle Martis Creek
02/10/2007	32	Middle Martis Creek
02/10/2007	12	Middle Martis Creek
02/10/2007	60	West Fork, West Martis Creek
02/10/2007	34	West Fork, West Martis Creek

A 95% confidence interval for mean turbidity in an ACL order was constructed. The data set used was a small sample size, so the 500 NTU (the value derived as the receiving water monitoring trigger for this General Permit) needed to be verified as a possible population mean. In this case, the population refers to a hypothetical population of turbidity measurements of which our sample of 20 represents. A t-distribution was assumed due to the small sample size:

Mean: 512.23 NTU
Standard Deviation: 686.85
Margin of Error: 321.45
Confidence Interval: 190.78 NTU (Low)
833.68 NTU (High)

Based on a constructed 95% confidence interval, an ACL order turbidity measurement will be between 190.78 – 833.68 NTU. 500 NTU falls within this range. Using the same data set, a small-sample hypothesis test was also performed to test if the ACL turbidity data set contains enough information to cast doubt on choosing a 500 NTU as a mean. 500 NTU was again chosen due to its proposed use as an acceptable value. The test was carried out using a 95% confidence interval. Results indicated that the ACL turbidity data set *does not* contain significant sample evidence to reject the claim of 500 NTU as an acceptable mean for the ACL turbidity population.

There are not many published, peer-reviewed studies and reports on in-situ performance of best management practices in terms of erosion and sediment control on active construction sites. The most often cited study is a report titled, "Improving the Cost Effectiveness of Highway Construction Site Erosion and Pollution Control" (Horner, Guedry, and Korten Hof 1990, <http://www.wsdot.wa.gov/Research/Reports/200/200.1.htm>). In a comment letter summarizing this report sent to the State Water Board, the primary author, Dr. Horner, states:

“The most effective erosion control product was wood fiber mulch applied at two different rates along with a bonding agent and grass seed in sufficient time before the tests to achieve germination. Plots treated in this way reduced influent turbidity by more than 97 percent and discharged effluent exhibiting mean and maximum turbidity values of 21 and 73 NTU, respectively. Some other mulch and blanket materials performed nearly as well. These tests demonstrated the control ability of widely available BMPs over a very broad range of erosion potential.”

Other technologies studied in this report produced effluent quality at or near 100 NTU. It is the BPJ of the State Water Board staff that erosion control, while preferred, is not always an option on construction sites and that technology performance in a controlled study showing effluent quality directly leaving a BMP is always easier and cheaper to control than effluent being discharged from the project (edge of property, etc.). As a result, it is the BPJ of the State Water Board staff that it is not cost effective or feasible, at this time, for all risk level and type 3 sites in California to achieve effluent discharges with turbidity values that are less than 100 NTU.

To summarize, the analysis showed that: (1) results of the Simon et. al dataset reveals turbidity values in background receiving water in California's ecoregions range from 16 NTU to 1716 NTU (with a mean of 544 NTU); (2) based on a constructed 95% confidence interval, construction sites will be subject to administrative civil liability (ACL) when their turbidity measurement falls between 190.78 – 833.68 NTU; and (3) sites with highly controlled discharges employing and maintaining good erosion control practices can discharge effluent from the BMP with turbidity values less than 100 NTU. State Water Board staff has determined, using its BPJ, that it is most cost effective to set the receiving water monitoring trigger for turbidity at 500 NTU.

i. ***Compliance Storm Event***

While this General Permit no longer contains “compliance storm event” exceptions from technology-based NELs, the “compliance storm event” exception from the ATS NELs remain in effect. See Section K of this Fact Sheet, and Attachment F of this General Permit for more information.

a. TMDLs and Waste Load Allocations

Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL for sediment has been adopted by the Regional Water Board or USEPA, must comply with the approved TMDL if it identifies “construction activity” or land disturbance as a source of sediment. If it does, the

TMDL should include a specific waste load allocation for this activity/source. The discharger, in this case, may be required by a separate Regional Water Board order to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. If a specific waste load allocation has been established that would apply to a specific discharge, the Regional Water Board may adopt an order requiring specific implementation actions necessary to meet that allocation. In the instance where an approved TMDL has specified a general waste load allocation to construction storm water discharges, but no specific requirements for construction sites have been identified in the TMDL, dischargers must consult with the state TMDL authority⁹ to confirm that adherence to a SWPPP that meets the requirements of the General Permit will be consistent with the approved TMDL.

2. Determining Compliance with Effluent Standards

a. Technology-Based Numeric Action Levels (NALs)

This General Permit contains technology-based NALs for pH and turbidity, and requirements for effluent monitoring at all Risk level 2 & 3, and LUP Type 2 & 3 sites. Numeric action levels are essentially numeric benchmark values for certain parameters that, if exceeded in effluent sampling, trigger the discharger to take actions. Exceedance of an NAL does not itself constitute a violation of the General Permit. If the discharger fails to take the corrective action required by the General Permit, though, that may constitute a violation.

The primary purpose of NALs is to assist dischargers in evaluating the effectiveness of their on-site measures. Construction sites need to employ many different systems that must work together to achieve compliance with the permit's requirements. The NALs chosen should indicate whether the systems are working as intended.

Another purpose of NALs is to provide information regarding construction activities and water quality impacts. This data will provide the State and Regional Water Boards and the rest of the storm water community with more information about levels and types of pollutants present in runoff and how effective the dischargers BMPs are at reducing pollutants in effluent. The State Water Board also hopes to learn more about the linkage between effluent and receiving water quality. In addition, these requirements will provide information on the mechanics needed to establish compliance monitoring programs at construction sites in future permit deliberations.

i. pH

The chosen limits were established by calculating one standard deviation above and below the mean pH of runoff from highway construction sites¹⁰ in California. Proper implementation of BMPs should result in discharges that are within the range of 6.5 to 8.5 pH Units.

⁹ <http://www.waterboards.ca.gov/tmdl/tmdl.html>.

¹⁰ Caltrans Construction Sites Runoff Characterization Study, 2002. Available at: <http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-02-055.pdf>.

The Caltrans study included 33 highway construction sites throughout California over a period of four years, which included 120 storm events. All of these sites had BMPs in place that would be generally implemented at all types of construction sites in California.

ii. Turbidity

BPJ was used to develop an NAL that can be used as a learning tool to help dischargers improve their site controls, and to provide meaningful information on the effectiveness of storm water controls. A statewide turbidity NAL has been set at 250 NTU.

G. Receiving Water Limitations

Construction-related activities that cause or contribute to an exceedance of water quality standards must be addressed. The dynamic nature of construction activity gives the discharger the ability to quickly identify and monitor the source of the exceedances. This is because when storm water mobilizes sediment, it provides visual cues as to where corrective actions should take place and how effective they are once implemented.

This General Permit requires that storm water discharges and authorized non-storm water discharges must not contain pollutants that cause or contribute to an exceedance of any applicable water quality objective or water quality standards. The monitoring requirements in this General Permit for sampling and analysis procedures will help determine whether BMPs installed and maintained are preventing pollutants in discharges from the construction site that may cause or contribute to an exceedance of water quality standards.

Water quality standards consist of designated beneficial uses of surface waters and the adoption of ambient criteria necessary to protect those uses. When adopted by the State Water Board or a Regional Water Board, the ambient criteria are termed “water quality objectives.” If storm water runoff from construction sites contains pollutants, there is a risk that those pollutants could enter surface waters and cause or contribute to an exceedance of water quality standards. For that reason, dischargers should be aware of the applicable water quality standards in their receiving waters. (The best method to ensure compliance with receiving water limitations is to implement BMPs that prevent pollutants from contact with storm water or from leaving the construction site in runoff.)

In California, water quality standards are published in the Basin Plans adopted by each Regional Water Board, the California Toxics Rule (CTR), the National Toxics Rule (NTR), and the Ocean Plan.

Dischargers can determine the applicable water quality standards by contacting Regional Water Board staff or by consulting one of the following sources. The actual Basin Plans that contain the water quality standards can be viewed at the website of the appropriate Regional Water Board. (<http://www.waterboards.ca.gov/regions.html>), the State Water Board site for statewide plans (<http://www.waterboards.ca.gov/plnspols/index.html>), or the USEPA regulations for the NTR and CTR (40 C.F.R. §§ 131.36-38). Basin Plans and statewide plans are also available by mail from the appropriate Regional Water Board or the State Water Board. The USEPA regulations are available at <http://www.epa.gov/>. Additional information concerning water quality standards can be accessed through http://www.waterboards.ca.gov/stormwtr/gen_const.html.

H. Training Qualifications and Requirements

The Blue Ribbon Panel (BRP) made the following observation about the lack of industry-specific training requirements:

“Currently, there is no required training or certification program for contractors, preparers of soil erosion and sediment control Storm Water Pollution Prevention Plans, or field inspectors.”

Order 99-08-DWQ required that all dischargers train their employees on how to comply with the permit, but it did not specify a curriculum or certification program. This has resulted in inconsistent implementation by all affected parties - the dischargers, the local governments where the construction activity occurs, and the regulators required to enforce 99-08-DWQ. This General Permit requires Qualified SWPPP Developers and practitioners to obtain appropriate training, and makes this curriculum mandatory two years after adoption, to allow time for course completion. The State and Regional Water Board are working with many stakeholders to develop the curriculum and mechanisms needed to develop and deliver the courses.

To ensure that the preparation, implementation, and oversight of the SWPPP is sufficient for effective pollution prevention, the Qualified SWPPP Developer and Qualified SWPPP Practitioners responsible for creating, revising, overseeing, and implementing the SWPPP must attend a State Water Board-sponsored or approved Qualified SWPPP Developer and Qualified SWPPP Practitioner training course.

I. Sampling, Monitoring, Reporting and Record Keeping

1. Traditional Construction Monitoring Requirements

This General Permit requires visual monitoring at all sites, and effluent water quality at all Risk Level 2 & 3 sites. It requires receiving water monitoring at some Risk Level 3 sites. All sites are required to submit annual reports, which contain various types of information, depending on the site characteristics and events. A summary of the monitoring and reporting requirements is found in Table 4.

Table 4 - Required Monitoring Elements for Risk Levels

	Visual	Non-visible Pollutant	Effluent	Receiving Water
Risk Level 1			where applicable	not required
Risk Level 2			pH, turbidity	not required
Risk Level 3	three types required for all Risk Levels: non-storm water, pre-rain and post-rain	As needed for all Risk Levels (see below)	pH, turbidity	(if Receiving Water Monitoring Trigger exceeded) pH, turbidity and SSC. Bioassessment for sites 30 acres or larger.

a. Visual

All dischargers are required to conduct quarterly, non-storm water visual inspections. For these inspections, the discharger must visually observe each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources. For storm-related inspections, dischargers must visually observe storm water discharges at all discharge locations within two business days after a qualifying event. For this requirement, a qualifying rain event is one producing precipitation of ½ inch or more of discharge. Dischargers must conduct a post-storm event inspection to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify any additional BMPs necessary and revise the SWPPP accordingly. Dischargers must maintain on-site records of all visual observations, personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

b. Non-Visible Pollutant Monitoring

This General Permit requires that all dischargers develop a sampling and analysis strategy for monitoring pollutants that are not visually detectable in storm water. Monitoring for non-visible pollutants must be required at any construction site when the exposure of construction materials occurs and where a discharge can cause or contribute to an exceedance of a water quality objective.

Of significant concern for construction discharges are the pollutants found in materials used in large quantities at construction sites throughout California and exposed throughout the rainy season, such as cement, flyash, and other recycled materials or by-products of combustion. The water quality standards that apply to these materials will depend on their composition. Some of the more common storm water pollutants from construction activity are not CTR pollutants. Examples of non-visible pollutants include glyphosate (herbicides), diazinon and chlorpyrifos (pesticides), nutrients (fertilizers), and molybdenum (lubricants). The use of diazinon and chlorpyrifos is a common practice among landscaping professionals and may trigger sampling and analysis requirements if these materials come into contact with storm water. High pH values from cement and gypsum, high pH and SSC from wash waters, and chemical/fecal contamination from portable toilets, also are not CTR pollutants. Although some of these constituents do have numeric water quality objectives in individual Basin Plans, many do not and are subject only to narrative water quality standards (i.e. not causing toxicity). Dischargers are encouraged to discuss these issues with Regional Water Board staff and other storm water quality professionals.

The most effective way to avoid the sampling and analysis requirements, and to ensure permit compliance, is to avoid the exposure of construction materials to precipitation and storm water runoff. Materials that are not exposed do not have the potential to enter storm water runoff, and therefore receiving waters sampling is not required. Preventing contact between storm water and construction materials is one of the most important BMPs at any construction site.

Preventing or eliminating the exposure of pollutants at construction sites is not always possible. Some materials, such as soil amendments, are designed to be used in a manner that will result in exposure to storm water. In these cases, it is important to make sure that these materials are applied according to the manufacturer's instructions and at a time when they are unlikely to be washed away. Other construction materials can be exposed when storage, waste disposal or the application of the material is done in a manner not protective of water quality. For these situations, sampling is required unless there is capture and containment of all storm water that has been exposed. In cases where construction materials may be exposed to storm water, but the storm water is contained and is not allowed to run off the site, sampling will only be required when inspections show that the containment failed or is breached, resulting in potential exposure or discharge to receiving waters.

The discharger must develop a list of potential pollutants based on a review of potential sources, which will include construction materials soil amendments, soil treatments, and historic contamination at the site. The discharger must review existing environmental and real estate documentation to determine the potential for pollutants that could be present on the construction site as a result of past land use activities.

Good sources of information on previously existing pollution and past land uses include:

- i. Environmental Assessments;
- ii. Initial Studies;
- iii. Phase 1 Assessments prepared for property transfers; and
- iv. Environmental Impact Reports or Environmental Impact Statements prepared under the requirements of the National Environmental Policy Act or the California Environmental Quality Act.

In some instances, the results of soil chemical analyses may be available and can provide additional information on potential contamination.

The potential pollutant list must include all non-visible pollutants that are known or should be known to occur on the construction site including, but not limited to, materials that:

- i. are being used in construction activities;
- ii. are stored on the construction site;
- iii. were spilled during construction operations and not cleaned up;
- iv. were stored (or used) in a manner that created the potential for a release of the materials during past land use activities;
- v. were spilled during previous land use activities and not cleaned up; or
- vi. were applied to the soil as part of past land use activities.

C. Effluent Monitoring

Federal regulations¹¹ require effluent monitoring for discharges subject to NALs. Subsequently, all Risk Level 2 and 3 dischargers must perform sampling and analysis of effluent discharges to characterize discharges associated with construction activity from the entire area disturbed by the project. Dischargers must collect samples of stored or contained storm water that is discharged subsequent to a storm event producing precipitation of ½ inch or more at the time of discharge.

Table 5 - Storm Water Effluent Monitoring Requirements by Risk Level

	Frequency	Effluent Monitoring (Section E, below)
Risk Level 1	when applicable	non-visible pollutant parameters (if applicable)
Risk Level 2	Minimum of 3 samples per day during qualifying rain event characterizing discharges associated with construction activity from the entire project disturbed area.	pH, turbidity, and non-visible pollutant parameters (if applicable)
Risk Level 3	Minimum of 3 samples per day during qualifying rain event characterizing discharges associated with construction activity from the entire project disturbed area.	pH, turbidity, and non-visible pollutant parameters if applicable

Risk Level 1 dischargers must analyze samples for:

- i. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment C contained in the General Permit.

¹¹ 40 C.F.R. § 122.44.

Risk Level 2 dischargers must analyze samples for:

- i. pH and turbidity;
- ii. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment D contained in the General Permit, and
- iii. any additional parameters for which monitoring is required by the Regional Water Board.

Risk Level 3 dischargers must analyze samples for:

- i. pH, turbidity;
- ii. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment E contained in the General Permit, and
- iii. any additional parameters for which monitoring is required by the Regional Water Board.

2. Linear Monitoring and Sampling Requirements

Attachment A, establishes minimum monitoring and reporting requirements for all LUPs. It establishes different monitoring requirements depending on project complexity and risk to water quality. The monitoring requirements for Type 1 LUPs are less than Type 2 & 3 projects because Type 1 projects have a lower potential to impact water quality.

A discharger shall prepare a monitoring program prior to the start of construction and immediately implement the program at the start of construction for LUPs. The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project.

a. Type 1 LUP Monitoring Requirements

A discharger must conduct daily visual inspections of Type 1 LUPs during working hours while construction activities are occurring. Inspections are to be conducted by qualified personnel and can be conducted in conjunction with other daily activities. Inspections will be conducted to ensure the BMPs are adequate, maintained, and in place at the end of the construction day. The discharger will revise the SWPPP, as appropriate, based on the results of the daily inspections. Inspections can be discontinued in non-active construction areas where soil disturbing activities have been completed and final stabilization has been achieved (e.g., trench has been paved, substructures have been installed, and successful final vegetative cover or other stabilization criteria have been met).

A discharger shall implement the monitoring program for inspecting Type 1 LUPs. This program requires temporary and permanent stabilization BMPs after active construction is completed. Inspection activities will continue until adequate permanent stabilization has been established and will continue in areas where re-vegetation is chosen until minimum vegetative coverage has been established. Photographs shall be taken during site inspections and submitted to the State Water Board.

b. Type 2 & 3 LUP Monitoring Requirements

A discharger must conduct daily visual inspections of Type 2 & 3 LUPs during working hours while construction activities are occurring. Inspections are to be conducted by qualified personnel and can be in conjunction with other daily activities.

All dischargers of Type 2 & 3 LUPs are required to conduct inspections by qualified personnel of the construction site during normal working hours prior to all anticipated storm events and after actual storm events. During extended storm events, the discharger shall conduct inspections during normal working hours for each 24-hour period. Inspections can be discontinued in non-active construction areas where soil disturbing activities have been completed and final stabilization has been achieved (e.g., trench has been paved, substructures installed, and successful vegetative cover or other stabilization criteria have been met).

The goals of these inspections are (1) to identify areas contributing to a storm water discharge; (2) to evaluate whether measures to reduce pollutant loadings identified in the SWPPP are adequate and properly installed and functioning in accordance with the terms of the General Permit; and (3) to determine whether additional control practices or corrective maintenance activities are needed. Equipment, materials, and workers must be available for rapid response to failures and emergencies. All corrective maintenance to BMPs shall be performed as soon as possible, depending upon worker safety.

All dischargers shall develop and implement a monitoring program for inspecting Type 2 & 3 LUPs that require temporary and permanent stabilization BMPs after active construction is completed. Inspections will be conducted to ensure the BMPs are adequate and maintained. Inspection activities will continue until adequate permanent stabilization has been established and will continue in areas where revegetation is chosen until minimum vegetative coverage has been established.

A log of inspections conducted before, during, and after the storm events must be maintained in the SWPPP. The log will provide the date and time of the inspection and who conducted the inspection. Photographs must be taken during site inspections and submitted to the State Water Board.

C. Sampling Requirements for all LUP Project Types

LUPs are also subject to sampling and analysis requirements for visible pollutants (i.e., sedimentation/siltation, turbidity) and for non-visible pollutants.

Sampling for visible pollutants is required for Type 2 & 3 LUPs.

Non-visible pollutant monitoring is required for pollutants associated with construction sites and activities that (1) are not visually detectable in storm water discharges, and (2) are known or should be known to occur on the construction site, and (3) could cause or contribute to an exceedance of water quality objectives in the receiving waters. Sample collection for non-visible pollutants must only be required (1) during a storm event when pollutants associated with construction activities may be discharged with storm water runoff due to a spill, or in the event there was a breach, malfunction, failure, and/or leak of any BMP, and (2) when the discharger has failed to adequately clean the area of material and pollutants. Failure to implement appropriate BMPs will trigger the same sampling requirements as those required for a breach, malfunction and/or leak, or when the discharger has failed to implement appropriate BMPs prior to the next storm event.

Additional monitoring parameters may be required by the Regional Water Boards.

It is not anticipated that many LUPs will be required to collect samples for pollutants not visually detected in runoff due to the nature and character of the construction site and activities as previously described in this fact sheet. Most LUPs are constructed in urban areas with public access (e.g., existing roadways, road shoulders, parking areas, etc.). This raises a concern regarding the potential contribution of pollutants from vehicle use and/or from normal activities of the public (e.g., vehicle washing, landscape fertilization, pest spraying, etc.) in runoff from the project site. Since the dischargers are not the land owners of the project area and are not able to control the presence of these pollutants in the storm water that runs through their projects, it is not the intent of this General Permit to require dischargers to sample for these pollutants. This General Permit does not require the discharger to sample for these types of pollutants except where the discharger has brought materials onsite that contain these pollutants and when a condition (e.g., breach, failure, etc.) described above occurs.

3. Receiving Water Monitoring

In order to ensure that receiving water limitations are met, dischargers subject to receiving water monitoring triggers (i.e., Risk Level 3 and LUP Type 3 sites) or numeric effluent limitations (i.e., Risk Level 3 and LUP Type 3 sites utilizing ATS with direct discharges into receiving waters) must also monitor the downstream receiving water(s) for turbidity, SSC, and pH (if applicable) when a receiving water monitoring trigger or NEL is exceeded.

a. Bioassessment Monitoring

This General Permit requires a bioassessment of receiving waters for dischargers of Risk Level 3 or LUP Type 3 construction projects equal to or larger than 30 acres with direct discharges into receiving waters. Benthic macroinvertebrate samples will be taken upstream and downstream of the site's discharge point in the receiving water. Bioassessments measure the quality of the stream by analyzing the aquatic life present. Higher levels of appropriate aquatic species tend to indicate a healthy stream; whereas low levels of organisms can indicate stream degradation. Active construction sites have the potential to discharge large amounts of sediment and pollutants into receiving waters. Requiring a bioassessment for large project sites, with the most potential to impact water quality, provides a snapshot of the health of the receiving water prior to initiation of construction activities. This snapshot can be used in comparison to the health of the receiving water after construction has commenced.

Each ecoregion (biologically and geographically related area) in the State has a specific yearly peak time where stream biota is in a stable and abundant state. This time of year is called an Index Period. The bioassessment requirements in this General Permit, requires benthic macroinvertebrate sampling within a sites index period. The State Water Board has developed a map designating index periods for the ecoregions in the State (see State Water Board Website).

This General Permit requires the bioassessment methods to be in accordance with the Surface Water Ambient Monitoring Program (SWAMP) in order to provide data consistency within the state as well as generate useable biological stream data.

Table 6 - Receiving Water Monitoring Requirements

	Receiving Water Monitoring Parameters
Risk Level 1 /LUP Type 1	not required
Risk Level 2 / LUP Type 2	not required
Risk Level 3 / LUP Type 3	If Receiving Water Monitoring Trigger exceeded: pH (if applicable), turbidity, and SSC. Bioassessment for sites 30 acres or larger.

4. Reporting Requirements

a. NAL Exceedance Report

All Risk Level 3 and LUP Type 3 dischargers must electronically submit all storm event sampling results to the State And Regional Boards, via the electronic data system, no later than 10 days after the conclusion of the storm event.

b. Annual Report

All dischargers must prepare and electronically submit an annual report no later than September 1 of each year using the Storm water Multi-Application Reporting and Tracking System (SMARTS). The

Annual Report must include a summary and evaluation of all sampling and analysis results, original laboratory reports, chain of custody forms, a summary of all corrective actions taken during the compliance year, and identification of any compliance activities or corrective actions that were not implemented.

5. Record Keeping

According to 40 C.F.R. Parts 122.21(p) and 122.41(j), the discharger is required to retain paper or electronic copies of all records required by this General Permit for a period of at least three years from the date generated or the date submitted to the State Water Board or Regional Water Boards. A discharger must retain records for a period beyond three years as directed by Regional Water Board.

J. Risk Determination

1. Traditional Projects

a. Overall Risk Determination

There are two major requirements related to site planning and risk determination in this General Permit. The project's overall risk is broken up into two elements – (1) project sediment risk (the relative amount of sediment that can be discharged, given the project and location details) and (2) receiving water risk (the risk sediment discharges pose to the receiving waters).

Project Sediment Risk:

Project Sediment Risk is determined by multiplying the R, K, and LS factors from the Revised Universal Soil Loss Equation (RUSLE) to obtain an estimate of project-related bare ground soil loss expressed in tons/acre. The RUSLE equation is as follows:

$$A = (R)(K)(LS)(C)(P)$$

Where: A = the rate of sheet and rill erosion

R = rainfall-runoff erosivity factor

K = soil erodibility factor

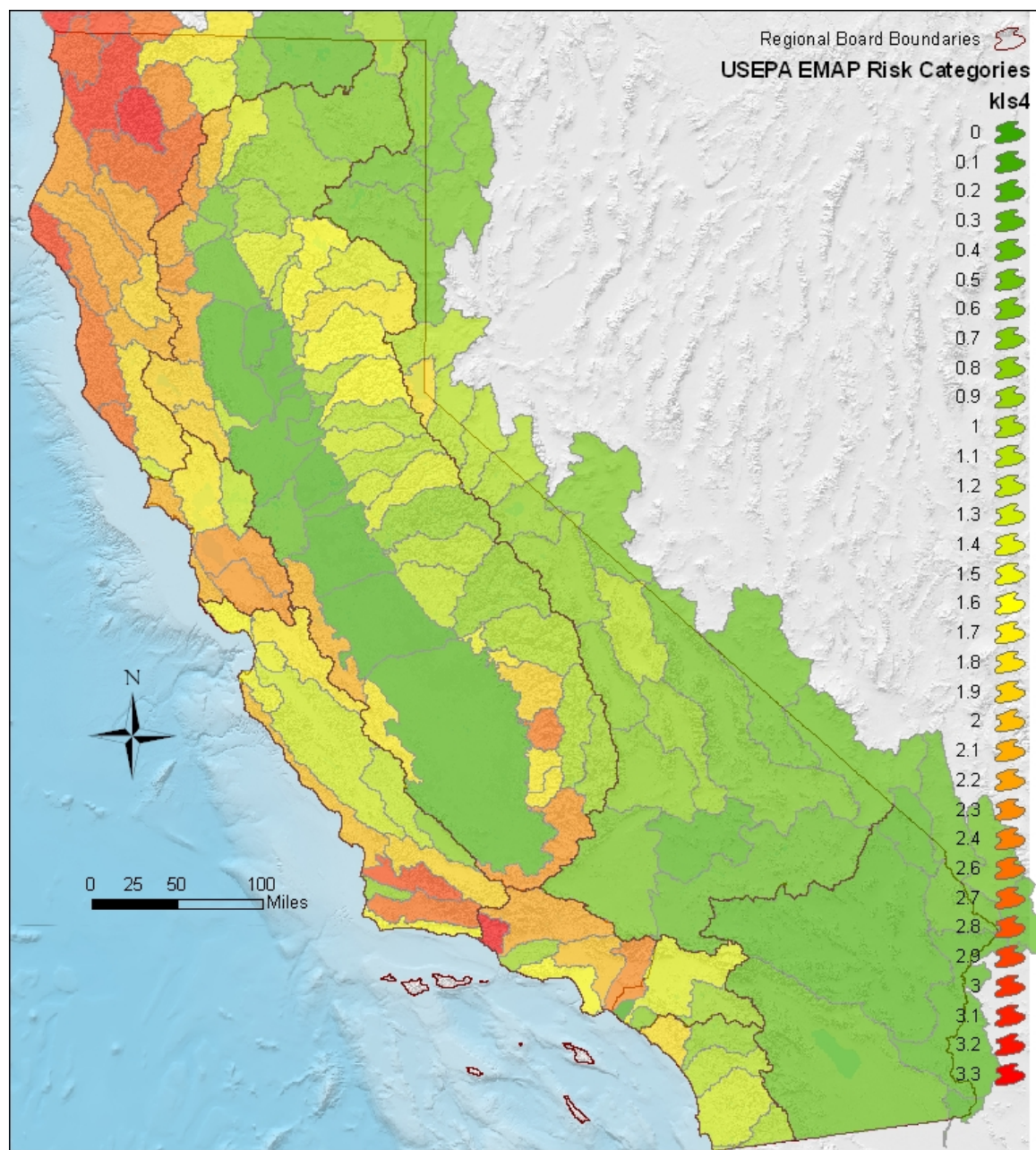
LS = length-slope factor

C = cover factor (erosion controls)

P = management operations and support practices (sediment controls)

The C and P factors are given values of 1.0 to simulate bare ground conditions.

There is a map option and a manual calculation option for determining soil loss. For the map option, the R factor for the project is calculated using the online calculator at <http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm>. The product of K and LS are shown on Figure 1. To determine soil loss in tons per acre, the discharger multiplies the R factor times the value for K times LS from the map.



State Water Resources Control Board, January 15, 2008

Figure 1 -Statewide Map of K * LS

For the manual calculation option, the R factor for the project is calculated using the online calculator at <http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm>. The K and LS factors are determined using Appendix 1.

Soil loss of less than 15 tons/acre is considered **low** sediment risk.
 Soil loss between 15 and 75 tons/acre is **medium** sediment risk.
 Soil loss over 75 tons/acre is considered **high** sediment risk.

The soil loss values and risk categories were obtained from mean and standard deviation RKLS values from the USEPA EMAP program. High risk is the mean RKLS value plus two standard deviations. Low risk is the mean RKLS value minus two standard deviations.

Receiving Water Risk:

Receiving water risk is based on whether a project drains to a sediment-sensitive waterbody. A sediment-sensitive waterbody is either

on the most recent 303d list for waterbodies impaired for sediment;
has a USEPA-approved Total Maximum Daily Load implementation plan for sediment; **or**
has the beneficial uses of COLD, SPAWN, and MIGRATORY.

A project that meets at least one of the three criteria has a high receiving water risk. A list of sediment-sensitive waterbodies will be posted on the State Water Board's website. It is anticipated that an interactive map of sediment sensitive water bodies in California will be available in the future.

The Risk Levels have been altered by eliminating the possibility of a Risk Level 4, and expanding the constraints for Risk Levels 1, 2, and 3. Therefore, projects with high receiving water risk and high sediment risk will be considered a Risk Level 3 risk to water quality.

In response to public comments, the Risk Level requirements have also been changed such that Risk Level 1 projects will be subject to minimum BMP and visual monitoring requirements, Risk Level 2 projects will be subject to NALs and some additional monitoring requirements, and Risk Level 3 projects will be subject to NALs, and more rigorous monitoring requirements such as receiving water monitoring and in some cases bioassessment.

Table 7 - Combined Risk Level Matrix

Combined Risk Level Matrix				
Receiving Water Risk		Sediment Risk		
		Low	Medium	High
	Low	Level 1	Level 2	
	High	Level 2		Level 3

b. Effluent Standards

All dischargers are subject to the narrative effluent limitations specified in the General Permit. The narrative effluent limitations require storm water discharges associated with construction activity to meet all applicable provisions of Sections 301 and 402 of the CWA. These provisions require controls of pollutant discharges that utilize BAT and BCT to reduce pollutants and any more stringent controls necessary to meet water quality standards.

Risk Level 2 dischargers that pose a medium risk to water quality are subject to technology-based NALs for pH and turbidity. Risk Level 3 dischargers that pose a high risk to water quality are also subject to technology-based NALs for pH and turbidity.

C. Good Housekeeping

Proper handling and managing of construction materials can help minimize threats to water quality. The discharger must consider good housekeeping measures for: construction materials, waste management, vehicle storage & maintenance, landscape materials, and potential pollutant sources. Examples include; conducting an inventory of products used, implementing proper storage & containment, and properly cleaning all leaks from equipment and vehicles.

d. Non-Storm Water Management

Non-storm water discharges directly connected to receiving waters or the storm drain system have the potential to negatively impact water quality. The discharger must implement measures to control all non-storm water discharges during construction, and from dewatering activities associated with construction. Examples include; properly washing vehicles in contained areas, cleaning streets, and minimizing irrigation runoff.

e. Erosion Control

The best way to minimize the risk of creating erosion and sedimentation problems during construction is to disturb as little of the land surface as possible by fitting the development to the terrain. When development is tailored to the natural contours of the land, little grading is necessary and, consequently, erosion potential is lower.¹⁴ Other effective erosion control measures include: preserving existing vegetation where feasible, limiting disturbance, and stabilizing and re-vegetating disturbed areas as soon as possible after grading or construction activities. Particular attention must be paid to large, mass-graded sites where the potential for soil exposure to the erosive effects of rainfall and wind is great and where there is potential for significant sediment discharge from the site to surface waters. Until permanent vegetation is established, soil cover is the most cost-effective and expeditious method to protect soil particles from detachment and transport by rainfall. Temporary soil stabilization can be the single most important factor in reducing erosion at construction sites. The discharger is required to consider measures such as: covering disturbed areas with mulch, temporary seeding, soil stabilizers, binders, fiber rolls or blankets, temporary vegetation, and permanent seeding. These erosion control measures are only examples of what should be considered and should not preclude new or innovative approaches currently available or being developed. Erosion control BMPs should be the primary means of preventing storm water contamination, and sediment control techniques should be used to capture any soil that becomes eroded.¹²

Risk Level 3 dischargers pose a higher risk to water quality and are therefore additionally required to ensure that post-construction soil loss is equivalent to or less than the pre-construction levels.

f. Sediment Control

Sediment control BMPs should be the secondary means of preventing storm water contamination. When erosion control techniques are ineffective, sediment control techniques should be used to capture any soil that becomes eroded. The discharger is required to consider perimeter control measures such as: installing silt fences or placing straw wattles below slopes. These sediment control measures are only

¹² U.S. Environmental Protection Agency. 2007. Developing Your Storm Water Pollution Prevention Plan: A Guide for Construction Sites.

examples of what should be considered and should not preclude new or innovative approaches currently available or being developed.

Because Risk Level 2 and 3 dischargers pose a higher risk to water quality, additional requirements for the application of sediment controls are imposed on these projects. This General Permit also authorizes the Regional Water Boards to require Risk Level 3 dischargers to implement additional site-specific sediment control requirements if the implementation of other erosion or sediment controls are not adequately protecting the receiving waters.

g. Run-on and Runoff Control

Inappropriate management of run-on and runoff can result in excessive physical impacts to receiving waters from sediment and increased flows. The discharger is required to manage all run-on and runoff from a project site. Examples include: installing berms and other temporary run-on and runoff diversions.

Risk Level 1 dischargers with lower risks to impact water quality are not subject to the run-on and runoff control requirements unless an evaluation deems them necessary or visual inspections show that such controls are required.

h. Inspection, Maintenance and Repair

All measures must be periodically inspected, maintained and repaired to ensure that receiving water quality is protected. Frequent inspections coupled with thorough documentation and timely repair is necessary to ensure that all measures are functioning as intended.

i. Rain Event Action Plan (REAP)

A Rain Event Action Plan (REAP) is a written document, specific for each rain event. A REAP should be designed that when implemented it protects all exposed portions of the site within 48 hours of any likely precipitation event forecast of 50% or greater probability.

This General Permit requires Risk Level 2 and 3 dischargers to develop and implement a REAP designed to protect all exposed portions of their sites within 48 hours prior to any likely precipitation event. The REAP requirement is designed to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures that are intended to reduce the amount of sediment and other pollutants generated from the active site. A REAP must be developed when there is likely a forecast of 50% or greater probability of precipitation in the project area. (The National Oceanic and Atmospheric Administration (NOAA) defines a chance of precipitation as a probability of precipitation of 30% to 50% chance of producing precipitation in the project area.¹³ NOAA defines the probability of precipitation (PoP) as the likelihood of occurrence (expressed as a percent) of a measurable amount (0.01 inch or more) of liquid precipitation (or the water equivalent of frozen precipitation) during a specified period of time at any given point in the forecast area.) Forecasts are normally issued for 12-hour time periods. Descriptive terms for uncertainty and aerial coverage are used as follows:

Table 8 -National Oceanic and Atmospheric Administration (NOAA) Definition of Probability of Precipitation (PoP)

¹³ <http://www.crh.noaa.gov/lot/severe/wxterms.php>.

PoP	Expressions of Uncertainty	Aerial Coverage
0%	none used	none used
10%	none used	isolated
20%	slight chance	isolated
30-50%	chance	scattered
60-70%	likely	numerous
80-100%	none used	none used

The discharger must obtain the precipitation forecast information from the National Weather Service Forecast Office (<http://www.srh.noaa.gov/>).

2. Linear Projects

a. Linear Risk Determination

LUPs vary in complexity and water quality concerns based on the type of project. This General Permit has varying application requirements based on the project's risk to water quality. Factors that lead to the characterization of the project include location, sediment risk, and receiving water risk.

Based on the location and complexity of a project area or project section area, LUPs are separated into project types. As described below, LUPs have been categorized into three project types.

i. *Type 1 LUPs*

Type 1 LUPs are those construction projects where:

- (1) 70 percent or more of the construction activity occurs on a paved surface and where areas disturbed during construction will be returned to preconstruction conditions or equivalent protection established at the end of the construction activities for the day, or
- (2) greater than 30 percent of construction activities occur within the non-paved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them where:

Areas disturbed during construction will be returned to pre-construction conditions or equivalent protection established at the end of the construction activities for the day to minimize the potential for erosion and sediment deposition, and

Areas where established vegetation was disturbed during construction will be stabilized and re-vegetated by the end of project. When required, adequate temporary stabilization Best Management Practices (BMPs) will be installed and maintained until vegetation is established to meet minimum cover requirements established in this General Permit for final stabilization.

Type 1 LUPs typically do not have a high potential to impact storm water quality because (1) these construction activities are not typically conducted during a rain event, (2) these projects are normally constructed over a short period of time¹⁴, minimizing the duration that pollutants could potentially be exposed to rainfall; and (3) disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered (e.g., metal plates, pavement, plastic covers over spoil piles) at the end of the construction day.

Type 1 LUPs are determined during the risk assessment found in Attachment A.1 to be 1) low sediment risk and low receiving water risk; 2) low sediment risk and medium receiving water risk; and 3) medium sediment risk and low receiving water risk.

This General Permit requires the discharger to ensure a SWPPP is developed for these construction activities that is specific to project type, location and characteristics.

ii. Type 2 LUPs:

Type 2 projects are determined to have a combination of High, Medium, and Low project sediment risk along with High, Medium, and Low receiving water risk. Like Type 1 projects, Type 2 projects are typically constructed over a short period of time. However, these projects have a higher potential to impact water quality because they:

- (1) typically occur outside the more urban/developed areas;
- (2) have larger areas of soil disturbance that are not closed or restored at the end of the day;
- (3) may have onsite stockpiles of soil, spoil and other materials;
- (4) cross or occur in close proximity to a wide variety of sensitive resources that may include, but are not limited to, steep topography and/or water bodies; and
- (5) have larger areas of disturbed soils that may be exposed for a longer time interval before final stabilization, cleanup and/or reclamation occurs.

This General Permit requires the discharger to develop and implement a SWPPP for these construction activities that are specific for project type, location and characteristics.

iii. Type 3 LUPs:

¹⁴ Short period of time refers to a project duration of weeks to months, but typically less than one year in duration.

Type 3 projects are determined to have a combination of High and Medium project sediment risk along with High and Medium receiving water risk. Similar to Type 2 projects, Type 3 projects have a higher potential to impact water quality because they:

- (1) typically occur outside of the more urban/developed areas;
- (2) have larger areas of soil disturbance that are not closed or restored at the end of the day;
- (3) may have onsite stockpiles of soil, spoil and other materials;
- (4) cross or occur in close proximity to a wide variety of sensitive resources that may include, but are not limited to, steep topography and/or water bodies; and
- (5) have larger areas of disturbed soils that may be exposed for a longer time interval before final stabilization, cleanup and/or reclamation occurs.

This General Permit requires the discharger to develop and implement a SWPPP for these construction activities that are specific for project type, location, and characteristics.

b. Linear Effluent Standards

All LUPs are subject to the narrative effluent limitations specified in the General Permit.

Type 2 and Type 3 projects are subject to technology-based NALs for pH and turbidity.

c. Linear Good Housekeeping

Improper use and handling of construction materials could potentially cause a threat to water quality. In order to ensure proper site management of these construction materials, all LUP dischargers must comply with a minimum set of Good Housekeeping measures specified in Attachment A of this General Permit.

d. Linear Non-Storm Water Management

In order to ensure control of all non-storm water discharges during construction, all LUP dischargers must comply with the Non-Storm Water Management measures specified in Attachment A of this General Permit.

e. Linear Erosion Control

This General Permit requires all LUP dischargers to implement effective wind erosion control measures, and soil cover for inactive areas. Type 3 LUPs posing a higher risk to water quality are additionally required to ensure the post-construction soil loss is equivalent to or less than the pre-construction levels.

f. Linear Sediment Control

In order to ensure control and containment of all sediment discharges, all LUP dischargers must comply with the general Sediment Control measures specified in Attachment A or this General Permit. Additional requirements for sediment controls are imposed on Type 2 & 3 LUPs due to their higher risk to water quality.

g. Linear Run-on and Runoff Control

Discharges originating outside of a project's perimeter and flowing onto the property can adversely affect the quantity and quality of discharges originating from a project site. In order to ensure proper management of run-on and runoff, all LUPs must comply with the run-on and runoff control measures specified in Attachment A of this General Permit. Due to the lower risk of impacting water quality, Type 1 LUPs are not required to implement run-on and runoff controls unless deemed necessary by the discharger.

h. Linear Inspection, Maintenance and Repair

Proper inspection, maintenance, and repair activities are important to ensure the effectiveness of on-site measures to control water quality. In order to ensure that inspection, maintenance, and repair activities are adequately performed, the all LUP dischargers are required to comply with the Inspection, Maintenance, and Repair requirements specified in Attachment A of this General Permit.

K. ATS¹⁵ Requirements

There are instances on construction sites where traditional erosion and sediment controls do not effectively control accelerated erosion. Under such circumstances, or under circumstances where storm water discharges leaving the site may cause or contribute to an exceedance of a water quality standard, the use of an Active Treatment System (ATS) may be necessary. Additionally, it may be appropriate to use an ATS when site constraints inhibit the ability to construct a correctly sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.¹⁶

Although treatment systems have been in use in some form since the mid-1990s, the ATS industry in California is relatively young, and detailed regulatory standards have not yet been developed. Many developers are using these systems to treat storm water discharges from their construction sites. The new ATS requirements set forth in this General Permit are based on those in place for small wastewater treatment systems, ATS regulations from the Central Valley Regional Water Quality Control Board (September 2005 memorandum "2005/2006 Rainy Season – Monitoring Requirements for Storm Water Treatment Systems that Utilize Chemical Additives to Enhance Sedimentation"), the Construction Storm Water Program at the State of Washington's Department of Ecology, as well as recent advances in technology and knowledge of coagulant performance and aquatic safety.

The effective design of an ATS requires a detailed survey and analysis of site conditions. With proper planning, ATS performance can provide exceptional water quality discharge and prevent significant impacts to surface water quality, even under extreme environmental conditions.

These systems can be very effective in reducing the sediment in storm water runoff, but the systems that use additives/polymers to enhance sedimentation also pose a potential risk to water quality (e.g., operational failure, equipment failure, additive/polymer release, etc.). The State Water Board is concerned about the potential acute and chronic impacts that the polymers and other chemical additives may have on fish and aquatic organisms if released in sufficient quantities or concentrations. In addition

¹⁵ An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation in order to reduce turbidity caused by fine suspended sediment.

¹⁶ Pitt, R., S. Clark, and D. Lake. 2006. Construction Site Erosion and Sediment Controls: Planning, Design, and Performance. DEStech Publications. Lancaster, PA. 370pp.

to anecdotal evidence of polymer releases causing aquatic toxicity in California, the literature supports this concern.¹⁷ For example, cationic polymers have been shown to bind with the negatively charged gills of fish, resulting in mechanical suffocation.¹⁸ Due to the potential toxicity impacts, which may be caused by the release of additives/polymers into receiving waters, this General Permit establishes residual polymer monitoring and toxicity testing requirements have been established in this General Permit for discharges from construction sites that utilize an ATS in order to protect receiving water quality and beneficial uses.

The primary treatment process in an ATS is coagulation/flocculation. ATS's operate on the principle that the added coagulant is bound to suspended sediment, forming floc, which is gravitationally settled in tanks or a basin, or removed by sand filters. A typical installation utilizes an injection pump upstream from the clarifier tank, basin, or sand filters, which is electronically metered to both flow rate and suspended solids level of the influent, assuring a constant dose. The coagulant mixes and reacts with the influent, forming a dense floc. The floc may be removed by gravitational setting in a clarifier tank or basin, or by filtration. Water from the clarifier tank, basin, or sand filters may be routed through cartridge(s) and/or bag filters for final polishing. Vendor-specific systems use various methods of dose control, sediment/floc removal, filtration, etc., that are detailed in project-specific documentation. The particular coagulant/flocculant to be used for a given project is determined based on the water chemistry of the site because the coagulants are specific in their reactions with various types of sediments. Appropriate selection of dosage must be carefully matched to the characteristics of each site.

ATS's are operated in two differing modes, either Batch or Flow-Through. Batch treatment can be defined as Pump-Treat-Hold-Test-Release. In Batch treatment, water is held in a basin or tank, and is not discharged until treatment is complete. Batch treatment involves holding or recirculating the treated water in a holding basin or tank(s) until treatment is complete or the basin or storage tank(s) is full. In Flow-Through treatment, water is pumped into the ATS directly from the runoff collection system or storm water holding pond, where it is treated and filtered as it flows through the system, and is then directly discharged. "Flow-Through Treatment" is also referred to as "Continuous Treatment."

1. Effluent Standards

This General Permit establishes NELs for discharges from construction sites that utilize an ATS. These systems lend themselves to NELs for turbidity and pH because of their known reliable treatment. Advanced systems have been in use in some form since the mid-1990s. An ATS is considered reliable, can consistently produce a discharge of less than 10 NTU, and has been used successfully at many sites in several states since 1995 to reduce turbidity to very low levels.¹⁹

This General Permit contains "compliance storm event" exceptions from the technology-based NELs for ATS discharges. The rationale is that technology-based requirements are developed assuming a certain design storm. In the case of ATS the industry-standard design storm is 10-year, 24-hour (as stated in

¹⁷ Romøen, K., B. Thu, and Ø. Evensen. 2002. Immersion delivery of plasmid DNA II. A study of the potentials of a chitosan based delivery system in rainbow trout (*Oncorhynchus mykiss*) fry. *Journal of Controlled Release* **85**: 215-225.

¹⁸ Bullock, G., V. Blazer, S. Tsukuda, and S. Summerfelt. 2000. Toxicity of acidified chitosan for cultured rainbow trout (*Oncorhynchus mykiss*). *Aquaculture* **185**:273-280.

¹⁹ Currier, B., G. Minton, R. Pitt, L. Roesner, K. Schiff, M. Stenstrom, E. Strassler, and E. Strecker. 2006. The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities.

Attachment F of this General Permit), so the compliance storm event has been established as the 10-year 24-hour event as well to provide consistency.

2. Training

Operator training is critical to the safe and efficient operation and maintenance of the ATS, and to ensure that all State Water Board monitoring and sampling requirements are met. The General Permit requires that all ATS operators have training specific to using ATS's liquid coagulants.

L. Post-Construction Requirements

Under past practices, new and redevelopment construction activities have resulted in modified natural watershed and stream processes. This is caused by altering the terrain, modifying the vegetation and soil characteristics, introducing impervious surfaces such as pavement and buildings, increasing drainage density through pipes and channels, and altering the condition of stream channels through straightening, deepening, and armoring. These changes result in a drainage system where sediment transport capacity is increased and sediment supply is decreased. A receiving channel's response is dependent on dominant channel materials and its stage of adjustment.

Construction activity can lead to impairment of beneficial uses in two main ways. First, during the actual construction process, storm water discharges can negatively affect the chemical, biological, and physical properties of downstream receiving waters. Due to the disturbance of the landscape, the most likely pollutant is sediment, however pH and other non-visible pollutants are also of great concern. Second, after most construction activities are completed at a construction site, the finished project may result in significant modification of the site's response to precipitation. New development and redevelopment projects have almost always resulted in permanent post-construction water quality impacts because more precipitation ends up as runoff and less precipitation is intercepted, evapotranspired, and infiltrated.

General Permit 99-08-DWQ required the SWPPP to include a description of all post-construction BMPs on a site and a maintenance schedule. An effective storm water management strategy must address the full suite of storm events (water quality, channel protection, overbank flood protection, extreme flood protection) (Figure 2).

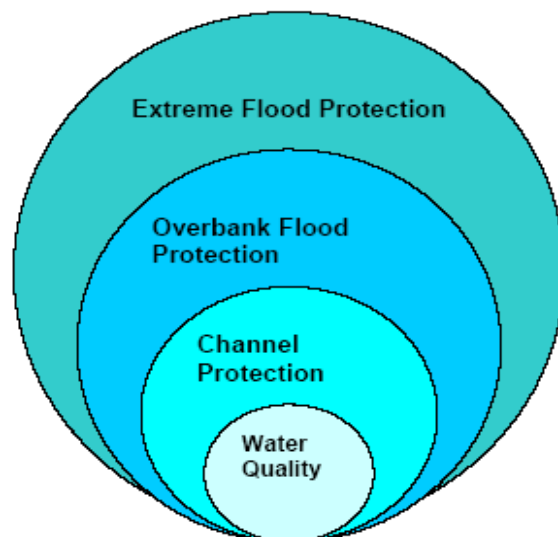


Figure 2 - Suite of Storm Events

The post-construction storm water performance standards in this General Permit specifically address water quality and channel protection events. Overbank flood protection and extreme flood protection events are traditionally dealt with in local drainage and flood protection ordinances. However, measures in this General Permit to address water quality and channel protection also reduce overbank and extreme flooding impacts. This General Permit aims to match post-construction runoff to pre-construction runoff for the 85th percentile storm event, which not only reduces the risk of impact to the receiving water's channel morphology but also provides some protection of water quality.

This General Permit clarifies that its runoff reduction requirements only apply to projects that lie outside of jurisdictions covered by a Standard Urban Storm water Management Plan (SUSMP) (or other more protective) post-construction requirements in either Phase I or Phase II permits.

Figures 3 and 4, below, show the General Permit enrollees (to Order 99-08-DWQ, as of March 10, 2008) overlaid upon a map with SUSMP (or more protective) areas in blue and purple. Areas without blue or purple indicate where the General Permit's runoff reduction requirements would actually apply.

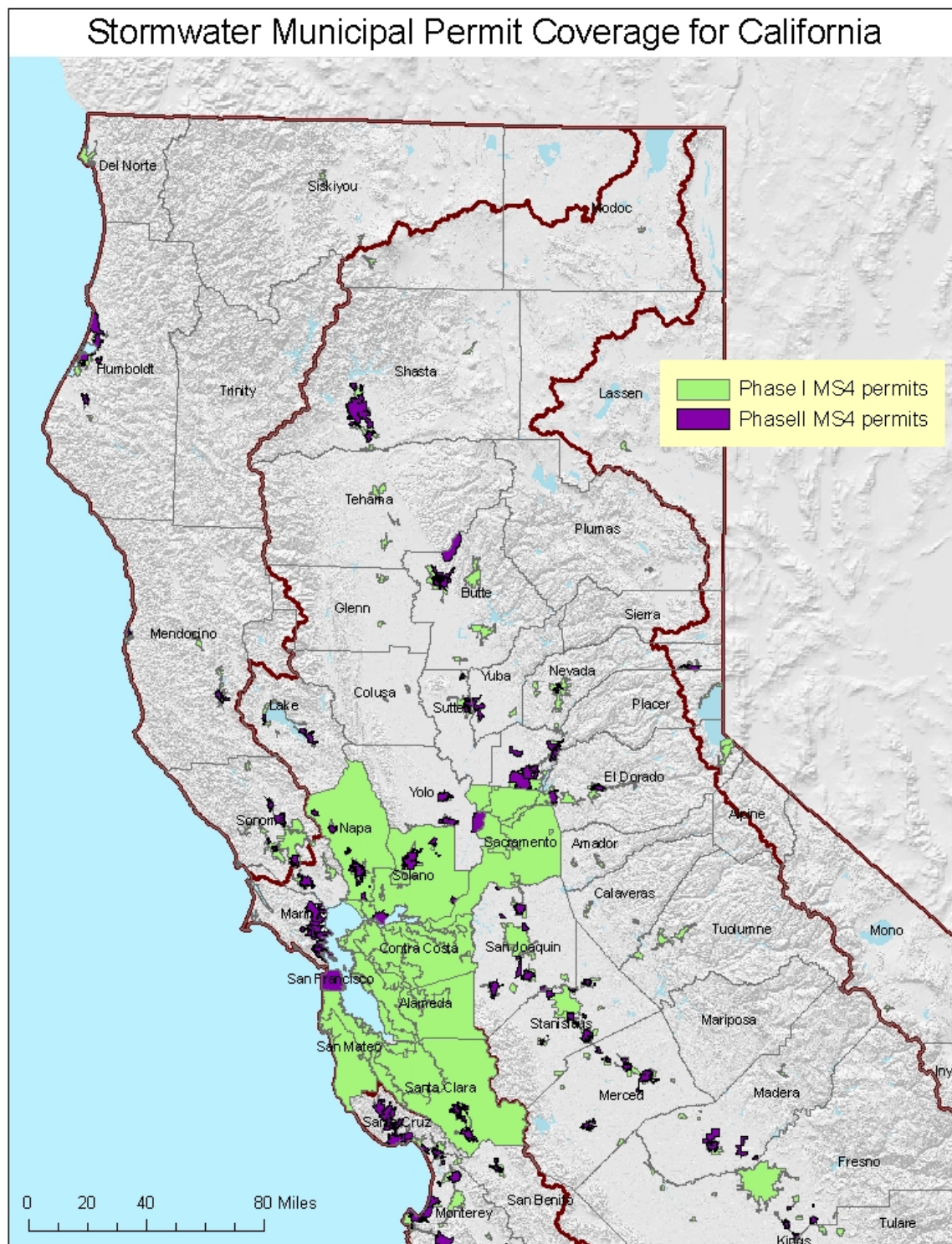
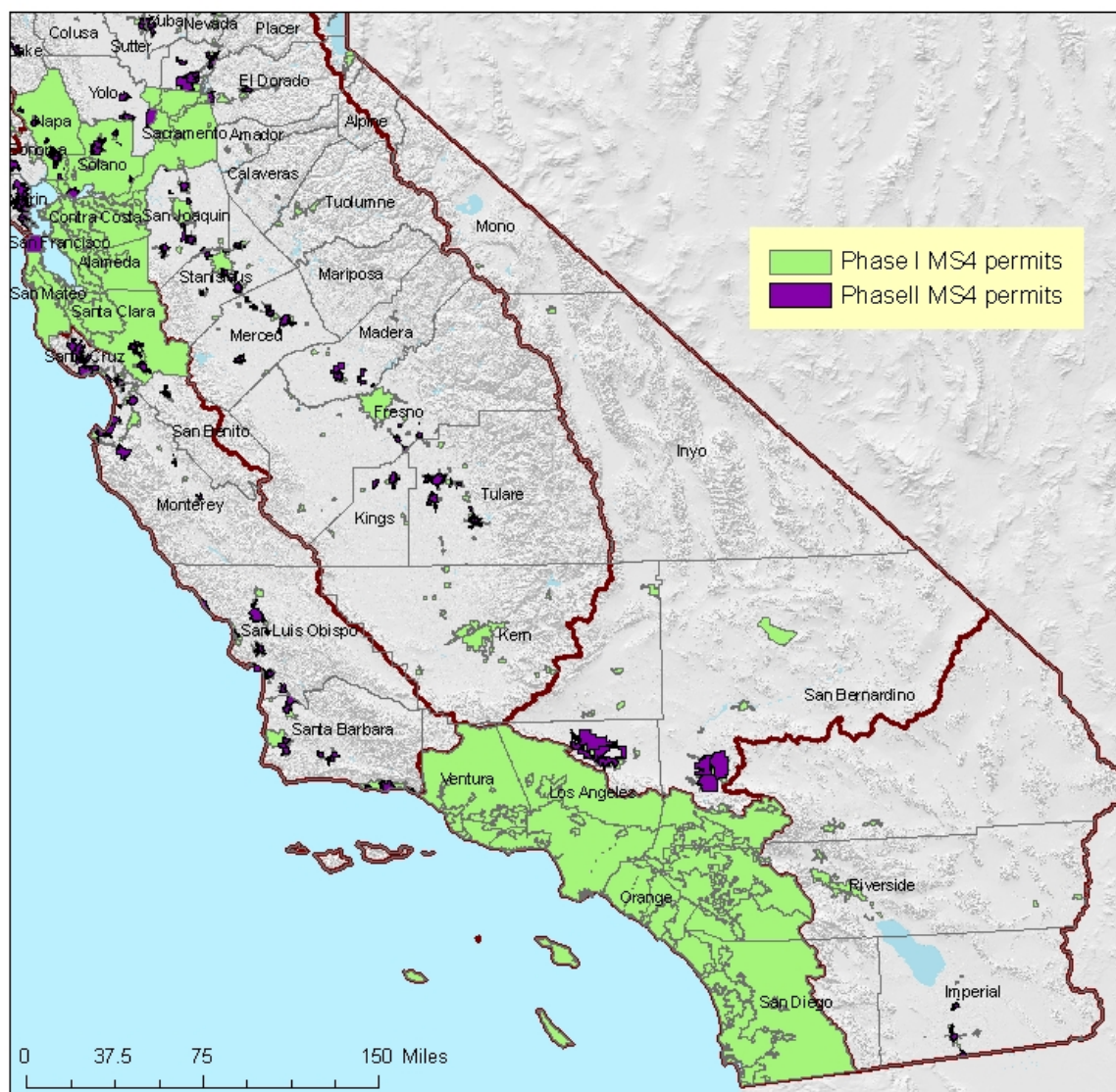


Figure 3 - Northern CA (2009) Counties / Cities With SUSMP-Plus Coverage



Stormwater Municipal Permit Coverage for California

Figure 4 - Southern CA (2009) Counties / Cities With SUSMP-Plus Coverage

Water Quality:

This General Permit requires dischargers to replicate the pre-project runoff water balance (defined as the amount of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event, or the smallest storm event that generates runoff, whichever is larger. Contemporary storm water management generally routes these flows directly to the drainage system, increasing pollutant loads and potentially causing adverse effects on receiving waters. These smaller water quality events happen much more frequently than larger events and generate much higher pollutant loads on an annual basis. There are other adverse hydrological impacts that result from not designing according to the site's pre-construction water balance. In Maryland, Klein²⁰ noted that baseflow decreases as the extent of urbanization increases. Ferguson and Suckling²¹ noted a similar relation in watersheds in Georgia. On Long Island, Spinello and Simmons²² noted substantial decreases in base flow in intensely urbanized watersheds.

The permit emphasizes runoff reduction through on-site storm water reuse, interception, evapo-transpiration and infiltration through non-structural controls and conservation design measures (e.g., downspout disconnection, soil quality preservation/enhancement, interceptor trees). Employing these measures close to the source of runoff generation is the easiest and most cost-effective way to comply with the pre-construction water balance standard. Using low-tech runoff reduction techniques close to the source is consistent with a number of recommendations in the literature.²³ In many cases, BMPs implemented close to the source of runoff generation cost less than end-of the pipe measures.²⁴ Dischargers are given the option of using Appendix 2 to calculate the required runoff volume or a watershed process-based, continuous simulation model such as the EPA's Storm Water Management Model (SWMM) or Hydrologic Simulation Program Fortran (HSPF). Such methods used by the discharger will be reviewed by the Regional Water Board upon NOT application.

Channel Protection:

In order to address channel protection, a basic understanding of fluvial geomorphic concepts is necessary. A dominant paradigm in fluvial geomorphology holds that streams adjust their channel dimensions (width and depth) in response to long-term changes in sediment supply and bankfull discharge (1.5 to 2 year recurrence interval). The bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which the moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels.²⁵ Lane (1955 as cited in Rosgen 1996²⁶) showed the generalized relationship between sediment load, sediment size, stream discharge and stream slope in

²⁰ Klein 1979 as cited in Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.

²¹ Ferguson and Suckling 1990 as cited Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.

²² Center for Watershed Protection (CWP). 2000. The Practice of Watershed Protection: Techniques for protecting our nation's streams, lakes, rivers, and estuaries. Ellicott City, MD. 741 pp.

²³ Bay Area Storm Water Management Agencies Association (BASMAA). 1997. Start at the Source: Residential Site Planning and Design Guidance Manual for Storm Water Quality Protection. Palo Alto, CA; McCuen, R.H. 2003 Smart Growth: hydrologic perspective. Journal of Professional Issues in Engineering Education and Practice. Vol (129), pp.151-154;

Moglen, G.E. and S. Kim. 2007. Impervious imperviousness-are threshold based policies a good idea? Journal of the American Planning Association, Vol 73 No. 2. pp 161-171.

²⁴ Delaware Department of natural Resources (DDNR). 2004. Green technology: The Delaware urban Runoff Management Approach. Dover, DE. 117 pp.

²⁵ Dunne, T and L.B. Leopold. 1978. Water in Environmental Planning. San Francisco W.H. Freeman and Company

²⁶ Rosgen. D.L. 1996. Applied River Morphology. Pagosa Springs. Wildland Hydrology

Figure 5. A change in any one of these variables sets up a series of mutual adjustments in the companion variables with a resulting direct change in the physical characteristics of the stream channel.

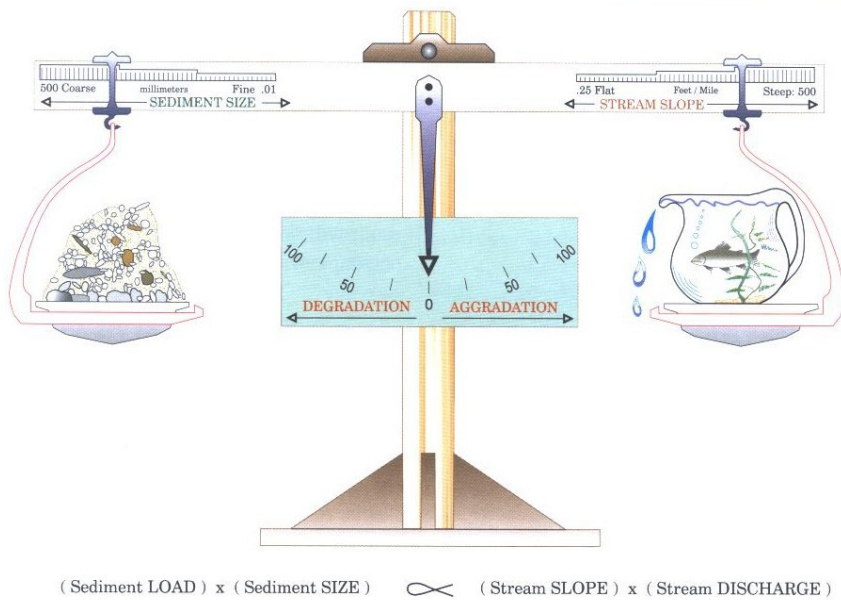


Figure 5 - Schematic of the Lane Relationship
After Lane (1955) as cited in Rosgen (1996)

Stream slope multiplied by stream discharge (the right side of the scale) is essentially an approximation of stream power, a unifying concept in fluvial geomorphology (Bledsoe 1999). Urbanization generally increases stream power and affects the resisting forces in a channel (sediment load and sediment size represented on the left side of the scale).

During construction, sediment loads can increase from 2 to 40,000 times over pre-construction levels.²⁷ Most of this sediment is delivered to stream channels during large, episodic rain events.²⁸ This increased sediment load leads to an initial aggradation phase where stream depths may decrease as sediment fills the channel, leading to a decrease in channel capacity and increase in flooding and overbank deposition. A degradation phase initiates after construction is completed.

Schumm et. al (1984) developed a channel evolution model that describes the series of adjustments from initial downcutting, to widening, to establishing new floodplains at lower elevations (Figure 6).

²⁷ Goldman S.J., K. Jackson, and T.A. Bursztynsky. 1986. Erosion and Sediment Control Handbook. McGraw Hill. San Francisco.

²⁸ Wolman 1967 as cited in Paul, M.P. and J.L. Meyer. 2001. Streams in the Urban Landscape. *Annu. Rev.Ecol. Syst.* 32: 333-365.

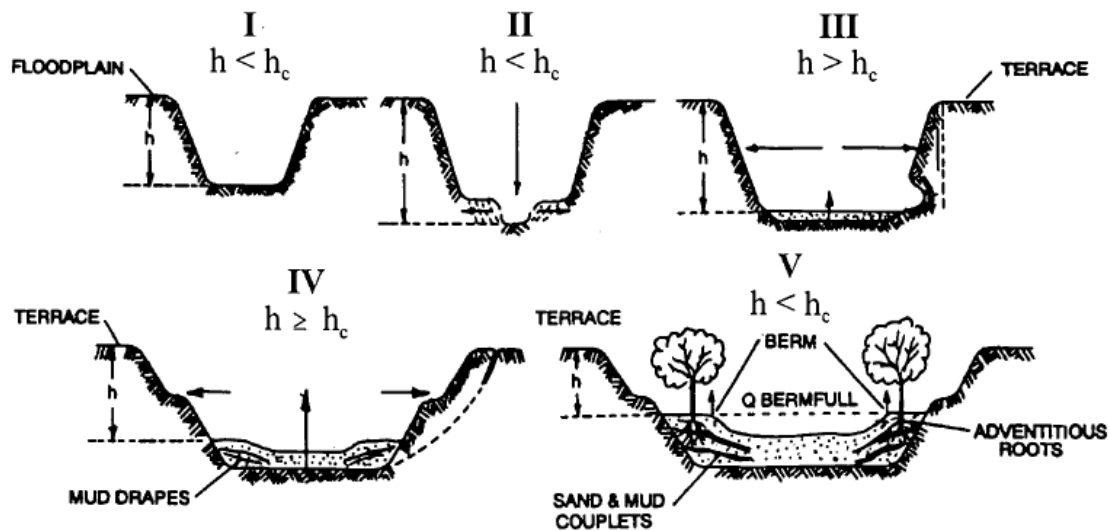


Figure 6 - Channel Changes Associated with Urbanization

After Incised Channel Evolution Sequence in Schumm et. al 1984

Channel incision (Stage II) and widening (Stages III and to a lesser degree, Stage IV) are due to a number of fundamental changes on the landscape. Connected impervious area and compaction of pervious surfaces increase the frequency and volume of bankfull discharges.²⁹ Increased drainage density (miles of stream length per square mile of watershed) also negatively impacts receiving stream channels.³⁰ Increased drainage density and hydraulic efficiency leads to an increase in the frequency and volume of bankfull discharges because the time of concentration is shortened. Flows from engineered pipes and channels are also often “sediment starved” and seek to replenish their sediment supply from the channel.

Encroachment of stream channels can also lead to an increase in stream slope, which leads to an increase in stream power. In addition, watershed sediment loads and sediment size (with size generally represented as the median bed and bank particle size, or d_{50}) decrease during urbanization.³¹ This means

²⁹ Booth, D. B. and C. R. Jackson. 1997. Urbanization of Aquatic Systems: Degradation Thresholds, Storm Water Detection, and the Limits of Mitigation. *Journal of the American Water Resources Association* Vol. 33, No.5, pp. 1077-1089.

³⁰ May, C.W. 1998. Cumulative effects of urbanization on small streams in the Puget Sound Lowland ecoregion. Conference proceedings from Puget Sound Research '98 held March 12, 13 1998 in Seattle, WA;

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2002. Hydromodification Management Plan Literature Review. 80 pp.

³¹ Finkenbine, J.K., D.S. Atwater, and D.S. Mavinic. 2000. Stream health after urbanization. *J. Am. Water Resour. Assoc.* 36:1149-60;

that even if pre- and post-development stream power are the same, more erosion will occur in the post-development stage because the smaller particles are less resistant (provided they are non-cohesive).

As shown in Stages II and III, the channel deepens and widens to accommodate the increased stream power³² and decrease in sediment load and sediment size. Channels may actually narrow as entrained sediment from incision is deposited laterally in the channel. After incised channels begin to migrate laterally (Stage III), bank erosion begins, which leads to general channel widening.³³ At this point, a majority of the sediment that leaves a drainage area comes from within the channel, as opposed to the background and construction related hillslope contribution. Stage IV is characterized by more aggradation and localized bank instability. Stage V represents a new quasi-equilibrium channel morphology in balance with the new flow and sediment supply regime. In other words, stream power is in balance with sediment load and sediment size.

The magnitude of the channel morphology changes discussed above varies along a stream network as well as with the age of development, slope, geology (sand-bedded channels may cycle through the evolution sequence in a matter of decades whereas clay-dominated channels may take much longer), watershed sediment load and size, type of urbanization, and land use history. It is also dependent on a channel's stage in the channel evolution sequence when urbanization occurs. Management strategies

Pizzuto, J.E. W.S. Hession, and M. McBride. 2000. Comparing gravel-bed rivers in paired urban and rural catchments of southeastern Pennsylvania. *Geology* 28:79-82.

³² Hammer 1973 as cited in Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp;

Booth, D.B. 1990. Stream Channel Incision Following Drainage Basin Urbanization. *Water Resour. Bull.* 26:407-417.

³³ Trimble, S.W. 1997. Contribution of Stream Channel Erosion to Sediment Yield from an Urbanizing Watershed. *Science*: Vol. 278 (21), pp. 1442-1444.

must take into account a channel's stage of adjustment and account for future changes in the evolution of channel form (Stein and Zaleski 2005).³⁴

Traditional structural water quality BMPs (e.g. detention basins and other devices used to store volumes of runoff) unless they are highly engineered to provide adequate flow duration control, do not adequately protect receiving waters from accelerated channel bed and bank erosion, do not address post-development increases in runoff volume, and do not mitigate the decline in benthic macroinvertebrate communities in the receiving waters³⁵ suggest that structural BMPs are not as effective in protecting aquatic communities as a continuous riparian buffer of native vegetation. This is supported by the findings of Zucker and White³⁶, where instream biological metrics were correlated with the extent of forested buffers.

This General Permit requires dischargers to maintain pre-development drainage densities and times of concentration in order to protect channels and encourages dischargers to implement setbacks to reduce channel slope and velocity changes that can lead to aquatic habitat degradation.

There are a number of other approaches for modeling fluvial systems, including statistical and physical models and simpler stream power models.³⁷ The use of these models in California is described in Stein and Zaleski (2005).³⁸ Rather than prescribe a specific one-size-fits-all modeling method in this permit, the State Water Board intends to develop a stream power and channel evolution model-based framework to assess channels and develop a hierarchy of suitable analysis methods and management strategies. In time, this framework may become a State Water Board water quality control policy.

Permit Linkage to Overbank and Extreme Flood Protection

Site design BMPs (e.g. rooftop and impervious disconnection, vegetated swales, setbacks and buffers) filter and settle out pollutants and provide for more infiltration than is possible for traditional centralized structural BMPs placed at the lowest point in a site. They provide source control for runoff and lead to a reduction in pollutant loads. When implemented, they also help reduce the magnitude and volume of larger, less frequent storm events (e.g., 10-yr, 24-hour storm and larger), thereby reducing the need for expensive flood control infrastructure. Nonstructural BMPs can also be a landscape amenity, instead of a large isolated structure requiring substantial area for ancillary access, buffering, screening and maintenance facilities.²⁵ The multiple benefits of using non-structural benefits will be critically important as the state's population increases and imposes strains upon our existing water resources.

Maintaining predevelopment drainage densities and times of concentration will help reduce post-development peak flows and volumes in areas not covered under a municipal permit. The most effective way to preserve drainage areas and maximize time of concentration is to implement landform grading,

³⁴ Stein, E.S. and S. Zaleski. 2005. Managing runoff to protect natural stream: the latest developments on investigation and management of hydromodification in California. Southern California Coastal Water Research Project Technical Report 475. 26 pp.

³⁵ Horner, R.R. 2006. Investigation of the Feasibility and Benefits of Low-Impact Site Design Practices (LID) for the San Diego Region. Available at: http://www.projectcleanwater.org/pdf/permit/case-study_lid.pdf.

³⁶ Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.

³⁷ Finlayson, D.P. and D.R. Montgomery. 2003. Modeling large-scale fluvial erosion in geographic information systems. *Geomorphology* (53), pp. 147-164.

³⁸ Stein, E.S. and S. Zaleski. 2005. Managing runoff to protect natural stream: the latest developments on investigation and management of hydromodification in California. Southern California Coastal Water Research Project Technical Report 475. 26 pp.

incorporate site design BMPs and implement distributed structural BMPs (e.g., bioretention cells, rain gardens, rain cisterns).

M. Storm Water Pollution Prevention Plans

USEPA's Construction General Permit requires that qualified personnel conduct inspections. USEPA defines qualified personnel as "a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity."³⁹ USEPA also suggests that qualified personnel prepare SWPPPs and points to numerous states that require certified professionals to be on construction sites at all times. States that currently have certification programs are Washington, Georgia, Florida, Delaware, Maryland, and New Jersey. The Permit 99-08-DWQ did not require that qualified personnel prepare SWPPPs or conduct inspections. However, to ensure that water quality is being protected, this General Permit requires that all SWPPPs be written, amended, and certified by a Qualified SWPPP Developer. A Qualified SWPPP Developer must possess one of the eight certifications and or registrations specified in this General Permit and effective two years after the adoption date of this General Permit, must have attended a State Water Board-sponsored or approved Qualified SWPPP Developer training course. Table 9 provides an overview of the criteria used in determining qualified certification titles for a QSD and QSP.

39 US Environmental Protection Agency. Stormwater Pollution Prevention Plans for Construction Activities. <<http://cfpub.epa.gov/npdes/stormwater/swppp.cfm>> and <http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf>.

Table 9 - Qualified SWPPP Developer/ Qualified SWPPP Practitioner Certification Criteria

Certification/ Title	Registered By	QSD/QSP	Certification Criteria
Professional Civil Engineer	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Professional Geologist or Engineering Geologist	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Landscape Architect	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Professional Hydrologist	American Institute of Hydrology	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Certified Professional in Erosion and Sediment Control™ (CPESC)	Enviro Cert International Inc.	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Inspector of Sediment and Erosion Control™ (CISEC)	Certified Inspector of Sediment and Erosion Control, Inc.	QSP	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Erosion, Sediment and Storm Water Inspector™ (CESSWI)	Enviro Cert International Inc.	QSP	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Professional in Storm Water Quality™ (CPSWQ)	Enviro Cert International Inc.	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education

The previous versions of the General Permit required development and implementation of a SWPPP as the primary compliance mechanism. The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of storm water discharges; and (2) to describe and ensure the implementation of BMPs to reduce or eliminate sediment and other pollutants in storm water and non-storm water discharges. The SWPPP must include BMPs that address source control, BMPs that address pollutant control, and BMPs that address treatment control.

This General Permit shifts some of the measures that were covered by this general requirement to specific permit requirements, each individually enforceable as a permit term. This General Permit emphasizes the use of appropriately selected, correctly installed and maintained pollution reduction BMPs. This approach provides the flexibility necessary to establish BMPs that can effectively address source control of pollutants during changing construction activities. These specific requirements also improve both the clarity and the enforceability of the General Permit so that the dischargers understand, and the public can determine whether the discharges are in compliance with, permit requirements.

The SWPPP must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The SWPPP must remain on the site during construction activities, commencing with the initial mobilization and ending with the termination of coverage under the General Permit. For LUPs the discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio or telephone. Once construction activities are complete, until stabilization is achieved, the SWPPP shall be available from the SWPPP contact listed in the PRDs

A SWPPP must be appropriate for the type and complexity of a project and will be developed and implemented to address project specific conditions. Some projects may have similarities or complexities, yet each project is unique in its progressive state that requires specific description and selection of BMPs needed to address all possible generated pollutants

N. Regional Water Board Authorities

Because this General Permit will be issued to thousands of construction sites across the State, the Regional Water Boards retain discretionary authority over certain issues that may arise from the discharges in their respective regions. This General Permit does not grant the Regional Water Boards any authority they do not otherwise have; rather, it merely emphasizes that the Regional Water Boards can take specific actions related to this General Permit. For example, the Regional Water Boards will be enforcing this General Permit and may need to adjust some requirements for a discharger based on the discharger's compliance history.



Linda S. Adams
Secretary for
Environmental Protection

State Water Resources Control Board

Division of Water Quality

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Arnold Schwarzenegger
Governor

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE
ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO. **CAS000002**

This Order was adopted by the State Water Resources Control Board on:	September 2, 2009
This Order shall become effective on:	July 1, 2010
This Order shall expire on:	September 2, 2014

IT IS HEREBY ORDERED, that this Order supersedes Order No. 99-08-DWQ [as amended by Order No. 2010-0014-DWQ] except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend
Clerk to the Board



Linda S. Adams
Secretary for
Environmental Protection

State Water Resources Control Board

Division of Water Quality

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Arnold Schwarzenegger
Governor

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

ORDER NO. 2010-0014-DWQ
NPDES NO. CAS000002

Order No. 2009-0009-DWQ was adopted by the State Water Resources Control Board on:	September 2, 2009
Order No. 2009-0009-DWQ became effective on:	July 1, 2010
Order No. 2009-0009-DWQ shall expire on:	September 2, 2014
This Order, which amends Order No. 2009-0009-DWQ, was adopted by the State Water Resources Control Board on:	November 16, 2010
This Order shall become effective on:	February 14, 2011

IT IS HEREBY ORDERED that this Order amends Order No. 2009-0009-DWQ. Additions to Order No. 2009-0009-DWQ are reflected in blue-underline text and deletions are reflected in ~~red-strikeout~~ text.

IT IS FURTHER ORDERED that staff are directed to prepare and post a conformed copy of Order No. 2009-0009-DWQ incorporating the revisions made by this Order.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on **November 16, 2010**.

AYE: Chairman Charles R. Hoppin
Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: None

ABSENT: None

ABSTAIN: None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board



EDMUND G. BROWN JR.
GOVERNOR



MATTHEW RODRIGUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

ORDER NO. 2012-0006-DWQ
NPDES NO. **CAS000002**

Order No. 2009-0009-DWQ was adopted by the State Water Resources Control Board on:	September 2, 2009
Order No. 2009-0009-DWQ became effective on:	July 1, 2010
Order No. 2010-0014-DWQ became effective on:	February 14, 2011
Order No. 2009-0009-DWQ as amended by 2010-0014-DWQ shall expire on:	September 2, 2014
This Order, which amends Order No. 2009-0009-DWQ as amended by 2010-0014-DWQ, was adopted by the State Water Resources Control Board on:	July 17, 2012
This Order No. 2012-0006-DWQ shall become effective on:	July 17, 2012

IT IS HEREBY ORDERED that this Order amends Order No. 2009-0009-DWQ. Additions to Order No. 2009-0009-DWQ are reflected in blue-underline text and deletions are reflected in ~~red-strikeout~~ text.

IT IS FURTHER ORDERED that staff are directed to prepare and post a conformed copy of Order No. 2009-000-DWQ incorporating the revisions made by this Order.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on July 17, 2012.

AYE: Chairman Charles R. Hoppin
Vice Chair Frances Spivy-Weber
Board Member Tam M. Doduc
Board Member Steven Moore
Board Member Felicia Marcus

NAY: None

ABSENT: None

ABSTAIN: None

Jeanine Townsend
Clerk to the Board

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Attachment A.2 – LUP Permit Registration Documents
Attachment B – Permit Registration Documents
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LIST OF APPENDICES

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Appendix 2 – Post-Construction Water Balance Performance Standard
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**STATE WATER RESOURCES CONTROL BOARD
ORDER NO. 2009-0009-DWQ
[AS AMENDED BY ORDER NO. 2010-0014-DWQ]
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT NO. CAS000002**

**WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES OF STORM WATER RUNOFF ASSOCIATED WITH
CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES**

I. FINDINGS

A. General Findings

The State Water Resources Control Board (State Water Board) finds that:

1. The federal Clean Water Act (CWA) prohibits certain discharges of storm water containing pollutants except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (Title 33 United States Code (U.S.C.) §§ 1311 and 1342(p); also referred to as Clean Water Act (CWA) §§ 301 and 402(p)). The U.S. Environmental Protection Agency (U.S. EPA) promulgates federal regulations to implement the CWA's mandate to control pollutants in storm water runoff discharges. (Title 40 Code of Federal Regulations (C.F.R.) Parts 122, 123, and 124). The federal statutes and regulations require discharges to surface waters comprised of storm water associated with construction activity, including demolition, clearing, grading, and excavation, and other land disturbance activities (except operations that result in disturbance of less than one acre of total land area and which are not part of a larger common plan of development or sale), to obtain coverage under an NPDES permit. The NPDES permit must require implementation of Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) to reduce or eliminate pollutants in storm water runoff. The NPDES permit must also include additional requirements necessary to implement applicable water quality standards.
2. This General Permit authorizes discharges of storm water associated with construction activity so long as the dischargers comply with all requirements, provisions, limitations and prohibitions in the permit. In addition, this General Permit regulates the discharges of storm water associated with construction activities from all Linear

Underground/Overhead Projects resulting in the disturbance of greater than or equal to one acre (Attachment A).

3. This General Permit regulates discharges of pollutants in storm water associated with construction activity (storm water discharges) to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.
4. This General Permit does not preempt or supersede the authority of local storm water management agencies to prohibit, restrict, or control storm water discharges to municipal separate storm sewer systems or other watercourses within their jurisdictions.
5. This action to adopt a general NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21100, et seq.), pursuant to Section 13389 of the California Water Code.
6. Pursuant to 40 C.F.R. § 131.12 and State Water Board [Resolution No. 68-16](#),¹ which incorporates the requirements of § 131.12 where applicable, the State Water Board finds that discharges in compliance with this General Permit will not result in the lowering of water quality standards, and are therefore consistent with those provisions. Compliance with this General Permit will result in improvements in water quality.
7. This General Permit serves as an NPDES permit in compliance with CWA § 402 and will take effect on July 1, 2010 by the State Water Board provided the Regional Administrator of the U.S. EPA has no objection. If the U.S. EPA Regional Administrator objects to its issuance, the General Permit will not become effective until such objection is withdrawn.
8. Following adoption and upon the effective date of this General Permit, the Regional Water Quality Control Boards (Regional Water Boards) shall enforce the provisions herein.
9. Regional Water Boards establish water quality standards in Basin Plans. The State Water Board establishes water quality standards in various statewide plans, including the California Ocean Plan. U.S. EPA establishes water quality standards in the National Toxic Rule (NTR) and the California Toxic Rule (CTR).

¹ Resolution No. 68-16 generally requires that existing water quality be maintained unless degradation is justified based on specific findings.

10. This General Permit does not authorize discharges of fill or dredged material regulated by the U.S. Army Corps of Engineers under CWA § 404 and does not constitute a waiver of water quality certification under CWA § 401.
11. The primary storm water pollutant at construction sites is excess sediment. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases.
12. Construction activities can impact a construction site's runoff sediment supply and transport characteristics. These modifications, which can occur both during and after the construction phase, are a significant cause of degradation of the beneficial uses established for water bodies in California. Dischargers can avoid these effects through better construction site design and activity practices.
13. This General Permit recognizes four distinct phases of construction activities. The phases are Grading and Land Development Phase, Streets and Utilities Phase, Vertical Construction Phase, and Final Landscaping and Site Stabilization Phase. Each phase has activities that can result in different water quality effects from different water quality pollutants. This General Permit also recognizes inactive construction as a category of construction site type.
14. Compliance with any specific limits or requirements contained in this General Permit does not constitute compliance with any other applicable requirements.
15. Following public notice in accordance with State and Federal laws and regulations, the State Water Board heard and considered all comments and testimony in a public hearing on 06/03/2009. The State Water Board has prepared written responses to all significant comments.
16. Construction activities obtaining coverage under the General Permit may have multiple discharges subject to requirements that are specific to general, linear, and/or active treatment system discharge types.
17. The State Water Board may reopen the permit if the U.S. EPA adopts a final effluent limitation guideline for construction activities.

B. Activities Covered Under the General Permit

18. Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.
19. Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or the sale of one or more acres of disturbed land surface.
20. Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to U.S. EPA regulations, such as dairy barns or food processing facilities.
21. Construction activity associated with Linear Underground/Overhead Utility Projects (LUPs) including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.
22. Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.²
23. Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction sites that intend to disturb one or more acres of land within the jurisdictional boundaries of

² Pursuant to the Ninth Circuit Court of Appeals' decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the U.S. EPA's petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the site.

C. Activities Not Covered Under the General Permit

24. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.
25. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.
26. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.
27. Construction activity and land disturbance involving discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction sites in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit.
28. Construction activity that disturbs less than one acre of land surface, and that is not part of a larger common plan of development or the sale of one or more acres of disturbed land surface.
29. Construction activity covered by an individual NPDES Permit for storm water discharges.
30. Discharges from small (1 to 5 acre) construction activities with an approved Rainfall Erosivity Waiver authorized by U.S. EPA Phase II regulations certifying to the State Board that small construction activity will occur only when the Rainfall Erosivity Factor is less than 5 ("R" in the Revised Universal Soil Loss Equation).
31. Landfill construction activity that is subject to the Industrial General Permit.
32. Construction activity that discharges to Combined Sewer Systems.
33. Conveyances that discharge storm water runoff combined with municipal sewage.
34. Discharges of storm water identified in CWA § 402(l)(2), 33 U.S.C. § 1342(l)(2).

35. Discharges occurring in basins that are not tributary or hydrologically connected to waters of the United States (for more information contact your Regional Water Board).

D. Obtaining and Modifying General Permit Coverage

36. This General Permit requires all dischargers to electronically file all Permit Registration Documents (PRDs), Notices of Termination (NOT), changes of information, annual reporting, and other compliance documents required by this General Permit through the State Water Board's Storm water Multi-Application and Report Tracking System (SMARTS) website.
37. Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.
38. This General Permit grants an exception from the Risk Determination requirements for existing sites covered under Water Quality Orders No. 99-08-DWQ, and [No. 2003-0007-DWQ](#). For certain sites, adding additional requirements may not be cost effective. Construction sites covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at the Risk Level 1. LUPs covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage as a Type 1 LUP. The Regional Water Boards have the authority to require Risk Determination to be performed on sites currently covered under Water Quality Orders No. 99-08-DWQ and No. 2003-0007-DWQ where they deem it necessary. The State Water Board finds that there are two circumstances when it may be appropriate for the Regional Water Boards to require a discharger that had filed an NOI under State Water Board Order No. 99-08-DWQ to recalculate the site's risk level. These circumstances are: (1) when the discharger has a demonstrated history of noncompliance with State Water Board Order No. 99-08-DWQ or; (2) when the discharger's site poses a significant risk of causing or contributing to an exceedance of a water quality standard without the implementation of the additional Risk Level 2 or 3 requirements.

E. Prohibitions

39. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit. Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may

contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural Best Management Practices (BMPs)³. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction.

40. This General Permit prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
41. This General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the State Water Board and the nine Regional Water Boards.
42. Pursuant to the Ocean Plan, discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.
43. This General Permit prohibits the discharge of any debris⁴ from construction sites. Plastic and other trash materials can cause negative impacts to receiving water beneficial uses. The State Water Board encourages the use of more environmentally safe, biodegradable materials on construction sites to minimize the potential risk to water quality.

F. Training

44. In order to improve compliance with and to maintain consistent enforcement of this General Permit, all dischargers are required to appoint two positions - the Qualified SWPPP Developer (QSD) and the Qualified SWPPP Practitioner (QSP) - who must obtain appropriate training. Together with the key stakeholders, the State and Regional Water Boards are leading the development of this curriculum through a collaborative organization called The Construction General Permit (CGP) Training Team.
45. The Professional Engineers Act (Bus. & Prof. Code section 6700, et seq.) requires that all engineering work must be performed by a California licensed engineer.

³ BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practice to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

⁴ Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

G. Determining and Reducing Risk

46. The risk of accelerated erosion and sedimentation from wind and water depends on a number of factors, including proximity to receiving water bodies, climate, topography, and soil type.
47. This General Permit requires dischargers to assess the risk level of a site based on both sediment transport and receiving water risk. This General Permit contains requirements for Risk Levels 1, 2 and 3, and LUP Risk Type 1, 2, and 3 (Attachment A). Risk levels are established by determining two factors: first, calculating the site's sediment risk; and second, receiving water risk during periods of soil exposure (i.e. grading and site stabilization). Both factors are used to determine the site-specific Risk Level(s). LUPs can be determined to be Type 1 based on the flowchart in Attachment A.1.
48. Although this General Permit does not mandate specific setback distances, dischargers are encouraged to set back their construction activities from streams and wetlands whenever feasible to reduce the risk of impacting water quality (e.g., natural stream stability and habitat function). Because there is a reduced risk to receiving waters when setbacks are used, this General Permit gives credit to setbacks in the risk determination and post-construction storm water performance standards. The risk calculation and runoff reduction mechanisms in this General Permit are expected to facilitate compliance with any Regional Water Board and local agency setback requirements, and to encourage voluntary setbacks wherever practicable.
49. Rain events can occur at any time of the year in California. Therefore, a Rain Event Action Plan (REAP) is necessary for Risk Level 2 and 3 traditional construction projects (LUPs exempt) to ensure that active construction sites have adequate erosion and sediment controls implemented prior to the onset of a storm event, even if construction is planned only during the dry season.
50. Soil particles smaller than 0.02 millimeters (mm) (i.e., finer than medium silt) do not settle easily using conventional measures for sediment control (i.e., sediment basins). Given their long settling time, dislodging these soils results in a significant risk that fine particles will be released into surface waters and cause unacceptable downstream impacts. If operated correctly, an Active Treatment System (ATS⁵) can prevent or reduce the release of fine particles from construction sites.

⁵ An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electro coagulation in order to reduce turbidity caused by fine suspended sediment.

Use of an ATS can effectively reduce a site's risk of impacting receiving waters.

51. Dischargers located in a watershed area where a Total Maximum Daily Load (TMDL) has been adopted or approved by the Regional Water Board or U.S. EPA may be required by a separate Regional Water Board action to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. Such dischargers may also be required to obtain an individual Regional Water Board permit specific to the area.

H. Effluent Standards

52. The State Water Board convened a blue ribbon panel of storm water experts that submitted a report entitled, "The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities," dated June 19, 2006. The panel concluded that numeric limits or action levels are technically feasible to control construction storm water discharges, provided that certain conditions are considered. The panel also concluded that numeric effluent limitations (NELs) are feasible for discharges from construction sites that utilize an ATS. The State Water Board has incorporated the expert panel's suggestions into this General Permit, which includes numeric action levels (NALs) for pH and turbidity, and special numeric limits for ATS discharges.

Determining Compliance with Numeric Limitations

53. This General Permit sets a pH NAL of 6.5 to 8.5, and a turbidity NAL of 250 NTU. The purpose of the NAL and its associated monitoring requirement is to provide operational information regarding the performance of the measures used at the site to minimize the discharge of pollutants and to protect beneficial uses and receiving waters from the adverse effects of construction-related storm water discharges. An exceedance of a NAL does not constitute a violation of this General Permit.
54. This General Permit requires dischargers with NAL exceedances to immediately implement additional BMPs and revise their Storm Water Pollution Prevention Plans (SWPPPs) accordingly to either prevent pollutants and authorized non-storm water discharges from contaminating storm water, or to substantially reduce the pollutants to levels consistently below the NALs. NAL exceedances are reported in the State Water Boards SMARTS system, and the discharger is

required to provide an NAL Exceedance Report when requested by a Regional Water Board.

I. Receiving Water Limitations

55. This General Permit requires all enrolled dischargers to determine the receiving waters potentially affected by their discharges and to comply with all applicable water quality standards, including any more stringent standards applicable to a water body.

J. Sampling, Monitoring, Reporting and Record Keeping

56. Visual monitoring of storm water and non-storm water discharges is required for all sites subject to this General Permit.

57. Records of all visual monitoring inspections are required to remain on-site during the construction period and for a minimum of three years.

58. For all Risk Level 3/LUP Type 3 and Risk Level 2/LUP Type 2 sites, this General Permit requires effluent monitoring for pH and turbidity. Sampling, analysis and monitoring requirements for effluent monitoring for pH and turbidity are contained in this General Permit.

59. Risk Level 3 and LUP Type 3 sites with effluent that exceeds the Receiving Water Monitoring Triggers contained in this General Permit and with direct discharges to receiving water are required to conduct receiving water monitoring. An exceedance of a Receiving Water Monitoring Trigger does not constitute a violation of this General Permit.

60. This General Permit establishes a 5 year, 24 hour (expressed in inches of rainfall) as an exemptions to the receiving water monitoring requirements for Risk Level 3 and LUP Type 3 dischargers.

61. If run-on is caused by a forest fire or any other natural disaster, then receiving water monitoring triggers do not apply.

62. For Risk Level 3 and LUP Type 3 sites larger than 30 acres and with direct discharges to receiving waters, this General Permit requires bioassessment sampling before and after site completion to determine if significant degradation to the receiving water's biota has occurred. Bioassessment sampling guidelines are contained in this General Permit.

- 63. A summary and evaluation of the sampling and analysis results will be submitted in the Annual Reports.
- 64. This General Permit contains sampling, analysis and monitoring requirements for non-visible pollutants at all sites subject to this General Permit.
- 65. Compliance with the General Permit relies upon dischargers to electronically self-report any discharge violations and to comply with any Regional Water Board enforcement actions.
- 66. This General Permit requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. For LUPs, these documents may be retained in a crew member's vehicle and made available upon request.

K. Active Treatment System (ATS) Requirements

- 67. Active treatment systems add chemicals to facilitate flocculation, coagulation and filtration of suspended sediment particles. The uncontrolled release of these chemicals to the environment can negatively affect the beneficial uses of receiving waters and/or degrade water quality (e.g., acute and chronic toxicity). Additionally, the batch storage and treatment of storm water through an ATS' can potentially cause physical impacts on receiving waters if storage volume is inadequate or due to sudden releases of the ATS batches and improperly designed outfalls.
- 68. If designed, operated and maintained properly an ATS can achieve very high removal rates of suspended sediment (measured as turbidity), albeit at sometimes significantly higher costs than traditional erosion/sediment control practices. As a result, this General Permit establishes NELs consistent with the expected level of typical ATS performance.
- 69. This General Permit requires discharges of storm water associated with construction activity that undergo active treatment to comply with special operational and effluent limitations to ensure that these discharges do not adversely affect the beneficial uses of the receiving waters or cause degradation of their water quality.
- 70. For ATS discharges, this General Permit establishes technology-based NELs for turbidity.

71. This General Permit establishes a 10 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based numeric effluent limitations for ATS discharges. Exceedances of the ATS turbidity NEL constitutes a violation of this General Permit.

L. Post-Construction Requirements

72. This General Permit includes performance standards for post-construction that are consistent with State Water Board [Resolution No. 2005-0006](#), "Resolution Adopting the Concept of Sustainability as a Core Value for State Water Board Programs and Directing Its Incorporation," and [2008-0030](#), "Requiring Sustainable Water Resources Management." The requirement for all construction sites to match pre-project hydrology will help ensure that the physical and biological integrity of aquatic ecosystems are sustained. This "runoff reduction" approach is analogous in principle to Low Impact Development (LID) and will serve to protect related watersheds and waterbodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.
73. LUP projects are not subject to post-construction requirements due to the nature of their construction to return project sites to pre-construction conditions.

M. Storm Water Pollution Prevention Plan Requirements

74. This General Permit requires the development of a site-specific SWPPP. The SWPPP must include the information needed to demonstrate compliance with all requirements of this General Permit, and must be kept on the construction site and be available for review. The discharger shall ensure that a QSD develops the SWPPP.
75. To ensure proper site oversight, this General Permit requires a Qualified SWPPP Practitioner to oversee implementation of the BMPs required to comply with this General Permit.

N. Regional Water Board Authorities

76. Regional Water Boards are responsible for implementation and enforcement of this General Permit. A general approach to permitting is not always suitable for every construction site and environmental circumstances. Therefore, this General Permit recognizes that Regional Water Boards must have some flexibility and authority to alter, approve, exempt, or rescind permit authority granted under this

General Permit in order to protect the beneficial uses of our receiving waters and prevent degradation of water quality.

IT IS HEREBY ORDERED that all dischargers subject to this General Permit shall comply with the following conditions and requirements (including all conditions and requirements as set forth in Attachments A, B, C, D, E and F)⁶:

II. CONDITIONS FOR PERMIT COVERAGE

A. Linear Underground/Overhead Projects (LUPs)

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g. telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.
2. The Legally Responsible Person is responsible for obtaining coverage under the General Permit where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties unless the LUP construction activities are covered under another construction storm water permit.
3. Only LUPs shall comply with the conditions and requirements in Attachment A, A.1 & A.2 of this Order. The balance of this Order is not applicable to LUPs except as indicated in Attachment A.

⁶ These attachments are part of the General Permit itself and are not separate documents that are capable of being updated independently by the State Water Board.

B. Obtaining Permit Coverage Traditional Construction Sites

1. The Legally Responsible Person (LRP) (see Special Provisions, Electronic Signature and Certification Requirements, Section IV.I.1) must obtain coverage under this General Permit.
2. To obtain coverage, the LRP must electronically file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.
3. PRDs shall consist of:
 - a. Notice of Intent (NOI)
 - b. Risk Assessment (Section VIII)
 - c. Site Map
 - d. Storm Water Pollution Prevention Plan (Section XIV)
 - e. Annual Fee
 - f. Signed Certification Statement

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

Attachment B contains additional PRD information. Dischargers must electronically file the PRDs, and mail the appropriate annual fee to the State Water Board.

4. This permit is effective on July 1, 2010.
 - a. **Dischargers Obtaining Coverage On or After July 1, 2010:** All dischargers requiring coverage on or after July 1, 2010, shall electronically file their PRDs prior to the commencement of construction activities, and mail the appropriate annual fee no later than seven days prior to the commencement of construction activities. Permit coverage shall not commence until the PRDs and the annual fee are received by the State Water Board, and a WDID number is assigned and sent by SMARTS.
 - b. **Dischargers Covered Under 99-08-DWQ and 2003-0007-DWQ:** Existing dischargers subject to State Water Board Order No. 99-08-DWQ (existing dischargers) will continue coverage under 99-08-DWQ until July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 99-08-DWQ will be terminated.

Existing dischargers shall electronically file their PRDs no later than July 1, 2010. If an existing discharger's site acreage subject to the annual fee has changed, it shall mail a revised annual fee no less than seven days after receiving the revised annual fee notification, **or else lose permit coverage**. All existing dischargers shall be exempt from the risk determination requirements in Section VIII of this General Permit until two years after permit adoption. All existing dischargers are therefore subject to Risk Level 1 requirements regardless of their site's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the Section VIII risk determination requirements.

5. The discharger is only considered covered by this General Permit upon receipt of a Waste Discharger Identification (WDID) number assigned and sent by the State Water Board Storm water Multi-Application and Report Tracking System (SMARTS). In order to demonstrate compliance with this General Permit, the discharger must obtain a WDID number and must present documentation of a valid WDID upon demand.
6. During the period this permit is subject to review by the U.S. EPA, the prior permit (State Water Board Order No. 99-08-DWQ) remains in effect. Existing dischargers under the prior permit will continue to have coverage under State Water Board Order No. 99-08-DWQ until this General Permit takes effect on July 1, 2010. Dischargers who complete their projects and electronically file an NOT prior to July 1, 2010, are not required to obtain coverage under this General Permit.
7. Small Construction Rainfall Erosivity Waiver

EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

If a small construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the

rainfall erosivity factor for the new project duration and submit this information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

8. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. Revising Permit Coverage for Change of Acreage or New Ownership

1. The discharger may reduce or increase the total acreage covered under this General Permit when a portion of the site is complete and/or conditions for termination of coverage have been met (See Section II.D Conditions for Termination of Coverage); when ownership of a portion of the site is sold to a different entity; or when new acreage, subject to this General Permit, is added to the site.
2. Within 30 days of a reduction or increase in total disturbed acreage, the discharger shall electronically file revisions to the PRDs that include:
 - a. A revised NOI indicating the new project size;
 - b. A revised site map showing the acreage of the site completed, acreage currently under construction, acreage sold/transferred or added, and acreage currently stabilized in accordance with the Conditions for Termination of Coverage in Section II.D below.
 - c. SWPPP revisions, as appropriate; and
 - d. Certification that any new landowners have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address of the new landowner.
 - e. If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

3. The discharger shall continue coverage under the General Permit for any parcel that has not achieved “Final Stabilization” as defined in Section II.D.
4. When an LRP with active General Permit coverage transfers its LRP status to another person or entity that qualifies as an LRP, the existing LRP shall inform the new LRP of the General Permit’s requirements. In order for the new LRP to continue the construction activity on its parcel of property, the new LRP, or the new LRP’s approved signatory, must submit PRDs in accordance with this General Permit’s requirements.

D. Conditions for Termination of Coverage

1. Within 90 days of when construction is complete or ownership has been transferred, the discharger shall electronically file a Notice of Termination (NOT), a final site map, and photos through the State Water Boards SMARTS system. Filing a NOT certifies that all General Permit requirements have been met. The Regional Water Board will consider a construction site complete only when all portions of the site have been transferred to a new owner, or all of the following conditions have been met:
 - a. For purposes of “final stabilization,” the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;
 - b. There is no potential for construction-related storm water pollutants to be discharged into site runoff;
 - c. Final stabilization has been reached;
 - d. Construction materials and wastes have been disposed of properly;
 - e. Compliance with the Post-Construction Standards in Section XIII of this General Permit has been demonstrated;
 - f. Post-construction storm water management measures have been installed and a long-term maintenance plan⁷ has been established; and
 - g. All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site.

⁷ For the purposes of this requirement a long-term maintenance plan will be designed for a minimum of five years, and will describe the procedures to ensure that the post-construction storm water management measures are adequately maintained.

2. The discharger shall certify that final stabilization conditions are satisfied in their NOT. Failure to certify shall result in continuation of permit coverage and annual billing.
3. The NOT must demonstrate through photos, RUSLE or RUSLE2, or results of testing and analysis that the site meets all of the conditions above (Section II.D.1) and the final stabilization condition (Section II.D.1.a) is attained by one of the following methods:
 - a. "70% final cover method," no computational proof required

OR:

- b. "RUSLE or RUSLE2 method," computational proof required

OR:

- c. "Custom method", the discharger shall demonstrate in some other manner than a or b, above, that the site complies with the "final stabilization" requirement in Section II.D.1.a.

III. DISCHARGE PROHIBITIONS

- A.** Dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.
- B.** All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit.
- C.** Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. The discharge of non-storm water is authorized under the following conditions:

 - 1. The discharge does not cause or contribute to a violation of any water quality standard;
 - 2. The discharge does not violate any other provision of this General Permit;
 - 3. The discharge is not prohibited by the applicable Basin Plan;
 - 4. The discharger has included and implemented specific BMPs required by this General Permit to prevent or reduce the contact of the non-storm water discharge with construction materials or equipment.
 - 5. The discharge does not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;
 - 6. The discharge is monitored and meets the applicable NALs; and
 - 7. The discharger reports the sampling information in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not already authorized by this General Permit or another NPDES permit, to determine whether a separate NPDES permit is necessary.

- D.** Debris resulting from construction activities are prohibited from being discharged from construction sites.
- E.** When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

IV. SPECIAL PROVISIONS

A. Duty to Comply

1. The discharger shall comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.
2. The discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

B. General Permit Actions

1. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.
2. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

C. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

D. Duty to Mitigate

The discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

F. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

G. Duty to Maintain Records and Provide Information

1. The discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be available at the construction site until construction is completed.
2. The discharger shall furnish the Regional Water Board, State Water Board, or U.S. EPA, within a reasonable time, any requested information to determine compliance with this General Permit. The discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

H. Inspection and Entry

The discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

2. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;
3. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and
4. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

I. Electronic Signature and Certification Requirements

1. All Permit Registration Documents (PRDs) and Notices of Termination (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP), as defined in Appendix 5 – Glossary, or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory, as defined in Appendix 5 - Glossary) must submit all information electronically via SMARTS.
2. Changes to Authorization. If an Approved Signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an Approved Signatory.
3. All Annual Reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, U.S. EPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's Approved Signatory.

J. Certification

Any person signing documents under Section IV.I above, shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

K. Anticipated Noncompliance

The discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

L. Bypass

Bypass⁸ is prohibited. The Regional Water Board may take enforcement action against the discharger for bypass unless:

1. Bypass was unavoidable to prevent loss of life, personal injury or severe property damage;⁹
2. There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that could occur during normal periods of equipment downtime or preventative maintenance;
3. The discharger submitted a notice at least ten days in advance of the need for a bypass to the Regional Water Board; or
4. The discharger may allow a bypass to occur that does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. In such a case, the above bypass conditions are not applicable. The discharger shall submit notice of an unanticipated bypass as required.

M. Upset

1. A discharger that wishes to establish the affirmative defense of an upset¹⁰ in an action brought for noncompliance shall demonstrate,

⁸ The intentional diversion of waste streams from any portion of a treatment facility

⁹ Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

¹⁰ An exceptional incident in which there is unintentional and temporary noncompliance the technology based numeric effluent limitations because of factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

through properly signed, contemporaneous operating logs, or other relevant evidence that:

- a. An upset occurred and that the discharger can identify the cause(s) of the upset
 - b. The treatment facility was being properly operated by the time of the upset
 - c. The discharger submitted notice of the upset as required; and
 - d. The discharger complied with any remedial measures required
2. No determination made before an action of noncompliance occurs, such as during administrative review of claims that noncompliance was caused by an upset, is final administrative action subject to judicial review.
 3. In any enforcement proceeding, the discharger seeking to establish the occurrence of an upset has the burden of proof

N. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than \$10,000 or by imprisonment for not more than two years or by both.

O. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the discharger is or may be subject to under Section 311 of the CWA.

P. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

Q. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of U.S. EPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

R. Penalties for Violations of Permit Conditions

1. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed \$37,500¹¹ per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.
2. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

S. Transfers

This General Permit is not transferable.

T. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

¹¹ May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act.

V. EFFLUENT STANDARDS & RECEIVING WATER MONITORING

A. Narrative Effluent Limitations

1. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
2. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

Table 1- Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5
		Risk Level 3			lower NAL = 6.5 upper NAL = 8.5
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2	1	NTU	250 NTU
		Risk Level 3			250 NTU

B. Numeric Action Levels (NALs)

1. For Risk Level 2 and 3 dischargers, the lower storm event average NAL for pH is 6.5 pH units and the upper storm event average NAL for

pH is 8.5 pH units. The discharger shall take actions as described below if the discharge is outside of this range of pH values.

2. For Risk Level 2 and 3 dischargers, the NAL storm event daily average for turbidity is 250 NTU. The discharger shall take actions as described below if the discharge is outside of this range of turbidity values.
3. Whenever the results from a storm event daily average indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.
4. The site evaluation shall be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:
 - a. Are related to the construction activities and whether additional BMPs are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

AND/OR:

- b. Are related to the run-on associated with the construction site location and whether additional BMPs measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) what corrective action(s) were taken or will be taken with a description of the schedule for completion.

C. Receiving Water Monitoring Triggers

1. The receiving water monitoring triggers for Risk Level 3 dischargers with direct discharges to surface waters are triggered when the daily average effluent pH values during any site phase when there is a high risk of pH discharge¹² fall outside of the range of 6.0 and 9.0 pH units, or when the daily average effluent turbidity exceeds 500 NTU.

2. Risk Level 3 dischargers with direct discharges to surface waters shall conduct receiving water monitoring whenever their effluent monitoring results exceed the receiving water monitoring triggers. If the pH trigger is exceeded, the receiving water shall be monitored for pH for the duration of coverage under this General Permit. If the turbidity trigger is exceeded, the receiving water shall be monitored for turbidity and SSC for the duration of coverage under this general permit.
3. Risk Level 3 dischargers with direct discharges to surface waters shall initiate receiving water monitoring when the triggers are exceeded unless the storm event causing the exceedance is determined after the fact to equal to or greater than the 5-year 24-hour storm (expressed in inches of rainfall) as determined by using these maps:

<http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif>
<http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif>

Verification of the 5-year 24-hour storm event shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

4. If run-on is caused by a forest fire or any other natural disaster, then receiving water monitoring triggers do not apply.

¹² A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

VI. RECEIVING WATER LIMITATIONS

- A.** The discharger shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.
- B.** The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.
- C.** The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).
- D.** Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL has been approved by the U.S. EPA, shall comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of the pollution.

VII. TRAINING QUALIFICATIONS AND CERTIFICATION REQUIREMENTS

A. General

The discharger shall ensure that all persons responsible for implementing requirements of this General Permit shall be appropriately trained in accordance with this Section. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Those responsible for preparing and amending SWPPPs shall comply with the requirements in this Section VII.

The discharger shall provide documentation of all training for persons responsible for implementing the requirements of this General Permit in the Annual Reports.

B. SWPPP Certification Requirements

1. **Qualified SWPPP Developer:** The discharger shall ensure that SWPPPs are written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:
 - a. A California registered professional civil engineer;
 - b. A California registered professional geologist or engineering geologist;
 - c. A California registered landscape architect;
 - d. A professional hydrologist registered through the American Institute of Hydrology;
 - e. A Certified Professional in Erosion and Sediment Control (CPESC)TM registered through Enviro Cert International, Inc.;
 - f. A Certified Professional in Storm Water Quality (CPSWQ)TM registered through Enviro Cert International, Inc.; or
 - g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET).

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

2. The discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.
3. **Qualified SWPPP Practitioner:** The discharger shall ensure that all BMPs required by this General Permit are implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:
 - a. A certified erosion, sediment and storm water inspector registered through Enviro Cert International, Inc.; or
 - b. A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

4. The LRP shall list in the SWPPP, the name of any Approved Signatory, and provide a copy of the written agreement or other mechanism that provides this authority from the LRP in the SWPPP.
5. The discharger shall include, in the SWPPP, a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.
6. The discharger shall ensure that the SWPPP and each amendment will be signed by the Qualified SWPPP Developer. The discharger shall include a listing of the date of initial preparation and the date of each amendment in the SWPPP.

VIII. RISK DETERMINATION

The discharger shall calculate the site's sediment risk and receiving water risk during periods of soil exposure (i.e. grading and site stabilization) and use the calculated risks to determine a Risk Level(s) using the methodology in

Appendix 1. For any site that spans two or more planning watersheds,¹³ the discharger shall calculate a separate Risk Level for each planning watershed. The discharger shall notify the State Water Board of the site's Risk Level determination(s) and shall include this determination as a part of submitting the PRDs. If a discharger ends up with more than one Risk Level determination, the Regional Water Board may choose to break the project into separate levels of implementation.

IX. RISK LEVEL 1 REQUIREMENTS

Risk Level 1 Dischargers shall comply with the requirements included in Attachment C of this General Permit.

X. RISK LEVEL 2 REQUIREMENTS

Risk Level 2 Dischargers shall comply with the requirements included in Attachment D of this General Permit.

XI. RISK LEVEL 3 REQUIREMENTS

Risk Level 3 Dischargers shall comply with the requirements included in Attachment E of this General Permit.

XII. ACTIVE TREATMENT SYSTEMS (ATS)

Dischargers choosing to implement an ATS on their site shall comply with all of the requirements in Attachment F of this General Permit.

¹³ Planning watershed: defined by the Calwater Watershed documents as a watershed that ranges in size from approximately 3,000 to 10,000 acres <http://cain.ice.ucdavis.edu/calwater/calwfaq.html>, <http://gis.ca.gov/catalog/BrowseRecord.epl?id=22175>.

XIII. POST-CONSTRUCTION STANDARDS

- A.** All dischargers shall comply with the following runoff reduction requirements unless they are located within an area subject to post-construction standards of an active Phase I or II municipal separate storm sewer system (MS4) permit that has an approved Storm Water Management Plan.
1. This provision shall take effect three years from the adoption date of this permit, or later at the discretion of the Executive Officer of the Regional Board.
 2. The discharger shall demonstrate compliance with the requirements of this section by submitting with their NOI a map and worksheets in accordance with the instructions in Appendix 2. The discharger shall use non-structural controls unless the discharger demonstrates that non-structural controls are infeasible or that structural controls will produce greater reduction in water quality impacts.
 3. The discharger shall, through the use of non-structural and structural measures as described in Appendix 2, replicate the pre-project water balance (for this permit, defined as the volume of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event (or the smallest storm event that generates runoff, whichever is larger). Dischargers shall inform Regional Water Board staff at least 30 days prior to the use of any structural control measure used to comply with this requirement. Volume that cannot be addressed using non-structural practices shall be captured in structural practices and approved by the Regional Water Board. When seeking Regional Board approval for the use of structural practices, dischargers shall document the infeasibility of using non-structural practices on the project site, or document that there will be fewer water quality impacts through the use of structural practices.
 4. For sites whose disturbed area exceeds two acres, the discharger shall preserve the pre-construction drainage density (miles of stream length per square mile of drainage area) for all drainage areas within the area serving a first order stream¹⁴ or larger stream and ensure that post-project time of runoff concentration is equal or greater than pre-project time of concentration.

¹⁴ A first order stream is defined as a stream with no tributaries.

- B.** All dischargers shall implement BMPs to reduce pollutants in storm water discharges that are reasonably foreseeable after all construction phases have been completed at the site (Post-construction BMPs).

XIV. SWPPP REQUIREMENTS

- A.** The discharger shall ensure that the Storm Water Pollution Prevention Plans (SWPPPs) for all traditional project sites are developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:
1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;
 2. Where not otherwise required to be under a Regional Water Board permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;
 3. Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;
 4. Calculations and design details as well as BMP controls for site run-on are complete and correct, and
 5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed.
- B.** To demonstrate compliance with requirements of this General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of BMPs.
- C.** The discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

XV. REGIONAL WATER BOARD AUTHORITIES

- A.** In the case where the Regional Water Board does not agree with the discharger's self-reported risk level (e.g., they determine themselves to be a Level 1 Risk when they are actually a Level 2 Risk site), Regional Water Boards may either direct the discharger to reevaluate the Risk Level(s) for their site or terminate coverage under this General Permit.
- B.** Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.
- C.** Regional Water Boards may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.
- D.** Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.
- E.** Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

XVI. ANNUAL REPORTING REQUIREMENTS

- A.** All dischargers shall prepare and electronically submit an Annual Report no later than September 1 of each year.
- B.** The discharger shall certify each Annual Report in accordance with the Special Provisions.
- C.** The discharger shall retain an electronic or paper copy of each Annual Report for a minimum of three years after the date the annual report is filed.
- D.** The discharger shall include storm water monitoring information in the Annual Report consisting of:
 - 1. a summary and evaluation of all sampling and analysis results, including copies of laboratory reports;
 - 2. the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");
 - 3. a summary of all corrective actions taken during the compliance year;
 - 4. identification of any compliance activities or corrective actions that were not implemented;
 - 5. a summary of all violations of the General Permit;
 - 6. the names of individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements;
 - 7. the date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge); and
 - 8. the visual observation and sample collection exception records and reports specified in Attachments C, D, and E.
- E.** The discharger shall provide training information in the Annual Report consisting of:
 - 1. documentation of all training for individuals responsible for all activities associated with compliance with this General Permit;

2. documentation of all training for individuals responsible for BMP installation, inspection, maintenance, and repair; and
3. documentation of all training for individuals responsible for overseeing, revising, and amending the SWPPP.

ATTACHMENT A
Linear Underground/ Overhead Requirements

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All Linear Underground/Overhead project dischargers who submit permit registration documents (PRDs) indicating their intention to be regulated under the provisions of this General Permit shall comply with the following:

A. DEFINITION OF LINEAR UNDERGROUND/OVERHEAD PROJECTS

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio, or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.
2. LUP evaluation shall consist of two tasks:

- a. Confirm that the project or project section(s) qualifies as an LUP. The State Water Board website contains a project determination guidance flowchart.
http://www.waterboards.ca.gov/water_issues/programs/stormwater/constructionpermits.shtml
 - b. Identify which Type(s) (1, 2 or 3 described in Section I below) are applicable to the project or project sections based on project sediment and receiving water risk. (See Attachment A.1)
- 3.** A Legally Responsible Person (LRP) for a Linear Underground/Overhead project is required to obtain CGP coverage under one or more permit registration document (PRD) electronic submittals to the State Water Board's Storm Water Multi-Application and Report Tracking (SMARTs) system. Attachment A.1 contains a flow chart to be used when determining if a linear project qualifies for coverage and to determine LUP Types. Since a LUP may be constructed within both developed and undeveloped locations and portions of LUPs may be constructed by different contractors, LUPs may be broken into logical permit sections. Sections may be determined based on portions of a project conducted by one contractor. Other situations may also occur, such as the time period in which the sections of a project will be constructed (e.g. project phases), for which separate permit coverage is possible. For projects that are broken into separate sections, a description of how each section relates to the overall project and the definition of the boundaries between sections shall be clearly stated.
- 4.** Where construction activities transverse or enter into different Regional Water Board jurisdictions, LRPs shall obtain permit coverage for each Regional Water Board area involved prior to the commencement of construction activities.
- 5.** Small Construction Rainfall Erosivity Waiver

EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

If a small linear construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

B. LINEAR PROJECT PERMIT REGISTRATION DOCUMENTS (PRDs)

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted. PRDs shall consist of the following:

1. Notice of Intent (NOI)

Prior to construction activities, the LRP of a proposed linear underground/overhead project shall utilize the processes and methods provided in Attachment A.2, Permit Registration Documents (PRDs) – General Instructions for Linear Underground/Overhead Projects to comply with the Construction General Permit.

2. Site Maps

LRPs submitting PRDs shall include at least 3 maps. The first map will be a zoomed¹ 1000-1500 ft vicinity map that shows the starting point of the project. The second will be a zoomed map of 1000-1500 ft showing the ending location of the project. The third will be a larger view vicinity map, 1000 ft to 2000 ft, displaying the entire project location depending on the project size, and indicating the LUP type (1, 2 or 3) areas within the total project footprint.

3. Drawings

LRPs submitting PRDs shall include a construction drawing(s) or other appropriate drawing(s) or map(s) that shows the locations of storm drain

¹ An image with a close-up/enhanced detailed view of site features that show minute details such as streets and neighboring structures.

Or: An image with a close-up/enhanced detailed view of the site's surrounding infrastructure.

Or: An image with a close up detailed view of the project and its surroundings.

inlets and waterbodies² that may receive discharges from the construction activities and that shows the locations of BMPs to be installed for all those BMPs that can be illustrated on the revisable drawing(s) or map(s). If storm drain inlets, waterbodies, and/or BMPs cannot be adequately shown on the drawing(s) or map(s) they should be described in detail within the SWPPP.

4. Storm Water Pollution Prevention Plan (SWPPP)

LUP dischargers shall comply with the SWPPP Preparation, Implementation, and Oversight requirements in Section K of this Attachment.

5. Contact information

LUP dischargers shall include contact information for all contractors (or subcontractors) responsible for each area of an LUP project. This should include the names, telephone numbers, and addresses of contact personnel. Specific areas of responsibility of each contact, and emergency contact numbers should also be included.

6. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. LINEAR PROJECT TERMINATION OF COVERAGE REQUIREMENTS

The LRP may terminate coverage of an LUP when construction activities are completed by submitting an electronic notice of termination (NOT) through the State Water Board's SMARTS system. Termination requirements are different depending on the complexity of the LUP. An LUP is considered complete when: (a) there is no potential for construction-related storm water pollution; (b) all elements of the SWPPP have been completed; (c) construction materials and waste have been disposed of properly; (d) the site is in compliance with all local storm water management requirements; and (e) the LRP submits a notice of termination (NOT) and has received approval for termination from the appropriate Regional Water Board office.

1. LUP Stabilization Requirements

The LUP discharger shall ensure that all disturbed areas of the construction site are stabilized prior to termination of coverage under this General Permit. Final stabilization for the purposes of submitting an NOT

² Includes basin(s) that the MS4 storm sewer systems may drain to for Hydromodification or Hydrological Conditional of Concerns under the MS4 permits.

is satisfied when all soil disturbing activities are completed and one of the following criteria is met:

- a. In disturbed areas that were vegetated prior to construction activities of the LUP, the area disturbed must be re-established to a uniform vegetative cover equivalent to 70 percent coverage of the preconstruction vegetative conditions. Where preconstruction vegetation covers less than 100 percent of the surface, such as in arid areas, the 70 percent coverage criteria is adjusted as follows: if the preconstruction vegetation covers 50 percent of the ground surface, 70 percent of 50 percent ($.70 \times .50 = .35$) would require 35 percent total uniform surface coverage; or
- b. Where no vegetation is present prior to construction, the site is returned to its original line and grade and/or compacted to achieve stabilization; or
- c. Equivalent stabilization measures have been employed. These measures include, but are not limited to, the use of such BMPs as blankets, reinforced channel liners, soil cement, fiber matrices, geotextiles, or other erosion resistant soil coverings or treatments.

2. LUP Termination of Coverage Requirements

The LRP shall file an NOT through the State Water Board's SMARTS system. By submitting an NOT, the LRP is certifying that construction activities for an LUP are complete and that the project is in full compliance with requirements of this General Permit and that it is now compliant with soil stabilization requirements where appropriate. Upon approval by the appropriate Regional Water Board office, permit coverage will be terminated.

3. Revising Coverage for Change of Acreage

When the LRP of a portion of an LUP construction project changes, or when a phase within a multi-phase project is completed, the LRP may reduce the total acreage covered by this General Permit. In reducing the acreage covered by this General Permit, the LRP shall electronically file revisions to the PRDs that include:

- a. a revised NOI indicating the new project size;
- b. a revised site map showing the acreage of the project completed, acreage currently under construction, acreage sold, transferred or added, and acreage currently stabilized.
- c. SWPPP revisions, as appropriate; and
- d. certification that any new LRPs have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address (if known) of the new LRP.

If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

D. DISCHARGE PROHIBITIONS

1. LUP dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.
2. LUP dischargers are prohibited from discharging non-storm water that is not otherwise authorized by this General Permit. Non-storm water discharges authorized by this General Permit³ may include, fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, street cleaning, dewatering,⁴ uncontaminated groundwater from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. Such discharges are allowed by this General Permit provided they are not relied upon to clean up failed or inadequate construction or post-construction BMPs designed to keep materials on site. These authorized non-storm water discharges:

³ Dischargers must identify all authorized non-storm water discharges in the LUP's SWPPP and identify BMPs that will be implemented to either eliminate or reduce pollutants in non-storm water discharges. Regional Water Boards may direct the discharger to discontinue discharging such non-storm water discharges if determined that such discharges discharge significant pollutants or threaten water quality.

⁴Dewatering activities may be prohibited or need coverage under a separate permit issued by the Regional Water Boards. Dischargers shall check with the appropriate Regional Water Boards for any required permit or basin plan conditions prior to initial dewatering activities to land, storm drains, or waterbodies.

- a. Shall not cause or contribute to a violation of any water quality standard;
- b. Shall not violate any other provision of this General Permit;
- c. Shall not violate any applicable Basin Plan;
- d. Shall comply with BMPs as described in the SWPPP;
- e. Shall not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;
- f. Shall be monitored and meets the applicable NALs; and
- g. Shall be reported by the discharger in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not authorized by this General Permit to determine the need for a separate NPDES permit.

Additionally, some LUP dischargers may be required to obtain a separate permit if the applicable Regional Water Board has adopted a General Permit for dewatering discharges. Wherever feasible, alternatives, that do not result in the discharge of non-storm water, shall be implemented in accordance with this Attachment's Section K.2 - SWPPP Implementation Schedule.

3. LUP dischargers shall ensure that trench spoils or any other soils disturbed during construction activities that are contaminated⁵ are not discharged with storm water or non-storm water discharges into any storm drain or water body except pursuant to an NPDES permit.

When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the LUP discharger shall have those soils sampled and tested to ensure that proper handling and public safety measures are

⁵ Contaminated soil contains pollutants in concentrations that exceed the appropriate thresholds that various regulatory agencies set for those substances. Preliminary testing of potentially contaminated soils will be based on odor, soil discoloration, or prior history of the site's chemical use and storage and other similar factors. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The legally responsible person will notify the appropriate local, State, or federal agency(ies) when contaminated soil is found at a construction site, and will notify the Regional Water Board by submitting an NOT at the completion of the project.

implemented. The LUP discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

4. Discharging any pollutant-laden water that will cause or contribute to an exceedance of the applicable Regional Water Board's Basin Plan from a dewatering site or sediment basin into any receiving water or storm drain is prohibited.
5. Debris⁶ resulting from construction activities are prohibited from being discharged from construction project sites.

E. SPECIAL PROVISIONS

1. Duty to Comply

- a. The LUP discharger must comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.
- b. The LUP discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

2. General Permit Actions

- a. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.

⁶ Litter, rubble, discarded refuse, and remains of something destroyed.

- b. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an LUP discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

4. Duty to Mitigate

The LUP discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

5. Proper Operation and Maintenance

The LUP discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit and with the requirements of the Storm Water Pollution Prevention Plan (SWPPP). Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

6. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

7. Duty to Maintain Records and Provide Information

- a. The LUP discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be kept at the construction site or in a crew

member's vehicle until construction is completed, and shall be made available upon request.

- b. The LUP discharger shall furnish the Regional Water Board, State Water Board, or USEPA, within a reasonable time, any requested information to determine compliance with this General Permit. The LUP discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

8. Inspection and Entry

The LUP discharger shall allow the Regional Water Board, State Water Board, USEPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

- a. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;
- b. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;
- c. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and
- d. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

9. Electronic Signature and Certification Requirements

- a. All Permit Registration Documents (PRDs) and Notices of Termination (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP), as defined in Appendix 5 – Glossary, or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory, as defined in Appendix 5 - Glossary) must submit all information electronically via SMARTS.
- b. Changes to Authorization. If an Approved Signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or

together with any reports, information or applications to be signed by an Approved Signatory.

- c. All SWPPP revisions, annual reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, USEPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's Approved Signatory.

10. Certification

Any person signing documents under Section E.9 above, shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

11. Anticipated Noncompliance

The LUP discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

12. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than \$10,000 or by imprisonment for not more than two years or by both.

13. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the LUP discharger is or may be subject to under Section 311 of the CWA.

14. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

15. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of USEPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

16. Penalties for Violations of Permit Conditions

- a. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed \$37,500⁷ per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.
- b. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

17. Transfers

This General Permit is not transferable. A new LRP of an ongoing construction activity must submit PRDs in accordance with the requirements of this General Permit to be authorized to discharge under this General Permit. An LRP who is a property owner with active General Permit coverage who sells a fraction or all the land shall inform the new property owner(s) of the requirements of this General Permit.

18. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those

⁷ May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act

dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

F. EFFLUENT STANDARDS & RECEIVING WATER MONITORING

1. Narrative Effluent Limitations

- a. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges regulated by this General Permit do not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
- b. LUP dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of structural or non-structural controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

Table 1. Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level
pH	Field test with calibrated portable instrument	LUP Type 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5
		LUP Type 3			lower NAL = 6.5 upper NAL = 8.5
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	LUP Type 2	1	NTU	250 NTU
		LUP Type 3			250 NTU

2. Numeric Action Levels (NALs)

- a. For LUP Type 2 and 3 dischargers, the lower storm event daily average NAL for pH is 6.5 pH units and the upper storm event daily average NAL for pH is 8.5 pH units. The LUP discharger shall take actions as described below if the storm event daily average discharge is outside of this range of pH values.
- b. For LUP Type 2 and 3 dischargers, the storm event daily average NAL for turbidity is 250 NTU. The discharger shall take actions as described below if the storm event daily average discharge is outside of this range of turbidity values.
- c. Whenever daily average analytical effluent monitoring results indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the LUP discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.
- d. The site evaluation will be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:
 - i. Are related to the construction activities and whether additional BMPs or SWPPP implementation measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

AND/OR:

- ii. Are related to the run-on associated with the construction site location and whether additional BMPs or SWPPP implementation measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) decide what corrective action(s) were taken or will be taken, including a description of the schedule for completion.

3. Receiving Water Monitoring Triggers

- a. The receiving water monitoring triggers for LUP Type 3 dischargers with direct discharges to surface waters are triggered when the daily average effluent pH values during any site phase when there is a high risk of pH discharge⁸ fall outside of the range of 6.0 and 9.0 pH units, or when the daily average effluent turbidity exceeds 500 NTU.
- b. LUP Type 3 dischargers with direct discharges to surface waters shall conduct receiving water monitoring whenever their effluent monitoring results exceed the receiving water monitoring triggers. If the pH trigger is exceeded, the receiving water shall be monitored for pH for the duration of coverage under this General Permit. If the turbidity trigger is exceeded, the receiving water shall be monitored for turbidity and SSC for the duration of coverage under this General Permit.
- c. LUP Type 3 dischargers with direct discharges to surface waters shall initiate receiving water monitoring when the triggers are exceeded unless the storm event causing the exceedance is determined after the fact to equal to or greater than the 5-year 24-hour storm (expressed in inches of rainfall) as determined by using these maps:

<http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif>
<http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif>

 Verification of the 5-year 24-hour storm event shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.
- d. If run-on is caused by a forest fire or any other natural disaster, then receiving water monitoring triggers do not apply.

G. RECEIVING WATER LIMITATIONS

1. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.
2. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.
3. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or

⁸ A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).

H. TRAINING QUALIFICATIONS

1. General

All persons responsible for implementing requirements of this General Permit shall be appropriately trained. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Persons responsible for preparing, amending and certifying SWPPPs shall comply with the requirements in this Section H.

2. SWPPP Certification Requirements

- a. **Qualified SWPPP Developer:** The LUP discharger shall ensure that all SWPPPs be written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:
 - i A California registered professional civil engineer;
 - ii A California registered professional geologist or engineering geologist;
 - iii A California registered landscape architect;
 - iv A professional hydrologist registered through the American Institute of Hydrology;
 - v A certified professional in erosion and sediment control (CPESC)™ registered through Enviro Cert International, Inc;
 - vi A certified professional in storm water quality (CPSWQ)™ registered through Enviro Cert International, Inc.; or
 - vii A certified professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET).

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

- b. The LUP discharger shall ensure that the SWPPP is written and amended, as needed, to address the specific circumstances for each construction site covered by this General Permit prior to commencement of construction activity for any stage.
- c. The LUP discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.
- d. **Qualified SWPPP Practitioner:** The LUP discharger shall ensure that all elements of any SWPPP for each project will be implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis, and for ensuring full compliance with the permit and implementation of all elements of the SWPPP. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:
 - i. A certified erosion, sediment and storm water inspector registered through Certified Professional in Erosion and Sediment Control, Inc.; or
 - ii. A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

- e. The LUP discharger shall ensure that the SWPPP include a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner, and who is ultimately responsible for implementation of the SWPPP. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.
- f. The LUP discharger shall ensure that the SWPPP and each amendment be signed by the Qualified SWPPP Developer. The LUP discharger shall include a listing of the date of initial preparation and the dates of each amendment in the SWPPP.

I. TYPES OF LINEAR PROJECTS

This attachment establishes three types (Type 1, 2 & 3) of complexity for areas within an LUP or project section based on threat to water quality. Project area Types are determined through Attachment A.1.

The Type 1 requirements below establish the baseline requirements for all LUPs subject to this General Permit. Additional requirements for Type 2 and Type 3 LUPs are labeled.

1. Type 1 LUPs:

LUP dischargers with areas of a LUP designated as Type 1 shall comply with the requirements in this Attachment. Type 1 LUPs are:

- a. Those construction areas where 70 percent or more of the construction activity occurs on a paved surface and where areas disturbed during construction will be returned to preconstruction conditions or equivalent protection established at the end of the construction activities for the day; or
- b. Where greater than 30 percent of construction activities occur within the non-paved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them where:
 - i Areas disturbed during construction will be returned to preconstruction conditions or equivalent protection is established at the end of the construction activities for the day to minimize the potential for erosion and sediment deposition, and
 - ii Areas where established vegetation was disturbed during construction will be stabilized and re-vegetated by the end of project. When required, adequate temporary stabilization BMPs will be installed and maintained until vegetation is established to meet minimum cover requirements established in this General Permit for final stabilization.
- c. Where the risk determination is as follows:
 - i Low sediment risk, low receiving water risk, or
 - ii Low sediment risk, medium receiving water risk, or
 - iii Medium sediment risk, low receiving water risk

2. Type 2 LUPs:

Type 2 LUPs are determined by the Combined Risk Matrix in Attachment A.1. Type 2 LUPs have the specified combination of risk:

- d. High sediment risk, low receiving water risk, or
- e. Medium sediment risk, medium receiving water risk, or
- f. Low sediment risk, high receiving water risk

Receiving water risk is either considered “Low” for those areas of the project that are not in close proximity to a sensitive receiving watershed, “Medium” for those areas of the project within a sensitive receiving watershed yet outside of the flood plain of a sensitive receiving water body, and “High” where the soil disturbance is within close proximity to a sensitive receiving water body. Project sediment risk is calculated based on the Risk Factor Worksheet in Attachment C of this General Permit.

3. Type 3 LUPs:

Type 3 LUPs are determined by the Combined Risk Matrix in Attachment A.1. Type 3 LUPs have the specified combination of risk:

- a. High sediment risk, high receiving water risk, or
- b. High sediment risk, medium receiving water risk, or
- c. Medium sediment risk, high receiving water risk

Receiving water risk is either considered “Medium” for those areas of the project within a sensitive receiving watershed yet outside of the flood plain of a sensitive receiving water body, or “High” where the soil disturbance is within close proximity to a sensitive receiving water body. Project sediment risk is calculated based on the Risk Factor Worksheet in Attachment C.

J. LUP TYPE-SPECIFIC REQUIREMENTS**1. Effluent Standards**

- a. Narrative – LUP dischargers shall comply with the narrative effluent standards below.

- i Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
 - ii LUP dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.
- b. Numeric – LUP Type 1 dischargers are not subject to a numeric effluent standard
 - c. Numeric –LUP Type 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.
 - d. Numeric – LUP Type 3 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

2. Good Site Management "Housekeeping"

- a. LUP dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, the good housekeeping measures shall consist of the following:
 - i Identify the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - ii Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).
 - iii Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).
 - iv Minimize exposure of construction materials to precipitation (not applicable to materials designed to be outdoors and exposed to the environment).

- v Implement BMPs to control the off-site tracking of loose construction and landscape materials.
- b. LUP dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:
 - i Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.
 - ii Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.
 - iii Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.
 - iv Cover waste disposal containers at the end of every business day and during a rain event.
 - v Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.
 - vi Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.
 - vii Implement procedures that effectively address hazardous and non-hazardous spills.
 - viii Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:
 - (1) Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and
 - (2) Appropriate spill response personnel are assigned and trained.
 - ix Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

- c. LUP dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:
 - i Prevent oil, grease, or fuel from leaking into the ground, storm drains or surface waters.
 - ii Implement appropriate BMPs whenever equipment or vehicles are fueled, maintained or stored.
 - iii Clean leaks immediately and disposing of leaked materials properly.
- d. LUP dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:
 - i Contain stockpiled materials such as mulches and topsoil when they are not actively being used.
 - ii Contain fertilizers and other landscape materials when they are not actively being used.
 - iii Discontinue the application of any erodible landscape material at least 2 days before a forecasted rain event⁹ or during periods of precipitation.
 - iv Applying erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.
 - v Stacking erodible landscape material on pallets and covering or storing such materials when not being used or applied.
- e. LUP dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, LUP dischargers shall do the following:

⁹ 50% or greater chance of producing precipitation.

- i Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.
 - ii Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.
 - iii Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.
 - iv Ensure retention of sampling, visual observation, and inspection records.
 - v Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.
- f. LUP dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations.

3. Non-Storm Water Management

- a. LUP dischargers shall implement measures to control all non-storm water discharges during construction.
- b. LUP dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.
- c. LUP dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

4. Erosion Control

- a. LUP dischargers shall implement effective wind erosion control.
- b. LUP dischargers shall provide effective soil cover for inactive¹⁰ areas and all finished slopes, and utility backfill.

¹⁰ Areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days

- c. LUP dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

5. Sediment Controls

- a. LUP dischargers shall establish and maintain effective perimeter controls as needed, and implement effective BMPs for all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.
- b. On sites where sediment basins are to be used, LUP dischargers shall, at minimum, design sediment basins according to the guidance provided in CASQA's Construction BMP Handbook.
- c. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths¹¹ in accordance with Table 2 below.

Table 2 – Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

- d. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent off-site tracking of sediment.
- e. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.
- f. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall inspect all immediate access roads. At a minimum daily and prior to any rain event, the discharger shall remove any

¹¹ Sheet flow length is the length that shallow, low velocity flow travels across a site.

sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

- g. **Additional LUP Type 3 Requirement:** The Regional Water Board may require LUP Type 3 dischargers to implement additional site-specific sediment control requirements if the implementation of the other requirements in this section are not adequately protecting the receiving waters.

6. Run-on and Run-off Controls

- a. LUP dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this Attachment.
- b. Run-on and runoff controls are not required for Type 1 LUPs unless the evaluation of quantity and quality of run-on and runoff deems them necessary or visual inspections show that the site requires such controls.

7. Inspection, Maintenance and Repair

- a. All inspection, maintenance repair and sampling activities at the discharger's LUP location shall be performed or supervised by a QSP representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.
- b. LUP dischargers shall conduct visual inspections and observations daily during working hours (not recorded). At least once each 24-hour period during extended storm events, **LUP Type 2 & 3 dischargers** shall conduct visual inspections to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.
- c. Upon identifying failures or other shortcomings, as directed by the QSP, LUP dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.
- d. For each pre- and post-rain event inspection required, LUP dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format that includes the information described below.

- e. The LUP discharger shall ensure that the checklist remains on-site or with the SWPPP. At a minimum, an inspection checklist should include:
 - i Inspection date and date the inspection report was written.
 - ii Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.
 - iii Site information, including stage of construction, activities completed, and approximate area of the site exposed.
 - iv A description of any BMPs evaluated and any deficiencies noted.
 - v If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.
 - vi Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.
 - vii Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.
 - viii Photographs taken during the inspection, if any.
 - ix Inspector's name, title, and signature.

K. STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS**1. Objectives**

SWPPPs for all LUPs shall be developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

- a. All pollutants and their sources, including sources of sediment, associated with construction activities associated with LUP activity are controlled;
- b. All non-storm water discharges are identified and either eliminated, controlled, or treated;
- c. BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from LUPs during construction; and
- d. Stabilization BMPs installed to reduce or eliminate pollutants after construction is completed are effective and maintained.

2. SWPPP Implementation Schedule

- a. LUPs for which PRDs have been submitted to the State Water Board shall develop a site/project location SWPPP prior to the start of land-disturbing activity in accordance with this Section and shall implement the SWPPP concurrently with commencement of soil-disturbing activities.
- b. For an ongoing LUP involving a change in the LRP, the new LRP shall review the existing SWPPP and amend it, if necessary, or develop a new SWPPP within 15 calendar days to conform to the requirements set forth in this General Permit.

3. Availability

The SWPPP shall be available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

L. REGIONAL WATER BOARD AUTHORITIES

1. Regional Water Boards shall administer the provisions of this General Permit. Administration of this General Permit may include, but is not limited to, requesting the submittal of SWPPPs, reviewing SWPPPs, reviewing monitoring and sampling and analysis reports, conducting compliance inspections, gathering site information by any medium including sampling, photo and video documentation, and taking enforcement actions.
2. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.
3. Regional Water Boards may issue separate permits for discharges of storm water associated with construction activity to individual dischargers, categories of dischargers, or dischargers in a geographic area. Upon issuance of such permits by a Regional Water Board, dischargers subject to those permits shall no longer be regulated by this General Permit.
4. Regional Water Boards may direct the discharger to reevaluate the LUP Type(s) for the project (or elements/areas of the project) and impose the appropriate level of requirements.
5. Regional Water Boards may terminate coverage under this General Permit for dischargers who negligently or with willful intent incorrectly determine or report their LUP Type (e.g., they determine themselves to be a LUP Type 1 when they are actually a Type 2).
6. Regional Water Boards may review PRDs and reject or accept applications for permit coverage or may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.
7. Regional Water Boards may impose additional requirements on dischargers to satisfy TMDL implementation requirements or to satisfy provisions in their Basin Plans.
8. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.
9. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

- 10.** Based on an LUP's threat to water quality and complexity, the Regional Water Board may determine on a case-by-case basis that an LUP, or a portion of an LUP, is not eligible for the linear project requirements contained in this Attachment, and require that the discharger comply with all standard requirements in this General Permit.
- 11.** The Regional Water Board may require additional monitoring and reporting program requirements including sampling and analysis of discharges to CWA § 303(d)-listed water bodies. Additional requirements imposed by the Regional Water Board shall be consistent with the overall monitoring effort in the receiving waters.

M. MONITORING AND REPORTING REQUIREMENTS

Table 3. LUP Summary of Monitoring Requirements

LUP Type	Visual Inspections				Sample Collection		
	Daily Site BMP	Pre-storm Event	Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water	Non-Visible (when applicable)
		Baseline					
1	X						X
2	X	X	X	X	X		X
3	X	X	X	X	X	X	X

1. Objectives

LUP dischargers shall prepare a monitoring and reporting program (M&RP) prior to the start of construction and immediately implement the program at the start of construction for LUPs. The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The M&RP must be a part of the SWPPP, included as an appendix or separate SWPPP chapter.

2. M&RP Implementation Schedule

- a. LUP dischargers shall implement the requirements of this Section at the time of commencement of construction activity. LUP dischargers are responsible for implementing these requirements until construction activity is complete and the site is stabilized.
- b. LUP dischargers shall revise the M&RP when:
 - i. Site conditions or construction activities change such that a change in monitoring is required to comply with the requirements and intent of this General Permit.
 - ii. The Regional Water Board requires the discharger to revise its M&RP based on its review of the document. Revisions may include, but not be limited to, conducting additional site inspections, submitting reports, and certifications. Revisions shall be submitted via postal mail or electronic e-mail.

- iii The Regional Water Board may require additional monitoring and reporting program requirements including sampling and analysis of discharges to CWA § 303(d)-listed water bodies. Additional requirements imposed by the Regional Water Board shall be consistent with the overall monitoring effort in the receiving waters.

3. LUP Type 1 Monitoring and Reporting Requirements

a. LUP Type 1 Inspection Requirements

- i LUP Type 1 dischargers shall ensure that all inspections are conducted by trained personnel. The name(s) and contact number(s) of the assigned inspection personnel should be listed in the SWPPP.
- ii LUP Type 1 dischargers shall ensure that all visual inspections are conducted daily during working hours and in conjunction with other daily activities in areas where active construction is occurring.
- iii LUP Type 1 dischargers shall ensure that photographs of the site taken before, during, and after storm events are taken during inspections, and submitted through the State Water Board's SMARTS website once every three rain events.
- iv LUP Type 1 dischargers shall conduct daily visual inspections to verify that:
 - (1) Appropriate BMPs for storm water and non-storm water are being implemented in areas where active construction is occurring (including staging areas);
 - (2) Project excavations are closed, with properly protected spoils, and that road surfaces are cleaned of excavated material and construction materials such as chemicals by either removing or storing the material in protective storage containers at the end of every construction day;
 - (3) Land areas disturbed during construction are returned to pre-construction conditions or an equivalent protection is used at the end of each workday to eliminate or minimize erosion and the possible discharge of sediment or other pollutants during a rain event.
- v Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures

are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).

- vi Inspection programs are required for LUP Type 1 projects where temporary and permanent stabilization BMPs are installed and are to be monitored after active construction is completed. Inspection activities shall continue until adequate permanent stabilization is established and, in areas where re-vegetation is chosen, until minimum vegetative coverage is established in accordance with Section C.1 of this Attachment.

b. LUP Type 1 Monitoring Requirements for Non-Visible Pollutants

LUP Type 1 dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants associated with (1) construction sites; (2) activities producing pollutants that are not visually detectable in storm water discharges; and (3) activities which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

- i Sampling and analysis for non-visible pollutants is only required where the LUP Type 1 discharger believes pollutants associated with construction activities have the potential to be discharged with storm water runoff due to a spill or in the event there was a breach, malfunction, failure and/or leak of any BMP. Also, failure to implement BMPs may require sample collection.
 - (1) Visual observations made during the monitoring program described above will help the LUP Type 1 discharger determine when to collect samples.
 - (2) The LUP Type 1 discharger is not required to sample if one of the conditions described above (e.g., breach or spill) occurs and the site is cleaned of material and pollutants and/or BMPs are implemented prior to the next storm event.
- ii LUP Type 1 dischargers shall collect samples down-gradient from all discharge locations where the visual observations were made triggering the monitoring, and which can be safely accessed. For sites where sampling and analysis is required, personnel trained in water quality sampling procedures shall collect storm water samples.
- iii If sampling for non-visible pollutant parameters is required, LUP Type 1 dischargers shall ensure that samples be analyzed for parameters indicating the presence of pollutants identified in the pollutant source assessment required in Section J.2.a.i.

- iv LUP Type 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
 - v LUP Type 1 dischargers shall ensure that a sufficiently large sample of storm water that has not come into contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample¹²) will be collected for comparison with the discharge sample. Samples shall be collected during the first two hours of discharge from rain events that occur during daylight hours and which generate runoff.
 - vi LUP Type 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. Analyses may include, but are not limited to, indicator parameters such as: pH, specific conductance, dissolved oxygen, conductivity, salinity, and Total Dissolved Solids (TDS).
 - vii For laboratory analyses, all sampling, sample preservation, and other analyses must be conducted according to test procedures pursuant to 40 C.F.R. Part 136. LUP Type 1 dischargers shall ensure that field samples are collected and analyzed according to manufacturer specifications of the sampling devices employed. Portable meters shall be calibrated according to manufacturer's specification.
 - viii LUP Type 1 dischargers shall ensure that all field and/or analytical data are kept in the SWPPP document.
- c. LUP Type 1 Visual Observation Exceptions
- i LUP Type 1 dischargers shall be prepared to collect samples and conduct visual observation (inspections) to meet the minimum visual observation requirements of this Attachment. The Type 1 LUP discharger is not required to physically collect samples or conduct visual observation (inspections) under the following conditions:
 - (1) During dangerous weather conditions such as flooding and electrical storms;
 - (2) Outside of scheduled site business hours.
 - (3) When access to the site is unsafe due to storm events.

¹² Sample collected at a location unaffected by construction activities.

- ii If the LUP Type 1 discharger does not collect the required samples or visual observation (inspections) due to these exceptions, an explanation why the sampling or visual observation (inspections) were not conducted shall be included in both the SWPPP and the Annual Report.

d. Particle Size Analysis for Risk Justification

LUP Type 1 dischargers utilizing justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

4. LUP Type 2 & 3 Monitoring and Reporting Requirements

a. LUP Type 2 & 3 Inspection Requirements

- i LUP Type 2 & 3 dischargers shall ensure that all inspections are conducted by trained personnel. The name(s) and contact number(s) of the assigned inspection personnel should be listed in the SWPPP.
- ii LUP Type 2 & 3 dischargers shall ensure that all visual inspections are conducted daily during working hours and in conjunction with other daily activities in areas where active construction is occurring.
- iii LUP Type 2 & 3 dischargers shall ensure that photographs of the site taken before, during, and after storm events are taken during inspections, and submitted through the State Water Board's SMARTS website once every three rain events.
- iv LUP Type 2 & 3 dischargers shall conduct daily visual inspections to verify that appropriate BMPs for storm water and non-storm water are being implemented and in place in areas where active construction is occurring (including staging areas).
- v LUP Type 2 & 3 dischargers shall conduct inspections of the construction site prior to anticipated storm events, during extended storm events, and after actual storm events to identify areas contributing to a discharge of storm water associated with construction activity. Pre-storm inspections are to ensure that BMPs are properly installed and maintained; post-storm inspections are to assure that BMPs have functioned adequately. During

extended storm events, inspections shall be required during normal working hours for each 24-hour period.

- vi Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).
- vii LUP Type 2 & 3 dischargers shall implement a monitoring program for inspecting projects that require temporary and permanent stabilization BMPs after active construction is complete. Inspections shall ensure that the BMPs are adequate and maintained. Inspection activities shall continue until adequate permanent stabilization is established and, in vegetated areas, until minimum vegetative coverage is established in accordance with Section C.1 of this Attachment.
- viii If possible, LUP Type 2 & 3 dischargers shall install a rain gauge on-site at an accessible and secure location with readings made during all storm event inspections. When readings are unavailable, data from the closest rain gauge with publically available data may be used.
- ix LUP Type 2 & 3 dischargers shall Include and maintain a log of the inspections conducted in the SWPPP. The log will provide the date and time of the inspection and who conducted the inspection.

b. LUP Type 2 & 3 Storm Water Effluent Monitoring Requirements

Table 4. LUP Type 2 & 3 Effluent Monitoring Requirements

LUP Type	Frequency	Effluent Monitoring
2	Minimum of 3 samples per day characterizing discharges associated with construction activity from the project active areas of construction.	Turbidity, pH, and non-visible pollutant parameters (if applicable)
3	Minimum of 3 samples per day characterizing discharges associated with construction activity from the project active areas of construction.	turbidity, pH, and non-visible pollutant parameters (if applicable)

- i LUP Type 2 & 3 dischargers shall collect storm water grab samples from sampling locations characterizing discharges associated with activity from the LUP active areas of construction. At a minimum, 3 samples shall be collected per day of discharge.

- ii LUP Type 2 & 3 dischargers shall collect samples of stored or contained storm water that is discharged subsequent to a storm event producing precipitation of ½ inch or more at the time of discharge.
- iii LUP Type 2 & 3 dischargers shall ensure that storm water grab sample(s) obtained be representative of the flow and characteristics of the discharge.
- iv LUP Type 2 & 3 dischargers shall analyze their effluent samples for:
 - (1) pH and turbidity
 - (2) Any additional parameter for which monitoring is required by the Regional Water Board.

c. LUP Type 2 & 3 Storm Water Effluent Sampling Locations

- i LUP Type 2 & 3 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire disturbed project or area.
- ii LUP Type 2 & 3 dischargers may monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to exceedance of NALs.
- iii LUP Type 2 & 3 dischargers shall select analytical test methods from the list provided in Table 5 below.
- iv LUP Type 2 & 3 dischargers shall ensure that all storm water sample collection preservation and handling shall be conducted in accordance with the “Storm Water Sample Collection and Handling Instructions” below.

d. LUP Type 3 Receiving Water Monitoring Requirements

- i In the event that an LUP Type 3 discharger’s effluent exceeds the receiving water monitoring triggers of 500 NTU turbidity or pH range of 6.0-9.0, contained in this General Permit and has a direct discharge to receiving waters, the LUP discharger shall subsequently sample Receiving Waters (RWs) for turbidity, pH (if applicable) and SSC for the duration of coverage under this General Permit. In the event that an LUP Tupe 3 discharger utilizing ATS with direct discharges into receiving waters discharges effluent that exceeds the NELs in this permit, the discharger shall

subsequently sample RWs for turbidity, pH (if applicable), and SSC for the duration of coverage under this General Permit.

- ii LUP Type 3 dischargers that meet the project criteria in Appendix 3 of this General Permit and have more than 30 acres of soil disturbance in the project area or project section area designated as Type 3, shall comply with the Bioassessment requirements prior to commencement of construction activity.
- iii LUP Type 3 dischargers shall obtain RW samples in accordance with the requirements of the Receiving Water Sampling Locations section (Section M.4.c. of this Attachment).

e. LUP Type 3 Receiving Water Sampling Locations

- i **Upstream/up-gradient RW samples:** LUP Type 3 dischargers shall obtain any required upstream/up-gradient receiving water samples from a representative and accessible location as close as possible to and upstream from the effluent discharge point.
- ii **Downstream/down-gradient RW samples:** LUP Type 3 dischargers shall obtain any required downstream/down-gradient receiving water samples from a representative and accessible location as close as possible to and downstream from the effluent discharge point.
- iii If two or more discharge locations discharge to the same receiving water, LUP Type 3 dischargers may sample the receiving water at a single upstream and downstream location.

f. LUP Type 2 & 3 Monitoring Requirements for Non-Visible Pollutants

LUP Type 2 & 3 dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants associated with (1) construction sites; (2) activities producing pollutants that are not visually detectable in storm water discharges; and (3) activities which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

- i Sampling and analysis for non-visible pollutants is only required where LUP Type 2 & 3 dischargers believe pollutants associated with construction activities have the potential to be discharged with storm water runoff due to a spill or in the event there was a breach, malfunction, failure and/or leak of any BMP. Also, failure to implement BMPs may require sample collection.

- (1) Visual observations made during the monitoring program described above will help LUP Type 2 & 3 dischargers determine when to collect samples.
 - (2) LUP Type 2 & 3 dischargers are not required to sample if one of the conditions described above (e.g., breach or spill) occurs and the site is cleaned of material and pollutants and/or BMPs are implemented prior to the next storm event.
- ii LUP Type 2 & 3 dischargers shall collect samples down-gradient from the discharge locations where the visual observations were made triggering the monitoring and which can be safely accessed. For sites where sampling and analysis is required, personnel trained in water quality sampling procedures shall collect storm water samples.
 - iii If sampling for non-visible pollutant parameters is required, LUP Type 2 & 3 dischargers shall ensure that samples be analyzed for parameters indicating the presence of pollutants identified in the pollutant source assessment required in Section J.2.a.i.
 - iv LUP Type 2 & 3 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
 - v LUP Type 2 & 3 dischargers shall ensure that a sufficiently large sample of storm water that has not come into contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample¹³) will be collected for comparison with the discharge sample. Samples shall be collected during the first two hours of discharge from rain events that occur during daylight hours and which generate runoff.
 - vi LUP Type 2 & 3 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. Analyses may include, but are not limited to, indicator parameters such as: pH, specific conductance, dissolved oxygen, conductivity, salinity, and Total Dissolved Solids (TDS).
 - vii For laboratory analyses, all sampling, sample preservation, and other analyses must be conducted according to test procedures pursuant to 40 C.F.R. Part 136. LUP Type 2 & 3 dischargers shall ensure that field samples are collected and analyzed according to manufacturer specifications of the sampling devices employed.

¹³ Sample collected at a location unaffected by construction activities

Portable meters shall be calibrated according to manufacturer's specification.

viii LUP Type 2 & 3 dischargers shall ensure that all field and/or analytical data are kept in the SWPPP document.

g. LUP Type 2 & 3 Visual Observation and Sample Collection Exceptions

i LUP Type 2 & 3 dischargers shall be prepared to collect samples and conduct visual observation (inspections) to meet the minimum visual observation requirements of this Attachment. Type 2 & 3 LUP dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

(1) During dangerous weather conditions such as flooding and electrical storms;

(2) Outside of scheduled site business hours.

(3) When access to the site is unsafe due to storm events.

ii If the LUP Type 2 or 3 discharger does not collect the required samples or visual observation (inspections) due to these exceptions, an explanation why the sampling or visual observation (inspections) were not conducted shall be included in both the SWPPP and the Annual Report.

h. LUP Type 2 & 3 Storm Water Sample Collection and Handling Instructions

LUP Type 2 & 3 dischargers shall refer to Table 5 below for test Methods, detection Limits, and reporting Units. During storm water sample collection and handling, the LUP Type 2 & 3 discharger shall:

i Identify the parameters required for testing and the number of storm water discharge points that will be sampled. Request the laboratory to provide the appropriate number of sample containers, types of containers, sample container labels, blank chain of custody forms, and sample preservation instructions.

ii Determine how to ship the samples to the laboratory. The testing laboratory should receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory). The options are to either deliver the samples to the laboratory, arrange to have the laboratory pick them up, or ship them overnight to the laboratory.

- iii Use only the sample containers provided by the laboratory to collect and store samples. Use of any other type of containers could contaminate your samples.
- iv Prevent sample contamination, by not touching, or putting anything into the sample containers before collecting storm water samples.
- v Not overfilling sample containers. Overfilling can change the analytical results.
- vi Tightly screw the cap of each sample container without stripping the threads of the cap.
- vii Complete and attach a label to each sample container. The label shall identify the date and time of sample collection, the person taking the sample, and the sample collection location or discharge point. The label should also identify any sample containers that have been preserved.
- viii Carefully pack sample containers into an ice chest or refrigerator to prevent breakage and maintain temperature during shipment. Remember to place frozen ice packs into the shipping container. Samples should be kept as close to 4° C (39° F) as possible until arriving at the laboratory. Do not freeze samples.
- ix Complete a Chain of Custody form for each set of samples. The Chain of Custody form shall include the discharger's name, address, and phone number, identification of each sample container and sample collection point, person collecting the samples, the date and time each sample container was filled, and the analysis that is required for each sample container.
- x Upon shipping/delivering the sample containers, obtain both the signatures of the persons relinquishing and receiving the sample containers.
- xi Designate and train personnel to collect, maintain, and ship samples in accordance with the above sample protocols and good laboratory practices.
- xii Refer to the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP) for more

information on sampling collection and analysis. See http://www.waterboards.ca.gov/water_issues/programs/swamp/¹⁴

Table 5. Test Methods, Detection Limits, Reporting Units and Applicable NALs

Parameter	Test Method	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Levels	(LUP Type 3) Receiving Water Monitoring Trigger
pH	Field test with calibrated portable instrument	Type 2 & 3	0.2	pH units	Lower = 6.5 upper = 8.5	Lower = 6.0 upper = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Type 2 & 3	1	NTU	250 NTU	500 NTU
SSC	ASTM Method D 3977-97 ¹⁵	Type 3 if Receiving Water Monitoring Trigger is exceeded	5	Mg/L	N/A	N/A
Bioassessment	(STE) Level I of (SAFIT), ¹⁶ fixed-count of 600 org/sample	Type 3 LUPs > 30 acres	N/A	N/A	N/A	N/A

i. LUP Type 2 & 3 Monitoring Methods

- i The LUP Type 2 or 3 discharger's project M&RP shall include a description of the following items:

- (1) Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

¹⁴ Additional information regarding SWAMP's QAPrP can be found at: http://www.waterboards.ca.gov/water_issues/programs/swamp/.

¹⁵ ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, D 3977-97, Vol. 11.02, pp. 389-394

¹⁶ The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

- (2) Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program a copy of the Chain of Custody form used when handling and shipping samples.
 - (3) Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section M.4.f above.
- ii LUP Type 2 & 3 dischargers shall ensure that all sampling and sample preservation be in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) shall be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. All laboratory analyses shall be conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses shall be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services (SSC exception). The LUP discharger shall conduct its own field analysis of pH and may conduct its own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.
- j. LUP Type 2 & 3 Analytical Methods

LUP Type 2 & 3 dischargers shall refer to Table 5 above for test Methods, detection Limits, and reporting Units.

- i **pH:** LUP Type 2 & 3 dischargers shall perform pH analysis on-site with a calibrated pH meter or pH test kit. The LUP discharger shall record pH monitoring results on paper and retain these records in accordance with Section M.4.o, below.
- ii **Turbidity:** LUP Type 2 & 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results shall

be recorded in the site log book in Nephelometric Turbidity Units (NTU).

- iii **Suspended sediment concentration (SSC):** LUP Type 3 dischargers exceeding the turbidity Receiving Water Monitoring Trigger, shall perform SSC analysis using ASTM Method D3977-97.
- iv **Bioassessment:** LUP Type 3 dischargers shall perform bioassessment sampling and analysis according to Appendix 3 of this General Permit.

k. Watershed Monitoring Option

If an LUP Type 2 or 3 discharger is part of a qualified regional watershed-based monitoring program the LUP Type 2 or 3 discharger may be eligible for relief from the monitoring requirements in this Attachment. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program if it determines that the watershed-based monitoring program will provide information to determine each discharger's compliance with the requirements of this General Permit.

l. Particle Size Analysis for Risk Justification

LUP Type 2 & 3 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

m. NAL Exceedance Report

- i In the event that any effluent sample exceeds an applicable NAL, the Regional Water Boards may require LUP Type 2 & 3 dischargers to submit NAL Exceedance Reports.
- ii LUP Type 2 & 3 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.
- iii LUP Type 2 & 3 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the exceedance report is filed.
- iv LUP Type 2 & 3 dischargers shall include in the NAL Exceedance Report:

- (1) the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”); and
- (2) the date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.
- (3) Description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

n. Monitoring Records

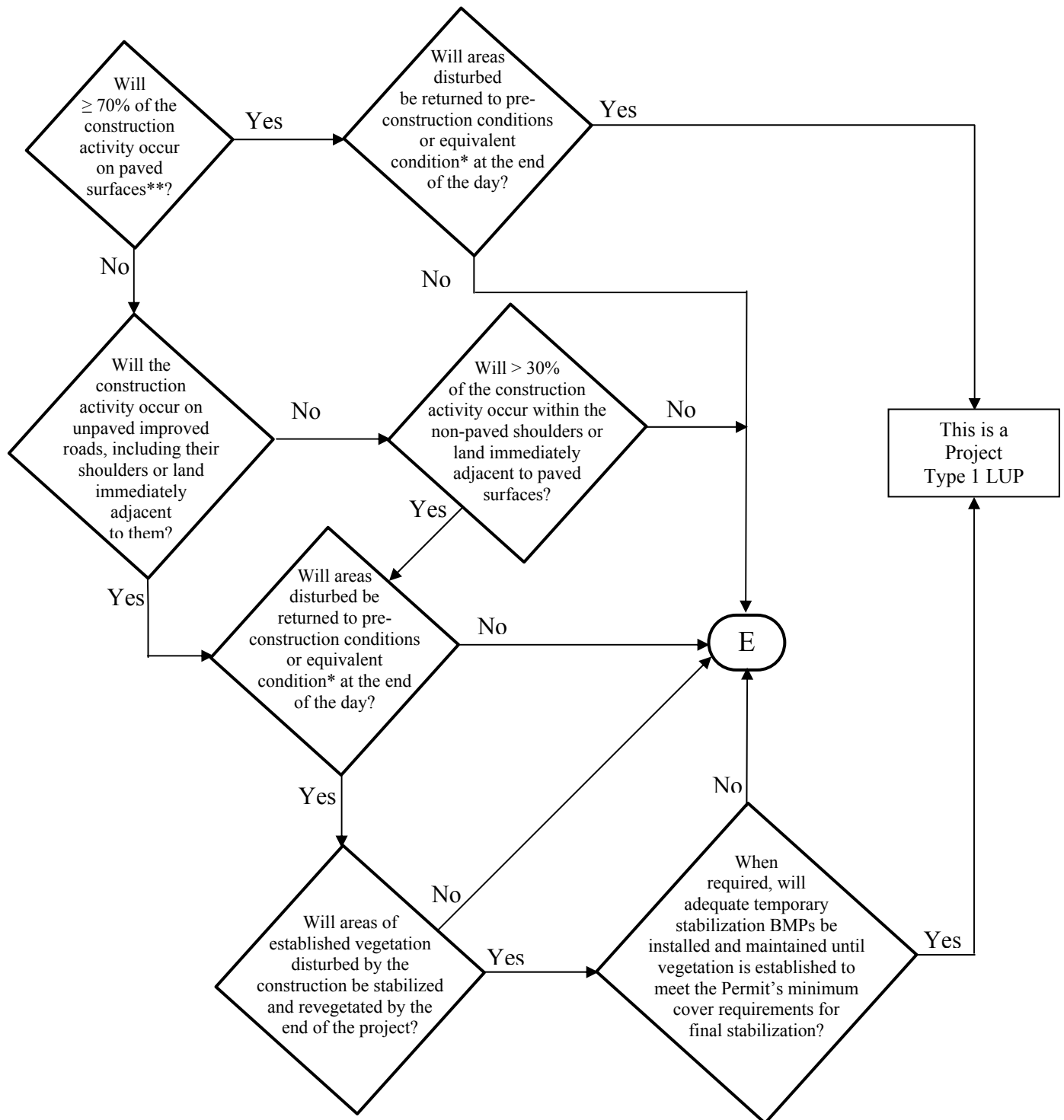
LUP Type 2 & 3 dischargers shall ensure that records of all storm water monitoring information and copies of all reports (including Annual Reports) required by this General Permit be retained for a period of at least three years. LUP Type 2 & 3 dischargers may retain records off-site and make them available upon request. These records shall include:

- i The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge);
- ii The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements;
- iii The date and approximate time of analyses;
- iv The individual(s) who performed the analyses;
- v A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and all chain of custody forms;
- vi Quality assurance/quality control records and results;
- vii Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Section M.4.a above);
- viii Visual observation and sample collection exception records (see Section M.4.g above); and

- ix The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

ATTACHMENT A.1

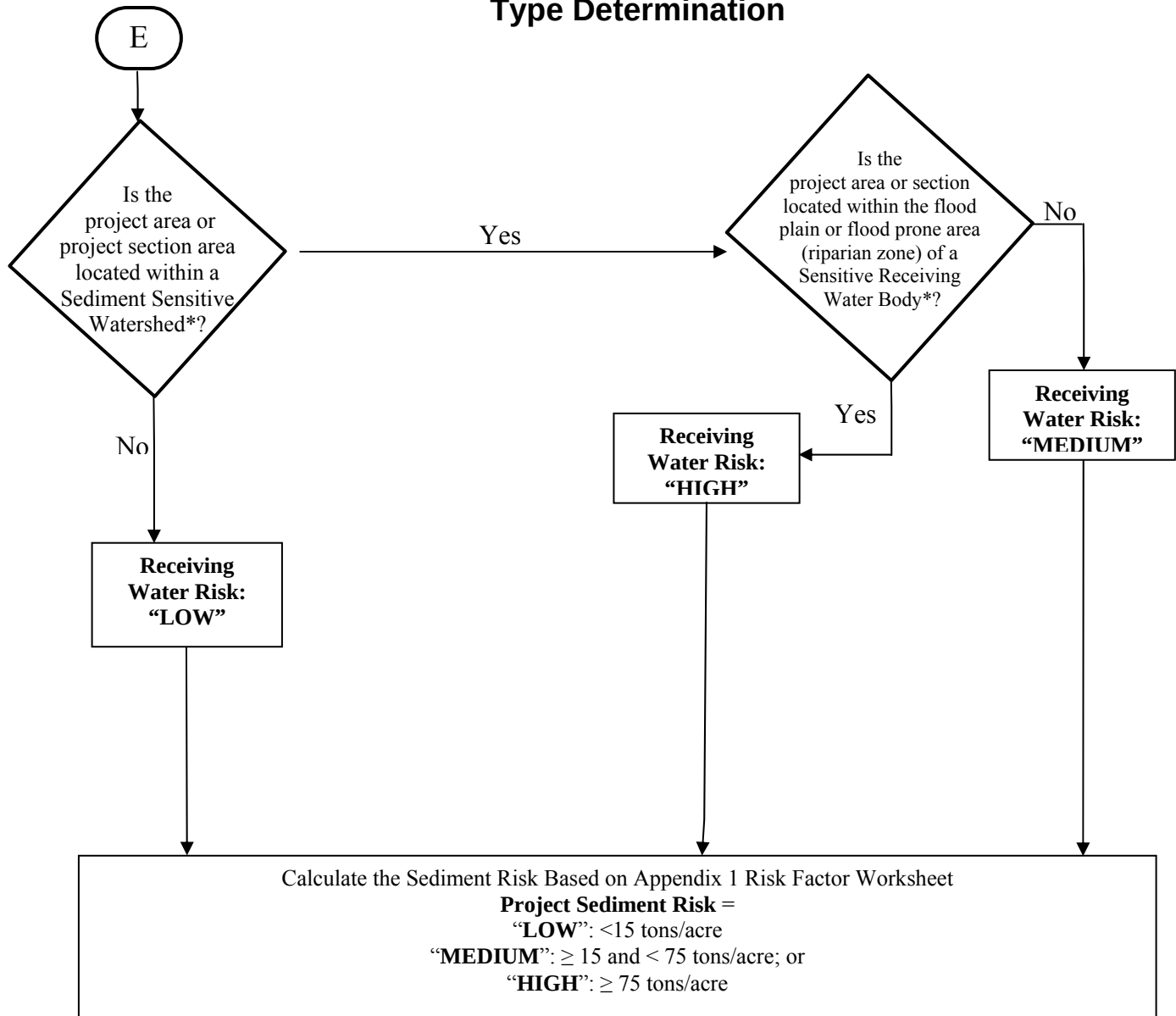
LUP Project Area or Project Section Area Type Determination



*See Definition of Terms

** Or: "Will < 30% of the soil disturbance occur on unpaved surfaces?"

ATTACHMENT A.1 **LUP Project Area or Project Section Area** **Type Determination**



* See Definition of Terms

PROJECT SEDIMENT RISK

RECEIVING **WATER RISK**

	LOW	MEDIUM	HIGH
LOW	Type 1	Type 1	Type 2
MEDIUM	Type 1	Type 2	Type 3
HIGH	Type 2	Type 3	Type 3

ATTACHMENT A.1

Definition of Terms

1. **Equivalent Condition** – Means disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered (e.g., metal plates, pavement, plastic covers over spoil piles) at the end of the construction day.
2. **Linear Construction Activity** – Linear construction activity consists of underground/ overhead facilities that typically include, but are not limited to, any conveyance, pipe or pipeline for the transportation of any gaseous, liquid (including water, wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/ tower pad and cable/ wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/ borrow locations.
3. **Sediment Sensitive Receiving Water Body** – Defined as a water body segment that is listed on EPA's approved CWA 303(d) list for sedimentation/siltation, turbidity, or is designated with beneficial uses of SPAWN, MIGRATORY, and COLD.
4. **Sediment Sensitive Watershed** – Defined as a watershed draining into a receiving water body listed on EPA's approved CWA 303(d) list for sedimentation/siltation, turbidity, or a water body designated with beneficial uses of SPAWN, MIGRATORY, and COLD.

**ATTACHMENT A.2
PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS FOR LINEAR UNDERGROUND/OVERHEAD PROJECTS TO
COMPLY WITH THE CONSTRUCTION GENERAL PERMIT**

GENERAL INSTRUCTIONS

Who Must Submit

This permit is effective on July 1, 2010.

The Legally Responsible Person (LRP) for construction activities associated with linear underground/overhead project (LUP) must electronically apply for coverage under this General Permit on or after July 1, 2010. If it is determined that the LUP construction activities require an NPDES permit, the Legally Responsible Person¹ (LRP) shall submit PRDs for this General Permit in accordance with the following:

LUPs associated with Private or Municipal Development Projects

1. For LUPs associated with pre-development and pre-redevelopment construction activities:

The LRP must obtain coverage² under this General Permit for its pre-development and pre-redevelopment construction activities where the total disturbed land area of these construction activities is greater than 1 acre.

2. For LUPs associated with new development and redevelopment construction projects:

The LRP must obtain coverage under this General Permit for LUP construction activities associated with new development and redevelopment projects where the total disturbed land area of the LUP is greater than 1 acre. Coverage under this permit is not required where the same LUP construction activities are covered by another NPDES permit.

LUPs not associated with private or municipal new development or redevelopment projects:

The LRP must obtain coverage under this General Permit on or after July 1, 2010 for its LUP construction activities where the total disturbed land area is greater than 1 acre.

PRD Submittal Requirements

Prior to the start of construction activities a LRP must submit PRDs and fees to the State Water Board for each LUP.

New and Ongoing LUPs

Dischargers of new LUPs that commence construction activities after the adoption date of this General Permit shall file PRDs prior to the commencement of construction and implement the SWPPP upon the start of construction.

¹ person possessing the title of the land on which the construction activities will occur for the regulated site

² obtain coverage means filing PRDs for the project.

PERMIT REGISTRATION DOCUMENTS (PRDs) GENERAL INSTRUCTIONS (CONTINUED)

Dischargers of ongoing LUPs that are currently covered under State Water Board Order No. 2003-0007 (Small LUP General Permit) shall electronically file Permit Registration Documents no later than July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 2003-0007-DWQ will be terminated. All existing dischargers shall be exempt from the risk determination requirements in Attachment A. All existing dischargers are therefore subject to LUP Type 1 requirements regardless of their project's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the risk determination requirements in Attachment A.

Where to Apply

The Permit Registration Documents (PRDs) can be found at www.waterboards.ca.gov/water_issues/programs/stormwater/

Fees

The annual fee for storm water permits are established through the State of California Code of Regulations.

When Permit Coverage Commences

To obtain coverage under the General Permit, the LRP must include the complete PRDs and the annual fee. All PRDs deemed incomplete will be rejected with an explanation as to what is required to complete submittal. Upon receipt of complete PRDs and associated fee, each discharger will be sent a waste discharger's identification (WDID) number.

Projects and Activities Not Defined As Construction Activity

1. LUP construction activity does not include routine maintenance projects to maintain original line and grade, hydraulic capacity, or original purpose of the facility. Routine maintenance projects are projects associated with operations and maintenance activities that are conducted on existing lines and facilities and within existing right-of-way, easements, franchise agreements or other legally binding agreements of the discharger. Routine maintenance projects include, but are not limited to projects that are conducted to:
 - Maintain the original purpose of the facility, or hydraulic capacity.
 - Update existing lines³ and facilities to comply with applicable codes, standards and regulations regardless if such projects result in increased capacity.
 - Repairing leaks.

Routine maintenance does not include construction of new⁴ lines or facilities resulting from compliance with applicable codes, standards and regulations.

³ Update existing lines includes replacing existing lines with new materials or pipes.

⁴ New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

PERMIT REGISTRATION DOCUMENTS (PRDs) GENERAL INSTRUCTIONS (CONTINUED)

Routine maintenance projects do not include those areas of maintenance projects that are outside of an existing right-of-way, franchise, easements, or agreements. When a project must acquire new areas, those areas may be subject to this General Permit based on the area of disturbed land outside the original right-of-way, easement, or agreement.

2. LUP construction activity does not include field activities associated with the planning and design of a project (e.g., activities associated with route selection).
3. Tie-ins conducted immediately adjacent to “energized” or “pressurized” facilities by the discharger are not considered small construction activities where all other LUP construction activities associated with the tie-in are covered by a NOI and SWPPP of a third party or municipal agency.

Calculating Land Disturbance Areas of LUPs

The total land area disturbed for LUPs is the sum of the:

- Surface areas of trenches, laterals and ancillary facilities, plus
- Area of the base of stockpiles on unpaved surfaces, plus
- Surface area of the borrow area, plus
- Areas of paved surfaces constructed for the project, plus
- Areas of new roads constructed or areas of major reconstruction to existing roads (e.g. improvements to two-track surfaces or road widening) for the sole purpose of accessing construction activities or as part of the final project, plus
- Equipment and material storage, staging, and preparation areas (laydown areas) not on paved surfaces, plus
- Soil areas outside the surface area of trenches, laterals and ancillary facilities that will be graded, and/or disturbed by the use of construction equipment, vehicles and machinery during construction activities.

Stockpiling Areas

Stockpiling areas, borrow areas and the removal of soils from a construction site may or may not be included when calculating the area of disturbed soil for a site depending on the following conditions:

- For stockpiling of soils onsite or immediately adjacent to a LUP site and the stockpile is not on a paved surface, the area of the base of the stockpile is to be included in the disturbed area calculation.
- The surface area of borrow areas that are onsite or immediately adjacent to a project site are to be included in the disturbed area calculation.
- For soil that is hauled offsite to a location owned or operated by the discharger that is not a paved surface, the area of the base of the stockpile is to be included in the disturbed area calculation except when the offsite location is already subject to a separate storm water permit.

**PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS (CONTINUED)**

- For soil that is brought to the project from an off-site location owned or operated by the discharger the surface area of the borrow pit is to be included in the disturbed area calculation except when the offsite location is already subject to a separate storm water permit.
- Trench spoils on a paved surface that are either returned to the trench or excavation or hauled away from the project daily for disposal or reuse will not be included in the disturbed area calculation.

If you have any questions concerning submittal of PRDs, please call the State Water Board at (866) 563-3107.

**ATTACHMENT B
PERMIT REGISTRATION DOCUMENTS (PRDs) TO COMPLY WITH THE TERMS
OF THE GENERAL PERMIT TO DISCHARGE STORM WATER
ASSOCIATED WITH CONSTRUCTION ACTIVITY**

GENERAL INSTRUCTIONS

- A.** All Linear Construction Projects shall comply with the PRD requirements in Attachment A.2 of this Order.

B. Who Must Submit

Discharges of storm water associated with construction that results in the disturbance of one acre or more of land must apply for coverage under the General Construction Storm Water Permit (General Permit). Any construction activity that is a part of a larger common plan of development or sale must also be permitted, regardless of size. (For example, if 0.5 acre of a 20-acre subdivision is disturbed by the construction activities of discharger A and the remaining 19.5 acres is to be developed by discharger B, discharger A must obtain a General Storm Water Permit for the 0.5 acre project).

Other discharges from construction activities that are covered under this General Permit can be found in the General Permit Section II.B.

It is the LRP's responsibility to obtain coverage under this General Permit by electronically submitting complete PRDs (Permit Registration Documents).

In all cases, the proper procedures for submitting the PRDs must be completed before construction can commence.

C. Construction Activity Not Covered By This General Permit

Discharges from construction that are not covered under this General Permit can be found in the General Permit Sections II.A & B..

D. Annual Fees and Fee Calculation

Annual fees are calculated based upon the total area of land to be disturbed not the total size of the acreage owned. However, the calculation includes all acres to be disturbed during the duration of the project. For example, if 10 acres are scheduled to be disturbed the first year and 10 in each subsequent year for 5 years, the annual fees would be based upon 50 acres of disturbance. The State Water Board will evaluate adding acreage to an existing Permit Waste Discharge Identification (WDID) number on a case-by-case basis. In general, any acreage to be considered must be contiguous to the permitted land area and the existing

SWPPP must be appropriate for the construction activity and topography of the acreage under consideration. As acreage is built out and stabilized or sold, the Change of Information (COI) form enables the applicant to remove those acres from inclusion in the annual fee calculation. Checks should be made payable to: State Water Board.

The Annual fees are established through regulations adopted by the State Water Board. The total annual fee is the current base fee plus applicable surcharges for all construction sites submitting an NOI, based on the total acreage to be disturbed during the life of the project. Annual fees are subject to change by regulation.

Dischargers that apply for and satisfy the Small Construction Erosivity Wavier requirements shall pay a fee of \$200.00 plus an applicable surcharge, see the General Permit Section II.B.7.

E. When to Apply

LRP's proposing to conduct construction activities subject to this General Permit must submit their PRDs prior to the commencement of construction activity.

F. Requirements for Completing Permit Registration Documents (PRDs)

All dischargers required to comply with this General Permit shall electronically submit the required PRDs for their type of construction as defined below.

G. Standard PRD Requirements (All Dischargers)

1. Notice of Intent
2. Risk Assessment (Standard or Site-Specific)
3. Site Map
4. SWPPP
5. Annual Fee
6. Certification

H. Additional PRD Requirements Related to Construction Type

1. Discharger in unincorporated areas of the State (not covered under an adopted Phase I or II SUSMP requirements) and that are not a linear project shall also submit a completed:
 - a. Post-Construction Water Balance Calculator (Appendix 2).
2. Dischargers who are proposing to implement ATS shall submit:
 - a. Complete ATS Plan in accordance with Attachment F at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation.

- b. Certification proof that design done by a professional in accordance with Attachment F.
- 3. Dischargers who are proposing an alternate Risk Justification:
 - a. Particle Size Analysis.

I. Exceptions to Standard PRD Requirements

Construction sites with an R value less than 5 as determined in the Risk Assessment are not required to submit a SWPPP.

J. Description of PRDs

- 1. Notice of Intent (NOI)
- 2. Site Map(s) Includes:
 - a. The project's surrounding area (vicinity)
 - b. Site layout
 - c. Construction site boundaries
 - d. Drainage areas
 - e. Discharge locations
 - f. Sampling locations
 - g. Areas of soil disturbance (temporary or permanent)
 - h. Active areas of soil disturbance (cut or fill)
 - i. Locations of all runoff BMPs
 - j. Locations of all erosion control BMPs
 - k. Locations of all sediment control BMPs
 - l. ATS location (if applicable)
 - m. Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
 - n. Locations of all post-construction BMPs
 - o. Locations of storage areas for waste, vehicles, service, loading/unloading of materials, access (entrance/exits) points to construction site, fueling, and water storage, water transfer for dust control and compaction practices
- 3. **SWPPPs**
A site-specific SWPPP shall be developed by each discharger and shall be submitted with the PRDs.
- 4. **Risk Assessment**
All dischargers shall use the Risk Assessment procedure as describe in the General Permit Appendix 1.
 - a. The Standard Risk Assessment includes utilization of the following:
 - i. Receiving water Risk Assessment interactive map

- ii. EPA Rainfall Erosivity Factor Calculator Website
 - iii. Sediment Risk interactive map
 - iv. Sediment sensitive water bodies list
- b. The Site-Specific Risk Assessment includes the completion of the hand calculated R value Risk Calculator
5. **Post-Construction Water Balance Calculator**
All dischargers subject to this requirement shall complete the Water Balance Calculator (in Appendix 2) in accordance with the instructions.
6. **ATS Design Document and Certification**
All dischargers using ATS must submit electronically their system design (as well as any supporting documentation) and proof that the system was designed by a qualified ATS design professional (See Attachment F).

To obtain coverage under the General Permit PRDs must be included and completed. If any of the required items are missing, the PRD submittal is considered incomplete and will be rejected. Upon receipt of a complete PRD submittal, the State Water Board will process the application package in the order received and assign a (WDID) number.

Questions?

If you have any questions on completing the PRDs please email stormwater@waterboards.ca.gov or call (866) 563-3107.

ATTACHMENT C RISK LEVEL 1 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 1 dischargers shall comply with the narrative effluent standards listed below:
 - a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
 - b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.
2. Numeric – Risk Level 1 dischargers are not subject to a numeric effluent standard.

B. Good Site Management "Housekeeping"

1. Risk Level 1 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 1 dischargers shall implement the following good housekeeping measures:
 - a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

- c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).
 - d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.
2. Risk Level 1 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:
- a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.
 - b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.
 - c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.
 - d. Cover waste disposal containers at the end of every business day and during a rain event.
 - e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.
 - f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.
 - g. Implement procedures that effectively address hazardous and non-hazardous spills.
 - h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:
 - i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

- ii. Appropriate spill response personnel are assigned and trained.
 - i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.
3. Risk Level 1 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:
- a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.
 - b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.
 - c. Clean leaks immediately and disposing of leaked materials properly.
4. Risk Level 1 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:
- a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.
 - b. Contain fertilizers and other landscape materials when they are not actively being used.
 - c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.
 - d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.
 - e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.
5. Risk Level 1 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 1 dischargers shall do the following:

- a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.
 - b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.
 - c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.
 - d. Ensure retention of sampling, visual observation, and inspection records.
 - e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.
6. Risk Level 1 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

C. Non-Storm Water Management

1. Risk Level 1 dischargers shall implement measures to control all non-storm water discharges during construction.
2. Risk Level 1 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.
3. Risk Level 1 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 1 dischargers shall implement effective wind erosion control.
2. Risk Level 1 dischargers shall provide effective soil cover for inactive¹ areas and all finished slopes, open space, utility backfill, and completed lots.
3. Risk Level 1 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 1 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.
2. On sites where sediment basins are to be used, Risk Level 1 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

F. Run-on and Runoff Controls

Risk Level 1 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 1 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.
2. Risk Level 1 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended

¹ Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 1 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.
4. For each inspection required, Risk Level 1 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.
5. Risk Level 1 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:
 - a. Inspection date and date the inspection report was written.
 - b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.
 - c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.
 - d. A description of any BMPs evaluated and any deficiencies noted.
 - e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.
 - f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.
 - g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.
 - h. Photographs taken during the inspection, if any.
 - i. Inspector's name, title, and signature.

H. Rain Event Action Plan

Not required for Risk Level 1 dischargers.

I. Risk Level 1 Monitoring and Reporting Requirements

Table 1- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
1	X	X		X	X		

1. Construction Site Monitoring Program Requirements

- a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.
- b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Programs to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.
- c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. Objectives

The CSMP shall be developed and implemented to address the following objectives:

- a. To demonstrate that the site is in compliance with the Discharge Prohibitions;

- b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
- c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges; and
- d. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. Risk Level 1 - Visual Monitoring (Inspection) Requirements for Qualifying Rain Events

- a. Risk Level 1 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.
- b. Risk Level 1 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of $\frac{1}{2}$ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.
- c. Risk Level 1 dischargers shall conduct visual observations (inspections) during business hours only.
- d. Risk Level 1 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.
- e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 1 dischargers shall visually observe (inspect):
 - i. All storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.
 - ii. All BMPs to identify whether they have been properly implemented in accordance with the SWPPP. If needed, the discharger shall implement appropriate corrective actions.

- iii. Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.
- f. For the visual observations (inspections) described in e.i and e.iii above, Risk Level 1 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.
- g. Within two business days (48 hours) after each qualifying rain event, Risk Level 1 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.
- h. Risk Level 1 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. Risk Level 1 – Visual Observation Exemptions

- a. Risk Level 1 dischargers shall be prepared to conduct visual observation (inspections) until the minimum requirements of Section I.3 above are completed. Risk Level 1 dischargers are not required to conduct visual observation (inspections) under the following conditions:
 - i. During dangerous weather conditions such as flooding and electrical storms.
 - ii. Outside of scheduled site business hours.
- b. If no required visual observations (inspections) are collected due to these exceptions, Risk Level 1 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the visual observations (inspections) were not conducted.

5. Risk Level 1 – Monitoring Methods

Risk Level 1 dischargers shall include a description of the visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures in the CSMP.

6. Risk Level 1 – Non-Storm Water Discharge Monitoring Requirements

a. Visual Monitoring Requirements:

- i. Risk Level 1 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.
- ii. Risk Level 1 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).
- iii. Risk Level 1 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 1 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

7. Risk Level 1 – Non-Visible Pollutant Monitoring Requirements

- a. Risk Level 1 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.
- b. Risk Level 1 dischargers shall ensure that water samples are large enough to characterize the site conditions.
- c. Risk Level 1 dischargers shall collect samples at all discharge locations that can be safely accessed.
- d. Risk Level 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
- e. Risk Level 1 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the

presence of pollutants identified in the pollutant source assessment required (Risk Level 1 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

- f. Risk Level 1 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.
- g. Risk Level 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.²
- h. Risk Level 1 dischargers shall keep all field /or analytical data in the SWPPP document.

8. Risk Level 1 – Particle Size Analysis for Project Risk Justification

Risk Level 1 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

9. Risk Level 1 – Records

Risk Level 1 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 1 dischargers shall retain all records on-site while construction is ongoing. These records include:

- a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.
- b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.
- c. The date and approximate time of analyses.
- d. The individual(s) who performed the analyses.

² For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

- e. A summary of all analytical results from the last three years, the method detection limits and reporting units, and the analytical techniques or methods used.
- f. Rain gauge readings from site inspections.
- g. Quality assurance/quality control records and results.
- h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.6 above).
- i. Visual observation and sample collection exception records (see Section I.4 above).
- j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

ATTACHMENT D RISK LEVEL 2 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:
 - a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
 - b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.
2. Numeric – Risk level 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:
 - a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

- c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).
 - d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.
2. Risk Level 2 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:
- a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.
 - b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.
 - c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.
 - d. Cover waste disposal containers at the end of every business day and during a rain event.
 - e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.
 - f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.
 - g. Implement procedures that effectively address hazardous and non-hazardous spills.
 - h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:
 - i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

- ii. Appropriate spill response personnel are assigned and trained.
 - i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.
3. Risk Level 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:
- a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.
 - b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.
 - c. Clean leaks immediately and disposing of leaked materials properly.
4. Risk Level 2 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:
- a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.
 - b. Contain all fertilizers and other landscape materials when they are not actively being used.
 - c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.
 - d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.
 - e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.
5. Risk Level 2 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

- a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.
 - b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.
 - c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.
 - d. Ensure retention of sampling, visual observation, and inspection records.
 - e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.
6. Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.
 7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 2 dischargers shall implement measures to control all non-storm water discharges during construction.
2. Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 2 dischargers shall implement effective wind erosion control.
2. Risk Level 2 dischargers shall provide effective soil cover for inactive¹ areas and all finished slopes, open space, utility backfill, and completed lots.
3. Risk Level 2 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.
2. On sites where sediment basins are to be used, Risk Level 2 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.
3. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active² construction.
4. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths³ in accordance with Table 1.

¹ Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

² Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage.

³ Sheet flow length is the length that shallow, low velocity flow travels across a site.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

5. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.
6. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.
7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

F. Run-on and Run-off Controls

Risk Level 2 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).
2. Risk Level 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 2 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.
4. For each inspection required, Risk Level 2 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.
5. Risk Level 2 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:
 - a. Inspection date and date the inspection report was written.
 - b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.
 - c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.
 - d. A description of any BMPs evaluated and any deficiencies noted.
 - e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.
 - f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.
 - g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.
 - h. Photographs taken during the inspection, if any.
 - i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any

likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall ensure a QSP obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at <http://www.srh.noaa.gov/forecast>).

2. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).
3. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:
 - a. Site Address
 - b. Calculated Risk Level (2 or 3)
 - c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
 - d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
 - e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number
4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:
 - a. Activities associated with each construction phase
 - b. Trades active on the construction site during each construction phase
 - c. Trade contractor information
 - d. Suggested actions for each project phase
5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:
 - a. Site Address
 - b. Calculated Risk Level (2 or 3)
 - c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number

- d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
 - e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number
 - f. Trades active on site during Inactive Construction
 - g. Trade contractor information
 - h. Suggested actions for inactive construction sites
6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.
7. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 2 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	X	X	X	X	X	X	

1. Construction Site Monitoring Program Requirements

- a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.
- b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.
- c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. Objectives

The CSMP shall be developed and implemented to address the following objectives:

- a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs).

- b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.
- c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.
- d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events

- a. Risk Level 2 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.
- b. Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of $\frac{1}{2}$ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.
- c. Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.
- d. Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.
- e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):
 - i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.
 - ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

- iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.
- f. For the visual observations (inspections) described in c.i and c.iii above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.
- g. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.
- h. Risk Level 2 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. Risk Level 2 – Water Quality Sampling and Analysis

- a. Risk Level 2 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.
- b. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.
- c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of $\frac{1}{2}$ inch or more at the time of discharge).

Storm Water Effluent Monitoring Requirements

- d. Risk Level 2 dischargers shall analyze their effluent samples for:
 - i. pH and turbidity.
 - ii. Any additional parameters for which monitoring is required by the Regional Water Board.

5. Risk Level 2 – Storm Water Discharge Water Quality Sampling Locations

Effluent Sampling Locations

- a. Risk Level 2 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.
- b. Risk Level 2 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.
- c. Risk Level 2 dischargers shall ensure that storm water discharge collected and observed represent⁴ the effluent in each drainage area based on visual observation of the water and upstream conditions.
- d. Risk Level 2 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.
- e. Risk Level 2 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.
- f. Risk Level 2 dischargers shall select analytical test methods from the list provided in Table 3 below.
- g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

6. Risk Level 2 – Visual Observation and Sample Collection Exemptions

- a. Risk Level 2 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk Level 2 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

⁴ For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment-laden water even if most water flowing through the fence is clear.

- i. During dangerous weather conditions such as flooding and electrical storms.
 - ii. Outside of scheduled site business hours.
 - b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 2 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.
- 7. Risk Level 2 – Storm Water Sample Collection and Handling Instructions**
- a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.
 - b. Risk Level 2 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.
 - c. Risk Level 2 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).⁵
- 8. Risk Level 2 – Monitoring Methods**
- a. Risk Level 2 dischargers shall include a description of the following items in the CSMP:
 - i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.
 - ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program

⁵ Additional information regarding SWAMP's QAPrP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
 QAPrP: http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.

an example Chain of Custody form used when handling and shipping samples.

- iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.
- b. Risk Level 2 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 2 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. Risk Level 2 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. Risk Level 2 – Analytical Methods

- a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.
- b. **pH:** Risk Level 2 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 2 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.
- c. **Turbidity:** Risk Level 2 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

10. Risk Level 2 - Non-Storm Water Discharge Monitoring Requirements

a. Visual Monitoring Requirements:

- i. Risk Level 2 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.
- ii. Risk Level 2 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).
- iii. Risk Level 2 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 2 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

b. Effluent Sampling Locations:

- i. Risk Level 2 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.
- ii. Risk Level 2 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.
- iii. Risk Level 2 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. Risk Level 2 – Non-Visible Pollutant Monitoring Requirements

- a. Risk Level 2 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual

inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

- b. Risk Level 2 dischargers shall ensure that water samples are large enough to characterize the site conditions.
- c. Risk Level 2 dischargers shall collect samples at all discharge locations that can be safely accessed.
- d. Risk Level 2 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
- e. Risk Level 2 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 2 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).
- f. Risk Level 2 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.
- g. Risk Level 2 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.⁶
- h. Risk Level 2 dischargers shall keep all field /or analytical data in the SWPPP document.

12. Risk Level 2 – Watershed Monitoring Option

Risk Level 2 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

⁶ For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

13. Risk Level 2 – Particle Size Analysis for Project Risk Justification

Risk Level 2 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. Risk Level 2 – Records

Risk Level 2 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 2 dischargers shall retain all records on-site while construction is ongoing. These records include:

- a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.
- b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.
- c. The date and approximate time of analyses.
- d. The individual(s) who performed the analyses.
- e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.
- f. Rain gauge readings from site inspections;
- g. Quality assurance/quality control records and results.
- h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).
- i. Visual observation and sample collection exception records (see Section I.6 above).
- j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. Risk Level 2 – NAL Exceedance Report

- a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 2 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.
- b. Risk Level 2 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.
- c. Risk Level 2 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.
- d. Risk Level 2 dischargers shall include in the NAL Exceedance Report:
 - i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).
 - ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.
 - iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

Table 3 – Risk Level 2 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2 Discharges	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2 Discharges other than ATS	1	NTU	250 NTU
		For ATS discharges	1	NTU	N/A

ATTACHMENT E RISK LEVEL 3 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 3 dischargers shall comply with the narrative effluent standards listed below:
 - a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
 - b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.
2. Numeric –Risk Level 3 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 3 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 3 dischargers shall implement the following good housekeeping measures:
 - a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

- c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).
 - d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.
2. Risk Level 3 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:
- a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.
 - b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.
 - c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.
 - d. Cover waste disposal containers at the end of every business day and during a rain event.
 - e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.
 - f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.
 - g. Implement procedures that effectively address hazardous and non-hazardous spills.
 - h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:
 - i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

- ii. Appropriate spill response personnel are assigned and trained.
 - i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.
3. Risk Level 3 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:
- a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.
 - b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.
 - c. Clean leaks immediately and disposing of leaked materials properly.
4. Risk Level 3 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:
- a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.
 - b. Contain fertilizers and other landscape materials when they are not actively being used.
 - c. Discontinuing the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.
 - d. Applying erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.
 - e. Stacking erodible landscape material on pallets and covering or storing such materials when not being used or applied.
5. Risk Level 3 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 3 dischargers shall do the following:

- a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.
 - b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.
 - c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.
 - d. Ensure retention of sampling, visual observation, and inspection records.
 - e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.
6. Risk Level 3 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.
 7. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 3 dischargers shall implement measures to control all non-storm water discharges during construction.
2. Risk Level 3 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 3 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 3 dischargers shall implement effective wind erosion control.
2. Risk Level 3 dischargers shall provide effective soil cover for inactive¹ areas and all finished slopes, open space, utility backfill, and completed lots.
3. Dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 3 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.
2. On sites where sediment basins are to be used, Risk Level 3 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.
3. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active² construction.
4. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths³ in accordance with Table 1.

¹ Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

² Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage

³ Sheet flow length is the length that shallow, low velocity flow travels across a site.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

5. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.
6. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.
7. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).
8. **Additional Risk Level 3 Requirement:** The Regional Water Board may require Risk Level 3 dischargers to implement additional site-specific sediment control requirements if the implementation of the other requirements in this section are not adequately protecting the receiving waters.

F. Run-on and Run-off Controls

Risk Level 3 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 3 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 3 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.
3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 3 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.
4. For each inspection required, Risk Level 3 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.
5. Risk Level 3 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:
 - a. Inspection date and date the inspection report was written.
 - b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.
 - c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.
 - d. A description of any BMPs evaluated and any deficiencies noted.
 - e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.
 - f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.
 - g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.
 - h. Photographs taken during the inspection, if any.

- i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The QSP shall obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at <http://www.srh.noaa.gov/forecast>).
2. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).
3. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:
 - a. Site Address.
 - b. Calculated Risk Level (2 or 3).
 - c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number.
 - d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number.
 - e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number.
4. **Additional Risk Level 3 Requirement:** The QSP shall include in the REAP, at a minimum, the following project phase information:
 - a. Activities associated with each construction phase.
 - b. Trades active on the construction site during each construction phase.
 - c. Trade contractor information.
 - d. Suggested actions for each project phase.
5. **Additional Risk Level 3 Requirement:** The QSP shall develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

- a. Site Address.
 - b. Calculated Risk Level (2 or 3).
 - c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number.
 - d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number.
 - e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number.
 - f. Trades active on site during Inactive Construction.
 - g. Trade contractor information.
 - h. Suggested actions for inactive construction sites.
6. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.
7. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 3 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
3	X	X	X	X	X	X	X ⁴

1. Construction Site Monitoring Program Requirements

- a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.
- b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Program in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.
- c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. Objectives

The CSMP shall be developed and implemented to address the following objectives:

⁴ When receiving water monitoring trigger is exceeded

- a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs) of this General Permit.
 - b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.
 - c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.
 - d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.
- 3. Risk Level 3 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**
- a. Risk Level 3 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.
 - b. Risk Level 3 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.
 - c. Risk Level 3 dischargers shall conduct visual observations (inspections) during business hours only.
 - d. Risk Level 3 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.
 - e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 3 dischargers shall visually observe (inspect):
 - i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

- ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.
 - iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.
- f. For the visual observations (inspections) described in c.i. and c.iii above, Risk Level 3 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.
 - g. Within two business days (48 hours) after each qualifying rain event, Risk Level 3 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.
 - h. Risk Level 3 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. Risk Level 3 – Water Quality Sampling and Analysis

- a. Risk Level 3 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.
- b. At minimum, Risk Level 3 dischargers shall collect 3 samples per day of the qualifying event.
- c. Risk Level 3 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

Storm Water Effluent Monitoring Requirements

- d. Risk Level 3 dischargers shall analyze their effluent samples for:
 - i. pH and turbidity.

- ii. Any additional parameters for which monitoring is required by the Regional Water Board.
- e. Risk 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event.

Receiving Water Monitoring Requirements

- f. In the event that a Risk Level 3 discharger's effluent exceeds the daily average receiving water monitoring trigger of 500 NTU turbidity or the daily average pH range 6.0-9.0 contained in this General Permit and has a direct discharge into receiving waters, the Risk Level 3 discharger shall subsequently sample receiving waters (RWs) for turbidity, pH (if applicable), and SSC for the duration of coverage under this General Permit. If a Risk Level 3 discharger utilizing ATS with direct discharges into receiving waters discharges effluent that exceeds the NELs in this permit, the discharger shall subsequently sample RWs for turbidity, pH (if applicable), and SSC for the duration of coverage under this General Permit.
- g. Risk Level 3 dischargers disturbing 30 acres or more of the landscape and with direct discharges into receiving waters shall conduct or participate in benthic macroinvertebrate bioassessment of RWs prior to commencement of construction activity (See Appendix 3).
- h. Risk Level 3 dischargers shall obtain RW samples in accordance with the Receiving Water sampling location section (Section I.5), below.

5. Risk Level 3 – Storm Water Discharge Water Quality Sampling Locations

Effluent Sampling Locations

- a. Risk Level 3 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.
- b. Risk Level 3 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

- c. Risk Level 3 dischargers shall ensure that storm water discharge collected and observed represent⁵ the effluent in each drainage area based on visual observation of the water and upstream conditions.
- d. Risk Level 3 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.
- e. Risk Level 3 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.
- f. Risk Level 3 dischargers shall select analytical test methods from the list provided in Table 3 below.
- g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 "Storm Water Sample Collection and Handling Instructions" below.

Receiving Water Sampling Locations

- h. **Upstream/up-gradient RW samples:** Risk Level 3 dischargers shall obtain any required upstream/up-gradient receiving water samples from a representative and accessible location as close as possible and upstream from the effluent discharge point.
- i. **Downstream/down-gradient RW samples:** Risk Level 3 dischargers shall obtain any required downstream/down-gradient receiving water samples from a representative and accessible location as close as possible and downstream from the effluent discharge point.
- j. If two or more discharge locations discharge to the same receiving water, Risk Level 3 dischargers may sample the receiving water at a single upstream and downstream location.

⁵ For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment-laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment laden water even if most water flowing through the fence is clear.

6. Risk Level 3 – Visual Observation and Sample Collection Exemptions

- a. Risk Level 3 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk Level 3 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:
 - i. During dangerous weather conditions such as flooding and electrical storms.
 - ii. Outside of scheduled site business hours.
- b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 3 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. Risk Level 3 – Storm Water Sample Collection and Handling Instructions

- a. Risk Level 3 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.
- b. Risk Level 3 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.
- c. Risk Level 3 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).⁶

⁶ Additional information regarding SWAMP's QAPrP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.

QAPrP: http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf

8. Risk Level 3 – Monitoring Methods

- a. Risk Level 3 dischargers shall include a description of the following items in the CSMP:
 - i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.
 - ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.
 - iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.
- b. Risk Level 3 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 3 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services (SSC exception). Risk Level 3 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. Risk Level 3 – Analytical Methods

- a. Risk Level 3 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

- b. **pH:** Risk Level 3 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 3 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.
- c. **Turbidity:** Risk Level 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).
- d. **Suspended sediment concentration (SSC):** Risk Level 3 dischargers that exceed the turbidity Receiving Water Monitoring Trigger shall perform SSC analysis using ASTM Method D3977-97.
- e. **Bioassessment:** Risk Level 3 dischargers shall perform bioassessment sampling and analysis according to Appendix 3 of this General Permit.

10. Risk Level 3 - Non-Storm Water Discharge Monitoring Requirements

- a. Visual Monitoring Requirements:
 - i. Risk Level 3 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.
 - ii. Risk Level 3 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).
 - iii. Risk Level 3 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 3 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to

reduce or prevent pollutants from contacting non-storm water discharges.

b. Effluent Sampling Locations:

- i. Risk Level 3 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.
- ii. Risk Level 3 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.
- iii. Risk Level 3 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. Risk Level 3 – Non-Visible Pollutant Monitoring Requirements

- a. Risk Level 3 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.
- b. Risk Level 3 dischargers shall ensure that water samples are large enough to characterize the site conditions.
- c. Risk Level 3 dischargers shall collect samples at all discharge locations that can be safely accessed.
- d. Risk Level 3 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
- e. Risk Level 3 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 3 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).
- f. Risk Level 3 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

- g. Risk Level 3 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.⁷
- h. Risk Level 3 dischargers shall keep all field /or analytical data in the SWPPP document.

12. Risk Level 3 – Watershed Monitoring Option

Risk Level 3 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. Risk Level 3 – Particle Size Analysis for Project Risk Justification

Risk Level 3 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. Risk Level 3 – Records

Risk Level 3 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 3 dischargers shall retain all records on-site while construction is ongoing. These records include:

- a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.
- b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.
- c. The date and approximate time of analyses.

⁷ For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

- d. The individual(s) who performed the analyses.
- e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.
- f. Rain gauge readings from site inspections.
- g. Quality assurance/quality control records and results.
- h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).
- i. Visual observation and sample collection exception records (see Section I.6 above).
- j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. Risk Level 3 – NAL Exceedance Report

- a. Risk Level 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.
- b. Risk Level 3 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity In this General Permit.
- c. Risk Level 3 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.
- d. Risk Level 3 dischargers shall include in the NAL Exceedance Report:
 - i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).

- ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.
- iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

16. Risk Level 3 – Bioassessment

- a. Risk Level 3 dischargers with a total project-related ground disturbance exceeding 30 acres shall:
 - i. Conduct bioassessment monitoring, as described in Appendix 3.
 - ii. Include the collection and reporting of specified in stream biological data and physical habitat.
 - iii. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP).⁸
- b. Risk Level 3 dischargers qualifying for bioassessment, where construction commences out of an index period for the site location shall:
 - i. Receive Regional Board approval for the sampling exception.
 - ii. Conduct bioassessment monitoring, as described in Appendix 3.
 - iii. Include the collection and reporting of specified instream biological data and physical habitat.
 - iv. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP).

OR

- v. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the WDID# on the check for the amount calculated for the exempted project.

⁸ http://www.waterboards.ca.gov/water_issues/programs/swamp/.

- vi. Send a copy of the check to the Regional Water Board office for the site's region.
- vii. Invest **\$7,500.00 X The number of samples required** into the SWAMP program as compensation (upon regional board approval).

Table 3 – Risk Level 3 Test Methods, Detection Limits, Reporting Units and Applicable NALs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level	Numeric Effluent Limitation	Receiving Water Monitoring Trigger
pH	Field test with calibrated portable instrument	Risk Level 3 Discharges	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A	lower limit = 6.0 upper limit = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 3 Discharges other than ATS	1	NTU	250 NTU	N/A	500 NTU
		For ATS discharges	1	NTU	N/A	10 NTU for Daily Weighted Average & 20 NTU for Any Single Sample	10 NTU for Daily Weighted Average & 20 NTU for Any Single Sample
SSC	ASTM Method D 3977-97 ⁹	Risk Level 3 (if Receiving Water Monitoring Trigger exceeded)	5	mg/L	N/A	N/A	N/A
Bioassessment	(STE) Level I of (SAFIT), ¹⁰ fixed-count of 600 org/sample	Risk Level 3 projects > 30 acres	N/A	N/A	N/A	N/A	N/A

⁹ ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, D 3977-97, Vol. 11.02, pp. 389-394.

¹⁰ The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

ATTACHMENT F: Active Treatment System (ATS) Requirements

Table 1 – Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
Turbidity	EPA 0180.1 and/or field test with a calibrated portable instrument	For ATS discharges	1	NTU	N/A	10 NTU for Daily Flow-Weighted Average & 20 NTU for Any Single Sample

- A.** Dischargers choosing to implement an Active Treatment System (ATS) on their site shall comply with all of the requirements in this Attachment.
- B.** The discharger shall maintain a paper copy of each ATS specification onsite in compliance with the record retention requirements in the Special Provisions of this General Permit.

C. ATS Design, Operation and Submittals

1. The ATS shall be designed and approved by a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ); a California registered civil engineer; or any other California registered engineer.
2. The discharger shall ensure that the ATS is designed in a manner to preclude the accidental discharge of settled floc¹ during floc pumping or related operations.
3. The discharger shall design outlets to dissipate energy from concentrated flows.
4. The discharger shall install and operate an ATS by assigning a lead person (or project manager) who has either a minimum of five years construction storm

¹ Floc is defined as a clump of solids formed by the chemical action in ATS systems.

water experience or who is a licensed contractors specifically holding a California Class A Contractors license.²

5. The discharger shall prepare an ATS Plan that combines the site-specific data and treatment system information required to safely and efficiently operate an ATS. The ATS Plan shall be electronically submitted to the State Water Board at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation. At a minimum, the ATS Plan shall include:
 - a. ATS Operation and Maintenance Manual for All Equipment.
 - b. ATS Monitoring, Sampling & Reporting Plan, including Quality Assurance/Quality Control (QA/QC).
 - c. ATS Health and Safety Plan.
 - d. ATS Spill Prevention Plan.
6. The ATS shall be designed to capture and treat (within a 72-hour period) a volume equivalent to the runoff from a 10-year, 24-hour storm event using a watershed runoff coefficient of 1.0.

D. Treatment – Chemical Coagulation/Flocculation

1. Jar tests shall be conducted using water samples selected to represent typical site conditions and in accordance with ASTM D2035-08 (2003).
2. The discharger shall conduct, at minimum, six site-specific jar tests (per polymer with one test serving as a control) for each project to determine the proper polymer and dosage levels for their ATS.
3. Single field jar tests may also be conducted during a project if conditions warrant, for example if construction activities disturb changing types of soils, which consequently cause change in storm water and runoff characteristics.

E. Residual Chemical and Toxicity Requirements

1. The discharger shall utilize a residual chemical test method that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold

² Business and Professions Code Division 3, Chapter 9, Article 4, Class A Contractor: A general engineering contractor is a contractor whose principal contracting business is in connection with fixed works requiring specialized engineering knowledge and skill. [<http://www.cslb.ca.gov/General-Information/library/licensing-classifications.asp>].

concentration³ (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used.

2. The discharger shall utilize a residual chemical test method that produces a result within one hour of sampling.
3. The discharger shall have a California State certified laboratory validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.
4. If the discharger cannot utilize a residual chemical test method that meets the requirements above, the discharger shall operate the ATS in Batch Treatment⁴ mode.
5. A discharger planning to operate in Batch Treatment mode shall perform toxicity testing in accordance with the following:
 - a. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge⁵. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.⁶
 - b. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012" for Fathead minnow, *Pimephales promelas* (fathead minnow). Acute toxicity for *Oncorhynchus mykiss* (Rainbow Trout) may be used as a substitute for testing fathead minnows.
 - c. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.
 - d. The discharger shall electronically report all acute toxicity testing.

³ The Maximum Allowable Threshold Concentration (MATC) is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. A typical MATC would be:

The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

⁴ Batch Treatment mode is defined as holding or recirculating the treated water in a holding basin or tank(s) until treatment is complete or the basin or storage tank(s) is full.

⁵ This requirement only requires that the test be initiated prior to discharge.

⁶ http://www.dhs.ca.gov/ps/ls/elap/pdf/FOT_Desc.pdf.

F. Filtration

1. The ATS shall include a filtration step between the coagulant treatment train and the effluent discharge. This is commonly provided by sand, bag, or cartridge filters, which are sized to capture suspended material that might pass through the clarifier tanks.
2. Differential pressure measurements shall be taken to monitor filter loading and confirm that the final filter stage is functioning properly.

G. Residuals Management

1. Sediment shall be removed from the storage or treatment cells as necessary to ensure that the cells maintain their required water storage (i.e., volume) capability.
2. Handling and disposal of all solids generated during ATS operations shall be done in accordance with all local, state, and federal laws and regulations.

H. ATS Instrumentation

1. The ATS shall be equipped with instrumentation that automatically measures and records effluent water quality data and flow rate.
2. The minimum data recorded shall be consistent with the Monitoring and Reporting requirements below, and shall include:
 - a. Influent Turbidity
 - b. Effluent Turbidity
 - c. Influent pH
 - d. Effluent pH
 - e. Residual Chemical
 - f. Effluent Flow rate
 - g. Effluent Flow volume
3. Systems shall be equipped with a data recording system, such as data loggers or webserver-based systems, which records each measurement on a frequency no longer than once every 15 minutes.

4. Cumulative flow volume shall be recorded daily. The data recording system shall have the capacity to record a minimum of seven days continuous data.
5. Instrumentation systems shall be interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH.
6. The system shall also assure that upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.
7. Instrumentation (flow meters, probes, valves, streaming current detectors, controlling computers, etc.) shall be installed and maintained per manufacturer's recommendations, which shall be included in the QA/QC plan.
8. The QA/QC plan shall also specify calibration procedures and frequencies, instrument method detection limit or sensitivity verification, laboratory duplicate procedures, and other pertinent procedures.
9. The instrumentation system shall include a method for controlling coagulant dose, to prevent potential overdosing. Available technologies include flow/turbidity proportional metering, periodic jar testing and metering pump adjustment, and ionic charge measurement controlling the metering pump.

I. ATS Effluent Discharge

1. ATS effluent shall comply with all provisions and prohibitions in this General Permit, specifically the NELs.
2. NELs for discharges from an ATS:
 - a. Turbidity of all ATS discharges shall be less than 10 NTU for daily flow-weighted average of all samples and 20 NTU for any single sample.
 - b. Residual Chemical shall be < 10% of MATC⁷ for the most sensitive species of the chemical used.

⁷ The Maximum Allowable Threshold Concentration (MATC) is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

3. If an analytical effluent sampling result exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file the results in violation within 24-hours of obtaining the results.
4. If ATS effluent is authorized to discharge into a sanitary sewer system, the discharger shall comply with any pre-treatment requirements applicable for that system. The discharger shall include any specific criteria required by the municipality in the ATS Plan.
5. Compliance Storm Event:

Discharges of storm water from ATS shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for ATS discharges is the 10 year, 24 hour storm, as determined using these maps:

<http://www.wrcc.dri.edu/pcpnfreq/nca10y24.gif>
<http://www.wrcc.dri.edu/pcpnfreq/sca10y24.gif>

This exemption is dependent on the submission of rain gauge data verifying the storm event is equal to or larger than the Compliance Storm.

J. Operation and Maintenance Plan

1. Each Project shall have a site-specific Operation and Maintenance (O&M) Manual covering the procedures required to install, operate and maintain the ATS.⁸
2. The O&M Manual shall only be used in conjunction with appropriate project-specific design specifications that describe the system configuration and operating parameters.
3. The O&M Manual shall have operating manuals for specific pumps, generators, control systems, and other equipment.

K. Sampling and Reporting Quality Assurance/ Quality Check (QA/QC) Plan

4. A project-specific QA/QC Plan shall be developed for each project. The QA/QC Plan shall include at a minimum:
 - a. Calibration – Calibration methods and frequencies for all system and field instruments shall be specified.

⁸ The manual is typically in a modular format covering generalized procedures for each component that is utilized in a particular system.

- b. Method Detection Limits (MDLs) – The methods for determining MDLs shall be specified for each residual coagulant measurement method. Acceptable minimum MDLs for each method, specific to individual coagulants, shall be specified.
- c. Laboratory Duplicates – Requirements for monthly laboratory duplicates for residual coagulant analysis shall be specified.

L. Personnel Training

- 1. Operators shall have training specific to using an ATS and liquid coagulants for storm water discharges in California.
- 2. The training shall be in the form of a formal class with a certificate and requirements for testing and certificate renewal.
- 3. Training shall include a minimum of eight hours classroom and 32 hours field training. The course shall cover the following topics:
 - a. Coagulation Basics –Chemistry and physical processes
 - b. ATS System Design and Operating Principles
 - c. ATS Control Systems
 - d. Coagulant Selection – Jar testing, dose determination, etc.
 - e. Aquatic Safety/Toxicity of Coagulants, proper handling and safety
 - f. Monitoring, Sampling, and Analysis
 - g. Reporting and Recordkeeping
 - h. Emergency Response

M. Active Treatment System (ATS) Monitoring Requirements

Any discharger who deploys an ATS on their site shall conduct the following:

- 1. Visual Monitoring
 - a. A designated responsible person shall be on site daily at all times during treatment operations.

- b. Daily on-site visual monitoring of the system for proper performance shall be conducted and recorded in the project data log.
 - i. The log shall include the name and phone number of the person responsible for system operation and monitoring.
 - ii. The log shall include documentation of the responsible person's training.

2. Operational and Compliance Monitoring

- a. Flow shall be continuously monitored and recorded at not greater than 15-minute intervals for total volume treated and discharged.
- b. Influent and effluent pH must be continuously monitored and recorded at not greater than 15-minute intervals.
- c. Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at not greater than 15-minute intervals.
- d. The type and amount of chemical used for pH adjustment, if any, shall be monitored and recorded.
- e. Dose rate of chemical used in the ATS system (expressed in mg/L) shall be monitored and reported 15-minutes after startup and every 8 hours of operation.
- f. Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records shall be maintained onsite.
- g. Effluent shall be monitored and recorded for residual chemical/additive levels.
- h. If a residual chemical/additive test does not exist and the ATS is operating in a batch treatment mode of operation refer to the toxicity monitoring requirements below.

3. Toxicity Monitoring

A discharger operating in batch treatment mode shall perform toxicity testing in accordance with the following:

- a. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge.⁹ All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS)

⁹ This requirement only requires that the test be initiated prior to discharge.

Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.¹⁰

- b. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in “Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012” for Fathead minnow, *Pimephales promelas* or Rainbow trout *Oncorhynchus mykiss* may be used as a substitute for fathead minnow.
- c. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.¹¹

4. Reporting and Recordkeeping

At a minimum, every 30 days a LRP representing the discharger shall access the State Water Boards Storm Water Multi-Application and Report Tracking system (SMARTS) and electronically upload field data from the ATS. Records must be kept for three years after the project is completed .

5. Non-compliance Reporting

- a. Any indications of toxicity or other violations of water quality objectives shall be reported to the appropriate regulatory agency as required by this General Permit.
- b. Upon any measurements that exceed water quality standards, the system operator shall immediately notify his supervisor or other responsible parties, who shall notify the Regional Water Board.
- c. If any monitoring data exceeds any applicable NEL in this General Permit, the discharger shall electronically submit a NEL Violation Report to the State Water Board within 24 hours after the NEL exceedance has been identified.
 - i. ATS dischargers shall certify each NEL Violation Report in accordance with the Special Provisions for Construction Activity in this General Permit.
 - ii. ATS dischargers shall retain an electronic or paper copy of each NEL Violation Report for a minimum of three years after the date the annual report is filed.
 - iii. ATS dischargers shall include in the NEL Violation Report:

¹⁰ http://www.dhs.ca.gov/ps/ls/elap/pdf/FOT_Desc.pdf.

¹¹ <http://www.epa.gov/waterscience/methods/wet/>.

- (1) The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”);
 - (2) The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation; and
 - (3) A description of the current onsite BMPs, and the proposed corrective actions taken to manage the NEL exceedance.
- iv. Compliance Storm Exemption - In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event, ATS dischargers shall report the on-site rain gauge reading and nearby governmental rain gauge readings for verification.

[illegible]

	A	B	C
1	Sediment Risk Factor Worksheet		Entry
2	A) R Factor		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	R Factor Value	0	
6	B) K Factor (weighted average, by area, for all site soils)		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	K Factor Value	0	
10	C) LS Factor (weighted average, by area, for all slopes)		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	LS Factor Value	0	
14			
15	Watershed Erosion Estimate (=R_xK_xLS) in tons/acre	0	
16	Site Sediment Risk Factor	Low	
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			
21			
22			
23	GIS Map Method:		
24	1. The R factor for the project is calculated using the online calculator at:		
25	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
26			
27	2. The K and LS factors may be obtained by accessing the GIS maps located on the State Water Board FTP website at:		
28	ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwg/cgp/Risk/		
29			

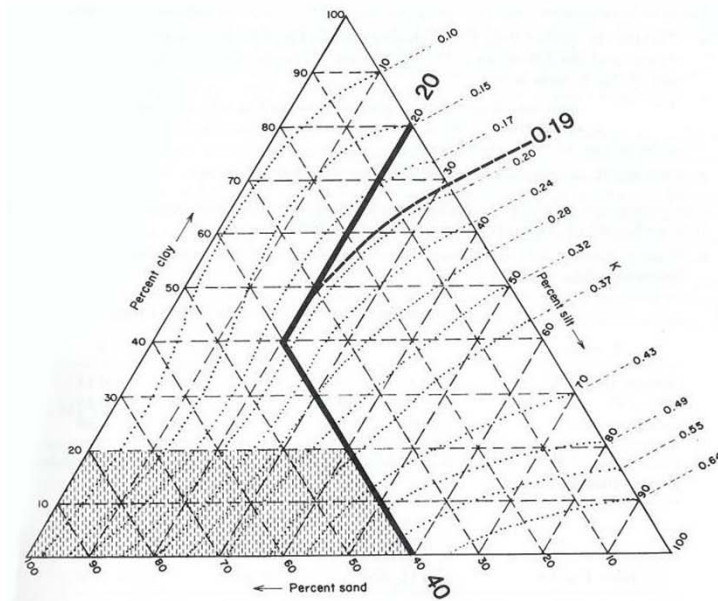
Receiving Water (RW) Risk Factor Worksheet		Entry	Score
A. Watershed Characteristics		yes/no	
A.1. Does the disturbed area discharge (either directly or indirectly) to a 303(d)-listed waterbody impaired by sediment (For help with impaired waterbodies please visit the link below) or has a USEPA approved TMDL implementation plan for sediment ? http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml OR		no	Low
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml			
Region 1 Basin Plan Region 2 Basin Plan Region 3 Basin Plan Region 4 Basin Plan Region 5 Basin Plan Region 6 Basin Plan Region 7 Basin Plan Region 8 Basin Plan Region 9 Basin Plan			

Combined Risk Level Matrix			
<u>Receiving Water Risk</u>	<u>Sediment Risk</u>		
	Low	Medium	High
	Low	Level 1	Level 2
High	Level 2		Level 3

Project Sediment Risk: **Low**
 Project RW Risk: **Low**
 Project Combined Risk: **Level 1**

Soil Erodibility Factor (K)

The K factor can be determined by using the nomograph method, which requires that a particle size analysis (ASTM D-422) be done to determine the percentages of sand, very fine sand, silt and clay. Use the figure below to determine appropriate K value.



Erickson triangular nomograph used to estimate soil erodibility (K) factor.

The figure above is the USDA nomograph used to determine the K factor for a soil, based on its texture (% silt plus very fine sand, % sand, % organic matter, soil structure, and permeability). *Nomograph from Erickson 1977 as referenced in Goldman et. al., 1986.*

Sheet Flow Length (ft)	Average Watershed Slope (%)																			
	0.2	0.5	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0	30.0	40.0	50.0	60.0	
<3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.35	0.36	0.38	0.39	0.41	0.45	0.48	0.53	0.58	0.63	
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.37	0.41	0.45	0.49	0.56	0.64	0.72	0.85	0.97	1.07	
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.38	0.45	0.51	0.56	0.67	0.80	0.91	1.13	1.31	1.47	
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.39	0.47	0.55	0.62	0.76	0.93	1.08	1.37	1.62	1.84	
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.40	0.49	0.58	0.67	0.84	1.04	1.24	1.59	1.91	2.19	
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36	0.45	0.57	0.71	0.85	0.98	1.24	1.56	1.86	2.41	2.91	3.36	
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54	0.70	0.91	1.15	1.40	1.64	2.10	2.67	3.22	4.24	5.16	5.97	
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69	0.91	1.20	1.54	1.87	2.21	2.86	3.67	4.44	5.89	7.20	8.37	
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82	1.10	1.46	1.88	2.31	2.73	3.57	4.59	5.58	7.44	9.13	10.63	
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05	1.43	1.92	2.51	3.09	3.68	4.85	6.30	7.70	10.35	12.75	14.89	
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25	1.72	2.34	3.07	3.81	4.56	6.04	7.88	9.67	13.07	16.16	18.92	
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43	1.99	2.72	3.60	4.48	5.37	7.16	9.38	11.55	15.67	19.42	22.78	
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60	2.24	3.09	4.09	5.11	6.15	8.23	10.81	13.35	18.17	22.57	26.51	
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90	2.70	3.75	5.01	6.30	7.60	10.24	13.53	16.77	22.95	28.60	33.67	
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43	3.52	4.95	6.67	8.45	10.26	13.94	18.57	23.14	31.89	39.95	47.18	
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89	4.24	6.03	8.17	10.40	12.69	17.35	23.24	29.07	40.29	50.63	59.93	
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30	4.91	7.02	9.57	12.23	14.96	20.57	27.66	34.71	48.29	60.84	72.15	

LS Factors for Construction Sites. *Table from Renard et. al., 1997.*

APPENDIX 2: Post-Construction Water Balance Performance Standard Spreadsheet

The discharger shall submit with their Notice of Intent (NOI) the following information to demonstrate compliance with the New and Re-Development Water Balance Performance Standard.

Map Instructions

The discharger must submit a small-scale topographic map of the site to show the existing contour elevations, pre- and post-construction drainage divides, and the total length of stream in each watershed area. Recommended scales include 1 in. = 20 ft., 1 in. = 30 ft., 1 in. = 40 ft., or 1 in = 50 ft. The suggested contour interval is usually 1 to 5 feet, depending upon the slope of the terrain. The contour interval may be increased on steep slopes. Other contour intervals and scales may be appropriate given the magnitude of land disturbance.

Spreadsheet Instructions

The intent of the spreadsheet is to help dischargers calculate the project-related increase in runoff volume and select impervious area and runoff reduction credits to reduce the project-related increase in runoff volume to pre-project levels.

The discharger has the option of using the spreadsheet (**Appendix 2.1**) or a more sophisticated, watershed process-based model (e.g. Storm Water Management Model, Hydrological Simulation Program Fortran) to determine the project-related increase in runoff volume.

In Appendix 4.1, you must complete the worksheet for each land use/soil type combination for each project sub-watershed.

Steps 1 through 9 pertain specifically to the Runoff Volume Calculator:

Step 1: Enter the county where the project is located in cell H3.

Step 2: Enter the soil type in cell H6.

Step 3: Enter the existing pervious (dominant) land use type in cell H7.

Step 4: Enter the proposed pervious (dominant) land use type in cell H8.

Step 5: Enter the total project site area in cell H11 or J11.

Step 6: Enter the sub-watershed area in cell H12 or J12.

- Step 7: Enter the existing rooftop area in cell H17 or J17, the existing non-rooftop impervious area in cell H18 or J18, the proposed rooftop area in cell H19 or J19, and the proposed non-rooftop impervious area in cell H20 or J20
- Step 8: Work through each of the impervious area reduction credits and claim credits where applicable. Volume that cannot be addressed using non-structural practices must be captured in structural practices and approved by the Regional Water Board.
- Step 9: Work through each of the impervious volume reduction credits and claim credits where applicable. Volume that cannot be addressed using non-structural practices must be captured in structural practices and approved by the Regional Water Board.

Non-structural Practices Available for Crediting

- ***Porous Pavement***
- ***Tree Planting***
- ***Downspout Disconnection***
- ***Impervious Area Disconnection***
- ***Green Roof***
- ***Stream Buffer***
- ***Vegetated Swales***
- ***Rain Barrels and Cisterns***
- ***Landscaping Soil Quality***

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Post-Construction Water Balance Calculator													
2														
3			User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.		(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below	(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.	SACRAMENTO							
4						(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recognize any of these locations, leave this drop-down menu at location. The average value for the County will be used.	SACRAMENTO FAA ARPT							
5	Project Information					Runoff Calculations								
6	Project Name:		Optional			(Step 2) Indicate the Soil Type (dropdown menu to right):	Group C Soils	Low infiltration. Sandy clay loam. Infiltration rate 0.05 to 0.15 inch/hr when wet.						
7	Waste Discharge Identification (WDID):		Optional			(Step 3) Indicate the existing dominant non-built land Use Type (dropdown menu to right):	Wood & Grass: <50% ground cover							
8	Date:		Optional			(Step 4) Indicate the proposed dominant non-built land Use Type (dropdown menu to right):	Lawn, Grass, or Pasture covering more than 75% of the open space							
9	Sub Drainage Area Name (from map):		Optional				Complete Either							
10	Runoff Curve Numbers						Sq Ft	Acres	Acres					
11	Existing Pervious Runoff Curve Number			82		(Step 5) Total Project Site Area:		5.00	5.00					
12	Proposed Development Pervious Runoff Curve Number			74		(Step 6) Sub-watershed Area:		5.00	5.00					
13	Design Storm					Percent of total project :	100%							
14	Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)* for your area.		0.62		in									
15	The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)*)		0.44		In	(Step 7) Sub-watershed Conditions	Complete Either			Calculated Acres				
16	P used for calculations (in) (the greater of the above two criteria)		0.62		In	Sub-watershed Area (acres)	Sq Ft	Acres	5.00					
17	^A Available at www.cabmphandbooks.com					Existing Rooftop Impervious Coverage		0	0.00					
18						Existing Non-Rooftop Impervious Coverage		0	0.00					
19						Proposed Rooftop Impervious Coverage		0	0.00					
20						Proposed Non-Rooftop Impervious Coverage		0	0.00					
21														
22						Credits	Acres			Square Feet				
23						Porous Pavement	0.00			0				
24						Tree Planting	0.00			0				
25	Pre-Project Runoff Volume (cu ft)		247		Cu.Ft.	Downspout Disconnection	0.00			0				
26	Project-Related Runoff Volume Increase w/o credits (cu ft)		0		Cu.Ft.	Impervious Area Disconnection	0.00			0				
27						Green Roof	0.00			0				
28						Stream Buffer	0.00			0				
29						Vegetated Swales	0.00			0				
30	Project-Related Volume Increase with Credits (cu ft)		0		Cu.Ft.	Subtotal	0.00			0				
31						Subtotal Runoff Volume Reduction Credit	0 Cu. Ft.							
32														
33	You have achieved your minimum requirements					(Step 9) Impervious Volume Reduction Credits	Volume (cubic feet)							
34						Rain Barrels/Cisterns	Cu. Ft.			0				
35						Soil Quality	Cu. Ft.			0				
36						Subtotal Runoff Volume Reduction	0 Cu. Ft.							
37						Total Runoff Volume Reduction Credit	Cu. Ft.			0				
38														
39														

Porous Pavement Credit Worksheet

Please fill out a porous pavement credit worksheet for each project sub-watershed.

For the *PROPOSED* Development:

Proposed Porous Pavement	Runoff Reduction*	Fill in either Acres or SqFt		Equivalent Acres
		In SqFt.	In Acres	
Area of Brick without Grout on <u>less than 12 inches</u> of base with at least 20% void space over soil	0.45			0.00
Area of Brick without Grout on <u>more than 12 inches</u> of base with at least 20% void space over soil	0.90			0.00
Area of Cobbles <u>less than 12 inches</u> deep and over soil	0.30			0.00
Area of Cobbles <u>less than 12 inches</u> deep and over soil	0.60			0.00
Area of Reinforced Grass Pavement on <u>less than 12 inches</u> of base with at least 20% void space over soil	0.45			0.00
Area of Reinforced Grass Pavement on <u>at least 12 inches</u> of base with at least 20% void space over soil	0.90			0.00
Area of Porous Gravel Pavement on <u>less than 12 inches</u> of base with at least 20% void space over soil	0.38			0.00
Area of Porous Gravel Pavement on <u>at least 12 inches</u> of base with at least 20% void space over soil	0.75			0.00
Area of Poured Porous Concrete or Asphalt Pavement with <u>less than 4 inches</u> of gravel base (washed stone)	0.40			0.00
Area of Poured Porous Concrete or Asphalt Pavement with <u>4 to 8 inches</u> of gravel base (washed stone)	0.60			0.00
Area of Poured Porous Concrete or Asphalt Pavement with <u>8 to 12 inches</u> of gravel base (washed stone)	0.80			0.00
Area of Poured Porous Concrete or Asphalt Pavement with <u>12 or more</u> inches of gravel base (washed stone)	1.00			0.00

*=1-Rv**

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**Using Site Design Techniques to meet Development Standards for Stormwater Quality (BASMAA 2003)

**NCDENR Stormwater BMP Manual (2007)

Tree Planting Credit Worksheet

Please fill out a tree canopy credit worksheet for each project sub-watershed.

Tree Canopy Credit Criteria	Number of Trees Planted	Credit (acres)
Number of proposed evergreen trees to be planted (credit = number of trees x 0.005)*	0	0.00
Number of proposed deciduous trees to be planted (credit = number of trees x 0.0025)*		0.00
	Square feet Under Canopy	
Square feet under an existing tree canopy, that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is LESS than 12 in diameter.		0.00
Square feet under an existing tree canopy that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is 12 in diameter or GREATER.		0.00
Please describe below how the project will ensure that these trees will be maintained.		

0

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* credit amount based on credits from Stormwater Quality Design Manual for the Sacramento and South Placer Regions

Downspout Disconnection Credit Worksheet

Please fill out a downspout disconnection credit worksheet for each project subwatershed. If you answer yes to all questions, all rooftop area draining to each downspout will be subtracted from your proposed rooftop impervious coverage.

Downspout Disconnection Credit Criteria					
Do downspouts and any extensions extend at least six feet from a basement and two feet from a crawl space or concrete slab?				☐ Yes	☒ No
Is the area of rooftop connecting to each disconnected downspout 600 square feet or less?				☐ Yes	☒ No
Is the roof runoff from the design storm event fully contained in a raised bed or planter box or does it drain as sheet flow to a landscaped area large enough to contain the roof runoff from the design storm event?				☐ Yes	☒ No
The Stream Buffer and/or Vegetated Swale credits will not be taken in this sub-watershed area?				☐ Yes	☒ No
Percentage of existing	0.00	Acres	of rooftop surface has disconnected downspouts		
Percentage of the proposed	0.00	Acres	of rooftop surface has disconnected downspouts	50	
				Return to Calculator	

Impervious Area Disconnection Credit Worksheet

Please fill out an impervious area disconnection credit worksheet for each project sub-watershed. If you answer yes to all questions, all non-rooftop impervious surface area will be subtracted from your proposed non-rooftop impervious coverage.

Non-Rooftop Disconnection Credit Criteria	Response
Is the maximum contributing impervious flow path length less than 75 feet or, if equal or greater than 75 feet, is a storage device (e.g. French drain, bioretention area, gravel trench) implemented to achieve the required disconnection length?	☒ Yes ☐ No
Is the impervious area to any one discharge location less than 5,000 square feet?	☒ Yes ☐ No
The Stream Buffer credit will not be taken in this sub-watershed area?	☒ Yes ☐ No

Percentage of existing	0.00	Acres non-rooftop surface area disconnected	
Percentage of the proposed	0.00	Acres non-rooftop surface area disconnected	70

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Green Roof Credit Worksheet

Please fill out a greenroof credit worksheet for each project sub-watershed. If you answer yes to all questions, 70% of the greenroof area will be subtracted from your proposed rooftop impervious coverage.

Green Roof Credit Criteria				Response	
Is the roof slope less than 15% or does it have a grid to hold the substrate in place until it forms a thick vegetation mat?				☒ Yes	☐ No
Has a professional engineer assessed the necessary load reserves and designed a roof structure to meet state and local codes?				☒ Yes	☐ No
Is the irrigation needed for plant establishment and/or to sustain the green roof during extended dry periods, is the source from stored, recycled, reclaimed, or reused water?				☒ Yes	☐ No
Percentage of existing	0.0	0	Acres rooftop surface area in greenroof		
Percentage of the proposed	0.0	0	Acres rooftop surface area in greenroof		
				Return to Calculator	

Stream Buffer Credit Worksheet

Please fill out a stream buffer credit worksheet for each project sub-watershed. If you answer yes to all questions, you may subtract all impervious surface draining to each stream buffer that has not been addressed using the Downspout and/or Impervious Area Disconnection credits.

Stream Buffer Credit Criteria				Response
Does runoff enter the floodprone width* or within 500 feet (whichever is larger) of a stream channel as sheet flow**?				☐ Yes ☒ No
Is the contributing overland slope 5% or less, or if greater than 5%, is a level spreader used?				☐ Yes ☒ No
Is the buffer area protected from vehicle or other traffic barriers to reduce compaction?				☐ Yes ☒ No
Will the stream buffer be maintained in an ungraded and uncompacted condition and will the vegetation be maintained in a natural condition?				☐ Yes ☒ No
Percentage of existing	0.00	Acres	impervious surface area draining into a stream buffer:	
Percentage of the proposed	0.00	Acres	impervious surface area that will drain into a stream buffer:	
Please describe below how the project will ensure that the buffer areas will remain in ungraded and uncompacted condition and that the vegetation will be maintained in a natural condition.				

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* floodprone width is the width at twice the bankfull depth.
** the maximum contributing length shall be 75 feet for impervious area

Vegetated Swale Credit Worksheet

Please fill out a vegetated swale worksheet for each project subwatershed. If you answer yes to all questions, you may subtract all impervious surface draining to each stream buffer that has not been addressed using the Downspout Disconnection credit.

Vegetated Swale Credit Criteria

Have all vegetated swales been designed in accordance with Treatment Control BMP 30 (TC-30 - Vegetated Swale) from the California Stormwater BMP Handbook, New Development and Redevelopment (available at www.cabmphandbooks.com)?

☐ Yes ☒ No

Is the maximum flow velocity for runoff from the design storm event less than or equal to 1.0 foot per second?

☐ Yes ☒ No

Percentage of existing	0.00	Acres of impervious area draining to a vegetated swale	
Percentage of the proposed	0.00	Acres of impervious area draining to a vegetated swale	

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Rain Barrel/Cistern Credit Worksheet

Please fill out a rain barrel/cistern worksheet for each project sub-watershed.

Rain Barrel/Cistern Credit Criteria	Response
Total number of rain barrel(s)/cisterns	
Average capacity of rain barrel(s)/cistern(s) (in gallons)	
Total capacity rain barrel(s)/cistern(s) (in cu ft) ¹	0

¹ accounts for 10% loss

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Please fill out a soil quality worksheet for each project sub-watershed.

	Response
Will the landscaped area be lined with an impervious membrane?	
Will the soils used for landscaping meet the ideal bulk densities listed in Table 1 below? ¹	☐ Yes ☒ No
If you answered yes to the question above, and you know the area-weighted bulk density within the top 12 inches for soils used for landscaping (in g/cm ³)*, fill in the cell to the right and skip to cell G11. If not select from the drop-down menu in G10.	1.3
If you answered yes to the question above, but you do not know the exact bulk density, which of the soil types in the drop down menu to the right best describes the top 12 inches for soils used for landscaping (in g/cm ³).	Sandy loams, loams
What is the average depth of your landscaped soil media meeting the above criteria (inches)?	12
What is the total area of the landscaped areas meeting the above criteria (in acres)?	2.97

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Table 1

Sands, loamy sands	<1.6
Sandy loams, loams	<1.4
Sandy clay loams, loams, clay loams	<1.4
Silts, silt loams	<1.3
Silt loams, silty clay loams	<1.1
Sandy clays, silty clays, some clay loams (35-45% clay)	<1.1
Clays (>45% clay)	<1.1

Porosity (%) 50.94%

Mineral grains in many soils are mainly quartz and feldspar, so 2.65 a good average for particle density. To determine percent porosity, use the formula: Porosity (%) = (1-Bulk Density/2.65) X 100

¹ USDA NRCS. "Soil Quality Urban Technical Note No.2-Urban Soil Compaction". March 2000.

http://soils.usda.gov/sqi/management/files/sq_utn_2.pdf

* To determine how to calculate density see:

<http://www.globe.gov/tctg/bulkden.pdf?sectionID=94>

APPENDIX 3

Bioassessment Monitoring Guidelines

Bioassessment monitoring is required for projects that meet all of the following criteria:

1. The project is rated Risk Level 3 or LUP Type 3
2. The project directly discharges runoff to a freshwater wadeable stream (or streams) that is either: (a) listed by the State Water Board or USEPA as impaired due to sediment, and/or (b) tributary to any downstream water body that is listed for sediment; and/or have the beneficial use SPAWN & COLD & MIGRATORY
3. Total project-related ground disturbance exceeds 30 acres.

For all such projects, the discharger shall conduct bioassessment monitoring, as described in this section, to assess the effect of the project on the biological integrity of receiving waters.

Bioassessment shall include:

1. The collection and reporting of specified instream biological data
2. The collection and reporting of specified instream physical habitat data

Bioassessment Exception

If a site qualifies for bioassessment, but construction commences out of an index period for the site location, the discharger shall:

1. Receive Regional Water Board approval for the sampling exception
2. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the WDID# on the check for the amount calculated for the exempted project.
3. Send a copy of the check to the Regional Water Board office for the site's region
4. Invest **7,500.00 X The number of samples required** into the SWAMP program as compensation (upon Regional Water Board approval).
5. Conduct bioassessment monitoring, as described in Appendix 4
6. Include the collection and reporting of specified instream biological data and physical habitat
7. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP)

Site Locations and Frequency

Macroinvertebrate samples shall be collected both before ground disturbance is initiated and after the project is completed. The "after" sample(s) shall be collected after at least one winter season resulting in surface runoff has transpired after project-related ground disturbance has ceased. "Before" and "after" samples shall be collected both upstream and downstream of the project's

discharge. Upstream samples should be taken immediately before the sites outfall and downstream samples should be taken immediately after the outfall (when safe to collect the samples). Samples should be collected for each freshwater Wadeable Stream that is listed as impaired due to sediment, or tributary to a water body that is listed for sediment. Habitat assessment data shall be collected concurrently with all required macroinvertebrate samples.

Index Period (Timing of Sample Collection)

Macroinvertebrate sampling shall be conducted during the time of year (i.e., the “index period”) most appropriate for bioassessment sampling, depending on ecoregion. This map is posted on the State Water Board’s Website: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

Field Methods for Macroinvertebrate Collections

In collecting macroinvertebrate samples, the discharger shall use the “Reachwide Benthos (Multi-habitat) Procedure” specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode 2007).¹

Physical - Habitat Assessment Methods

The discharger shall conduct, concurrently with all required macroinvertebrate collections, the “Full” suite of physical habitat characterization measurements as specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode 2007), and as summarized in the Surface Water Ambient Monitoring Program’s *Stream Habitat Characterization Form — Full Version*.

Laboratory Methods

Macroinvertebrates shall be identified and classified according to the Standard Taxonomic Effort (STE) Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists (SAFIT),² and using a fixed-count of 600 organisms per sample.

Quality Assurance

The discharger or its consultant(s) shall have and follow a quality assurance (QA) plan that covers the required bioassessment monitoring. The QA plan shall include, or be supplemented to include, a specific requirement for external QA checks (i.e., verification of taxonomic identifications and correction of data where

¹ This document is available on the Internet at: http://www.swrcb.ca.gov/swamp/docs/phab_sopr6.pdf.
http://swamp.mpsl.mml.calstate.edu/wp-content/uploads/2009/04/swamp_sop_bioassessment_collection_020107.pdf.

² The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf http://www.safit.org/Docs/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board’s SWAMP website.

errors are identified). External QA checks shall be performed on one of the discharger's macroinvertebrate samples collected per calendar year, or ten percent of the samples per year (whichever is greater). QA samples shall be randomly selected. The external QA checks shall be paid for by the discharger, and performed by the California Department of Fish and Game's Aquatic Bioassessment Laboratory. An alternate laboratory with equivalent or better expertise and performance may be used if approved in writing by State Water Board staff.

Sample Preservation and Archiving

The original sample material shall be stored in 70 percent ethanol and retained by the discharger until: 1) all QA analyses specified herein and in the relevant QA plan are completed; and 2) any data corrections and/or re-analyses recommended by the external QA laboratory have been implemented. The remaining subsampled material shall be stored in 70 percent ethanol and retained until completeness checks have been performed according to the relevant QA plan. The identified organisms shall be stored in 70 percent ethanol, in separate glass vials for each final ID taxon. (For example, a sample with 45 identified taxa would be archived in a minimum of 45 vials, each containing all individuals of the identified taxon.) Each of the vials containing identified organisms shall be labeled with taxonomic information (i.e., taxon name, organism count) and collection information (i.e., site name/site code, waterbody name, date collected, method of collection). The identified organisms shall be archived (i.e., retained) by the discharger for a period of not less than three years from the date that all QA steps are completed, and shall be checked at least once per year and "topped off" with ethanol to prevent desiccation. The identified organisms shall be relinquished to the State Water Board upon request by any State Water Board staff.

Data Submittal

The macroinvertebrate results (i.e., taxonomic identifications consistent with the specified SAFIT STEs, and number of organisms within each taxa) shall be submitted to the State Water Board in electronic format. The State Water Board's Surface Water Ambient Monitoring Program (SWAMP) is currently developing standardized formats for reporting bioassessment data. All bioassessment data collected after those formats become available shall be submitted using the SWAMP formats. Until those formats are available, the biological data shall be submitted in MS-Excel (or equivalent) format.³

The physical/habitat data shall be reported using the standard format titled *SWAMP Stream Habitat Characterization Form — Full Version*.⁴

³ Any version of Excel, 2000 or later, may be used.

⁴ Available at:

http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/fieldforms_fullversion052908.pdf

Invasive Species Prevention

In conducting the required bioassessment monitoring, the discharger and its consultants shall take precautions to prevent the introduction or spread of aquatic invasive species. At minimum, the discharger and its consultants shall follow the recommendations of the California Department of Fish and Game to minimize the introduction or spread of the New Zealand mudsnail.⁵

⁵ Instructions for controlling the spread of NZ mudsnails, including decontamination methods, can be found at: <http://www.dfg.ca.gov/invasives/mudsnail/>
More information on AIS More information on AIS
http://www.waterboards.ca.gov/water_issues/programs/swamp/ais/

Appendix 4 Non Sediment TMDLs

Region 1 Lost River-DIN and CBOD

Region 1 Source: Cal Trans Construction TMDL Completion Date: 12 30 2008 TMDL Type: River, Lake Watershed Area= 2996 mi ²	Pollutant Stressors/WLA	
	Dissolved inorganic nitrogen (DIN) (metric tons/yr)	Carbonaceous biochemical oxygen demand (CBOD) (metric tons/yr)
Lost River from the Oregon border to Tule Lake	.1	.2
Tule Lake Refuge	.1	.2
Lower Klamath Refuge	.1	.2

Region 2 San Francisco Bay-Mercury

Region 2 Source: Non-Urban Stormwater Runoff TMDL Type: Bay	Name	Pollutant Stressor/WLA	TMDL Completion Date
	San Francisco Bay	Mercury 25 kg/year	08 09 2006

Region 4 Ballona Creek-Metals and Selenium

Region 4 Source: NPDES General Construction TMDL Completion Date: 12 22 2005 TMDL Type: Creek	Pollutant Stressors/WLA							
	Copper (Cu)		Lead (Pb)		Selenium (Se)		Zinc (Zn)	
	g/day	g/day/acre	g/day	g/day/acre	g/day	g/day/acre	g/day	g/day/acre
Ballona Creek	4.94E-07 x Daily storm volume (L)	2.20E-10 x Daily storm volume (L)	1.62E-06 x Daily storm volume (L)	7.20E-10 x Daily storm volume (L)	1.37E-07 x Daily storm volume (L)	6.10E-11 x Daily storm volume (L)	3.27E-06 x Daily storm volume (L)	1.45E-09 x Daily storm volume (L)

General Construction Storm Water Permits:

Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board.

- Dry-weather Implementation Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3 and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be:
 - (1) infeasible to eliminate
 - (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and
 - (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order.
 Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ.
- Wet-weather Implementation Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees.
- Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL.
- General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations.

Region 4 Calleguas Creek-OC Pesticides, PCBs, and Siltation**Interim Requirements**

Region 4 Calleguas Creek Source: Minor NPDES point sources/WDRs TMDL Completion Date: 3 14 2006 TMDL Type:Creek	Pollutant Stressor	WLA Daily Max (µg/L)	WLA Monthly Ave (µg/L)
	Chlordane	1.2	0.59
	4,4-DDD	1.7	0.84
	4,4-DDE	1.2	0.59
	4,4-DDT	1.2	0.59
	Dieldrin	0.28	0.14
	PCB's	0.34	0.17
	Toxaphene	0.33	0.16

Final WLA (ng/g)							
Region 4 Calleguas Creek Source: Stormwater Permittees TMDL Completion Date: 3 14 2006 TMDL Type:Creek	Chlordane	4,4-DDD	4,4-DDE	4,4-DDT	Dieldrin	PCB's	Toxaphene
Mugu Lagoon*	3.3	2.0	2.2	0.3	4.3	180.0	360.0
Callegaus Creek	3.3	2.0	1.4	0.3	0.2	120.0	0.6
Revolon Slough (SW)*	0.9	2.0	1.4	0.3	0.1	130.0	1.0
Arroyo Las posas(SW)*	3.3	2.0	1.4	0.3	0.2	120.0	0.6
Arroyo Simi	3.3	2.0	1.4	0.3	0.2	120.0	0.6
Conejo Creek	3.3	2.0	1.4	0.3	0.2	120.0	0.6
Interim Requirements (ng/g)							
Mugu Lagoon*	25.0	69.0	300.0	39.0	19.0	180.	22900.0
Callegaus Creek	17.0	66.0	470.0	110.0	3.0	3800.0	260.0
Revolon Slough (SW)*	48.0	400.0	1600.0	690.0	5.7	7600.0	790.0
Arroyo Las posas(SW)*	3.3	290.0	950.0	670.0	1.1	25700.0	230.0
Arroyo Simi	3.3	14.0	170.0	25.0	1.1	25700.0	230.0
Conejo Creek	3.4	5.3	20.0	2.0	3.0	3800.0	260.0

*(SW)=Subwatershed

*Mugu Lagoon includes Duck pond/Agricultural Drain/Mugu/Oxnard Drain #2

Compliance with sediment based WLAs is measured as an instream annual average at the base of each subwatershed where the discharges are located.

Region 4 Calleguas Creek-Salts

Final Dry Weather Pollutant WLA (mg/L)					
Region 4 Calleguas Creek Source Permitted Stormwater Dischargers TMDL Completion Date: 12 2 2008 TMDL Type:Creek	Critical Condition Flow Rate (mgd)	Chloride (lb/day)	TDS (lb/day)	Sulfate (lb/day)	Boron (lb/day)
Simi	1.39	1738.0	9849.0	2897.0	12.0
Las Posas	0.13	157.0	887.0	261.0	N/A
Conejo	1.26	1576.0	8931.0	2627.0	N/A

Camarillo	0.06	72.0	406.0	119.0	N/A
Pleasant Valley (Calleguas)	0.12	150.0	850.0	250.0	N/A
Pleasant Valley (Revolon)	0.25	314.0	1778.0	523.0	2.0
Dry Weather Interim Pollutant WLA (mg/L)					
	Chloride (mg/L)	TDS (mg/L)	Sulfate (mg/L)	Boron (mg/L)	
Simi	230.0	1720.0	1289.0	1.3	
Las Posas	230.0	1720.0	1289.0	1.3	
Conejo	230.0	1720.0	1289.0	1.3	
Camarillo	230.0	1720.0	1289.0	1.3	
Pleasant Valley (Calleguas)	230.0	1720.0	1289.0	1.3	
Pleasant Valley (Revolon)	230.0	1720.0	1289.0	1.3	

- General Construction permittees are assigned a dry weather wasteload allocation equal to the average dry weather critical condition flow rate multiplied by the numeric target for each constituent. Waste load allocations apply in the receiving water at the base of each subwatershed. Dry weather allocations apply when instream flow rates are below the 86th percentile flow and there has been no measurable precipitation in the previous 24 hours.
- Because wet weather flows transport a large mass of salts at low concentrations, these dischargers meet water quality objectives during wet weather.
- Interim limits are assigned for dry weather discharges from areas covered by NPDES stormwater permits to allow time to implement appropriate actions. The interim limits are assigned as concentration based receiving water limits set to the 95th percentile of the discharger data as a monthly average limit except for chloride. The 95th percentile for chloride was 267 mg/L which is higher than the recommended criteria set forth in the Basin Plan for protection of sensitive beneficial uses including aquatic life. Therefore, the interim limit for chloride for Permitted Stormwater Dischargers is set equal to 230 mg/L to ensure protection of sensitive beneficial uses in the Calleguas Creek watershed.

Region 4 San Gabriel River and Tributaries-Metals and Selenium

Region 4 San Gabriel River and Tributaries Source: Construction Stormwater Dischargers TMDL Completion Date: 3 2007 TMDL Type: Creek	Pollutant Stressor	Wet weather Allocations	Dry Weather Allocations	% of Watershed
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San Gabriel Reach 2	Lead (Pb)	0.7% * 166 µg/l * Daily Storm Vol	N/A	0.7%
San Gabriel Reach 2	Lead (Pb) Mass based	0.8 kg/d	N/A	0.7%
Coyote Creek	Copper (Cu)	0.285 kg/d	0	5.0%
Coyote Creek	Lead (Pb)	1.70 kg/d	N/A	5.0%
Coyote Creek	Zinc (Zn)	2.4 kg/d	N/A	5.0%
San Jose Creek Reach 1 and 2	Selenium	5 µg/L	5 µg/L	5.0%

Wet-weather allocations for lead in San Gabriel River Reach 2. Concentration-based allocations apply to non-stormwater NPDES discharges. Stormwater allocations are expressed as a percent of load duration curve. Mass-based values presented in table are based on a flow of 260 cfs (daily storm volume = 6.4×10^8 liters).

There are 1555 acres of water in the entire watershed, 37.4 acres of water in the Reach 1 subwatershed (2.4%), and 269 acres in the Coyote Creek subwatershed (17%).

General Construction Storm Water Permits

Waste load allocations for the general construction storm water permits may be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board. An estimate of direct atmospheric deposition is developed based on the percent area of surface water in the watershed. Approximately 0.4% of the watershed area draining to San Gabriel River Reach 2 is comprised of water and approximately 0.2% of the watershed area draining to Coyote Creek is comprised of water.

Region 4 The Harbor Beaches of Ventura County-Bacteria

The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine water to protect the water contact recreation use. These targets are the most appropriate indicators of public health risk in recreational waters. Bacteriological objectives are set forth in Chapter 3 of the Basin Plan. The objectives are based on four bacteria indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are:

The General NPDES Construction permit is seen as a minor contributor and is given no allocation

General NPDES permits, individual NPDES permits, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, and WDR permittees in the Channel Islands Harbor subwatershed are assigned WLAs of zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, individual NPDES permit, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, and WDR will also be subject to a WLA of zero (0) days of allowable exceedances.

Region 4 Resolution No. 03-009 Los Angeles River and Tributaries-Nutrients

Minor Point Sources

Waste loads are allocated to minor point sources enrolled under NPDES or WDR permits including but not limited to Tapia WRP, Whittier Narrows WRP, Los Angeles Zoo WRP, industrial and construction stormwater, and municipal storm water and urban runoff from municipal separate storm sewer systems (MS4s)

Region 4 Minor Point Sources for NPDES/WDR Permits TMDL Completion Date: 7 10 2003 TMDL Type: River	Pollutant Stressor/WLA				
	Total Ammonia (NH₃)		Nitrate-nitrogen (NO₃-N)	Nitrite-nitrogen (NO₂-N)	NO₃-N + NO₃-N
	1 Hr Ave mg/l	30 Day Ave mg/l	30 Day Ave mg/l		30 Day Ave mg/l
LA River Above Los Angeles-Glendale WRP (LAG)	4.7	1.6	8.0	1.0	8.0
LA River Below LAG	8.7	2.4	8.0	1.0	8.0
Los Angeles Tributaries	10.1	2.3	8.0	1.0	8.0

Malibu Creek Attachment A to Resolution No. 2004-019R-Bacteria

12 13 2004 The WLAs for permittees under the NPDES General Stormwater Construction Permit are zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean.

Region 4 Marina del Rey Harbor, Mothers' Beach and Back Basins

Attachment A to Resolution No. 2003-012-Bacteria

8 7 2003 As discussed in "Source Analysis", discharges from general NPDES permits, general industrial storm water permits and general construction storm water permits are not expected to be a significant source of bacteria. Therefore, the WLAs for these discharges are zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, general industrial storm water permit or general construction storm water permit within the MdR Watershed will also be subject to a WLA of zero days of allowable exceedances.

Region 4 San Gabriel River and Tributaries-Metals and Selenium

Dry Weather Selenium WLA

A zero WLA is assigned to the industrial and construction stormwater permits during dry weather. Non-storm water discharges are already prohibited or restricted by existing general permits.

Region 4 General Construction Permittees TMDL Completion Date: 7 13 2006 TMDL Type: River	Total Recoverable Metals (kg/day)		
	Copper (Cu) Kg/day	Lead (Pb) Kg/day	Zinc (Zn) Kg/day
San Gabriel River Reach 2 and upstream reaches/tributaries	XXXX	Daily storm volume x 1.24 µg/L	XXXX
Coyote Creek and Tributaries	Daily storm volume x 0.7 µg/L	Daily storm volume x 4.3 µg/L	Daily storm volume x 6.2 µg/L

Each enrollee under the general construction stormwater permit receives a WLA on a per acre basis

Region 4 General Construction Permittees TMDL Completion Date: 7 13 2006 TMDL Type: River	Total Recoverable Metals (kg/day/acre)		
	Copper (Cu) Kg/acre/day	Lead (Pb) Kg/acre/day	Zinc (Zn) Kg/acre/day
San Gabriel River Reach 2 and upstream reaches/tributaries	XXXX	Daily storm volume x 0.56 µg/L	XXXX

Coyote Creek and Tributaries	Daily storm volume x 0.12 µg/L	Daily storm volume x 0.70 µg/L	Daily storm volume x 1.01 µg/L
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For the general industrial and construction storm water permits, the daily storm volume is measured at USGS station 11085000 for discharges to Reach 2 and above and at LACDPW flow gauge station F354-R for discharges to Coyote Creek.

General construction storm water permits

WLAs will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board.

Dry-weather implementation

Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (NPDES Permit No. CAS000002), or any successor permit, are exempt from the dry-weather WLA equal to zero as long as they comply with the provisions of sections C.3. and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be (1) infeasible to eliminate (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order. Unauthorized non-storm water flows are already prohibited by Permit No. CAS000002.

Upon permit issuance, renewal, or re-opener

Non-storm water flows not authorized by Order No. 99-08 DWQ, or any successor order, shall achieve dry-weather WLAs. WLAs shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.

Six years from the effective date of the TMDL

The construction industry will submit the results of wet-weather BMP effectiveness studies to the Los Angeles Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.

Seven years from the effective date of the TMDL

The Los Angeles Regional Board will consider results of the wet weather BMP effectiveness studies and consider approval of BMPs.

Eight years from the effective date of the TMDL

All general construction storm water permittees shall implement Regional Board-approved BMPs.

Region 8 RESOLUTION NO. R8-2007- 0024

Total Maximum Daily Loads (TMDLs) for San Diego Creek,
Upper and Lower Newport Bay, Orange County, California

Region 8 NPDES Construction Permit TMDL Completion Date: 1 24 1995 TMDL Type: River. Cr, Bay	Organochlorine Compounds							
	Total DDT		Chlordane		Total PCBs		Toxaphene	
	g/day	g/yr	g/day	g/yr	g/day	g/yr	g/day	g/yr
San Diego Creek	.27	99.8	.18*	64.3*	.09*	31.5*	.004	1.5
Upper Newport Bay	.11	40.3	.06	23.4	.06	23.2	X	X
Lower Newport Bay	.04	14.9	.02	8.6	.17	60.7	X	X

*Red= Informational WLA only, not for enforcement purposes

Organochlorine Compounds TMDLs Implementation Tasks and Schedule

Regional Board staff shall develop a SWPPP Improvement Program that identifies the Regional Board's expectations with respect to the content of SWPPPs, including documentation regarding the selection and implementation of BMPs, and a sampling and analysis plan. The Improvement Program shall include specific guidance regarding the development and implementation of monitoring plans, including the constituents to be monitored, sampling frequency and analytical protocols. The SWPPP Improvement Program shall be completed by *(the date of OAL approval of this BPA)*. **No later than two months** from completion of the Improvement Program, Board staff shall assure that the requirements of the Program are communicated to interested parties, including dischargers with existing authorizations under the General Construction Permit. Existing, authorized dischargers shall revise their project SWPPPs as needed to address the Program requirements as soon as possible but **no later than (three months of completion of the SWPPP Improvement Program)**. Applicable SWPPPs that do not adequately address the Program requirements shall be considered inadequate and enforcement by the Regional Board shall proceed accordingly. The Caltrans and Orange County MS4 permits shall be revised as needed to assure that the permittees communicate the Regional Board's SWPPP expectations, based on the SWPPP Improvement Program, with the Standard Conditions of Approval.

Appendix 4 Sediment TMDLs

Implemented Sediment TMDLs in California. Construction was listed as a source in all fo these TMDLs in relation to road construction. Although construction was mentioned as a source, it was not given a specific allocation amount. The closest allocation amount would be for the road activity management WLA. **Implementation Phase** – Adoption process by the Regional Board, the State Water Resources Control Board, the Office of Administrative Law, and the US Environmental Protection Agency completed and TMDL being implemented.

A. Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi ² yr
1 R1.epa.albionfinaltmdl	R	Albion River	Sedimentation	Road Construction	2001	43 acres	See A (table 6)

B Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi ² yr
1 R1.epa.EelR-middle.mainSed.temp	R	Middle Main Eel River and Tributaries (from Dos Rios to the South Fork)	Sedimentation	Road Construction	2005-2006	521 mi ²	100

C Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi ² yr
1 R1.epa.EelRsouth.sed.temp	R	South Fork Eel River	Sedimentation	Road Construction	12 1999	See chart	473

D Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi ² yr
1 R1.epa.bigfinaltmdl	R	Big River	Sedimentation	Road Construction	12 2001	181 mi ² watershed drainage	TMDL = loading capacity = nonpoint sources + background =

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							393 t mi ² yr
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E Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi² yr
1 R1.epa.EelR-lower.Sed.temp-121807-signed	R	Lower Eel River	Sedimentation	Road Construction	12 2007	300 square-mile watershed	898

F Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi² yr
1 R1.epa.EelR-middle.Sed.temp-	R	Middle Fork Eel River	Sedimentation	Road Construction	12 2003	753 mi ² (approx. 482,000 acres)	82

G Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres Mi²	WLA tons mi² yr
1 R1.epa.EelRnorth-Sed.temp.final-121807-signed	R	North Fork Eel River	Sedimentation	Road Construction	12 30 2002	289 (180,020 acres)	20

H Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres Mi²	WLA tons mi² yr
1 R1.epa.EelR-upper.mainSed.tem-	R	Upper Main Eel River and Tributaries (including Tomki Creek, Outlet Creek and Lake Pillsbury)	Sedimentation	Road Construction	12 29 2004	688 (approx. 440,384 acres)	14

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I Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi² yr
1 R1.epa.gualalafina ltmdl	R	Gualala River	Sedimentation	Road Construction	Not sure	300 (191,145 acres)	7

J Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi²	WLA tons mi² yr
1 R1.epa.Mad- sed.turbidity	R	Mad River	Sedimentation	Road Construction	12 21 2007	480	174

K Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi²	WLA tons mi² yr
1 R1.epa.mattole.se diment	R	Mattole River	Sedimentation	Road Construction	12 30 2003	296	27 or 520+27 = 547

L Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi²	WLA tons mi² yr
1 R1.epa.navarro.se d.temp	R	Navarro River	Sedimentation	Road Construction	Not sure	315 (201,600 acres).	50

M Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi²	WLA tons mi² yr
1 R1.epa.noyo.sedi ment	R	Noyo River	Sedimentation	Road Construction	12 16 1999	113 (72,323 acres)	68 (three areas measured) Table 16 in the TMDL

N Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi²	WLA tons mi² yr
1 R1.epa.RedwoodCk.sed	Cr	Redwood Creek	Sedimentation	Road Construction	12 30 1998	278	1900 Total allocation

O Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi²	WLA – Roads tons mi² yr
1 R1.epa.tenmile.sed	R	Ten Mile River	Sedimentation	Road Construction	2000	120	9

P Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi²	WLA management tons mi² yr
1 R1.epa.trinity.sed	R	Trinity River	Sedimentation	Road Construction	12 20 2001	2000 of 3000 covered in this TMDL	See rows below
1	Cr	Horse Linto Creek	Sedimentation	Road Construction	12 20 2001	64	528
1	Cr	Mill creek and Tish Tang	Sedimentation	Road Construction	12 20 2001	39	210
1	Cr	Willow Creek	Sedimentation	Road Construction	12 20 2001	43	94
1	Cr	Campbell Creek and Supply Creek	Sedimentation	Road Construction	12 20 2001	11	1961
1	Cr	Lower Mainstem and Coon Creek	Sedimentation	Road Construction	12 20 2001	32	63
1	R	Reference	Sedimentation	Road	12 20 2001	434	24

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		Subwatershed ¹		Construction			
1	Cr	Canyon Creek	Sedimentation	Road Construction	12 20 2001	64	326
1	R	Upper Tributaries ²	Sedimentation	Road Construction	12 20 2001	72	67
1	R	Middle Tributaries ³	Sedimentation	Road Construction	12 20 2001	54	53
1	R	Lower Tributaries ⁴	Sedimentation	Road Construction	12 20 2001	96	55
1	Cr	Weaver and Rush Creeks	Sedimentation	Road Construction	12 20 2001	72	169
1	Cr	Deadwood Creek Hoadley Gulch Poker Bar	Sedimentation	Road Construction	12 20 2001	47	68
1	L	Lewiston Lake	Sedimentation	Road Construction	12 20 2001	25	49
1	Cr	Grassvalley Creek	Sedimentation	Road Construction	12 20 2001	37	44
1	Cr	Indian Creek	Sedimentation	Road Construction	12 20 2001	34	81
1	Cr	Reading and Browns Creek	Sedimentation	Road Construction	12 20 2001	104	66
1	Cr	Reference Subwatersheds ⁵	Sedimentation	Road Construction	12 20 2001	235	281
1	L, Cr	Westside tributaries ⁶	Sedimentation	Road Construction	12 20 2001	93	105
1	R, Cr, G	Upper trinity ⁷	Sedimentation	Road Construction	12 20 2001	161	690
1	R, Cr, G	East Fork Tributaries ⁸	Sedimentation	Road Construction	12 20 2001	115	65

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APPENDIX 4

1	R, L	Eastside Tributaries ⁹	Sedimentation	Road Construction	12 20 2001	89	60
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1 New River, Big French, Manzanita, North Fork, East Fork, North Fork

2 Dutch, Soldier, Oregon gulch, Conner Creek

3 Big Bar, Prairie Creek, Little French Creek

4 Swede, Italian, Canadian, Cedar Flat, Mill, McDonald, Hennessy, Quimby, Hawkins, Sharber

5 Stuarts Fork, Swift Creek, Coffee Creek

6 Stuart Arm, Stoney Creek, Mule Creek, East Fork, Stuart Fork, West Side Trinity Lake, Hatchet Creek, Buckeye Creek,

7 Upper Trinity River, Tangle Blue, Sunflower, Graves, Bear Upper Trinity Mainstream, Ramshorn Creek, Ripple Creek, Minnehaha Creek, Snowslide Gulch, Scorpion Creek

8 East Fork Trinity, Cedar Creek, Squirrel Gulch

9 East Side Tributaries, Trinity Lake

Q Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi ²	WLA tons mi ² yr
1 R1.epa.trinity.so.sed	R, Cr	South Fork Trinity River and Hayfork Creek	Sedimentation	Road Construction	12 1998	Not given, 19 miles long	33 (road total)

R Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi ²	WLA tons mi ² yr
1 R1.epa.vanduzen.sed	R, Cr	Van Duzen River and Yager Creek	Sedimentation	Various	12 16 1999	429	1353 total allocation
1		Upper Basin	Sedimentation	Road Construction			7
1		Middle Basin	Sedimentation	Road Construction			22
1		Lower Basin	Sedimentation	Road Construction			20

S Region	Type	Name	Pollutant Stressor	Potential	TMDL	Watershed	WLA tons mi ²
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APPENDIX 4

				Sources	Completion Date	Acres mi ²	yr
6 R6.blackwood.sed	Cr	Blackwood Creek (Placer County)	Bedded Sediment	Various	9 2007	11	17272 total

T Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi ²	WLA tons mi ² yr
6 R6.SquawCk.sed	R	Squaw Creek (Placer County)	Sedimentation /controllable sources	Various – basin plan amendment	4 13 2006	8.2	10,900

Adopted TMDLs for Construction Sediment Sources

Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Area mi ²	Waste load Allocation tons mi ² yr
8	R	Newport Bay San Diego Creek Watershed	Sedimentation	Construction Land Development	1999	2.24 (1432 acres)	125,000 tons per Year (no more than 13,000 tons per year from construction sites)

APPENDIX 5: Glossary

Active Areas of Construction

All areas subject to land surface disturbance activities related to the project including, but not limited to, project staging areas, immediate access areas and storage areas. All previously active areas are still considered active areas until final stabilization is complete. [The construction activity Phases used in this General Permit are the Preliminary Phase, Grading and Land Development Phase, Streets and Utilities Phase, and the Vertical Construction Phase.]

Active Treatment System (ATS)

A treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation to aid in the reduction of turbidity caused by fine suspended sediment.

Acute Toxicity Test

A chemical stimulus severe enough to rapidly induce a negative effect; in aquatic toxicity tests, an effect observed within 96 hours or less is considered acute.

Air Deposition

Airborne particulates from construction activities.

Approved Signatory

A person who has been authorized by the Legally Responsible Person to sign, certify, and electronically submit Permit Registration Documents, Notices of Termination, and any other documents, reports, or information required by the General Permit, the State or Regional Water Board, or U.S. EPA. The Approved Signatory must be one of the following:

1. For a corporation or limited liability company: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (a) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation or limited liability company; or (b) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
2. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;
3. For a municipality, State, Federal, or other public agency: a principal executive officer, ranking elected official, city manager, council president, or any other authorized public employee with managerial responsibility over the

construction or land disturbance project (including, but not limited to, project manager, project superintendent, or resident engineer);

4. For the military: any military officer or Department of Defense civilian, acting in an equivalent capacity to a military officer, who has been designated;
5. For a public university: an authorized university official;
6. For an individual: the individual, because the individual acts as both the Legally Responsible Person and the Approved Signatory; or
7. For any type of entity not listed above (e.g. trusts, estates, receivers): an authorized person with managerial authority over the construction or land disturbance project.

Beneficial Uses

As defined in the California Water Code, beneficial uses of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

Best Available Technology Economically Achievable (BAT)

As defined by USEPA, BAT is a technology-based standard established by the Clean Water Act (CWA) as the most appropriate means available on a national basis for controlling the direct discharge of toxic and nonconventional pollutants to navigable waters. The BAT effluent limitations guidelines, in general, represent the best existing performance of treatment technologies that are economically achievable within an industrial point source category or subcategory.

Best Conventional Pollutant Control Technology (BCT)

As defined by USEPA, BCT is a technology-based standard for the discharge from existing industrial point sources of conventional pollutants including biochemical oxygen demand (BOD), total suspended sediment (TSS), fecal coliform, pH, oil and grease.

Best Professional Judgment (BPJ)

The method used by permit writers to develop technology-based NPDES permit conditions on a case-by-case basis using all reasonably available and relevant data.

Best Management Practices (BMPs)

BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures,

and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Chain of Custody (COC)

Form used to track sample handling as samples progress from sample collection to the analytical laboratory. The COC is then used to track the resulting analytical data from the laboratory to the client. COC forms can be obtained from an analytical laboratory upon request.

Coagulation

The clumping of particles in a discharge to settle out impurities, often induced by chemicals such as lime, alum, and iron salts.

Common Plan of Development

Generally a contiguous area where multiple, distinct construction activities may be taking place at different times under one plan. A plan is generally defined as any piece of documentation or physical demarcation that indicates that construction activities may occur on a common plot. Such documentation could consist of a tract map, parcel map, demolition plans, grading plans or contract documents. Any of these documents could delineate the boundaries of a common plan area. However, broad planning documents, such as land use master plans, conceptual master plans, or broad-based CEQA or NEPA documents that identify potential projects for an agency or facility are not considered common plans of development.

Daily Average Discharge

The discharge of a pollutant measured during any 24-hour period that reasonably represents a calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged during the day. For pollutants with limitations expressed in other units of measurement (e.g., concentration) the daily discharge is calculated as the average measurement of the pollutant throughout the day (40 CFR 122.2). In the case of pH, the pH must first be converted from a log scale.

Debris

Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

Direct Discharge

A discharge that is routed directly to waters of the United States by means of a pipe, channel, or ditch (including a municipal storm sewer system), or through surface runoff.

Discharger

The Legally Responsible Person (see definition) or entity subject to this General Permit.

Dose Rate (for ATS)

In exposure assessment, dose (e.g. of a chemical) per time unit (e.g. mg/day), sometimes also called dosage.

Drainage Area

The area of land that drains water, sediment, pollutants, and dissolved materials to a common outlet.

Effluent

Any discharge of water by a discharger either to the receiving water or beyond the property boundary controlled by the discharger.

Effluent Limitation

Any numeric or narrative restriction imposed on quantities, discharge rates, and concentrations of pollutants which are discharged from point sources into waters of the United States, the waters of the contiguous zone, or the ocean.

Erosion

The process, by which soil particles are detached and transported by the actions of wind, water, or gravity.

Erosion Control BMPs

Vegetation, such as grasses and wildflowers, and other materials, such as straw, fiber, stabilizing emulsion, protective blankets, etc., placed to stabilize areas of disturbed soils, reduce loss of soil due to the action of water or wind, and prevent water pollution.

Field Measurements

Testing procedures performed in the field with portable field-testing kits or meters.

Final Stabilization

All soil disturbing activities at each individual parcel within the site have been completed in a manner consistent with the requirements in this General Permit.

First Order Stream

Stream with no tributaries.

Flocculants

Substances that interact with suspended particles and bind them together to form flocs.

Good Housekeeping BMPs

BMPs designed to reduce or eliminate the addition of pollutants to construction site runoff through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions.

Grading Phase (part of the Grading and Land Development Phase)

Includes reconfiguring the topography and slope including; alluvium removals; canyon cleanouts; rock undercuts; keyway excavations; land form grading; and stockpiling of select material for capping operations.

Hydromodification

Hydromodification is the alteration of the hydrologic characteristics of coastal and non-coastal waters, which in turn could cause degradation of water resources. Hydromodification can cause excessive erosion and/or sedimentation rates, causing excessive turbidity, channel aggradation and/or degradation.

Identified Organisms

Organisms within a sub-sample that is specifically identified and counted.

Inactive Areas of Construction

Areas of construction activity that are not active and those that have been active and are not scheduled to be re-disturbed for at least 14 days.

Index Period

The period of time during which bioassessment samples must be collected to produce results suitable for assessing the biological integrity of streams and rivers. Instream communities naturally vary over the course of a year, and sampling during the index period ensures that samples are collected during a time frame when communities are stable so that year-to-year consistency is obtained. The index period approach provides a cost-effective alternative to year-round sampling. Furthermore, sampling within the appropriate index period will yield results that are comparable to the assessment thresholds or criteria for a given region, which are established for the same index period. Because index periods differ for different parts of the state, it is essential to know the index period for your area.

K Factor

The soil erodibility factor used in the Revised Universal Soil Loss Equation (RUSLE). It represents the combination of detachability of the soil, runoff potential of the soil, and the transportability of the sediment eroded from the soil.

Legally Responsible Person

The Legally Responsible Person (LRP) will typically be the project proponent. The categories of persons or entities that are eligible to serve as the LRP are set forth below. For any construction or land disturbance project where multiple persons or entities are eligible to serve as the LRP, those persons or entities

shall select a single LRP. In exceptional circumstances, a person or entity that qualifies as the LRP may provide written authorization to another person or entity to serve as the LRP. In such a circumstance, the person or entity that provides the authorization retains all responsibility for compliance with the General Permit. Except as provided in category 2(d), a contractor who does not satisfy the requirements of any of the categories below is not qualified to be an LRP.

The following persons or entities may serve as an LRP:

1. A person, company, agency, or other entity that possesses a real property interest (including, but not limited to, fee simple ownership, easement, leasehold, or other rights of way) in the land upon which the construction or land disturbance activities will occur for the regulated site.
2. In addition to the above, the following persons or entities may also serve as an LRP:
 - a. For linear underground/overhead projects, the utility company, municipality, or other public or private company or agency that owns or operates the LUP;
 - b. For land controlled by an estate or similar entity, the person who has day-to-day control over the land (including, but not limited to, a bankruptcy trustee, receiver, or conservator);
 - c. For pollution investigation and remediation projects, any potentially responsible party that has received permission to conduct the project from the holder of a real property interest in the land; or
 - d. For U.S. Army Corp of Engineers projects, the U.S. Army Corps of Engineers may provide written authorization to its bonded contractor to serve as the LRP, provided, however, that the U.S. Army Corps of Engineers is also responsible for compliance with the general permit, as authorized by the Clean Water Act or the Federal Facilities Compliance Act.

Likely Precipitation Event

Any weather pattern that is forecasted to have a 50% or greater chance of producing precipitation in the project area. The discharger shall obtain likely precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at <http://www.srh.noaa.gov/forecast>).

Maximum Allowable Threshold Concentration (MATC)

The allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity

testing conducted by an independent, third-party laboratory. A typical MATC would be:

The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

Natural Channel Evolution

The physical trend in channel adjustments following a disturbance that causes the river to have more energy and degrade or aggrade more sediment. Channels have been observed to pass through 5 to 9 evolution types. Once they pass through the suite of evolution stages, they will rest in a new state of equilibrium.

Non-Storm Water Discharges

Discharges are discharges that do not originate from precipitation events. They can include, but are not limited to, discharges of process water, air conditioner condensate, non-contact cooling water, vehicle wash water, sanitary wastes, concrete washout water, paint wash water, irrigation water, or pipe testing water.

Non-Visible Pollutants

Pollutants associated with a specific site or activity that can have a negative impact on water quality, but cannot be seen through observation (ex: chlorine). Such pollutants being discharged are not authorized.

Numeric Action Level (NAL)

Level is used as a warning to evaluate if best management practices are effective and take necessary corrective actions. Not an effluent limit.

Original Sample Material

The material (i.e., macroinvertebrates, organic material, gravel, etc.) remaining after the subsample has been removed for identification.

pH

Unit universally used to express the intensity of the acid or alkaline condition of a water sample. The pH of natural waters tends to range between 6 and 9, with neutral being 7. Extremes of pH can have deleterious effects on aquatic systems.

Post-Construction BMPs

Structural and non-structural controls which detain, retain, or filter the release of pollutants to receiving waters after final stabilization is attained.

Preliminary Phase (Pre-Construction Phase - Part of the Grading and Land Development Phase)

Construction stage including rough grading and/or disking, clearing and grubbing operations, or any soil disturbance prior to mass grading.

Project

Qualified SWPPP Developer

Individual who is authorized to develop and revise SWPPPs.

Qualified SWPPP Practitioner

Individual assigned responsibility for non-storm water and storm water visual observations, sampling and analysis, and responsibility to ensure full compliance with the permit and implementation of all elements of the SWPPP, including the preparation of the annual compliance evaluation and the elimination of all unauthorized discharges.

Qualifying Rain Event

Any event that produces 0.5 inches or more precipitation with a 48 hour or greater period between rain events.

R Factor

Erosivity factor used in the Revised Universal Soil Loss Equation (RUSLE). The R factor represents the erosivity of the climate at a particular location. An average annual value of R is determined from historical weather records using erosivity values determined for individual storms. The erosivity of an individual storm is computed as the product of the storm's total energy, which is closely related to storm amount, and the storm's maximum 30-minute intensity.

Rain Event Action Plan (REAP)

Written document, specific for each rain event, that when implemented is designed to protect all exposed portions of the site within 48 hours of any likely precipitation event.

Remaining Sub sampled Material

The material (e.g., organic material, gravel, etc.) that remains after the organisms to be identified have been removed from the subsample for identification. (Generally, no macroinvertebrates are present in the remaining subsampled material, but the sample needs to be checked and verified using a complete Quality Assurance (QA) plan)

Routine Maintenance

Activities intended to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Runoff Control BMPs

Measures used to divert runoff from offsite and runoff within the site.

Run-on

Discharges that originate offsite and flow onto the property of a separate project site.

Revised Universal Soil Loss Equation (RUSLE)

Empirical model that calculates average annual soil loss as a function of rainfall and runoff erosivity, soil erodibility, topography, erosion controls, and sediment controls.

Sampling and Analysis Plan

Document that describes how the samples will be collected, under what conditions, where and when the samples will be collected, what the sample will be tested for, what test methods and detection limits will be used, and what methods/procedures will be maintained to ensure the integrity of the sample during collection, storage, shipping and testing (i.e., quality assurance/quality control protocols).

Sediment

Solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentation

Process of deposition of suspended matter carried by water, wastewater, or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material.

Sediment Control BMPs

Practices that trap soil particles after they have been eroded by rain, flowing water, or wind. They include those practices that intercept and slow or detain the flow of storm water to allow sediment to settle and be trapped (e.g., silt fence, sediment basin, fiber rolls, etc.).

Settleable Solids (SS)

Solid material that can be settled within a water column during a specified time frame. It is typically tested by placing a water sample into an Imhoff settling cone and then allowing the solids to settle by gravity for a given length of time. Results are reported either as a volume (mL/L) or a mass (mg/L) concentration.

Sheet Flow

Flow of water that occurs overland in areas where there are no defined channels where the water spreads out over a large area at a uniform depth.

Site**Soil Amendment**

Any material that is added to the soil to change its chemical properties, engineering properties, or erosion resistance that could become mobilized by storm water.

Streets and Utilities Phase

Construction stage including excavation and street paving, lot grading, curbs, gutters and sidewalks, public utilities, public water facilities including fire hydrants, public sanitary sewer systems, storm sewer system and/or other drainage improvements.

Structural Controls

Any structural facility designed and constructed to mitigate the adverse impacts of storm water and urban runoff pollution

Suspended Sediment Concentration (SSC)

The measure of the concentration of suspended solid material in a water sample by measuring the dry weight of all of the solid material from a known volume of a collected water sample. Results are reported in mg/L.

Total Suspended Solids (TSS)

The measure of the suspended solids in a water sample includes inorganic substances, such as soil particles and organic substances, such as algae, aquatic plant/animal waste, particles related to industrial/sewage waste, etc. The TSS test measures the concentration of suspended solids in water by measuring the dry weight of a solid material contained in a known volume of a sub-sample of a collected water sample. Results are reported in mg/L.

Toxicity

The adverse response(s) of organisms to chemicals or physical agents ranging from mortality to physiological responses such as impaired reproduction or growth anomalies.

Turbidity

The cloudiness of water quantified by the degree to which light traveling through a water column is scattered by the suspended organic and inorganic particles it contains. The turbidity test is reported in Nephelometric Turbidity Units (NTU) or Jackson Turbidity Units (JTU).

Vertical Construction Phase

The Build out of structures from foundations to roofing, including rough landscaping.

Waters of the United States

Generally refers to surface waters, as defined by the federal Environmental Protection Agency in 40 C.F.R. § 122.2.¹

Water Quality Objectives (WQO)

Water quality objectives are defined in the California Water Code as limits or levels of water quality constituents or characteristics, which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.

¹ The application of the definition of “waters of the United States” may be difficult to determine; there are currently several judicial decisions that create some confusion. If a landowner is unsure whether the discharge must be covered by this General Permit, the landowner may wish to seek legal advice.

APPENDIX 6: Acronym List

ASBS	Areas of Special Biological Significance
ASTM	American Society of Testing and Materials; Standard Test Method for Particle-Size Analysis of Soils
ATS	Active Treatment System
BASMAA	Bay Area Storm water Management Agencies Association
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
BPJ	Best Professional Judgment
CAFO	Confined Animal Feeding Operation
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities
CIWQS	California Integrated Water Quality System
CKD	Cement Kiln Dust
COC	Chain of Custody
CPESC	Certified Professional in Erosion and Sediment Control
CPSWQ	Certified Professional in Storm Water Quality
CSMP	Construction Site Monitoring Program
CTB	Cement Treated Base
CTR	California Toxics Rule
CWA	Clean Water Act
CWC	California Water Code
CWP	Center for Watershed Protection
DADMAC	Diallyldimethyl-ammonium chloride
DDNR	Delaware Department of Natural Resources
DFG	Department of Fish and Game
DHS	Department of Health Services
DWQ	Division of Water Quality
EC	Electrical Conductivity
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ESA	Environmentally Sensitive Area
ESC	Erosion and Sediment Control
HSPF	Hydrologic Simulation Program Fortran
JTU	Jackson Turbidity Units
LID	Low Impact Development
LOEC	Lowest Observed Effect Concentration
LRP	Legally Responsible Person
LUP	Linear Underground/Overhead Projects

MATC	Maximum Allowable Threshold Concentration
MDL	Method Detection Limits
MRR	Monitoring and Reporting Requirements
MS4	Municipal Separate Storm Sewer System
MUSLE	Modified Universal Soil Loss Equation
NAL	Numeric Action Level
NEL	Numeric Effluent Limitation
NICET	National Institute for Certification in Engineering Technologies
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observed Effect Concentration
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTR	National Toxics Rule
NTU	Nephelometric Turbidity Units
O&M	Operation and Maintenance
PAC	Polyaluminum chloride
PAM	Polyacrylamide
PASS	Polyaluminum chloride Silica/sulfate
POC	Pollutants of Concern
PoP	Probability of Precipitation
POTW	Publicly Owned Treatment Works
PRDs	Permit Registration Documents
PWS	Planning Watershed
QAMP	Quality Assurance Management Plan
QA/QC	Quality Assurance/Quality Control
REAP	Rain Event Action Plan
Regional Board	Regional Water Quality Control Board
ROWD	Report of Waste Discharge
RUSLE	Revised Universal Soil Loss Equation
RW	Receiving Water
SMARTS	Storm water Multi Application Reporting and Tracking
System	
SS	Settleable Solids
SSC	Suspended Sediment Concentration
SUSMP	Standard Urban Storm Water Mitigation Plan
SW	Storm Water
SWARM	Storm Water Annual Report Module
SWAMP	Surface Water Ambient Monitoring Program
SWMM	Storm Water Management Model
SWMP	Storm Water Management Program
SWPPP	Storm Water Pollution Prevention Plan
TC	Treatment Control
TDS	Total Dissolved Solids

TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USACOE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WDID	Waste Discharge Identification Number
WDR	Waste Discharge Requirements
WLA	Waste Load Allocation
WET	Whole Effluent Toxicity
WRCC	Western Regional Climate Center
WQBEL	Water Quality Based Effluent Limitation
WQO	Water Quality Objective
WQS	Water Quality Standard

APPENDIX 7: State and Regional Water Resources Control Board Contacts

NORTH COAST REGION (1)

5550 Skylane Blvd, Ste. A
Santa Rose, CA 95403
(707) 576-2220 FAX: (707) 523-0135

SAN FRANCISCO BAY REGION (2)

1515 Clay Street, Ste. 1400
Oakland, CA 94612
(510) 622-2300 FAX: (510) 622-2640

CENTRAL COAST REGION (3)

895 Aerovista Place, Ste 101
San Luis Obispo, CA 93401
(805) 549-3147 FAX: (805) 543-0397

LOS ANGELES REGION (4)

320 W. 4th Street, Ste. 200
Los Angeles, CA 90013
(213) 576-6600 FAX: (213) 576-6640

LAHONTAN REGION (6 SLT)

2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150
(530) 542-5400 FAX: (530) 544-2271

VICTORVILLE OFFICE (6V)

14440 Civic Drive, Ste. 200
Victorville, CA 92392-2383
(760) 241-6583 FAX: (760) 241-7308

CENTRAL VALLEY REGION (5S)

11020 Sun Center Dr., #200
Rancho Cordova, CA 95670-6114
(916) 464-3291 FAX: (916) 464-4645

FRESNO BRANCH OFFICE (5F)

1685 E St.
Fresno, CA 93706
(559) 445-5116 FAX: (559) 445-5910

REDDING BRANCH OFFICE (5R)

364 Knollcrest Drive, Ste. 205
Redding, CA 96002
(530) 224-4845 FAX: (530) 224-4857

COLORADO RIVER BASIN REGION (7)

73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491 FAX: (760) 341-6820

SANTA ANA REGION (8)

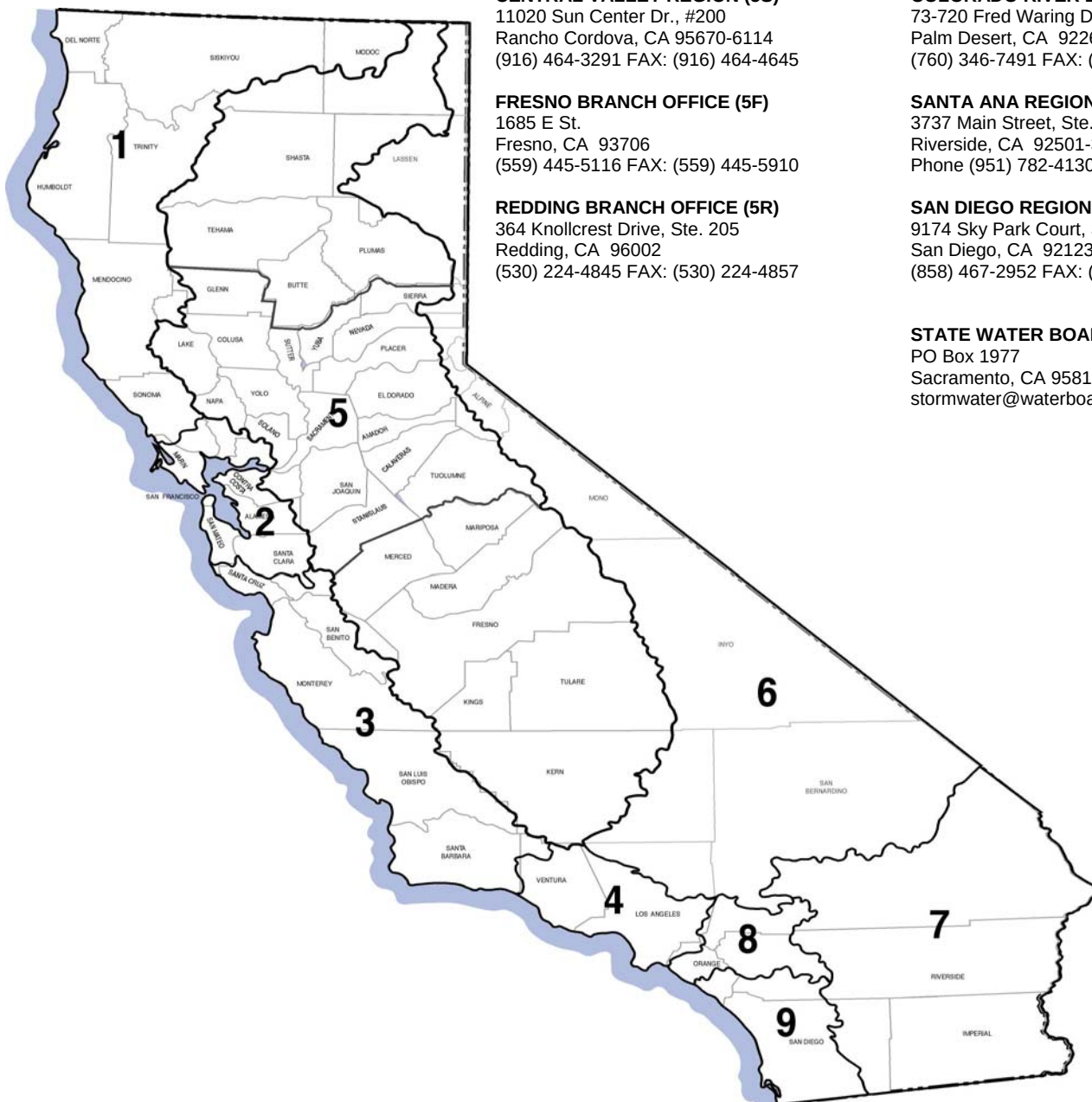
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
Phone (951) 782-4130 FAX: (951) 781-6288

SAN DIEGO REGION (9)

9174 Sky Park Court, Ste. 100
San Diego, CA 92123-4340
(858) 467-2952 FAX: (858) 571-6972

STATE WATER BOARD

PO Box 1977
Sacramento, CA 95812-1977
stormwater@waterboards.ca.gov



Appendix O: Notice of Termination

Appendix C

Technical Plans, Reports, and other Documentation

C-1: Construction Equipment List

C-2: Carmel Valley Pump Station Construction Specifications

C-3: General Avoidance and Minimization Measures (Submittal Forthcoming)

C-4: County of Monterey Encroachment Permit

C-5: Accident Prevention and Safety Program and Site-Specific Safety Plan

C-6: Soil and Groundwater Management Plan

C-7: Construction Equipment and Vehicle Efficiency Plan

C-8: Fugitive Dust Control Plan

C-9: Noise Management Plan

C-10: Construction Waste Reduction and Recycling Plan

C-11. Traffic Control Plan

Appendix C-1
Construction Equipment List

**Carmel Valley Pump Station
Equipment List**

Backhoe

Vehicle #	Description	Category	Serial #
3529	CASE 590 SN 4WD B/H	BH	JJGN59SNPFC724260
3541	CASE 590 SN 4WD B/H	BH	NGC736194
3542	CASE 590 SN 4WD B/H	BH	NGC736196
3549	CASE 590 SN 4WD B/H	BH	JJGN59SNHHC746093
3549	CASE 590 SN 4WD B/H	BH	JJGN59SNHHC746093
3557	CASE 590 SN 4WD B/H	BH	JJG59SNPHC746343
3564	CASE 590 SN 4WD B/H	BH	JJGN59SNHGC736078
3565	CASE 590 SN 4WD B/H	BH	JJGN59SNLGC736080
3571	CASE 590 SN 4WD B/H	BH	JJGN59SNJCC557011

Excavator

Vehicle #	Description	Category	Serial #
3527	HITACHI ZX135 EXCAVATOR	EXC	HCMDAF60V00100195
3528	HITACHI ZX85 EXCAVATOR	EXC	HCMDEF60H00017441
3538	CAT 328D LCR EXCAVATOR	EXC	RMX00392
3556	CAT 335FLCR EXCAVATOR	EXC	CAT0335FCKNE00576
3562	CAT 305.5E EXCAVATOR	EXC	CAT3055EJCR500210

Bobcat Loader

Vehicle #	Description	Category	Serial #
3530	BOBCAT S630 LOADER	BOB	AHGL12004
3537	BOBCAT T590 LOADER	BOB	ALJU20957
3539	BOBCAT S630 LOADER	BOB	AHGL1185
3540	BOBCAT S770 LOADER	BOB	ATF211978
3547	BOBCAT S750 LOADER	BOB	ATDZ13991
3558	BOBCAT T770 LOADER	BOB	AN8T14303
3561	BOBCAT S650 LOADER	BOB	ALJ817009
3572	BOBCAT S630 LOADER	BOB	A3NT14056
3573	BOBCAT S630 LOADER	BOB	AHGL11965

Wheel Loader

Vehicle #	Description	Category	Serial #
3536	JD 14 544K WHEEL LOADER	LRT	1DW544KZJEE661981
3560	JD 744J WHEEL LOADER	LRT	DW744JX606893
3563	JD 644K WHEEL LOADER	LRT	1DW644KZEBE636801
3566	JD 644K WHEEL LOADER	LRT	1DW644KZEBE636796
3568	JD 210LJ 4x4 SKIP LOADER	LS	T0210LJ890242
3570	JD 210KEP 4x4 SKIP LOADER	LS	1T8210EKADG891423

**Carmel Valley Pump Station
Equipment List**

Bobcat Loader

Vehicle #	Description	Category	Serial #
3535	CAT CB434D ROLLER	ROL	CATCB434CCNH01253
3548	BOMAG BW80AD% ROLLER	ROL	101462001175
3551	DYNAPAC CC1200 ROLLER	ROL	10000364J0A14798
3552	BOMAG BW11RH RT ROLLER	PAM	901A22231057
3559	BOMAG BW120AD-4 ROLL	ROL	861880231185
3569	VOLVO SD100D VIB ROLLER	ROL	VCEOS100L0S226293
3574	BOMAG BW120AD-4 ROLL	ROL	861880182119

Trucks

Vehicle #	Description	Category	Serial #
2415	15 CAT CT660 TRANSPORT	VSE	3HSJGTKR6FN733755
2420	19 FORD F450 FLATBED	VMT	1FDUF4GT4KDA02803
2421	13 INTL 4300 BOBTAIL DUMP	VB	3HAMMAAL9DL242763
2422	12 INTL 4300 2000 GAL WT	WT	3HAMMAAL1CL052549
2423	14 CAT CT660 10 WH DUMP	VSE	3HTJGTKR4EN774928
2424	14 CAT CT660 FUEL TRUCK	VFT	3HSJGTKR7EN775897
2425	11 FORD F550 FLATBED	VMT	1FDUF5GT1BEB45983
2426	14 INTL 8600 FUEL TRUCK	VFT	1HTHWSJN0EJ479578
2427	12 FORD F750 2000 GAL WT	WT	3FRXF7FA8CV199495
2428	13 JET 46' SIDE DUMP TRLR	TSD	5JNSS4539DH000386
2429	09 FORD F550 XL DUMP	VMT	1FDAF56R99EA86054
2400	09 PETERBLT 4600 GAL WT	WT	2NPRLN0X49M777170
2413	06 FREIGHTLNR 2000 GAL WT	WT	1FVACXDD86HV82073
2430	12 Ford F450 VACUUM TRK	VMT	1FDUF4GT0CEC02573

Misc.

Vehicle #	Description	Category	Serial #
3546	IR P185 AIR COMP	COM	4FVCABAA5AU416782
3550	SKYTRAK 4x4 FORKLIFT	FOR	0160042045
3553	IR 130 BW AIR COMP	COM	218087UJC275
4591	BOBCAT SWEEPER ATTACH	ATT	714412779
4580	BOBCAT SWEEPER ATTACH	ATT	714420624
4581	BOBCAT SWEEPER ATTACH	ATT	714422164

Paver

Vehicle #	Description	Category	Serial #
3567	CAT AP1055F PAVER	PAV	TJ500276

Appendix C-2

Carmel Valley Pump Station Construction Specifications

100% TECHNICAL SPECIFICATIONS

CARMEL VALLEY PUMP STATION for the Monterey Peninsula Water Supply Project 26530 RANCHO SAN CARLOS RD, CARMEL, CA



California American Water

511 Forest Lodge Road, Suite 100
Pacific Grove, CA 93950



Prepared by **AECOM**

October 2019

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01010: SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Work
- B. CONTRACTOR's Use of Site
- C. Work Sequence
- D. CALIFORNIA AMERICAN WATER (CAW) Occupancy

1.02 DESCRIPTION OF WORK

- A. General: The Work to be done under this Contract is shown on the drawings and specified in Contract Documents. The project will include a pump station building containing the pumps, and electrical equipment at the existing San Carlos Well Site located at 26530 Rancho San Carlos Rd, Carmel, CA, 93923. The pump station building will be built using CMU split face block construction and a wood truss roof system. The pump station will be approximately 28 feet wide by 26 feet long.

Below is a list of the major features of the pump station building:

- Three vertical turbine pumps.
- Pump piping and valves.
- Security - intrusion alarms at exterior doors.
- PLC and SCADA controls

Other site improvements will include:

- Site grading and drainage.
- 10 foot wide gravel access road from San Carlos Ranch Road to the pump station building.
- Gravel utility yard.
- Transmission piping, fitting, and valving to and from the pump station building and the existing 30-inch transmission main in Carmel Valley Road.
- Bio retention swales

- B. The Work includes:

- 1. Furnishing of all labor, material, superintendence, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services and other means of construction necessary or proper for performing and completing the Work

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01010: SUMMARY OF WORK

2. Sole responsibility for adequacy of plant and equipment.
 3. Maintaining the Work area and site in a clean and acceptable manner.
 4. Maintaining existing facilities in service at all times.
 5. Protection of finished and unfinished Work.
 6. Repair and restoration of Work or existing facilities damaged during construction.
 7. Furnishing as necessary proper equipment and machinery, of a sufficient capacity, to facilitate the Work and to handle all emergencies normally encountered in Work of this character.
 8. Furnishing, installing, and protecting all necessary guides, track rails, bearing plates, anchor and attachment bolts, and all other appurtenances needed for the installation of the devices included in the equipment specified. Make anchor bolts of appropriate size, strength and material for the purpose intended. Furnish substantial templates and shop drawings for installation.
- C. Implied and Normally Required Work: It is the intent of these Specifications to provide the CAW with complete operable systems, subsystems and other items of Work. Any part or item of Work, which is reasonably implied or normally required to make each installation satisfactorily and completely operable, is deemed to be included in the Work and the Contract Amount. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of these Specifications are included in the Work and the Contract Amount even though these appurtenances may not be specifically called for in these Specifications.
- D. Quality of Work: Regard the apparent silence of the Contract Documents as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished as meaning that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Interpretation of these specifications will be made upon this basis.

1.03 CONTRACTOR'S USE OF SITE

- A. In addition to the requirements of the Supplemental Terms and Conditions, limit use of site and premises for work and storage to allow for the following:
1. Coordination of the Work under this CONTRACT with the work of the other contractors where Work under this CONTRACT encroaches on the Work of other contractors.
 2. CAW occupancy and access to operate existing facilities.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01010: SUMMARY OF WORK

3. Coordination of site use with ENGINEER.
4. Responsibility for protection and safekeeping of products under this CONTRACT.
5. Providing additional offsite storage at no additional cost to the CAW as needed.

1.40 WORK SEQUENCE

- A. Construct Work in stages to accommodate the CAW's use of premises during construction period and in accordance with the limitations on the sequence of construction specified. Coordinate construction schedules and operations with ENGINEER.
- B. Coordinate Work of all subcontractors.

1.05 CAW OCCUPANCY

- A. The CAW may occupy premises during period of construction in order to maintain normal operations. Cooperate with the CAW's Manager or designee in all construction operations to minimize conflict, and to facilitate CAW usage.
- B. Coordinate Work of all subcontractors

1.06 PROTECTION OF EXISTING UTILITIES

- A. In case of damage to existing utilities caused by construction activities, contact the owner of the utility or appropriate CAW department immediately. Repair any damage to existing utilities caused by construction activities in coordination with or as directed by the owner of the utility.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

- A. Starting Work: Start Work within 10 days following the date stated in the Notice to Proceed and execute with such progress as may be required to prevent delay to other contractors or to the general completion of the project. Execute Work at such items and in or on such parts of the project, and with such forces, material and equipment, as to complete the Work in the time established by the Contract. At all times, schedule and direct the Work so that it provides an orderly progression to completion within the specified time for completion.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01010: SUMMARY OF WORK

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01011: USE OF OWNER'S FACILITIES

PART 1 GENERAL

1.01 DESCRIPTION

- A. CONTRACTOR may use existing facilities or equipment in the Work for construction purposes, only if the OWNER'S written permission is obtained.
- B. Restore existing facilities and equipment used for temporary purposes to original condition in a manner satisfactory to OWNER.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01011: USE OF OWNER'S FACILITIES

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01045: CUTTING AND PATCHING

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section includes all cutting and patching of all Work under construction, completed Work and existing facilities in order to accommodate the coordination of work, install other work, uncover Work for access, inspection or testing, or similar purposes. "Demolition Work" is specified elsewhere. Execute all cutting and patching, including excavation, backfill and fittings required to:
 - 1. Remove and replace defective Work or Work not conforming to requirements of the Contract Documents.
 - 2. Remove samples of installed Work, as required for testing.
 - 3. Remove all constructions required to provide for specified alteration or addition to existing work.
 - 4. Uncover Work to provide for OWNER'S observation of covered Work or observation by regulatory agencies having jurisdiction.
 - 5. Connect to completed Work that was not accomplished in the proper sequence.
 - 6. Remove or relocate existing utilities and pipes which obstruct the Work in locations where connections shall be made.
 - 7. Make connections or alterations to existing or new facilities.
- B. Restore all existing work to a state equal to that existing prior to cutting and restore Work to the standards of these Specifications.
- C. Submittals:
 - 1. Prior to cutting, which may affect integrity and design function of Project, or OWNER'S operations, submit written notice to OWNER requesting consent to proceed with cutting, including:
 - a. Identification of Project.
 - b. Description of affected Work of CONTRACTOR and work of others.
 - c. Necessity for cutting.
 - d. Effect on other work and on structural integrity of Project.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01045: CUTTING AND PATCHING

- e. Description of proposed Work. Designate:
 - (1) Scope of cutting and patching.
 - (2) CONTRACTOR, SUBCONTRACTOR or trade to execute Work.
 - (3) Products proposed to be used.
 - (4) Extent of refinishing.
 - (5) Schedule of operations.
 - (6) Alternatives to cutting and patching, if any.
 - (7) Designation of party responsible for cost of cutting and patching.
- 2. Should conditions of Work, or schedule, indicate change of materials or methods, submit written recommendation to OWNER, including:
 - a. Conditions indicating change.
 - b. Recommendations for alternative materials or methods.
 - c. Submittals, as required for substitutions.
- 3. Submit written notice to OWNER, designating time Work will be uncovered, to provide for observation. Do not begin cutting or patching operations until authorized by OWNER.
- D. Provide shoring, bracing and support, as required to maintain structural integrity of Project and protect adjacent Work from damage during cutting and patching.
- E. Conform to all applicable Specifications for application and installation of materials used for patching.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01046: CONNECTIONS TO EXISTING FACILITIES

PART 1 GENERAL

1.01 DESCRIPTION

- A. Perform all construction necessary to complete connections and tie-ins to existing facilities.
- B. Keep existing facilities in operation, unless otherwise specifically permitted in these
- C. Specifications or approved by OWNER.
- D. CONTRACTOR shall perform all construction activities so as to avoid interference with the work of others. PRODUCTS (NOT USED)

1.02 SEQUENCING AND OPERATIONS

- A. All operations of existing valves that are required for the Work shall be done by OWNER.
- B. Insofar as possible, all equipment shall be tested and in operating condition before the final tie-ins are made to connect equipment to the existing facility.
- C. CONTRACTOR shall carefully coordinate all Work and schedules and shall provide OWNER written notice, at least 96 hours, before shut-downs or by-passes are required.

PART 2 EXECUTION (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01046: CONNECTIONS TO EXISTING FACILITIES

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01047: COORDINATION WITH OWNER'S OPERATIONS

PART 1 GENERAL

1.01 DESCRIPTION

- A. The intent of this Section is to provide CONTRACTOR a sequence to perform the Work in such a manner that continuous, uninterrupted booster pump station operation and all essential plant services and facilities are maintained operational throughout the construction period.
- B. The elements of the Work are specified under Section 01010, Summary of Work. The sequences have been assembled to maintain booster pump station operations during construction.
- C. Except for the shutdown durations specified in this Section, CONTRACTOR'S means and methods shall be implemented such that the existing facility, shall remain in continuous satisfactory operation during the entire construction period. Work shall be so scheduled and conducted by CONTRACTOR such that it shall not impede any operations, compromise security, create potential hazards to operating equipment and facility personnel. In performing the Work shown and specified, plan and schedule the Work to meet both the constraints outlined in this Section and plant operating requirements.
- D. Work not specifically covered in Section 01010, Summary of Work; or in the following paragraphs may, in general, be done at anytime during normal work hours during the Contract period, subject to the operating requirements outlined in this Section. All references to days in this Section are consecutive calendar days.
- E. The CONTRACTOR has the option of providing additional temporary facilities that can eliminate a constraint provided it is done without additional cost to the OWNER, presents no safety hazards, and provided that all requirements of these Specifications are fulfilled.
- F. The CONTRACTOR is responsible for coordinating all shutdowns with the OWNER and ENGINEER. Whenever possible, combine discrete shutdown procedures identified in this Section or by CONTRACTOR into a single shutdown when the duration of the shutdowns or the Work requirements allow such combining to occur on a unit process or work area. The intent of combining procedures is to minimize the impacts upon plant operations and processes by limiting the number of shutdowns required.
- G. The CONTRACTOR shall not shut-off or disconnect any operating system of the facility, unless approved by the OWNER, in writing. All equipment operations and shutdowns shall be executed by the OWNER, unless otherwise noted. Seal OWNER operated gates and valves to prevent unnecessary leakage. After CONTRACTOR'S Work has been completed, remove the seal to the satisfaction of the OWNER.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01047: COORDINATION WITH OWNER'S OPERATIONS

- H. This Section of the Specifications contains several references to equipment, piping, material and appurtenances to be removed or reinstalled. Refer to the Drawings and other applicable Sections, for definition of the equipment, piping, material and appurtenances to be removed, turned over to the OWNER and stored on site, or to become the property of CONTRACTOR and removed from the site.
- I. The CONTRACTOR is responsible for supplying all temporary pipelines, valves, pumps, meters, spare parts, electrical, controls, any other appurtenances, and labor required for the installation and operation of temporary bypass lines, pumping systems, power or conveyance systems required to maintain operations of the plant during construction activities. All pumps shall be provided with magnetic flowmeters capable of providing a 4 to 20 mADC output signal. Man all pumps continuously (24 hours per day) when in service. Submit to the ENGINEER, for information only, the design for all temporary lines, pumping, or conveyance systems at least seven days prior to the commencement of the Work.

1.02 GENERAL CONSTRAINTS

- A. The sequence and shutdown durations are specified, where applicable, for facility units which are to be taken out of service. The operational status of new or existing units other than the designated units shall not be interrupted by CONTRACTOR during the specified time periods. New units may only be used after the specified testing is completed and the units are accepted for use by the OWNER, in writing.
- B. The following constraints shall be applied to all equipment and appurtenant utility systems on the plant site.
 - 1. Access to Booster Pump Station Site: An unobstructed traffic route into the booster station site shall be maintained at all times.
 - 2. Safety Barriers: Place safety barriers around unsafe areas located around operational areas accessible to plant Personnel.
 - 3. Personnel Access: Personnel shall have access to all areas which remain in operation throughout the construction period.
 - 4. Storm drainage: Storm drainage on the site shall be operational at all times, unless otherwise specified below.
 - 5. Power, Light and Communication Systems: Electric power, lighting service and communication systems shall be maintained in uninterrupted operation in all areas, unless otherwise specified below.
 - 6. Sump Pumps and Sumps: All existing sumps shall be maintained in an operable condition with either existing pumps or temporary pumps

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01047: COORDINATION WITH OWNER'S OPERATIONS

provided by CONTRACTOR. Interim piping, power and controls shall be provided by CONTRACTOR, as required by the construction sequence and as directed by the OWNER.

7. Seal and Service Water Piping: A supply of service and seal water and the necessary connections to existing equipment shall be maintained during construction, unless otherwise specified below. Interim piping shall be provided by CONTRACTOR, as required.
8. Draining Process Pipes and Conduits:
 - a. Unless otherwise specified, the contents of pipes and conduits undergoing modifications shall be transferred to a vactor truck using hoses, piping, pumps, or other applicable means.
 - b. If a drain is not available on the pipe to be drained, then a wet tap shall be made by CONTRACTOR using a tapping saddle and valve approved by the ENGINEER. No uncontrolled spillage of a pipe's contents shall be allowed.
 - c. Any spillage shall be brought to the OWNER'S attention immediately in writing. Wash down any spillage to floor drains, sumps and sump pump discharge piping and then flush out the system to prevent clogging and septic odors. If spillage is not suitable for drainage system, e.g. chemical spills, etc, as determined by the OWNER, remove spillage by other method such as Vactor truck, as approved by the OWNER.
9. Temporary Partitions and Enclosures: Provide temporary partitions and enclosures necessary to maintain dust-free, heated and ventilated spaces in all areas which are adjacent to his Work and which must be kept operational.
10. Dead End Valves or Pipe: Provide blind flanges on all valves or pipes which dead-end a line on a temporary or permanent basis. Blind flanges shall be braced and blocked, as required or as directed by the OWNER in the field.
11. Schedule all start-ups/shutdowns for Monday through Thursday. No start-ups/shutdowns will be allowed on Friday, Saturday, and Sunday.
12. Sound enclosures shall be provided on all temporary booster pumps and generators.
13. No high decibel work shall be permitted before 8:00 AM each day.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01047: COORDINATION WITH OWNER'S OPERATIONS

14. All temporary piping, pumps, and fittings will need to be chlorinated and BacT tested before distribution into the system. Verification is required for all pumps, piping, and fittings to ensure they have only been used on potable water system prior to this operation.
15. Security: CONTRACTOR shall be responsible for security on the project sites throughout the duration of the installation until final approval. Temporary security measures will include chainlink fencing around the work site at all times.

1.03 SHUTDOWNS

A. General:

1. A shutdown shall be defined as a portion of the normal operation of a facility unit or conduit that has to be suspended or taken out of service in order to perform the specified Work. For each shutdown, compile an inventory of labor and materials required to perform tasks, provide an estimate of the time required (including time for the OWNER to take down and start-up the plant unit or conduit), and a written description of steps required to complete all tasks. The inventory, the estimate, and written procedures shall be submitted to the OWNER for review 14 calendar days prior to the proposed start date of the shutdown. Request, in writing from the OWNER, approval for each shutdown a minimum of 14 calendar days prior to the proposed shutdown date. No shutdown shall be initiated until the inventory of materials and labor is verified by the OWNER on site at least 1 week(s) prior to the proposed start date. No shutdowns will be permitted on the weekends.
2. The Work required herein and any other Work required by the OWNER which may interrupt the normal plant operations shall be accomplished at such times that will be convenient to the OWNER.
3. Have on hand and located in close proximity to the Work area, all tools, equipment, spare parts and materials, both temporary and permanent, necessary to complete each Work category without interruption. The OWNER does not guarantee all shut downs will be completely dry. The CONTRACTOR shall have adequate pumping equipment to keep trenches and work areas free of water during all shutdowns. Adequate numbers of personnel shall be scheduled for each shutdown, so that the Work shall be accomplished within the specified time frame. Prefabrication of all piping and other assemblies shall be completed, to the greatest degree possible, prior to any shutdowns. The OWNER shall be satisfied that CONTRACTOR has complied with these requirements, to the fullest extent possible, before shutdowns will be authorized.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01047: COORDINATION WITH OWNER'S OPERATIONS

4. If CONTRACTOR'S procedures cause an unscheduled shutdown of the facilities, perform Work as necessary to immediately re-establish satisfactory operation. Notify the OWNER, in writing, immediately of any unscheduled shutdown. Permit OWNER'S personnel to work with CONTRACTOR'S personnel, as required, to maintain the plant in continuous satisfactory operation. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of the facilities that result in fines levied by the U.S. Environmental Protection Agency, California Environmental Protection Agency, Monterey County Health Department Environmental Health Bureau, or the Monterey County Department of Environmental Management shall be the responsibility of CONTRACTOR if it is demonstrated that CONTRACTOR was negligent in the Work or did not exercise proper precautions in the conduct of the Work.
 5. The scheduled shutdowns during the period of CONTRACTOR'S Work are called out in the table at the end of this Section. All Work requiring the plant to be out-of-service shall be performed during the scheduled shutdowns shown. It should be noted plant staff shall continue to perform administrative, operation and maintenance functions during shutdowns.
 6. Electrical Ductbank Installation: Shutdown and relocation of conflicting utilities alignments with electrical ductbank will only be allowed for certain types of process pipelines. Any shutdown and relocations shall follow a strict time schedule in order to minimize impact to plant operations.
- B. Shutdowns of Electrical Systems: CONTRACTOR shall lock out and tag circuit breakers and switches operated by the OWNER and shall check cables and wires to be sure that they are de-energized to ground potential before Work begins. Upon completion of the Work, remove the locks and tags and notify the OWNER that the facilities are available for use.

1.04 OVERTIME

- A. All overtime Work by CONTRACTOR necessary to conform to the requirements of this Section shall be performed by CONTRACTOR, at no additional cost to the OWNER and shall be performed in accordance with the General Conditions. Make no claims for extra compensation as a result thereof.

1.05 MAINTENANCE OF PLANT OPERATIONS SCHEDULE

- A. In order to maintain a continuous plant operation during construction, a Maintenance of Plant Operations (MOPOs) Schedule is included at the end of this Section.

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- B. Within each MOPO item's procedural steps, time and scheduling constraints and milestone dates may be outlined and are intended to assist CONTRACTOR in developing a sequence of Work and timing in order to maintain continuous operation of the plant.
- C. Develop a detailed description of the complete sequence of construction for all the MOPO events contained herein. The sequences shall be submitted to the ENGINEER for review and approval 21 days following the Notice to Proceed.
- D. The procedures contained herein were developed based upon available information. This list does not address all required tie-ins, but only those anticipated to be of significant impact to plant operations.
- E. Is required to make all tie-ins, connections, and replacements necessary to perform the Work.
- F. Is advised that Work in multiple areas of the plant, gravity sewer and force main system shall be performed simultaneously in order to complete the entire scope of the Work within the allotted Contract time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
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01050: FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Providing and paying for field engineering services required for Project.
 - 1. Survey work required in execution of Project.
 - 2. Civil, structural and other professional engineering services specified or required to verify that Contractor's construction methods are in accordance with Contract Documents.
- B. Field measurements also will be required for existing and new construction, and for siting, anchoring, embedding, aligning, and connecting work.
- C. Seismic requirements: All design shall accommodate seismic load occurring simultaneously with normal loads as described in Section 01601.

1.02 RELATED SECTIONS

- A. Section 01010: Summary of Work
- B. Section 01601: Seismic Design Requirements
- C. Section 01720: Record Drawings
- D. Section 02200: Earthwork and Structural Excavation

1.03 QUALIFICATIONS OF SURVEYORS AND ENGINEERS

- A. Qualified engineers or registered land surveyors, acceptable to Engineer and Owner.
- B. Registered professional engineers of the disciplines required for the specific service on the Project, licensed in California.

1.04 SURVEY REFERENCE POINTS

- A. Survey control points and benchmarks in the project area are provided in Appendix B of the specifications.
- B. Locate and protect control points before starting site work, and preserve all permanent reference points during construction.
 - 1. Make no changes or relocations without prior written notice to Engineer.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
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2. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require surveyor to replace Project control points which may be lost or destroyed. Establish replacements based on original survey control.

1.05 PROJECT SURVEY REQUIREMENTS

- A. Establish a minimum of two permanent bench marks at each Work site, referenced to data established by survey control points.
 1. Record locations, with horizontal and vertical data, on Project Record Documents.
- B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:
 1. Site improvements:
 - a. Stakes for grading, fill and topsoil placement
 - b. Utility slopes and invert elevations.
 2. Project piping.
 3. Vault locations.
 4. Controlling lines and levels required for mechanical and electrical trades.
- C. From time to time, verify layouts by same methods.

1.06 RECORDS

- A. Maintain a complete, accurate log of all control, survey, and field measurement work as it progresses.
- B. On completion of foundation walls and major site improvements, prepare a certified survey showing all dimensions, locations, angles and elevations of construction.

1.07 SUBMITTALS

- A. Submit name and address of surveyors and professional engineers to Engineer.
- B. Submit documentation to verify accuracy of field and design engineering work.

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- C. Submit certificate signed by registered engineers or surveyors certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.
- D. Where design engineering, drawings, calculations and civil or structural construction methods and procedures are required to be submitted for review, they shall bear the stamp and signature of the responsible registered professional engineer.
- E. Surveys for measurement of quantities shall be reduced and plotted, necessary calculations performed and results presented in an orderly form. All plotted plans, cross sections, calculations, and recap sheets shall be submitted to the Engineer for review and record.

1.08 OTHER SURVEY REQUIREMENTS

- A. Survey buried fittings location, depth and elevation prior to backfill.

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01050: FIELD ENGINEERING

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01060: REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements for: Codes, Seismic Loading Design Provisions and Excavation and Trench Support Design Provisions.
- B. Related Documents and Sections include:
 - 1. Section 01062 - Environmental Requirements
 - 2. Section 01300 – Contractor Submittals
 - 3. Section 02160 – Excavation Support Systems

1.2 CODES:

- A. Contractor shall conform all work of the Contract to meet or exceed the applicable requirements of the latest editions of the applicable codes, laws, ordinances, standards, rules and regulations, including but not limited to the following:
 - 1. CCR Title 8, Industrial Relations
 - 2. CCR Title 17, Public Health
 - 3. CCR Title 19, Public Safety
 - 4. CCR Title 24, Building Standards
 - a. Part 1, California Building Standards Administrative Code
 - b. Part 2, California Building Code
 - c. Part 3, California Electrical Code
 - d. Part 4, California Mechanical Code
 - e. Part 5, California Plumbing Code
 - f. Part 6, California Energy Code
 - g. Part 7, California Elevator Safety Construction Code
 - h. Part 8, California Historic Building Code
 - i. Part 9, California Fire Code
 - j. Part 10, California Code for Building Conservation
 - k. Part 11, NOT USED
 - l. Part 12, California Reference Standards Code
 - 5. Americans with Disabilities Act Guidelines
 - 6. AWWA C651-92, Disinfection of Water Mains
- B. Except where noted, the most recent editions of Codes, Standards and Regulations at the time of the Contract shall apply. Whenever reference is made to “Caltrans

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
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Standard Specifications,” it shall be understood to be the most recent edition of the State of California, Department of Transportation, Standard Specifications.

- C. Other Applicable Laws and Regulations: All applicable Federal, State, and local laws, and the latest rules and regulations of governing utility districts and the various other authorities having jurisdiction over construction and completion of the work, including but not limited to Cal-OSHA and California Labor Code, shall apply to the Contract throughout, and they shall be deemed to be incorporated by reference.
- D. Obtain copies of codes and reference standards when required by the Contract Documents.
- E. The codes referred to shall have full force and effect as though printed in these Specifications. Nothing in the Contract Documents shall be construed to permit work not conforming to the governing code requirements.

1.3 PROJECT-SPECIFIC REQUIREMENTS (NOT USED)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01062: ENVIRONMENTAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. All materials, installation, and construction shall comply with the applicable provisions of current laws, codes, the State of California, and the Federal Government, and any other applicable authority.
- B. Contractor shall be responsible for all costs necessary to prevent its operations from violating any federal, state, or local governmental regulations and the requirements of the Contract Documents.
- C. Contractor shall review and become familiar with project's Mitigation Monitoring and Reporting Plan (MMRP), when it becomes available. Contractor shall also review and become familiar with the project Final Environmental Impact Report/Environmental Impact Statement (EIR/EIS). Mitigation measures in the Final EIR/EISs and its MMRP and other measures that apply to the Contractor are included in the Contract Documents. Copies of the FEIR/EIS will be made available upon request and the MMRP, when it is finalized.
- D. Contractor shall review and comply with the conditions per the resource agency permits acquired by the Owner when they become available. A list of anticipated avoidance and minimization measures are presented in Attachment A. Additional measures may be included in the agency permits and will be available when the permits have been issued. Contractor shall keep a copy of each resource agency permit in its jobsite field office. All Contractor and subcontractors superintendents and forepersons shall be thoroughly familiar and compliant with the requirements of the permits. The Owner anticipates the following environmental permits:
 - 1. U.S. Army Corps of Engineers (ACOE) Section 404 Clean Water Act for impacts to jurisdictional waters of the United States.
 - 2. U.S. Fish and Wildlife Service (USFWS) Section 7 consultation for endangered species (e.g. Biological Opinion).
 - 3. National Marine Fisheries Service (NMFS) Section 7 consultation for endangered species (i.e. Letter of Concurrence or Biological Opinion).
 - 4. USFWS with Federal Endangered Species Act (FESA) Section 7 Incidental Take Permit
 - 5. USFWS with the Migratory Bird Treaty Act (MBTA) Incidental Take Permit

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6. State Historic Preservation Officer (SHPO) consultation and/or Tribal Historic Preservation Officer (THPO) with Section 106 of National Historic Preservation Act (NHPA)
7. National Oceanic and Atmospheric Administration (NOAA) authorization by the superintendent of the Monterey Bay National Marine Sanctuary of federal, state, and local agencies' permits within the sanctuary in accordance with NOAA's National Marine Sanctuary Program (15 CFR Part 922)
8. NOAA Incidental Take Permit or Incidental Harassment Authorization in accordance with Section 104 of the Marine Mammal Protection Act (MMPA)
9. NOAA Consultation and Biological Opinion in accordance with FESA Section 7
10. NOAA Incidental Take Statement in accordance with FESA Section 7
11. California Public Utilities Commission (CPUC) Certificate of Public Convenience and Necessity
12. CPUC Consultation with NOAA fisheries in accordance with Section 305(b) of the Sustainable Fisheries Act
13. Central Coast Regional Water Quality Control Board (RWQCB) National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges of Storm Water Associated with Construction Activity
14. RWQCB NPDES Clean Water Act Section 402 permit
15. RWQCB Porter-Cologne Water Quality Control Act Waste Discharge Requirements
16. California Department of Fish and Wildlife (CDFW) Section 1602 Lake/Streambed Alteration Agreement.
17. California Department of Fish and Wildlife California Endangered Species Act Section 2081 Incidental Take Permit.
18. California Regional Water Quality Control Board (RWQCB) 401 Water Quality Certification for the discharge of dredged or fill materials
19. Regional Water Quality Control Board Potable Water Discharges Permit
20. California Department of Public Health (CDPH) Permit to Operate a Public Water System

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21. California Department of Toxic Substances Control (DTSC) hazardous waste management and disposal requirements under Title 22, Division 4.5, Chapter 11, Article 3, Soluble Threshold Limit Concentrations (STLC)/Total Threshold Limits Concentrations (TTLC)
 22. California Department of Health Services Office of Drinking Water: Variance for exceptions to their regulations regarding separation requirements for water and sewer lines
 23. Monterey County Public Works Department Encroachment Permit and Tree Removal Permit
 24. Monterey County Health Department, Environmental Health Division Well Construction Permit and Permit to Construct Desalination facility
 25. Monterey County Planning and Building Inspection Department
 - a. Conditional Use Permit
 - b. Grading Permit
 - c. Digging and Excavation Permit
 - d. Erosion Control Permit
 26. Monterey Peninsula Water Management District (MPWMD) Water System Expansion Permit from Ordinance 96 of the MPWMD Board of Directors
 27. Monterey Bay Unified Air Pollution Control District (MBUAPCD) Authority to Construct permit and Permit to Operate
- E. In the event of a conflict or discrepancy between this Section and any other Specification Section, then the language of this Section will prevail.

1.02 RELATED DOCUMENTS AND SECTIONS

- A. Section 01060 – Regulatory Requirements
- B. Section 01300 – Contractor Submittals
- C. Section 01313 – Construction Schedule Constraints
- D. Section 01400 – Quality Control
- E. Section 01510 – Temporary Utilities

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- F. Section 01530 – Protection of Existing Facilities
- G. Section 01561 – SPP, Erosion and Sediment Control
- H. Section 01656 – Pressure Pipeline Testing and Disinfection
- I. Section 02125 – Trench and Structure Excavation and Backfill
- J. Section 02140 – Dewatering
- K. Section 02200 –Earthwork
- L. Section 02270 – Erosion and Sediment Control
- M. Section 02930 - Seeding

1.03 REFERENCES

- A. Mitigation Monitoring and Reporting Program
- B. “Pruning Guidelines” adopted by the California Department of Forestry and Fire Protection

1.04 DEFINITIONS AND ABBREVIATIONS

Avoidance Area:	Work not allowed in areas shown on drawings as “Avoidance Area” without prior Owner approval
Best Management Practices (BMP):	See Sections 01561 – SPP, Erosion and Sediment Control and 02270 – Erosion and Sediment Control.
California Code of Regulations (CCR)	
CDFW:	Contractor requirements from the CDFW Section 1602 Streambed Alteration Agreement will be identified in brackets (e.g., “[CDFW 1, CDFW 22, etc.]”).
California Department of Public Health (CDPH)	
California Environmental Quality Act (CEQA):	State required environmental review process resulting in project EIR and MMRP.
California Public Utilities Commission (CPUC)	
RWQCB:	Contractor requirements from the RWQCB 401 Certification are identified in brackets (e.g.,

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	“[RWQCB 1, RWCCB 2, etc.]”).
Change Order Request (COR)	
Construction Risk and Spoils Management Plan (CRSMP)	
Construction Work Limit:	Area to which Contractor shall confine work activities.
Environmental Inspector:	Owner Representative assigned as necessary to inspect the work and verify contractor’s compliance with applicable requirements.
Environmental Review Officer (ERO):	the Environmental Review Officer designated by the Owner for this project.
Environmental Impact Report (EIR)	
Federal Endangered Species Act (FESA)	
Migratory Bird Treaty Act (MBTA)	
Mitigation Monitoring and Reporting Program (MMRP):	The Public Resources Code requires the adoption of a reporting or monitoring program to ensure compliance during project implementation. The mitigation measures included in this project’s MMRP will be identified in brackets by the resource type and mitigation number as identified in both the MMRP and FEIR (e.g., [BIO-1, AIR-4, NOI-2, CR-1a, etc.]).
National Historic Preservation Act (NHPA).	
National Pollutant Discharge Elimination System (NPDES).	
Leq:	The level of constant sound energy that is equivalent to the time-varying sound energy over a specified time (e.g., over 15 minutes, 1 hour, or several hours). For this project, Leq references the equivalent level of sound for a 1-hour period, unless otherwise noted.
Lmax:	The maximum A-weighted noise level recorded for a single noise event
Monterey Bay Unified Air Pollution Control District (MBUAPCD)	
Monterey Peninsula Water	

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Management District (MPWMD)

Regional Water Quality Control
Board (RWQCB)

State of California Public Utility
Commission:

Sensitive Resources:

Lead agency for environmental review pursuant to the California Environmental Quality Act.

Biological species, cultural resources, or other resources that are to be protected from construction activities. Sensitive resources are identified in environmental permits and mitigation measures and include, but are not limited to, wetlands, streams, riparian vegetation, California red-legged frog, California tiger salamander, migratory birds, raptors, cultural and paleontological resources.

Soluble Threshold Limit
Concentrations (STLC)

Special-status Species:

Species listed as threatened or endangered, by the USFWS and CDFW, and species listed as fully-protected, rare, or of concern by CDFW. See Draft EIR for complete list.

Specialty Environmental Monitor:

Owner Representative who will monitor resource protection or conduct surveys within a specific area of expertise (cultural, biological, or paleontological resources) where required during construction.

Standard Construction Measures
(SCM):

The Owner may establish Standard Construction Measures that will be included in the project's FEIR/EIS. As applicable, Contractor required measures are included in this section.

State Historic Preservation
Officer (SHPO)

Stormwater Pollution Prevention
Plan (SWPPP)

Total Threshold Limits
Concentrations (TTLC)

Tribal Historic Preservation
Officer (THPO)

USFWS and NMFS:

Excerpts from the USFWS and/or NMFS Biological Opinion (BO) Conservation Measure (CM) and Terms and Conditions (TM) will be identified in brackets (e.g., "[BO CM 1, BO CM 22, BO TM 1 and BO TM 2a, etc.]").

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1.05 SUBMITTALS

- A. General – Contractor shall make submittals in accordance with Section 01300.
- B. Prepare, submit, and implement the following plans:
 - 1. Soil and Groundwater Management Plan – Prepare and submit plan to Owner Representative no less than 70 days prior to commencement of construction activities.
 - 2. Site-Specific Health and Safety Plan. Prepare and submit plan to Owner Representative no less than 30 days prior to commencement of construction activities Per Article 3.10D.
 - 3. Storm Water Pollution Prevention Plan (SWPPP) - In accordance with State Water Resources Control Board NPDES General Permit for Stormwater Discharges Associated with Construction Activity (Water Quality Order 2009-0009-DWQ, NPDES No. CAS000002) Prepare and submit SWPPP to Owner Representative no less than 70 days prior to any earthwork for review and approval by Owner Representative and the RWQCB in accordance with Section 01561 and 02270. Plan shall identify erosion and sediment control measures (BMPs) to protect water quality of creeks and wetlands.
 - 4. Attachment A includes the recommended BMPs for inclusion in the SWPPP. Modification of approved BMPs shall be subject to review and approval by Owner Representative. Proposed BMP modifications shall also be subject to review and acceptance by the RWQCB. Owner Representative and RWQCB will review proposed modifications to determine if measures included in the SWPPP provide equal or greater effectiveness.
 - 5. Groundwater Dewatering Control and Disposal Plan - Prepare and submit at least 70 days prior to commencement of construction activities in accordance with this section and Section 01150 and 02140. Plan shall identify procedures for handling, treatment, and discharge of groundwater encountered during excavation.
 - 6. Traffic Control and Safety Assurance Plan – Submit the existing or, where necessary, a revised plan in accordance with Section 01570 for review and approval prior to construction. Submit final plan to Owner Representative no less than 30 days prior to construction.
 - 7. Dust Control Plan – Prepare and submit at least 60 days prior to commencement of construction activities in accordance with Article 3.5D.
 - 8. Emergency Response Plan – Prepare and submit 45 days prior to commencing construction activities in accordance with Article 3.8B.

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9. Construction Waste Reduction and Recycling Plan – Prepare and submit to Owner 30 days prior to commencing construction activities in accordance with Article 3.8C.
 10. Noise Control Plan – Submit as specified in Article 3.6D and 3.6E below.
- C. Prepare and submit the following report, inventory, log, photographic, and video submittals:
1. Historical Resource Photographs – Prior to construction and at the completion to construction activities at historical resources take photographs with regular digital camera.
 2. Preconstruction Crack Survey Report – Submit report documenting results of Preconstruction Crack Survey prior to start of street openings or controlled detonations.
 3. Construction Equipment Tune-Up Log – Develop a schedule of low-emissions tune-ups for all equipment and maintain a log of the performed tune-ups. Submit copy of the log to the Owner on a monthly basis.
 4. Submit report with data documenting the existing baseline 1-hour Leq and 24-hour Ldn noise levels at the adjacent residential property lines at each work area two weeks prior to mobilization.
 5. Noise and vibration monitoring data results weekly.
 6. Maintain log of noise complaints and notifications.
 7. Maintain written records of all BMPs installed, inspections, maintenance activities, corrective actions, and visual observations of offsite discharge of sediment or other pollutants. Submit to Owner monthly.
 8. Maintain written records of all spills and cleanup activities. Submit to Owner monthly.
 9. Document testing of potable and groundwater discharges. Submit to Owner not less than weekly.

1.06 QUALITY ASSURANCE

- A. The Owner will inspect and monitor Contractor's adherence to the requirements specified herein and will report on Contractor's compliance pursuant to CEQA and regulatory agency permits.

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1. Said inspection, monitoring, and reporting activities may include, but are not limited to, qualitative, quantitative and photographic observations and data collection on the impacts of noise, vibration, air quality, traffic, street pavement damage, water quality, cultural resources, biological resources, and hazardous materials.
 2. Contractor shall cooperate with such inspection and monitoring activities, provide access to the Work site to establish and secure monitoring stations, and make its facilities and records available to the Owner for performing such monitoring.
- B. The Owner will issue a Non-Compliance Notice to the Contractor for any detected non-compliance with the provisions herein and for any other environmentally objectionable acts. The Contractor shall take immediate corrective action and respond in accordance with Section 01400 – Quality Control.

1.07 ACCOUNTABILITY AND REMEDIAL ACTION

- A. Contractor shall be held responsible for any damage to natural vegetation, wildlife, cultural resources, waters of the United States and water quality, and any other environmental resources resulting from Contractor operations, located either:
1. Outside the Work areas permitted in the Contract Documents, or
 2. Inside the Work areas but clearly marked by Owner on the Contract Drawings or in the field to indicate that avoidance of that sensitive resource is required.
- B. Requirements contained in this Section are based on conditions attached to the environmental permits and agreements obtained by the Owner. Violation of these conditions can result in monetary fines, requirements for restoration of or compensation for damage, additional environmental training, or stoppage of Work. Costs or fines resulting from non-compliance with the requirements of the Contract Documents or violation of conditions of permits and agreements shall be paid by the Contractor at no additional cost to the Owner.

1.08 CHANGE REQUESTS AFFECTING ENVIRONMENTAL REQUIREMENTS

- A. Should Contractor submit a Change Order Request (COR) or propose some other type of change that may affect or propose modifying some aspect of the Project's environmental requirements (i.e., CEQA/NEPA requirements, permit requirements, or agency agreements), the Owner Representative will conduct a preliminary review of such COR or change proposal to determine whether detailed review is warranted and can be completed within the timeframe needed by the Contractor. Note that such change requests may require concurrence from a regulatory agency (e.g., US Army Corps of Engineers, US Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Wildlife, County of Monterey) or the State of California Public

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Utilities Commission (the CEQA Lead Agency) or Department of Toxic Substances Control, and, therefore, the review process may be lengthy. Change requests may be approved, approved with conditions, or denied based on various factors.

- B. Requests that will require review and concurrence from the Owner Representative, regulatory agencies and/or the CEQA/NEPA Lead Agencies include but are not limited to the following:
1. New access roads and truck turnaround/turnouts including road widening
 2. Use of private well, deep quarry pit, or reservoir for water source
 3. Use of additional or expanded staging areas or work areas, for example:
 - a. Requests for use of yard or staging area that has a previously graded or otherwise improved (graveled or paved) surface.
 - b. Request for use of a staging area or yard in a plowed or cultivated agricultural field.
 - c. Request for use of extra workspace to store spoil, materials, or equipment outside of approved construction work limits.
- C. In cases where the Contractor requests extra space outside the construction work limits shown on the drawings, such extra space shall not impinge upon the limits of sensitive resources shown on the environmental drawings or identified through field surveys, including the Federal Emergency Management Agency (FEMA)-designated Floodway.
- D. Additionally, requests to obtain water from any water body, such as from the Carmel River or a landowner's pond, will not be approved if the water body is in potential sensitive resource habitat (e.g., California tiger salamander, red-legged frog).

1.09 ENVIRONMENTAL TRAINING PROGRAM

- A. Contractor and all subcontractor personnel shall attend environmental training conducted by the Owner Representative prior to accessing or performing work in the project construction work limits.
- B. Supervisory Level Training - All construction staff at the foreman level and above shall attend a training that will last no more than 4 hours. The training will be conducted at the project site office or as otherwise designated.
- C. Crew Level Training - All other field personnel shall attend a training that will last no more than 1 hour. The training will take place at the project site office, on an ongoing as-needed basis during construction. Owner Representative will establish a schedule and

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may provide additional trainings with at least 8 hours' notice from Contractor that training will be needed.

- D. Prior to accessing or performing work in the work limits, all Contractor personnel and their subcontractors shall:
1. Sign an agreement acknowledging their intent to conform to the environmental measures addressed in the training program (provided by the Owner Representative after completion of the training).
 2. Display an environmental training hard hat decal at all times when working within the project construction work limits (provided by the Owner Representative after completion of the training).
 3. For any Contractor or subcontractor personnel involved in soil-disturbing activities, an archaeological resource "ALERT" sheet will be distributed at the training by the Owner Representative and Contractor and subcontractor personnel shall review said sheet.
- E. Owner Representative may require Contractor personnel to attend additional environmental training in response to Contractor non-compliance.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Orange Barrier Fence: Install minimum 3 to 4 feet tall orange plastic mesh fence to prevent access to areas containing sensitive resources (e.g., around trees, designated sensitive habitat and historical resources to be protected) as identified by the Owner. Attached to stakes or posts a minimum of every 6 to 10 feet or as needed to provide sturdy support.
- B. Silt Fence: Install to prevent sediments in runoff from exiting construction areas or entering wetlands and other sensitive resource areas. Fence shall be tightly woven geotextile materials or other approved material as specified in Section 02270 and shown on the drawings. Install a minimum of 42 inches above ground and buried 4 to 6 inches below ground. Secure to stakes or posts a minimum of every 5 feet. Silt Fencing shall be in accordance with local and State Guidelines for Best Management Practices.
- C. Erosion-control materials (e.g., wattles made of straw or rice straw) shall be certified, weed-free. Owner approval required for all erosion control materials.

PART 3 EXECUTION

3.01 TIMING AND SCHEDULE RESTRICTIONS

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- A. Conduct authorized tree and shrub removal during the non-breeding season (generally August 31 through February 15) to avoid impacts to migratory birds and raptors and special-status bat species. If these activities must occur during the breeding season for special-status bats and/or birds (February 15 through August 31), Owner approval is required. If active nests or roosts are located, no-disturbance buffers may be established by the Owner in consultation with the CDFW.
- B. Spoils hauling shall be limited to the hours specified below. Spoils generated outside of these times shall be held at the work area:
 - 1. 7 a.m. to 7 p.m., Monday through Saturday
- C. Pile driving and other high noise/high vibration activities shall generally be limited at all work sites to daytime hours (7 a.m. to 7 p.m.), Monday through Saturday. Pile driving and other high noise/high vibration activities on Sundays and during night time hours (7 p.m. to 10 a.m.) will be allowed only if Contractor demonstrates by a qualified vibration consultant that vibrations will not exceed 0.1 in/sec peak particle velocity (PPV) at the nearest residential receptor. Overall, nighttime construction activities are to be avoided unless authorized by the Owner. As specified below in Articles 3.6 and 3.7.
- D. Noise and Vibration restrictions: As specified below in Articles 3.3, 3.6, and 3.7.
- E. Flaggers or other equivalent traffic control safety measures are required during school morning arrival (7:00 to 8:00 a.m.) and afternoon release (2:00 to 3:00 p.m.) times or as otherwise directed by the Owner.

3.02 HYDROLOGY AND WATER QUALITY

- A. Stormwater and Groundwater Dewatering Discharges
 - 1. Stormwater and groundwater dewatering discharges shall comply with the RWQCB National Pollutant Discharge Elimination System (NPDES) General permit for storm water discharges associated with construction and land disturbance activities (Order No. 2009-0009-DWQ, as amended, NPDES No. CAS000002). Available Online At:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml
 - 2. Prepare and submit a final Stormwater Pollution Prevention Plan (SWPPP) as specified. Implement the measures identified in the SWPPP to prevent transport of sediment or other pollutants (e.g., fuels, paints, etc.) via storm water runoff to any creeks and wetlands during and after project construction.
 - a. At a minimum, the SWPPP must include the following:

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- 1) A description of construction materials, practices, and equipment storage maintenance;
 - 2) A list of pollutants likely to contact stormwater and site specific erosion and sedimentation control practices;
 - 3) A list of provisions to eliminate or reduce discharge of materials to stormwater;
 - 4) BMPs for fuel and equipment storage;
 - 5) Non-stormwater management measures to manage pollutants generated by activities such as paving operations and vehicle and equipment washing and fueling;
 - 6) The requirement that the appropriate equipment, materials, and workers be available to respond rapidly to spills and/or emergencies. All corrective maintenance or BMPs must be performed as soon as possible, depending upon worker safety; and
 - 7) On-site post-construction controls.
- b. BMPs shall be consistent with approved final SWPPP and are subject to review and approval by Owner Representative and by the RWQCB. Section 01561 includes recommended measures for inclusion in the Contractor's final SWPPP.
 - c. Include emergency procedures to be followed in event of accidental releases of hazardous materials used or stored by project.
3. All exposed/disturbed areas shall be stabilized where sediment or other pollutants have the potential to leave the work site and enter creeks and wetlands.
 4. Contractor shall regularly inspect, maintain, and repair all erosion and sediment controls. At a minimum, such inspections shall be carried out before, during, and after each storm event.
 5. Erosion control matting, if used, shall be free of synthetic material, such as plastic monofilament netting.
- B. Drinking Water Discharges**
1. Drinking water discharges shall comply with the RWQCB Waste Discharge Requirements for the California-American Water System (Order No. Order WQ 2014-0194-DWQ, General Order No. CAG140001).

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- C. Any discharges to storm drains shall comply with the NPDES General Permit for WDRs for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) (Order No. 2013-001-DWQ, NPDES No. CAS000004), to be obtained by the Contractor, as necessary.
- D. Soil and Groundwater Management Plan: Contractor shall prepare and submit a Soil and Groundwater Management Plan 70 days prior to start of construction that specifies how the construction contractor will remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner.
 - 1. The Plan must identify appropriate procedures for handling contaminated soils and groundwater should any be encountered.
 - 2. The Plan must identify protocols for soil testing and disposal, identify the approved disposal site, and include written documentation that the disposal site will accept the waste.
 - 3. The Plan must identify the locations at which groundwater dewatering is likely to be required, the method to analyze groundwater for hazardous materials, and the appropriate treatment and/or disposal methods.
 - 4. Contractor shall be solely and fully responsible for compliance with all laws, rules, and regulations applicable to the identification, transportation, and disposal of hazardous materials, including those encountered in excavated soil or dewatering effluent.
- E. Groundwater Dewatering Control and Disposal Plan - Prepare and submit to the Owner for review and approval prior at least 70 days prior to commencement of construction. The plan shall be in accordance with Section 01150 and 02140.
 - 1. The Plan shall include but not be limited to the following:
 - a. Requirements to adhere to Construction General Permit requirements for construction dewatering discharges, or control, test, and treat the dewatering effluent as needed to minimize or avoid water quality degradation, erosion, and sedimentation in the receiving waters in conformance with the applicable RWQCB permits.
 - b. Identification of methods for collecting and handling water onsite for treatment prior to discharge, including locations and capacity of settling basins, treatment ponds, and/or holding tanks.
 - c. Identification of methods for treating water onsite prior to discharge, such as filtration, coagulation, sedimentation settlement areas, oil skimmers, pH adjustment, and other BMPs, as necessary to comply with discharge water

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- quality requirements as specified in Section 01150 and/or applicable permits.
- d. Procedures and methods for maintaining and monitoring dewatering operations to ensure that no breach in the process occurs that could result in exceedance of applicable water quality objectives.
 - e. Identification of discharge locations and details for erosion and scour protection/avoidance at each location.
 - f. Monitoring and reporting procedures in conformance with the applicable RWQCB permits identified above. At a minimum, water quality data shall be collected 50 feet upstream and 50 feet downstream of the discharge location.
- 2. Discharge water in a manner that does not cause erosion or scour. Any erosion and vegetation loss caused by the Contractor's activities shall be restored by Contractor, including replanting riparian vegetation. See Section 02270 for revegetation requirements.
 - 3. If the dewatering effluent contains contaminants that exceed the requirements of the General WDRs for Discharges with a Low Threat to Water Quality (Order No. R3-2011-0223, NPDES Permit No. CAG993001), the Contractor shall contain the dewatering effluent in a portable holding tank for appropriate offsite disposal or discharge. The Contractor will either dispose of the contaminated effluent at a permitted waste management facility or discharge the effluent, under permit, to a publicly owned treatment works such as the MRWPCA Regional Wastewater Treatment Plant.
 - 4. Discharge generated during pump station development would be allowed to percolated into the ground, provided that:
 - a. The discharge shall be spread over an undisturbed, vegetated area capable of absorbing the top-hole water and filtering solids in the discharge, and spread in a manner that prevents a direct discharge to surface waters;
 - b. The pH of the discharge shall be between 6.5 and 8.3;
 - c. The discharge shall not contain oil or grease;
 - d. The discharge shall not have chlorine or bromine concentrations that could impact groundwater quality;
 - e. The discharge area shall not be within 100 feet of a stream, water body, wetland, or streamside riparian corridor;

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- f. The Contractor shall implement appropriate management practices to dissipate energy and prevent erosion;
 - g. The Contractor shall implement appropriate management practices to preclude discharge to surface waters and surface water drainage courses; and
 - h. The Contractor shall immediately notify the Owner and/or the Owner Representative of any discharge to surface waters or surface water drainages.
- F. During storm events, visually monitor all receiving drainage systems (e.g., creeks and storm drains) for flooding. If flooding is observed in any main or localized drainage system, decrease or cease dewatering discharges until flooding has subsided and discharge to other detention facilities (e.g., tanks) as needed.

3.03 PROTECTION OF CULTURAL RESOURCES

A. General Requirements

- 1. Unauthorized collection of prehistoric, historic, or fossil materials is strictly prohibited.
- 2. Training: Prior to any ground disturbing activities all Contractor personnel and subcontractors shall attend training conducted by the Owner Representative discussing the nature of historical, archeological, and paleontological resources and potential materials that may be encountered.

B. Archaeological Resources:

Contractor shall adhere to the archaeological mitigation requirements of the Final EIR and letter of concurrence from the State Historic Preservation Officer. Certain portions of the project area may be established as Archaeologically Sensitive Areas (ASA), which require preparation of an Archaeological Monitoring Plan and monitoring by the Owner's archaeological consultant (Representative).

Monitoring of ground disturbance in the ASA will be overseen by an archaeologist who qualifies for the Secretary of Interior Standards. Construction activities within the ASA would need to be of a nature and pace that allows the archaeological monitor adequate time to inspect excavation spoils and sidewalls and halt construction in the event of an archaeological discovery. If archaeological materials are encountered, all soil disturbing activities within 100 feet of the find shall cease until the resource is evaluated. The Lead Archaeologist shall immediately notify the lead agency of the encountered archaeological resource.

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If preservation in place is not feasible, the Owner Representative Archaeologist shall implement an Archaeological Research Design and Treatment Plan (ARDTP). The Lead Archaeologist, Native American representatives, and the lead agency shall meet to determine the scope of the ARDTP.

C. Unanticipated Discoveries

1. If potential historical or archaeological resources, including but not limited to human remains, are discovered during construction, Contractor shall: 1) suspend all soil disturbing activities within 100 feet of the discovery, 2) immediately notify the Owner Representative, and 3) install fencing or staking to prevent vehicles, equipment or personnel from entering the area until a Secretary of the Interior-qualified archaeologist can inspect the find and determined its significance.
2. If required by the nature of the unanticipated discovery and as directed by the Owner, Contractor shall relocate operations and adjust the construction schedule to allow implementation of appropriate archaeological management procedures by the Owner. If necessary, the Owner will issue a written order to suspend work in accordance with state law and applicable mitigation measures. Cost or time impacts as a result of a suspension shall be resolved in accordance with .
3. If potential paleontological resources are discovered during construction, Contractor shall: 1) suspend all soil disturbing activities within 50 feet of the discovery; 2) immediately notify the Owner Representative, and 3) install fencing or staking to prevent vehicles, equipment or personnel from entering the area.
4. In the event of discovery or recognition of any human remains during construction activities, such activities within 100 feet of the find shall cease and immediately notify the Owner's Representative.
5. Contractor shall not resume work in effected area until approved by the Owner.

3.04 TRAFFIC AND TRANSPORTATION

- A. See Section 011570 Traffic Control for additional requirements for each area along with general mitigation requirements.
- B. Contractor shall comply with all federal, state, local and any governing authority regarding their construction traffic operations.
- C. Traffic Control and Safety Assurance Plan - The construction contractor(s) shall obtain any necessary road encroachment permits prior to constructing each project component and shall comply with the conditions of approval to project implementation. As part of

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the road encroachment permit process, a registered qualified traffic engineer shall prepare a traffic control and safety assurance plan in accordance with professional engineering standards and submit the plan to the agencies with jurisdiction over the affected roads for review and approval. For all project construction activities that could affect the public right-of-way (e.g., roadways, sidewalks, and walkways), the plan shall include measures that would provide for continuity of vehicular, pedestrian, and bicyclist traffic; reduce the potential for traffic accidents; and ensure worker safety in construction zones. Where project construction activities could disrupt mobility and access for bicyclists and pedestrians, the plan shall include measures to ensure safe and convenient access would be maintained.

The Traffic Control and Safety Assurance Plan shall be developed on the basis of detailed design plans for the approved project. The plan shall include, but not necessarily be limited to, the elements listed below:

1. General
 - a. Develop circulation and detour plans to minimize impacts on local streets. Haul routes that minimize truck traffic on local roadways and residential streets shall be used. As necessary, signage and/or flaggers shall be used to guide vehicles through the construction work areas.
 - b. Implement a public information program to notify motorists, bicyclists, nearby residents, and adjacent businesses of the impending construction activities (e.g., media coverage, email notices, websites, etc.). Notices of the location(s) and timing of road closures shall be published in local newspapers and on available websites to allow motorists to select alternative routes.
 - c. Control and monitor construction vehicle movements by enforcing standard construction specifications through periodic onsite inspections.
 - d. Install traffic control devices where traffic conditions warrant, as specified in the applicable jurisdiction's standards (e.g., the California Manual of Uniform Traffic Controls for Construction and Maintenance Work Zones).
 - e. Store all equipment and materials in designated contractor staging areas.
 - f. Install detour signs to direct traffic to alternative routes around the closed road segment if alternate one-way traffic flow cannot be maintained past the construction zone.
2. Roadways

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- a. Post detour signs along affected roadways to notify motorists of alternative routes.
 - b. The Contractor shall schedule construction activities to minimize impacts during heavy recreational use periods (e.g., weekends and holidays).
 - c. Maintain alternate two-way traffic flow past the construction zone where possible.
 - d. Haul routes that minimize truck traffic on local roadways and residential streets shall be used to the extent feasible.
 - e. Schedule truck trips outside of peak morning and evening commute hours to minimize adverse impacts on traffic flow (e.g., if agencies with jurisdiction over the affected roads identify highly congested roadway segments during their review of the encroachment permit applications).
 - f. Limit lane closures during peak hours. Travel lane closures, when necessary, shall be managed such that one travel lane is kept open at all times to allow alternating traffic flow in both directions along affected two-lane roadways; the contractor shall use steel plates for trench backfilling to restore vehicle access at the end of each workday.
 - g. Restore roads and streets to normal operation by covering trenches with steel plates outside of normal work hours or when work is not in progress.
 - h. Comply with roadside safety protocols to reduce the risk of accidents. Provide “Road Work Ahead” warning signs and speed control (including signs informing drivers of state-legislated double fines for speed infractions in a construction zone) to achieve required speed reductions for safe traffic flow through the work zone. Train construction personnel to apply appropriate safety measures as described in the Traffic Control and Safety Assurance Plan.
 - i. Provide flaggers in school areas at street crossings to manage traffic flow and maintain traffic safety during the school drop-off and pickup hours on days when pipeline installation would occur in designated school zones.
 - j. Maintain access to private driveways.
 - k. Coordinate with Monterey-Salinas Transit (MST) so the transit provider can temporarily relocate bus routes or bus stops in work zones as deemed necessary.
3. Pedestrian Bicyclists

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- a. Perform construction that crosses on-street and off-street bikeways, sidewalks, and other walkways in a manner that allows for safe access for bicyclists and pedestrians. Alternatively, provide safe detours to reroute affected bicycle/pedestrian traffic.
- 4. Recreational Trails
 - a. At least two weeks prior to construction, post signage along all potentially affected recreational trails; Class I, II, and II bicycle routes; and pedestrian pathways to warn bicyclists and pedestrians of construction activities. The signs shall include information regarding the nature of construction activities, duration, and detour routes. Signage shall be composed of or encased in weatherproof material and posted in conspicuous locations, including on park message boards, and existing wayfinding signage and kiosks, for the duration of the closure period. At the end of the closure period, the Contractor shall retrieve all notice materials.
- 5. Emergency Access
 - a. Maintain access for emergency vehicles at all times. Coordinate with facility owners or administrators of sensitive land uses such as police and fire stations, transit stations, hospitals, and schools.
 - b. Provide advance notification to local police, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on area roadways.
 - c. Avoid truck trips through designated school zones during the school drop-off and pickup hours to the extent feasible. [
- D. Roadway Rehabilitation Program.
 - 1. Prior to commencing project construction, the Owner and the affected jurisdiction(s) shall enter into an agreement detailing the preconstruction condition of all major construction access and haul routes proposed for use by project-related construction vehicles, in addition to any appropriate post-construction roadway rehabilitation requirements. Temporary detour routes may also be included, if appropriate. The construction routes identified in the rehabilitation program must be consistent with those identified in the construction Traffic Control and Safety Assurance Plan. Roads damaged by project-related construction vehicles shall be repaired to a structural condition equal to that which existed prior to construction activities.
 - 2. Prior to commencing project construction, The Contractor shall detail the preconstruction condition of all local construction access and haul routes

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proposed for substantial use by project-related construction vehicles. The construction routes surveyed must be consistent with those identified in the construction Traffic Control and Safety Assurance Plan. After construction is completed, the same roads shall be surveyed again to determine whether excessive wear and tear or construction damage has occurred. Roads damaged by project-related construction vehicles shall be repaired to a structural condition equal to that which existed prior to construction activities.

E. Construction Worker Parking Requirements.

Prior to commencing project construction, the construction contractor(s) shall coordinate with the potentially affected jurisdictions to identify designated worker parking areas that would avoid or minimize parking displacement in congested areas of unincorporated Monterey County. The contractors shall provide transport between the designated parking location and the construction work areas. The construction contractor(s) shall also provide incentives for workers that carpool or take public transportation to the construction work areas. The engineering and construction design plans shall specify that contractors limit time of construction within travel lanes and public parking spaces and provide information to the public about locations of alternative spaces to reduce parking disruptions.

F. Truck operations shall be limited as follows and to the extent necessary to comply with specified noise thresholds in Section 3.6.

1. Hauling and delivery truck operations (including concrete delivery trucks) shall not occur during nighttime hours and shall be restricted during evening and daytime hours, as necessary to comply with noise limitations.
2. Delivery trucks shall not operate within 200 feet of any residential receptor between the hours of 10 p.m. and 7 a.m.
 - a. Limited truck operations will be allowed between 10 p.m. and 7 a.m. provided that noise thresholds in Section 3.06 are not exceeded.
 - b. Where residential receptors are located within 200 feet of the truck route, night time deliveries shall be made to staging areas away from residential areas, then transferred to the construction site during daytime hours (7 a.m. to 7 p.m.).
3. Contractor shall develop and submit a plan for onsite delivery and hauling truck circulation that minimizes the need for backward movement.

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3.05 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

- A. Contractor is informed that criminal and/or civil penalties may be imposed on any person who violates any rule, regulation, permit or Order of the State Air Resources Board or Monterey Bay Unified Air Quality Management District (MBUAPCD) that is adopted to control and contain air emissions.
- B. Use of Equipment with High-Tiered Engine Standards
- C. For diesel-fueled off-road construction equipment of more than 50 horsepower, the Construction Contractor shall make a good faith effort to use available construction equipment that meets the highest USEPA-certified tiered emission standards. For all pieces of equipment that would not meet at least Tier 3 emission standards, CalAm or its Construction Contractor shall retain documentation from two local heavy construction equipment rental companies that indicates that the companies do not have access to higher-tiered equipment for the given class of equipment.
- D. Implement the following measures to reduce Greenhouse Gas emissions:
 - 1. Training: All Contractor personnel and subcontractors shall attend training conducted by the Owner Representative discussing greenhouse gas emissions.
 - 2. Maintain tire inflation to the manufacturers' inflation specifications on all construction vehicles and delivery trucks.
 - 3. Construction Equipment Efficiency Plan. Contractor shall prepare and implement measures identified in the Construction Equipment Efficiency Plan as part of project construction to increase the efficient use of construction equipment to the maximum extent feasible. Such measures shall include, but not necessarily be limited to: procedures to ensure that all construction equipment is properly tuned and maintained at all times; a commitment to utilize existing electricity sources where feasible rather than portable diesel-powered generators; consistent compliance with idling restrictions of the state; and identification of procedures (including the use of routing plans for haul trips) that will be followed to ensure that all materials and debris hauling is conducted in a fuel-efficient manner. The Owner shall contract a qualified professional (e.g., construction planner/energy efficiency expert) to prepare a Construction Equipment Efficiency Plan. It shall be submitted to CPUC for review and approval at least 30 days prior to the beginning of construction activities.
- E. Contractor is responsible for any damage resulting from dust originating from its operations.
- F. Dust Control Plan: Contractor shall prepare and implement a Dust Control Plan that includes, at a minimum, the following dust control measures:

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1. Water all active construction areas at least twice daily (preferably from non-potable sources); frequency should be based on the type of operation, soil, and wind exposure.
 2. Cover and maintain at least 2 feet of freeboard on all trucks hauling soil, sand, and other loose debris on public roads.
 3. Unpaved access roads, parking areas, and staging areas at construction sites shall either be paved, watered three times daily, or nontoxic soil stabilizers shall be applied.
 4. Sweep paved access roads, parking areas, and staging areas at construction sites daily with water sweepers when not raining.
 5. Sweep adjacent streets daily with water sweepers if visible soil material is carried onto adjacent public streets because of construction activities.
 6. Apply hydroseed or nontoxic soil stabilizers to all inactive, previously graded areas that will be inactive for 10 days or more.
 7. Enclose, cover, or water twice daily exposed stockpiles (dirt, sand, etc.).
 8. Limit traffic speeds on unpaved roads to 15 mph (miles per hour)
 9. Install effective erosion and sediment control measures to prevent soil runoff to public roadways per Section 02270 and approved SWPPP.
 10. Replant disturbed areas as quickly as possible, per Section 02930, Seeding.
 11. Wheel washers shall be installed and used by truck operators at the exits of the construction sites to the proposed Carmel Valley Pump Station.
 12. Post a publicly visible sign that specifies the telephone number and person to contact regarding dust complaints. This person shall respond to complaints and take corrective action within 48 hours. The phone number of the MBUAPCD shall also be visible to ensure compliance with MBUAPCD rules.
 13. Limit grading activities during periods of high wind (over 15 mph).
- G. The construction contractor(s) shall gravel or pave the existing access road to the Carmel Valley Pump Station site. This access road shall be stabilized prior to the commencement of construction activities at the Pump Station site.
- H. Contractor shall implement the following MBUAPCD measures to limit engine exhaust emissions:

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1. On road vehicle idling time shall be minimized and shall not exceed a five minute maximum. Additionally, off-road engines shall not idle for longer than five minutes per Section 2449(d)(3) of Title 13, Article 4.10, Chapter 9 of the California Code of Regulations. Clear signage of this requirement shall be provided for construction workers at all access points to construction areas.
 2. Contractor's operations shall be in accordance with Section 93115, Title 17, CCR, Airborne Toxic Control Measure for Stationary Compression Ignition Engines that specifies fuel and fuel additive requirements; emission standards for operation of any stationary, diesel-fueled, compression-ignition engines; and operation restrictions within 500 feet of school grounds when school is in session.
 3. Properly tune and maintain equipment used on the project in accordance with manufacturer specifications.
 4. Perform monthly low-emissions tune-ups for all petroleum fuel powered equipment used on the project.
 - a. Maintain a construction vehicle maintenance log for each contractor-owned and/or maintained vehicle indicating the date and a description of all preventative maintenance, the individual who performed the maintenance; and other information related to the vehicle. The construction vehicle maintenance and low-emissions tune-up log shall be submitted to the Owner on a monthly basis throughout the duration of the project.
 - b. Low-sulfur fuels. Low-sulfur fuels shall be used in all stationary and mobile equipment. Submit documentation of fuel usage on a monthly basis along with vehicle maintenance logs.
- I. All off-road diesel construction equipment shall be equipped with Tier 2 diesel engines as defined in Title 13, CCR, §2485 and with Level 3 Diesel Emission Control Strategies as defined in Title 13, CCR, §2700 through 2710.
1. Submit inventory of all off-road construction equipment that will be used an aggregate of 8 or more hours during any portion of the construction project.
 - a. Include vehicle license plate number, horsepower rating, engine production year, and projected hours of use or fuel throughput for each piece of equipment.
 2. Submit updated inventory and usage records monthly to Owner throughout the duration of the project.
- J. Notification: Immediately notify Owner of complaints related to air quality.

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- K. If hydrogen sulfide gas or any other odorous gases are encountered during tunnel excavation or odor complaints are received, water scrubbers and/or other equipment shall be added to the ventilation system as necessary to remove the nuisance odors.

3.06 NOISE

- A. This section presents noise performance standards. See Article 3.7 and Article 3.3 for additional vibration requirements.
- B. In areas where there are adjacent residences within the project construction boundary, the Contractor shall retain a qualified noise consultant to document the existing baseline 1-hour L_{eq} and 24-hour L_{dn} noise levels at the adjacent residential property lines at each work area for a minimum of 2 weeks prior to construction and submit results to Owner. In addition, the Contractor shall also ensure the following:
1. The Contractor shall identify the number and location of monitoring locations and relation to sensitive receptors.
 2. The Contractor shall establish a schedule for ongoing monitoring and reporting of construction noise levels to meet performance standards.
 3. The Contractors shall schedule tests to confirm construction noise levels and effectiveness of noise control measures prior to commencement of substantial noise-generating activities such as grading, earthmoving, demolition.
 4. Monitoring shall occur at least weekly, and more often if needed, in response to complaints.
 5. Monitoring records shall be provided to the Owner at least weekly or more often if requested by the Owner if noise complaints occur.
 6. The Contractor shall not resume operations before correcting conditions that cause excessive noise or vibration, subject to approval by the Owner. Contractor shall not be entitled to additional compensation or extension of contract time for suspended operations because of its failure to meet specified noise and vibration criteria
 7. Contractor shall pay any and all fines and penalties that may be levied for violations pertaining to noise and vibration thresholds specified herein, at no additional cost to the Owner
 8. In the event that any monitoring results indicate exceedance of noise or vibration thresholds, the Contractor shall immediately notify the Owner and local municipality of the exceedance, identify the source and cause of the exceedance, implement corrective actions, and provide documentation to the Owner and local

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municipality that subsequent noise and vibration levels are within acceptable limits

- C. Construction-caused noise shall not exceed the noise thresholds or established time limits established under the County of Monterey (County) Noise Ordinance (Ordinance 5250) without authorization by the Owner. Ordinance 5250 amends portions of the County's noise ordinance to feature the following provisions to be adhered to and verified by the Construction Contractor:

- No higher than 85 dBA allowed at a distance of 50 feet from the source.
- Exterior noise at night (10pm to 7am) limited to 45 dBA hourly Leq; and, 65 dBA Lmax as measured at or beyond the property line of the noise source.

Per, Section 10.60.040 C.3 of the Monterey County Code (MCC), any required regular testing of a backup power generator shall occur during daytime hours so as not to require compliance with the above stated nighttime noise thresholds. The generator shall have a factory-approved sound attenuating casing, exhaust muffler, and heat dissipation means so as to meet the 85 dBA at 50 feet requirement (per MCC 10.60.030).

- D. Noise Control Plan For Nighttime Construction. Nighttime construction shall only occur if authorized by the CalAm or the Owner's Representative 75 days prior to the scheduled commencement of project nighttime construction work. If so authorized, the Contractor shall submit a Noise Control Plan for all nighttime pipeline work to the Owner for review and approval 60 days prior to the commencement of project construction activities. The Noise Control Plan shall identify all feasible noise control procedures to be implemented during nighttime pipeline installation in order to reduce noise levels to the extent practicable at the nearest residential or noise sensitive receptor. At a minimum, the Noise Control Plan shall require use of moveable noise screens, noise blankets, or other suitable sound attenuation devices be used to reduce noise levels during nighttime pipeline installation activities below 60 dBA Leq. The Noise Control Plan for nighttime construction shall also include, but is not limited to, the following nighttime construction noise controls:

1. Operation of equipment requiring the use of back up beepers shall be minimized near sensitive receptors to the extent feasible during nighttime construction work hours between 10 p.m. to 7 a.m. If nighttime work requires backwards movement and the use of backup alarms results in the exceedance of noise level thresholds specified herein, Contractor shall implement alternative methods such as the use of "smart" alarms, radar activated backup alarms, or administrative controls such as use of a spotter to direct the backing operation and planning activities to minimize backwards movement. Backup warning alarms shall comply with Cal-OSHA requirements (Title 8, CCR). Alternatively, or in conjunction with the above, obtain approval from Cal/OSHA to use alternative systems with lower noise levels, such as those listed below.

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- a. “Smart” alarms with an audible range of 77 to 97 A-weighted decibels (dBA), which limit the warning signal to 5 dBA over ambient noise levels.
 - b. Radar presence-sensing alarms, which identify objects in the reversing path of a truck;
 - c. “bbs-tek” broadband backup alarm system, which uses a broadband sound instead of a more noticeable single-frequency sound.
 - d. Strobe lights instead of audible alarms (particularly for night use).
 2. Offsite Accommodations for Substantially Affected Nighttime Receptors at Occupied Properties within 100 feet of the Project Site. The Owner shall provide temporary hotel accommodations for all residences and any other nighttime sensitive receptors located within 100 feet of a designated construction work area that would be exposed to 24-hour construction activities and where nighttime construction noise would exceed the County thresholds described above even with implementation of acoustic barriers and/or shielding measures. The accommodations shall be provided for the duration of 24-hour construction activities.
- E. Prepare and submit a Noise Control Plan for construction. At a minimum, the plan shall include the following elements:
1. Detailed descriptions and design drawings for proposed noise control methods to be implemented to meet the noise thresholds described above, including but not limited to sound walls and other measures described below in Noise Controls.
 2. Proposed staging and scheduling of noise control measures.
 3. Noise control methods/management practices to reduce noise levels during construction worker shift changes.
 4. Noise control methods/management practices to reduce noise levels from maintenance activities during construction.
 5. Anticipated performance of proposed noise control measures.
 6. Proposed staging and scheduling of vibration control measures.
 7. Proposed noise monitoring procedures, locations, and schedules.
- F. Noise Controls: Contractor shall implement effective noise control measures, as necessary, during construction activities (including mobilization and demobilization) to maintain noise levels below the specified noise thresholds. Contractor shall be responsible for ensuring that all implemented noise and vibration control measures are

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installed and used correctly. Control measures include but are not limited to the following:

1. General Noise Control For Construction Equipment: The construction contractor(s) shall assure that construction equipment with internal combustion engines have sound control devices at least as effective as those provided by the original equipment manufacturer. No equipment shall be permitted to have an unmuffled exhaust. The Contractor will ensure that best available controls techniques including mufflers, intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds for all construction-noise equipment and trucks are used.
 - a. Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler shall be placed on the compressed air exhaust to lower noise levels by up to approximately 10 dBA. External jackets shall be used on impact tools, where feasible, in order to achieve a further reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible. Piles shall be installed using drilled methods wherever feasible. Pile driving using impact or vibratory methods shall be prohibited except for locations and times specifically approved in writing by Owner Representative.
 - b. The construction contractor(s) shall locate stationary noise sources as far from nearby receptors as possible, and shall muffle and enclose them in temporary sheds, incorporate noise barriers, or implement other noise control measures to the extent feasible. If they must be located near receptors, adequate muffling, (such enclosures) shall be installed to ensure noise thresholds specified herein are not exceeded. Enclosure openings shall be faced away from sensitive receptors. The noise controls shall be sufficient to reduce noise levels during drilling and development of pump station construction activities below the threshold of 85 dBA at a distance of 50 feet from the source.
 - c. Sound barrier material shall have a minimum surface density of pound per square foot (psf) and a minimum sound transmission class (STC) rating of 25. Sound barrier design shall be prepared by the Contractor's qualified noise consultant and shall be subject to review and approval by the Owner prior to erection.
 - d. Materials stockpiles as well as staging and parking areas shall be located as far as feasible from sensitive receptors.

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- e. If construction is within 100 feet of school classrooms or childcare facilities, Contractor shall schedule construction activities during the summer break, on weekend or school vacation days, to the extent feasible, avoiding weekday hours when schools are in session. If construction must occur within the school session hours, construction-caused interior noise levels in any classroom shall not exceed 70 dBA.
 - f. Design and construct temporary noise barriers at locations indicated on the Contract Drawings and/or as required to meet specified noise criteria.
- G. The contractor shall notify residents and other sensitive receptors within 300 feet of a daytime construction area and within 900 feet of nighttime construction areas of the construction location, nature of activities, and schedule, in writing, at least 14 days prior to the commencement of construction activities. The notice shall be posted along the proposed pipeline alignments, near the proposed facility sites, and at nearby recreational facilities. The Owner shall designate a Construction Disturbance Coordinator who would be responsible for responding to construction complaints. The coordinator shall determine the cause of the complaint and ensure that reasonable measures are implemented to correct the problem. A contact number for the Construction Disturbance Coordinator shall be conspicuously placed on construction site fences and included in the notice. Prior to distributing the notice to nearby residences, the Contractor shall first submit the notice for review and approval to County Staff as may be required by local regulations. This measure shall be implemented in conjunction with the noticing provisions in Section 3.4. The Contractor shall ensure the following occurs:
 - 1. If the County of Monterey informs the Contractor of noise or vibration complaints received, the Contractor shall inform the Owner. In coordination with the Owner, the Contractor shall modify any construction activities that generate excessive noise or vibration levels.
 - 2. If Contractor receives any noise or vibration complaints directly, Contractor shall immediately notify the Owner.
 - 3. Owner will inform Contractor of noise complaints received and Contractor, in coordination with the Owner, shall modify any construction activities that generated the excessive noise levels.
 - 4. Contractor shall monitor noise and vibration at the construction site and adjoining buildings using acceptable equipment and methods. Monitoring shall be sufficient to measure potential building damage and effects on occupants, property and sensitive equipment.
 - 5. The Contractor will suspend operations when noise exceeds specified limits. Contractor shall restrict use of equipment causing noise so that specified limits are not exceeded.

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3.07 VIBRATION

This Article presents vibration performance standards. See Article 3.3 for additional requirements.

- A. Vibration Reduction Measures. Construction practices shall be utilized that do not generate vibration levels at the closest sensitive land uses above 0.1 in/sec PPV. The following measures, at a minimum, shall be employed to ensure this threshold is met:
 - 1. Vibration monitoring shall be conducted for pipeline construction. If vibration levels exceed the limits of this mitigation measure, then construction practices shall be modified to use smaller types of construction equipment, operate the equipment in a manner to reduce vibration, or use alternate construction methods, and monitoring shall continue. The monitoring in this mitigation measure shall be repeated if the construction methods change in a manner that would increase vibration levels, or when structures are closer to the limits of construction than previous vibration monitoring have confirmed is below the vibration thresholds.
 - 2. Smaller vibratory rollers shall be used to minimize vibration levels during repaving activities where needed to meet vibration limits.

3.08 UTILITIES

- A. Implement requirements in Section 01530 Protection of Existing Facilities.
- B. Implement the following measures to avoid conflicts with existing utilities and, should they occur, respond in an appropriate and timely manner:
 - 1. Notify the Owner Representative at least two weeks in advance of any potential utility service disruption to allow Owner Representative to notify residents and businesses two to four days in advance of potential utility service disruption.
 - 2. Prior to excavation, locate overhead and underground utilities that may be encountered during excavation work prior to opening an excavation.
 - 3. Notify utility owner prior to excavation.
 - 4. When a project excavation is within the approximate location of a subsurface utility, the Operator or its contractor shall determine the exact location of the underground utility by safe and acceptable means, including with the use of hand tools and modern techniques.
 - 5. To safeguard employees from potential accidents related to underground utilities the following would be implemented:

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- a. While any excavation is open, protect, support, or remove underground utilities as necessary to safeguard employees.
 - b. Provide weekly updates to Owner and construction workers regarding the planned excavations for the upcoming week, and to specify when construction will occur near a high-priority utility (e.g., pipelines carrying petroleum products, oxygen, chlorine, or toxic or flammable gases; natural gas pipelines greater than 6 inches in diameter or with normal operating pressures greater than 60 pounds per square inch gauge; and underground electric supply lines, conductors, or cables that have a potential to ground more than 300 volts that do not have effectively grounded sheaths).
 - c. Owner's construction managers shall hold regular tailgate meetings with construction staff on days when work near high-priority utilities occurs to review all safety measures—including those identified in the Mitigation Monitoring and Reporting Program and in construction specifications—regarding such excavations.
 - d. The contractor shall designate a qualified Health and Safety Officer that shall specify a safe distance to work near high-priority utilities. Excavation near such utility lines shall not be authorized until the designated Health and Safety Officer confirms and documents in the construction records that: (1) the line was appropriately located in the field by the utility owner using as-built drawings and a pipeline-locating device, and (2) the location was verified by hand by the construction contractor.
6. Notify the utility company and the local fire departments any time damage to a gas utility results in a leak or suspected leak, or whenever damage to any utility results in a threat to public safety.
7. Develop an Emergency Response Plan prior to commencing construction activities. The Emergency Response Plan shall outline procedures to follow in the event of a leak or explosion. The emergency response plan shall identify the names and phone numbers of staff at the potentially affected utilities that would be available 24 hours per day in the event that construction activities cause damage to or rupture of a high-risk utility. The plan shall also detail emergency response protocols, including notification, inspection, and evacuation procedures; any equipment and vendors necessary to respond to an emergency (such as an alarm system); and routine inspection guidelines.
8. Promptly work with the utility provider to reconnect any disconnected utilities if encountered and impacted as soon as it is safe to do so.
- C. Implement Construction Waste Reduction and Recycling plan
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1. The construction contractor(s) shall prepare a Construction Waste Reduction and Recycling Plan identifying the types of debris the proposed project will generate and the manner in which those waste streams will be handled. In accordance with the California Integrated Waste Management Act of 1989, the plan shall emphasize source reduction measures, followed by recycling and composting methods, to ensure that construction and demolition waste generated by the project is managed consistent with applicable statutes and regulations. In accordance with the California Green Building Standards Code and local regulations, the plan shall specify that all trees, stumps, rocks, and associated vegetation and soils, and 50 percent of all other nonhazardous construction and demolition waste, be diverted from landfill disposal. The plan shall be prepared in coordination with the Monterey Regional Waste Management District and be consistent with Monterey County's Integrated Waste Management Plan. Upon project completion, Owner shall collect the receipts from the contractor(s) and submit them to the Owner as documentation that the waste reduction, recycling, and diversion goals have been met.

3.09 BIOLOGICAL RESOURCES

- A. Construction Worker Environmental Awareness Training and Education Program: Prior to any work (i.e., equipment mobilization, vegetation clearing, site grading) all personnel, including subcontractors, shall attend mandatory environmental training provided by the Owner's Representative/Lead Biologist on biological resources potentially present at the site, including but not limited to California tiger salamander, California red-legged frog, Western pond turtle, burrowing owls, and other sensitive species. The training will include a description, representative photographs, and legal status of each special-status species and the penalties for not complying with biological mitigation requirements. The training will also address noxious weed control. If new construction personnel are added to the project, Contractor shall require each new person to receive training before they start working.
- B. Notification: Provide four weeks notification to the Owner prior to the start of mobilization to enable Owner Specialty Environmental Monitor to perform required biological surveys.
- C. Construction work area limits: Confine all project activities to the designated work area limits as shown on the Drawings.
 1. Before construction begins, Contractor shall clearly stake and flag, or fence-off construction work area limits to ensure no grading or other activities occur outside of the approved limits.
 2. During construction, Owner Representatives (e.g., QA Inspectors, Environmental Inspectors, and Specialty Environmental Monitors) will inspect and verify that

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construction equipment and associated activities remain within the designated work area limits.

3. Requests for use of additional work area outside of the designated work area limits: Subject to formal review and approval by Owner Representative and applicable regulatory agencies.

D. Restrictions and General Measures:

1. All personnel, equipment, project-related vehicles, and materials shall stay within the designated construction work area limits and shall not go outside these boundaries.
2. Project-related vehicles shall observe the posted speed limit on hard-surfaced roads and a 15-mile-per-hour speed limit on unpaved roads.
3. Provide closed garbage containers for the disposal of all food-related trash items (e.g., wrappers, cans, bottles, food scraps). All garbage shall be collected daily from the project site and placed in a closed container that shall be emptied at least weekly at an approved offsite disposal site.
4. Personnel shall not feed or otherwise attract wildlife to the project area.
5. No pets or firearms shall be allowed in the construction work limits.
6. Vehicle or equipment maintenance shall be performed in the designated staging areas.

E. Noxious Weed Control:

1. Construction equipment must arrive to the project clean and free of soil, seed, and plant parts to reduce the likelihood of introducing new weed species.
2. Any imported fill material, soil amendments, gravel etc., required for construction and/or restoration activities that would be placed within the upper 12 inches of the ground surface shall be free of vegetation and plant material.
3. Imported erosion-control materials shall be certified weed free.
4. Contractor shall stockpile the first 6 inches of topsoil (12 inches in agricultural areas) removed during excavations and shall subsequently replace the topsoil last on top of all subsoils during re-establishment of disturbed project areas.
5. Use of pesticides or herbicides is prohibited without Owner approval.

F. Sensitive Resource Fencing:

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1. Install fencing around sensitive resources. Provide no less than 2 weeks' notice to the Owner prior to fence installation. Owner Representative's Lead Biologist and/or Specialty Environmental Monitor shall be on-site during fence installation. If authorized by applicable permits, Owner will relocate sensitive species encountered during fence installation.
2. Fencing shall be installed 1 to 2 weeks prior to construction activities including mobilization of any equipment or materials (including mobile offices). Fencing shall be located as shown on the construction drawings and as marked in the field (with pin flags) by the Owner Representative's Lead Biologist and/or Specialty Environmental Monitor.
 - a. Wildlife exclusion fencing shall be installed along the perimeter of the construction work area limits where required. Fence shall be buried 6 inches deep, unless otherwise specified by Owner as specified by USFWS and CDFW.
 - b. Orange barrier fencing shall be installed within the work area to exclude trees, protect historical resources, and delineate avoidance areas that shall be left undisturbed.
 - c. Silt fence shall be installed along edges of the work areas in the vicinity of wetlands, stream channels, or other open water bodies, and other work areas where erosion may occur.
3. Construction personnel, construction-related activities, vehicle/equipment operation, material and equipment storage, and other surface-disturbing activities are prohibited within the fenced sensitive resource areas.
4. Contractor shall furnish, install, and maintain fencing during construction and remove fencing when construction is complete.

G. Topsoil Salvage

1. Salvage, at a minimum, the top 6 inches of soil (12 inches in agricultural areas or areas containing organic-rich topsoil) during grading, blading, trenching, or other earth moving activities. Stockpile topsoil separately from subsoils, and protect it from erosion until reused for restoration.
2. Salvaged topsoil shall be used for restoration and revegetation of temporarily disturbed areas by restoring the topsoil to the approximate location from where it was removed after backfilling with subsoil and before seeding. See Section 02930 for restoration and revegetation requirements.

H. Vegetation Protection

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1. Minimize vegetation removal to the minimum area necessary to safely complete the project.
2. Prune or trim trees only where necessary for construction clearance. Pruning of trees shall be subject to Owner approval and where approved shall be carried out in conformance with the “Pruning Guidelines” adopted by the California Department of Forestry and Fire Protection.
3. Avoid and minimize impacts on native mature trees or protected trees (as defined by County tree ordinances) by implementing the following measures:
 - a. Install orange barrier fencing where designated by Owner’s qualified arborist or Specialty Environmental Monitor.
 - b. Install and maintain orange barrier fencing outside the dripline of all trees that are to be retained and that are within 50 feet of any grading, road improvements, underground utilities, or other development activity.

For native trees on slopes, install silt fence at the upslope side of the protective fencing to prevent soil from drifting down over the root zone (if work will be performed upslope of the trees).

Contractor equipment, vehicles, personnel, materials, and spoils shall not encroach into areas where orange barrier fencing has been installed to protect native mature trees.

I. Stream and Wetland Protection

1. Notification: Owner is responsible for notifying CDFW within 5 working days of beginning work within the stream zone or area covered in the CDFW Section 1602 Streambed Alteration Agreement. Contractor shall notify Owner within 10 working days so that Owner can notify CDFW. In addition, Contractor shall notify Owner 10 days prior to completion of work within the stream zone or area covered in the CDFW Section 1602 Streambed Alteration Agreement so that notification can be provided to CDFW.
2. Avoid construction activities in saturated or ponded wetlands and streams shown on construction drawings and as designated in the field to the maximum extent feasible. The area of disturbance for construction shall be minimized in such areas.
3. Install silt fence adjacent to all wetlands and drainages to be avoided within 50 feet of any proposed construction activity.

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4. To minimize the degradation of wetland soils and vegetation where avoidance is infeasible, protective practices such as use of geotextile cushions and other materials (e.g., timber pads, prefabricated equipment pads, geotextile fabric) or vehicles with balloon tires shall be employed in saturated conditions (e.g., when there is noticeable rutting due to saturated conditions and mixing of topsoil and subsoil).
 5. Stabilize exposed slopes by implementation of appropriate erosion control measures immediately upon completion of construction activities.
 6. Stabilize banks for stream channels using approved materials and methods in areas where disturbed during installation or removal of the temporary and permanent bridges. Use biodegradable materials (such as just matting or coir mats) where deemed feasible and effective.
 7. Erosion control matting or rolls, if used, shall be free of synthetic material, such as plastic monofilament netting.
 8. Placement of any soil, fill, construction debris, or other non-permanent, non-required material below the ordinary high-water mark of any stream or in any wetland area is strictly prohibited. Should any debris or soils be inadvertently deposited below the ordinary high-water mark of stream channels or wetland in the work area, such materials shall be immediately removed and set back at least 10 feet from all drainages and wetlands in the project area.
 9. To the extent feasible, and subject to the approval of the Owner Representative, Contractor shall use vegetable-based biodegradable hydraulic fluids in all equipment working in close proximity to streams or wetlands.
- J. Wildlife Protection
1. Contractor personnel is prohibited from handling any and all wildlife on-site due to potential for it to be a special-status species which only agency approved staff are authorized to handle.
 2. Any Contractor employee who inadvertently injures or kills a designated special-status species or who finds one dead, injured, or entrapped shall immediately report the incident to the Owner. The Owner, in consultation with the Owner Representative's Lead Biologist, will notify the appropriate resource agencies.
 3. If any special-status species are found by Contractor personnel or the Owner Specialty Environmental Monitor within the work area, Contractor shall cease construction activities in the immediate vicinity and notify the Owner Representative's Biological Leader or Specialty Environmental Monitor. Contractor shall not resume work until approved by the Owner. This may require

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waiting until the animal moves on its own, if possible, or handling and relocation by the Specialty Environmental Monitor with required handling permits, if allowed by agencies, Contractor shall redirect work activities to avoid areas in the immediate vicinity of identified species.

4. If a federally or state listed species is in immediate danger of being injured or killed, the Owner Representative's Lead Biologist and Specialty Environmental Monitor have the authority to halt construction activities until the species has either left the area or been relocated out of the construction area and released into nearby suitable habitat.
5. Contractor shall install one or more escape ramps (constructed of earth fill or wooden planks) in all excavated areas more than 2 feet deep at the end of each day to prevent entrapment and potential injury or mortality of wildlife, especially any special-status amphibian, reptile, or mammal species. If escape ramps cannot be provided, then holes or trenches shall be covered with plywood or other hard material at the end of the work day.
6. Contractor personnel and subcontract personnel shall check under parked vehicles or equipment prior to moving for the presence of salamanders, frogs, snakes, or other sensitive species. Contractor shall immediately notify Owner Representative if species are discovered. Vehicles and equipment shall not be moved if an animal is discovered until the animal moves on their own or is relocated by the approved Specialty Environmental Monitor.
7. All construction pipes, culverts, or similar structures that are stored at a construction site for one or more overnight periods and with a diameter of 4 inches or more shall be inspected for special-status wildlife before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a special-status animal is discovered inside a pipe, that section of pipe shall not be moved until the animal moves on their own or is relocated by the approved Specialty Environmental Monitor. If necessary, under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity until the animal has escaped.
8. All vertical tubes used in project construction, such as chain link fencing poles or signage mounts, shall be temporarily or permanently capped at the time they are installed to avoid the entrapment and death of special-status birds.
9. Contractor shall trim or remove trees and shrubs during the nonbreeding season (generally February 15 and August 31 for most birds) where feasible to avoid loss of active nests and potential mortality of special-status and non-special status migratory birds and special status bats. Where not feasible, Contractor shall notify Owner at least 2 weeks in advance of trimming and tree removal.

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K. Pre-construction Biological Surveys by the Owner Specialty Environmental Monitor

1. The following information is included for information purposes for the Contractor. Contractor is not responsible for performing pre-construction biological surveys. Contractor is required to provide notification to Owner of mobilization as specified so that Owner can schedule the biological surveys accordingly.
2. Owner shall perform pre-construction biological surveys not more than 2 weeks prior to the onset of work activities (including equipment mobilization) and immediately prior to commencing work. If more than 2 weeks elapses between preconstruction surveys and onset of work, preconstruction surveys will be repeated no more than 14 days prior to commencement of work. Contractor shall not initiate work activities at the project site, including equipment mobilization, until Owner has provided formal written clearance to proceed.
3. Pre-construction surveys will be conducted for the following species:
 - a. Dusky-footed woodrat: Not more than 2 weeks prior to disturbance or vegetation removal in suitable habitat for dusky-footed woodrat (riparian willow forest/scrub) Specialty Environmental Monitor will conduct a pre-construction survey for stick nests of woodrats up to 50 feet around work areas, to the extent allowable by access. Locations of nests within the survey area will be flagged and mapped. Woodrat nests within the construction areas shall be fenced for avoidance by the Contractor at the Owner's direction. If it is determined that avoidance is not possible, the Owner will consult with CDFW to determine if trapping woodrats (using live-traps) and disassembling nests is warranted.
 - b. California tiger salamander: Not more than 2 weeks prior to the onset of work activities (including equipment mobilization) and immediately prior to commencing work, the Specialty Environmental Monitor will survey upland habitat in the primary study area suitable for California tiger salamanders and suitable refuge or burrow/aestivation sites. As feasible, refuge/burrow areas identified will be temporarily fenced with wildlife exclusion fencing by the Contractor at the Owner's direction and avoided. At locations where avoidance is not feasible, the burrows will be excavated by hand by Owner's special environmental monitor prior to construction. If a burrow is occupied, the individual animal will be moved to a natural burrow within 0.25 mile of the project area. Excavation and relocation will only be conducted as authorized by the USFWS and CDFW.
 - c. California red-legged frog: Not more than 2 weeks prior to the onset of work activities (including equipment mobilization) and immediately prior

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to commencing work, the Specialty Environmental Monitor will survey upland habitat in the primary study area suitable for California red-legged frog and suitable refuge or burrow/aestivation sites. As feasible, refuge/burrow areas identified will be temporarily fenced with wildlife exclusion fencing by the Contractor at the Owner's direction and avoided. At locations where avoidance is not feasible, the burrows will be excavated by hand prior to construction. If a burrow is occupied, the individual animal will be moved to a natural burrow within 0.25 mile of the project area. Excavation and relocation will only be conducted as authorized by the USFWS and CDFW.

- d. Migratory birds and raptors: No more than 1 week prior to initiation of construction activities during the breeding season for migratory birds and raptors (i.e., between February 15 and August 31), Specialty Environmental Monitor will conduct nesting-bird surveys within 500 feet of the project site for raptors and 100 feet for migratory birds.

If active raptor nests and/or migratory bird nests are detected, trees shall not be removed until after the breeding season (February 15 through August 31).

If active raptor nests and/or migratory bird nests are detected during the breeding season, Owner will establish, in consultation with the USFWS and CDFW appropriate no-disturbance boundary that shall be observed until the end of the nesting season or the young have fledged (usually late-June through mid-July).

Special Status Bats: No more than 1 week prior to initiation of construction activities, Owner will survey the project area for active roosts.

If special-status bats or evidence of bats are found, trees shall not be removed until after the breeding season (February 15 through August 15).

If active bat roosts are detected during the breeding season, Owner will establish, in consultation with the USFWS and CDFW appropriate no-disturbance boundary that shall be observed until the end of the nesting season or the young have fledged (usually late-June through mid-July).

- e. Monterey Pine Native Stands: Individual Monterey pine trees existing within the construction work area shall be evaluated to determine if they are native occurrences, relics, or otherwise naturally-occurring remnants of the past historic range. Maps depicting the results of these surveys shall be prepared for consideration during final facility design. Native stands of Monterey pine could occur at the identified facility sites and pipeline

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alignments based on the historical extent of native Monterey pines and biological reconnaissance surveys.

L. Specialty Environmental Monitoring by the Owner During Construction

1. The following information is included for information purposes for the Contractor. Specialty Environmental Monitoring will be performed by the Owner Representative.
2. Contractor is responsible for notifying Owner in advance of working in areas where environmental monitoring is required as specified below and as shown on the Drawings.
3. Specialty Environmental Monitoring will be conducted as follows:
 - a. Specialty Environmental Monitor will monitor construction activities at the beginning of each work day (daily) during initial ground disturbing activities (vegetation removal, grading, and excavation) and during the rainy season. Unless the work activities require it, the Specialty Environmental Monitor will usually not stay onsite for the entire day. When not onsite, the Specialty Environmental Monitor will remain on-call in case animals are discovered and need to be moved. As specified above, Contractor shall immediately contact Owner Representative in this event.
 - b. Once all initial ground-disturbing activities are completed, Specialty Environmental Monitor will perform spot checks of the project area at least once a week or more often if needed for the duration of construction. Environmental Inspector(s) and Specialty Environmental Monitor(s) will check to verify that perimeter fences are in good order, trenches are being covered if left open overnight (or escape ramps are being provided), project personnel are conducting checks beneath parked vehicles prior to their movement, that no individual animals are located outside or inside the construction fencing, and that all other required biological protection measures are being complied with.

M. Habitat Restoration

1. See Section 02930 and Appendix A for habitat restoration and revegetation requirements in areas of temporary construction disturbance.

3.10 HAZARDS AND HAZARDOUS MATERIALS

- A.** Contractor shall adhere to all local, state, and federal regulations related to the use, transport, handling, and disposal of hazardous materials. See Sections 01060 and 02111 for additional requirements.

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B. Environmental Site Assessment: If required by local jurisdictions and property owners with approval responsibility for construction of each component, Owner shall conduct a Phase I Environmental Site Assessment in conformance with ASTM Standard 1527-05 to identify potential locations where hazardous material contamination may be encountered. If an Environmental Site Assessment indicates that a release of hazardous materials could have affected soil or groundwater quality at a project site, a Phase II environmental site assessment shall be conducted to determine the extent of contamination and to prescribe an appropriate course of remediation, including but not limited to removal of contaminated soils, in conformance with state and local guidelines and regulations. If the results of the subsurface investigation(s) indicate the presence of hazardous materials, additional site remediation may be required by the applicable state or local regulatory agencies, and the contractors shall be required to comply with all regulatory requirements for facility design or site remediation.

C. Soil and Groundwater Management Plan: Contractor shall develop and implement a Soil and Groundwater Management Plan that includes a materials disposal plan specifying how the construction contractor will remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner. The plan must identify protocols for soil testing and disposal, identify the approved disposal site, and include written documentation that the disposal site will accept the waste. This plan shall be submitted to the California Public Utilities Commission for review and approval prior to commencement of construction.

As part of the Soil and Groundwater Management Plan, the Contractor shall develop a groundwater dewatering control and disposal plan specifying how contaminated groundwater (dewatering effluent), if encountered, will be handled and disposed of in a safe, appropriate and lawful manner. The plan must identify the locations at which groundwater dewatering is likely to be required, the method to analyze groundwater for hazardous materials, and the appropriate treatment and/or disposal methods.

If the dewatering effluent contains contaminants that exceed the requirements of the General WDRs for Discharges with a Low Threat to Water Quality (Order No. R3-2011-0223, NPDES Permit No. CAG993001), the construction contractor shall contain the dewatering effluent in a portable holding tank for appropriate offsite disposal or discharge. The contractor can either dispose of the contaminated effluent at a permitted waste management facility or discharge the effluent, under permit, to a publicly owned treatment works such as the MRWPCA Regional Wastewater Treatment Plant.

D. Site-Specific Health and Safety Plan: Contractor's Site-Specific Health and Safety Plan shall be prepared by a qualified health and safety professional in accordance with applicable laws, rules, and regulations, and in accordance with 29 CFR 1910.120. This plan shall be submitted to the California Public Utilities Commission for review prior to commencement of construction. The Health and Safety Plan shall include the following:

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1. Designation of a trained, experienced site safety and health supervisor who has the responsibility and authority to develop and implement the site health and safety plan.
2. A summary of all potential risks to construction workers and maximum exposure limits for all known and reasonably foreseeable site chemicals (the HSP shall incorporate and consider the information in all available existing Environmental Site Assessments and remediation reports for properties within ¼-mile using the EnviroStor Database).
3. Measures to protect construction workers and the general public by including engineering controls, monitoring, and security measures to prevent unauthorized entry to the construction area and to reduce hazards outside the construction area.
4. Specified personal protective equipment (PPE) and decontamination procedures, if needed, to be implemented in accordance with state and federal regulations if prescribed exposure levels are exceeded, for review by the Owner prior to the start of construction.
5. Emergency procedures, including route to the nearest hospital.
6. Procedures to be followed in the event that evidence of potential soil or groundwater contamination is encountered, such as soil staining, noxious odors, debris, or previously unreported tanks or wells. These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following: immediately stopping work in the vicinity of the unknown hazardous materials release, notifying Monterey County Department of Environmental Health, and retaining a qualified environmental firm to perform sampling and remediation.

Review of Contractor's Site-Specific Health and Safety Plan by the Owner shall not be construed as approval of the adequacy of Contractor's health and safety professional, the Contractor's Site-Specific Health and Safety Plan, or any safety measure taken in or near the construction site. Contractor shall be solely and fully responsible for compliance with all laws, rules, and regulations applicable to the health and safety of persons during the performance of construction work.

- E. The project SWPPP specified in Section 01561 shall contain provisions to prevent transport of hazardous materials to surface waters.
- F. Contractor shall implement fire-prevention measures, including smoking in disturbed areas only and disposing of cigarette butts in waste bins, parking in non-vegetated areas, and compliance with the requirements of the California PRC, beginning with Section 4427.

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- G. Procedures for evaluation, handling, stockpiling, storage, testing, and disposal of excavated material shall be as specified in Section 02111 and as follows.
1. Excavated trench spoils shall be inspected by Contractor and Owner prior to initial stockpiling. Spoils that are visibly stained and/or have a noticeable odor shall be stockpiled separately for characterization.
 2. Materials excavated from potentially hazardous work areas shall be stockpiled separately and be examined for evidence of building materials, debris, signs of underground storage tanks, and other indication of hazardous materials.
 3. All separately stockpiled excavation spoils suspected of containing hazardous materials shall be sampled and characterized as follows:
 - a. As directed by the Owner and in accordance with RWQCB requirements if intended to still be placed at the designated on-site disposal areas.
 - b. In accordance with landfill disposal requirements and as specified in Section 02111.b)
- H. Prior to demolition of structures, Contractor shall retain a qualified environmental professional to perform a hazardous building materials survey.
1. If lead, asbestos, or other hazardous building materials are present, applicable federal and state construction worker health and safety regulations shall be followed during abatement activities.
 - a. Asbestos-containing materials shall be abated by a certified asbestos abatement contractor in accordance with the regulations and notification requirements of the MBUAPCD
 - b. Lead-based paint shall be removed by a qualified lead abatement contractor and disposed of in accordance with existing hazardous waste regulations.

3.11 GEOTECHNICAL

- A. Contractor shall ensure that any areas used for staging, laydown, material storage, equipment storage, job trailers, employee parking, or other project-related support activities are located away from jurisdictional areas, sensitive communities, and protected from stormwater run-off using temporary perimeter sediment barriers such as berms, silt fences, fiber rolls, covers, sand/gravel bags, and straw bale barriers.
- B. Contractor shall store all potential contaminants on impervious surfaces, plastic ground covers, or in secondary containment to prevent any spills or leakage from contaminating the ground, and locate them at least 100 feet from adjacent habitat where practicable.

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- C. Contractor shall immediately contain any spillage of pollutants or construction material in accordance with the project SWPPP. The contaminated area shall be cleaned and any contaminated materials properly disposed of. In case of a spill, the contractor shall notify the Lead Biologist.
- D. Wherever feasible, contractor shall salvage a minimum of 12" of topsoil (or if there is less than 12 inches of topsoil initially, as much as practicable) during grading and earthmoving activities. Topsoil shall be stockpiled separately from subsoil, and protected from erosion (e.g., covered or watered). Contractor shall amend the soil if needed by using composting additives and prepare it prior to reuse for post-construction restoration of temporarily disturbed areas. Contractor shall be responsible for providing all composting additives. The contractor shall seek approval for the stockpile areas from the applicable jurisdictional agency.
- E. For project components in agricultural lands, the contractor shall conduct excavations in a manner that minimizes adverse impacts on crop productivity. The contractor shall separately stockpile surface and subsurface soil layers and subsequently use these layers to backfill excavations. Contractor shall restore the appropriate location to pre-construction soil profile. Contractor shall seek approval for stockpile locations prior to construction activity.
- F. The contractor shall measure soil densities prior to the start of construction activities to avoid over compaction backfill the surface soil (roughly the upper 3 feet of soil) to within 5 percent of the original density. The contractor shall evaluate if the uppermost 3 feet of soil needs to be ripped to achieve the appropriate soil density. Ripping may also be used in areas where vehicle and equipment traffic has compacted the topsoil layers, such as along construction access roads and staging areas. Prior to ripping the contractor shall consult with the Owner.
- G. The contractor shall inspect existing agricultural drainage systems to ensure they function as necessary throughout the construction period so that agricultural uses are not disrupted.

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01750: SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 GENERAL

1.01 DESCRIPTION

- A. CONTRACTOR shall furnish spare parts data and maintenance material for equipment within ninety (90) days after approval of the Shop Drawing of the equipment specified in the individual Sections. The data shall include a complete list of parts and supplies, with current unit prices and source or sources of supply.
- B. Spare parts and materials required to be supplied in the Contract Documents shall be furnished in manufacturer's unopened cartons, boxes, crates or other protective covering suitable for preventing corrosion or deterioration for the maximum length of storage which may be normally anticipated. They shall be clearly marked and identified as to the name of manufacturer or supplier, applicable equipment, part number, description and location in the equipment. All parts shall be protected and packaged for a shelf life of at least ten (10) years.
- C. During construction, store parts in buildings or trailers with floor, roof and closed sides and in accordance with manufacturers' recommendations. Protect from weather, condensation and humidity.
- D. Parts and materials shall be delivered to the OWNER upon Substantial Completion of the Work or start-up. CONTRACTOR shall then place them in permanent storage rooms or areas approved by the OWNER.
- E. Provide a letter of Transmittal and spare parts receiver form including the following:
 - 1. Date of letter and transfer of parts and material.
 - 2. Contract title and number.
 - 3. CONTRACTOR'S name and address.
 - 4. Transmittal should list applicable specification sections for each set of spare parts supplied.
 - 5. Spare Parts Receiver Form.
- F. CONTRACTOR shall be fully responsible for loss or damage to parts and materials until they are transmitted to the OWNER.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01750: SPARE PARTS AND MAINTENANCE MATERIALS

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01090: REFERENCE STANDARDS

PART 1 GENERAL

1.01 GENERAL

- A. **Titles of Sections and Paragraphs:** Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.
- B. **Applicable Publications:** Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the WORK is advertised for bids shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.
- C. **Specialists, Assignments:** In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents.
- B. References herein to "Building Code" or "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO). Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01090: REFERENCE STANDARDS

for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

- C. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.
- D. References herein to "OSHA Regulations for Construction" shall mean **Title 29, Part 1926, Construction Safety and Health Regulations**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- E. References herein to "OSHA Standards" shall mean **Title 29, Part 1910, Occupational Safety and Health Standards**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- F. **Applicable Standard Specifications:** References in the Contract Documents to "Standard Specifications" or SSPWC shall mean the Standard Specifications for Public Works Construction, Latest Edition.
- G. **Applicable Safety Standards:** References herein to "Cal-OSHA" shall mean State of California, Department of Industrial Relations, Construction Safety Orders, as amended to date, and all changes and amendments thereto.

1.03 REGULATIONS RELATED TO HAZARDOUS MATERIALS

- A. The CONTRACTOR shall be responsible that all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of hazardous materials, including petroleum products.
- B. Where no specific regulations exist, chemical, hazardous, and petroleum product piping and storage in underground locations shall be installed with double containment piping and tanks, or in separate concrete trenches and vaults, or with an approved lining which cannot be penetrated by the chemicals, unless waived in writing by the OWNER.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01150: WATER TREATMENT AND DISPOSAL

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies minimum requirements for collecting, handling, treating, sampling, testing, and disposing of all groundwater and storm water encountered in construction of the facilities. Water treatment and disposal shall be in accordance with all applicable permits, regulatory requirements, and requirements specified in Section 01062, Environmental Requirements. Water treatment and disposal shall be implemented for the following:
1. Groundwater inflows into excavations.
 2. Groundwater discharged from surface dewatering wells.
 3. Wet weather surface flows entering the construction work areas.
 4. Incidental water utilized by the Contractor during the course of construction.
- B. Related Sections:
1. Section 01062 – Environmental Requirements
 2. Section 01300 – Submittal Procedures
 3. Section 01561 – Stormwater Pollution Prevention, Erosion and Sediment Control
 4. Section 02140 – Dewatering
- C. Design Criteria:
1. Design treatment processes to reduce contaminants in the discharged water to the levels specified in the applicable permits, NPDES Waste Discharge Requirements Order, and applicable discharge water quality requirements.
 2. Design and select the water treatment system, capacity, and materials as necessary to satisfactorily treat all discharged water including groundwater inflows and water resulting from the construction process. Treatment shall include removal of suspended solids, oil, grease, and other contaminants introduced by or resulting from construction operations including but not limited to the following:
 - a. Contaminants derived from cementitious products
 - b. Chemical grouts

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01150: WATER TREATMENT AND DISPOSAL

- c. Contaminants generated by the excavation process and muck handling systems
 - d. Oil, grease, and other hydrocarbons from equipment.
- D. Sampling: Take samples as specified to verify water quality before discharge. Sample receiving waters upstream and downstream of discharge points. The Contactor is responsible for all sampling and chemical analysis of samples.
- E. Minimum Discharge Water Quality Requirements: Except as may be amended or modified by applicable permits, the following minimum water quality requirements shall be complied with at all times:
 - 1. pH: between 6.5 and 8.5
 - 2. Turbidity: Increase above background levels no greater than 10 percent if background level is greater than 50 NTU and no greater than 5 NTU if background level is less than 50 NTU.
 - 3. Temperature: Increase no more than 5 degrees Fahrenheit above natural receiving water temperature.
 - 4. Free of coloration that causes nuisance or adversely affects beneficial uses.
 - 5. Free of floating materials, including solids, liquids, foams, and scum in concentrations that cause nuisance or adversely affect beneficial uses
 - 6. Free of oils, greases, waxes, and other materials in concentrations that cause visible films or coatings on the surface of the water or on objects in the water or that adversely affect beneficial uses.
 - 7. Free of toxic substances in concentrations that are harmful to aquatic organisms.

1.02 SUBMITTALS

- A. General:
 - 1. Make submittals in accordance with Section 01300.
- B. Qualifications:
 - 1. California Licensed Civil Engineer designing water handling and treatment facilities. Minimum 5 years of experience designing similar systems.
 - 2. Water Quality Testing laboratory. Appropriately certified, qualified, and experienced with the required testing methods.

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01150: WATER TREATMENT AND DISPOSAL

- C. Working Drawings for handling, treating, measuring and disposing of water from work areas. Submit Drawings and operations plans describing details of procedures, processes, and criteria required, including, but not limited to, the following:
1. Proposed general layout and location of water handling and treatment facilities at each site.
 2. Handling facilities, holding basins, and a schedule for installation of the facilities at each location.
 3. Methods and equipment proposed for treating, measuring and disposing of inflow groundwater, and removing the treatment facilities when they are no longer needed.
 4. Details for each work area shall include:
 - a. Location, depth, and size of tanks, retention basin(s), treatment ponds; and retention time, if applicable.
 - b. Sizes and locations of each discharge point including energy dissipation facilities at discharge point to prevent erosion.
 - c. Types, capacities and numbers of pumps, generators and standby units.
 - d. Calculations demonstrating the adequacy of the water handling and treatment system design including verification of capacity of receptor for discharge.
 - e. Methods for monitoring water quality to check compliance with regulatory requirements prior to discharge.
 - f. Detailed method statement for the collection of water inflows, conveyance of water to the treatment point, treatment of water, and discharge of the water from each area. The processes described for each work area shall include estimated inflow rates, means and methods of treatment including use of any chemicals and flocculents, retention times required, and statements of water quality achieved using each process, chemical consumption, cleaning of retention ponds or tanks, and any other significant aspect of water handling and treatment.
- D. Provide copies of all materials submitted for permit compliance including field and laboratory water quality results.
- E. Notify the Owner and Engineer immediately if discharge water quality at any site exceeds 80 percent of allowed limits for any monitoring parameter.
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TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01150: WATER TREATMENT AND DISPOSAL

1.03 QUALITY ASSURANCE

- A. Retain the services of a qualified supplier, subject to review and approval by Engineer, to design and furnish the required treatment facilities.
- B. Provide qualified personnel, subject to review and approval by Engineer, to install, maintain, and operate the required treatment facilities.
- C. Provide the services of an Independent Testing Laboratory, subject to review and approval by Engineer, to sample, test, and verify that the chemical and physical condition of the discharge and receiving water at each location complies with specified requirements.
- D. Preconstruction Meeting:
 - 1. Hold a meeting to review water treatment and disposal plans for each site at least 5 days but not more than 30 days prior to furnishing, installing and operating water collection, treatment, and discharge facilities.
 - 2. Review and discuss the following items:
 - a. Scope of the work to be performed.
 - b. Construction methods and constraints overview.
 - c. Equipment operating parameters.
 - d. Safety procedures.
 - e. Quality Control procedures and Quality Assurance requirements.
 - f. Reporting requirements.
 - g. Other issues as may be raised by either party.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Adequacy of Operations: Ensure that water control operations are adequate to protect the integrity of the work in progress and the finished product, to protect adjacent structures and facilities, and to satisfy discharge water quality required for the project.

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01150: WATER TREATMENT AND DISPOSAL

- B. Demonstrate the proposed system for handling, treating and disposing of groundwater, including backup power systems, and verify that adequate equipment, people and materials are provided.
- C. Integrate the water collection, handling, treatment, and disposal facilities with the work in progress, and protect adjacent structures and facilities.
- D. Follow hazardous material, and health and safety procedures when transporting, storing, and using chemicals or other hazardous materials for any water treatment processes.

3.02 EQUIPMENT AND RESOURCES

- A. Provide sufficient, qualified personnel and equipment as follows:
 - 1. Pumping equipment and machinery in good working condition.
 - 2. Competent workmen available for manual operation, maintenance, and supervision of the treatment system.
- B. Maintain a supply of chemicals, flocculants, and other materials needed for the proposed treatment system.

3.03 DISCHARGING WATER FROM THE SITE

- A. Water shall be disposed of without damage to the construction works, receiving waters, or adjacent property.
- B. Discharged water shall not cause the capacity of receiving water bodies to be exceeded including during storm events.
- C. Discharged water shall have excess energy dissipated via approved means so that it does not cause erosion of the receiving water body.
- D. All water discharged from the site shall comply with the criteria specified in Section 01062 and applicable permits listed in Document 00800 APA and APB and applicable regulations governing discharged water quality.
- E. Discharge to State or City owned storm drain or sanitary sewer facilities shall be subject to restriction and permit by the facility owners.
- F. Discharge water that does not comply with the quality standards stipulated in applicable permits and in Section 01062 shall be treated or subject to offsite disposal.
- G. Contractor shall be solely responsible for any and all fines or penalties resulting from non-compliant discharges.

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01150: WATER TREATMENT AND DISPOSAL

- H. Based on analytical results, collected groundwater may be used for dust control. Application of groundwater as dust control is to be done in a manner which would prevent direct skin exposure or accidental ingestion.
- I. The Contractor may discharge water that they have demonstrated to be clean according to the applicable permit conditions to the following discharge locations:
 - 1. CAW owned ASR Well Site 2 washwater pond
 - 2. Monterey Peninsula Water Management District (MPWMD) owned ASR Well Site 1 washwater pond
 - 3. Monterey Regional Water Pollution Control Agency (MRWPCA) recharge pond (pending MRWPCA approval) at the end of the Salinas Valley Return Pipeline
 - 4. Lake El Estero, City of Monterey (pending City of Monterey approval)
 - 5. Dust control application

3.04 HANDLING OF WATER ENCOUNTERED DURING TRENCH EXCAVATION

- A. When groundwater is encountered and dewatering activities are performed, all water shall be stored in tanks prior to testing and discharge.
- B. During construction, remove and treat all water inflows to excavations. Provide pumps, sumps, water discharge lines, other water handling facilities as needed, and water storage and treatment facilities at each site, as appropriate. Treat, store, and discharge groundwater and surface water inflows for each site in addition to water used for construction purposes at Engineer approved locations only.

3.05 FIELD QUALITY CONTROL

- A. Water Quality Testing:
 - 1. Any groundwater samples collected shall be analyzed by a state certified lab. The samples shall be analyzed for metals, TPH-g, TPH-d, and VOCs.
 - 2. Any groundwater samples collected shall be given a unique sample ID, stored on ice, and transported to a state certified lab under proper chain of custody.
 - 3. Sample discharge and receiving waters according to permit conditions which at a minimum include:
 - a. At no greater than the intervals specified in Section 01062 and in applicable discharge permits.

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01150: WATER TREATMENT AND DISPOSAL

- b. Immediately upstream of the discharge point.
 - c. Downstream of the discharge point a sufficient distance to allow for mixing with receiving waters.
- 4. Keep complete records showing the date, time, and location of each test, the quantity of discharge, and the analytical results as well as the records specified in Section 01060.
 - a. Notify the Engineer immediately of any test that finds the water to be non-conforming.
 - b. Submit copies of the results of those tests, together with written details of the actions being taken to remedy the non-conformance.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01150: WATER TREATMENT AND DISPOSAL

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01210: PRECONSTRUCTION CONFERENCE

PART 1 GENERAL

1.01 DESCRIPTION

- A. Date, Time and Location: Conference will be held after execution of the Contract and before construction is started at the site. OWNER will fix the date, time and location of the meeting, in accordance with the General Conditions.
- B. OWNER shall prepare agenda, preside at meeting, and prepare and distribute a transcript of proceedings to all parties.
- C. CONTRACTOR shall provide data required, contribute appropriate items for discussion, and be prepared to discuss all items on agenda.

1.02 REQUIRED ATTENDANCE

- A. CONTRACTOR and major Subcontractors.
- B. OWNER'S representative.
- C. ENGINEER.
- D. Utility company representatives.

1.03 AGENDA

- A. Agenda will include, but will not necessarily be limited to, the following:
 - 1. Designation of responsible personnel.
 - 2. Subcontractors.
 - 3. Coordination with other contractors and projects.
 - 4. Progress schedule.
 - 5. Processing of Shop Drawing Submittals.
 - 6. Schedule of Shop Drawing submittals.
 - 7. Processing of Field Orders, Requests for Information and Clarification and Change Orders.
 - 8. Requirements for copies of Contract Documents.
 - 9. Insurance in force.
 - 10. Schedule of values.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01210: PRECONSTRUCTION CONFERENCE

11. Processing and Schedule of Payments.
12. Use of premises.
13. CONTRACTOR responsibility for safety and first aid procedures.
14. Security.
15. Housekeeping.
16. Field Offices.
17. Record Drawings.
18. Letter of Notice to Proceed.
19. Permits.
20. Emergency Telephone Numbers.
21. Operation and Maintenance Manuals.
22. Temporary Utilities.
23. Any other project related items.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01220: PROGRESS MEETINGS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Date and Time:
 - 1. Regular Meetings: Biweekly on a day and time agreeable to OWNER and CONTRACTOR.
 - 2. Other Meetings: On call.
- B. Place: CONTRACTOR'S field office at Project site, or other mutually agreed upon location.
- C. OWNER shall prepare agenda, preside at meetings, and prepare and distribute a transcript of proceedings to all parties.
- D. CONTRACTOR shall provide data required and be prepared to discuss all items on agenda.

1.02 MINIMUM ATTENDANCE

- A. CONTRACTOR:
 - 1. When needed for the discussion of a particular agenda item, CONTRACTOR shall require representatives of Subcontractors or suppliers to attend a meeting.
- B. OWNER'S representative, if required.
- C. Others, as appropriate.
- D. Representatives present for each party shall be authorized to act on their behalf.

1.03 AGENDA

- A. Agenda will include, but will not necessarily be limited to, the following:
 - 1. Transcript of previous meeting.
 - 2. Progress since last meeting.
 - a. CONTRACTOR
 - b. Subcontractors
 - 3. Planned progress for next period.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01220: PROGRESS MEETINGS

4. Problems, conflicts and observations.
5. Change Orders.
6. Status of Shop Drawings.
7. Quality standards and control.
8. Schedules, including off-site fabrication and delivery schedules; corrective measures, if required.
9. Coordination between parties.
10. Safety concerns.
11. Construction Photographs.
12. Record Drawings.
13. Other business.
14. Next meeting date.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01300: CONTRACTOR SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. List of material sources.
- B. Submittal requirements.

1.02 RELATED SECTIONS

- A. General Conditions – 6.16 Shop Drawings and Samples
- B. Project progress schedules and status reports are specified in Section 01311 – Construction Schedule.
- C. Submittals related to the CONTRACTOR's quality program are specified in Section 01400 - Quality Control.
- D. Submittals required to complete the Contract closeout are specified in Section 01700 – Project Closeout.
- E. Preparation and submission of project record documents are specified in Section 01700- Project Closeout.
- F. Preparation and submission of equipment and systems operation and maintenance manuals and training plan are specified in Section 01730 - Operation and Maintenance Data.

1.03 LIST OF MATERIALS SOURCES:

The CONTRACTOR shall submit to the ENGINEER a list of the CONTRACTOR's sources of materials. The list shall be submitted in sufficient time to permit proper inspections and testing of materials to be furnished from such listed sources in advance of their use.

1.04 SUBMITTAL REQUIREMENTS

- A. Schedule of Submittals: Within ten calendar days after the effective date of Notice to Proceed, the CONTRACTOR shall submit a completed submittal schedule and list of products for all items requiring the ENGINEER's review and approval, as follows:
 - 1. Submittals, including description of the item and name of manufacturer, trade name and model number.
 - 2. Specification reference.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01300: CONTRACTOR SUBMITTALS

3. Intended submission/resubmission date(s).
4. Order release date.
5. Lead time to delivery/anticipated delivery date(s).
6. Highlight any items that require expedited review to meet the project schedule.

These schedules shall be presented in a form acceptable to the ENGINEER in both electronic and hard copy versions and shall be updated and sent to the ENGINEER on a monthly basis. Identify all submittals that are required by the Contract Documents and determine the date on which each submittal will be submitted in conformance with the schedules specified in Section 01311 – Construction Schedule.

- B. Professional Seal Required: Submittals involving engineering design services, when required by the Contract Documents or by governing codes and regulations, such as shoring and underpinning, excavation support structures, falsework for concrete, corrosion control system design, and load and design calculations, shall be sealed and signed in blue ink by a professional engineer, currently registered in the State of California, for the discipline involved.
- C. Review Period:
1. Prepare submittals sufficiently in advance so that approval may be given before commencement of related work.
 2. Allow 30 calendar days after receipt by the ENGINEER for review of each submittal, including resubmittals.
 3. The CONTRACTOR shall be responsible for determining whether or not certain governmental entities and utility districts require longer review periods. When longer review periods are required, the CONTRACTOR shall schedule the Work accordingly, so that the Work and project progress schedules are not adversely impacted.
- D. Submittal Delivery: Ship submittals prepaid or deliver by hand directly to the ENGINEER.
- E. Transmittal Form: Accompany submittals with an OWNER-furnished transmittal form in duplicate containing the following information:
1. The CONTRACTOR's name, address, and telephone number;
 2. Submittal number and date;
 3. Contract title and number;

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01300: CONTRACTOR SUBMITTALS

- 4. Supplier's, manufacturer's, or SubCONTRACTOR's name, address, and telephone number; and
- 5. Subject identification, including Contract Drawing and Specification reference.
- F. Changes in Approved Submittals: Changes in approved submittals will not be allowed unless those approved submittals with changes have been resubmitted and approved, in the same manner as the original submittal.
- G. Supplemental Submittals: Supplemental submittals initiated by the CONTRACTOR for consideration of corrective procedures shall contain sufficient data for review. Make supplemental submittals in the same manner as initial submittals.

1.05 CONTRACTOR'S RESPONSIBILITIES

- A. CONTRACTOR's Review and Approval:
 - 1. Each submittal shall be reviewed, stamped, and signed as reviewed and approved by the CONTRACTOR prior to submission. The CONTRACTOR's approval shall indicate review and approval with respect to the following responsibilities:
 - 2. The CONTRACTOR shall be responsible for:
 - a. The correctness of the drawings, for shop fits and field connections, and for the results obtained by the use of such drawings.
 - b. Verification of catalog numbers, and similar data.
 - c. Determination and verification of field measurements and field construction criteria.
 - d. Checking and coordinating information in the submittal with requirements of the Work and of the Contract Documents.
 - e. Determination of accuracy and completeness of dimensions and quantities.
 - f. Confirmation and coordination of dimensions and field conditions at the site.
 - g. Safety precautions.
 - h. Errors or omissions on submittals.
 - i. Coordination and performance of work of all trades.
 - j. Identification of deviation(s) from Contract requirements.
 - 3. The CONTRACTOR shall coordinate each submittal with the requirements of the Work, placing particular emphasis upon assuring that each submittal of one trade is compatible with other submittals of related work. Ensure submittal is complete with all relevant data required for review.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01300: CONTRACTOR SUBMITTALS

4. The CONTRACTOR shall stamp, initial or sign the submittal, certifying:
 - a. Dimensional compatibility of the product with the space in which it is intended to be used.
 - b. Review of submittals for compliance with Contract requirements.
 5. Do not start work for that requires approval by the ENGINEER until submittals have been returned to the CONTRACTOR with official indication that approval has been granted by the ENGINEER.
 6. If the submittal is designated to be sent to the ENGINEER for information, approval by the designated approval authority shall take place before submission to the ENGINEER.
 7. Approval of drawings and associated calculations by the ENGINEER shall not relieve the CONTRACTOR from the responsibility for errors or omissions in the drawings and associated calculations, or from deviations from the Contract Documents, unless submittals containing such deviations were submitted to the ENGINEER and the deviations were specifically called to the attention of the ENGINEER in the letter of transmittal and within the submittal, and approved specifically by the ENGINEER as a Contract change.
 8. Approval of the CONTRACTOR's submittal by the ENGINEER shall not relieve the CONTRACTOR of any responsibility, including responsibility for accuracy and agreement of dimensions and details.
- B. Review by the ENGINEER: One marked up reproducible set of drawings, one copy of product data, and one sample will be returned to the CONTRACTOR.
- C. Distribution of Submittals after Review: Distribute prints or copies of approved submittals, bearing the ENGINEER's or designated approval authority's stamp and signature, to the CONTRACTOR's field office and the ENGINEER's field office; to affected and concerned SubCONTRACTORS, Suppliers, and fabricators; and to affected and concerned members of the CONTRACTOR's workforce.

1.06 ENGINEER'S REVIEW

- A. Submittals will be reviewed for conformance with requirements of the Contract Documents. Review of a separate item will not constitute review of an assembly in which the item functions. Neither review nor approval shall relieve the CONTRACTOR from CONTRACTOR's responsibility for accuracy of submittals, for conformity of submittals to requirements of Contract Documents, for compatibility of described product with other provided products and the rest of the system, or for prosecution and completion of the Contract in accordance with the Contract Documents.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01300: CONTRACTOR SUBMITTALS

- B. Submittals shall be understood as being made for approval, unless otherwise specified, for example, as being made for information, record, or review. The ENGINEER will indicate its reviews of submittals and the action taken (approvals and non-approvals) by means of its review stamp. The review stamp will be affixed by the ENGINEER, the action block will be marked, and the stamp will be signed in blue ink and dated.
1. Approval of the submittal by the ENGINEER does not relieve the responsibilities of the professional ENGINEER who originally signed and sealed the submittal or the responsibilities of the CONTRACTOR to meet the Contract requirements..
- C. The review-stamp action-block marks will have the following meanings:
1. The mark APPROVED is an acceptance, and means that the submittal appears to conform to the respective requirements of the Contract Documents; that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed; and that the submittal need not be resubmitted.
 2. The mark APPROVED AS NOTED - RESUBMISSION NOT REQUIRED is an acceptance, and means that the submittal appears to conform to the respective requirements of the Contract Documents upon incorporation of the reviewer's corrections, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed. Submittals so marked need not be resubmitted unless the CONTRACTOR challenges the reviewer's exception within 7 calendar days. All noted changes will be reflected in the as-built drawing by the CONTRACTOR.
 3. The mark LIMITED APPROVAL – RESUBMISSION REQUIRED is an approval except for the work impacted by the notes and comments, and means that the submittals requires corrections to conform to the respective requirements of the Contract Documents. Fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed at the Contract's risk only for the elements of work not impacted by and changes required to incorporate the reviewer's corrections. The noted work cannot proceed until verification by the ENGINEER that the review's correction have been properly incorporated in the submittal.
 4. The mark NOT APPROVED - RESUBMISSION REQUIRED is a disapproval, and means that the submittal requires corrections to conform to the respective requirements of the Contract Documents, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may not proceed until incorporation of the reviewer's corrections and verification by the ENGINEER that the reviewer's corrections have been properly incorporated in the submittal.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01300: CONTRACTOR SUBMITTALS

- 5. The mark REJECTED – RESUBMISSION REQUIRED is a disapproval, and means that the submittal is deficient to the degree that the reviewer cannot correct the submittal with a reasonable degree of effort, has not made a thorough review of the submittal, and that the submittal needs revision and is to be corrected and resubmitted.
 - 6. The mark NOT REVIEWED is acknowledgement of receipt and means that the submittal is for information and record purposes only.
- D. Review stamps or other approval methods of the various designated approval authorities may not be the same as those of the OWNER. The CONTRACTOR shall work with the various designated approval authorities and shall obtain approvals in the clearest and most straightforward manner possible.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01310: SCHEDULE OF VALUES

PART 1 GENERAL

1.01 GENERAL

- A. This Section defines the process whereby the Schedule of Values (lump sum price breakdown for the Pump Station) shall be developed.

1.02 SUBMITTAL REQUIREMENTS

- A. Submit within thirty 30 consecutive calendar days after Notice to Proceed.
- B. The CONTRACTOR shall submit a preliminary Schedule of Values for the major components of the WORK at the Preconstruction Conference in accordance with Section 01010 - Summary of Work. The listing shall include, at a minimum, the proposed value for the following major WORK components:
1. Provide a detailed cost breakdown for each Bid Item listed in the Schedule of Bid Prices, covering all items of Work by classification, in accordance with the Construction Specifications Institute 16 Division format (1988 Edition) as represented by the Specifications Table of Contents.
 2. Provide a breakdown of each lump sum item into all identifiable separate components of work as specified and as shown on the Drawings, and for each component list amounts for labor, material, equipment, fixed cost elements, incidental expenses, and overhead and profit.
 3. Allocate all overhead and profit across all of the work activities in the Schedule of Values based only on the pro rata value of each work activity and without regard to the type of work, timing, or other considerations. Overhead and profit shall not be listed as separate items.
 4. Identify separate line items for each component of work as noted above including but not limited to each item of temporary work, all components of Mobilization and Demobilization, final cleaning, all major submittals such as operations and maintenance manuals, and start-up testing.
- C. Incorporate all executed change orders into the Schedule of Values and allocate value as required by this Section.

1.03 COORDINATION

- A. Coordinate the preparation of the schedule of values with Contractor's progress schedule.
1. The Schedule of Values shall be developed utilizing resource loading of the Baseline CPM Progress Schedule as specified in Section 01310-Progress Schedules.
 2. The Contractor shall prepare and submit a detailed Schedule of Values to the City Representative coordinated with the Baseline CPM Progress Schedule submittal.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01310: SCHEDULE OF VALUES

- 3. An unbalanced Schedule of Values providing for early overpayment to Contractor on lump sum work will not be accepted.
- B. Coordinate the preparation of the Schedule of Values with Contractor's Application for Payment.
 - 1. The Schedule of Values shall be coded to the Schedule of Bid Prices in sufficient detail to facilitate continued evaluation of progress payment applications and submitted to the City Representative for approval prior to the first Application for Payment.
 - 2. In addition to construction work items that have definable quantity scope values, the Schedule of Values shall include other discrete items of work including but not limited to mobilization, administration, material procurement, final cleaning, operations and maintenance manuals, start-up, and adjusting and testing. The Schedule of Values shall indicate each item's relationship to activities in the Baseline CPM Progress Schedule.
- C. The Schedule of Values shall be coded such that the sum of the Schedule of Values roll up to and are in balance with each lump sum bid item.
- D. The Schedule of Values shall be updated to reflect all approved Change Orders prior to the next scheduled submission of the Monthly Schedule update and Application for Payment.

1.04 REVIEW AND ACCEPTANCE

- A. The City Representative shall review and return Contractor's Schedule of Values with comments within ten (10) working days of its receipt. Contractor shall make corrections requested by the City Representative and resubmit for approval within five (5) working days.
- B. Final acceptance by the City Representative shall indicate only consent to the Schedule of Values as a basis for preparation of applications for progress payments, and shall not constitute an agreement as to the value of each indicated item.
- C. No payments for any bid item other than Mobilization shall be made nor shall the City Representative accept any change order requests until the detailed Schedule of Values is submitted and accepted as required herein.

1.05 PROJECT-SPECIFIC REQUIREMENTS

- A. Mobilization
 - 1. The maximum amount included in the Schedule of Values for Mobilization as specified in Section 01013 shall be 5 percent of the total original Contract Price.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01310: SCHEDULE OF VALUES

2. Mobilization payments will be processed as follows:
 - a. 40 percent of the Schedule of Values amount for Mobilization will be paid in consideration of the Contractor's furnishing of performance and payment bonds and specified insurance, and shall be included with the first Application for Payment.
 - b. When 5 percent of the total original Contract Price is earned from other Schedule of Value items, excluding Mobilization, an additional 40 percent of the Schedule of Values amount for Mobilization amount shall be included in the next scheduled Application for Payment.
 - c. When 10 percent of the total original Contract Price is earned from other Schedule of Value items, excluding payments for Mobilization, the remaining (20) percent of the Schedule of Values amount for Mobilization shall be included in the next scheduled Application for Payment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01310: SCHEDULE OF VALUES

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01311: CONSTRUCTION SCHEDULE

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

B. General Conditions

1. 2.05 Preliminary Schedules

2. 6.04 Progress Schedule

C. Section 01010 - Summary of Work.

Section 01062 – Environmental Requirements

D. Section 01300 - Submittals.

Section 01313 – Construction Schedule Constraints

1.02 DESCRIPTION OF WORK

A. This section describes preparation and submittal of the Project Schedule. The project schedule is critical in that this project is complex and the Owner has specified an accelerated schedule for completing construction. It is critical for the Contractor to design a schedule that they can meet since construction of the desalination plant and storage of rarely available wet year water is dependent on the timely completion of this project.

1.03 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or consultant specializing in Scheduling with three (3) years minimum experience in scheduling construction work of a complexity comparable to this project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.04 FORMAT

A. Schedule: Format to be determined by contractor.

B. Scale and Spacing: Time scale using units of approximately one week. Allow spacing for notations and revisions

TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 01311: CONSTRUCTION SCHEDULE

1.05 SCHEDULES

- A. The progress schedule to be prepared by Contractor pursuant to AIA Document A201 as supplemented shall consist of a Schedule as described herein. The Schedule shall be based on the precedence diagramming method with no lead and/or lag time. Preparation of the Schedule is solely the responsibility of the Contractor; senior management personnel shall actively participate in its development. The Schedule shall consist of a detailed network, mathematical analyses, and network diagrams.
- B. The network diagram shall show the order and interdependence of activities and the sequence in which the work is to be accomplished as planned by Contractor. The basic concept of a network diagram shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.
- C. The substantial and final completion dates for the work which is shown in the complete Schedule shall be those detailed in the Contract documents.
- D. Activities contained in the schedule and the mathematical analyses and shown on the schedule shall include:
 - 1. Construction activities, which shall have a minimum duration of one work day and a maximum duration of fifteen work days. The activity shall be descriptive of the work to be performed. If, in the opinion of the Contractor, a task requires greater than fifteen work days to perform, that task shall be broken into two or more logically discrete activities, each with durations equal to or less than fifteen work days. The definition "start" or "finish" are not acceptable.
 - 2. Submittal, review and approval of samples of materials and shop drawings. A minimum of 10 working days or two (2) working weeks per sheet of drawings to be reviewed, whichever is greater, shall be scheduled for review and approval of submittals by Architect.
 - 3. Fabrication, installation and testing of special materials or equipment.
 - 4. Activities of User, including delivery and installation of Owner-provided equipment and furnishings, substantial completion, punch list, and closeout requirements, or of ENGINEER or others that affect progress of the work.
- E. The schedule shall show the duration of each activity in work days. Update monthly to show actual progress of each activity.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01311: CONSTRUCTION SCHEDULE

- F. Related activities shall be grouped in the schedule. The activities on the critical path shall be highlighted. Weekends, holidays and other non-work periods shall be indicated. Where float or slack exists, the activities shall be shown at the earliest times they can be completed.

1.06 SUBMITTALS

- A. A preliminary schedule defining the work during the first sixty (60) days following the Notice to Proceed shall be submitted to ENGINEER within 10 days following Notice of Award. Contractor's general approach for the balance of the contract shall also be indicated. The format of this submittal and the information provided therein shall be in accordance with Paragraphs 1.04 and 1.05 of this section.
- B. The complete Schedule shall be submitted to ENGINEER within 30 days following the Notice to Proceed.
- C. Documents to be submitted shall include:
1. Three copies of the proposed schedule.
- D. Contractor shall submit, as part of its monthly Application for Payment, a report of the actual construction progress by updating the Schedule and the report required in Subparagraph 1.05 of this section. All approved contract changes shall be included in this report. This report shall be submitted in the format and media described in Paragraph 1.05 of this section.
1. The report shall show the activities or portions of activities completed during the reporting period and their total value as basis for the Contractor's request for payment. The report shall state the percentage of the work actually completed and scheduled as of the report date and the progress along the critical path in terms of days ahead or days behind the mutually acceptable schedule dates. If the work is behind schedule, progress along other paths with negative float or slack shall also be reported
 2. Contractor shall submit a narrative report with the updated Schedule which shall include a description of current and anticipated problem areas, current and anticipated delaying factors, the impact of these areas and factors, and actions taken or proposed to correct these areas and factors.

1.07 UPDATING SCHEDULE

- A. If Contractor thereafter desires to make changes in its method of operating or scheduling, it shall notify the ENGINEER in writing, stating the reasons for the proposed change. If the ENGINEER considers these changes to be of a major nature it may require Contractor to revise and submit, at no increase in the Contract Sum or Contract Time, all of the

TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 01311: CONSTRUCTION SCHEDULE

affected portion of the Schedule to show the impact of the requested change on the balance of the work. Such a submittal shall undergo the review and acceptance process defined in Section 1300. A change may be considered to be of a major nature if the time estimated to be required or actually used for an activity, the network logic, or sequence of activities varies from the original Schedule to a degree that there is reasonable doubt regarding the Contract Completion Date. Changes affecting activities with adequate slack time shall be considered as minor changes, except that an accumulation of minor changes may be considered a major change when their cumulative effect might affect the Contract completion date. Out of sequence operations by the Contractor without prior notification to the ENGINEER may be considered a "de facto" change of a major nature by the ENGINEER.

1.08 DISTRIBUTION

- A. Following joint review, distribute copies of updated schedules to Contractor's project site file, to Subcontractors, Suppliers, Engineer and Owner.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01400: QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Source of materials.
- B. Work quality.
- C. Manufacturer's specifications and instructions.
- D. Specialist applications/installer.
- E. Manufacturer's field services.
- F. Finish tolerances.
- G. Engineer's monitoring.
- H. Engineer's inspections and tests.
- I. Contractor's quality testing.
- J. Test reports.
- K. Quality control audits.
- L. Certificates of compliance.
- M. Special inspections.

1.02 MEASUREMENT AND PAYMENT

- A. Separate measurement or payment will not be made for work required under this Section. All costs in connection with the work specified herein will be considered to be included with the related item of work in the Bid Schedule of the Bid Form, or incidental to the Work.

1.03 SUBMITTALS

- A. General: Refer to Section 01300 – Contractor Submittals, for submittal requirements and procedures.
- B. Within five days after completion of testing performed by or for the contractor, submit test results of such tests to the Engineer. Identify test reports with the information specified for submittals in Section 01300 – Contractor Submittals, and additionally, the name and address of the organization performing the test, and the date of the tests.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01400: QUALITY CONTROL

1.04 SOURCE OF MATERIALS

- A. In accordance with Section 01300 – Contractor Submittals, the Contractor shall notify the Engineer in writing of the sources from which the Contractor proposes to obtain materials requiring Owner approval, certification, or testing.

1.05 WORK QUALITY

- A. Shop and field work shall be performed by mechanics, crafts-persons, artisans, and workers skilled and experienced in the fabrication and installations of the work involved. The work shall be performed in accordance with the Contract Documents and the reviewed and accepted Shop Drawings.
- B. Work shall be erected and installed plumb, level, square, and true, or true to indicated angle, and in proper alignment and relationship to the work of other trades. Finished Work shall be free from defects and damage.

1.06 MANUFACTURER’S SPECIFICATIONS AND INSTRUCTIONS

- A. Unless otherwise indicated or specified, manufactured materials, products, processes, equipment, systems, assemblies, and the like shall be erected, installed, or applied in accordance with the manufacturer’s instructions, directions, or specifications. Said erection, installation, or application shall be in accordance with printed instructions furnished by the manufacturer of the material or equipment concerned for use under conditions similar to those at the jobsite.
- B. Any deviation from the manufacturer’s printed installation instructions and recommendations shall be explained and acknowledged as correct and appropriate for the circumstances, in writing, by the particular manufacturer. The Contractor will be held responsible for installations contrary to the respective manufacturer’s installations and recommendations.

1.07 SPECIALIST APPLICATOR/INSTALLER

- A. Materials, equipment, systems, and assemblies requiring special knowledge and skill for the application or installation of such materials, equipment, systems, or assemblies shall be applied or installed by the specified product manufacturer or its authorized representative or by a skilled and experienced Subcontractor qualified and specializing in the application or installation of the specified product.
- B. The installation Subcontractor shall be approved by the product manufacturer, as applicable.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01400: QUALITY CONTROL

1.08 MANUFACTURER'S FIELD SERVICES

- A. The Contractor shall have the manufacturer of a product, system, or assembly that requires special knowledge and skill for the proper application or installation of such product, system, or assembly provide appropriate field or job service at no additional cost to the Owner. The Contractor shall have the manufacturer inspect and approve the application or installation work.
- B. The Contractor shall make all necessary arrangements with the manufacturer of the products to be installed to provide onsite consultation and inspection services to assure the correct application or installation of the product, system, or assembly.
- C. The manufacturer's authorized representative shall be present at the time any phase of this work is started.
- D. The Contractor shall have the manufacturer inspect and approve all surfaces over which, or upon which, the manufacturer's product will be applied or installed.
- E. The Contractor shall have the manufacturer's representative make periodic visits to the site as the work progresses as necessary for consultation and for expediting the work in the most practical manner.

1.09 ENGINEER'S MONITORING

- A. The Engineer will perform surveillance inspection of the Contractor's on-site construction activities. Surveillance inspection consists of a review, observation, or inspection of Contractor personnel, material, equipment, processes, and test results, performed at random or at selected stages of the construction operations. The purpose of surveillance inspection is to determine if an action has been accomplished or if documents have been prepared in accordance with selected requirements of the Contract Documents.
- B. The Contractor shall provide access to the Work and shall furnish the Engineer reasonable facilities for obtaining such information as may be necessary to be fully informed of the quality and progress of the Work.
- C. Surveillance inspection does not take the place of the Contractor's quality programs or assume any responsibility for such programs or the quality of the Work. The Contractor shall establish its own quality program, perform the required inspections, and provide the necessary documentation to assure that acceptable quality has been achieved. The Contractor is responsible for specifying and controlling the quality of work performed by its Subcontractors.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01400: QUALITY CONTROL

1.10 ENGINEER'S INSPECTIONS AND TESTS

- A. The Engineer may perform inspections and tests as necessary to determine the Contractor's compliance with Contract requirements. The Engineer may perform such additional inspections and tests as it deems necessary to verify compliance with Contract requirements.
- B. For inspections and tests by the Engineer, the Engineer will provide the services of a qualified testing laboratory, soils engineer, or inspector, selected and paid for by the Owner.
- C. The Owner-employed testing laboratory will supervise the preparation and selection of samples required for testing.
- D. The Contractor shall provide such facilities and assistance as the testing laboratory may require for obtaining the necessary samples.

1.11 CONTRACTOR'S QUALITY CONTROL TESTING

- A. Scope: The Contractor shall perform quality control inspections and tests as necessary to ensure compliance with Contract requirements.
- B. Testing Services:
 - 1. Quality control testing is the testing of materials prior to their delivery from a manufacturer, or during construction, such as soils compaction tests, load tests, concrete tests during placement, concrete strength tests, pipe leakage tests, and such other tests as are specified in the various Sections of the Specifications to ensure compliance with the Contract Documents. The Contractor shall assume full responsibility for quality control testing and shall give sufficient notice to the Engineer to permit the Engineer to witness the tests. Quality control testing shall be at the expense of the Contractor and shall be performed by a Contractor-employed independent testing firm.
- C. Laboratory Tests: All laboratory testing shall be performed by an independent, qualified testing laboratory approved by the Engineer. The selected laboratory shall employ the proper equipment and qualified testing personnel for the testing specified in these Specifications. The Contractor shall obtain the Engineer's approval of the testing equipment and personnel. The Engineer may monitor the operations to ensure that tests are being performing in accordance with approved procedures and in compliance with these Specifications.
- D. Qualification of Laboratory Testing Personnel: Personnel performing laboratory tests shall be qualified for such work by virtue of prior experience and training.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01400: QUALITY CONTROL

- E. Testing Equipment: Testing equipment shall be in satisfactory operating condition, of adequate capacity and range, and accurately calibrated. Testing equipment shall be calibrated in accordance with national standards which are certified by the National Institute of Standards and Technology. Testing equipment shall be calibrated at the frequency recommended by the equipment manufacturer.

1.12 TEST REPORTS

- A. Test reports shall include the following information:
1. Actual test results compared with the Contract requirements and identification of all non- conforming items.
 2. Calibration Certificates.
- B. The Engineer will make available to the Contractor copies of all test reports of tests performed by the Engineer.

1.13 QUALITY CONTROL AUDITS

- A. The Engineer may perform quality control audits of the Contractor's, Subcontractor's, and Supplier's quality records and performance. The Contractor shall ensure that all quality control records and places of work are open and available to the Engineer for inspection. The Engineer will give 30 days notice of intention to audit specific activities or installations.
- B. The Contractor, Subcontractor, or Supplier being audited shall be available during the audit as required by the audit team.

1.14 CERTIFICATES OF COMPLIANCE

- A. The Contractor may use certificates of compliance for certain materials and products in lieu of the specified sampling and testing procedures. Submit any certificates required for demonstrating proof of compliance of materials with specification requirements with each lot of material delivered to the Work. The lot so certified shall be clearly identified by the certificate. Certificates shall be signed by an authorized representative of the producer or manufacturer and shall state that the material complies in all respects with Contract requirements.
- B. The Contract Schedule specified in Section 01311 - Construction Schedule, shall indicate the date scheduled for the submittal of certificates. In the case of multiple shipments, each of which shall be accompanied by a certificate of compliance, the scheduled date on the Project CPM Schedule shall indicate the initial submittal only.
- C. The certificate of compliance shall be accompanied by a certified copy of test results or shall state that such test results are on file with the producer or manufacturer and shall be

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01400: QUALITY CONTROL

furnished to the Owner on request. In addition to the identifying information specified for submittals in Section 01300 – Contractor Submittals, the name and address of the organization performing the tests, the date of the tests, and the quantity of material shipped.

- D. Materials used on the basis of a certificate of compliance may be sampled and tested by the Engineer at any time. The fact that material is used on the basis of a certificate of compliance shall not relieve the Contractor of its responsibility for incorporating material in the Work which conforms to the requirements of the Contract, and any such material not conforming to such requirements will be subject to rejection, whether in place or not.
- E. The Owner reserves the right to reject a certificate of compliance and require submittal and execution of sampling and testing procedures described herein.

1.15 SPECIAL INSPECTONS

- A. Any special inspections required shall be executed by an independent inspection organization, not affiliated with the Contractor or its regular quality control organization.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01410: TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 DESCRIPTION

- A. The OWNER will employ and pay for an independent testing laboratory to perform the specified services.
- B. Inspection, sampling and testing shall be as specified in the individual Sections. These include:
 - 1. Section 02220, Excavation and Backfill.
 - 2. Section 03300, Cast-In-Place Concrete.
 - 3. Section 03600, Grout.
 - 4. Section 04065, Masonry Mortar and Grout.
 - 5. Section 09900, Painting.
- C. The OWNER will pay for the testing listed above, except for repeat testing which results from CONTRACTOR'S negligence or his repeated failure to meet Contract Document requirements.
- D. CONTRACTOR shall pay for:
 - 1. Tests not listed above.
 - 2. Tests made for CONTRACTOR'S convenience.
 - 3. Repeat tests required because of CONTRACTOR'S negligence or repeated failure, three (3) or more tests for the same item, to meet Contract Document requirements.
- E. The testing laboratory is not authorized to approve or accept any portion of the Work; rescind, alter or augment the requirements of the Contract Documents; or perform any duties of CONTRACTOR.

1.02 QUALIFICATIONS OF LABORATORY

- A. Where applicable, the testing laboratory will meet "Recommended Requirements for Independent Laboratory Qualification", latest edition, published by American Council of Independent Laboratories and the basic requirements of ASTM E 329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01410: TESTING LABORATORY SERVICES

- B. Testing equipment used by the laboratory will be calibrated at maximum twelve (12) month intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.03 LABORATORY DUTIES

- A. The testing laboratory shall:
1. Cooperate with CONTRACTOR and provide qualified personnel promptly on notice.
 2. Perform specified inspections, sampling and testing of materials and methods of construction; comply with applicable standards; and ascertain Compliance with the requirements of the Contract Documents.
 3. Promptly notify OWNER and CONTRACTOR of irregularities or deficiencies of Work observed during performance of services.
 4. Promptly submit five (5) copies of reports of inspections and tests to OWNER, including:
 - a. Date issued.
 - b. Project title and number.
 - c. Testing laboratory name and address.
 - d. Date of inspection or sampling.
 - e. Record of temperature and weather.
 - f. Date of test.
 - g. Identification of product and Specification Section.
 - h. Location in Project.
 - i. Type of inspection or test.
 - j. Results of tests and observations regarding compliance with Contract Documents.
 5. Perform additional tests and services, as required by OWNER.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. CONTRACTOR shall:

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01410: TESTING LABORATORY SERVICES

1. Cooperate with laboratory personnel and provide access to Work and to manufacturer's operations.
2. Provide to laboratory, preliminary representative samples of materials to be tested, in required quantities.
3. Furnish copies of product test reports.
4. Provide to the laboratory the preliminary design mix proposed for concrete and other material mixes that require testing by the testing laboratory.
5. Furnish labor and facilities:
 - a. To provide access to Work to be tested.
 - b. To obtain and handle samples at the site.
 - c. To facilitate inspections and tests.
 - d. For laboratory's exclusive use for storage and curing of test samples.
 - e. Forms for preparing concrete test beams and cylinders.
6. Notify laboratory and OWNER sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.
7. Arrange with laboratory and pay for additional samples and tests required for CONTRACTOR'S convenience.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01410: TESTING LABORATORY SERVICES

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01420: SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 DESCRIPTION

- A. The following types of Work will be subject to Special Inspections, which may be performed by the OWNER or by such other special inspector as the OWNER may employ:
1. High-Strength Bolting: During all bolt installations and tightening operations.
 - a. Exceptions:
 - (1) The special inspector need not be present during the entire installation and tightening operation, provided he has:
 - (a) Inspected the surfaces and bolt type for conformance to plans and specifications prior to start of bolting, and "will, upon completion of all bolting, verify the minimum specified bolt tension for ten percent of the bolts for each connection, with a minimum of two bolts per connection".
 - (2) In bearing-type connections when threads are not required by design to be excluded from the shear plane, inspection prior to or during installation will not be required.
 2. All Reinforcing Steel
 3. All Concrete
 4. Structural Backfill
 5. Structural Welding
 6. Structural Masonry
 7. Epoxy Anchor Systems
 8. All Electrical Systems and Components.
 9. All Architectural Components.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01420: SPECIAL INSPECTIONS

1.02 SPECIAL INSPECTOR

- A. The special inspector shall be a qualified person who shall demonstrate his competence to the satisfaction of the regulatory authorities for inspection of the particular type of construction or operation requiring special inspection.

1.03 DUTIES AND RESPONSIBILITIES OF SPECIAL INSPECTOR

- A. The special inspector shall observe the Work assigned to be certain it conforms to the Contract Documents.
- B. The special inspector shall furnish inspection reports to the regulatory authorities, the OWNER and other designated persons. All discrepancies shall be brought to the immediate attention of CONTRACTOR for correction, then, if uncorrected, to the OWNER and regulatory authorities.
- C. The special inspector shall submit a final signed report stating whether the Work requiring special inspection was, to the best of his knowledge, in conformance with the Contract Documents and the applicable workmanship provision of these codes.

1.04 PERIODIC SPECIAL INSPECTIONS

- A. Some inspections may be made on a periodic basis and satisfy the requirements of continuous inspection, provided this periodic scheduled inspection is performed as outlined in the Contract Documents and approved by the regulatory authorities.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01505: MOBILIZATION

PART 1 GENERAL

1.01 SUMMARY

- A. This Specification Section outlines those responsibilities of the CONTRACTOR that are scheduled to be performed for both mobilization and demobilization.
- B. Related Sections:
 - 1. Section 01010 – Summary of Work
 - 2. Section 01060 – Regulatory Requirements
 - 3. Section 01062 – Environmental Requirements
 - 4. Section 01300 – Contractor Submittals
 - 5. Section 01530 – Protection of Existing Facilities
 - 6. Section 01700 – Closeout Procedures

1.02 WORKSITE

- A. This project is for a pipeline with an alignment through several local communities and other government agencies. The pipeline is generally located within road or rail right-of-ways. The Limits of Work for the project are described by Temporary Construction Easements provided by each community/agency and are typically the full-width of the right-of-way. However, each community/agency will set restrictions on the use of the right-of-way. The CONTRACTOR shall confirm the limits of work with each community and acquire the necessary permits to conduct the work prior to mobilization. All worksites shall be returned to existing conditions or better upon demobilization.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Mobilization shall include the obtaining of permits, preparing and furnishing specified submittals, moving onto the Site all equipment necessary for the Work; furnishing and erecting plants, temporary buildings, and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of Work.
- B. Prior to the mobilization of all plant, equipment, offices or temporary facilities to the Site, the CONTRACTOR and OWNER Representative shall jointly perform a site survey of the existing conditions per the requirements of Section 01530.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01505: MOBILIZATION

- C. Mobilization shall include, but not be limited to, the following work items:
1. Attendance at pre-construction meeting.
 2. Signatures on all Contract Documents necessary to proceed.
 3. Delivery of all required pre-construction submittals, including reservoir and water treatment plant methodology shut-down plan, construction schedule, CPM schedule, submittal schedule, joint survey to establish authenticity of possible claims, schedule of values, and others as specified.
 4. Mobilizing and moving onto site the CONTRACTOR's plant, equipment, tools, materials and labor required for the first 30 days of work.
 5. Providing the CONTRACTOR's Project Manager, Project Superintendent, Project Engineer and Site Safety Representative at the Project site full time.
 6. Obtaining and paying for all required permits, insurance, and bonds.
 7. Installing temporary construction power, wiring, and lighting facilities.
 8. Developing and installing construction water supply, including fire protection system, and paying any required deposit.
 9. Providing on-site sanitary facilities and potable water facilities.
 10. Arranging for and erection of CONTRACTOR's work and storage yards and any required on-site and off-site parking areas.
 11. Posting all OSHA-required notices and establishing safety programs as defined in CONTRACTOR's Cal-OSHA approved Safety Program.
 12. Fabricating and erecting project signs, construction area signs, traffic handling and detour signs, and temporary traffic control devices.
 13. Preparing and submitting Site Specific CONTRACTOR Health and Safety Plan.
 14. Providing onsite communication facilities, including telephones.
 15. Constructing and implementing safety and security features.
 16. Installing erosion control measures, and other environmental protection measures such as environmental fencing as Specified in Section 01062, indicated in the Drawings, and/or covered in applicable permits.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01505: MOBILIZATION

17. All other incidental work of a general and administrative nature as specified in the Contracting Requirements and General Requirements and not covered under separate bid items.
- D. Demobilization shall include, but not be limited to, the following work items:
1. Demobilizing and removal of the CONTRACTOR's facilities and equipment.
 2. Removing all project signs from project site, and removing all construction area signs, traffic handling and detour signs, and temporary traffic control devices from project vicinity.
 3. Removing all temporary construction facilities and other equipment and utilities from the site as CONTRACTOR's property within 10 calendar days after Final Completion. Cleanup of all debris and restoring the site as specified.
 4. Furnishing all required equipment installation certification forms, warranty documents and Operations and Maintenance (O&M) data and manuals and spare parts, special tools and keys.
 5. Coordinate and attend O&M meeting and hand-off meeting.
 6. Performing all required training sessions.
 7. Performing and submitting all manufacturer installation checkouts.
 8. Preparing and submitting all final documents, including certified payroll, and other records of payments to suppliers and subcontractors, and lien releases/claims waivers needed to close the contract within the time requirements.
 9. Furnishing the CONTRACTOR's Final Updated Construction Drawings (Record Drawings).
 10. Finishing all punch list work within the time requirements.
 11. Successfully completing Startup and Testing.
 12. Performing final site cleanup and restoration as required.
 13. Providing signoffs from affected property owners and permitting agencies confirming that their requirements have been met.
 14. Completing all specified close-out requirements.
 15. Requesting final payment.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01505: MOBILIZATION

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01510: TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary electrical facilities.
- B. Temporary water.
- C. Temporary heat.
- D. Temporary bath rooms.

1.02 RELATED SECTIONS

Not Used

1.03 REFERENCES

- A. State of California, Department of Transportation (Caltrans), Standard Specifications: Section 86 Signals, Lighting and Electrical Systems

1.04 TEMPORARY ELECTRICAL FACILITIES

- A. Electrical Services: Provide and maintain during the course and progress of the Work all electrical power and wiring requirements to facilitate the work of all trades and services associated with the Work. Electrical power shall be provided at the CONTRACTOR's expense. The CONTRACTOR shall request the utility company to install temporary power poles in locations required. All temporary wiring, feeders, and connections shall be furnished by the CONTRACTOR, as required.
- B. Falsework Lighting: Falsework lighting shall comply with the requirements of Caltrans Standard Specifications, Article 86-6.11, "Falsework Lighting." The CONTRACTOR shall submit a plan of the proposed falsework lighting installations in accordance with the submittal requirements of Section 01300 – CONTRACTOR Submittals.

1.05 TEMPORARY WATER

- A. Provide temporary water service as required for the Work, at the CONTRACTOR's expense. Closest availability of water shall be determined by the CONTRACTOR and shall be approved by authorities having jurisdiction before making the connection.
- B. Provide temporary piping or hose to carry water to every point where needed. All water used shall be potable water, unless otherwise approved by the jurisdictional authority for a specific purpose.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01510: TEMPORARY UTILITIES

1.06 TEMPORARY HEAT

- A. Provide, at the CONTRACTOR's expense, temporary heat as necessary for drying out the station facilities and other structures, curing of concrete, the proper installation of materials, and the protection of the Work, materials, and workers against injury from dampness and cold.
- B. Fuel, equipment, and methods of heating shall be approved by the jurisdictional fire marshal before using.

1.07 TEMPORARY BATH ROOMS

- A. CONTRACTOR shall provide temporary bathrooms for project team members including the CONTRACTOR's staff, OWNER, ENGINEER, and Official Project Stakeholders visiting the project site(s).
- B. CONTRACTOR shall provide portable toilets and wash stations within 0.5 mi. of the active work area.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 CLEANUP

- A. Remove all materials and equipment as a part of final cleanup.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01520: SECURITY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This Section describes the security requirements for high risk projects to reduce the risk of theft and vandalism to OWNER and CONTRACTOR property.

1.02 RELATED SECTIONS

- A. Project progress schedules and status reports are specified in Section 01311 – Construction Schedule.
- B. Section 01300 – Contractor Submittals
- C. Section 01550 – Site Access and Storage
- D. Section 01590 – Field Offices

1.03 MEASUREMENT AND PAYMENT

- A. Separate measurement or payment will not be made for work required under this Section. All costs in connection with the work specified herein will be considered to be included with the related item of work in the Bid Schedule of the Bid Form, or incidental to the Work.

1.04 SUBMITTAL REQUIREMENTS

- A. Schedule of Submittals: Within thirty calendar days after the effective date of Notice to Proceed or before start of Work at the jobsite, whichever occurs first, the CONTRACTOR shall submit for the ENGINEER's review and approval, as follows:
 - 1. CONTRACTOR shall provide a security plan to the OWNER via the ENGINEER at the start of Work to establish necessary coordination between OWNER, property OWNERS, and municipalities. The security plan must include a definition of work, list of employees and subcontractor employees that will be on the jobsite, a list of contact numbers and security measures that the CONTRACTOR intends to take during the Work. The OWNER will sign off on the security plan. Correspondence shall continue with OWNER on a need by need basis until the Acceptance of Work. The CONTRACTOR shall maintain and submit the security plan on a monthly or as needed basis for approval as determined by the ENGINEER.
 - 2. The CONTRACTOR shall provide the ENGINEER with an inventory of assets that will be stored at the Work site. Project assets include tools, machines, vehicles, and construction materials of value. Asset inventory shall include the cost of asset, serial numbers or other unique identifiers, photographs, replacement

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01520: SECURITY

costs, planned storage locations and the quantity of materials stored at Work site. The CONTRACTOR shall provide updates as major inventory changes occur or as requested by the ENGINEER.

1.05 CONTRACTOR'S RESPONSIBILITIES

- A. The CONTRACTOR shall prepare and maintain a weekly written roster of all personnel, including subcontractors that are performing work on the jobsite. The CONTRACTOR shall be prepared to provide updated rosters to ENGINEER or OWNER upon request.
- B. CONTRACTOR shall report crime and attempted crime that occurs within Work area to OWNER immediately. A formal report shall be made to the ENGINEER. CONTRACTOR and SUBCONTRACTORS employees shall cooperate with OWNER during an investigation.
- C. If criminal acts persist or if risk is deemed high enough as determined by the ENGINEER, a survey of the Work area shall be jointly conducted by the OWNER, ENGINEER and the CONTRACTOR to identify existing threats to Work site security. OWNER shall provide the Engineer and CONTRACTOR with a set of written or verbal recommendations based on the threat assessment. The CONTRACTOR shall put in a good faith effort in implementing OWNER recommendations.
- D. When the CONTRACTOR is not present or performing Work, no assets (regardless of value) shall be left unsecured at the Work site. Materials vulnerable to theft, such as cables, tools and equipment, shall be secured in a locked storage facility. Daily removal of scrap material shall be performed.
- E. A locked, physical perimeter shall be established around the storage area. The CONTRACTOR shall post Project Name and after hours contact information in such a manner as to be plainly visible from inside and outside of the construction area.
- F. Entry doors to storage areas and fenced gates shall be properly secured with a high grade, anti-cut lock. During nonbusiness hours, heavy equipment shall be disabled to prevent unauthorized use and, if applicable, shall be parked in front of the doors of temporary storage containers to serve as a barricade.
- G. If criminal activity persists or if risk is deemed high enough, the ENGINEER at his discretion may direct the CONTRACTOR to hire private security and/or implement electronic surveillance at no additional cost to the OWNER.

1.06 PRIVATE SECURITY

- A. If private security forces are provided due to high risk or repeated incidents, the CONTRACTOR shall provide security services that comply with the following requirements.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01520: SECURITY

1. Security guards must be employed by licensed private patrol operators.
2. The CONTRACTOR through the ENGINEER shall provide OWNER with the company name, contact information and the specific date, time and location of private patrols.
3. Security guards shall be in uniform and drive a marked company vehicle while on patrol.
4. Security guards must possess a valid security guard registration and carry it with them at all times while on duty.

PART 2 PRODUCTS

2.01 ELECTRONIC SURVEILLANCE

- A. If electronic surveillance is provided due to high risk or repeated incidents, the CONTRACTOR shall provide electronic surveillance that meets the following requirements.
 1. The electronic surveillance equipment shall be a mobile surveillance unit (MSU) consisting of multiple cameras as required to provide video coverage of vulnerable areas of the worksite.
 2. Cameras shall be high resolution (minimum 720p), color, and low light cameras.
 3. Upon detection of any movement, a remote alarm shall be generated and video shall be recorded until movement has ceased. The video shall be retained for a minimum of 7 days. Recorded video and related information shall be provided to OWNER upon request.
 4. The MSU alarm shall be live off-site monitored 24 hours per day, 7 days a week. Any movement shall be promptly evaluated and if appropriate, result in prompt notification of the OWNER.
 5. The MSU shall be self-powered or CONTRACTOR shall provide the necessary power.

PART 3 EXECUTION – NOT USED

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01520: SECURITY

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01530: PROTECTION OF EXISTING FACILITIES

PART 1 GENERAL

1.1 GENERAL

- A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than prior to such damage or temporary relocation, all in accordance with the Contract Documents.
- B. The CONTRACTOR is responsible for determining the location and timing of potholing and shall secure Encroachment permits for those activities, including the preparation and submittal of traffic control plans. Encroachment Permits will be required from Monterey County, affected municipalities and the Presidio of Monterey.

1.2 CONTRACTOR SUBMITTALS

- A. Contractor shall provide Owner with copies of all materials submitted for the Encroachment permits at the time they are submitted.
- B. If not shown correctly on the project plans, the Contractor shall identify the correct location and elevation of all existing utilities crossed by or adjacent to the project pipelines in the record drawings in accordance with Section 01720.

1.3 RIGHTS-OF-WAY

- A. The CONTRACTOR shall not do any WORK that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified that the OWNER has secured authority therefor from the proper party. Copies of encroachment agreements for work in existing rights of way are included in the contract documents. The CONTRACTOR shall implement actions required by those agreements.
- B. After authority has been obtained, the CONTRACTOR shall give said party due notice of its intention to begin work, if required by said party, and shall remove, shore, support, or otherwise protect such pipeline, transmission line, ditch, fence, or structure, or replace the same.

1.4 PROTECTION OF STREET OR ROADWAY MARKERS

- A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. Survey markers or points disturbed by the CONTRACTOR shall be accurately restored after street or roadway resurfacing has been completed.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01530: PROTECTION OF EXISTING FACILITIES

1.5 RESTORATION OF PAVEMENT

- A. **General:** All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials per recommendations presented in the geotechnical investigations report, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. The pavement restoration requirement to match existing sections shall apply to all components of existing sections, including sub-base, base, and pavement. Temporary and permanent pavement shall conform to the requirements of the affected pavement owner. Pavements which are subject to partial removal shall be neatly saw cut in straight lines.
- B. **Temporary Resurfacing:** Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.
- C. **Permanent Resurfacing:** This project includes significant construction activity in paved streets. The project goal is to leave the streets in better condition than they were found. This includes a milling and resurfacing program after pipeline construction is completed. See contract drawings for limits of resurfacing.
- D. **Restoration of Sidewalks or Private Driveways:** Wherever sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions. If no such period of time is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or roadways until the final restoration thereof has been made.

1.6 EXISTING UTILITIES AND IMPROVEMENTS

- A. **General:** The CONTRACTOR shall protect underground Utilities and other improvements which may be impaired during construction operations, regardless of whether or not the Utilities are indicated on the Drawings. The CONTRACTOR shall take all possible precautions for the protection of unforeseen Utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.
- B. The CONTRACTOR shall confine the construction activities to the limits of the Public Utility Easement (PUE) and Public Right of Way. Any work outside PUE on private property will require specific written approval of the property owner.
- C. Completion of work across private property shall be carried out in one continuous operation of construction of the facilities with immediate restoration and cleanup of the construction area

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01530: PROTECTION OF EXISTING FACILITIES

- D. The CONTRACTOR shall restore all rights-of-way to a condition equal to its original condition and in a condition satisfactory to the property owner and the Owner.
- E. The CONTRACTOR shall be responsible for exploratory excavations as it deems necessary to determine the exact locations and depths of all Utilities which may interfere with its work. All such exploratory excavations shall be performed as soon as practicable after Notice to Proceed and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's progress. When such exploratory excavations show the Utility location as shown on the Drawings to be in error, the CONTRACTOR shall so notify the ENGINEER.
- F. Utility laterals are not shown on the drawings. It is the Contractor's responsibility to locate, pothole and protect utility laterals or relocate them in accordance with the affected utility's requirements. Sewer laterals shall remain below the new potable water lines unless approved in advance by the Owner.
- G. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the Utility.
- H. **Utilities to be Moved:** In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

Unless prior authorization is given by the City, a preliminary plan and profile of the relocated utility shall be provided to the City prior to any relocation activities. Once the relocation is complete, the City shall be provided a plan and profile as-built of the relocated utility alignment.
- I. **Utilities to be Removed:** Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing Utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such Utility or improvement in a manner satisfactory to the ENGINEER and the owner of the facility. In all cases of such temporary removal or relocation, restoration to the former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the Utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.
- J. **OWNER's Right of Access:** The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01530: PROTECTION OF EXISTING FACILITIES

way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.

- K. **Underground Utilities Indicated:** Existing Utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all Utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR, unless otherwise repaired by the owner of the damaged Utility. If the owner of the damaged facility performs its own repairs, the CONTRACTOR shall reimburse said owner for the costs of repair.
- L. **Underground Utilities Not Indicated:** In the event that the CONTRACTOR damages existing Utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR prior to excavation, a verbal report of such damage shall be made immediately to the ENGINEER and a written report thereof shall be made promptly thereafter. The ENGINEER will immediately notify the owner of the damaged Utility. If the ENGINEER is not immediately available, the CONTRACTOR shall notify the Utility owner of the damage. If directed by the ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra work contained in the front-end documents.
- M. Costs of locating and repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such Utility facilities not indicated in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the WORK which was interrupted or idled by removal or relocation of such Utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of Section 3 of the General Conditions.
- N. **Approval of Repairs:** All repairs to a damaged Utility or improvement are subject to inspection and approval by an authorized representative of the Utility or improvement owner before being concealed by backfill or other work.
- O. **Maintaining in Service:** Unless indicated otherwise, oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the ENGINEER are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01530: PROTECTION OF EXISTING FACILITIES

1.7 TREES OR SHRUBS WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

- A. **General:** Except where trees or shrubs are indicated to be removed, the CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. Existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.
- B. **Trimming:** Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. Cuts over 1-1/2 inches in diameter shall be coated with a tree paint product that is waterproof, adhesive, and elastic, and free from kerosenes, coal tar, creosote, or other material injurious to the life of the tree.
- C. **Replacement:** The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree or shrub is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree or shrub at its own expense. The tree or shrub shall be of a like size and variety as the one damaged, or, if of a smaller size, the CONTRACTOR shall pay to the owner of said tree a compensatory payment acceptable to the tree or shrub owner, subject to the approval of the jurisdictional agency or OWNER. The size of the tree or shrub shall be not less than 1-inch diameter nor less than 6 feet in height. Planting of replacement trees and shrubs shall be in accordance with the recommendations of the nursery furnishing the plants. Unless otherwise indicated, the CONTRACTOR shall water and maintain the replacement trees and shrubs for 6 months after planting.

1.8 LAWN AREAS

- A. Lawn or landscaped areas damaged during construction shall be repaired to match the pre-construction condition to the satisfaction of the land owner and the OWNER.

1.9 NOTIFICATION BY THE CONTRACTOR

- A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, the CONTRACTOR shall notify the respective authorities representing the owners or agencies responsible for such

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01530: PROTECTION OF EXISTING FACILITIES

facilities not less than 3 days nor more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire. The CONTRACTOR shall also notify the regional notification center at 1-800-642-2444 at least 2 days, but no more than 14 days, prior to such excavation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01532: SITE CONDITION SURVEYS

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall conduct thorough pre-construction and post-construction Site conditions surveys of the entire Project. Site conditions surveys shall consist of digital photographs and/or video in a common format.

1.02 CONTRACTOR SUBMITTALS

- A. Photographs, and other data of the preconstruction conditions shall be submitted to the ENGINEER for record purposes prior to, but not more than three weeks before, commencement of any construction activities.
- B. A complete set of all photographs and survey data of the post-construction conditions shall be completed and submitted prior to final inspection by the OWNER and ENGINEER.
- C. The surveys shall be submitted as 2 sets of compact disks (one for Owner, one for Engineer).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PHOTOGRAPHS

- A. CONTRACTOR, as a minimum, shall document pre- and post-construction conditions by preparing photographs of the following:
1. Roadways used to access the Site or haul materials and equipment to the Site.
 2. Work areas, including actual work sites, materials processing and stockpiling areas, access corridors, disposal areas, and staging areas.
 3. Any work completed by other contractors at the Site that will be connected to or otherwise affected by the WORK.
 4. Driveways, sidewalks, and buildings which might be affected by the WORK.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01532: SITE CONDITION SURVEYS

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01550: SITE ACCESS AND STORAGE

PART 1 GENERAL

1.01 HIGHWAY LIMITATIONS

- A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. It shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

1.02 TEMPORARY CROSSINGS

- A. **General:** Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300 feet shall be provided. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.
- B. **Temporary Bridges:** Wherever necessary, to maintain vehicular crossings, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the responsible individuals or authorities to omit such temporary bridges or steel plates, which written consent shall be delivered to the ENGINEER prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.
- C. **Street Use:** Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder, and it shall conduct its operations to not interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. No street shall be closed to the public without first obtaining permission of the ENGINEER and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01550: SITE ACCESS AND STORAGE

accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets, and other drainage facilities.

- D. **Traffic Control:** For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, Part VI - Traffic Controls for Street and Highway Construction and Maintenance Operations," published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1).
1. The CONTRACTOR shall take all necessary precautions for the protection of the WORK and the safety of the public. Barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. Signs, signals, and barricades shall conform to the requirements of Cal-OSHA and Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.
 2. The CONTRACTOR shall submit traffic control plans in accordance with Section 01570 – Traffic Control. The CONTRACTOR shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.
- E. **Temporary Street Closure:** If closure of any street is required during construction, the CONTRACTOR shall apply in writing to the City Engineer and any other jurisdictional agency at least 30 days in advance of the required closure. A Detour and Traffic Control Plan shall accompany the application.
- F. **Temporary Driveway Closure:** The CONTRACTOR shall notify the owner or occupant (if not owner-occupied) of the closure of the driveways to be closed more than one eight-hour work day at least 3 working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the owner/occupant how long the closure will take and when closure will start.

1.03 CONTRACTOR'S WORK AND STORAGE AREA

- A. The CONTRACTOR shall construct and use a separate storage area for hazardous materials used in constructing the WORK.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01550: SITE ACCESS AND STORAGE

1. For the purpose of this paragraph, hazardous materials to be stored in the separate area are all products labeled with any of the following terms: Warning, Caution, Poisonous, Toxic, Flammable, Corrosive, Reactive, or Explosive. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints and paint thinners, two-part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.
2. Hazardous materials shall be stored in groupings according to the Material Safety Data Sheets.
3. The CONTRACTOR shall develop and submit to the ENGINEER a plan for storing and disposing of the materials above.
4. The CONTRACTOR shall obtain and submit to the ENGINEER a single EPA number for wastes generated at the Site.
5. The separate storage area shall meet all the requirements of all authorities having jurisdiction over the storage of hazardous materials.
6. The separate storage area shall be inspected by the City Hazardous Materials Management Division in which it resides prior to construction of the area, upon completion of construction of the area, and upon cleanup and removal of the area.
7. All hazardous materials which are delivered in containers shall be stored in the original containers until use. Hazardous materials which are delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

1.04 PARKING

A. The CONTRACTOR shall:

1. The CONTRACTOR shall direct its employees to park in areas as directed by the ENGINEER.
2. Traffic and parking areas shall be maintained in a sound condition, free of excavated material, construction equipment, mud, and construction materials. The CONTRACTOR shall repair breaks, potholes, low areas which collect standing water, and other deficiencies.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01560: TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 EXPLOSIVES AND BLASTING

The use of explosives on the WORK will not be permitted.

1.02 DUST ABATEMENT

The CONTRACTOR shall prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The CONTRACTOR shall be responsible for any damage resulting from dust originating from its operations. The CONTRACTOR shall never leave the construction premises dirty and dusty. The dust abatement measures shall be continued until the CONTRACTOR is relieved of further responsibility by the ENGINEER.

1.03 SEDIMENTATION ABATEMENT

- A. The CONTRACTOR shall be responsible for collecting, storing, hauling, and disposing of spoil, silt, and waste materials in compliance with applicable federal, state, and local rules and regulations and the Contract Documents.
- B. Install and maintain erosion and sediment control measures, such as swales, grade stabilization structures, berms, dikes, waterways, filter fabric fences, and sediment basins.
- C. Filter fabric barrier systems, if used, shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- D. Remove and dispose of sediment deposits at the designated spoil area. If a spoil area is not indicated, dispose of sediment off-Site at a location not in or adjacent to a stream or floodplain. Sediment to be placed at the spoil area should be spread evenly, compacted, and stabilized. Sediment shall not be allowed to flush into a stream or drainage way.
- E. Maintain erosion and sediment control measures until final acceptance or until requested by the ENGINEER to remove it.

1.04 RUBBISH CONTROL

During the progress of the WORK, the CONTRACTOR shall keep the Site and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the Site, and shall establish regular intervals of collection and disposal of such materials and waste. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the Site in accordance with local codes and ordinances governing locations and methods of

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disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.05 CHEMICALS

All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer. In addition, see the requirements set forth in Section 5 of the General Conditions.

1.06 CULTURAL RESOURCES

- A. The CONTRACTOR's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources").
- B. The CONTRACTOR shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.
- C. In the event potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures shall be instituted:
 - 1. The ENGINEER will issue a Field Order directing the CONTRACTOR to cease all construction operations at the location of such potential cultural resources find.
 - 2. Such Field Order shall be effective until such time as a qualified archaeologist can be called to assess the value of these potential cultural resources and make recommendations to the State Historic Preservation Office.
- D. If the archaeologist determines that the potential find is a bona fide cultural resource, at the direction of the State Historic Preservation Office, the CONTRACTOR shall suspend work at the location of the find under the provisions for changes contained in Section 3 of the General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
01561: STORMWATER POLLUTION PREVENTION, EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. CONTRACTOR shall prepare and submit a site-specific SWPPP (SWPPP) for the Project. CONTRACTOR shall prepare the SWPPP using the template provided by the California Stormwater Quality Association available at <http://www.cabmphandbooks.com/Construction.asp>. CONTRACTOR shall submit the SWPPP to the OWNER Representative for review, approval, and forwarding to appropriate agencies, as necessary, no less than 70 day prior to any earthwork.
- B. CONTRACTOR shall perform all necessary erosion control and storm water management measures in compliance with all federal, state and local regulations for erosion control and pollution prevention, including all requirements set forth in the SWPPP. Requirements for erosion control and disposal of surface water during construction may include, but are not limited to, construction of sedimentation ponds, ditches, culverts, silt fences, straw wattles, pumping, draining and other measures required for the removal or exclusion of water from the excavations, stockpile, and other incidental work areas.
- C. CONTRACTOR shall implement the SWPPP and apply best management practices (BMPs) to effectively perform erosion control and storm water management to prohibit the entry of pollutants from the construction Site into surface waters or storm drains. CONTRACTOR will be fully responsible for compliance with, execution and implementation of the SWPPP and related requirements of the Construction General Permit. CONTRACTOR's preparation of the SWPPP, its compliance with, execution and implementation of the SWPPP, and its compliance with the Construction General Permit as set forth in the Contract Documents is incidental work and is deemed included in CONTRACTOR's Total Bid Price.
- D. CONTRACTOR shall be responsible for all injury to persons or damage to property on or off the OWNER's land due to surface or drainage water not properly controlled and disposed of as specified in the SWPPP, the Construction General Permit, and this Section.
- E. CONTRACTOR will be responsible for all delays and costs, assessments, fines, and penalties levied against the OWNER by any local, state, or federal agency resulting from CONTRACTOR's failure to fully comply with and/or fully execute and implement the SWPPP and related requirements of the Construction General Permit. CONTRACTOR's responsibility includes completion of all clean-up operations and paying for all associated costs resulting from CONTRACTOR's non-compliance that causes damages to surface waters including reservoirs, creeks, etc.

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DIVISION 01: GENERAL REQUIREMENTS

01561: STORMWATER POLLUTION PREVENTION, EROSION AND SEDIMENT CONTROL

1.02 RELATED SECTIONS

- A. Document 00800/APA: Permits and Agreements to be Obtained by the Owner
- B. Section 01062: Environmental Requirements
- C. Section 01300: Submittal Procedures
- D. Section 02052: Site Preparation, Clearing Grubbing and Stripping
- E. Section 02140: Dewatering
- F. Section 02200: Earthwork
- G. Section 02270: Erosion and Sediment Control

1.03 NOT USED

1.04 REGULATORY REQUIREMENTS

- A. The Clean Water Act, as amended in 1972, prohibits the discharge of pollutants into the waters of the United States from storm water. No debris, soil, ash, silt, sand, cement or concrete, or washing thereof, oil or petroleum products or other organic materials from CONTRACTOR's operation shall be allowed to enter or be placed where it may be washed by rainfall or runoff directly into creek or other waters of the United States.
- B. As part of the permitting process for working within a creek or waterway, the OWNER will obtain a 404 permit from the U.S. Army Corps of Engineers, a 1602 Streambed Alteration Agreement from California Department of Fish and Game, and a 401 Certification from the Regional Water Quality Control Board (RWQCB), as applicable. See Document 00800/APA for a listing of Permits and Agreements to be obtained by the City.
- C. National Pollution Discharge Elimination System (NPDES) General Construction Permit for Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction Activity (General Permit).
- D. CONTRACTOR shall comply with all provisions of the Limited and Full SWPPPs, including but not limited to the following requirements:
 - 1. CONTRACTOR shall attempt to divert any clean storm water away from construction activities. In areas where storm water cannot be diverted, erosion control BMPs to effectively prohibit the entry of pollutants from construction Site

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DIVISION 01: GENERAL REQUIREMENTS

01561: STORMWATER POLLUTION PREVENTION, EROSION AND SEDIMENT CONTROL

into any creek or storm drain shall be utilized. Trap eroded sediments on site using basins or other devices. CONTRACTOR shall use temporary sediment barriers near the creeks and drainage swales to prevent sediment, excavated spoil, construction materials, or fluid spills from construction equipment from entering the creeks, drainage swales, or drainage canals. If the pollutants or sediments from the construction Site enter the creeks, drainage swales, or drainage canals, the pollutants and sediments shall be removed immediately.

2. CONTRACTOR shall allow areas of infiltration as long as the areas are controlled and do not produce uncontrolled runoff. Avoid concentrating runoff into one area.
3. CONTRACTOR shall maintain excavations free of standing accumulated water. Protect exposed and excavated areas or arrange for dewatering.
4. CONTRACTOR shall install erosion and sediment control measures adjacent to aquatic habitat to prevent sediment from entering these areas.
5. CONTRACTOR shall install erosion and sediment control measures on slopes adjacent to streams and wetlands to prevent sediment from entering these areas.
6. CONTRACTOR shall provide, operate, and maintain pumping equipment as needed to control water at the Site.
7. If hazardous material spills occur in the temporary storage areas or at the Site, CONTRACTOR shall immediately notify the OWNER Representative and, at CONTRACTOR's expense, contain and clean up the spill. CONTRACTOR shall identify containment areas for such materials, and provide for disposal of the materials, their containers, and pavement or soil that may be contaminated with fuel, hydraulic fluid, or oil in accordance with all applicable laws and regulations.
8. Prevention of other non-storm discharge such as slurries from concrete or mortar mixing, equipment cleaning, fueling, and maintenance operations/chemical spills, etc. Measures to be implemented for the cleanout of concrete trucks during concrete placement operations shall be included in the SWPPP. Washout of concrete trucks shall not be allowed to drain into creeks or other bodies of water.
9. Water from equipment washing shall not be discharged to the creeks, drainage swales, or drainage canals or allowed to percolate into the ground. CONTRACTOR shall not sweep, grade, or flush surplus materials, rubbish, or debris into drainage swales or drainage canals.

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10. To the extent practical, fueling, maintenance, and parking of vehicles and vehicle maintenance equipment shall not be performed within 50 feet of any creek, drainage canal, or drainage swale.
 11. Establish inspection, maintenance, and reporting program for the implemented control measures.
 12. CONTRACTOR shall refer to Section 01062 for additional measures to be included in the SWPPP.
- E. Under no circumstances shall a creek or natural waterway be disturbed, filled in, dammed or altered.
- F. CONTRACTOR shall report any serious sediment release immediately to the OWNER Representative so that the appropriate public agencies are notified.

1.05 SWPPP AMENDMENTS; ANNUAL COMPLIANCE CERTIFICATION

- A. When changes in the SWPPP are required during the course of the Project, the CONTRACTOR shall prepare and certify an amendment to the SWPPP and submit it to the Owner Representative for review. CONTRACTOR shall prepare an amendment to SWPPP when one or more of the following conditions exist:
1. Whenever there is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system; or
 2. If any of the conditions of the General Permit is violated or the general objective of reducing or eliminating pollutants in storm water discharges has not been achieved. If the RWQCB determines that a Construction General Permit violation has occurred, the SWPPP shall be amended and the amended provisions implemented within 14 calendar days after notification by the RWQCB; or
 3. Annually, prior to the defined rainy season, if required by the Project's Contract Documents; or
 4. When deemed necessary by the OWNER Representative or resource agency.
- B. Contractor shall include the following information with each proposed amendment to a SWPPP:
1. Describe who requested the proposed amendment.

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2. Describe the location of the proposed change.
 3. Describe reason for change.
 4. Describe the new BMP proposed.
- C. All proposed amendments to a SWPPP shall be submitted electronically to the OWNER Representative in accordance with Section 01300. All proposed amendments shall include a completed SWPPP Certification and Approval form signed by CONTRACTOR.
- D. CONTRACTOR shall insert all approved amendments into the CONTRACTOR's onsite SWPPP. CONTRACTOR shall also record all approved amendments in the SWPPP amendment log located in the appropriate SWPPP.
- E. In no event will CONTRACTOR be entitled to increases in the Contract Sum or the Contract Time for SWPPP amendments and resulting Work caused by CONTRACTOR's failure to comply with the Construction General Permit, the SWPPP, or the requirements set forth in this Section.
- F. By June 15 of each year, CONTRACTOR shall submit a completed Annual Certification of Compliance form to the OWNER Representative stating compliance with the terms and conditions of the Construction General Permit and the SWPPP, as appropriate. CONTRACTOR shall insert a copy of each completed and signed Certification of Compliance form into CONTRACTOR's onsite SWPPP.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use certified, weed free, natural/biodegradable imported erosion control materials (e.g. straw wattles, hay bales).
- B. Fiber or sediment roll consisting of biodegradable (plastic monofilament netting shall not be allowed because of potential entanglements of wildlife in these materials) fibers.
- C. Erosion control mat (plastic monofilament netting shall not be allowed because of potential entanglements of wildlife in these materials).
- D. Filter fabric

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PART 3 EXECUTION

3.01 EROSION AND STORM WATER CONTROL

CONTRACTOR shall maintain a copy of the SWPPP at the Site and shall abide by all SWPPP requirements contained therein.

- A. In company with the OWNER Representative, visit the Site to agree on the areas for site-specific erosion and sedimentation control measures and temporary stockpiling of soil to be implemented during construction.
- B. Designated areas for stockpiling of CONTRACTOR's materials shall be away from creeks or other bodies of water. Stockpile areas will be located along rights-of-way as shown on the Contract Drawings.
- C. CONTRACTOR shall protect all exposed and graded areas from wind and water erosion until soil stabilization has been achieved.
- D. CONTRACTOR shall divert water away from slope where indicated on the Drawings.
- E. CONTRACTOR shall provide for the continuous uninterrupted control of surface water during the construction period. Precipitation statistics are available from (<http://cdec.water.ca.gov/>). Control measures shall also be provided as required to comply with the SWPPP.
- F. Control and disposal of water shall be accomplished in a manner that will prevent erosion and shall maintain the stability and integrity of excavated slopes, bottom of excavation, ditches, pipes, culverts and adjoining utilities, structures, facilities, roads, and land areas. Appropriate erosion and sediment control measures shall be in place before start of work subject to the approval of the City Representative. Trench excavations shall not be used as drainage ditches.
- G. Install erosion and silt control devices where indicated on the Drawings or as directed by the OWNER Representative. Erosion control devices shall not be removed without the approval of the OWNER Representative. CONTRACTOR shall monitor weather forecasts and shall install erosion control devices when the rain forecast exceeds a probability of 40 percent. Silt fences, check berms, ponds, basins or other devices shall be checked and repaired or replaced after each rainstorm. CONTRACTOR shall correct all deficiencies in runoff and erosion control measures within 24 hours of when the deficiency is identified.
- H. Retain existing vegetation to the extent feasible to minimize surface area of exposed soil.

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- I. Fit grading to the surrounding terrain. Time grading operations to minimize soil exposure in the rainy season.
- J. Cover the soil piles with waterproof tarps to prevent erosion and dust blowoff. Install sandbags and straw bails around perimeter of tarps.
- K. Trap any sediment runoff to downhill road, embankment, or creek with vertical filter fabric, staked straw bales, or sediment rolls. Direct runoff away from disturbed areas of construction.
- L. Install filter fabric/ or straw wattles around inlet drains.
- M. Discharge of wastewater used to wash the concrete trucks or other equipment into the creeks will not be allowed.
- N. No debris, soil, ash, silt, sand, cement or concrete, oil or petroleum products, or other organic materials from the construction operations would be allowed to enter or be placed where it may be washed by rainfall or runoff directly into a creek.

3.02 CLEAN UP AND DISPOSAL

- A. Remove all erosion and sediment control devices and material, equipment, and temporary structures used for the control and disposal of water from the Site once Work is completed.
- B. Grade Site and remove unused soil as CONTRACTOR's property from Site as soon as possible.
- C. Arrange to have the catch basins cleaned if sediment enters the storm water system.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 01: GENERAL REQUIREMENTS
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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01570: TRAFFIC CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. This Specification Section sets forth the minimum requirements for traffic routing, traffic control, and site access during construction.
- B. Related Traffic Control Requirements:
 - 1. City of Pacific Grove
 - 2. City of Monterey
 - 3. City of Seaside
 - 4. City of Marina
 - 5. Caltrans
 - 6. County of Monterey
- C. Design Criteria:
 - 1. All traffic control work shall be performed in accordance with specifications and standards of the entities listed above, as applicable and as supplemented herein.
 - 2. Traffic control plans shall implement devices conforming to the latest edition of the Federal Highway Administration "Manual on Uniform Traffic Control Devices for Streets and Highways" (FHWA MUTCD), as amended for use in California.

1.02 SCOPE OF WORK

- A. The CONTRACTOR shall verify and update if necessary the Traffic Control Plans (provided in Appendix E), and then construct, operate and maintain traffic control in conformance with the requirements in this section. The required traffic control work shall be in place prior to the start of the construction work of the CONTRACTOR and/or any of the sub-contractors. The Traffic Control Plans must clearly depict the sequence of the construction operation(s), the construction to be performed and the traveled way that will be utilized by all movement of traffic during each phase of construction. Multiple phases of construction will require a separate traffic control plan for each different construction phase or operation.

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DIVISION 1: GENERAL REQUIREMENTS
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- B. The CONTRACTOR shall provide for the protection of the traveling public, pedestrians and workers within the area covered by the limits of construction, at all times when the area is affected by construction facilities or activities.
- C. The CONTRACTOR shall engage a qualified specialty subcontractor to perform all traffic control/routing work. The subcontractor shall provide all material, labor, equipment and service required for traffic control. This subcontractor shall also furnish the following:
 - 1. Traffic Control Supervisors
 - a. The traffic control supervisors shall direct the traffic crews and/or perform the traffic control work whenever there is work in the street, sidewalk, path or any other public right of way. When work is being performed at multiple sites, separate supervisors shall be designated for each site. Separate supervisors shall be designated to provide coverage when work is being performed for multiple shifts at a given site.
 - b. The traffic control supervisors shall possess a minimum of five years' experience in traffic control supervision. At least one supervisor shall be present at the job site during all traffic control operations and whenever the CONTRACTOR's activities impact the public roadway.
 - 2. Traffic Crew
 - a. The subcontractor shall provide sufficient traffic crews to implement and maintain the Traffic Control work. A Traffic Crew shall be comprised of at least two persons and each crewmember shall have a minimum of one year experience in Traffic Control on similar scale projects, and shall have passed a Flagger Training Course given by the American Traffic Safety Services Association or another institution acceptable to the OWNER Representative.
 - 3. The Traffic Crew shall:
 - a. Assist the Traffic Supervisor in re-striping, flagging and setting up all traffic signs and other traffic control devices in accordance with the Approved Traffic Control Plans and Traffic Detour Plans. The required traffic control work shall be in place prior to the start of the construction work of the General CONTRACTOR and/or any of the sub-contractors.
 - b. Be on site especially during nights, weekends, and holidays, as required by the OWNER Representative in setting up and/or correcting the traffic control devices, during the CONTRACTOR's actual working hours or as directed by the OWNER Representative.

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- D. The CONTRACTOR shall so conduct his operations as to cause the least possible obstruction and inconvenience to the public and area residents, and shall have under construction no greater duration or amount of work, than he can prosecute properly with due regard to the rights of the public and area residents. The CONTRACTOR shall ensure all streets, and intersections remain open to traffic and maintain access to public and private properties to the greatest extent possible by constructing the work in stages.
- E. The CONTRACTOR shall furnish, install, relocate to provide for lane shifting, remove, store, maintain (including covering and uncovering as required), move to new locations, replace when damaged or missing and dispose of all traffic signs and traffic control devices and features necessary for safety and convenience of the general public and area residents. All workers and work shall be safeguarded, where, and as required by conditions at the site of the work and in addition to the requirements specified herein, with various signage and barricades, including but not limited to the following:
1. Traffic signs and parking prohibition signs
 2. Barricades with flashers
 3. Delineators
 4. High level warning devices
 5. Solar Powered Flashing arrow signs
 6. Pedestrian barricades
 7. Temporary and permanent pavement markings
 8. Flag persons
 9. Excavation plating/bridging, including any temporary plating and bridging required by the CONTRACTOR's operations
- F. The CONTRACTOR shall provide traffic lanes and routing of vehicular and pedestrian traffic, as specified herein, in a manner that will be safe and will minimize traffic congestion and delays.

1.03 APPLICABLE CODES AND STANDARDS

- A. In addition to compliance with this specification, the CONTRACTOR shall comply with all applicable requirements of the latest editions of the following:
1. California Vehicle Code
 2. Standard Specifications and Plans, Department of Transportation, State of California (Caltrans Standard Specifications and Caltrans Standard Plans) except as modified herein
 3. Manual of Uniform Traffic Control Devices (MUTCD)
 4. California Manual of Uniform Traffic Control Devices (CA MUTCD)

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5. Other Applicable Government Regulations

1.04 SUBMITTALS

- A. The CONTRACTOR shall submit the following and obtain approval from the OWNER Representative before starting work on the project. Approval by the City of Pacific Grove, the City of Monterey, the City of Seaside, the City of Marina, the County of Monterey, and Caltrans will also be required as applicable for each work site:
1. Traffic Control Plans - an electronic version on a compact disc and one printed version to each jurisdiction.
 2. Contractor Storage/Staging Plans
 3. Schedules of Traffic diversion and control
 4. Specifications for proposed materials, equipment and devices
 5. Resumes for traffic control supervisors, traffic crew, and certified Flag persons.
 6. Names and telephone numbers of persons responsible for providing 24-hour emergency maintenance services
- B. The CONTRACTOR shall submit all documents identified above in 1.04 (A) to the respective agencies noted below, as applicable. However, it is the CONTRACTOR's responsibility to verify the contact information for each agency at the time of submittal.

County of Monterey–Resource Management
Agency
Department of Public Works – Encroachment
168 W. Alisal Street, 2nd Floor
Salinas, CA 93901-2438

City of Marina
Public Works division
211 Hillcrest Avenue
Marina, CA 93933

City of Seaside
Public Works Department
440 Harcourt Avenue
Seaside, CA 93955

City of Monterey
Plans and Public Works
580 Pacific Street
Monterey, CA 93940

City of Pacific Grove
Public Works Department
2100 Sunset Drive
Pacific Grove, CA 93950

Headquarters
U.S. Army Garrison, Presidio of
Monterey
1759 Lewis Road, Suite 210
Monterey, CA 93944-3223

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Encroachment Permit Engineer
California Department of Transportation District
5
3196 S. Higuera St., Suite A
San Luis Obispo, CA 9340

Fort Ord Reuse Authority
Executive Officer
920 2nd Avenue
Marina, CA 93933

1.05 TRAFFIC CONTROL PLANS

- A. The Traffic Control Plans shall be prepared, signed and stamped by a qualified and experienced Civil Engineer or Traffic Engineer (Registered in the State of California). The attached Traffic Control Plans may be used unless there are changes to the location of the construction area depicted. The CONTRACTOR shall submit separate Traffic Control Plans adequate for approval by affected jurisdictions for each phase of work including potholing, pavement restoration work, before the start of each particular phase of work. The plans shall include an affidavit signed by the licensed engineer who prepared the plan attesting that he/ she has personal knowledge of the traffic conditions in the work areas.
- B. The above mentioned Traffic Control Plans for each phase shall be submitted at least 90 days prior to the particular phase, except for the first submission which shall be made no later than 21 days after NTP and 10 days prior to commencing the work. Complete traffic control and detour plans shall be submitted within ten (10) working days of the Notice to Proceed date for the Contract. A submittal shall consist of four (4) copies on white paper of each drawing. Maximum drawing size shall be 36" X 24".

The CONTRACTOR shall submit the plans to/through the OWNER Representative and the affected jurisdiction for approval, and shall allow 21 calendar days in his/her schedule for the OWNER Representative and jurisdiction to review and respond to the traffic control plans. No work shall be allowed on the streets without approved Traffic Control Plans. Failure of the CONTRACTOR to comply will result in penalties as administered by the local municipality.

- C. Each Traffic Control Plan shall show the following minimum information, as applicable and as needed to describe the proposed traffic control measures:
1. Street and traffic lane layout (sidewalk, street and traffic lanes etc.); outline of the work under construction
 2. Label all taper/transition lengths and widths, delineator spacing and sign spacing.
 3. Provide a safe path of travel for pedestrians, in addition to signs and barricades to direct pedestrians through or around the construction work zone.
 4. Existing striping, pavement markings and traffic signs, and a description of what is to be removed/covered prior to installation of temporary striping and signage, and what will be restored after the construction is completed.

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5. Location and description of traffic control devices proposed for the protection of the work area, excavation, workers, equipment, pedestrians, vehicles, and property.
 6. Other proposed changes and provisions for removal, relocation, or temporary installation of:
 - a. Traffic signs.
 - b. Transit stops.
 - c. Barricades, chain link and/or plywood fence, temporary K- Rail, crash cushions (sand barrels), etc.
 - d. Solar operated flashing arrow signs (required for each lane closure).
 7. Safe path of travel for passengers using public transit, from/to loading platform to/from the sidewalk.
 8. Provide a safe path of travel for bicycles, in addition to signs and barricades to direct bicyclists through or around the construction work zone.
- D. The CONTRACTOR is solely responsible for all permits and fees required to acquire any new Encroachment Permits if identified later due to changes in the design or required by the agency for any unforeseen reason.

1.06 PARKING AND STORAGE PLAN

- A. The CONTRACTOR shall submit plans for material storage and equipment parking, for each area of the work, along with the respective Traffic Control Plans. For materials storage and equipment parking, the CONTRACTOR shall comply with all local requirements.
- B. No construction equipment and material storage, including but not limited to pipes, pipe-fittings, steel bars, shoring, backfill, asphalt mix etc. shall be allowed on any sidewalk, street or property, except as shown on the approved Plans for various phases of construction.
- C. The CONTRACTOR shall provide his/her own yard for the storage of pipes, pipe fittings, steel bars, shoring, etc. The proposed areas for storage of materials or equipment shall be included in the Plans.
- D. The CONTRACTOR shall be responsible for ensuring that only CONTRACTOR's vehicles, clearly identified with the name of the CONTRACTOR on each side of each vehicle, may be parked in the construction area.

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- E. Employees of the CONTRACTOR, sub-Contractors, and suppliers shall not park their vehicles within the active construction area when they are currently working and where public access is prohibited. The CONTRACTOR shall provide parking for their employees at a site, which will not impact local public parking and transport employees between the parking area and the work.

1.07 RESUME AND CERTIFICATES OF FLAG PERSONS

The Flag Persons shall have a minimum experience of one year of utilizing manual traffic controls on similar construction projects. The Flag Persons shall have passed The Flagger Training Course offered by National Safety Council Western Region Office, (800) 621-7619 or institutions acceptable to the OWNER Representative. The Flag Persons must have valid certification. The CONTRACTOR shall submit the resumes of at least four Flag Persons to the OWNER Representative for review and approval.

1.08 QUALIFICATIONS

- A. The subcontractor performing traffic control shall have a minimum of 5 years' experience performing traffic control in California. The subcontractor performing the traffic control work shall possess a current C-31 Construction Zone Traffic Control license issued by the California CONTRACTOR State License Board.
- B. The traffic control supervisors shall each have a minimum of 5 years' experience in traffic control. The traffic control supervisors shall be certified as a Traffic Control Supervisor by the American Traffic Safety Services Association or another institution acceptable to the OWNER Representative.

PART 2 PRODUCTS

2.01 GENERAL

- A. All traffic signs, barricades, delineators, flashing arrow signs and other traffic control devices shall conform to the requirements of the California Manual on Uniform Traffic Control Devices (Part 6, Temporary Traffic Control), Standard Plans, and Standard Specifications for traffic control systems. The MUTCD and the California MUTCD are available on the internet at the following web sites:

<http://mutcd.fhwa.dot.gov>

<http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp>

- B. All barricades shall have flashers. The flashers shall be maintained in good operating condition at all times by the CONTRACTOR. Cones, pylons, barricades, or posts used in diversion of traffic during hours of darkness shall be illuminated.
- C. All signs shall be reflectorized.

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2.02 DELINEATORS

Delineators for lane taper areas or for the separation of traffic from other work, shall be either reflectorized traffic cones minimum 28 inches high, or reflectorized portable tubular delineators minimum 36 inches high.

2.03 TAPE FOR TEMPORARY STRIPING

- A. Tape for temporary striping shall be either of the following types, or an OWNER Representative-approved equivalent:
1. Advanced Traffic-Marking, ATM Series 200
 2. Swarco Industries, "Director 2"
- B. Cutting and spacing of the tape for the temporary striping shall be as follows:
1. Crosswalk and STOP line: Three strips 4 inch wide to mark 12 inches wide crosswalk or limit lines.
 2. Striping across intersections and lines for left and/or right turn lanes: Two strips 4 inches wide to mark 8 inches wide guidelines.
 3. Double yellow centerline: 2-4 inches wide, 3 inches apart.
 4. Other striping: 4 inches wide.

2.04 TEMPORARY REFLECTIVE PAVEMENT MARKERS

- A. The temporary reflective pavement markers shall be one of the following types:
1. Temporary Overlay Markers (Types Y and W) manufactured by Davidson Traffic Control Products, 3110 70th Avenue East, Tacoma, Washington 98424, telephone (253) 284-8400.
 2. Swareflex Pavement Markers (Models 3553, 3554, Cat Eyes Nos. 3002 and 3004), manufactured by Swareco and distributed by Servtech Plastics Inc. 1711 South California Street, Monrovia, CA 91016, telephone (626) 359-9248.
 3. Safe-Hit Temporary Pavement Markers manufactured by Safe Hit Corporation, 132 N. El Camino Real #291, P.O. Box 291, Encinitas, CA 92024 (760) 295-2699.

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2.05 PAVEMENT MARKERS AND ADHESIVE

- A. Non-reflective Markers shall conform to Section 85-1.04 “Non-Reflective Pavement Markers”, of Caltrans Standard Specifications.
- B. Reflective Pavement Markers shall conform to Section 85-1.05, “Reflective Pavement Markers,” of Caltrans Standard Specifications.
- C. Adhesive of the above pavement markers shall conform to Section 85-1.055 “Adhesives”, of Caltrans Standard Specifications.

2.06 PAVEMENT MARKINGS

The thermoplastic and glass beads for the permanent pavement markings shall conform to Section 84-2.02, “Materials”, of Caltrans Standard Specifications.

2.07 NON-SKID METAL PLATING:

Metal plating and any metal bridging shall be coated via a blasting process with Integrated 750 HS (formerly 7300 Magna-Prime) Amido-Amine Epoxy, manufactured by Courtaulds Coatings (Division of International), 400 South 13th Street, P.O. Box 4139, Louisville, KY 40201-1439; Fax (502) 588-9316 or equal. Plating shall be coated in accordance with the coating manufacturer’s instructions, and installed and maintained in such a manner as to provide a non-skid surface with no edges or corners sticking up, and with no bouncing or shifting.

PART 3 EXECUTION

3.01 GENERAL

- A. Furnish, install, construct, maintain, and remove detours, road closures, signs, barricades, K-rail, fences, gates, flag men, radios, flares, miscellaneous traffic devices, drainage facilities, paving, and such other items and services as are necessary to adequately safeguard the public from hazard and inconvenience.
- B. During the duration of a detour, cover all signs not in accordance with the traffic control plan. Relocate existing signs to provide visibility from all relocated traffic lanes.
- C. All such work shall comply with the ordinances, directives, and regulations of authorities with jurisdiction over the public roads in which the construction takes place and over which detoured traffic is routed by the CONTRACTOR.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01570: TRAFFIC CONTROL

3.02 CONTROL OF ACCESS

- A. Post signs and barricades at all local road closure/work area access locations to prevent any public vehicular access during all working and non-working hours for the duration of the work.
- B. Control/detour traffic at all locations in conformance with the approved Traffic Control Plans for each site.
- C. Provide access for the OWNER and the OWNER Representative to all areas of the construction site at all times.
- D. Provide uninterrupted access for the OWNER recreational facilities adjacent to the well sites.

3.03 VEHICULAR TRAFFIC

- A. Traffic Lane and Parking Requirements

The CONTRACTOR shall provide the minimum number of lanes to satisfactorily accommodate vehicular traffic. Vehicular/ pedestrian access to properties in the project site area shall be maintained at all times.

The width of a traffic lane shall be measured from center to center of striping, or to the face of curb, or center of channelizer or delineator, as applicable.

- 1. The CONTRACTOR shall maintain the required travel way for vehicles in any public street, or right of way, and a minimum width of 5 feet of clear sidewalk, or full sidewalk at locations where the sidewalk is less than 5 feet wide for the pedestrians, at all times.
- 2. All existing traffic movements at the intersections shall be maintained by bridging and/or phasing.
- 3. No street closure shall interfere with the access of emergency vehicles including those of Police and Fire Departments and ambulances. Local access and detour plan shall be maintained at all times

3.04 SPECIAL INSTRUCTIONS

- A. The CONTRACTOR shall separate the construction area and staging areas from the traffic lanes by barricades and delineators and shall plate over the trenches after working hours.

TECHNICAL SPECIFICATIONS
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- B. The CONTRACTOR shall provide flag persons to control the traffic, as shown on the approved traffic control plans or as directed by the OWNER Representative. The number of flag persons required shall depend on the phase of work, traffic conditions, etc.
- C. The CONTRACTOR shall use hot asphalt concrete to provide longitudinal and/or transverse transitions with a slope of 1:18 between the newly constructed concrete base, manhole, etc. and existing pavement (whenever the difference in the grade of the pavement and the concrete base, manhole, etc. exceeds 3/4 of an inch) by the end of the work shift or before opening the lanes to traffic.
- D. Any existing crosswalks and STOP lines that are removed or damaged by the work activity shall be restored with temporary retroreflective tape.

3.05 PROHIBITION OF PARKING

- A. The CONTRACTOR shall not prohibit stopping in parking lanes except where and when necessary to gain access to the work or to provide the required lanes. The CONTRACTOR shall maintain the signs on a continual basis and shall replace damaged or missing signs daily, and shall remove the signs immediately after they are no longer needed.
- B. The CONTRACTOR shall coordinate with the local agencies for the posting of the required signs for the prohibition of parking. The CONTRACTORS shall post the signs at least 72 hours in advance of the effective date and time.
- C. If “Tow-Away – No Stopping” signs are to remain in place for less than 5 days, such signs may be attached to Type II barricades, placed at 25 ft. centers. The CONTRACTOR shall post the signs only in the area where they are actually working. Parking shall not be prohibited in the area where there is no construction activity. The name and contact telephone number of the CONTRACTOR shall be shown on all signs.
- D. When a vehicle is removed from a street at the request of the CONTRACTOR and a post-storage hearing determines that as a result of the CONTRACTOR’s improper posting of the required signs, reasonable grounds did not exist for removal, the CONTRACTOR shall reimburse the appropriate authority for the cost incurred in storage and towing. The failure of the CONTRACTOR to provide reimbursement or to agree to assume all liability for any improper posting shall result in the Police Department’s denial of any future requests by that CONTRACTOR for removal of vehicles in violation.

3.06 MASS TRANSIT VEHICLES

The CONTRACTOR shall NOT impede public transit operations at any time. The CONTRACTOR shall familiarize himself with the routes of the coach lines that operate within the limits of the work. The lanes made available for traffic shall be located so as to include an adequate and allowable travel path for the coach lines.

TECHNICAL SPECIFICATIONS
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In the event that the work requires any transit stops to be relocated or routes to be rerouted, the CONTRACTOR shall contact the transit agency impacted at least 10 days in advance of work.

3.07 TRIMMING OF TREES

At least (2) weeks prior to start of work in any particular block, the CONTRACTOR shall to coordinate with the OWNER Representative the requirement to trim any trees that will be in conflict with the construction job itself, with construction equipment, or with the traveling public during construction. The CONTRACTOR shall not detour any traffic onto any lane until all tree branches that may interfere with the traveling public have been addressed. The CONTRACTOR will not be allowed to trim any trees without a written approval and supervision from the appropriate authority including, as required the retention of an approved arborist if the authority requires it. The CONTRACTOR will perform all necessary trimming of trees, as directed, at no additional cost to the OWNER.

3.08 TEMPORARY CONSTRUCTION AND TRAFFIC SIGNS

- A. The signs and equipment shall conform to the requirements of the California Manual on Uniform Traffic Control Devices (CA MUTCD).
- B. The CONTRACTOR shall be familiar with the California MUTCD and the Special Provisions of the Contract. The CONTRACTOR, before starting any work which will affect the normal flow of traffic, shall furnish, install where and as necessary, or directed, and maintain, temporary signs, mounted on barricades or other suitable supports.
- C. The CONTRACTOR shall, as a minimum, furnish and make available to the site the following signs and equipment in sufficient quantities to maintain required traffic control:
 - 1. Barricades, as required by Section 21 of the State of California *Vehicle Code* and as specified in the California MUTCD Part 6 - Temporary Traffic Controls, in sufficient amount to safeguard the public and the workers.
 - 2. "TOW-AWAY - NO PARKING" signs as herein specified;
 - 3. Traffic cones and/or delineators and/or temporary reflectorized removable tape to delineate traffic lanes as required to guide and separate traffic movements, as directed by the OWNER Representative.
 - 4. High level warning flag units, in advance of traffic approaching the work, each displaying three- (3) flags mounted at a minimum height of 8 feet (2.4m).
 - 5. "ROAD WORK AHEAD" signs, Code W20-1, size 48" x 48" (122cm x 122cm) placed in conspicuous locations, in advance of the work, and facing approaching traffic, as directed by the OWNER Representative.

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6. “END ROAD WORK” signs, Code G20-2, size 36”x18” (90cm x 45cm) placed near the end of the termination area or as directed by the OWNER Representative.
7. “RIGHT/LEFT LANE CLOSED AHEAD” ” signs Code C20 (RT/LT), size 48” x 48” (122cm x 122cm), placed as directed by the OWNER Representative.
8. “ROAD CLOSED” signs, Code R11-2, size 48”x30” (122cm x 76cm), placed as directed by the OWNER Representative.
9. “ROAD CLOSED TO THRU TRAFFIC” signs, Code R11-4, 60”x30” (152cm x 76cm), placed as directed by the OWNER Representative.
10. “ROAD CLOSED AHEAD” signs, Code W20-3, 48”x48” (122cm x 122cm), placed as directed by the OWNER Representative.
11. “NO PED CROSSING SYMBOL” and “USE CROSSWALK (RIGHT OR LEFT ARROW)” signs, Code R9-3a and R9-3b (RT/LT), size 18” x 18” (46cm x 46cm) and 18” x 12” (46cm x 30cm), placed as directed by the OWNER Representative.
12. “FLAGGER SYMBOL” signs, Code C9A, size 48” x 48” (122cm x 122cm) placed as directed by the OWNER Representative.
13. “ROUGH ROAD” signs, Code W-33, size 30” x 30” (76cm x 76cm) placed as directed by the OWNER Representative.
14. “DETOUR AHEAD” signs, Code W20-2, size 48” x 48” (122cm x 122cm) placed as directed by the OWNER Representative.
15. “DETOUR” and “END DETOUR” signs, Code M4-8, M4-10 (RT/LT) and /or SC-3, size 48” x 18” (122cm x 45cm) placed as directed by the OWNER Representative.
16. “Street Name” signs, size 48” x 18” (122cm x 46cm) placed with items 14 and 15, as directed by the OWNER Representative.
17. “TWO WAY TRAFFIC SYMBOL” signs, Code W-6-3, size standard 48” (122cm), placed as directed by the OWNER Representative.
18. “BE PREPARED TO STOP” signs, Code W3-4, size standard 48” x 48” (122cm x 122cm) placed as directed by the OWNER Representative.
19. “NO LEFT OR RIGHT TURN SYMBOL” signs, Code R3-1 and R3-2, size 30” (76cm), placed as directed by the OWNER Representative.

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20. “BIKE LANE” and “END” signs, Code R-81 (CA) and R-81B (CA) placed as directed by the OWNER Representative.
21. “ROAD WORK/SPEED LIMIT” signs, Code C17 (CA), size 24” X 24” placed as directed by the OWNER Representative.
22. “TRUCKS ENTERING EXITING” signs, Code C44 (CA), size 48” X 48” placed as directed by the OWNER Representative.
23. Flashing arrow signs, Type II conforming to Section 12-3.03 of Caltrans Standard Specifications dated July 1992, except as modified herein and placed as shown on the approved Traffic Control Plans. A flashing arrow sign is required for each lane closure. The CONTRACTOR shall use Solar Operated Flashing Arrow signs.
24. All signs installed by the CONTRACTOR shall employ the use of Type III Graffiti proof sheeting on aluminum signs and Type IV for roll-up signs. This sheeting can be obtained from the following sources approved by Caltrans:

TYPE III	3M High Intensity 3M Center, Building 42-6E-37 Saint Paul, Minnesota 55144-1000 1-888-364-3577
TYPE IV	Reflexite Vinyl Microprism Reflexite P.O. Box 1200 315 South Street New Britain, Connecticut 06050 1-800-654-7570
25. The actual number and type of signs to be placed shall be as shown on the approved traffic control plans or as directed by the OWNER Representative.

All signs and/or temporary striping shall be reflectorized. Signs shall be installed so that the bottom of the sign is at least 8 feet above the sidewalk or pavement or as directed by the OWNER Representative.

3.09 TRAFFIC CONTROL

A. Traffic Coordination with Others

1. In order to maintain a continuous flow of traffic, including truck traffic hauling materials and equipment, the CONTRACTOR shall coordinate the traffic control work with his sub-contractors and other CONTRACTORS working in the same adjacent area.

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2. All proposed traffic control changes shall be subject to approval of the OWNER Representative and/or local agency.

B. Traffic Control Flag Persons

1. Flaggers, flagging procedures (signaling), flagger stations and flagger control, shall conform to the requirements of California MUTCD Part 6 Temporary Traffic Controls.
2. The CONTRACTOR shall ensure that flaggers are trained in the proper fundamentals of flagging traffic before being assigned as flaggers.
3. The flaggers shall be used in each situation when the CONTRACTOR's equipment or vehicle backs up into a travel lane, or intermittently occupies a traffic lane, or enters from the work area into a traffic lane, or where required for traffic control, as directed by the OWNER Representative.

3.10 MAINTENANCE OF TRAFFIC

- A. The CONTRACTOR shall cause the least possible interference with traffic and shall not obstruct nor close any roadway to vehicular or pedestrian traffic, except in the immediate vicinity of the work.
- B. Those parts of public streets, ways and sidewalks that are occupied by the CONTRACTOR shall be immediately vacated and returned to public use when CONTRACTOR's use thereof is no longer necessary for the prosecution of the work.
- C. The CONTRACTOR, except as hereinafter provided, shall not impede, at any time, free access for vehicles and pedestrians to warehouses, stores, service stations, dwellings, garages and other properties in the vicinity of the work and on adjacent streets, including those properties fronting on streets allowed or stipulated by the Specifications to be closed to through vehicular traffic. CONTRACTOR shall provide for such local access by phasing his operations, bridging, or employing other procedures approved by the OWNER Representative.
- D. The CONTRACTOR shall obtain written permission of each affected property or business OWNER, or responsible building or business manager, for any proposed period of prohibition or impediment of such access. Prohibition or impediment of access to any building or property for which the OWNER Representative does not have a copy of the specified-signed permission will not be allowed.
- E. To assure their immediate and unhampered use at all times, access to fire hydrants shall not be impaired by the CONTRACTOR. No debris, materials or equipment shall be placed within 10 feet of any fire hydrant.

TECHNICAL SPECIFICATIONS
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3.11 DIVERTING OF VEHICULAR TRAFFIC

- A. When closing one or more lanes to vehicular traffic or to otherwise divert such traffic from its normal paths, the CONTRACTOR shall clearly delineate temporary centerlines separating two-way traffic and dividing lines for other temporary traffic lanes, by employing cones, barricades, flags, reflectors, or other approved methods or devices.
- B. Placing of devices shall commence sufficiently in advance of the obstruction or other cause of the diverting of traffic to minimize congestion and shall enable traffic to enter, traverse and leave the site of the work without abrupt or unwarranted changes in direction. Unless otherwise specified or approved, each temporary traffic lane shall be not less than 10 feet clear width.
- C. When a detour is necessary for full or partial roadway closure, all detour signs needed for the required traffic control must be in place before the roadway can be closed for construction. Failure to comply with this requirement shall result in liquidated damages associated with improper lane closure.
- D. High rise warning flag units, each displaying three flags mounted at the minimum height of 8 feet, to provide advance warning for traffic approaching the work, will be required in all cases where motorists' visibility of the work is limited or obscured.

3.12 RELOCATION AND REMOVAL OF EXISTING PERMANENT TRAFFIC CONTROL SIGNALS AND SIGNS

- A. The CONTRACTOR shall be familiar with all existing permanent traffic signs and other traffic control devices within and adjacent to the project limit. The CONTRACTOR shall survey the site thoroughly to get all pertinent information of the signs in the construction area, including but not limited to sign type, message, location, orientation, number of faces (double sided or single sided), and reflectivity. The CONTRACTOR shall pay particular attention to the signs that will likely be damaged, removed or relocated during construction.
- B. Contractor shall not interfere with or obstruct existing traffic signal installations intended to remain in operation during construction activities. The CONTRACTOR shall temporarily relocate all traffic control, street name, and other City signs, as required for the prosecution of the work, and shall satisfactorily maintain such signs in place at all times. The CONTRACTOR shall similarly relocate, or remove and salvage as OWNER property, the standards for such signs. The CONTRACTOR shall salvage standards in their entirety, and shall remove all concrete therefrom.
- C. The temporary relocation of each arterial "STOP" or other traffic regulatory sign shall be done immediately upon its removal, and to a location as close as possible to the original position of such sign, or where directed by the OWNER Representative.

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- D. The CONTRACTOR shall remove, and salvage as OWNER property, existing arterial “STOP” or other signs superseded by traffic signals installed by him, immediately upon being notified by the OWNER Representative that such signals will remain in operation.
- E. The CONTRACTOR shall reinstall any traffic signs removed or relocated during construction to local standards.

3.13 PAVING MARKINGS

A. Temporary Pavement Markings

- 1. After each day’s work the CONTRACTOR shall furnish and install temporary pavement delineation, which shall be maintained by the CONTRACTOR until the permanent markings are installed.
- 2. The CONTRACTOR prior to construction shall survey each street and inventory all existing pavement markings including marking type and material used. The pavement markings shall include, but not be limited to traffic striping, crosswalks, stop lines, messages, raised pavement markers and traffic arrows.
- 3. Temporary pavement delineation of lane lines and centerlines shall consist of temporary reflective pavement markers placed at longitudinal intervals of not more than 24 feet apart. The temporary pavement markers shall be the same color as the markings they replace.
- 4. Surfaces on which temporary pavement delineation is to be applied shall be cleaned of all dirt and loose material and shall be dry when the pavement markers are applied.
- 5. Temporary pavement delineation shall be applied in accordance with the manufacturer’s instructions. Butyl adhesive pads shall be used to apply temporary reflective pavement markers to the top layer of permanent surfacing or existing surfacing.

B. Permanent Pavement Markings

- 1. The CONTRACTOR shall furnish all material and labor to replace all permanent thermoplastic stripes and pavement markings damaged or removed by its operations.
- 2. Reflective and non-reflective markers shall be placed in accordance with Section 85-1.06 of the State Specifications and to State Standard Plans.
- 3. Thermoplastic pavement markings shall be placed in accordance with Section 84-2.04 of the State Specifications and State Standard Plans.

TECHNICAL SPECIFICATIONS
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4. Any pavement markings removed or damaged by the CONTRACTOR's operation shall be replaced within 30 days of permanent pavement restoration. All temporary pavement markings shall be removed according to manufacturer's specification and to the satisfaction of the OWNER Representative prior to restoring the permanent markings.

3.14 CROSSWALKS, SIDEWALKS AND BICYCLE PATHS

- A. All crosswalks and bicycle paths shall be kept open at all times, unless a substitute temporary crosswalk and/or bicycle path is provided or otherwise approved by the OWNER Representative.
- B. R9-3A and R9-3B, "NO PED CROSSING, USE CROSSWALK" and "USE CROSSWALK (L/R)" signs shall be placed at each end of a temporarily closed crosswalk.
- C. Whenever a temporary crosswalk is provided outside of the existing crosswalk, such temporary crosswalks shall be clearly defined by signs, striping, pedestrian bridges or plates. The minimum width of the temporary crosswalk shall be 10 feet measured between the outside edges of the striping tape. The CONTRACTOR shall provide access to mobility and visually impaired persons at all temporary and/or permanent crosswalks at all times by providing accessible temporary curb ramps.
- D. The CONTRACTOR shall provide temporary pedestrian signals at temporary crosswalks to be located at 15 feet or more from the existing crosswalk with existing pedestrian signals.
- E. No obstruction or openings of any kind shall be allowed in portions of sidewalks and bicycle paths accessible to pedestrians/bicyclists.
- F. Portions of sidewalk and bicycle paths closed to pedestrians/ bicyclists shall be delineated by a continuous line of pedestrian barriers. Barriers shall not have legs or other parts projecting into pedestrian/bicyclists ways and shall meet the requirements for the visually impaired persons.

3.14 TRUCK ROUTES

- A. The CONTRACTOR shall ensure that all trucks and equipment associated with the project travel only on the truck routes designated by the local agencies. The CONTRACTOR shall not permit any trucks, or equipment associated with this project to be driven on non-truck route local streets except to use the shortest route to and from the project sites. In the event truck routes are not designated by a local agency, the CONTRACTORS shall use the local arterials to the projects sites.
- B. The CONTRACTOR is solely responsible for all permits and fees required to operate extralegal size, weight, or load vehicles associated with this project.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01570: TRAFFIC CONTROL

3.15 MAINTENANCE AND REPAIR/RESTORATION

- A. Installed traffic control devices and other materials, shall be maintained and kept in good repair and working order until no longer required.
 - 1. Visually ensure that all traffic control devices are installed in accordance with the approved working drawings.
 - 2. Periodically during construction, verify that all traffic control devices are visible and functional.
 - 3. Replace such devices that are lost or damaged, to such an extent as to require replacement, regardless of the cause of such loss or damage.
 - 4. When and where flagmen or radio controllers are an essential part of the traffic control plan (such as during working hours) they shall remain in effect until the plan indicates they are no longer necessary (such as after the construction site has been closed down for the night).
- B. Maintain a 24-hour per day emergency service to remove, install, relocate, and maintain warning devices.
 - 1. Furnish to the authority having jurisdiction names and telephone numbers of 3 persons responsible for this emergency service.
 - 2. In the event these persons do not promptly respond or the authority having jurisdiction deems it necessary to call out other forces to accomplish emergency service, the CONTRACTOR will be held responsible for the cost of such emergency service.
- C. All site access security provisions, including manning with proficient personnel and adequate communications, shall be applied on a continuous 24 hours per day, seven days per week basis throughout duration of construction.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01570: TRAFFIC CONTROL

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01580: PROJECT SIGNS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for installing Project Identification Signs removal and disposal of signs following completion of the Work.

1.02 RELATED SECTIONS

- A. Section 01300 – CONTRACTOR Submittals
- B. Section 01600 - Products, Materials, Equipment and Substitutions
- C. Section 02200 - Earthwork

1.03 SYSTEM DESCRIPTION

- A. Contractor shall post a Project Identification Signs at each active work site and at the CONTRACTOR's construction trailer.
- B. A sign shall also be placed every 2 miles along the alignment.
- C. Details of Project Identification Sign construction and legends are shown on figures appended to this Section, titled:
 - 1. Sign Assembly Detail.
- D. Where sign is to be posted at an active work site, the Project Sign shall be secured in a way as to prevent it from being stolen, on the project fencing, where it is visible to the public.
- E. Size of signs will be as shown on appended figure unless variance is required to meet special or local requirements; however, proportions of signs to be maintained.
- F. Mount signs on freestanding fixed posts painted white.
- G. Supports:
 - 1. For each sign, provide at least two posts of size shown on appended figures.
 - 2. Provide attachment devices, fasteners, and other necessary hardware and materials.
- H. Painting: Both sides and all edges.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01580: PROJECT SIGNS

- I. Content: At a minimum the project sign shall include the following:
 - 1. Project name.
 - 2. Contractor name, CONTRACTOR logo, contact phone number and after hours contact number
 - 3. Owner name, OWNER logo, contact number and after hours contact number (to be provided by OWNER)
 - 4. Estimated Project Construction Period (to be provided by OWNER).
- J. Upon completion of work under contract, Project Identification Signs, shall become the property of CONTRACTOR and shall be removed and legally disposed.

1.04 SUBMITTALS

- A. Submittals' General Requirements: Refer to Section 01300 – CONTRACTOR Submittals and Section 01600 - Products, Materials, Equipment and Substitutions.
- B. Shop Drawings: For each Project Identification Sign show and describe:
 - 1. Panel with the specified text, logos, and other painted features.
 - 2. Supports, attachment, and installation details.
 - 3. Materials of construction and the type of paint and colors.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sign Panels: Standard waterproof exterior grade plywood sheets.
- B. Paint: Exterior gloss enamel with a clear graffiti-proof coating.
- C. Supports: Douglas Fir construction grade.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Construct and erect signs, at locations selected by the CONTRACTOR for OWNER review. Prior to excavating post holes, follow the procedures for locating existing utilities and potholing specified in Section 02200, Earthwork.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01580: PROJECT SIGNS

- B. Excavate post holes by hand, except power equipment may be used if it is determined that there are no utility facilities in the area of the proposed post holes.

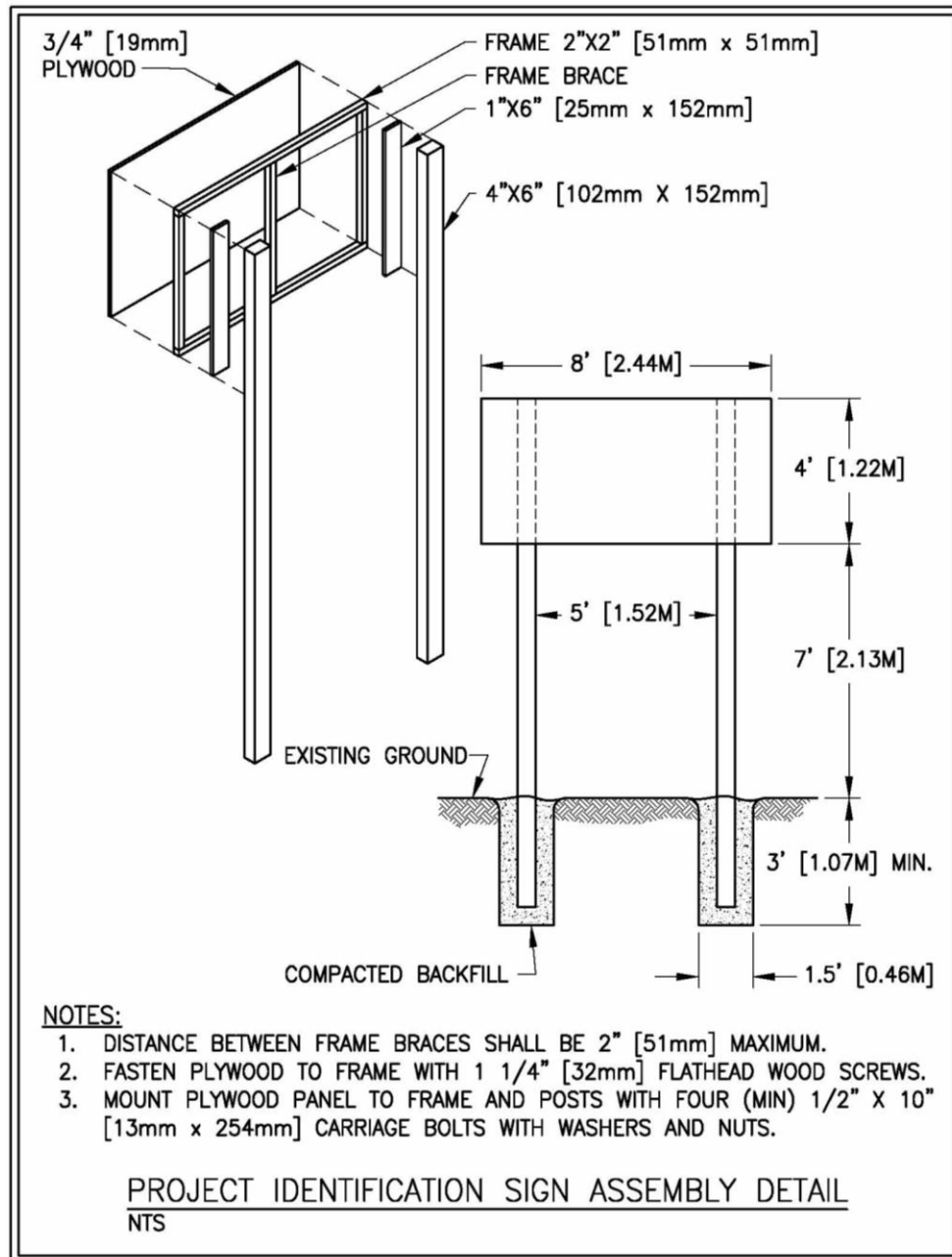
3.02 MAINTENANCE

- A. Signs shall be kept clean and in good repair by the CONTRACTOR.

3.03 REMOVAL

- A. Remove and dispose of Project Identification Signs after project completion only when directed by the OWNER.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01580: PROJECT SIGNS



END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01590: FIELD OFFICES

PART 1 GENERAL

1.01 SUMMARY

A. This Specification Section covers the general requirements pertaining to:

1. Contractor's Field Office and Sheds
2. Owner Representative's Field Office

B. Related Documents and Sections

1. Section 01025 – Measurement and Payment
2. Section 01510 – Temporary Utilities.
3. Section 01700 – Project Closeout

1.02 GENERAL REQUIREMENTS

- A. Contractor shall provide and maintain the OWNER Representative's field office as specified herein including all specified furnishings, equipment and services during the entire period of construction until final completion.
- B. Contractor shall provide and pay for temporary utility connections and services as required to support the field office, including sanitary sewer, potable water, power (electricity) and communication (telephone and internet) services for the entire period of construction until final completion.
- C. All required field offices shall be equipped and furnished as specified herein, and shall be ready for use by the OWNER Representative within 10 calendar days following Notice To Proceed.
- D. All office, furnishing, tools and equipment specified herein to be provided to the OWNER Representative shall be for the OWNER's exclusive use.
- E. Contractor shall provide, maintain, and pay for their own temporary field offices and storage sheds, including all utilities and maintenance services, as required for proper project management and execution of the work.
- F. Contractor is responsible for obtaining all required permits for the CONTRACTOR's and the OWNER Representative's field offices including all associated temporary facilities.
- G. Materials, installation, maintenance and removal of CONTRACTOR's and OWNER Representative's field offices shall comply with all applicable specifications and regulatory requirements, and shall be paid for by the CONTRACTOR.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01590: FIELD OFFICES

- H. Contractor shall remove field offices and construction facilities, including associated equipment and utilities, from the site as CONTRACTOR's property, within 14 calendar days after CONTRACTOR's Application for Final Payment has been approved by the OWNER Representative, or when its use is no longer required as determined by the OWNER Representative. Restore the site occupied by said field offices to the original or better condition. All furnishings and equipment as specified herein will be returned to the CONTRACTOR for removal from the field office.

1.03 OWNER REPRESENTATIVE'S FIELD OFFICE SUPPLIES AND EQUIPMENT

- A. The CONTRACTOR shall furnish consumable and replaceable supplies to the Resident Engineer's Field Office. This includes, but: photocopy and fax machine paper and toner, paper towels, paper cups, soap, toilet paper, bottled water service (with hot and cold water faucets), telephone service, electric lighting, electric heating, electric cooling and security services.

1.04 PROJECT-SPECIFIC REQUIREMENTS

- A. Provide and pay for a temporary field office for the OWNER Representative and OWNER field personnel. The field office shall consist of a minimum 300 square foot trailer located where directed by the OWNER and providing toilet facilities consisting of one lavatory and one water closet complete with connections to water and sewer mains. Provide a mail slot in the door or a lockable mailbox mounted on the surface of the door. Include the following:
1. 4 by 8 ft plan table
 2. 2 standard size office desks with chairs
 3. A book shelf and a 2-drawer locking filing cabinet
 4. Custodial and bathroom supplies for the duration of the project.
 5. Secure Wifi service compatible with OWNER's Representative laptops
 6. Two (2) wastepaper baskets
 7. One (1) microwave ovens with 750 watts power and 1 cu. ft. volume minimum and one (1) small reffridgerator with a freezer.
 8. One coat rack and one boot scraper.
- B. The CONTRACTOR shall also provide a meeting room for at least 10 people with a conference call phone line, either in the OWNER trailer or in the CONTRACTOR trailer.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01590: FIELD OFFICES

PART 2 PRODUCTS

2.01 OWNER REPRESENTATIVE'S FIELD OFFICE

- A. Contractor shall provide new construction trailers as specified herein. If the field office(s) are used or reconditioned, the OWNER Representative will have sole authority to determine their acceptability.
- B. Contractor shall locate the OWNER Representative's field office close to the CONTRACTOR's field office or other approved point convenient to the construction operations.
- C. The OWNER Representative shall approve the final location and floor-plan layout prior to delivery of the field office to the jobsite.
- D. The OWNER Representative's Field Office shall be a trailer type mobile structure. The field office shall have the following features:
 - 1. The area of the field office shall be as specified, including a ADA ramp at trailer entrance(s).
 - 2. The office shall have as a minimum:
 - a. 120-volt AC power and associated meter, circuit breakers, switches, outlets, motion sensor actuated exterior spotlights at entrance and on parking spaces, etc.
 - b. Potable water and sanitary sewage service.
 - c. Telephone service and equipment with 1 phone lines and 1 fax line.
 - d. One (1) T-1 data line, or equivalent in capacity, plus appropriate network outlets.
 - e. Seismic restraint system.
 - f. Security guard screens on all windows and doors with vandal resistant bolts.
 - g. Keyed alike locking handsets and deadbolts on doors with 4 keys. Separate ¼" thick security bar across each door with shrouded weather resistant padlock with 4 keys.
 - h. Trailer skirting to match the exterior finish
 - i. Insulated double walls, floor, and roof.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01590: FIELD OFFICES

- j. Self-contained, built-in electric heater and air conditioner with thermostatic controls.
 - k. Fluorescent ceiling lights.
 - l. Electrical outlets shall have 20 amp wall plug circuits located approximately 10 feet o.c., minimum of 24 outlets.
- E. The OWNER Representative's Field Office shall have the following additional features, all subject to approval by the OWNER Representative:
 - 1. Operable windows, in accordance with applicable regulations, with screens and new blinds in all habitable rooms.
 - 2. Minimum interior height 7 feet.
 - 3. Circuit breakers sized and grouped such that operation of the electrical equipment in the trailer does not interrupt operation of the computers and electrical equipment.
 - 4. One restroom with flushable toilet, washbasin, and running hot and cold potable water.
 - 5. Trailer shall have linoleum flooring.
 - 6. Graveled parking space for at least ten (10) parking spaces vehicles adjacent to the OWNER Representative's Field Office.
 - 7. Twice weekly wastewater holding tank pump-out and maintenance service.
- F. Contractor shall maintain the Field Office and appurtenances in good repair and appearance as accepted by the OWNER Representative. The CONTRACTOR shall furnish and pay for regular janitorial services at least once a week. This will include collection and removal of refuse from site. Field Office shall be swept, dusted, vacuumed and mopped, and waste receptacles emptied. Toilet facilities shall be sanitized and cleaned. Dispensers and continuous supply of toilet paper, seat covers, soap and paper towels shall be furnished for restroom facility.
- G. Contractor shall provide including all assembly, installation and hookup, one new copy machine (with service contract) that can stack feed, collate, copy double sided, reduce and enlarge, make both 8.5x11 and 11x17 copies, and as well as print, scan and e-mail. CONTRACTOR shall pay for all maintenance, service, service contract and supplies to keep the copier working. Copier/printer shall be capable of at least 10 pages per minute (b/w).

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01590: FIELD OFFICES

- H. In addition, CONTRACTOR shall provide all paper and toner supplies for 50 color/black/white prints per work day the duration of the project as needed by the OWNER Representative, and shall ensure that those supplies include recycled, post-consumer content.
- I. Contractor shall provide one new plain paper multi-page-feed fax machine (with service contract, maintenance and supplies).
- J. Trailer shall have electrical power, telephone and data wiring and outlets as necessary to serve the foregoing equipment. At a minimum each desk location shall be served with electrical, telephone and data outlets.

2.02 TOOLS AND OTHER EQUIPMENT

- A. Contractor shall provide the following new tools and equipment which shall become the property of the OWNER upon completion of the project:
 - 1. First aid kit in accordance with Cal OSHA requirements.
 - 2. One (1) wall mounted fire extinguisher, 10 lb. Size, effective against Class A, B and C fires, for each trailer office.

2.03 TELEPHONE AND INTERNET SERVICE

- A. Within 7 calendar days after Notice to Proceed, the CONTRACTOR shall provide in the Field Office for the use of the OWNER Representative, the required number of incoming telephone lines including the one(s) dedicated for the FAX machine, and the required number of T-1 data lines. CONTRACTOR shall also pay for telephone and internet usage by OWNER employees during construction.

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01600: PRODUCTS MATERIALS EQUIPMENT AND SUBSTITUTION

PART 1 GENERAL

1.01 DEFINITIONS

- A. The word "Products," as used in the Contract Documents is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form WORK. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," "special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying, and erection of the WORK.
- C. Related Sections
1. General Conditions – 6.05

1.02 QUALITY ASSURANCE

- A. **Source Limitations:** To the greatest extent possible for each unit of WORK, the CONTRACTOR shall provide products, materials, and equipment of a singular generic kind from a single source.
- B. **Compatibility of Options:** Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.03 PRODUCT DELIVERY AND STORAGE

- A. The CONTRACTOR shall deliver and store the WORK in accordance with manufacturer's written recommendations and by methods and means that will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at the Site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01600: PRODUCTS MATERIALS EQUIPMENT AND SUBSTITUTION

1.04 TRANSPORTATION AND HANDLING

- A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.
- B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment, including those furnished by OWNER, by methods to prevent soiling and damage.
- C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.05 STORAGE AND PROTECTION

- A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.
- B. For exterior storage of fabricated products, products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.
- C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
- D. Storage shall be arranged to provide access for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.
- E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

1.06 MAINTENANCE OF PRODUCTS IN STORAGE

- A. Stored products shall be periodically inspected on a scheduled basis. The CONTRACTOR shall maintain a log of inspections and shall make the log available on request.
- B. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations.
- C. The CONTRACTOR shall maintain manufacturer-required environmental conditions continuously.
- D. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01600: PRODUCTS MATERIALS EQUIPMENT AND SUBSTITUTION

- E. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.
- F. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to final acceptance by the OWNER in accordance with the Contract Documents.

1.07 PROPOSED SUBSTITUTIONS OR "OR-EQUAL" ITEM

- A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular manufacturer, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted, materials or equipment of other manufacturers may be accepted if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:
 - 1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the CONTRACTOR.
 - 2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitution and the ENGINEER's decision shall be final.
 - 3. The ENGINEER may require the CONTRACTOR to furnish additional data about the proposed substitution.
 - 4. The OWNER may require the CONTRACTOR to furnish a special performance guarantee or other surety with respect to any substitution.
 - 5. Acceptance by the ENGINEER of a substitution item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitution.
 - 6. The CONTRACTOR shall pay all costs of implementing accepted substitutions, including redesign and changes to WORK necessary to accommodate the substitution.
- B. The procedure for review by the ENGINEER will include the following:
 - 1. If the CONTRACTOR wishes to provide a substitution item, the CONTRACTOR shall make written application to the ENGINEER on the "Substitution Request Form."

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01600: PRODUCTS MATERIALS EQUIPMENT AND SUBSTITUTION

2. Unless otherwise provided by law or authorized in writing by the ENGINEER, the "Substitution Request Form(s)" shall be submitted within the 35-day period after award of the Contract.
 3. Wherever a proposed substitution item has not been submitted within said 35-day-period, or wherever the submission of a proposed substitution material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.
 4. The CONTRACTOR shall certify by signing the form that the list of paragraphs on the form are correct for the proposed substitution.
 5. The ENGINEER will evaluate each proposed substitution within a reasonable period of time.
 6. As applicable, no shop drawing submittals shall be made for a substitution item nor shall any substitution item be ordered, installed, or utilized without the ENGINEER'S prior written acceptance of the CONTRACTOR'S "Substitution Request Form."
 7. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby.
- C. The CONTRACTOR's application shall address the following factors which will be considered by the ENGINEER in evaluating the proposed substitution:
1. Whether the evaluation and acceptance of the proposed substitution will prejudice the CONTRACTOR's achievement of Substantial Completion on time.
 2. Whether acceptance of the substitution for use in the WORK will require a change in any of the Contract Documents to adapt the design to the proposed substitution.
 3. Whether incorporation or use of the substitution in connection with the WORK is subject to payment of any license fee or royalty.
 4. Whether all variations of the proposed substitution from the items originally specified are identified.
 5. Whether available maintenance, repair, and replacement service are indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01600: PRODUCTS MATERIALS EQUIPMENT AND SUBSTITUTION

6. Whether an itemized estimate is included of all costs that will result directly or indirectly from acceptance of such substitution, including cost of redesign and claims of other contractors affected by the resulting change.
 7. Whether the proposed substitute item meets or exceeds the experience and/or equivalency requirements listed in the appropriate technical specifications.
- D. Without any increase in cost to the OWNER, the CONTRACTOR shall be responsible for and pay all costs in connection with proposed substitutions and of inspections and testing of equipment or materials submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK, whether or not the ENGINEER accepts the proposed substitution or proposed equipment or material. The CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitution.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01600: PRODUCTS MATERIALS EQUIPMENT AND SUBSTITUTION

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01640: DEMOLITION AND RECONSTRUCTION

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall demolish and reconstruct existing civil, landscaping, and structural facilities as indicated, in accordance with the Contract Documents.

1.02 COORDINATION

- A. The CONTRACTOR shall carefully coordinate the WORK in areas where existing facilities are interconnected with new facilities and where existing facilities remain operational. The WORK as indicated is not all inclusive, and the CONTRACTOR shall be responsible to perform the reconstruction indicated plus that which can be reasonably inferred from the Contract Documents as necessary to complete the Project. The Specifications and Drawings identify the major facilities that shall be demolished and reconstructed, but auxiliary utilities such as water, air, chemicals, drainage, lubrication, fluid power, electrical wiring, controls, and instrumentation are not necessarily shown.
- B. The CONTRACTOR shall note that the Drawings used to indicate demolition and reconstruction are based on record drawings of the existing facilities. These record drawings have been reproduced to show existing conditions and to clarify the scope of WORK as much as possible. Prior to bidding, the CONTRACTOR shall conduct a comprehensive survey at the Site to verify the correctness and exactness of the Drawings, the scope of WORK, and the extent of auxiliary utilities.
- C. While demolition and reconstruction are being performed, the CONTRACTOR shall provide adequate access for the continued operation and maintenance of equipment and treatment processes. The CONTRACTOR shall erect and maintain fences, warning signs, barricades, and other devices around the reconstruction as required for the protection of the CONTRACTOR's employees and the OWNER's personnel. The CONTRACTOR shall remove such protection when reconstruction activities are complete, or as work progresses, or when directed by the ENGINEER.

1.03 CONTRACTOR SUBMITTALS

- A. Demolition and reconstruction activities and procedures, including operational sequence, shall be submitted to the ENGINEER for approval. The procedures shall provide for safe conduct of the WORK, careful removal and disposition of materials and equipment, protection of existing facilities which are to remain undisturbed, coordination with existing facilities to remain in service, and timely disconnection and reconnection of utility services. The procedures shall include a detailed description and time schedule of the methods and equipment to be used for each operation and the sequence of operation. A storage plan for salvaged items shall be included.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01640: DEMOLITION AND RECONSTRUCTION

1.04 DEMOLITION

- A. Existing pavement, structures, equipment, piping, utilities, and related appurtenances such as anchors, supports, and hardware indicated or required to be demolished as part of the WORK shall be removed and disposed of unless otherwise indicated. Removal of buried structures, utilities, and appurtenances includes the related excavation and backfill as required. Removed items shall be disposed of offsite by the CONTRACTOR.

1.05 REHABILITATION

- A. Existing civil, landscaping, and structural WORK disturbed or damaged by reconstruction activities shall be repaired or rehabilitated to existing or better than existing conditions.
- B. Damaged items shall be repaired or replaced with new items to restore items or surfaces to a condition equal to and matching that existing prior to damage.

1.06 DISPOSAL

- A. The CONTRACTOR shall be responsible for the offsite disposal of debris resulting from reconstruction in compliance with local, state, and federal codes and requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. The CONTRACTOR shall coordinate demolition and reconstruction WORK with the OWNER and ENGINEER. Unless otherwise indicated, the CONTRACTOR shall be responsible for the sequence of activities. WORK shall be performed in accordance with applicable safety rules and regulations.
- B. The CONTRACTOR shall verify that any utilities connected to structures, equipment, and facilities to be removed, relocated, salvaged, replaced, or abandoned are rendered inoperable, replaced with new utilities, or adequately bypassed with temporary utilities before proceeding with demolition and reconstruction.
- C. The CONTRACTOR shall take precautions to avoid damage to adjacent facilities and to limit the WORK activities to the extent indicated. If reconstruction beyond the scope indicated is required, the CONTRACTOR shall obtain approval from the ENGINEER prior to commencing.

3.02 WELL DEMOLITION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01640: DEMOLITION AND RECONSTRUCTION

- A. CONTRACTOR shall obtain a well destruction permit from the County of Monterey Health Department and perform well demolition in accordance with local and state regulations.
- B. Well Demolition shall be performed by a certified contractor with a valid and C-57 Drilling License.
- C. General Well Demolition Sequencing
 - 1. Inspect well and remove all obstructions.
 - 2. Measure and confirm depth of water well
 - 3. Determine if there is an open annulus around the well casing
 - 4. Flush remaining debris from water well that may interfere with slurry grout placement
 - 5. Perforate well casing using mechanical perforator
 - 6. Using a tremie, pump grout slurry into abandoned well from the bottom up to the surface. Slowly extract the tremie pie as the grout slurry is placed.

3.03 PROTECTION OF EXISTING FACILITIES

- A. Before beginning any reconstruction, the CONTRACTOR shall carefully survey the existing facilities and examine the Specifications and Drawings to determine the extent of reconstruction and coordination with the WORK. Existing facilities not subject to reconstruction shall be protected and maintained in accordance with Section 01530 - Protection of Existing Facilities. Damaged existing facilities shall be repaired to the previous condition or replaced at no additional cost to the OWNER.
- B. Persons shall be afforded safe passages around areas of demolition.
- C. Structural elements shall not be overloaded. The CONTRACTOR shall be responsible for shoring, bracing, or adding new supports as may be required for adequate structural support as a result of WORK performed under this Section. The CONTRACTOR shall remove temporary protection when the WORK is complete or when so authorized by the ENGINEER.
- D. The CONTRACTOR shall carefully consider bearing loads and capacities before placement of equipment and material on Site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, the CONTRACTOR shall consult with the ENGINEER prior to the placement of such equipment or material.

3.04 DISPOSAL

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01640: DEMOLITION AND RECONSTRUCTION

- A. Demolition and removal of debris shall minimize interference with roads, streets, walks, and other adjacent occupied or used facilities which shall not be closed or obstructed without permission from the OWNER. Alternate routes shall be provided around closed or obstructed traffic ways.
- B. Site debris, rubbish, and other materials resulting from reconstruction operations shall be legally removed and disposed of. Structures and equipment to be demolished shall be cleaned prior to demolition and the wash water properly disposed of. No trace of these structures shall remain prior to placing of backfill in the areas from which structures were removed.
- C. Refuse, debris, and waste materials resulting from demolition and clearing operations shall not be burned.

3.05 OCCUPANCY AND POLLUTION CONTROL

- A. Water sprinkling, temporary enclosures and other suitable methods shall be used to limit dust and dirt rising and scattering in the area. The CONTRACTOR shall comply with government regulations pertaining to environmental protection.
- B. Water shall not be used if it creates hazardous or objectionable conditions such as ice, flooding, or pollution.

3.06 CLEANING

- A. During and upon completion of WORK, the CONTRACTOR shall promptly remove tools and equipment, surplus materials, rubbish, debris, and dust and shall leave areas affected by WORK in a clean, approved condition.
- B. Adjacent structures shall be cleaned of dust, dirt, and debris caused by reconstruction, as directed by the ENGINEER or governing authorities, and adjacent areas shall be returned to condition existing prior to start of WORK.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01656: PRESSURE PIPE TESTING AND DISINFECTION

PART 1 GENERAL

1.01 SUMMARY

- A. The CONTRACTOR shall test and disinfect potable water pipelines and appurtenant piping, in accordance with the Contract Documents.
- B. The CONTRACTOR shall be responsible for obtaining permits for discharging excess testing and disinfection water and dechlorination of such water if required to satisfy permit limits.
- C. The state of California is in the midst of a severe drought. The contractor shall make every endeavor to conserve water.

1.02 REFERENCES

- A. American Water Works Association
 - 1. AWWA B301, Liquid Chlorine
 - 2. AWWA B300, Hypochlorites
 - 3. AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances
 - 4. AWWA C651, Disinfecting Water Mains

1.03 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 – Contractor Submittals.
- B. Furnish:
 - 1. A testing plan and schedule, including method for water conveyance, control, disposal, and disinfection shall be submitted in writing for approval.
 - 2. Name of certified bacteriological testing laboratory.
 - 3. Resume of experienced technician, if liquid chlorine is proposed.

PART 2 PRODUCTS

2.01 MATERIAL REQUIREMENTS

- A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, and other water control equipment, and choice of disinfectant shall be as determined by the CONTRACTOR. No materials shall be used which would be injurious to the WORK for future conveyance of potable water.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01656: PRESSURE PIPE TESTING AND DISINFECTION

- B. Chlorine for disinfection may be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
 - 1. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301 - Liquid Chlorine, and shall be used only when each of the following conditions are satisfied:
 - a. Appropriate gas flow chlorinators and ejectors are used.
 - b. An experienced technician directly supervises.
 - c. Appropriate safety practices are observed.
 - 2. Sodium and calcium hypochlorite shall be in accordance with ANSI/AWWA B300 - Hypochlorites.
- C. Dechlorination agents may be sodium bisulfate, sodium sulfite, or sodium thiosulfate.

PART 3 EXECUTION

3.01 GENERAL

- A. Water for testing and disinfecting water pipelines will be furnished by the OWNER; however, the CONTRACTOR shall convey the water from the OWNER-designated source to the points of use.
- B. All pressure pipelines shall be tested; those for potable water shall be disinfected. All chlorinating and testing operations shall be performed in the presence of the ENGINEER.
- C. Disposal of flushing water and water containing chlorine shall be by methods acceptable to the ENGINEER.
- D. Disinfection operations shall be scheduled as late as possible during the Contract Time to maximize the degree of sterility of the facilities at the time the WORK is accepted by the OWNER. Bacteriological testing shall be performed by a certified testing laboratory accepted by the OWNER or ENGINEER. Results of the bacteriological testing shall be satisfactory with the State Department of Health or other appropriate regulatory agency.

3.02 HYDROSTATIC TESTING OF PIPELINES

- A. Perform hydrostatic pressure tests in accordance with AWWA C600. The test pressure will approximately range from 150 to 200 psi.
- B. Contractor may, at his option, completely or partially backfill the trench over the center portion of each pipe section to be tested. However, owner may direct the Contractor to completely backfill the trench if local traffic or safety conditions require.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01656: PRESSURE PIPE TESTING AND DISINFECTION

- C. Pipeline 30-inches diameter and larger shall be visually inspected that all debris has been removed prior to flushing.
- D. Prior to hydrostatic testing, pipelines shall be flushed or blown out as appropriate. The CONTRACTOR shall test pipelines in sections. Sections to be tested shall be defined by isolation valves in the pipeline. Where such valves are not present, the CONTRACTOR shall install temporary bulkheads or plugs for the purpose of testing. Sections that do not have isolation valves shall be tested in approximate one-mile segments. Sections that have a zero leakage allowance may be tested as a unit. No section of the pipeline shall be tested until field-placed concrete or mortar has attained an age of 14 Days. The test shall be made by closing valves when available or by placing bulkheads and filling the line slowly with water. The CONTRACTOR shall be responsible for ascertaining that test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to or movement of the adjacent pipe. Unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test to avoid movement and damage to piping and equipment. Remove or protect any pipeline-mounted devices that may be damaged by the test pressure. The CONTRACTOR shall provide sufficient temporary tappings in the pipelines to allow for trapped air to exit. After completion of the tests, such taps shall be permanently plugged. Care shall be taken that air relief valves are open during filling.
- E. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the release valves at a reasonable velocity. The air within the pipeline shall be allowed to escape completely. The differential pressure across the orifices in the air release valves shall not be allowed to exceed 5 psi at any time during filling. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb water and to allow the escape of air from air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the ENGINEER shall be taken. The test pressure for yard piping shall be as indicated on the Piping Schedule measured at the lowest point of the pipeline section being tested. No pressure test will be required for a reservoir overflow line.
- F. Conduct a leakage test concurrently with the pressure test. Leakage is defined as the volume of water that must be supplied into the pipeline being tested to maintain pressure within ± 5 psi of the test pressure, after the pipeline is filled and purged of air. The maximum leakage for yard piping shall be as indicated on the table below. Pipe with welded joints shall have no leakage. Exposed piping shall show no visible leaks and no pressure loss during the test. Visible leaks that appear during testing shall be repaired in a manner acceptable to the ENGINEER. In the case of pipelines that fail to pass the leakage test, the CONTRACTOR shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipeline, repeating as necessary until the pipeline passes.

Allowable Leakage per 1000 ft. of Pipeline (gph)

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01656: PRESSURE PIPE TESTING AND DISINFECTION

Avg. Test Pressure <i>psi</i>	Nominal Pipe Diameter— <i>in.</i>																	
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	64
450	0.43	0.57	0.86	1.15	1.43	1.72	2.01	2.29	2.58	2.87	3.44	4.30	5.16	6.02	6.88	7.74	8.60	9.17
400	0.41	0.54	0.81	1.08	1.35	1.62	1.89	2.16	2.43	2.70	3.24	4.05	4.86	5.68	6.49	7.30	8.11	8.65
350	0.38	0.51	0.76	1.01	1.26	1.52	1.77	2.02	2.28	2.53	3.03	3.79	4.55	5.31	6.07	6.83	7.58	8.09
300	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21	4.92	5.62	6.32	7.02	7.49
275	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03	4.71	5.38	6.05	6.72	7.17
250	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85	4.49	5.13	5.77	6.41	6.84
225	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65	4.26	4.86	5.47	6.08	6.49
200	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44	4.01	4.59	5.16	5.73	6.12
175	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22	3.75	4.29	4.83	5.36	5.72
150	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98	3.48	3.97	4.47	4.97	5.30
125	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72	3.17	3.63	4.08	4.53	4.83
100	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43	2.84	3.24	3.65	4.05	4.32

3.03 DISINFECTING PIPELINES

- A. **General:** Potable water pipelines except those appurtenant to hydraulic structures shall be disinfected in accordance with the requirements of ANSI/AWWA C651 - Disinfecting Water Mains, using the Continuous-Feed Method..
- B. **Sources of Water:** Water for disinfection and testing may be provided by the OWNER.
- C. **Chlorinating Valves:** During the application of chlorine, position valves so that the chlorine solution in the main being treated will not flow into water mains in active service. All valves and other appurtenances in the section treated shall be operated from closed to full open to closed while the pipeline is filled with the heavily-chlorinated water.
- D. **Sampling Ports:** The CONTRACTOR shall provide sampling ports along the pipeline as defined on AWWA C651. Taps may be made at manways and air valves to help facilitate the spacing requirement.
- E. **Final Flushing:** After the applicable retention period, the heavily chlorinated water shall be flushed from the pipeline until chlorine measurements show that the concentration in the water leaving the pipeline is no higher than that generally prevailing in the system or is acceptable for domestic use. Do not keep heavily chlorinated water in contact with the pipe for more than 24 hours after the applicable retention period. Any release of chlorinated water shall comply with federal, state, and local regulation and the permits for the project. Chlorine in excessive amounts shall be treated before discharge. Refer to Specification 01150 for water disposal requirements.

3.04 CONNECTIONS TO EXISTING SYSTEM

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01656: PRESSURE PIPE TESTING AND DISINFECTION

New water mains and appurtenances must be completely installed, flushed, disinfected and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system. Connection disinfection procedures shall conform to AWWA C651. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01656: PRESSURE PIPE TESTING AND DISINFECTION

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01660: EQUIPMENT TESTING AND STARTUP

PART 1 GENERAL

1.01 GENERAL

- A. Equipment testing and startup are prerequisites to satisfactory completion of the contract requirements and shall be completed within the Contract Times.
- B. The startup of a pump station is a complex operation requiring the combined expertise of the CONTRACTOR, manufacturers' representatives, subcontractors, the ENGINEER, and the OWNER. The CONTRACTOR shall be responsible for coordinating all parties for a successful startup: the ENGINEER and OWNER will be available for technical and operational advice prior to and during startup.
- C. Testing and startup activities shall be scheduled according to Construction Schedule.
- D. The 7-day test and the 8-day test shall start prior to midday on a Monday, Tuesday, or Wednesday. Testing periods shall not include holidays, based on the OWNER's calendar.

1.2 SUBMITTALS

- A. **Schedule:** The schedule for testing and startup shall be submitted per Section 01300.
- B. **Testing and Startup Plan:** Not less than 45-days prior to startup, submit for review a detailed Testing and Startup Plan. The Plan shall include schedules for manufacturers' equipment certifications, list of OWNER and CONTRACTOR-furnished supplies, electrical testing, and detailed schedule of operations to achieve successful system testing, startup, and performance and acceptance testing. The Plan shall include test checklists and data forms for each item of equipment and shall address coordination with the OWNER's staff. The CONTRACTOR shall revise the Plan as necessary based on review comments.
- C. Records and Documentation
 - 1. Equipment Installation Certification: Where required by the specifications, submit documentation from manufacturer's representative that the equipment has been properly installed and lubricated, is in accurate alignment, is free from undue stresses from connecting piping and anchoring, and has operated satisfactorily under full load conditions.
 - 2. Records of testing and startup as indicated below.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01660: EQUIPMENT TESTING AND STARTUP

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXECUTION

- A. **Prerequisites:** The following shall be completed before testing and startup begins.
1. Furnish all Technical Manual information required by the Contract Documents.
 2. Provide all safety equipment, emergency shower and eyewash units, fire extinguishers, protective guards and shields, emergency repair kits, safety chains, handrails, gratings, safety signs, and valve and piping identification required by the Contract Documents. Devices and equipment shall be fully functional, adjusted, and tested.
 3. Manufacturer's certifications of proper installation have been accepted.
 4. Leakage tests, electrical tests, and adjustments have been completed.
 5. The ENGINEER has approved the CONTRACTOR's Testing and Startup Plan.
 6. Functional verification of the individual instrumentation loops (analog, status, alarm, and control) from the field devices to the workstation display screen.
 7. Adjustment of the pressure switches, flow switches, timing relays, level switches, vibration switches, temperature switches, RTD monitors, pressure regulating valves, and all other control devices to the settings determined by the ENGINEER or the equipment manufacturer.
 8. Functional verification of the individual interlocks between the field-mounted control devices and the motor control circuits, control circuits of variable-speed controllers, and packaged system controls.
- B. Supplies
1. The CONTRACTOR shall furnish:
 - a. Chemicals
 - b. Oil and grease
 - c. Other necessary materials not listed for the OWNER to furnish

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01660: EQUIPMENT TESTING AND STARTUP

2. The OWNER will furnish:
 - a. Water
 - b. Power
- C. **Records of Testing and Startup:** The CONTRACTOR shall maintain the following during testing and startup and submit originals to ENGINEER prior to acceptance:
 1. Lubrication and service records for each mechanical and electrical equipment item
 2. Hours of daily operation for each mechanical and electrical equipment item
 3. Equipment alignment and vibration measurement records
 4. Logs of electrical measurements and tests
 5. Instrumentation calibration and testing logs and alarms
 6. Testing and validation of SCADA inputs, outputs, logic functions, status indications,
 7. Factory and field equipment settings
 8. Log of problems encountered and adjustments made
 9. Other records, logs, and checklists as required by the Contract Documents

3.2 SYSTEM TESTING

- A. After individual equipment items have been tested and certified as required by the Technical Specifications, tests of systems comprised of single or multiple equipment items with appurtenant equipment and instruments and controls shall be conducted. All items of equipment shall be tested as part of a system to the maximum extent possible.
- B. The CONTRACTOR shall demonstrate the manual and automatic modes of operation to verify proper control sequences, software interlocks, proper operation of software logic and controllers, etc. System testing shall include the use of water, to simulate the actual conditions of operation.
- C. All systems testing activities shall follow the detailed test procedures and checklists in the Testing and Startup Plan. Completion of systems testing shall be documented by a report.
- D. The CONTRACTOR shall system test the utility, chemical feed, safety equipment, and other support systems before testing the process system.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01660: EQUIPMENT TESTING AND STARTUP

- E. Furnish the ENGINEER at least 10 days written notice confirming the start of system testing. The OWNER's staff will observe systems testing.
- F. The CONTRACTOR shall arrange for manufacturer's representative to revisit the Site as often as necessary to correct malfunctions to the ENGINEER's satisfaction.
- G. Each system shall be tested for a continuous, 7-day, 24-hour/day period. If any system malfunctions during the test, the item or equipment shall be repaired and the test restarted at time zero with no credit given for the elapsed time before the malfunction.

3.3 STARTUP AND ACCEPTANCE TESTING

- A. The CONTRACTOR shall start up the pump station and operate it at rates directed by the ENGINEER without malfunction for a continuous 8-day, 24 hour/day acceptance test period. If any equipment item, sub system, or system malfunctions during the test period, the item shall be repaired and the test restarted at time zero with no credit given for the elapsed time before the malfunction.
- B. Defects in material or workmanship which appear shall be promptly corrected. Time lost for wiring corrections, control point settings, or other reasons which interrupt the test may, at the judgment of the ENGINEER, be cause for extending the test period an equal amount of time.
- C. Acceptance testing shall not begin until all leakage tests, instrumentation tests and adjustments, electrical tests and adjustments, equipment field tests, disinfection, and system tests have been completed to the satisfaction of the ENGINEER.
- D. The CONTRACTOR shall furnish the services of manufacturer's representatives, if necessary, to correct equipment malfunctions.
- E. During acceptance testing, the CONTRACTOR shall:
 - 1. Lubricate and maintain all equipment in accordance with the manufacturers' recommendations.
 - 2. Clean or replace strainers, screens, and filter elements.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01700: PROJECT CLOSEOUT

PART 1 PART 1 -- GENERAL

1.01 FINAL CLEANUP

The CONTRACTOR shall promptly remove from the vicinity of the completed WORK, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily performed the final cleanup of the Site.

1.02 CLOSEOUT TIMETABLE

The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow the OWNER, the ENGINEER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.03 TECHNICAL MANUAL SUBMITTAL

The CONTRACTOR's attention is directed to the condition that one percent of the Contract Price will be retained from any monies due the CONTRACTOR as progress payments, if at the 75 percent construction completion point, the approved Technical Manual complying with Section 01300 has not been submitted. The aforementioned amount will be retained by the OWNER as the agreed, estimated value of the approved Technical Manual. Any such retention of money for failure to submit the approved Technical Manual on or before the 75 percent construction completion point shall be in addition to the retention of any payments due to the CONTRACTOR under Section 7 of the General Conditions.

1.04 FINAL SUBMITTALS

- A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the ENGINEER for transmittal to the OWNER:
1. Written guarantees, where required.
 2. Technical Manuals and instructions.
 3. New permanent cylinders and key blanks for all locks.
 4. Maintenance stock items; spare parts; special tools.
 5. Bonds for roofing, maintenance, etc., as required.
 6. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01700: PROJECT CLOSEOUT

7. Completed record drawings.
8. Mill certificates for casing materials
9. Certificates of inspection and acceptance by local governing agencies having jurisdiction.

1.05 MAINTENANCE AND GUARANTEE

- A. The CONTRACTOR shall comply with the maintenance and guarantee requirements contained in Section 7 of the General Conditions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.
- C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and its surety shall be liable to the OWNER for the cost thereof.

1.06 BOND

The CONTRACTOR shall provide a bond to guarantee performance of the provisions contained in Paragraph "Maintenance and Guarantee" above, and Section 7 of the General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01717: CLEANING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Execute cleaning, during progress of the Work, at completion of the Work, and as required by General Conditions. If CONTRACTOR fails to clean areas as specified in this Section, the OWNER will have the areas cleaned and the effort will be backcharged against the CONTRACTORS Contract Price. Some materials of construction are to be installed for use in a drinking water storage and distribution system. The CONTRACTOR shall provide all means possible to protect the materials from contamination of any kind at no additional cost to the OWNER.

- B. Requirements of Regulatory Agencies:
 - 1. In addition to the requirements herein, maintain the cleanliness of the Work and surrounding premises within the Work limits so as to comply with federal, state, and local fire and safety laws, ordinances, codes and regulations.
 - 2. Comply with all federal, state and local anti-pollution laws, ordinances, codes and regulations when disposing of waste materials, debris and rubbish.

- C. Scheduling of Cleaning and Disposal Operations:
 - 1. So that dust, wash water or other contaminants generated during such operations do not damage or mar painted or finished surfaces.
 - 2. To prevent accumulation of dust, dirt, debris, rubbish and waste materials on or within the Work or on the premises surrounding the Work.

- D. Waste Disposal:
 - 1. Dispose of all waste materials, surplus materials, debris and rubbish off the project site.
 - 2. Do not burn or bury rubbish and waste materials on the project site.
 - 3. Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 4. Do not discharge wastes into streams or waterways.
 - 5. CONTRACTOR shall be solely responsible for complying with any federal, state, and local environmental and regulations in disposing of waste.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01717: CLEANING

E. Cleaning Materials:

1. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
2. Use each type of cleaning material on only those surfaces recommended by the cleaning material manufacturer.
3. Use only materials which will not create hazards to health or property.

F. During Construction:

1. Keep the Work and surrounding premises within Work limits free of accumulations of dirt, dust, waste materials, debris and rubbish.
2. Keep dust generating areas wetted down.
3. Provide suitable containers for storage of waste materials, debris and rubbish until time of disposal.
4. Dispose of waste, debris and rubbish off site to legal disposal areas.

G. When Project is Completed:

1. Remove and dispose of all excess or waste materials, debris, rubbish, and temporary facilities from the site, structures and all facilities.
2. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.
3. Remove spatter, grease, stains, fingerprints, dirt, dust, labels, tags, packing materials and other foreign items or substances from interior and exterior surfaces, equipment, signs and lettering.
4. Repair, patch and touch up chipped, scratched, dented or otherwise marred surfaces to match specified finish.
5. Remove paint, clean and restore all equipment and material nameplates, labels and other identification markings.
6. Wash and shine mirrors, glazing and polished surfaces.
7. Clean all floors, slabs, pavements, and ground surfaces.
8. Maintain cleaning until acceptance and occupation by OWNER.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01717: CLEANING

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01717: CLEANING

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01720: RECORD DRAWINGS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Contractor shall provide and maintain on the jobsite one complete set of prints of all Plans which form a part of the contract. Immediately after each portion of the work is installed, indicate all deviations from the original design shown on the Plans either by additional sketches or marked in red ink thereon and reviewed by OWNER's Representative. Upon completion of the job, deliver this record set to the OWNER's Representative.
- B. The CONTRACTOR shall supply the OWNER Representative with GPS or surveyed points of all installed buried structures, piping, appurtenances and equipment. This information, along with an electronic copy of the record drawings (CAD and PDF format) shall be submitted to the OWNER upon completion of the project.
- C. Record GPS location of any abandoned facilities (i.e. end of pipe).
- D. Record drawings shall be submitted with final request of progress payment.
- E. Make the record drawings available for review by OWNER in CONTRACTOR's field office.
- F. Protect the record set from damage or loss.
- G. Related Documents and Sections include:
 - 1. General Conditions: 6.12 Record Documents

1.02 DETAILED REQUIREMENTS

- A. The CONTRACTOR shall provide Record Drawings which shall clearly show all differences between the contract Work as drawn and as installed for all concealed construction, as well as construction added to the Contract, which is not indicated on the Contract Drawings.
- B. Concealed shall mean construction installed underground or in an area which cannot be readily inspected by use of access panels, inspection plates or other removable features.
- C. Show all changes in the Work, or Work added on the Record Drawings in a contrasting color.
- D. In showing changes in the Work, or added Work, use the same legends that are used on the Contract Drawings. Indicate exact locations by dimensions and exact elevations. Give dimensions from a permanent point.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01720: RECORD DRAWINGS

- E. Record by marking on the Drawings all changes in the Work which occur during construction, including adding approved change orders.
- F. Show locations by key dimensions, depths, elevations of all underground lines, conduit runs, sensor lines, valves, capped ends, branch fittings, pull boxes, etc.
- G. Record information on how to maintain and/or service concealed Work.
- H. CAD files shall be in AUTOCAD format, latest version.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Deliver the marked record set of Drawings to the OWNER prior to acceptance of the Work.
- B. Confirm measurements with OWNER Representative before backfilling any new facilities.
- C. Photograph all buried facilities, prior to backfill.
- D. Owner will provide CAD files of conformed drawing set. CONTRACTOR will edit these to create record drawings in CAD and pdf format electronic files.

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01730: OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 DESCRIPTION

- A. The CONTRACTOR shall provide operation and maintenance data in the form of instructional manuals for use by the OWNER's personnel for:
 - 1. All equipment and systems.
 - 2. All valves, actuators, gates and related accessories.
 - 3. All instruments and control devices.
- B. Contractor shall be responsible for providing O&M training to OWNER Operations Staff.
- C. Operation and Maintenance Data Manuals shall be submitted with last pay request.
- D. Definitions:
 - 1. Operation and Maintenance Data:
 - a. The term "operation and maintenance data" includes all product related information and documents which are required for preparation of the operation and maintenance manual. It also includes all data, which must accompany said manual as directed by current regulations of any participating government agency.
 - b. Required operation and maintenance data includes, but is not limited to, the following:
 - 1) Complete, detailed written operating instructions for each product or piece of equipment including: equipment function; operating characteristics; limiting conditions; operating instructions for startup, normal and emergency conditions; regulation and control; and shutdown.
 - 2) Complete, detailed written preventive maintenance instructions as defined below.
 - 3) Recommended spare parts lists and local sources of supply for parts.
 - 4) Written explanations of all safety considerations relating to operation and maintenance procedures.
 - 5) Name, address and phone number of manufacturer, manufacturer's local service representative, and Subcontractor or installer.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01730: OPERATION AND MAINTENANCE DATA

- 6) Copy of all approved Shop Drawings, and copy of warranty bond and service contract as applicable.
- 2. Preventive Maintenance Instructions:
 - a. The term "preventive maintenance instructions" includes all information and instructions required to keep a product or piece of equipment properly lubricated, adjusted and maintained so that the item functions economically throughout its full design life.
 - b. Preventive maintenance instructions include, but are not limited to, the following:
 - 1) A written explanation with illustrations for each preventive maintenance task.
 - 2) Recommended schedule for execution of preventive maintenance tasks.
 - 3) Lubrication charts.
 - 4) Table of alternative lubricants.
 - 5) Trouble shooting instructions.
 - 6) List of required maintenance tools and equipment.
- E. Submittals:
 - 1. General: The CONTRACTOR shall submit the operations and maintenance data to the Engineer within 30 days after approval of the final Shop Drawing.
 - 2. Number of Copies: Six of each item.
 - 3. Letter of Transmittal: Provide a letter of transmittal with each submittal and include the following in the letter:
 - a. Date of submittal.
 - b. Contract title and number.
 - c. Contractor's name and address.
 - d. A list of the attachments and the Specification Sections to which they relate.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01730: OPERATION AND MAINTENANCE DATA

- e. Reference to or explanation of related submittals already made or to be made at a future date.
- 4. Format Requirements:
 - a. The CONTRACTOR shall use 8-1/2 inch by 11 inch paper of high rag content and quality. Larger drawings or illustrations are acceptable if neatly folded to the specified size in a manner, which will permit easy unfolding without removal from the binder. Provide reinforced punched binder tab or provide fly-leaf for each product.
 - b. All text must be legible typewritten or machine printed originals or high quality copies of same.
 - c. Each page shall have a binding margin of approximately 1-1/2 inches and be punched for placement in a three ring looseleaf or triple post binder. Provide binders not less than one inch or more than 2-1/2 inches thick. Identify each binder on the spine and outside front cover with the following:
 - 1) Title "OPERATING AND MAINTENANCE INSTRUCTIONS".
 - 2) Title of Project.
 - 3) Identity of building, structure or area as applicable.
 - 4) Identity of general subject matter covered.
 - d. The CONTRACTOR shall use dividers and typewritten indexed tabs between major categories of information such as operating instructions, preventive maintenance instructions, or other. When necessary, place each major category in a separate binder.
 - e. The CONTRACTOR shall provide a table of contents for each binder.
 - f. The CONTRACTOR shall identify products by their functional names in the table of contents and at least once in each chapter or Section. Thereafter, abbreviations and acronyms may be used if their meaning is explained in a table in the back of each binder. Use of model or catalog numbers or letters for identification is not acceptable.

PART 2 MATERIALS (NOT USED)

PART 3 EXECUTION (NOT USED)

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01730: OPERATION AND MAINTENANCE DATA

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01731: INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 1 GENERAL

1.01 DESCRIPTION

- A. CONTRACTOR shall provide the services of factory-trained maintenance specialists to instruct OWNER'S operations and maintenance personnel in the recommended operation and the preventive maintenance procedures for equipment specified in the equipment Sections.
- B. The qualifications of specialists shall be subject to approval by OWNER.
- C. CONTRACTOR shall coordinate these services at times acceptable to OWNER, with a minimum of seven (7) days prior notice.
- D. Manufacturer shall provide a combination of classroom and field training. All training shall be conducted at the Facility, unless otherwise stated in the equipment Sections. Class size shall be limited to no more than 15 trainees. Manufacturer shall provide training for all plant shifts, or as approved by OWNER.
- E. Manufacturer shall allow any and all training sessions to be videotaped by OWNER.
- F. Section 01600, General Equipment Provisions, Section 01620, Installation of Equipment, Section 01655, Starting and Placing Equipment in Operation and Section 01660, Field Tests of Equipment includes, additional requirements for manufacturer's and supplier's field and test data.
- G. Instruction of OWNER'S personnel, as described in Section 01731, Instruction of Operations and Maintenance Personnel, shall commence only after the equipment has been started, approved Operation and Maintenance Manuals have been turned over to the OWNER, and acceptance tests have been completed according to the provisions in Section 01655, Starting and Placing Equipment in Operation, and Section 01660, Field Tests of Equipment.
- H. CONTRACTOR shall submit a copy of this Section 01731, Instruction of Operations and Maintenance Personnel, to all manufacturers of equipment for this contract.

1.02 TRAINING SCHEDULE

- A. Each manufacturer shall provide as a minimum the following hours of training. Travel time and expenses are responsibility of manufacturer and are not included in training schedule time.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01731: INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

EQUIPMENT	SPEC SECTION	TRAINING HOURS
Pump Station System	11300	24
PRV/Specialty Valves	15218	2
VFDs	11300	4
Miscellaneous Instrumentation	Division 16	4

1.03 SUBMITTAL

- A. Manufacturer shall submit for approval the following:
1. Proposed Lesson Plan for each scheduled instruction thirty (30) days prior to commencement of training. Lesson plans shall be approved a minimum of seven (7) days prior to scheduled instruction.
 2. Credentials of their designated operations and maintenance instructor. Credentials shall include a brief resume and specific details of the instructor's experience pertaining to operation of, maintenance of, and training for the equipment specified.
 3. Training Request Form. CONTRACTOR shall submit the Training Request Form to the OWNER fourteen (14) days prior to the requested training date.
 4. There shall be separate "Operations" and "Maintenance" staff training.

1.04 INSTRUCTION LESSON PLAN

- A. Manufacturer's proposed Lesson Plan shall include the elements presented in the outline of Instruction Lesson Plan in Paragraph 1.4.D of this Section. Specific components and procedures shall be identified in the proposed Lesson Plan.
- B. Manufacturer's proposed Lesson Plan shall detail specific instruction topics. Training aids to be utilized in the instruction shall be referenced and attached where applicable to the proposed Lesson Plan. "Hands-On" demonstrations planned for the instruction shall be described in the Lesson Plan.
- C. The manufacturer shall indicate the estimated duration of "each segment of the training Lesson Plan.
- D. Instruction Lesson Plan shall include the following as a minimum:
1. Equipment Operation:
 - a. Describe equipment's operating (process) function.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01731: INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

- b. Describe equipment's fundamental operating principals and dynamics.
 - c. Identify equipment's mechanical, electrical and electronic components and features.
 - d. Identify all support equipment associated with the operation of subject equipment (e.g., valve actuators, motors, etc.).
 - e. Recommend standard operating procedures to cover start-up, routine monitoring and shutdown of the equipment.
- 2. Detailed Component Description:
 - a. Identify and describe in detail each component's function.
 - b. Where applicable, group related components into subsystems. Describe subsystem functions and their interaction with other subsystems.
 - c. Identify and describe in detail equipment safeties and control interlocks.
- 3. Equipment Preventive Maintenance (PM):
 - a. Describe PM inspection procedures required to:
 - 1) Perform an inspection of the equipment in operation.
 - 2) Spot potential trouble symptoms and anticipate breakdowns.
 - 3) Forecast maintenance requirements (predictive maintenance).
 - b. Define the recommended PM intervals for each component.
 - c. Provide lubricant and replacement part recommendations and limitations.
 - d. Describe appropriate cleaning practices and recommend intervals.
 - e. Identify and describe the use of special tools required for maintenance of the equipment.
 - f. Describe component removal/installation and disassembly/assembly procedures.
 - g. Perform at least two "hands-on" demonstrations of preventive maintenance procedures.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01731: INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

- h. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
 - i. Define recommended torquing, mounting, calibration and/or alignment procedures and settings, as appropriate.
 - j. Describe recommended procedures to check/test equipment following a corrective repair.
- 4. Equipment Troubleshooting:
 - a. Define recommended systematic troubleshooting procedures.
 - b. Provide component specific troubleshooting checklists.
 - c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.

1.05 TRAINING AIDS

- A. The manufacturer's instructor shall incorporate training aids as appropriate to assist in the instruction. As a minimum, the training aids shall include text and figure handouts. Other appropriate training aids are:
 - 1. Audio-Visual Aids (e.g., films, slides, videotapes, overhead transparencies, posters, blueprints, diagrams, catalogue sheets).
 - 2. Equipment cutaways and samples (e.g., spare parts and damaged equipment).
 - 3. Tools (e.g., repair tools, customized tools, measuring and calibrating instruments).
- B. The manufacturer's instructor shall utilize descriptive class handouts during the instruction. Photocopied class handouts shall be good quality reproductions. Class handouts should accompany the instruction with frequent reference made to them. Customized handouts developed especially for the instruction are encouraged. Handouts planned for the instruction shall be attached with the manufacturer's proposed Lesson Plan.

1.06 "HANDS-ON" DEMONSTRATIONS

- A. The manufacturer's instructor shall present "hands-on" demonstrations of operations and maintenance of the equipment for each scheduled group. The proposed "hands-on" demonstrations should be described in the manufacturer's proposed Lesson Plan.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01731: INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01731: INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01760: POST FINAL INSPECTION

PART 1 GENERAL

1.01 DESCRIPTION

- A. Approximately 30 days after final acceptance, OWNER will make arrangements with CONTRACTOR for a Post Final Inspection and will send a written notice to said parties informing them of the date and time of the inspection.
- B. After the inspection, OWNER will inform CONTRACTOR of any corrections required prior to release of the balance of payment due and forward a certificate for final payment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01760: POST FINAL INSPECTION

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TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01810: COMMISSIONING

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section Includes: Responsibility of the OWNER and CONTRACTOR during the Commissioning Phase(s) of the Project.
- B. Start-up and commissioning of the Work, or a specified part of the Work, under this Project shall be coordinated with OWNER'S Operations. Work under this Section shall not start until the Work under Section 01655, Section 01660, Section 01720, Section 01730, Section 01731, and as defined under the individual technical specifications, Divisions 2-16; and Substantial Completion for the Work has been completed and issued by the OWNER. Spare parts shall also be on-site and accepted prior to commissioning.

1.02 REFERENCES

- A. Related Sections:
 - 1. Division 1, General Requirements.
 - 2. Division 11, Equipment.
 - 3. Division 15, Mechanical.
 - 4. Division 16, Electrical.

1.03 DEFINITIONS

- A. Commissioning: The sequential process in which a newly constructed facility is put into successful operation.
- B. Successful Operation: The resultant operation of all the processes and related controls in a manner that is consistent with the Contract Documents.
- C. Manual Operational Mode: This operational mode represents the lowest level of control philosophy utilized in the plant instrumentation and control system. For all practical purposes, it means that an operational control decision requiring equipment or process monitoring and/or control will require an individual to physically go to the local control for the associated task in order to operate the facility. In the manual operational mode, the focus will be on verifying that the equipment and processes function correctly, independent of the instrumentation system and control system. The maximum duration of the manual commissioning period shall be twenty-five (25) percent of the total Work area commissioning duration.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01810: COMMISSIONING

- D. Semi-Automatic Operational Mode: The highest level of control philosophy utilized in the instrumentation and control system.

1.04 SUBMITTAL

- A. Preventive and Unscheduled Maintenance Plan: Submit detailed plan prior to start of commissioning for providing all preventive and unscheduled maintenance of all equipment and facilities throughout the entire commissioning phase of the project.
- B. OWNER'S Personnel Training Schedule and Plan: Submit detailed plan and schedule for training OWNER'S personnel in accordance with Section 01731, Instruction of Operations and Maintenance Personnel.

1.05 REQUIREMENTS

- A. The Commissioning Process for the Project will consist of the following and will have a Commissioning Duration of 90 days:
 - 1. Monterey Pump Station System and Supporting Systems
- B. Commissioning process will commence after issuance of Substantial Completion of the Work to the CONTRACTOR.
- C. Commissioning for each Pump Station will occur on different days and shall conform to the construction phasing presented in Section 01047, Coordination with Owner's Operations.
- D. During the course of the Commissioning Process, the OWNER will evaluate design related issues and recommend design modifications which shall be implemented by CONTRACTOR through the Change Order process.
- E. No system or subsystem shall be started up for continuous operation unless all components of that system or subsystem, including instrumentation, have been tested and proven to be operable as intended by the Contract Documents.

1.06 RESPONSIBILITIES

- A. Responsibilities listed do not relieve CONTRACTOR from all other responsibilities and duties associated with project closeout as defined in Division 0 and Division 1, General Requirements of the Specifications.
- B. CONTRACTOR'S responsibilities during the Commission Process:
 - 1. CONTRACTOR shall provide all staff, labor, equipment and appurtenances required for the commissioning of the facilities.

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01810: COMMISSIONING

2. All Change Order work resulting from the evaluation of design-related issues by the OWNER.
 3. All preventive and unscheduled maintenance of all equipment and facilities. This shall include, but not be limited to the following:
 - a. Providing all lubricants.
 - b. Lubrication of all equipment in accordance with manufacturer's recommendations.
 - c. Perform all manufacturer recommended preventive maintenance.
 - d. Exercise all equipment not in use during Commissioning phase.
 - e. Repair all failed equipment.
 - f. Periodic check of all equipment alignment, vibration, and noise levels in accordance with Specifications.
 - g. Provide all parts required for equipment repair.
 - h. Provide all tools and miscellaneous equipment required for equipment repair.
 - i. Administration/logging/documentation of all preventive maintenance and repair work.
 - j. Cleanup associated with equipment failure and repair.
 - k. Daily cleanup of buildings.
 - l. Landscaping maintenance.
 - m. Roadway cleanup and maintenance.
 - n. Replacement of all HVAC filters.
 4. Warranty related issues/items.
 5. Other contractual requirements including, but not limited to, incomplete Work list.
- C. OWNER'S responsibilities during the Commissioning Process:

TECHNICAL SPECIFICATIONS
DIVISION 1: GENERAL REQUIREMENTS
01810: COMMISSIONING

1. Provide all chemicals required for plant operations, including scheduling and securing of chemical deliveries to the plant and respective storage tanks.
 2. Perform all laboratory analysis required for plant operations.
 3. Review training schedules and plans, and schedule personnel training.
 4. Assisting OWNER in the evaluation of design related issues and recommendations of modifications to be implemented by CONTRACTOR through the change order process.
- D. ENGINEER'S responsibilities during Commissioning Process:
1. Assist OWNER with technical data and information.
- E. Based upon the data compiled during the commissioning period modifications may be required. The OWNER may issue a request for proposal to modify the Work, to change design or process related issues. CONTRACTOR shall respond to the request. Appropriate cost and time adjustment will be made to address the proposed change.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

PART 1 - GENERAL

1.01 SUMMARY

- A. The CONTRACTOR shall furnish all labor, services, supervision, material, tools, trucks, equipment and all other appurtenances necessary to safely perform the work as shown on the Contract Drawings and as specified herein.
 - 1. Site preparation shall consist of all clearing and related work necessary to prepare the Contract site for construction operations.
 - 2. Vegetation and trees shall be protected from damage incident to site preparation and construction, as specified in Section 01062 and other applicable sections.
 - 3. Noise and dust control shall be implemented as specified in Sections 01055 and 01062.
 - 4. The restoration of landscape, sprinkler system, sidewalks, curbs, underground utilities, and any asphalt road disturbed by construction activities shall be considered incidental to the work specified herein.
 - 5. The CONTRACTOR is advised to inspect the site for estimating purpose prior to bidding for the work under this contract.
- B. Related Sections:
 - 1. Section 01060 - Regulatory Requirements.
 - 2. Section 01062 - Environmental Requirements.
 - 3. Section 01150 - Water Treatment and Disposal.
 - 4. Section 01530 - Protection of Existing Facilities.
 - 5. Section 01640 – Demolition and Reconstruction.
 - 6. Section 02111 - Disposal of Excavated Materials.
 - 7. Section 02270 - Erosion and Sediment Control.
- C. Definitions:
 - 1. Drip Line: The limits established by the outermost tips of the branches of comprising a single plant, bush or tree, or group thereof, projected to the ground in plan view.

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

2. Clearing: The removal of materials including trees, tree stumps, brush, other vegetation, rocks, concrete rubble, trash, and debris.
 - a. Clearing shall consist of cutting, removing, and disposing of all objectionable material from the ground surface, such as trash, trees, brush, logs, stumps, weeds, grasses, and obstructions of any kind, natural or artificial. Trees, shrubs, and vegetation designated to remain shall not be removed or disturbed. Trees and shrubs adjacent to work areas shall be protected from damage.
 - b. Work shall be performed in such a manner as to remove all evidence of the objects' presence from the surface. Clearing shall also include the removal and disposal of trash piles and rubbish from the work site created prior to and during the duration of the work.
3. Equipment: Includes existing valves or abandoned pipelines.
4. Grubbing: Grubbing shall consist of cutting, removing, and disposing of all objectionable material found below the ground surface, including natural or artificial obstructions. Trees, stumps and roots below the surface requiring removal shall be removed completely from the ground.
5. Stripping: Stripping shall consist of the removal of the top 12 inches of soil after clearing and grubbing have been completed, or as required by the OWNER's Representative.
6. Tree Specialist: Horticulturist or licensed tree surgeon.
7. Vegetative materials: General term applied to any portion of a plant, bush, or tree.

1.02 SUBMITTALS

A. Working Drawings and Methods Statements:

1. The CONTRACTOR shall submit a detailed clearing, grubbing and stripping plan. The plan shall include proposed temporary construction haul routes, traffic flows, number and types of equipment, and sequence of work. Include in the plan, the proposed methods of disposal of cleared vegetation and stockpiling of topsoil. The plan should also include but is not limited to:
 - a. Extents of zones to be cleared, grubbed, and stripped and identify each work item to be performed within the zones depicted

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

- b. Show layout, type, and location of barriers for trees to be protected.
 - c. Show location and indicate size of each tree to be pruned. For each tree, the Tree Specialist shall describe the extent of the pruning process and indicate the anticipated impacts to the tree from the pruning process and any construction activities.
 - d. Show location and indicate size of trees to be cleared and grubbed. Identify the trees to be removed. For any additional trees proposed by the CONTRACTOR to be cleared and grubbed, provide:
 - (1) Information on the location, size and species of each tree to be disturbed or removed. Describe the anticipated impacts to construction if the tree remains in place and any feasible alternatives to removal.
 - (2) Information on the location, size and species of each tree to be pruned. The Tree Specialist shall describe the extent of the pruning process and indicate the anticipated impacts to the tree from the pruning process and any construction activities.
 - 2. Submit a Recycling Program plan describing recycling to the extent possible for any trees, tree stumps, brush, other vegetation, rocks, concrete rubble, trash, metals, and debris.
 - 3. Submit pre-construction photographs for existing structures and facilities located above or adjacent to the new construction and which may be affected by the work as necessary to fully document pre-construction conditions.
 - 4. Submit Excavated Material Disposal Plan describing disposal of excavated materials in accordance with Section 02111.
- B. Quality Control:
- 1. Qualifications:
 - a. Tree Specialist.
 - 2. Certifications:
 - a. Certification by Tree Specialist that the tree limbs proposed to be cut due to interference with CONTRACTOR operations will not injure the tree.
 - b. Permit from local authorities to proposed pruning of tree limbs as required.
-

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

3. Recordkeeping:
 - a. Assign each tree a number and log the extent of clearing, pruning, repairs, and replacement for each of the trees. The Tree Specialist shall, on at least a semiannual basis and at the completion of the Work, monitor the health and assess the impacts of construction for each of the trees. Assessments shall be placed in the log according to number and description of tree.
4. Notifications:
 - a. If any tree becomes damaged during construction, notify the City Representative before the end of the work shift.
 - b. Notify City Representative of any state or federally listed animal species encountered on the work sites.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Tree Specialist: Name and credentials of horticulturist or licensed tree surgeon to be retained by the CONTRACTOR in the event of any injury to vegetation.

1.04 JOB CONDITIONS

- A. Contractor shall inspect all existing features and conditions at the job site including access and satisfy itself as to the extent of work that needs to be done, regardless of the completeness of details shown on the Drawings.
- B. Regulatory Requirements:
 1. Comply with the requirements of Section 01062 Environmental Requirements.
 2. Conform to the City of Monterey, Seaside and Marina Standard Specifications, Latest Edition.
 3. Conform to Monterey County Standard specifications, Latest Edition.
 4. Conform to the Standard Specification of Department Of Transportations, State of California, Latest Edition.
 5. Most strict specification will take precedence.
 6. Conform to applicable State and Local Code requirements and with all applicable State and local ordinances or regulations.

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

- a. CAL and Federal-OSHA Regulations.
- b. American National Standards Institute “Safety Requirements for Demolition”, ANSI AID.G (latest edition).
- C. Comply with Section 01150, “Water Treatment and Disposal.”
- D. Comply with the requirements of Section 01530, “Protection of Existing Facilities.”
- E. Contractor shall verify existing conditions and make provisions as required so that no work would interfere with drainage, electrical and communication services with other facilities.
- F. Contractor shall operate warning lights during hours from dusk to dawn each day and as otherwise required when constructing near public right-of-way.
- G. Comply with all requirements of Section 02270, “Erosion and Sediment Control.”

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. The use of diesel or gasoline powered equipment inside potable water facilities and within permit-required confined spaces will not be allowed for water quality and personnel safety reasons. The use of propane-powered equipment with special air scrubbers will be allowed. All hydraulic equipment shall use vegetable oil based fluids or other NSF 61 approved for potable water. Ventilation and lighting must be provided, where required.
- B. The CONTRACTOR shall furnish all materials, tools, equipment, devices, appurtenances, temporary fences, and barricades, etc., as required for performing the site clearing, demolition and other miscellaneous work.

PART 3 - EXECUTION

3.01 GENERAL

- A. Clearing, grubbing, and stripping operations shall be conducted with minimum interference with roads, and adjacent facilities. Roads and adjacent facilities shall not be obstructed without approval from the City and other authorities having jurisdiction.

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

- B. Stockpile the top 6 inches of topsoil in vegetated areas for use in subsequent landscaping in accordance with Sections 01062 “Environmental Requirements” and 02200, “Excavation, Backfilling, and Compaction.”
- C. Dispose off non-recycled materials removed during clearing and grubbing to an off-site location. Burning of materials to be cleared and grubbed on-site is not allowed. The CONTRACTOR shall stake out all work areas designated for clearing, grubbing, and stripping by survey. The CONTRACTOR shall be responsible for the accuracy, maintenance and observation of all lines and elevations.
 - 1. The location, limits, and methods to be used for clearing, grubbing, and stripping shall be reviewed with the OWNER Representative prior to start of work.
 - 2. The CONTRACTOR shall review with the OWNER Representative all trees greater than 4 inches in diameter at a distance of 36 inches above the ground to be removed or trimmed.
- D. Do not disturb areas outside the construction limits. Protect areas outside the construction limits from CONTRACTOR operations.
- E. Do not utilize vegetation as anchorages or for other purposes.
- F. Prior to cutting or removing tree limbs or roots have a Tree Specialist inspect and approve cut or removal.
- G. Assume all responsibility for injuries to, or death of vegetation arising from CONTRACTOR operations.

3.02 PREPARATION

- A. Contact Local, State and Federal agencies responsible for air, noise and water quality control regulations to determine all applicable standards to be followed during construction operations.
- B. Examine the areas and conditions under which the work in this section will be performed. Correct conditions detrimental to the timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected with OWNER Representative’s approval.
- C. In company with the OWNER Representative, visit the site and verify the extent of clearing and demolition to be performed under this Contract before proceeding with the prescribed work.

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

- D. Protect trees indicated to be protected from damage or injury by erecting protective barriers around the trees at least one foot outside the drip line as directed by the Tree Specialist.
- E. Coordinate the removal of protective barriers with demolition and final cleanup.
- F. Traffic: The CONTRACTOR shall conduct site clearing and demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent facilities. Streets, walks or other facilities shall not be closed or obstructed without prior permission from authorities having jurisdiction. The CONTRACTOR shall provide alternate routes around closed or obstructed traffic ways as required by governing regulations or conditions.
- G. Protection: The CONTRACTOR shall provide fencing or other protection for safe passage of persons around the affected area of vegetation.
- H. Provide, erect and maintain temporary barriers such as fencing. All holes shall be barricaded and covered after normal working hours.
- I. Contact serving utilities and arrange for relocation of items interfering with construction.
- J. Locate, identify and protect existing structures, utilities, drainage and irrigation systems, and equipment that are to remain from damage. If utility is damaged, immediately notify the City Representative and the utility OWNER for corrective action.
- K. Maintain egress and access at all times.
- L. Protect all trees and plant materials that are to remain. Water trees and plant materials that are to remain for the duration of the contract. The CONTRACTOR shall replace at its own expense any tree and/or plant material that is damaged as a result of construction or lack of irrigation.
- M. The CONTRACTOR shall provide temporary construction fence and other forms of traffic protection control before beginning demolition.

3.03 DUST AND WATER RUN-OFF CONTROL AND REMOVAL

- A. Prevent air-borne dust from dispersing into the atmosphere. Keep work sprinkled with clean water to minimize dust. Provide hoses and water connections for this purpose. Any water run-off should be kept away from drinking water appurtenances.

3.04 CLEARING

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

- A. Clear, grub, and strip within the limits of excavation and grading indicated.
 - 1. Vegetative materials not designated to be protected.
 - 2. Trash piles, surficial rubbish, and fencing, including fence-post footings.
- B. Remove cleared, grubbed, and stripped materials that are not to be recycled from the project site and dispose in accordance with all applicable laws, codes, and ordinances.
- C. Recycle tree trunks and limbs to the extent possible.
- D. Except as otherwise directed by OWNER Representative, cut, grub, and dispose of concrete, paving, base, vegetation, rubbish, debris and any objectionable material encountered within the limits required for construction. Areas outside the limits of clearing shall be protected. Provide temporary barricades or protection or secure the area from damage.
- E. If suspected hazardous materials are encountered, immediately notify City Representative. Handle and remove suspected materials in accordance with Sections 02111 and applicable local, state and federal regulations.
- F. Any removed meters, valves and covers during construction shall be delivered to the California-American Water Corporation Yard, Pacific Grove, California.
- G. Conduct operation with minimum interference to public or private access. Maintain protected egress and access at all time. Ensure safety of persons and adjacent property against damage by falling debris or other causes in connection with this work.
- H. The CONTRACTOR shall cease operation immediately if adjacent structures or facilities appear to be in danger. Notify OWNER Representative and do not resume operation until directed. Repair any damages caused by the CONTRACTOR to adjacent structures and as directed by the OWNER Representative at no cost to the OWNER.
- I. Keep vibration to a minimum to avoid damaging the remaining structure/lining.
- J. Storage areas shall be cleared before use.
- K. If the sites have been surveyed and staked prior to start of the work, use all means necessary to protect the benchmarks, survey stakes and monuments. If damaged during construction, the replacement of the damaged survey monuments and benchmarks will be at CONTRACTOR's expense.

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

3.05 REPAIR AND REPLACEMENT

- A. Repair injured trees:
 - 1. The term “injuries” in this context shall comprise any bruising, scarring, or breaking of roots, trunks, or branches.
 - 2. Repair or treat injured vegetation as recommended by and under the direction of the Tree Specialist.
- B. Plant replacement trees as directed by OWNER Representative.

3.06 RESTORATION, CLEAN UP AND DISPOSAL

- A. Remove from site surplus material and debris during the course and at completion of the worksite as CONTRACTOR’s property and dispose of in accordance with applicable Federal, State and Local Codes, Ordinances and Regulations. Burning or burying of waste material on site is prohibited.
- B. Cleanup any spillage from haul routes and adjacent areas.
- C. Restore utility service to normal operation.
- D. Remove equipments, temporary protection and barriers and debris.

END OF SECTION

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

02052: SITE PREPARATION, CLEARING, GRUBBING, AND STRIPPING

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TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02111: DISPOSAL OF EXCAVATED MATERIALS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies the requirements for:
1. On-site temporary stockpiling and management of excavated materials in a Material Classification Area (MCA)
 2. Sampling, testing, and material classification by the Contractor.
 3. Handling and transport of spoils from the tunnel, portals, shaft, structures, and trench excavations and disposal at the specified on-site disposal areas.
 4. Off-site disposal of excavated material determined to be unsuitable for onsite disposal.
- B. Related Sections:
1. Section 01060 – Regulatory Agency and Utility Requirements.
 2. Section 01560 – Temporary Environmental Controls.
 3. Section 02200 – Earthwork.
 4. Section 02125 – Trench Structure Excavation and Backfill.
- C. Definitions:
1. Material Classification Area (MCA): A site to be used by the Contractor as a staging area for sampling and testing of suspect potentially contaminated material in order to determine if the material must be disposed of at a hazardous waste site or is acceptable for placement in on-site disposal areas.
 2. Suspect Material: Potentially contaminated excavated material, suspected or observed to be contaminated.
 3. Spoils: Muck as defined above and surplus materials, generated during access road, portal, and other excavation activities, and requiring off-site disposal.
 4. Topsoil: Refer to Section 02200.
- D. Design Criteria:

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02111: DISPOSAL OF EXCAVATED MATERIALS

1. Segregation Bins for MCA:
 - a. Prevent cross contamination to take place between spoil piles.
 2. Establish stockpile locations and heights as shown on approved submittals and based on proposed construction methods.
 3. Confine work to areas within the construction limits indicated on the Drawings.
- E. Performance Requirements:
1. Segregation, sampling, and testing will be required only for tunnel spoils suspected of being potentially contaminated, as determined by the Owner Representative.
 2. MCA:
 - a. Shall be of the size and arrangement required to maintain satisfactory progress during construction. Evaluate MCA space and stockpile for logistics of stockpiling, sampling, material classification, and hauling classified material.
 - b. Segregate and stockpile suspect materials within the MCA to prevent cross-contamination of materials until classifications have been completed.
 - c. Determine the appropriate classification for suspect materials as Class I, Class II, or Class III materials.
 3. The Drawings indicate allowable haul routes for transporting the spoils to onsite disposal areas.
 4. Haul routes used for transport to offsite disposal areas shall be subject to all applicable regulatory and permit requirements.
 5. Refer to Section 01060 and 01062 for limitations on spoils hauling times and other permit and regulatory constraints.

1.02 REFERENCES

- A. Bay Area Air Quality Management District (BAAQMD) Regulations.
- B. California Air Resources Board (ARB): Section 93106, Asbestos Airborne Toxic Control Measure for Surfacing Applications.
- C. California Code of Regulations (CCR): Title 8.

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02111: DISPOSAL OF EXCAVATED MATERIALS

1.03 SUBMITTALS

A. Working Drawings and Methods Statements:

1. Work plan for locating, sizing, constructing, and maintaining segregation bins and stockpiles within the MCA. Include details for the design criteria of the segregation bins. Demonstrate that cross-contamination of spoil piles and seepage and flow of water decanting from the spoils is controlled and treated prior to discharge. Describe the erosion control measures and the storm and wind protection measures.
2. Include in the work plan a list of equipment proposed loading, hauling, spreading, moisture conditioning, disking, scarifying, and compacting. For the compaction equipment proposed, sufficient data and drawings shall be furnished for verification of the requirements specified in this section.
3. Contractor-furnished MCA:
 - a. Site layout and stockpile capacity.
 - b. Name, address, telephone number, and contact name of property owner.
4. Work Plan describing the muck evaluation, sorting/classification work.
5. Work Plan describing transportation and disposal activities for each class of material to be disposed of.
6. Quality Control:
 - a. Means and methods for performing required activities at the MCA, including the layout and types of physical and protective barriers.
 - b. Details for loading, transporting, and dumping materials, including:
 - (1) Proposed haul routes and haul times from the project to the MCA, from the project to the permanent disposal sites, and from the MCA to the permanent disposal sites.
 - (2) Methods for controlling and removing spillage, tracking of materials, and dust anywhere offsite.
7. Certifications:
 - a. Environmental permits to transport all materials.

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02111: DISPOSAL OF EXCAVATED MATERIALS

- b. State-licensed hauler for hazardous material, as required by state and federal regulations.
 - c. State-licensed disposal facility for hazardous material, as required by state and federal regulations.
 - d. Permits for proposed haul routes from governing jurisdictions.
- 8. For Contractor-provided stockpiling facilities offsite:
 - a. Permits from applicable governing jurisdictions.
 - b. Name, address, telephone number, and contact name for each disposal site used.
 - c. Lease or agreement with the property owner.
- 9. Daily Records: Submit no later than the end of the work day following the performance of the work truck counts for the transportation of all excavated materials grouped by haul destination and comprising material hauled from:
 - a. The project site.
 - b. Contractor-furnished stockpile facilities offsite.
 - c. The MCA.
- 10. Notifications: Immediately upon receiving a complaint from any source.

1.04 QUALITY CONTROL

- A. Quality control testing shall be performed by the Contractor. Corrective measures shall be made by the Contractor until conformance is achieved.
- B. Preconstruction Meeting:
 - 1. Hold a meeting at least 5 days but not more than 30 days prior to commencing excavation requiring the offsite disposal of materials.
 - 2. Review and discuss the following items:
 - a. Construction methods and constraints overview.
 - b. Equipment operating parameters.

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02111: DISPOSAL OF EXCAVATED MATERIALS

- c. Safety procedures.
- d. Quality Control procedures and Quality Assurance requirements.
- e. Reporting requirements.
- f. Other issues as may be raised by either party.

1.05 JOB CONDITIONS

Refer to the Geotechnical Data Report (GDR) for information on the materials encountered in the exploratory borings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

Provide barriers, stakes, and colored flagging to:

- A. Maintain controlled access to the MCA.
- B. Indicate the work area limits.
- C. Prevent impacts to land outside work areas.
- D. Furnish and install barriers to segregate MCA stockpile materials for sampling and classification.

3.02 STOCKPILING

- A. Remove, handle, segregate, and store suspected hazardous material as hazardous until the Owner Representative has reviewed the required laboratory analysis and determined the appropriate classification.
- B. Do not commingle materials from different areas of work until materials have been classified. For tunnel excavation, do not commingle individual loads of muck hauled out of the tunnel.

3.03 TESTING AND DISPOSAL REQUIREMENTS

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02111: DISPOSAL OF EXCAVATED MATERIALS

- A. All suspect material shall be tested and classified as specified herein and in accordance with applicable permits and landfill disposal regulations, as applicable.
- B. Minimum testing required in order to clear suspect material for placement in on-site disposal areas shall include the following:
 - 1. Total Petroleum Hydrocarbons (TPH) as diesel (TPH-d) and as motor oil (TPH-mo), in accordance with U.S. EPA Method 8015B.
 - 2. Title 22 Metals, in accordance with U.S. EPA Methods 6010B and 7470A.
- C. In order for suspect material to be cleared for placement in on-site disposal areas, the following criteria must be met:
 - 1. Concentrations of Title 22 Metals shall not exceed regional ambient levels, as defined by the RWQCB.
 - 2. Organics shall not exceed RWQCB Environmental Screening Levels (ESLs) for commercial/industrial sites, as provided at the following website:
<http://www.waterboards.ca.gov/sanfranciscobay/esl.shtml>
- D. If suspect material is cleared for placement in on-site disposal areas, all such affected material shall be buried with not less than 3 feet of clean soil cover in the final disposal area grading.
- E. Suspect material not cleared for placement in on-site disposal areas shall be hauled and disposed of at a suitable offsite location, subject to approval by the Owner Representative.

3.04 HAULING

- A. Maintain haul routes free of spoils.
- B. Perform hauling in accordance with permit requirements.

END OF SECTION

TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02125: TRENCH AND STRUCTURE EXCAVATION AND BACKFILL

PART 1 GENERAL

1.01 SUMMARY

A. This specification section includes the following items of work:

1. Trench excavation and backfill around pipes, conduits, and appurtenances.
2. Backfill behind concrete walls, vaults and other structures.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of Notice Inviting Bids shall be used.

B. American Society for Testing and Materials (ASTM):

1. ASTM D1556: Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
2. ASTM D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³ (2,700 kN-m/m³)).
3. ASTM D2216: Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.
4. ASTM D4253: Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
5. ASTM D4318: Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
6. ASTM D4718: Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.

1.03 DEFINITIONS

A. Maximum Dry Unit Weight: the maximum dry unit weight in pounds per cubic foot, obtained in accordance with laboratory compaction standard ASTM D1557.

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- B. Optimum Water Content: the water content at which a material can be compacted to its maximum dry unit weight when compacted in accordance with laboratory compaction standard ASTM D1557.
- C. Compaction Water Content: per Section 02200, Earthwork.
- D. Percent Compaction or Relative Compaction: per Section 02200, Earthwork.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01300, CONTRACTOR Submittals at least 60 days in advance of the relevant work commencing or materials being ordered, unless noted otherwise.
- B. Submit a detailed work plan describing excavation and backfill procedures proposed for all trench and structure excavations.
- C. Material Source: Submit names of imported materials suppliers.
- D. Shoring: The shoring layout and calculations shall be approved and stamped by a Civil Engineer registered in the State of California, and submitted to the OWNER Representative for record purposes.
- E. Certificates: Gradation and certification of backfill, bedding and foundation materials.
- F. Pipe supports: Submit pipe support fabrication drawings that show materials of construction and spacing (as determined by pipe joint spacing and calculations). Include calculations demonstrating support spacing is consistent with maximum allowable free span.
- G. Contractor may submit substitution request for use of alternative material in the pipe zone by submitting material data sheets and proposed placement procedures to the OWNER Representative for approval.

1.05 QUALITY ASSURANCE

Quality assurance testing will be performed by the OWNER Representative to check conformance with these specifications. Where any nonconformance is revealed, further testing will be performed by the OWNER Representative. Corrective measures, to the extent of complete replacement of applied material, shall be made by the CONTRACTOR until conformance is achieved. All costs for retests shall be borne by the CONTRACTOR.

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1.06 PROTECTION

- A. The CONTRACTOR shall furnish, place, and maintain all support and shoring that may be required for the excavations and shall be responsible for the adequacy of all support facilities.
1. Shoring, sheeting, and bracing shall be in accordance with the safety requirements of federal, state, or local agencies having jurisdictions.
 2. The CONTRACTOR shall maintain all supports and shall be responsible for the adequacy of support facilities, including the liability for any damage related thereto, or failure thereof.
- B. Whenever, in the opinion of the OWNER Representative, sufficient or proper shoring and bracing has not been provided, the CONTRACTOR shall, on demand, furnish and install additional shoring and bracing, but neither compliance with such demand, nor failure of the OWNER Representative to make such demand, shall relieve the CONTRACTOR of responsibility for sufficiency of the shoring and bracing. If any damage occurs as a result of inadequate shoring and bracing, the CONTRACTOR shall conduct the necessary repairs or reconstruction, at no cost to the OWNER, as directed by the OWNER Representative.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Trench zone backfill shall meet the following requirements:
1. Trench zone backfill materials shall have a plasticity index (PI) of not more than 8 as determined by ASTM D4318.
 2. Trench zone backfill material shall be free of wood, trash, construction debris, and organic, contaminated, or deleterious material.
 3. All rock and fill material larger than three inches shall be excluded from all trench zone backfill. All trench zone backfill material shall be free from unbroken masses of earth materials that might arch or bridge and leave unfilled pockets.
 4. The use of select native backfill is subject to approval by the OWNER Representative and shall conform to requirements above and from Section 02200. Where the onsite materials are

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determined by the OWNER Representative to be unsuitable, imported fill shall be provided by the CONTRACTOR.

- B. Pipe Zone Bedding Material, Pipe Zone Backfill Material and Pipe Zone Foundation Material shall be Sand Backfill meeting the requirements specified in Section 02200, Earthwork.
1. Upon approval of submittal by the OWNER Representative, processed sand and gravel free from clay lumps, organic, or other deleterious material complying with the following gradation requirements may be substituted for Sand Backfill:

Sieve Size	Percent Passing By Weight
1 Inch	100
3/4 Inch	90 to 100
3/8 Inch	20 to 55
No. 4	0 to 10
No. 8	0 to 5

2.02 EQUIPMENT

- A. Compaction equipment, including hand operated equipment, shall be of suitable type for the material being compacted and adequate to obtain the compaction specified. If inadequate compaction is obtained, larger or different types of equipment shall be used.
- B. Equipment for applying water shall be of a type and quality adequate for the work, shall be free of leaks or equipment problems, and shall be equipped with distributor bars or other approved device to ensure uniform application.

PART 3 EXECUTION

3.01 EXCAVATIONS

- A. General:

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1. Excavation shall be performed to the lines and grades shown on the Drawings. Where unsuitable foundation materials as determined by the OWNER Representative are encountered, additional excavation of such materials shall be performed as directed by the OWNER Representative.
2. Excavations shall include the removal and disposal of all materials encountered, including obstructions of any nature that would interfere with the proper execution and completion of the work as shown or specified.
3. The CONTRACTOR shall be prepared to handle cobbles, boulders, and other oversized materials encountered during excavations. No payment will be made for over-excavation or for resulting additional backfill placement and its compaction.
4. The use of methods which result in over-excavation of trenches or of structure foundations will not be permitted. The CONTRACTOR shall take care to avoid disturbances of adjacent ground.
5. As part of the work of making the required excavations, the CONTRACTOR shall remove any loose material that appears dangerous to workers or to structures.
6. The CONTRACTOR shall do such grading or other work as is necessary to prevent surface water from entering the excavation.
7. The CONTRACTOR shall immediately notify the OWNER Representative upon encountering underground water. Accumulated water shall be prevented from flowing down through the bedding material and later pumping out and softening surfaces or subgrade. Where water causes such problems during construction, it shall be drained to the nearest point where flow can be acceptably relieved; using gravel encased perforated pipe. Dewatering operations, if required, shall be in accordance with Section 02140, "Dewatering."
8. Protect bench marks, property corners, and other survey monuments from damage or displacement. Where markers are required to be removed, provide removal and reinstallation by land surveyor licensed in the State of California.

B. Trench Excavations:

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1. Excavation for piping and utility lines shall be in open-cut trenches with side slopes as determined by the CONTRACTOR and subject to the OWNER Representative's approval. The width of the base of the trench shall be as shown on the Drawings. The CONTRACTOR shall proceed carefully with the trenching to avoid excavating below the bottom of the pipe trench. The trench bottom shall be given a final trim so that each pipe section, where not encased in concrete, will be uniformly supported and in continuous contact with the bedding material on the required grade for the full length of the pipe section.
2. Wherever over-excavation, inaccurate trimming, or other reason causes failure of the trench bottom to uniformly support pipes, conduits, ducts, or other similar facility, as herein required, the CONTRACTOR shall remove any of the materials that failed, refill to the required grade in lifts with approved material, compact that material as specified in Article 3.04, and re-trim the trench to the required section and grade.
3. Where the trench cuts through paved areas, the pavement shall be saw-cut prior to excavation of the asphalt. The trench shall be excavated to vertical sides with bracing and shoring, as required, regardless of whether the adjoining sections are vertical sided trenches or not.
4. Where the trench cuts through rock or any other material which cannot be trimmed to provide uniform support for the pipe, the trench bottom shall be over-excavated a minimum of six inches and backfilled, compacted to at least 95 percent relative compaction, and shaped to provide uniform support and continuous contact for the pipe invert.
5. Where unsuitable trench invert conditions are encountered, perform additional excavation and place additional material to stabilize the subgrade, subject to OWNER Representative approval.
6. The position of the pipe, with respect to the ground surface as shown on the Drawings is subject to revision to any extent that the OWNER Representative may find advisable, and the CONTRACTOR shall be entitled to extra payment only if the pipe is lowered by 9" or more. If the pipe is moved higher than the elevation shown on the Drawings, no extra payment will be made.

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C. Structure Excavations:

1. Structure excavation shall be cut to specified lines, grades, and cross sections. Bottom of excavation shall be undisturbed material, cut to the elevation shown on the Drawings.
2. Where unanticipated utilities are encountered, the CONTRACTOR shall support, shore, and protect the utilities and immediately notify the OWNER Representative. For utilities considered to be abandoned; only the interfering portions shall be removed. For utilities considered to be active, the OWNER Representative shall be consulted for instructions. The CONTRACTOR shall not proceed without instructions, except to correct an immediate hazard or emergency condition. Any work performed on an active utility shall be the CONTRACTOR's responsibility and liability. All damage caused by excavation activities shall be repaired by the CONTRACTOR at own expense.
3. The CONTRACTOR shall remove obstructions within the perimeter of required excavation, such as boulders, tree stumps, abandoned pipes and structures, and debris of all types as part of excavation work.
4. Where the bottom line of excavation cannot be cut to a uniform bearing due to rock formation, bedrock shall be trimmed to the prescribed lines and thoroughly cleaned of mud and debris. Unstable or unsuitable material for foundation, as determined by the OWNER Representative, shall be removed and replaced with Class 2000B concrete as directed by the OWNER Representative.
5. Excavated material acceptable for fill shall be stockpiled in a designated stockpile area; unacceptable material shall be disposed of in the designated disposal sites.

3.02 DISPOSAL OF EXCAVATED MATERIALS

A. General:

1. All materials removed by clearing, grubbing and stripping of work areas shall be disposed of by the CONTRACTOR.
2. Reuse excavated material which meets the requirements of trench backfill. Excavated material, including boulders, which

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cannot be used shall be hauled to and placed in disposal areas. Concrete rubble shall be disposed of as specified in Section 02111, Disposal of Excavated Materials. Construction debris shall be hauled offsite.

3. No material shall be disposed of on privately or publicly owned property unless the CONTRACTOR first obtains written approval from the OWNER or agency concerned. The CONTRACTOR shall furnish satisfactory written evidence to the OWNER Representative that such consent has been obtained.
4. All costs of inspection required by city, county, state, or other governmental authorities in connection with the disposal of materials, shall be borne by the CONTRACTOR.

B. Temporary Stockpile Areas:

1. Wherever space is available within the areas assigned for the CONTRACTOR's use, it may be used for temporary storage of excavated material; provided that no material shall be stored or deposited in violation of any federal, state, county, or city ordinance or regulation prohibiting the filling or obstruction of watercourses and drainage channels.
2. Before completion of the Contract all temporary stockpiles shall be removed. This includes restoring slopes, drainage facilities, plantings, and all other areas disturbed as a result of the CONTRACTOR's usage.
3. Materials shall not be stockpiled over pipelines.

3.03 FOUNDATION PREPARATION

A. General:

1. In the preparation of foundations, the materials shall be excavated to sufficient depths to ensure removal of all loose, soft, weak, unstable, organic, or other materials not suitable as a foundation, as determined by the OWNER Representative.
2. Rocks, stones or other objects shall not project into space in which structural concrete is required to be placed. All such protruding materials shall be completely removed or shall be cut back to the limits of structural concrete. Any rocks or stones in the prepared foundation, including those cut back or trimmed,

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which are loose or otherwise unsuitable in the foundation as determined by the OWNER Representative, shall be removed and disposed of as waste material.

3. All foundation surfaces shall be firm, unyielding, and free of standing water at the time of placing other materials on them.
 4. After the preparation has been completed and the foundation is approved by the OWNER Representative, the CONTRACTOR shall promptly place concrete, bedding, or structural fill, as shown on the Drawings or as determined by the OWNER Representative, on the foundation to prevent deterioration of the surface. If deterioration of said surface does occur due to air-slaking, mechanical breakdown, loosening from traffic, erosion, or other cause, the CONTRACTOR shall perform additional excavation, compaction, foundation preparation, and cleanup as required, at no cost to the OWNER.
 5. No materials shall be placed on any foundation until the foundation has been approved by the OWNER Representative.
 6. Whenever any excavation in rock is made beyond the prescribed subgrade or width, the excess excavation shall be filled with concrete at no cost to the OWNER.
- B. Foundations in soil upon which pipe and fittings are to be placed shall be finished to the dimensions shown on the Drawings, brought to the specified compaction water content by sprinkling as required, and compacted as specified herein. No boulders or waste portions of broken concrete shall be left projecting within the excavation lines shown on the Drawings. Where culverts or other pipe are placed under roadway fills or embankments, the fill shall be constructed to at least one foot above the indicated top of pipe elevation before the trench is excavated.
- C. Materials to a depth of two feet below the base of structure foundation excavations shall be compacted to at least 95 percent relative compaction as specified in Article 3.05. If localized areas of loose or soft soils are observed, they shall be removed to depths required by the OWNER Representative and then replaced and compacted to 95 percent relative compaction. The compaction requirement may be waived by the OWNER Representative if rock is exposed at the base of a structure foundation excavation.
- D. If at any place the natural foundation material is disturbed or loosened during the process of excavation or otherwise, it shall be compacted as

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specified herein. If required by the OWNER Representative, the disturbed or loosened material shall be removed and replaced with concrete at no cost to the OWNER.

3.04 BACKFILLING AND COMPACTION

A. General:

1. Trench excavations shall be backfilled to the level of the ground surface as it existed immediately before beginning construction hereunder, except where otherwise shown on the Drawings.
2. Trench backfill shall not be dropped directly upon any pipe or fitting. The material used for trench backfill, the amount thereof, and the manner of depositing shall be subject to the approval of the OWNER Representative. The CONTRACTOR shall be responsible for any displacement of pipe, fabricated fittings, or structures; any damage to their surfaces; or any instability of the structures caused by the improper depositing of the backfill materials.
3. The CONTRACTOR shall brace steel pipe and fabricated fittings sufficiently to ensure that the diameter of the pipe does not vary by more than 0.5 percent of the design diameter at any point. Excessive deflection of steel pipe and fittings shall be repaired by the CONTRACTOR at no cost to the OWNER.
4. Bracing placed in steel pipe or fabricated fittings shall remain in place during backfilling and shall not be removed without permission of the OWNER Representative.

B. Pipe Zone Bedding Material, Pipe Zone Backfill Material and Pipe Zone Foundation Material shall be compacted to at least 90 percent relative compaction.

C. Trench Zone Backfill shall be compacted to at least 90 percent relative compaction.

D. Backfill to be compacted by heavy compaction equipment shall be placed in horizontal layers not exceeding eight inches in thickness before compaction; however, heavy compaction equipment shall not be used closer than five feet to walls or the top of any structure, nor closer than three feet to the top of any pipe. Before each layer is placed, the material therein shall be brought to within plus or minus two percent of optimum water content as defined by ASTM D1557.

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- E. When excavating and backfilling within three feet of pipelines or five feet of structures, special care shall be exercised not to remove lateral support or undermine them in any way that could cause settlement, displacement or deformation of the pipeline or structure. Fill shall be brought up uniformly on all sides of pipelines, walls and other structures. To safeguard against movement of pipelines or structures, the CONTRACTOR shall place backfill at these locations in layers not exceeding four inches in thickness, and shall thoroughly compact each layer with hand-operated, power-driven tampers to at least 95 percent of the laboratory maximum dry unit weight. Before each layer is tamped, the material therein shall be brought to within plus or minus one percent of optimum water content as defined by ASTM D1557.
- F. Trench backfill shall be compacted by mechanical tampers or rollers or other mechanical means approved by the OWNER Representative. Compacting by ponding or jetting will not be permitted.
- G. Material conditioning, filling, and compacting operations shall be executed in a systematic manner. The CONTRACTOR shall devise whatever safeguards and standards of operation the OWNER Representative may require to ensure that compacted fill or backfill will meet or exceed the minimum compaction standards. If, in the opinion of the OWNER Representative, the CONTRACTOR's methods are not conducive to achieving the desired results, these methods shall be immediately changed.
- H. All material limits shall be constructed within a tolerance of ± 0.1 foot, except where another tolerance is specified herein or shown on the Drawings.
- I. The CONTRACTOR shall not backfill against walls until concrete has obtained compressive strength equal to the specified 28-day compressive strength or as approved by the OWNER Representative.

3.05 QUALITY CONTROL TESTING

- A. Quality control testing shall be performed by the CONTRACTOR during the progress of the work to determine compliance with the compaction requirements specified herein.
- B. Unless another percent compaction is specified, all compaction shall be not less than 95 percent of maximum dry unit weight.
- C. The maximum dry unit weight and optimum water content will be determined in accordance with ASTM D1557. The maximum dry unit

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weight of cohesionless, free-draining sand and gravel materials will be determined in accordance with ASTM D4253.

D. Field In-Place Dry Unit Weight:

1. The field in-place dry unit weight will be determined in accordance with ASTM D1556 to determine total unit weight and ASTM D2216 to determine water content.
2. A correction for oversized material will be performed on the field unit weight test in accordance with ASTM D4718. "Oversize material" shall mean all material retained on the corresponding screen used for preparing the ASTM D1557 sample.

E. Number of Field Unit Weight Tests:

1. One test for every 100 to 200 cubic yards of backfill in trenches or around structures, depending on the total quantity of material involved.
2. At least one test for every full shift of compaction operations on earthwork.
3. One test for whenever there is a change in the quality of moisture control or effectiveness of compaction as determined by the OWNER Representative.

F. The CONTRACTOR shall remove material as required in any areas where compaction of the material does not fully comply with these specifications. The unsatisfactorily compacted material shall be promptly removed and reworked or replaced with material that will conform to the specified requirements at no cost to the OWNER.

END OF SECTION

**TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02240: DEWATERING**

PART 1 GENERAL

1.01 SUMMARY

- A. This specification section includes the following items of work:
1. Dewatering of pipeline and waters entering construction area.
 2. Disposing of pumped water.

1.02 DEFINITIONS:

1. Groundwater: Groundwater denotes all water below the existing ground surface.
2. Perched Water: Perched water denotes unconfined groundwater within the work area that is separated from the underlying main body of groundwater by unsaturated material.
3. Surface Water: Surface water is all water that enters the work area at or above the ground surface, from either natural or artificial sources, including precipitation.
4. Infiltration Water: Potable water that enters the work area due to incomplete upstream valve closure.

1.03 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of the Notice Inviting Bids shall be used.
- B. American Water Works Association:
1. Standard for Water Wells (AWWA A100-84).
- C. California Department of Water Resources:
1. Water Well Standards: State of California, Bulletin 74-81 (with Supplemental Bulletin 74-90).

1.04 SUBMITTALS

- A. Submit in accordance with Section 01300 - Submittals at least 30 days in advance of the relevant work commencing or materials being ordered, unless noted otherwise.

**TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02240: DEWATERING**

- B. Submit dewatering plan including drawings and design data for the proposed dewatering system, showing the equipment and methods that the CONTRACTOR proposes to use to dewater the excavations, and to control and remove surface water.

1.05 QUALITY ASSURANCE

- A. Acceptance Criteria:
 - 1. The work specified herein shall conform to the requirements of the documents listed below. In the event of any conflict between the documents, or the documents and these specifications, such conflict shall be immediately referred to the OWNER Representative for written resolution. The OWNER Representative's interpretation shall govern.

PART 2 PRODUCTS

2.01 EQUIPMENT FOR DEWATERING

- A. The CONTRACTOR shall furnish all materials, tools, equipment, facilities, and services as required for providing the necessary dewatering work and facilities. Provide back-up equipment as necessary for replacement and for unanticipated emergencies.
- B. Pumps shall be regularly maintained and kept in good operating condition with no leaks from operating fluids. CONTRACTOR shall comply with applicable local, state and federal regulations regarding contamination of water during dewatering operations.

PART 3 EXECUTION

3.01 GENERAL

- A. The CONTRACTOR shall take all steps to become familiar with the site conditions, ground conditions, and the groundwater conditions.
- B. Excavation dewatering includes, but is not limited to, pumping, piping, draining and other measures required for the removal or exclusion of water excavation areas, throughout the entire period of time that construction work is taking place. This also includes the control and disposal of water produced during dewatering operations.
- C. The CONTRACTOR's operations shall not compromise safe control and disposal of water, and the CONTRACTOR shall be responsible for any damages caused as a result of its operations. Review of the dewatering system plans by the OWNER Representative will not relieve the CONTRACTOR of its responsibility for the adequacy of the systems, including responsibility for repairing any damage to any part of the work caused by the operation, failure, or inadequacy of the system. The CONTRACTOR shall have sole responsibility for all aspects of the dewatering system.

**TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02240: DEWATERING**

3.02 GENERAL DEWATERING OPERATIONS

Perform dewatering in accordance with approved shop drawings. Advise OWNER Representative of any changes made to accommodate field conditions and, on completion of the dewatering system installation, revise and resubmit shop drawings as necessary to indicate the installed configuration.

3.03 WATER DISCHARGE/CONTROL

The CONTRACTOR shall discharge water produced during dewatering operations that is not used for construction activities in accordance with approved dewatering plan and into offsite detention ponds.

END OF SECTION

TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02240: DEWATERING

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TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02160: EXCAVATION SUPPORT SYSTEMS

PART 1 GENERAL

1.01 WORK OF THIS SECTION

- A. The work of this Section includes support of temporary open excavations by means of sheet pilings, soldier piles and lagging, structural steel walls and struts, liner plates, and timber. The Contractor shall be responsible for the design and selection of methods in conformance with the design criteria as specified herein.
- B. The work of this Section applies to temporary excavation support systems for demolition, and installation of buried pipelines, and boring and receiving shaft or pits.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02140 – Dewatering
- B. Section 02125 – Trench and Structure Excavation and Backfill

1.03 QUALITY ASSURANCE

- A. Support of excavation shall be designed, and Shop Drawings and calculations stamped and signed, by a Professional Engineer, licensed to practice in the State of California and experienced in the design of excavation support systems.

1.04 SUBMITTALS

- A. The following shall be submitted in compliance with Section 01300 – CONTRACTOR Submittals and 01600 – Products, Materials, Equipment and Substitutions:
 - 1. The proposed excavation support system for each construction component where excavation support systems will be used.
 - 2. Arrangement and details for each excavation support system, supporting design calculations, and construction methods to be used for the installation of each system.
 - 3. Soldier pile installation methods, connection details, bracing preloading, and jacking procedures.
 - 4. Depths below the main excavation bottom elevation to which the support system will be installed.
 - 5. Elevations of ground surface, struts, and shores, as applicable.
 - 6. Permissible depth to which excavation may be carried before supports must be installed and preloaded.

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DIVISION 2: SITE WORK
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7. Full excavation depth load to be carried by various support system members.
 8. Bracing loads for various stages of excavation, bracing removal, and concrete placement.
 9. Preloads as required.
 10. Proposed sequence of strut and shore removal as applicable and as related to concrete placement and backfilling operations.
- B. The above Shop Drawings shall be coordinated with other shop drawing submittals for work specified elsewhere in which support of excavation is required.
- C. The proposed method of installing sheet piling including sequence of installation, template, and equipment description.
- D. Contingency plan for alternative procedures to be implemented if the excavation support system is found to perform unfavorably.

1.05 DESIGN CRITERIA

- A. Shop Drawings with supporting calculations for the various excavation support systems shall be prepared in accordance with the following criteria:
1. Design the excavation support system and all components to support the earth pressures, unrelieved hydrostatic pressures, utility loads, equipment, traffic, and construction loads including impact, and other surcharge loads in such manner as will allow the safe and expeditious construction of the permanent structures, to minimize ground movement or settlement, and to prevent damage to or movement of adjacent buildings, structures, roadways and utilities.
 2. Design support members to resist the maximum loads expected to occur during the excavation and support removal stages.
 3. No portion of the excavation support system's vertical face will be permitted to penetrate the design lines as indicated on the Drawings for the permanent concrete structure to be constructed within the excavation.
 4. Review of the CONTRACTOR'S Shop Drawings and methods of construction by the Construction Manager does not relieve the CONTRACTOR of responsibility for the adequacy of the excavation support systems.
 5. Design and fabrication of steel components shall conform to AISC Manual of Steel Construction.

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02160: EXCAVATION SUPPORT SYSTEMS

- 6. Timber Support Systems and Members
 - a. Basis for determination of minimum allowable working stress: UBC Chapter 25.
 - b. Design calculations shall be submitted for timber support systems and lagging.

1.06 SAFETY

- A. Except as otherwise indicated, the following codes apply to the work of this Section:
 - 1. Title 8, California Administrative Code, Chapter 4, Subchapter 4, Construction Safety Orders, Article 6, Excavations, Trenches, Earthwork, Section 1542, Shafts.

1.07 PROJECT CONDITIONS

- A. Utility agencies shall be notified and caution exercised while exposing utility facilities by hand or other methods approved by utility owner.
- B. If existing utility facilities interfere with the proposed method of support, the method shall be modified in a manner that will protect the facility and accommodate the proposed work. Shop Drawings shall be revised and resubmitted along with design calculations required to account for the modified support method and to show the actual location of the existing utilities.
- C. Provisions shall be made for contingencies as follows:
 - 1. Monitor performance of support system components, for both vertical and horizontal movement, at regular intervals not to exceed 3 days.
 - 2. Provide contingency plan for alternative procedures to be implemented if unfavorable performance is evidenced.
 - 3. Keep on hand materials and equipment necessary to implement contingency plan.
- D. Elements of the support system shall not be spliced unless approved by the Construction Manager.

PART 2 MATERIALS

2.01 MATERIALS

- A. Steel sheet piling shall be continuous interlocking type ASTM A 328 of appropriate shape and provided with at least one 2-1/2-inch-diameter handling hole on the centerline of the web located at least 6 inches from each end of the sheet pile.

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- B. Fabricated connections and accessories, steel H-piles, WF shapes, and other structural steel shall conform to the requirements of ASTM A 36, unless otherwise approved.
- C. Concrete shall be as specified in the Specifications.
 - 1. For encasement of steel soldier piles below the final level of excavation, 2,500 psi shall be used.
 - 2. For encasement of soldier piles above the final level of excavation, lean concrete shall be used, the strength of which shall be adequate to protect the excavated faces of the augured hole.
- D. Wood lagging shall be dimension lumber with minimum allowable stress of 1,100 psi.
 - 1. The stress grade of the lagging shall be in conformance with the allowable stresses of the UBC, Chapter 25.
 - 2. Lumber shall be grade marked by WWP or WCLIB with species and grade conforming to those shown on approved Shop Drawings.

PART 3 EXECUTION

3.01 GENERAL

- A. The support system shall extend the main excavation bottom elevation to a depth adequate to prevent lateral movement and to adequately support applied vertical loads. In areas where additional excavation is required below the main excavation subgrade provisions shall be made to prevent movement of main excavation supports. Damage to existing utilities during installation of excavation support system shall be avoided.
- B. Water control measures shall be provided in accordance with the requirements specified in Section 02140 – Dewatering.

3.02 SHEETING AND LAGGING

- A. Sheeting and lagging shall be installed with no gap between the boards unless specifically approved. As installation progresses, the voids between the excavation face and the lagging or sheeting shall be backfilled with sand or soil and rammed into place. Materials such as hay or burlap shall be used where necessary to allow drainage of groundwater without loss of soil or packing material. If gaps in the lagging are allowed, the gap width between lagging boards shall be limited to 1/2 inch maximum.
- B. If unstable material is encountered, suitable measures shall be taken to retain it in place or to otherwise prevent soil displacement.
- C. Extend lagging down to final subgrade.

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- D. A sufficient quantity of material shall be on hand for sheeting, shoring, bracing, and other operations for protection of work and for use in case of accident or emergency.

3.03 STEEL SHEET PILING

- A. Steel sheet piling may be used only where existing subsurface conditions are suitable for installation of sheet piling to the full depth of penetration required, and to proper alignment and plumbness, specified herein, without damage to the sheet piling or rupture of its interlocks. The use of steel sheet piling will not be permitted where sheeting would be required to penetrate boulders, rock or other materials which may prevent the proper installation of sheet piling.
- B. Steel sheet piling shall be installed in plumb position with each pile interlocked with adjoining piles for its entire length so as to form a continuous diaphragm throughout the length of each run of wall, bearing tightly against original ground. Install sheeting to depth required for design. Exercise care during installation so that interlocking members can be extracted, if required, without injury to adjacent ground. The installation equipment shall be suitable to the type and nature of the subsurface materials anticipated to be encountered. The equipment and methods of installation, cutting, and splicing shall conform to the approved Shop Drawings.

3.04 INTERNAL BRACING SUPPORT SYSTEM

- A. All bracing support members shall be installed and maintained in tight contact with each other and with the surface being supported.
- B. Bracing members shall be preloaded by jacking the struts and shores in accordance with loads, methods, procedures, and sequence as described on the approved Shop Drawings. Coordinate excavation work with bracing installation and preloading. Use steel shims and steel wedges welded or bolted in place to maintain the preloading force in the bracing after release of the jacking equipment pressure. Use procedures so as to produce uniform bracing member loading without appreciable eccentricities, overstressing, or support member distortion.
- C. Struts shall be provided with intermediate bracing as needed to enable them to carry their maximum design load without distortion or buckling. Provide diagonal bracing as necessary to maintain the stability of the system. Web stiffeners, plates, or angles shall be provided as needed to prevent rotation, crippling, or buckling of connectors at points of bearing between structural steel members. Allow for eccentricities resulting from field fabrication and assembly.
- D. Excavations shall be to a depth no more than 2 feet below the elevation of the support member about to be placed. The support member shall be installed and preloaded immediately after installation and prior to continuing excavation.

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3.05 REMOVAL OF SUPPORT SYSTEMS

- A. Where removal is required wholly or in part, such removal shall be performed in a manner that will not disturb or damage adjacent new or existing construction or utilities. Fill all voids immediately with lean concrete, or other approved means.
- B. All elements of support systems shall be removed to a minimum depth of 6 feet below final ground surface. However, when a structure poured against the sheeting system extends above the 6-foot limit, removal of the sheeting system shall be to the top of the structure.
- C. All damage to property resulting from removal shall be promptly repaired. The Construction Manager shall be the sole judge as to the extent and determination of the materials and methods for repair.

END OF SECTION

TECHNICAL SPECIFICATIONS
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PART 1 GENERAL

1.01 SUMMARY

- A. This specification section includes the following items of work:
1. Furnishing all equipment, labor, tools and techniques for construction of earthwork for roadways in accordance with the Contract documents or as directed by the OWNER Representative. The work includes, but is not limited to the following:
 - a. Existing Pavement cutting if necessary.
 - b. Earthwork in cutting and in banking for construction including watering and compaction.
 - c. Shoring of excavations during construction, trench support work, backfilling and compaction.
 - d. Disposal of surplus suitable excavated materials.
 - e. Disposal of unsuitable excavated materials.
 - f. Cleanup.

1.02 RELATED SECTIONS

- A. Section 01300 –Submittals.
- B. Section 02160 – Excavation Support Systems.
- C. Section 02231 – Aggregate Base and Subbase.
- D. Section 02460 – Asphalt Concrete Paving.

1.03 REFERENCES

- A. ASTM C136 – Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D698 - Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
- C. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- D. Section 6705 and 6707 of the California Labor Code.

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1.04 SUBMITTALS

Plans and calculations for shoring systems shall be submitted for review and approval prior to trench excavation in accordance with Section 02160, Excavation Support Systems. Approval shall not relieve the CONTRACTOR of responsibility to provide a satisfactory and safe shoring system.

1.05 SAFETY REQUIREMENTS

- A. All excavating and other earthwork shall be done in conformance with the rules and regulations pertaining to safety established by the California Department of Industrial Relations, Division of Occupational Safety and Health (CAL-OSHA).
- B. Trenches and other excavations shall be made safe and passable by the use of barricades, bridges and other improved means.
- C. Trenches and other excavations shall be sufficiently wide to allow for the proper construction, installation and inspection of the work, but shall not exceed such necessary width.
- D. Tunneling or jacking shall only be used where specified or unless approved in writing by the OWNER Representative.
- E. The CONTRACTOR shall do whatever additional work he considers necessary to assure the safety of all persons employed on the work and of the general public.
- F. Trenches and other excavations shall be guarded against hazard by means of shoring, lagging and bracing in conformance with the applicable Safety Orders issued by CAL-OSHA.
- G. During construction, the CONTRACTOR shall construct and maintain satisfactory, substantial and appropriate barricades and steel plates at all excavations, at locations where materials are stored and at other hazards. All such enclosures shall have warning lights adequate for public safety.
- H. High rise warning flag units, to provide advance warning for traffic approaching excavations, will be required in all cases where motorists' visibility of the work is limited or obscured. Where required, the CONTRACTOR shall provide and maintain safe and adequate passage for vehicular and pedestrian traffic over and adjacent to trenches and other excavations by the use of barricades, bridges and other approved means.
- I. The CONTRACTOR shall take adequate measures, commensurate with the danger involved, to prevent unauthorized entry by children or others upon the area of excavation operations. The measures shall include the provision of proper and adequate guard railing, solid or chain link fence and the placement of a difficult to remove weighted cover on each deep shaft excavation.

TECHNICAL SPECIFICATIONS

DIVISION 2: SITE WORK

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- J. If the CONTRACTOR encounters material in trench or other excavation, which he has reason to believe may be hazardous waste, as defined by Section 25117 of the Health and Safety Code of the State of California, he shall immediately so notify the OWNER Representative in writing. If authorized by the OWNER Representative, excavation in the immediate area of the suspected hazardous material shall be suspended until the OWNER Representative authorizes it to be resumed. If such suspension delays the current controlling operation, the CONTRACTOR will be granted an extension of time.
- K. The OWNER reserves the right to use other forces for exploratory work to identify and determine the extent of the hazardous material and for removing such material from the site.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. All native materials to be used in fill shall be free of organic and deleterious materials and stock piling. The CONTRACTOR shall protect fill material during stockpiling by plastic sheeting or other acceptable means, to prevent the entry of water during rains. If the material becomes permeated with water and the required compaction cannot be obtained by the CONTRACTOR after drying the material, he shall remove such material from the site and replace it with acceptable material, at no cost to the OWNER.
- B. Imported sand type or equivalent backfill shall be free from rock, concrete, organic material and other objectionable material. Backfill material shall have 100 percent passing the 3/8 inch sieve size, 93 percent to 100 percent passing the No. 4 sieve size and 0 percent to 10 percent passing the No. 200 sieve size. Samples shall be submitted to and approved by the OWNER Representative prior to placement. Unacceptable material shall be immediately removed from the site of work.

PART 3 EXECUTION

3.01 EXAMINATION

Verify fill material to be reused is acceptable. See article 2.01 for details.

3.02 PREPARATION

- A. Identify required lines, levels, contours and datum shown in the Contract drawings.
- B. Maintain and protect existing utilities remaining, which pass through work area.
- C. Protect bench marks, existing structures, sidewalks and curbs from excavation equipment and vehicular traffic.

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02200: EARTHWORK

3.03 PAVEMENT CUTTING

- A. Use concrete saw cutting or vibratory pavement breaker or equal.
- B. No machine or device that breaks pavement by blows struck by a falling or driven hammer or weight shall be allowed. Ram hoe and trenching machine shall not be used for at edge of pavement restoration. Such prohibition, however, shall not be construed as barring the use of hand tools or manually operated air tools such as jackhammers.
- C. Rock Cutter: The use of the rock wheel cutter for street excavation is prohibited unless specifically permitted by the OWNER Representative for specific locations. It shall only be used to remove the pavement (concrete base and asphalt wearing surface), and only after potholing has been done to determine the pavement thickness. It shall not be used on concrete streets; it shall not be used as a trenching device and shall not be used within 10 feet of a signalized intersection.
- D. All areas of pavement to be cut shall be in neat and straight lines and over cutting of lateral trenches shall not be allowed. Dust control shall be provided by using non-potable water with the rock cutting wheel. Protection from flying rocks, debris, etc. shall be provided.
- E. Specified noise limitations shall be observed at all times.
- F. Where the existing finished pavement surface is concrete, including concrete parking strip, concrete gutter and concrete sidewalk, cuts therein between pavements to be removed and those to remain in place shall be made by an approved pavement cutting saw before any pavement is jack hammered or broken, and in sidewalk and traffic island pavement. Similarly, concrete saw cuts shall be made for the full length of the juncture of the portion of existing concrete structure or footing to remain with that to be removed.
- G. Saw cuts shall be 2 inches deep, neat, regular and vertical. The CONTRACTOR shall exercise extreme care not to damage the cut edges of the surface. Damaged edges shall be re cut to acceptable alignment and vertical surface.
- H. Where the edge of excavation closest to the curb in concrete parking strip or pavement is less than 4 feet from the curb, the pavement in the area of the cut shall be removed to the curb; if the parking strip in this case is monolithic with curb; removal shall be to within 6 inches of the curb.
- I. When an edge of excavation is less than 4 feet from a construction joint in parking strip or pavement, that portion thereof between the construction joint and the excavation shall be removed.
- J. Cuts to the curb in concrete pavement not monolithic with adjacent curb shall be saw cut to as close to the curb as possible and extended neatly and regularly thereto by means other than saw cutting.

TECHNICAL SPECIFICATIONS
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02200: EARTHWORK

- K. Saw cuts to the curb in monolithic curb and parking strip shall be terminated as close to the curb as possible and in the case of trench, with a saw cut parallel thereto and the work completed by tunneling. If the cut is not for trench, extension thereof shall be as hereinbefore specified for pavement not monolithic with curb.

3.04 PAVEMENT EXCAVATION

- A. The CONTRACTOR shall excavate, remove and dispose of existing concrete curb, sidewalk, pavement and base, stone curb, asphalt concrete base and wearing surface, including the latter at conform points, cement treated rock base and plain and reinforced concrete and masonry, walls, foundations, coping, sections of manholes, catch basins and other structures, all where, as, and from within the limits shown or indicated on the plans for pavement excavation, and elsewhere where directed; shall construct compacted embankment in the areas from which, as necessary to obtain the required sub grade, the hereinafter specified materials have been removed; and shall do all other necessary or required Incidental Work.
- B. Materials excavated beyond the shown or specified limits, and over break, shall be satisfactorily replaced by the CONTRACTOR, at no additional cost to the OWNER.
- C. Pavement excavation not within the limits shown or specified therefore, necessitated by other work under the Contract shall be done as Incidental Work.
- D. Existing concrete, masonry and pavement necessary to be removed to obtain the required sub grade shall be excavated to 3 feet below such sub grade and the resulting voids created below sub grade shall be backfilled. In areas where no improvement is to be constructed, such concrete, masonry and pavement shall be excavated to a depth of one foot, measured normal to the slope, beneath the face of the slope.
- E. Abandoned pits, vaults and basements under pavement or sidewalk areas, to the extent that the walls and slabs thereof are to remain in place, after having been broken or penetrated as required to allow normal water filtration and drainage, shall be backfilled with sand compacted to maximum density.
- F. Where existing pavement surface is asphalt concrete, cuts therein, as for trenches, etc., shall be made vertical and to neat regular lines.

3.05 TRENCH EXCAVATION

- A. The CONTRACTOR shall do all trenching and excavating, as to the depths necessary, or required, for the proper construction of the work and installation of equipment.
- B. Excavate every type of material encountered within the limits of the work to the lines, grades and elevations indicated on the drawings and specified herein, except materials indicated on the drawings or directed by the OWNER Representative to remain.

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C. Unauthorized Excavation

1. Unauthorized excavation shall be excavation below indicated sub grade elevations or beyond indicated dimensions without specific instruction from the OWNER Representative.
2. Under footings, foundations or retaining walls. Fill unauthorized excavation by lowering the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.
3. Lean concrete fill may be used to bring bottom elevations to proper position, subject to the OWNER Representative's approval.
4. Elsewhere, backfill and compact unauthorized excavation as specified for authorized excavations, unless otherwise directed by the OWNER Representative.

D. Tunneling or jacking shall not be used unless specified, or approved in writing by the OWNER Representative, except that the CONTRACTOR may tunnel under concrete curb and combined concrete curb and gutter. If it required, or if the CONTRACTOR elects to remove a portion of the curb or of combined curb and gutter, he shall remove an entire section between construction joints.

E. The CONTRACTOR shall prepare trench sub grade for sewers and pipes not less than 30 linear feet in advance of such sewer and other pipe construction.

F. The CONTRACTOR shall not have more than 500 linear feet of trench, other than side sewer or culvert trench, open at any one time, subject however, to possible further limitations because of traffic routing restrictions. Such maximum footage of open trench shall include backfilled but unpaved trench, partially or completely excavated trench, and area from which pavement has been removed for anticipated trench excavation.

3.06 REMOVAL OF SUBSURFACE OBSTACLES

A. Subsurface obstacles are defined as foreign, man-made, or man-deposited materials and objects required to be removed in order to construct the contracted for facilities, and are included in one or more of the following categories:

1. Building and other debris, and rubble, used as fill material.
2. Boulders obviously not native material.
3. Abandoned sewers and sewer structures not shown on the plans or specified to be removed.
4. Iron and steel, including rails and auto bodies.

TECHNICAL SPECIFICATIONS
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- 5. Wood, steel or concrete, including:
 - a. Structures.
 - b. Walls, foundations and slabs.
 - c. Abandoned utility facilities, not shown on the plans or specified to be removed.
- 6. Pavement materials.
- 7. Piles, separate from attached material, (not subject to the hereinafter specified initial one cubic yard exclusion).
- B. Subsurface obstacles, regardless of size, shape or type of material, encountered within the limits of the excavation necessary for the work, shall be removed by the CONTRACTOR to the extent required and the resulting void backfilled.
- C. Subsurface obstacles shall be removed to not less than 3 feet below sub grade for street pavement, curb and sidewalk.
- D. Where the surface serves as sub grade for footings or foundations, the voids left by the removal of subsurface obstacles shall be backfilled with Class 4-2000-1-1/2 concrete.

3.07 EXCAVATION OF UNSOUND SUBGRADE MATERIAL

- A. The CONTRACTOR, where and as shown on the plans, and where and to the extent directed, shall excavate, as common excavation, all existing topsoil, loam, wet clay, and any other materials determined by the OWNER Representative to be unsound and inferior, encountered at any required sub grade. In place of the unsound materials, he shall construct satisfactorily compacted backfill. This provision shall apply to sub grade for embankment as well as to sub grade for any other construction.
- B. The excavation and disposal of unsound sub grade materials to a depth of 12 inches below the existing or required sub grade, whichever is lower, shall be done where required and directed by the OWNER Representative.

3.08 TRENCH SUPPORT WORK

- A. Shoring of excavation during construction shall include adequate sheeting shoring and bracing etc. or equivalent method, for the protection of life and limb and conforming to applicable safety orders of OSHA and the State of California Division of Industrial Safety.
- B. Section 6705 and 6707 of the California Labor Code shall apply to any excavation 5 feet or more in depth.

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3.09 TRENCH BACKFILL

- A. The CONTRACTOR shall do all backfilling and restoring of pavement necessary, or required, to satisfactorily complete the work and he shall backfill all excavations to the elevations of the required sub grade or adjacent ground, as the case may be.
- B. Backfilling shall not commence until after sewers, culverts, drains, sewerage and drainage structures, pipe, conduit and other equipment and appurtenances placed in trench or similar excavations have been properly constructed, or installed as applicable, inspected and if required, tested.
- C. Backfill shall be placed in a manner not to disturb, damage, nor subject such facilities to unbalanced loads or forces.
- D. Backfilling over and against sewerage and drainage facilities shall not commence until concrete has attained a compressive strength of at least 2,500 pounds per square inch based on field cured cylinders, nor until all mortar joints are set sufficiently to prevent damage.
- E. All pipe sewers and all cast or ductile iron pipe culverts, shall be constructed on a prepared or natural sand bed the width of which shall be at least the full width of the pipe and not less than 4 inches thick below the line of the bells of the pipe after installation; however, a sand bed will not be required for pipe sewers on concrete foundations, in encasements, or on crushed rock bedding.
- F. Sub grade surfaces on which pile-supported concrete is placed shall be adequately prepared to assure proper support for the placed concrete until such concrete has sufficient strength to span and be supported solely by the piles.
- G. Crushed rock shall be furnished and placed where necessary to maintain an appropriately dry trench.
- H. Backfill around all culverts and drainage structures and all cast or ductile iron pipe, from the bottom of the trench to a height 6 inches above the top of such facilities for the full width of the trench shall be sand only. Backfill around manholes and catch basins shall be sand to a level 6 inches above the supporting structure or adjacent sewer or culvert.
- I. Each layer of backfill shall be compacted both during placement and following the withdrawal of sheet piling and lagging to the top of the layer being compacted. Withdrawal of sheet piles or other trench support systems shall be done such that voids are not created from loose material under the adjacent pavement entering the trench. After the placing of backfill has been started, the CONTRACTOR shall proceed as soon as practicable with densification.

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- J. All backfill shall be placed in horizontal layers not more than 8 inches thick before compaction and each layer shall be satisfactorily compacted by mechanical means. Flooding or jetting will not be allowed.

3.10 COMPACTION

- A. The CONTRACTOR shall do the work necessary to obtain the required compaction of sub grade, embankment, and fill and backfill materials.
- B. Tests of relative compaction, including determination of optimum moisture content and maximum density of backfill, fill and embankment materials, will be made in accordance with Method "C" of ASTM "Standard Methods of Test for Moisture-Density Relations of Soils, Using 10-pound Rammer and 18-inch Drop," Designation D 1557, ASTM "Standard Method of Test for Density of Soil in Place by the Sand Cone Method," Designation D 1556 and Methods "A" and/or "B" of ASTM "Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)," Designation D 2922. As stated therein, the term "relative compaction," used hereinafter regarding compaction of backfill or embankment, means the percentage ratio of the field-compacted dry density to the maximum dry density obtainable by compaction at optimum moisture content.
- C. Density and compaction tests of in place compacted backfill, fill, or embankment, as the case may be and of the materials used, required by the OWNER Representative as the work progresses, will be conducted and evaluated by the OWNER at no cost to the CONTRACTOR, unless otherwise stipulated in the specifications.
- D. The CONTRACTOR shall obtain a relative compaction of not less than 95 percent throughout each layer of all backfill, fill and embankment constructed within 3 feet of pavement sub grade, or adjacent ground, as the case may be. Below the top 3 feet of backfill, fill and embankment constructed, the relative compaction shall not be less than 90 percent.
- E. Compaction of material too sandy to be satisfactorily compacted by the usual rolling and tamping shall be effected by watering to the point that the required compaction is obtained by rolling and tamping, or by the use of vibrating rollers or compactors.
- F. The CONTRACTOR shall obtain a relative compaction of not less than 95 percent for the 6-inch layer of undisturbed material underlying all areas cleared, or from which existing pavement or excavated material has been removed and which serve as sub grade for backfill, embankment, pavement sub base or base, curb, or pavement, as the case may be.
- G. 95 percent relative compaction shall be obtained in backfilling excavation in excess of that shown on the plans, including overbreak and that from which unsound sub grade materials have been removed.

TECHNICAL SPECIFICATIONS

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- H. When combined aggregate filter material is placed as a layer in backfill, fill or embankment, such material and the first 12-inch layer of backfill or embankment directly above it, shall be compacted by use of a vibratory compactor.
- I. Unless otherwise specified, all compacting equipment shall be power equipment and shall be capable of obtaining the specified compaction.
- J. If, however, compaction is not sufficiently uniform, or tests show it to be inadequate, the OWNER Representative may require placement in thinner layers or the use of other or additional equipment. Selection of such equipment shall be by the CONTRACTOR, and it shall be solely his responsibility to obtain the specified compactions throughout the required volume.
- K. The use of heavy compacting equipment in areas immediately behind retaining walls will not be permitted and in general only hand-portable power tampers or vibratory compactors will be approved for such compaction.
- L. If small or hand-portable equipment is used, as for compacting narrow berm, confined areas, or behind retaining walls, the thickness of layers and other conditions shall be adjusted as required to obtain the specified compaction.

3.11 FIELD QUALITY CONTROL

- A. CONTRACTOR shall retain qualified testing laboratory and geotechnical services to determine suitability of subgrade and compaction of fill layers in meeting specification.
- B. Secure the OWNER Representative's inspection and approval of sub grades and fill layers before proceeding with construction thereon.
- C. Fill and backfill materials shall be compacted to densities specified.
- D. If based on reports from CONTRACTOR's Testing Laboratory, sub grade or fills, which have been placed, are below specified requirements, provide additional compacting and retest at no cost to the OWNER.

3.12 MAINTENANCE

- A. Protection of newly graded areas:
 - 1. Protect newly graded areas from traffic and erosion and keep free from trash and weeds.
 - 2. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.

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- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape and compact to the required density prior to further construction.

END OF SECTION

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TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02231: AGGREGATE BASE AND SUBBASE

PART 1 GENERAL

1.01 SUMMARY

- A. This specification section includes the following items of work:
1. The CONTRACTOR shall construct aggregate base or subbase, as specified, spread and compacted to the lines, grades and dimensions shown on the Plans and where directed, including preparing the subgrade and doing the required watering, shaping, smoothing and other Incidental Work.

PART 2 PRODUCTS

2.01 FILL MATERIALS BASE

- A. The aggregate shall be free from vegetable matter and other deleterious substances. Aggregate for aggregate base shall be classified Caltrans Class 2. The percentage composition by weight of aggregate base shall conform to $\frac{3}{4}$ " maximum grading when determined by Test Method No. Calif. 202.
1. Unless otherwise specified, the aggregate base size distribution shall be in accordance with the grading specified for $\frac{3}{4}$ inch maximum

AGGREGATE GRADING REQUIREMENTS

Sieve Sizes	Percentage Passing			
	1-1/2" Maximum		3/4" Maximum	
	Operating Range	Contract Compliance	Operating Range	Contract Compliance
2"	100	100	—	—
1 1/2"	90-100	87-100	—	—
1"	—	—	100	100
3/4"	50-85	45-90	90-100	87-100
No. 4	25-45	20-50	35-60	30-65
No. 30	10-25	6-29	10-30	5-35
No. 200	2-9	0-12	2-9	0-12

- B. The aggregate base shall also conform to the following quality requirements:

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QUALITY REQUIREMENTS

Test	Test Method No. California	Operating Range	Contract Compliance
Resistance (R-value)*	301	—	78 Min.
Sand Equivalent	217	25 Min.	22 Min.
Durability Index	229	—	35 Min.

* The R-value requirement will be waived provided the aggregate base conforms to the specified grading and durability and has a sand equivalent value of 35 or more.

- C. The aggregate shall not be treated with lime, cement or other chemicals before the Durability Index test is performed.
1. Material yielding a maximum dry density of less than 112 pounds per cubic foot when tested in the laboratory in accordance with ASTM “Standard Methods of Test for Moisture-Density Relations of Soils, Using 10-pound Rammer and 18-inch Drop,” Designation D 1557, shall not be used.
 2. Any rock, including red rock, meeting all the requirements of this Section will be acceptable. Such rock shall be plant processed at an approved processing plant.
- D. Contractor shall perform all tests as required by this specification.
- E. At least 10 working days prior to the use thereof, the CONTRACTOR shall submit to the OWNER Representative a 120-pound sample of aggregate, graded as intended for use and testing report for review. This requirement shall be complied with for each aggregate and grading thereof that has not been approved. The OWNER Representative may choose to perform its own test on the sample, at no cost to the CONTRACTOR, to verify and determine the acceptability of the aggregate.

2.02 FILL MATERIALS - SUBBASE

- A. The aggregate shall be free from vegetable matter and other deleterious substances. Aggregate for subbase shall be Caltrans classified Class 3 with R-value of no less than 40.
1. Unless otherwise specified, the particle size distribution shall be in accordance with the grading specified for 3-inch maximum size aggregate.

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Sieve Sizes	Percentage Passing 3" Maximum
3"	100
2-1/2"	87-100
No. 4	45-100
No. 200	0-34

2. The subbase shall have a relative compaction ratio of 95%.

PART 3 EXECUTION

3.01 SPREADING

- A. Aggregate base material shall be delivered to the roadbed as uniform mixtures and each layer shall be spread in one operation.
- B. At the time aggregate base is spread it shall have a moisture content sufficient to obtain the required compaction. Such moisture shall be uniformly distributed throughout the material. The material shall be spread upon the subgrade prepared by means of vehicles equipped with approved spreading devices at a uniform quantity per linear foot, which quantity will provide the required compacted thickness within the tolerances specified. Depositing and spreading shall commence at that part of the work farthest from the supply of base material and shall progress continuously without breaks, unless otherwise directed by the OWNER Representative.
- C. Where the required thickness is 6 inches or less, the base material may be spread and compacted in one layer. Where the required thickness is more than 6 inches, the base material shall be spread and compacted in 2 or more layers of approximately equal thickness, and the maximum compacted thickness of any one layer shall not exceed 6 inches. Each layer shall be spread and compacted in a similar manner. Base material placed in areas inaccessible to the spreading equipment, may be spread in one or more layers by any means that will make possible the specified compaction and surface. When the subgrade for aggregate base consists of cohesionless sand and written permission is granted by the OWNER Representative, the base material may be dumped in piles upon the subgrade and spread ahead from the dumped material.
- D. The base material, after spreading, shall be shaped by means of a blade grader to such thickness that after watering and compacting, the completed base will conform to the required grade and cross section within the tolerances specified. Segregation of aggregate shall be avoided and the base shall be free from pockets of coarse or fine material.

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3.02 COMPACTING

- A. Immediately following spreading, shaping and smoothing, the full width of the base material shall be watered as ordered by the OWNER Representative, and compacted by rolling with a minimum of two self-propelled reversible equipment specified as follows:
1. For initial rolling use a 3 wheel steel-tired roller, weighing not less than 12 tons distributed so that the rear wheels will apply to the surface being rolled not less than 325 pounds per linear inch of rear tire width. Rolling shall commence by covering completely the outer edge of the material. Subsequent passes shall lap at least 25 percent on previously rolled material.
 2. For subsequent rollings use a pneumatic-tired roller of the oscillating type, having a width of not less than 4 feet and equipped with tires of equal size and diameter. Wobble wheel rollers will not be permitted. The tires shall be so spaced that the entire gap between adjacent tires will be covered by the tread of the following tire. The tires shall be inflated to 90 pounds per square inch minimum.
 3. To compact all areas inaccessible to the rollers, use compressed air, or gas, powered tampers.
- B. The foregoing equipment requirements serve as a standard of adequacy.
1. Subject to the condition that the CONTRACTOR shall notify the OWNER Representative at least 10 days in advance, and shall secure approval for the use of each piece of compacting equipment other than that specified, selection thereof and obtainment of the specified compaction throughout the volume of base and the specified surface, shall be solely the responsibility of the CONTRACTOR.
 2. If compaction is not uniform or tests show it to be inadequate, or if the surface is unsatisfactory, the OWNER Representative may require the use of other or additional equipment.
 3. Should low or high spots develop during rolling operations, such spots shall be smoothed out by blading with a self-propelled and pneumatic-tired motor grader having a wheelbase not less than 15 feet long and a blade not less than 10 feet long.
- C. Aggregate base shall be watered after compaction. Water shall be applied at the rate and in the quantities proposed by the CONTRACTOR and accepted by the OWNER Representative.
1. The relative compaction of aggregate base, determined by tests of the in place, field compacted base shall be not less than 95 percent of the maximum compaction at optimum moisture content determined by ASTM Methods of Test,

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Designation D 1556 and Method C of Designation D 1557. The tests will be conducted and evaluated in the laboratory by the OWNER at no cost to the CONTRACTOR.

2. The surface of the finished aggregate base at any point shall not vary more than 0.05 foot above or below proper grade and such surface shall contain no ridges, valleys or sharp breaks.
3. Finished base that does not conform to the foregoing requirement shall be reshaped or reworked, watered and thoroughly re-compacted to conform thereto.
4. The CONTRACTOR shall not allow any completed untreated rock base to be subjected to public or construction traffic, except the latter necessary to the completion of the overlying surface course.

END OF SECTION

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TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02270: EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for erosion control and prevention of sediment discharge from the Work. The scope of work includes:
1. Identifying potential sources that may affect the quality of stormwater discharges.
 2. Identifying non-stormwater discharges.
 3. Designing, implementing and maintaining Best Management Practices (BMP) for control of erosion and sediment discharge.
- B. Related Sections:
1. Section 01150 – Water Treatment and Disposal.
 2. Section 01561 – SPP, Erosion and Sediment Control.
 3. Section 02052 – Site Preparation, Clearing, Grubbing, and Stripping.
 4. Section 02111 – Disposal of Excavated Materials.
 5. Section 02160 – Excavation Support Systems.
 6. Section 02200 – Earthwork.
 7. Section 02125 – Trench and Structure Excavation and Backfill.
 8. Section 02930 – Seeding.
- C. Definitions:
1. Stormwater Pollution Prevention Plan (SWPPP): A plan prepared and implemented by the CONTRACTOR prior to any clearing, grading, or excavation subject to the General Permit issued by the California State Water Resources Control Board, as specified in Section 01062 and applicable permits.
 2. BMP: Measures recommended by the California Stormwater Quality Association (CASQA) for erosion control, temporary sediment control, wind erosion control, and tracking of discharge.

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D. Performance Requirements:

1. The CONTRACTOR shall provide erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties according to requirements of authorities having jurisdiction.
2. The CONTRACTOR shall inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
3. The CONTRACTOR shall prevent the discharge, or creation of a potential discharge, of any material to storm drains or waters of the State of California.

1.02 REFERENCE

- A. CASQA, Storm water Best Management Practice Handbook, Construction.

1.03 SUBMITTALS

A. Working Drawings and Methods Statements:

1. Submit a list all of the construction activities and material that have the potential to contribute sediment to stormwater discharge. Describe the anticipated soil and stockpile materials at the construction site.
2. Submit a list all of the construction methods that have the potential to track sediment off-site onto haul routes and access roads. Identify BMP for control and tracking of sediment off-site during construction. Provide BMP selection details, advantages, and disadvantages.
3. Submit a vicinity map that shows outline of construction site perimeters, staging areas, access roads, major roadways, geographic features and landmarks, municipal storm sewer systems, bodies of water within and adjacent to the project vicinity, wetlands, known wells, off-site draining into the construction site, and general topography. Identify anticipated discharge locations for the work. Show the area to be disturbed by construction activities, and location of the stockpiles. Indicate locations of erosion control measures such as straw rolls, silt fences, concrete swales, detention basins, infiltration basins, sediment basins, slope protection, erosion control, landscaping, ditch lining, and energy dissipaters. Identify wheel wash, and garbage storage and pickup sites.
4. Submit working drawings that show installation details, dimensions, and materials for implementing each BMP identified on the vicinity map. Identify quantities of materials for implementing BMP to be stored on-site for ensuring adequate supply for the work. Show storage locations on the vicinity map.

TECHNICAL SPECIFICATIONS
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5. Submit shop drawings and material data sheets for manufactured BMP measures.
 6. Identify sampling and analyses strategies to detect discharge of sediment and pollutants. Provide sampling schedules for discharges that have been identified as potentially contaminated.
 7. Submit detailed methods for monitoring the weather, alerting work crews, and implementing additional BMP for rainfall and/or high wind. Include provisions for weekends and holidays.
 8. Provide time schedules to construct, implement, and maintain BMP for the work for the duration of construction.
- B. Provide inspection schedules to ensure that each BMP measures is in place, functioning properly, and adequate for the work. Include inspection of storage and handling area for construction materials that have the potential to contribute sediment or pollutants.

1.04 QUALITY ASSURANCE

- A. Preconstruction Meeting: CONTRACTOR shall participate in an on-site meeting with the OWNER Representative not less than 2 weeks prior to implementing erosion and sediment control measures. Items to be discussed include:
1. Erosion and sediment methods to be implemented, and schedule for implementation.
 2. Quality Control procedures, including inspection and maintenance protocol.
 3. Reporting requirements.
- B. Comply with the requirements of all applicable permits and environmental requirements specified in Section 01062 – Environmental Requirements.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Store adequate quantities of materials for implementation of each BMP as shown on the vicinity map.
- B. Packaged Material:
1. Deliver packaged materials showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

TECHNICAL SPECIFICATIONS
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02270: EROSION AND SEDIMENT CONTROL

1.06 REJECTION AND SUBSTITUTION

- A. All materials not conforming to the requirements specified herein shall be considered defective and such materials, whether in place or not, shall be rejected and be immediately removed from the site and replaced with acceptable materials.

1.07 SITE OBSERVATION VISITS

- A. Schedule site observation visits with the OWNER Representative prior to commencement of work to verify existing conditions and environmentally sensitive areas.
- B. The CONTRACTOR or his authorized representative shall be on site at the time of each site observation visit.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Straw rolls: manufactured from certified weed free straw that is wrapped in tubular black plastic netting, approximately 8 inches in diameter by 25-30 feet long.
- B. Silt fences.
 - 1. Prefabricated silt fence with posts, with the following properties:
 - a. Materials:
 - 1) Fabric: Type 100X - Woven Polypropylene with minimum 100 lbs/in² grab tensile strength
 - 2) Size: Width: 4 feet minimum.
 - 3) Description: Pre-fabricated and pre-assembled silt fence with 1-1/2 inch nominal square hardwood posts. Top edge shall be reinforced with high strength industrial tensioning belt.

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4) Properties:

Property	Test Method	Value
Grab Tensile Strength	ASTM D4632	120 lbs
Mullin Burst Strength	ASTM D3786	10%
Permittivity	ASTM D4491	0.2 sec-1
Water Flow Rate	ASTM D4491	20 gal/min/ft2
UV Stability	ASTM D4355	70%
Grab Tensile Elongation	ASTM D4595	10%

- C. Stockpile covers: polyethylene tarps.
- D. Catch basin filter fabric.
- E. Geotextile filter fabric: Type 100X - Woven Polypropylene with minimum 100 lbs/in2 grab tensile strength.
- F. Oil absorbent sock filters: 3M High-Capacity Petroleum Sorbent pads, rolls and rugs, or equal.
- G. Hydroseed and Mulch: Per Section 02930 “-Seeding”.
- H. Erosion Control Fiber Matrix: Use certified, weed free, natural/biodegradable imported erosion control materials.
- I. Rip Rap: Sound, angular rock fragments free of sand, dust, organic material, excessive cracks, mineral lenses or other impurities. Twenty percent by weight shall be at least 4 inches in size.

PART 3 EXECUTION

3.01 GENERAL

- A. Implement BMP measures prior to clearing or grading the site.
- B. Protect stockpiled areas prior to forecast storm events using polyethylene covers and/or other appropriate cover systems.
- C. Protect disturbed areas prior to forecast storm events using geotextile blankets, straw rolls, and/or other appropriate blanket systems.

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02270: EROSION AND SEDIMENT CONTROL

- D. Protect disturbed areas from overland sheet flow from adjacent areas prior to forecasted storm events using curbs, swales, dikes, berms, inlets, drains, and/or other appropriate stormwater diversion systems.
- E. Trap any loose sediment from disturbed areas before discharging any stormwater using silt fences, filter fabric, straw rolls, and/or other appropriate sediment trapping systems.
- F. Dissipate the velocity of the discharged stormwater to prevent erosion using rock, grouted rip rap, rubble, and/or other appropriate stormwater velocity dissipation systems.
- G. Confine construction materials that have the potential to contribute pollutants to storage and handling areas shown on the vicinity map. Provide adequate cover from the rain and wind to these storage areas using polyethylene covers and/or other appropriate cover systems. Contain areas where liquids are stored and handled using geomembranes, sandbags, berms, dikes, and/or other liquid containment systems.
- H. Confine garbage to the storage and handling areas shown on the vicinity map. Provide adequate shelter from the rain and wind using containers.
- I. Protect municipal storm sewer systems shown on the vicinity map from discharge of pollutants and sediment from the construction site using sandbags dams fitted with filter fabric, oil absorbent sock filters, and/or other appropriate oil and sediment filtering systems.
- J. Stabilize inactive disturbed areas as soon as feasible after the cessation of construction activities.
- K. Preserve existing vegetation to the extent feasible to minimize surface area of exposed soil.
- L. Preserve condition of haul routes and access roads from tracked sediment using vehicle tire washers, street sweepers, and/or other appropriate sediment tracking control systems.
- M. Immediately notify the OWNER Representative of any situation requiring additional erosion control devices to prevent soil erosion or sedimentation into any area beyond the project limits.

3.02 MAINTENANCE AND REPAIR/RESTORATION

- A. Immediately repair, restore, and/or replace any low performing BMP identified in the high wind and rain storm reports. Immediately implement additional BMP in construction areas with insufficient BMP as identified in the high wind and rain storm reports. Repair, restore, and/or replace any deficiencies noted in scheduled inspections prior to forecast storm events.

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- B. Inspect straw rolls after significant storms. Ensure straw rolls are in contact with the soil. Replace straw rolls after 1 year or sooner if required.
- C. Seed and protect any areas that remain unworked for more than 30 days or as specified in Section 01062, Environmental Requirements or in applicable permits.
- D. At no time shall the CONTRACTOR apply fertilizers, pesticides, or herbicides other than those specified to any of the planted or hydro seeded areas unless directed by the OWNER Representative.
- E. Operate and maintain storm and surface water facilities as follows:
 - 1. Remove sediment from behind silt fences and straw rolls to prevent overtopping.
 - 2. Prevent sediments from being flushed to the downstream system during cleaning.
 - 3. Sediment, trash, and debris shall be removed from catch basin grate surfaces when blocking more than 20 percent of the grate surface.
 - 4. Sediment, trash, and debris shall be removed from catch basin interiors when debris exceeds 1/3 of the depth from bottom to pipe invert.
 - 5. Sediment, trash, and debris shall be removed from rock dams, ponds, and traps when more than 1 foot of sediment has accumulated.
- F. Dust Control:
 - 1. During dry weather conditions, take preventative measures to minimize the wind transport of soil. Use water sprinkling, temporary enclosures, and other methods to minimize dust and dirt migration.

3.03 MONITORING AND REPORTING

- A. Monitor each BMP measure, storage and handling area for construction materials that have the potential to contribute pollutants, and areas for garbage storage and pickup during storm events involving high wind and rain to ensure that they function properly and are adequate for the work. Provide performance details for each BMP in the required reports as specified in Section 01062 and in the SWPPP.
- B. Monitor construction site areas for adequacy of BMP implementation. Provide details for each area monitored in the high wind and rain storm report.
- C. Monitor each municipal storm sewer system, known well, wetland, and body of water shown on the vicinity map for adequacy of BMP implementation. Provide details in the high wind and rain storm report.

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
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3.04 CLEAN-UP AND DISPOSAL

- A. All work areas shall be kept clean, neat and orderly at all times.
- B. Remove all stockpiles from the site upon completion of the work.
- C. Remove all temporary erosion and sediment control devices from the site upon completion of the work.
- D. Remove all mulch and straw from paved areas.
- E. Remove any detrimental plants growing in the work area not specified in the seed mix.
- F. Upon completion of work, remove rubbish, trash, debris resulting from operation. Remove unused equipment and implements of service; leave worksite in neat, acceptable condition as to meet approval of the OWNER Representative.
- G. See Section 02930 – Seeding for hydroseeding and mulching requirements.

END OF SECTION

TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02460: ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. The CONTRACTOR shall provide asphalt concrete pavement structural section as indicated on the Drawings, above the pavement subgrade in accordance with the Contract Documents.
- B. Reworking of pavement subgrade, when directed by the Engineer.

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals

1.3 REFERENCES

- A. Standards listed below apply to this section. Where the applicable year of adoption or revision is not listed below, the latest edition applies.
- B. State of California, Department of Transportation's "Standard Specifications" May 2006 (CSS).
- C. State of California Department of Transportation, "Manual of Test".
 - 1. Test 304 – Method of Preparation of Bituminous Mixtures for Testing.
 - 2. Test 367 – Method for Recommending Optimum Bitumen Content.
- D. American Society for Testing and Materials (ASTM):
 - 1. D 244 – Emulsified Asphalts.
 - 2. D 402 – Distillation of Cut-Back Asphaltic (Bituminous) Products.
 - 3. D 1188 – Bulk Specific Gravity of and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.
 - 4. D 2950 – Density of Bituminous Concrete in Place by Nuclear Method.

1.4 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Certificates of compliance with specified standards for natural materials and manufactured items.

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2. For manufactured items, the manufacturer's technical data of the product of physical properties.
3. Asphalt concrete mix design including California Test 367 results indicating optimum bitumen content, void content and maximum density. (Do not schedule paving Work until submittal has been reviewed).
4. Samples as requested by Engineer.

1.5 DEFINITIONS

- A. Pavement Subgrade: The material in excavation or embankments underlying the lowest layer of subbase, base, pavement surfacing or other specified layer which is to be placed. The surface upon which embankment is to be placed is sometimes called "subgrade" in other sections, not to be confused with pavement subgrade.
- B. Structural Section: The planned traffic support layers of specified materials, normally consisting of base and pavement placed over the pavement subgrade. The structural section is also commonly called the pavement structural section.
- C. Surface Course: The top layer of AC pavement. The top layer of AC pavement is sometimes called the "wearing course".

1.6 QUALITY CONTROL

- A. Comply with all requirements of the Air Pollution Control District, including, but not limited to:
 1. Use no rapid-curing liquid asphalt or rapid setting emulsified asphalt on this project.
 2. Use no medium-curing liquid asphalt on this project unless specifically authorized by the local District. Present proof of authorization.
 3. Use no slow-curing liquid asphalt on this project which contains more than 0.5% by volume of petroleum solvents which evaporate at less than 260 degrees C (500 degrees F) as determined by ASTM D402.
 4. Use no emulsified asphalt on this project containing petroleum solvents in excess of 3% by volume which evaporate at less than 260 degrees C (500 degrees F) as determined by ASTM D244.
 5. Medium-curing liquid asphalt may be used when the National Weather Service forecasts that atmospheric temperature for the 24-hour period following application will not exceed 50 degrees F. Maintain records

TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
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proving occurrence of this condition, and verify that local jurisdiction approves this exception.

6. Certain jurisdictions may allow use of the above prohibited products under certain conditions. Prior to use, submit proof of such allowance.

1.7 SITE CONDITIONS

- A. Do not place asphalt concrete unless atmospheric temperature is at least 50 degrees Fahrenheit and rising.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Materials specified below, to be included in the work, are detailed on the Drawings or are indicated in these specifications.
- B. Aggregates:
 1. Asphalt Concrete (AC): Type A, 1/2-inch maximum size, medium grading, CSS Section 39.
 2. Aggregate Base (AB): Class 2, 3/4-inch size, CSS Section 26. Virgin rock only.

Sieve Sizes	Percentage Passing 3/4" Maximum	
	Operating Range	Contract Compliance
2"	—	—
1 1/2"	—	—
1"	100	100
3/4"	90-100	87-100
No. 4	35-60	30-65
No. 30	10-30	5-35
No. 200	2-9	0-12

TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02460: ASPHALT CONCRETE PAVING

QUALITY REQUIREMENTS

Test	Operating Range	Contract Compliance
Resistance (R-value)	—	78 Min.
Sand Equivalent	25 Min.	22 Min.
Durability Index	—	35 Min.

3. Asphalt Binder: Steam-refined paving asphalt, CSS Section 92 Grade AR-4000.
4. Prime Coat: Liquid asphalt, Grade SC-70, CSS Section 93.
5. Paint Binder or Tack Coat: Type SS1h or SS1 asphaltic emulsion, CSS Section 94, subject to limitations of paragraph 1.06.

C. Prime Coat:

1. The rolled surface of the base material shall be primed with liquid asphalt prime coat, Grade SC-70, applied at a uniform rate of 0.25 gallons per square yard. Application shall conform to the requirements of Section 39, Caltrans Standard Specifications, State of California, Division of Highway.

D. Tack Coat or Binder:

1. A tack coat or paint binder shall be SS-1 asphalt emulsion in conformance with Section 39 of Caltrans Standard Specifications.

E. Fine Asphalt Concrete Patch Paving:

1. Fine asphalt concrete for patch paving shall be Type B, 3/8" maximum size. The asphalt binder shall be paving asphalt Grade AR-4000 in conformance with Section 92 of the Caltrans Standard Specification.

2.2 MIXES

A. Asphalt Concrete:

1. CSS Section 39, Type A asphalt concrete
2. CSS Section 39, Type B asphalt concrete.

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- 3. Contractor shall determine the optimum amount of asphalt binder in accordance with the mix design prepared in accordance with California Test 367.
- B. Do not change sources from those used in mix designs without prior written approval by Engineer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive asphalt concrete paving and verify the following:
 - 1. That abutting improvements have been set at proper elevations.
 - 2. That gradients and elevations of pavement subgrade are correct.
 - 3. That the condition of the pavement subgrade has been approved by the Engineer.
 - 4. Absence of wet receiving surfaces and other conditions that adversely affect execution of this Work.
- B. Do not start Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. If after initial preparation, the pavement subgrade is allowed to stand or is used by construction equipment, or is otherwise damaged, repair in accordance with CSS 26-1.03 at no additional cost to the OWNER.
- B. Protect existing Work from damage. Protect concrete Work from staining with asphalt materials. Shield from overspray.
- C. Existing Asphalt Paving to receive the new wearing course of asphalt paving shall be thoroughly cleaned of all dirt, water and oil to the satisfaction of the Engineer. Cracks 1/8 inch wide or greater shall be cleaned and filled with bituminous material or by a method approved by the Engineer. Large cracks, faults or potholes shall be repaired as specified above or shown on the plans.

3.3 AGGREGATE BASE

- A. Spread and compact in accordance with CSS Section 26, to thickness, lines and grades noted, with a maximum deviation of plus 0.0 and minus 0.05 feet from plan grade. Refer to Section 02200 for compaction test methods.

TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02460: ASPHALT CONCRETE PAVING

- B. Do not incorporate into the completed section any base material used for construction traffic.
- C. Water the compacted base in accordance with CSS Section 17.

3.4 BASE PRIME COAT

- A. After base has been approved by Engineer, place asphalt concrete paving on new aggregate base while base is still tight and damp, without prime coat.
- B. If base has been allowed to dry before placing asphalt concrete, apply prime coat in amount of 0.25 gallons per square yard of surface area to base in accordance with CSS Section 39, at no additional cost to the CITY. Allow at least 24 hours for prime coat to set; remove any puddles; and spread sand over damp spots before placing asphalt concrete.

3.5 PAINT BINDER

- A. Prior to placing asphalt concrete surfacing, apply a coat of asphaltic emulsion paint binder to all vertical contact surfaces in accordance with CSS Section 39 at an approximate rate of 0.10 gallons per square yard of surface covered.

3.6 ASPHALT CONCRETE

- A. After prime coats have been approved by Engineer, spread and compact asphalt concrete paving to compacted thickness shown on Drawings in accordance with CSS Section 39, including all requirements for mix temperatures, and thickness of layers.
- B. Compact to a density at least 95 percent of that obtained with the California Kneading Compactor, California Test 304.
- C. Provide surface which is dense, smooth, tight, free from pores, loose material or segregation, within tolerances specified, and free of bird baths.
- D. Finished surface shall be to more than 0.02 feet below the bottom of a 12-foot straightedge laid on the surface in any direction.
- E. Place asphalt concrete so that finished surface will be 0-inch to 1/8-inch, above edge of adjacent concrete gutters designed to collect water runoff, or 0-inch to 1/8-inch below edge of adjacent concrete designed to deposit runoff onto paved surface.

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SECTION 02460: ASPHALT CONCRETE PAVING

- F. Carefully roll with proper heat at edges alongside curbs, walks and driveways to match balance of rolled Work. Hand tamping will be permitted only where inaccessible to heavy equipment.
- G. Finish rolling before paving temperature has dropped to 150 degrees F.

3.7 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by CONTRACTOR under provisions of Section 01400.
- B. Contractor shall retain service of qualified Testing Laboratory to:
 - 1. Inspect and test base and paving, including but not limited to:
 - a. Compaction and thickness of base according to CSS Section 26.
 - b. Compaction of asphalt concrete tested with nuclear gauge in accordance with ASTM D2950. Nuclear density gauge determination will be correlated with density of compacted specimens determined according to ASTM D1188.
 - 2. Check thickness of surfacing by coring.
- C. Contractor shall:
 - 1. Measure and record temperature of asphalt concrete just prior to paving.
 - 2. Flood all paved surfaces with water to verify positive drainage.
 - 3. Repair areas cored for testing.
 - 4. As directed by Engineer, remove and replace or repair all paving not meeting Contract Document requirements.
- D. After the completion of the inspections and tests performed, the results shall be delivered to Engineer within 5 working days.

3.8 PROTECTION

- A. Permit no surface traffic until surface has cooled sufficiently to resist damage.

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3.9 STRUCTURES

- A. Adjust existing and new manholes, meter boxes, catch basins, cleanouts, etc. to match the new grade.

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02521: CONCRETE CURBS, GUTTERS AND SIDEWALKS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install concrete ribbon curbs, gutters and sidewalks.
- B. Related Sections:
 - 1. Section 02220, Excavation and Backfill.
 - 2. Section 02230, Crushed Stone and Gravel.
 - 3. Section 03300, Cast-In-Place Concrete.

1.02 QUALITY ASSURANCE

- A. Standard Specifications and Details:
 - 1. CONTRACTOR shall conform to all applicable requirements of local, city, county, and state standard specifications.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. ASTM D 1190, Specification for Concrete Joint Sealer, Hot Poured Elastic type.
- C. Installers Qualifications: Minimum of two (2) years installing curbs, gutters and sidewalks.

1.03 SUBMITTAL

- A. Samples: Submit for approval the following:
 - 1. Samples, manufacturer's product data, test reports and material certifications as required in referenced Sections for concrete Work.
- B. Certificates: Manufacturer's certification that sealer meets Specification requirements.

TECHNICAL SPECIFICATIONS
DIVISION 2: SITE WORK
02521: CONCRETE CURBS, GUTTERS AND SIDEWALKS

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars and Welded Wire Fabric: Deformed steel bars and smooth wire fabric shall comply with requirements of Section 03200, Concrete Reinforcement.
 - 1. Furnish wire fabric in flat sheets, not rolls.
- B. Concrete Materials: Comply with requirements of applicable Division 3 - Concrete Work Sections for formwork, concrete materials, admixtures, bonding materials, curing materials and others as required.
- C. Expansion Joint Material: Comply with requirements of Section 03251, Concrete Joints, for preformed expansion joint fillers.

2.02 CONCRETE MIX, DESIGN AND TESTING

- A. Comply with requirements of applicable provisions of Section 03300, Cast-In-Place Concrete, for concrete mix design, sampling and testing, and quality control.
- B. Design the mix to produce concrete having properties of compressive strength, slump range and air content as specified in Section 03300, Cast-In-Place Concrete.

PART 3 EXECUTION

3.01 INSPECTION

- A. CONTRACTOR and his installer shall examine the subgrade and the conditions under which Work is to be performed and notify OWNER, in writing, of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to OWNER.
- B. Verify that earthwork is completed to correct line and grade.
- C. Check that subgrade is smooth, compacted, and free of frost and excessive moisture.
- D. Do not commence Work until conditions are satisfactory, and approved by OWNER.

3.02 POROUS FILL

- A. Porous Fill Under Sidewalk: Furnish fill consisting of crushed stone, gravel, sand, or other approved material. Properly wet and compact fill to the thickness shown.

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3.03 FORM CONSTRUCTION

- A. Set forms to line and grade. Install forms over full length of curb, gutter and sidewalk.

3.04 REINFORCEMENT

- A. Locate, place, and support reinforcement as specified in Section 03200, Concrete Reinforcement, unless otherwise shown. Size of reinforcement shall be as shown on the Drawings.

3.05 CONCRETE PLACEMENT

- A. General: Comply with the requirements of Section 03300, Cast-In-Place Concrete, for mixing and placing concrete, and as specified.
- B. Place concrete for curbs and gutters using methods which prevent segregation of the mix. Consolidate concrete along the face of forms with an internal vibrator.
- C. For sidewalks, place concrete in one course, monolithic construction, for the full width and depth of walks.
- D. Machine Formed: Automatic curb, gutter and sidewalk machine may be used for forming, at CONTRACTOR'S option. Concrete shall have properties as specified in Section 03300, Cast-In-Place Concrete, except that maximum slump shall be 2-1/2 inches and air content shall be 2 percent of design. Machine forming shall produce curbs, gutters and sidewalks to the required cross-section, lines, grades, finish, and jointing, as specified for conventionally formed concrete. If results do not conform to requirements remove and replace, at no additional cost to the OWNER.

3.06 JOINTS

- A. General: Construct expansion; contraction, and construction joints with faces perpendicular to surface of the curb, gutter and sidewalk. Construct transverse joints at right angles to the Work centerline and as shown.
- B. Contraction Joints: Provide these joints at ten feet on centers for curbs and gutters and five feet on centers for sidewalks.
- C. Construction Joints: Place joints at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.
- D. Expansion Joints: Provide 1/2-inch expansion joint filler where Work abuts structures; at returns; and at thirty-foot spacing for straight runs. If curb, gutter,

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and sidewalk are not placed monolithically, provide expansion joints where each abuts the other.

1. Place top of expansion joint material not less than 1/2-inch or more than 1-inch below concrete surface. Apply joint sealer on top of expansion joint material flush with concrete surface, and in accordance with manufacturer's instructions.

3.07 CONCRETE FINISHING

- A. Smooth the exposed surface by screeding and floating.
- B. Work edges of gutter and sidewalks, back top edge of curb, and transverse joints; and round to 1/4-inch radius.
- C. Complete surface finishing by drawing a fine-hair broom across surface, perpendicular to line of traffic.

3.08 CURING

- A. Protect and cure finished concrete curbs, gutters and sidewalks, complying with applicable requirements of Section 03300, Cast-In-Place Concrete.

END OF SECTION

**TECHNICAL SPECIFICATION
DIVISION 2: SITE WORK
SECTION 02890: TRAFFIC SIGNS AND MARKERS**

PART 1 GENERAL

1.01 SUMMARY

- A. This specification section includes the following items of work:
1. Furnishing and installing markers, marker posts and signs.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. When a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of Notice Inviting Bids shall be used.
- B. American Society for Testing and Materials (ASTM):
1. ASTM C150: Specifications for Portland Cement.

1.03 CONTRACTOR SUBMITTALS

- A. Submit in accordance with Section 01300, "Submittals" at least 60 days in advance of the relevant work commencing or materials being ordered, unless noted otherwise.
- B. Submit shop drawings of markers, signs, posts, and connecting hardware.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Posts for the metal markers and signs shall be of standard galvanized steel pipe in the diameter shown on the Drawings.
- B. Traffic Loops: Follow the requirements of each local community.
- C. Signs and markers shall be manufactured of porcelain enamel or baked enamel on 18 gauge steel. The signs and markers shall have black letters on white background. The dimensions shall be as shown on the Drawings.
1. Markers will display the pipeline station of the gate or appurtenance.

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PART 3 EXECUTION

3.01 GENERAL

- A. Provide metal markers showing pipeline station at the following locations on the appurtenance:
 - 1. Main Line Valves.
 - 2. New and any currently unmarked Air Release/Air Vacuum Valves vaults.
 - 3. New and any currently unmarked Water Blow-Offs vaults.
 - 4. New and any currently unmarked Vehicular and Personnel Gates
- B. Signs (metal markers on posts) will be required at the following locations:
 - 1. Where access road crosses pipeline.
 - 2. Both sides of drainage crossings.
- C. The Contractor shall install markers and signs at pipeline appurtenances and road crossings and along the alignment as indicated herein and on the Drawings. The Contractor shall furnish bolts and hardware as required to install the signs on the posts.
- D. The exact location of the markers and signs will be determined by the OWNER Representative.

END OF SECTION

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PART 1 GENERAL

1.01 SCOPE

- A. The CONTRACTOR shall apply seeding, complete and in place, in accordance with the Contract Documents.
- B. Seeding materials, installation, and maintenance methods shall be compatible with Central California coastal conditions and fully comply with applicable permit requirements, if any.
- C. All disturbed, non-paved areas of the project shall be re-seeded according to this specification. The seed mix shall be appropriate for the existing environmental conditions within each distinct portion of the project area. Work shall include, but is not limited to, all labor, tools, materials, equipment, and incidentals required to complete activities shown on the Drawings, described in these specifications, and as directed by the Engineer. No deviations from the plans or these specifications shall be allowed without written approval from the Engineer. The Contractor shall plan for appropriate crew sizes supplied with necessary equipment to complete the required work for seeding, as described in this Section.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
 - 1. Cal-IPC. 2006. California Invasive Plant Inventory. Cal –IPC Publication, Berkeley, CA.
 - 2. AGRICULTURAL MARKETING SERVICE (AMS):AMS-01 (Amended through: Aug 1988) Federal Seed Act Regulations (Part 201-202)
 - 3. COMMERCIAL ITEM DESCRIPTIONS (CID) CID A-A-1909 (Basic) Fertilizer
 - 4. FEDERAL SPECIFICATIONS (FS) FS O-F-241 (Rev D) Fertilizers, Mixed, Commercial
 - 5. California Agricultural Code.
 - 6. FS O-F-241D Fertilizer, Mixed, Commercial.
 - 7. ANSI/ASTM D 422 Method for Particle-Size Analysis of Soils.

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1.03 DEFINITIONS

- A. **SEEDING PERIOD:** The Seeding Period refers to the time required to complete required pre-seeding weed management, site and soil preparation, and seeding as indicated on the Drawings and described in these Specifications. Written, signed, and dated "Seeding Period Acceptance" issued by the ENGINEER upon satisfactory completion of the two-part Seeding Period Inspection shall constitute the beginning of the Seeding Establishment Period.
- B. **SEEDING PERIOD ACCEPTANCE:** Seeding Period Acceptance is the milestone when all work associated with the Seeding Period is completed to the OWNER's satisfaction upon completion of the Seeding Period Inspection.
- C. **SEEDING ESTABLISHMENT PERIOD:** The Seeding Period work performed shall be followed by a one-year establishment period immediately following Seeding Acceptance by the OWNER of each of the seeded portions of the project. The CONTRACTOR shall be responsible for the maintenance of the entire Project Area as defined by the Drawings as Limit of Work and these Specifications during the Seeding Establishment Period. Specific maintenance actions required will be based on seasonality, weather and soil conditions, terrestrial populations and distribution of invasive weeds, seeded plants condition, and percent cover. Seeding establishment maintenance actions include: supplemental irrigation, appropriate site weeding, reseeding of herbaceous cover in under-performing areas, trash removal, and any other actions necessary to successfully establish the area to meet the performance standards prescribed herein. The CONTRACTOR shall be responsible for the work as required by the Specifications and the Drawings, until the OWNER gives Final Project Acceptance of the project in writing.
- D. **FINAL SEEDING ACCEPTANCE:** The conclusion of the Seeding Establishment Period shall be based upon satisfactory completion of the Seeding Establishment Period and required performance standards prescribed herein.
- E. **HEALTHY PLANTS:** Healthy plants shall be those that are of good form, free of disease and insect infestation, are robust, and exhibit vigorous growth. Plants must not be heat or water stressed.
- F. **NATIVE GRASSLAND:** For the purposes of this Contract, native grassland is defined as established native grasses and forbs comprised of the seeded species contained in the Drawings and Specifications.
- G. **SEEDBED PREPARATION:** Activities required to prepare an area for seeding. Seedbed preparation activities vary by treatment area, as described in Part 3, Execution of this Section, and can include clearing debris, weed management, disking, leveling, and irrigation system removal.

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- H. **SUITABLE SEEDBED:** A suitable seedbed is defined as a vegetation- and thatch-free soil surface that has been cultivated and prepared to provide a uniform surface as determined by ENGINEER.
- I. **NATIVE GRASS SEED MIX:** Native grass seed mix is a seed mix prescribed on the Drawings and in these Specifications, and shall be applied according to the prescribed application rates of pounds per acre of Pure Live Seed (PLS) at the locations shown on the plans.

1.04 QUALIFICATIONS

- A. All work shall be done by an experienced Landscaping Contractor familiar with native herbaceous vegetation seeding and horticulture, industry methods and standards for seeding. The Contractor shall employ modern equipment and state of the art methods and techniques. The Contractor shall have a minimum of 3 years of applicable on-the-job experience with native herbaceous plant seeding and weed control and shall possess a C-27 California Landscaping Contractor License

1.05 SUBMITTALS

- A. Furnish submittals in accordance with Section 01300-Contractor Submittals for approval.
- B. **Materials List:** A list of all materials to be used in the seeding operations together with the source of those materials. The list shall include mulches, soil amendments, and seed mixtures. Manufacturer's literature showing physical characteristics, applications, and installation equipment shall be included.
- C. **Schedules:** CONTRACTOR shall provide the following schedules within 15 calendar days of the Award of Contract, and before any work is started.
 - 1. **Delivery schedule:** CONTRACTOR shall provide a seeding delivery schedule describing planned activities, their location, start dates, and durations.
 - 2. **Establishment Period Work Schedule:** Written calendar schedule for the beginning of seeding establishment period, planned establishment activities, such as weeding, irrigation, re-seeding, dead vegetation removal (their start dates, frequencies, durations, and number of personnel performing them), and end of seeding establishment period. When there is more than one establishment period, the boundaries of the different seeding areas covered for each period shall be described. The schedule shall address all aspects of weed management (i.e., monitoring, assessment, eradication, and control) for the OWNER's approval. The schedule shall include weed eradication methods descriptions, mowing

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events, discing and reseedling, and a description of the types of equipment. The plan shall propose a sequence of mowing and eradication methods tailored to specific weed populations, and shall include a written Pest Control Advisor (PCA) recommendation.

3. Herbicide Treatment Plan and Schedule, giving proposed sequence of pesticide treatment work, before work is started. The pesticide trade name, chemical composition, formulation, concentration, application rate of active ingredients and methods of application for all materials furnished, and the name and state license number of the state-certified applicator shall be included. No herbicides shall be used prior to ENGINEER approval and before all Integrative Pest Management methods of invasive plant control are exhausted.
- D. Equipment: A list of seeding and mulching equipment to be used during seeding, descriptive data, and calibration tests.
- E. Reports
1. Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described. Reports for the following materials shall be included.
 - a. Topsoil: For pH, plant macro- and micronutrient chemical analysis, organic material contents, and particle size.
 - b. Fertilizer or Compost: For chemical analysis and composition percent.
 - c. Seed: For mixture, percent pure live seed, minimum percent germination and hard seed, maximum percent weed content, date tested and state certification. The OWNER may at any time request, test, and analyze seeding materials to ensure their conformance to these Specifications. The Contractor shall furnish, at no additional cost, certified seed mix labels from the supplier affixed to sealed seed mix bags for the OWNER's approval prior to seeding. Seeding materials not meeting the OWNER's approval shall be immediately removed from the project site at the Contractor's expense. The Contractor shall incur any additional expenses required because of materials not meeting the requirements of these Specifications.
 - d. Straw Mulch: Harvest date, source location, species, and weed content

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- e.
 - f. Percolation Test: For each distinct seeding area, and for each different part of the same seeding area if soil conditions vary.
- F. **Certificates:** Certificates of compliance that materials meet the indicated requirements prior to the delivery of materials.
- G. Records:
- 1. Plant Establishment Period Monthly Activities Reports
 - 2. Final Seeding Acceptance Report
 - 3. Maintenance Instructions Report
 - 4. As-built drawings indicating which seed mixes were installed, when and in what areas.

1.06 INSPECTIONS

- A. It is the CONTRACTOR's responsibility to notify the ENGINEER at least 10 working days prior to each anticipated inspection. The ENGINEER may at any time inspect work without notification. The following are key inspection events:
- 1. Pre-Installation Conference: Conduct conference at Project site in the presence of the ENGINEER.
 - 2. Seeding Areas Layout Acceptance Inspection.
 - 3. Seeding Application Inspection: Seeding shall not start and shall not be accepted without this inspection. The CONTRACTOR shall provide supplier and collector names and addresses upon award of contract. Seed suppliers and collectors are subject to inspection of methods, materials, and processing. Seed shall be inspected upon arrival at the job site on the day of seeding by the ENGINEER for conformity to species, quantity and quality. Seed shall be delivered to project site in sealed bags with seed suppliers or testing laboratory tags attached. The CONTRACTOR shall provide ENGINEER with receipts of the seed purchased and delivered to the site. Receipts shall provide name of company from which the seed was purchased, seed species, seed place of origin, composition, quantity, germination rate, and pure-live-seed (P.L.S.) percentage. Other seeding materials shall be inspected for compliance with specified requirements. Unacceptable materials shall be removed from the job site and replaced by the CONTRACTOR. Immediately prior to commencement of seeding operations, the CONTRACTOR shall adjust and calibrate equipment as

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per manufacturer's specifications and field test in the presence of the ENGINEER. Seeding operation shall be inspected during equipment calibration, material loading, and seed application. CONTRACTOR shall not start calibration, seeding material loading or seeding in any area before the ENGINEER's presence at the project site.

4. Seeding Period Inspection: This inspection shall be performed by the ENGINEER in two parts. First, a preliminary punch list inspection of the seeded areas will be performed. This inspection will be followed by the final verification inspection upon CONTRACTOR notice of punch list items completion. During the preliminary inspection, unsatisfactory conditions and deficiencies will be listed in a punch list. The following items will be reviewed: conformance of the seeding aerial extent with Drawings, quantity and type of species seeded, clean-up requirements, and the acceptability of the seeding operation. During the verification re-inspection, the ENGINEER will evaluate completion of the punch list items to ensure they have been corrected. A "Seeding Period Acceptance" will be issued after all seeding requirements have been satisfactorily completed and approved by the ENGINEER. If the ENGINEER is required to perform additional punch list items verification inspections because any of the punch list items are not complete during the first verification inspection, the CONTRACTOR shall be responsible for any expenses associated with the additional inspection. Partial acceptance of any area or any item will not be issued. Written, signed and dated "Seeding Period Acceptance" issued by the ENGINEER shall constitute the beginning of the Establishment Period.
5. Final Seeding Inspection: This inspection shall be performed by the ENGINEER in two parts at the end of the Seeding Establishment Period. First, a preliminary punch list inspection of the seeded areas will be performed. This inspection will be followed by the final verification inspection upon CONTRACTOR notice of punch list items completion. During the preliminary inspection, unsatisfactory conditions and deficiencies will be listed in a punch list. The following items will be reviewed: vegetation cover, native grass cover, and broadleaf invasive exotic plant cover compliance with performance criteria in Table 1 of this specification, conformance of the aerial extent of seeding with Drawings, quantity and type of species seeded, clean-up requirements, and the acceptability of the seeding operation. During the verification re-inspection, the ENGINEER will evaluate completion of the punch list items to ensure they have been corrected. A "Final Seeding Acceptance" will be issued after all seeding requirements have been satisfactorily completed and approved by the ENGINEER. If the ENGINEER is required to perform additional punch list items verification inspections because any of the punch list items are not complete during the first

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verification inspection, the CONTRACTOR shall be responsible for any expenses associated with the additional inspection. Partial acceptance of any area or any item will not be issued. Written, signed and dated "Final Seeding Acceptance" issued by the ENGINEER shall constitute the satisfactory completion of the seeding work.

1.07 SHIPMENT, DELIVERY, STORAGE AND HANDLING

- A. Shipment: Preparation for shipment shall be done in a manner that will not cause damage to seed or any other seeding material.
- B. Delivery: Seeds, fiber, mulch, and any other seeding material shall be protected from weather and contamination during delivery.
- C. Storage: Seeding material shall be stored in areas approved by the ENGINEER. Seed shall be stored in cool, dry locations away from contaminants. Chemicals of any kind shall not be stored with other landscape materials and shall be stored in a spillage-contained area. Mulch shall be kept covered from rain.
- D. Handling: Except for bulk deliveries, material shall not be dropped or dumped from vehicles.

1.08 TIMES AND CONDITIONS

- A. Seeding Conditions: Seeding shall be performed only during periods when beneficial results can be obtained. When excessive moisture, winds or other unsatisfactory conditions prevail, the work shall be stopped as directed by the ENGINEER. When special conditions warrant a variance to the seeding operations, a proposed seeding time shall be submitted in writing to, and approved by, the ENGINEER. The CONTRACTOR shall be prepared to seed at the earliest time when all conditions (weather, moisture, temperature) are acceptable.
- B. Seeding Restrictions: Coordinate carefully seeding periods with seeding establishment period activities to provide required care from the first date of seeding completion.
- C. Weather Limitations: Proceed with seeding only when existing and forecasted weather conditions permit seeding to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions. Seeding shall not commence on days when the official weather report predicts 95°F or higher temperature during any time of the day.
- D. The CONTRACTOR shall closely review the Integrative Pest Management Ordinance and methodology and consult with an Integrative Pest Management Specialist before any weed, pest or disease corrective action is undertaken.

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PART 2 PRODUCTS

2.01 TOPSOIL

- A. Topsoil shall be the existing soil stripped to the depth indicated and stockpiled at a location directed by the ENGINEER in accordance with Section 02200-Earthwork.
- B. Additional topsoil, if needed, shall comply with the following:
 - 1. Topsoil shall be of loam texture suitable for plant growth. Topsoil shall be subject to ENGINEER inspection and approval at the source of supply and upon delivery.
 - 2. Topsoil shall be obtained from naturally drained areas and shall be fertile, friable loam suitable for plant growth. Topsoil shall be subject to inspection and approval at the source of supply and upon delivery.
 - 3. Topsoil shall be of uniform quality, free from subsoil, stiff or lumpy clay, hard clods, hardpan, rocks, disintegrated debris, plants, roots, seeds, and any other materials that would be toxic or harmful to seeded plant growth. Topsoil shall contain no noxious weeds or noxious weed seeds.
 - 4. Topsoil shall contain at least 6 percent organic matter as determined by loss of weight after ignition of dried (moisture-free) samples in accordance with current methods of the Association of Official Agricultural Chemists.
 - 5. The acidity range of the topsoil shall be (pH 5.5 to pH 7.5). The salinity level shall be less than 3 millimhos/cm.
 - 6. Clay, as determined by the Bouyoucous hydrometer or by the decantation method, shall not exceed 60 percent of the topsoil material.
- C. Soil Test
 - 1. Topsoil history: A 3-year history of the herbicide(s) used and crops grown on the topsoil shall be provided by the CONTRACTOR. The history shall also be provided to the laboratory performing the soil test.]
 - 2. Topsoil tests: The topsoil shall be tested for pH, particle size, salt levels, chemical analysis, and plant macro- and micronutrient analysis, by an independent testing company or agency which uses State of California recommended procedures. The soil samples for the soil tests shall be of a quantity and locations so an accurate soil test representative of the soil(s) can be performed. The independent testing company or agency shall

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outline the soil testing procedures. The ENGINEER will have the right to be present at the time the samples are taken.

3. Topsoil recommendation: The independent test company performing soil test shall establish the quantities and type of soil amendments and fertilizer (initial and maintenance) that the CONTRACTOR shall add to topsoil. The CONTRACTOR shall obtain approval of topsoil and soil amendments and their amounts by the ENGINEER prior to the beginning of work.

2.02 FERTILIZER AND OTHER SOIL AMENDMENTS

- A. Fertilizer shall be furnished in bags or other standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. Fertilizer containers shall not exceed 50 pounds each.
- B. Chemical fertilizers shall be a mixed commercial fertilizer conforming to FS 0-F-241D, Type I, with percentages of nitrogen, phosphoric acid, and potash at [5-10-5 or 6-10-4]. The combined N-P-K content shall be the following percentages of total weight: [5] percent nitrogen, [10] percent phosphoric acid and [5] percent potash. Fertilizers shall be uniform in composition, dry, and free flowing.
- C. Animal fertilizer shall be well-rotted cattle manure, free from sawdust, shaving or refuse of any kind, and shall contain no more than 25 percent straw or litter by volume. Limestone shall be ground to such fineness that 100 percent will pass a No. 200 sieve.
- D. Lime shall be dolomitic limestone containing not less than 85 percent of total carbonates. Limestone shall be ground to such fineness that 100 percent will pass No. 200 sieve.
- E. Agricultural gypsum shall be approved standard brand agricultural calcium sulfate (CaSO₄) as applied to soils and shall contain 19 percent combined sulfur and a minimum of 90 percent of calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
- F. Iron Sulfate shall be granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- G. Sulfur shall be granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve

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2.03 MULCH

- A. Wood Cellulose Fiber: Wood cellulose fiber shall be commercially available and produced from virgin wood fiber. Fiber shall be of such character that fiber will disperse into uniform slurry when mixed with water. The water content of the fiber before mixing into the slurry shall not exceed 15 percent of the dry weight of the fiber. The moisture content of the fiber shall be clearly marked on the package.
 - 1. Ash Content: Fiber shall not contain more than 7 percent ash as determined by the Technical Association of the Pulp and Paper Industry (TAPPI) Standard T 413, and shall be nontoxic to plant or animal life and shall not contain any growth or germination-inhibiting factors.
 - 2. Water-holding Capability: Fiber shall have a water-holding capability by weight of not less than 1,200 percent. Water-holding capability of the fiber shall be marked on the package.
 - 3. Composition: 9 to 15 percent moisture based on air-dry weight basis, and pH range from 4.5 to 6.0.
 - 4. Coloring: Fiber shall be colored to contrast the area on which the fiber is to be applied to aid visual monitoring during application. The material used for color shall be nontoxic to plant and animal life and biodegradable.
 - 5. Paper Fiber. Paper fiber mulch is not allowed.
- B. Straw: Straw mulch shall consist of native hay or stalks of native grasses. It shall be applied at a rate of 3 tons per acre.
 - 1. Straw shall be furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment. Substitutions shall be requested in writing and must be approved by ENGINEER. Rice straw is not allowed in wetland or mesic areas.

2.04 SEED MIXTURES

- A. General: Seed shall conform with applicable County, State of California, and Federal regulations. Seed shall be mixed by the seed supplier. The CONTRACTOR shall furnish the seed supplier's guaranteed germination of each variety listed in the seed mixture. Seed shall not be delivered to the Site until samples have been approved by the ENGINEER. Approval of samples, however, shall not affect the right of the ENGINEER to reject seed upon or after delivery. Seed which has become wet, moldy, or otherwise damaged prior to use will not be accepted.

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- A. Seed Source: Seed will be sourced from Monterey County or areas with the same environmental conditions within 100 miles of the Project Site. The seed collector is responsible for maintaining records of source populations and amounts collected per collection site.
- B. Seed Classification: State-certified seed of the latest season's or previous season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis, including percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS-01 and applicable state seed laws. AOSCA / CCIA certifications for seeds are encouraged.
- B. Packaging: Seed shall be delivered in strong, clearly marked containers or bags not exceeding 50 pounds each.
- C. Seed Quality: Weed seed shall not exceed five percent by weight of the total of each seed mix. Wet, moldy, insect-infested, or otherwise damaged seed shall be rejected and removed from project site. Open containers or bags of seed or improperly tagged containers or bags will be rejected and removed from project site.
- D. Sampling: For all seeds or containers, it is the option of the OWNER to take random samples for each species, and require the CONTRACTOR to provide analysis of samples at no extra cost to the OWNER.
- E. Seed Mixing: If additional seed mixing is necessary, it shall be performed by the CONTRACTOR, in ENGINEER.
- F. Substitutions: Substitutions will not be allowed without written request and approval from the ENGINEER.
- C. The CONTRACTOR is hereby warned that these seed mixtures are composed of native grass, grass-like species, as well as forbs and some lead time will be necessary to locate a distributor or seed collector and to have the seed mix dried, mixed and prepared (cleaned and pre-treated) for seeding.

SEED MIXES			
Common Names	By Weight (lbs)	Proportion Purity (percent)	Germination (percent)
Type 1: Upland Non-Irrigated Landscaped or Urban Areas (Disturbed Habitat) Seed Mix Application rate of 38 lbs/acre			
California barley (<i>Hordeum brachyantherum</i> ssp.	15.00		

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<i>californicum)</i>			
California brome (<i>Bromum carinatus</i>)	10.00		
Zorro annual fescue (<i>Festuca [Vulpia] myuros</i> var. <i>hirsute</i> 'Zorro')	5.00		
Idaho fescue (<i>Festuca idahoensis</i>)	5.00		
Spanish clover (<i>Acmispon americanus</i> var. <i>a.</i> [<i>Lotus purshianus</i>])	1.00		
tree clover (<i>Trifolium ciliolatum</i>)	2.00		
Type 2: Streambank Areas (Riparian Habitat) Seed Mix Application rate of 40 lbs/acre			
meadow barley 'salt-tolerant' (<i>Hordeum brachyantherum</i> ssp. <i>b.</i>)	15.00		
blue wildrye (<i>Elymus glaucus</i>)	10.00		
Molate fescue (<i>Festuca rubra</i> (Molate))	5.00		
creeping wildrye (<i>Leymus triticoides</i>)	5.00		
coastal tufted hairgrass (<i>Deschampsia cespitosa</i> ssp. <i>holciformis</i>)	3.00		
spreading rush (<i>Juncus patens</i>)	0.25		
mugwort (<i>Artemisia douglasiana</i>)	0.25		
deerbed sedge (<i>Carex praeegracilis</i>)	0.50		
Umbrella sedge (<i>Cyperus eragrostis</i>)	1.00		
Type 3: Sandy Coastal Salt Spray Areas (Coastal Strand) Seed Mix Application rate of 35 lbs/acre			
American dune grass (<i>Elymus mollis</i> ssp. <i>mollis</i>)	15.00		
salt grass (<i>Distichlis spicata</i>)	15.00		
silver dune lupine (<i>Lupinus chamissonis</i>)	2.00		
Lizzard tail (<i>Eriophyllum staechadifolium</i>)	0.25		

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sandhill sage (<i>Artemisia pycnocephalla</i>)	0.50		
Beach strawberry (<i>Fragaria chiloensis</i>)	0.25		
Silver beachweed (<i>Ambrosia chamissonis</i>)	0.50		
Beach saltbush (<i>Atriplex leucophylla</i>)	1.00		
Red sand verbena (<i>Abronia maritima</i>)	0.50		
Type 4: Well Developed Mesic (Not Sand) Soil Areas (Coastal Terrace Prairie) Seed Mix Application rate of 45 lbs/acre			
California oatgrass (<i>Danthonia californica</i>)	10.00		
Idaho fescue (<i>Festuca idahoensis</i>)	10.00		
coastal tufted hairgrass (<i>Deschampsia cespitosa</i> ssp. <i>holciformis</i>)	10.00		
purple needlegrass (<i>Stipa pulchra</i>)	10.00		
brown-headed rush (<i>Juncus phaeocephalus</i>)	2.00		
California buttercup (<i>Ranunculus californicus</i>)	0.25		
Blue-eyed grass (<i>Sisyrinchium bellum</i>)	0.25		
tomcat clover (inoculated) (<i>Trifolium willdenovii</i>)	2.50		

2.05 PESTICIDE

- A. Use of pesticides is prohibited without express written approval from ENGINEER, and upon exhausting all Integrative Pest Management methods to control invasive plant populations.
- B. Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide, and miticide. Pesticide material shall be labeled for use and applied only as registered by EPA and approved.
- C. Herbicide shall contain maximum 54 percent glyphosate as an active ingredient. The herbicide shall not contain a surfactant. The herbicide shall allow seeding/sodding to take place 3 days after application of the herbicide.

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2.06 TACKIFIER

- A. The tackifier shall be non-toxic to plant and animal life, non-corrosive, non-crystalline, and non-staining to concrete or painted surfaces. The tackifier shall be biodegradable.

2.07 WATER

- A. Water shall be the responsibility of the CONTRACTOR, unless otherwise noted. Water shall not contain elements toxic to plant life.

PART 3 EXECUTION

3.01 SOIL PREPARATION

- A. The seeding shall not begin until the CONTRACTOR has repaired all areas of settlement, erosion, rutting, etc. and the soils have been placed, compacted, and contoured to finish grade. The ENGINEER shall be notified of areas which prevent the seeding work from being executed.
- B. After removal of waste materials in the planting areas, such as weeds, roots, rocks 6- inches and larger, construction materials, etc., the seeding subgrade shall be scarified and pulverized to a depth of not less than 6 inches and all surface irregularities removed.
- C. Areas requiring grading by the CONTRACTOR including adjacent transition areas shall be uniformly level or sloping between finish elevations to within 0.1-ft above or below required finish elevations.
- D. Any unusual subsoil condition that will require special treatment shall be reported to the ENGINEER.
- E. Topsoil: Topsoil shall be distributed uniformly and spread evenly to a thickness of 4 inches on subgrade for seeded areas. Subgrade shall be ripped or disked to a depth of 8-12 inches. Topsoil shall be spread so that seeding can proceed with little additional soil preparation or tillage. Topsoil shall not be placed when the subgrade is excessively wet, extremely dry, excessively compacted or in a condition detrimental to the proposed planting or grading.
- F. Fertilizer: Fertilizer shall be applied at the rate recommended by the soil testing laboratory and approved by ENGINEER. Fertilizer shall be incorporated into the soil to a minimum depth of 4 inches and may be incorporated as part of the tillage or hydroseeding operation.
- G. Tillage

TECHNICAL SPECIFICATIONS

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1. Preparation. Seeded areas shall be filled as needed or have surplus soil removed to attain the finished grade. Drainage patterns shall be maintained as indicated on Drawings. Seeded areas compacted by construction operations shall be completely pulverized by tillage.
 2. Seeded Areas Debris. Seeded areas shall have debris and stones larger than 6 inch in any dimension removed from the surface.
 3. Protection. Finished graded areas shall be protected from damage by vehicular or pedestrian traffic and erosion.
 4. Finish Grading. Finished grade shall be 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing. Make minor adjustments of finish grades as directed by the ENGINEER.
- H. No seeding shall be done when wind velocity exceeds 4 mph, within 4 hours; after rain, or if the surface has been compacted without first loosening the ground.

3.02 APPLICATION OF PESTICIDE MATERIAL

- A. When pesticide becomes necessary to remove a disease or pest upon exhausting all integrative pest management methods and upon ENGINEER's written approval, a state-certified applicator shall apply required pesticide in accordance with State EPA label restrictions and recommendations. Hydraulic equipment for the liquid application of pesticides shall consist of a leak-proof tank, positive agitation methods, controlled application pressure, and metering gauges. A pesticide treatment plan shall be furnished to the ENGINEER as indicated above.

3.03 BROADCAST SEEDING

- A. Broadcast seeding shall be performed where indicated or as directed in the field by the ENGINEER.
- B. The soil shall be prepared per soil preparation instructions. The ENGINEER will inspect and approve the soil preparation prior to commencing with seeding and fertilizing. The CONTRACTOR shall prepare only enough ground that can be planted within 24 hours thereafter.
- C. Fertilizer shall be evenly applied to the prepared ground at a rate of 350 pounds per acre. Fertilizing shall be completed prior to seeding.
- D. Sow seed at the application rates indicated above. Equal quantities of seed shall be sown in two directions at right angles to each other to produce an even distribution of seed over the entire area.

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- E. The seed shall then be covered with a fine layer of soil to a depth not greater than 1/4- inch.
- F. Critical areas within 12 feet of streams or other water bodies shall be mechanically or hand raked to cover seed prior to mulching or installation of erosion control fabric. ENGINEER may designate in the field other areas that require raking.
- G. Flat, seeded areas shall be evenly covered with a weed-free straw mulch at the rate of [2,000] pounds per acre. Areas with slopes steeper than 4 horizontal to 1 vertical shall be covered with the indicated erosion control matting.
- H. Broadcast seeding method shall be utilized between October 15 and November 15 or between February 1 and March 1.
- I. Mechanical application (hydroseeding) is acceptable. The CONTRACTOR shall notify the ENGINEER of proposed method, mulch, and type of equipment to be used and shall receive approval before beginning this operation.

3.04 HYDROSEEDING

- A. **General:** Areas labeled seed shall be hydroseeded or drill seeded if flat and larger than 1/2 acre.
- B. **Equipment:** Mixing shall be performed in a tank. The tank shall have a built-in continuous agitation and circulation system, of sufficient operating capacity to produce a homogenous slurry of mulch, stabilizer, seed, fertilizer and water in the designated unit proportions for a minimum coverage of one-half acre. The tank shall have a discharge system which will permit attachment of at least 500 feet of hose extensions, a change of elevation of 150 feet in height from tank to discharge nozzle, and still retain enough pressure to apply the slurry to the areas at a continuous and uniform rate.
- C. **Proportions:** Proportions per acre shall be as follows:
 - 1. Mulch, 2,500 pounds
 - 2. Seed, proportioned to mixture of seed as specified herein
 - 3. Stabilizer, 120 pounds
 - 4. Fertilizer, 350 pounds
 - 5. Water, 3,000 gallons
- D. Application

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1. With agitation system operating at part speed, water shall be added to the tank and good recirculation shall be established. Materials shall be added in such a manner that they are uniformly blended into the mixture.
2. When the tank is 1/3 filled with water, add the following materials in the sequence listed:

Sequence	Material
1	Stabilizer, 1/2 acre requirement
2	Three 50-pounds bales mulch
3	Seed, 1/2 acre requirement
4	Fertilizer, 1/2 acre requirement

- a. Agitate mixture at full speed when the tank is half filled with water.
- b. Add remainder of mulch requirement before tank is 3/4 full.
- c. Slurry distribution shall begin immediately. Application of slurry shall be done only when rain is not anticipated for at least three days after slurry application.
- d. The entire tank of each batch of slurry shall be emptied and the slurry evenly applied to areas to be hydroseeded within a 2-hour period following the mixing of each slurry batch. Slurry batches not applied during this time will be rejected.

3.05 DRILL SEEDING

- A. Flat areas larger than 1/2 acre in size that are designated for seeding in the Contract Documents shall be seeded by drilling.
- B. **Seeding:** Seed shall be uniformly drilled to an average depth of 1/4 to 1/2 inch at the rate specified using equipment having drills not more than 6-1/2 inches apart. Row markers shall be used with the drill seeder. Drill seeding shall take place 3 days after application of herbicide.
- C. **Rolling:** Immediately after seeding, the entire area shall be firmed with a roller not exceeding 90 pounds for each foot of roller width. Areas seeded with drills equipped with rollers shall not be rolled.

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- D. **Water:** Watering shall be started within 4 days after completing the seeded area. Water shall be applied at a rate sufficient to ensure moist soil conditions to a minimum depth of 2 inches. Run-off and puddling shall be prevented.

3.06 SEEDING ESTABLISHMENT PERIOD

- A. General: The CONTRACTOR shall be responsible for protecting, watering, fertilizing, weeding, and maintaining seeded areas until Final Seeding Acceptance.
- B. At time of Final Seeding Acceptance, seeded areas shall be completely established with no bare spots. The target percent cover for seeding in seeded areas as shown on the Drawings shall meet the performance standards in Table 1 below. If the performance is less than the standards indicated in Table 1, remedial actions shall be taken, in conformance to the Drawings and these Specifications, as required to achieve the identified performance standards. If the performance standards are not met at the time of Final Project Acceptance, the project will not be accepted until the identified remedial actions are implemented by the CONTRACTOR, at the CONTRACTOR's expense, and as directed by the OWNER. Remedial actions could include additional weed control, or additional soil preparation and replanting or reseeded, followed by another one-year Seeding Establishment Period as determined by the ENGINEER. All remedial actions shall be conducted in strict coordination with, and upon the approval of, the OWNER. OWNER shall provide CONTRACTOR with the performance assessment methodology. CONTRACTOR shall conduct surveys at a time that allows data to be analyzed and corrective actions to be taken at the appropriate time of year (i.e., Fall/Winter). CONTRACTOR shall submit results to OWNER in the form of Final Acceptance Report described in Article 3.6, Project Area Establishment Reports, in this Section.

Table 1. Performance Standard for Seeded Areas	
Seeded Vegetation Type	Absolute Cover²
All native and nonnative vegetation	greater than or equal to 90%
Native grasses	greater than or equal to 50%
Nonnative broadleaf weeds ³	less than 10%
¹ Performance standard applies to cover surveyed during Year 3 of the Maintenance Period. ² Cover surveys shall adhere to the City's Native Standards (Protocol). ³ Cal IPC invasive broadleaf plants with High and Moderate rating.	

- C. Upon completion of seeding, the entire seeded area shall be soaked to saturation by a fine spray. The soil in the seeding areas shall be kept constantly moist during the first three weeks after seeding and during dry weather or whenever

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necessary for proper establishment. Care shall be taken to avoid excessive washing or puddling on the surface and any such damage caused thereby shall be repaired by the CONTRACTOR.

- D. Protection: The CONTRACTOR shall provide adequate protection to all newly seeded/sodded areas including the installation of approved temporary fences to prevent trespassing and damage, as well as erosion control, until the end of the one-year correction period.
- E. The CONTRACTOR shall replace any materials or equipment it has damaged or which has been damaged by its employees or subcontractors.
- F. Partial utilization of the project shall not relieve the CONTRACTOR of any of the requirements of this Section
- G. Maintenance shall include, in addition to the foregoing, cleaning, edging, the repair of erosion, and other maintenance work. Sidewalks and other paved areas shall be kept clean while planting and maintenance are in progress.

3.07 CLEANUP

- A. Upon completion of all seeding operations, the portion of the Site used for a work or storage area by the CONTRACTOR shall be cleaned of all debris, superfluous materials, equipment, and garbage.
- B. Walks, pavement, and any other hardscape structures shall be swept or washed clean upon completion of the WORK of this Section.

END OF SECTION

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TECHNICAL SPECIFICATIONS
DIVISION 3: CONCRETE
SECTION 03100: CONCRETE FORMWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. This specification section includes the following items of work:
1. Concrete formwork, including all accessories, shoring and form support required to place concrete in accordance with the Drawings.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of the Notice Inviting Bids shall be used.
- B. American Concrete Institute (ACI):
1. ACI 301: Specifications for Structural Concrete for Buildings.
 2. ACI 347: Recommended Practice for Concrete Formwork.

1.03 SUBMITTALS

- A. Submit in accordance with Section 01300, CONTRACTOR Submittals at least 60 days in advance of the relevant work commencing or materials being ordered, unless noted otherwise.
- B. Submit formwork calculations as prepared by a civil or structural engineer registered in the State of California. The design and engineering of formwork as well as its construction shall be the complete responsibility of the CONTRACTOR. OWNER Representative's review of forms and/or drawings in no way relieves the CONTRACTOR of his/her responsibility for adequately designing, constructing, and maintaining the forms so that they will function properly.
- C. Submit all manufacturer's product data and application procedures for the form coating materials, form coatings, form ties, and other accessories.
- D. Shop Drawings:
1. Submit formwork Shop Drawings prepared by or under the supervision of a qualified Professional Engineer detailing fabrication, assembly and support.
 2. Form Ties Tapered Through Bolts: Submit proposed method of sealing form tie hole; coordinate with any details shown on Drawings.
- E. Quality Control Submittals: Statements of qualification for formwork and shoring designer. For reused formwork provide:

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1. Record Documents of previous reuse.
2. Operation and Maintenance records of past use.
3. Warranty.

1.04 QUALITY ASSURANCE

- A. Qualifications: Formwork, falsework, and shoring designs prepared by a civil or structural Engineer experienced in design of this type of work and registered in the State of California.
- B. Maintain one copy of ACI 347 and ACI 301 on site.
- C. Conform to requirements of the Division of Industrial Safety, State of California, and all other codes and regulations.

1.05 TOLERANCES

Tolerances for construction of formwork shall be as necessary to provide completed concrete structures within the tolerances specified in ACI 301 and ACI 347, as applicable, and Section 03300, "Cast-In-Place Concrete." Provide positive means of adjustment to maintain tolerances before and during concrete placement.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Form materials accessories shall meet the recommendations and requirements of ACI 347.
- B. Form materials shall be made of wood or an approved equal. Wood sheathing shall meet the following minimum specifications:
 1. APA grade-stamped "B-B plyform, Class 1, Exterior" Douglas fir plywood; each piece grade marked.
 2. Minimum 3/4 inch thick.
 3. Clean, smooth, uniform in size and free of raised grain, torn surfaces, worn edges, patches or other defects.
 4. No mill oiling permitted.
- C. Use of form materials other than wood must be approved by the OWNER Representative.
- D. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall have sufficient rigidity to maintain specified tolerances. Nails, spikes, lag bolts, through bolts, and anchorages shall be sized as required to prevent movement of formwork during placing and setting of concrete.
- E. Seal porous form materials to prevent absorption of water from the concrete.

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- F. Use of aluminum form materials in contact with concrete is prohibited.
- G. Use of form release agents is prohibited on surfaces where crystal forming waterproofing is to be applied.
- H. Form coating: Non-staining and non-toxic after 30 days; VOC compliant. Form coatings containing mineral oils or petroleum solvents such as paraffin or other non-drying materials will not be permitted.

2.02 FORMWORK ACCESSORIES

- A. Form ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent deflection, and to prevent spalling of concrete surfaces upon their removal.
 - 1. Unless otherwise shown, provide ties so that portion remaining within concrete, after removal of exterior parts, is at least 1-1/2 inch from the outer concrete surface.
 - 2. Unless otherwise shown, provide form ties that will leave a hole not larger than 1 inch diameter in the concrete surface.
 - 3. Ties shall be of sufficient strength to prevent the spreading of the forms during concrete placement.
 - 4. The use of wire ties will not be permitted.
- B. Form sealers and gaskets, tape and other miscellaneous materials: At the CONTRACTOR's option to produce specified finishes and tolerances.
- C. All other materials, not specifically described, but required for proper completion of concrete formwork, may be as selected by the CONTRACTOR but are subject to approval of the OWNER Representative.

PART 3 - EXECUTION

3.01 INSPECTION

- A. The OWNER Representative will inspect the substrate, ground or other support and the conditions under which concrete formwork is to be performed; the OWNER Representative will notify the CONTRACTOR of unsatisfactory conditions and require the CONTRACTOR to correct all deficiencies.
- B. Do not proceed with the work until unsatisfactory conditions have been corrected.
- C. Concrete shall not be deposited in the forms until all work connected with the forms has been completed, all material required to be embedded has been placed, and the OWNER Representative has inspected the formwork and related materials. This work shall include the removal of all dirt, chips sawdust, water and other foreign material from the forms.

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- D. The approval by the OWNER Representative shall not absolve the CONTRACTOR for design or erection deficiencies.

3.02 FORMWORK DESIGN REQUIREMENTS

- A. Design and construction of all forms and form supports shall be performed by the CONTRACTOR and their safety and adequacy shall be solely the responsibility of the CONTRACTOR.
- B. Design, support, brace and maintain formwork to safely support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by formwork system and in-place structure construction that has attained adequate strength.
- C. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, temporary construction material, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
- D. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- E. Provide formwork sufficiently tight to minimize leakage during concrete placement. Solidly butt joints and provide backup material at joints, as required, to minimize leakage and fins.
- F. Provide temporary openings in wall forms, column forms, and at other locations necessary for inspection and cleanout.
- G. Forms for Exposed Concrete:
1. Drill forms to suit ties used, and to prevent leakage of concrete material around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
 2. Provide sharp, clean corners, without visible edges or offsets, at intersecting planes. Back joints with extra studs or girts to maintain true, square intersections.
 3. Use extra studs, walers and bracing, to prevent bowing of forms between studs, and to avoid bowed appearance in concrete
 4. Assemble forms to be readily removed without damage to exposed concrete surfaces.
 5. Form molding shapes, recesses, and projections, with smooth-finish materials, and install with sealed joints to prevent displacement.
 6. Make plywood panel patterns regular and symmetrical, joints plumb and level, and horizontal joints continuous. Control reuse of forms for exposed surfaces to provide surface of uniform color and texture without sharp demarcation between adjacent surfaces.
 7. Form ties for exposed concrete surfaces shall be arranged symmetrically and shall be aligned both vertically and horizontally (do not stagger).

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H. Corner Treatment:

1. Form unexposed corners either square or chamfered.
2. Provide 3/4 inch chamfers for all exposed joints, edges, and external corners except as otherwise indicated. Form chamfers accurately and surface to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer at changes in direction.

I. Joints: Furnish and install construction and contraction joints as shown on the Drawings, or as proposed by the CONTRACTOR and concurred by the OWNER Representative.

J. Provisions for Other Trades:

1. Provide blockouts and sleeves to accommodate work of other trades, including mechanical and electrical work, even though not shown on the Drawings.
2. Accurately place and securely support items to be built into forms.

K. For tremie placed concrete, design forms to facilitate tremie placement and prevent water pockets.

3.03 FORM CONSTRUCTION

- A. Construct forms complying with ACI 301, to the sizes, lines, and dimensions shown, and as required to obtain accurate alignment, location and grades. Level and plumb work in finished structures.
- B. Provide temporary openings where interior area of formwork is inaccessible for cleanout, inspection before concrete placement, or placement of concrete mortar. Locate temporary openings in an inconspicuous location, and consistent with project requirements.
- C. At the CONTRACTOR's option, as concurred by the OWNER Representative, form sides of footings in lieu of placing concrete directly against excavated surfaces.
- D. Where placement of concrete against an excavated surface is shown, the excavated surface shall be sound and shall not extend inside the concrete lines indicated.
- E. Provide shores and struts, with positive means of adjustment, capable of taking up formwork settlement during concrete placing operations. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- F. Support form facing materials by structural members spaced sufficiently close, and of sufficient stiffness to limit deflection. Fit forms for continuous surfaces to accurate alignment, free from irregularities, and within allowable tolerances.

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- G. Edge sealing: Edge seal plywood forming materials with an effective water-excluding coating. Seal cutouts, holes and field cuts.
- H. Secure all embedded items before concreting. Use templates for equipment anchor bolts and other embedded items. Fill voids with readily removable material to prevent entry of concrete.

3.04 FORMWORK MAINTENANCE

- A. Provide positive means of adjustment. Inspect and adjust formwork before and during concrete placement to achieve the specified tolerances.
- B. Thoroughly clean forms prior to reuse.
- C. Where form coatings and form release agents are used, verify compatibility with the form materials.

3.05 INSTALLATION OF EMBEDDED ITEMS

- A. Provide formed openings, where required, for pipes, conduits, sleeves, and other work embedded in, and passing through, concrete members.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate the work of other technical sections in locating and forming openings, slots and recesses, and in locating sleeves, anchor bolts and other inserts.

3.06 FORMWORK REMOVAL

- A. General:
 - 1. Do not remove forms, shores, and bracing until concrete has gained sufficient strength to carry its own weight and the construction and design loads imposed. Verify strength of concrete by test results.
 - 2. Remove formwork progressively, and in accordance with code requirements, so that no shock loads or unbalanced loads are imposed on the structure.
 - 3. Reshore structural members as required. Remove load supporting forms only when concrete has attained the required 28 day compressive strength.
 - 4. Remove forms in a manner which will not damage concrete.
- B. Limit construction loads at all times to those which can be carried safely by the developed strength of the structure at time of loading, and by formwork and shoring in-place at time of loading.

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SECTION 03100: CONCRETE FORMWORK

3.07 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in the work. Damaged form facing materials will not be acceptable.
- B. Patched forms for textured, coated, or smooth architectural surfaces will not be acceptable.
- C. Reuse of form facings more than four times will not be permitted.

3.08 SPECIAL TECHNIQUES

- A. Circular Structures:
 - 1. Forms conform to the circular shape of structure.
 - 2. Straight panels may be substituted for circular forms provided panels to not exceed 2 feet in width and angular deflection is no greater than 3-1/2 degrees per joint.

END OF SECTION

TECHNICAL SPECIFICATIONS
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SECTION 03100: CONCRETE FORMWORK

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**TECHNICAL SPECIFICATION
DIVISION 3: CONCRETE
SECTION 03200: CONCRETE REINFORCEMENT**

PART 1 GENERAL

1.01 SUMMARY

- A. This specification section includes the following items of work:
1. All reinforcement and accessories required to place reinforcement in accordance with the Drawings.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of Notice Inviting Bids shall be used.
- B. American Concrete Institute (ACI):
1. ACI 301: Specifications for Structural Concrete for Buildings.
 2. ACI 318: Building Code Requirements for Reinforced Concrete.
 3. ACI SP-66: Detailing Manual, (including ACI 315 and ACI 315R).
- C. American Public Works Association, Southern California Chapter (APWA):
1. Standard Specifications for Public Works Construction (SSPWC).
- D. American Society for Testing and Materials (ASTM):
1. ASTM A185: Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 2. ASTM A497: Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
 3. ASTM A615: Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- E. Concrete Reinforcing Steel Institute (CRSI):
1. MSP-2-01, Manual of Standard Practice for Reinforced Concrete Construction.

TECHNICAL SPECIFICATION
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- 2. Manual of Standard Practice.
- 3. Placing Reinforcing Bars.
- F. Wire Reinforcement Institute (WRI):
 - 1. Manual of Standard Practice, Welded Wire Fabric.
- G. California Code of Regulations (CCR):
 - 1. Title 8, Construction Safety Order.

1.03 SUBMITTALS

- A. Submit in accordance with Section 01300, CONTRACTOR Submittals at least 60 days in advance of the relevant work commencing or materials being ordered, unless noted otherwise.
- B. Provide shop drawings in accordance with the requirements of CRSI Manual of Standard Practice (MSP-2-01) and the ACI Detailing Manual SP-66, ACI 315. Bar lists and drawings for the fabrication and placing of reinforcement shall have sufficient plans, elevations, and sections to adequately detail and label all reinforcement. The bar lists and drawings shall also include a reference to the structure in which the reinforcement will be installed and to the Drawings showing the reinforcement. In addition, provide the following specific information:
 - 1. Fabrication and bending lists.
 - 2. Fabrication and placing drawings.
 - 3. Lab test reports/mill certificates showing stress-strain curves, yield strength, ultimate strengths, and chemical properties.
 - 4. Shop drawings showing location of lap splices where required by the Drawings or where the CONTRACTOR specifically requests consideration for use.
 - 5. All embedments.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. The CONTRACTOR shall deliver steel with suitable hauling and handling equipment. Steel shall be stored to prevent bending, damage, contact with the ground, and kept free of moisture, dirt, oil or other injurious contaminants. The unloading, storing, and handling of bars on the job shall be in accordance with the requirements of CRSI publication "Placing Reinforcing Bars."

TECHNICAL SPECIFICATION
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SECTION 03200: CONCRETE REINFORCEMENT

- B. Only bars delivered in bundles from the mill and tagged with valid identification Certificates are acceptable for use. All steel which cannot be properly identified will be rejected, and shall be immediately removed from the job site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Deformed billet-steel bars shall be in accordance with the requirements of ASTM A615, Grade 60.
- B. Smooth bars: ASTM A615, Grade 60.
- C. Mechanical Couplers:
1. Type: Tension-Compression
 2. Strength: Develop 125% of the reinforcing yield strength in tension and compression.
 3. Reinforcing Coupler shall be Dayton Superior D-250 Bar Lock L-Series Coupler (ICC ER-5064) or approved equal.
- D. Welded Wire Fabric: ASTM A185 or A497
- E. Tie Wire: 16-gauge minimum.
- F. Dowel Sleeves: Shall be of the dimensions as shown in the Drawings and shall fit the dowel bar snugly. One end of the sleeve shall be closed so that concrete cannot enter. The sleeve shall be indented or have suitable flange at least 1-inch from the closed end to provide a limiting stop for the sleeve when being placed on the dowel bar and to insure subsequent free movement of the dowel in the sleeve. The sleeve shall be of such rigid design that the closed end will not collapse during construction.
- G. Grease for dowels in dowel sleeves shall be food grade and conform to requirements of NSF 60.

2.02 ACCESSORIES

- A. Tie wire shall be soft-annealed wire where tie wire is bent to be not closer than one-inch from surface after tying.
- B. Supports for deformed reinforcing bars and welded wire fabric shall be cement-mortar cubes wherever the finished concrete surface is continuously in contact with water. Cubes shall be of the same strength and density as the concrete in the section being placed.

TECHNICAL SPECIFICATION
DIVISION 3: CONCRETE
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- C. Metal supports, where used, shall have stainless steel tips as supplied by Burke Concrete Accessories, Inc.; Superior Concrete Accessories, Inc.; or equal. Supports shall conform to CSRI Class 2, Type B so that no non-stainless steel wire of the bar support lies closer than 0.75 inch to the form surface.
- D. Supports made with plastic material or with plastic tips shall not be used.
- E. Aluminum or stainless steel supports or accessories shall not be used.

2.03 FABRICATION

- A. The CONTRACTOR shall cut and bend all reinforcement in accordance with reviewed fabrication details. Fabricate bars of indicated size and accurately form to shapes and lengths indicated and required. Fabricate by methods not injurious to materials. Reject bars with kinks or bends not scheduled. All bars shall be bent cold.
- B. Fabrication shall conform to CRSI Manual Chapters 6 and 7, including tolerances.
- C. Splice, development and embedment lengths: Furnish bars with lap lengths equivalent to ACI 318, Class B splices for the specified concrete strength, bar size and location, unless noted otherwise.
- D. Welded splices are not permitted.
- E. Dowels:
 - 1. Provide deformed reinforcing steel bar dowels as shown on the Drawings.
 - 2. Provide same dowel size and spacing as the reinforcing to which they are spliced, unless noted otherwise.

PART 3 EXECUTION

3.01 GENERAL

- A. The CONTRACTOR shall fabricate and place reinforcement in structures in accordance with reviewed complete bending diagrams, placing lists, and placing diagrams prepared in accordance with the requirements as specified herein.
- B. Details of reinforcement for fabrication and erection shall be in accordance with the requirements of these specifications and to those applicable provisions not in conflict with the requirements specified herein of CRSI MSP-2-01.

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- C. All reinforcement and welded wire fabric shall be furnished, fabricated, and installed by the CONTRACTOR. The CONTRACTOR shall also furnish all the wires, metal supports, clips, and other appurtenances necessary to fulfill the requirements of the specifications.
- D. The CONTRACTOR shall notify the OWNER Representative when reinforcing is ready for inspection and allow sufficient time for this inspection prior to casting concrete.
- E. The Contract Drawings will be used for inspection of reinforcing.

3.02 PREPARATION

- A. Surface Preparation:
 - 1. Clean metal reinforcement of loose mill scale, oil, earth, and other contaminants that might reduce the bond between steel and concrete.

3.03 ERECTION AND INSTALLATION

- A. General: Reinforcing steel placement shall be in accordance with the requirements of ACI 301 and SP-66, and the ends of bars shall be covered to protect workers from impalement in accordance with Cal/OSHA, CCR, Title 8, Construction Safety Orders.
- B. Straightening and Rebending:
 - 1. The CONTRACTOR shall not straighten or rebend metal reinforcement.
 - 2. Bundle or space bars, instead of bending, where construction access through reinforcing is necessary.
 - 3. Where construction access through reinforcing is necessary, details shall be submitted and OWNER Representative's review shall be obtained prior to placing.
- C. Spacing and Positioning:
 - 1. The CONTRACTOR's performance shall be in accordance with requirements of the current edition of the SSPWC, reviewed placing drawings, Design Drawings, and the specifications.
 - 2. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 3. Reinforcement shall be placed not closer than two inches to formed surfaces of concrete in contact with water, ground, or air, or three inches to the surfaces of concrete placed against the ground, unless otherwise shown on the Drawings.

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4. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
 5. Reinforcement shall be placed not closer than three inches to any embedded piping or sleeves passing through walls or slabs, unless otherwise shown on Drawings.
 6. Bars additional to those shown on the Drawings or ordered, which may be found necessary or desirable by the CONTRACTOR for the purpose of securing reinforcement in position, shall be furnished and installed by the CONTRACTOR.
- D. Surface condition of reinforcement: Before placing concrete, clean reinforcement of loose rust and other substances that would impair bond with concrete. Remove rust by vigorous rubbing with burlap cloth or wire brushing.
- E. Reinforcement shall at all times be protected from moisture until concrete is placed around it. Ends of bars left projecting from the concrete for any considerable time shall be painted with a heavy coat of neat cement grout. Take special care to prevent any disturbance of reinforcement in concrete that has already been placed.
- F. The CONTRACTOR shall place reinforcing steel in accordance with the following location tolerances:

Table 03200-1		
	Condition	Tolerance
Variation from protective covering	With 2" or less cover	1/4"
	With 3" cover	1/2"
Variation from indicated spacing		1/2"

- G. Splicing:
1. Bars shall be spliced only at points shown on the approved bending lists and Drawings or where approved by the OWNER Representative.
- H. Wherever bars are spliced, they shall be lapped to meet the requirements for a Class B tension lapped splice in accordance with ACI 318, unless otherwise shown on the Drawings. For bars of different sizes, the lap length shall be that given for the smaller size bar or shall be equal to the required embedment for the larger size bar, whichever is greater. Bars in lapped splices shall be in contact and shall be tied in a manner which maintains bar spacing shown on the Drawings.

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- I. The CONTRACTOR's performance shall be in accordance with the requirements of CRSI Placing Reinforcing Bars and to the details and notes on the Drawings.
- J. The CONTRACTOR shall place an equivalent area of steel around the pipe or opening and extend on each side sufficiently to develop bond in each bar. Bar extension length on each side of opening shall be as shown on the Drawings. Where welded wire fabric is used, extra reinforcement shall be provided using fabric or deformed bars.

3.04 PLACING WELDED WIRE FABRIC

The CONTRACTOR shall extend fabric to within two inches of the edges of the slab, and lap splices at least two courses of the fabric and a minimum of eight inches. Laps and splices shall be securely tied at ends and at least every 24 inches with 16-gauge black annealed steel wire. Welded wire fabric shall be placed on cement-mortar cubes at the proper distance above the bottom of the slab and supported rigidly. The CONTRACTOR's performance shall be in accordance with the requirements of the WRI Manual of Standard Practice, Welded Wire Fabric, regarding placement, bends, laps, and other requirements. Fabric that has been rolled shall not be used; flat sheets only shall be used.

3.05 FIELD BENDING

Field bending of reinforcing steel bars is not permitted when rebending will later be required to straighten bars.

3.06 FIELD QUALITY CONTROL

- A. Inspection:
 - 1. The OWNER Representative will inspect and approve sub-grade or existing concrete before the installation of reinforcement.
 - 2. The OWNER Representative will inspect all reinforcing installations. The CONTRACTOR shall provide 48 hours notice for inspection of reinforcing bar installation before concrete placement. If installation is not approved, CONTRACTOR shall make corrections and give 24 hours notice for the OWNER Representative's re-inspection. Do not schedule concrete placement without inspection approval
 - 3. Verify placement tolerances are not exceeded.

END OF SECTION

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TECHNICAL SPECIFICATIONS
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PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for anchoring structural steel and metal fabrications to concrete.
- B. Related Sections:
 - 1. Section 01300 – Contractor Submittals.
 - 2. Section 01400 – Quality Control.
 - 3. Section 03200 – Concrete Reinforcement.
 - 4. Section 03300 – Cast-in-Place Concrete.

1.02 SUBMITTALS

- A. General: Make submittals in accordance with Section 01300.
- B. Product Data:
 - 1. Manufacturer's data on drilled dowels.
 - 2. Manufacturer's written instructions for storage, handling, and installation.
- C. Welder Certification.
- D. Weld Procedure Specification.
- E. Source Quality Control Inspection and Test Reports.
- F. Field Quality Control Inspection and Test Reports.

1.03 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A108, Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
 - b. ASTM A563, Standard Specification for Carbons and Alloy Steel Nuts.

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- c. ASTM F436, Standard Specification for Austenitic Gray Iron Castings.
 - d. ASTM F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
 - e. ASTM A36, Standard Specification for Carbon Structural Steel.
 - f. ASTM A307, Standard Specification for Carbon Steel Bolts and studs, 60000 SI Tensile Strength.
- 2. American National Standards Institute/American Welding Society (ANSI/AWS):
 - a. ANSI/AWS D1.1 Structural Welding Code – Steel.
- B. Welder Certification: Current Washington Association of Building Officials certification for each process, method, position, and size of weld executed.
- C. Weld Procedure Specification: ANSI/AWS D1.1.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast-in concrete anchor materials to the fabricator tied and identified with plastic tags indicating the mill, melt or heat number, and the grade and size of bar.
- B. Store and handle post-installed concrete anchors in conformance with manufacturer's written instructions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cast-in Concrete Anchors:
 - 1. Anchor Rods:
 - a. Unless noted otherwise: ASTM F1554 Grade 36 with ASTM A563A hex nuts.
 - b. ASTM F1554 Grade 105 with ASTM A563DH heavy hex nuts.
 - c. Washers: ASTM F436.
 - 2. Welded Headed Studs: ASTM A108, grades 1015 through 1020, headed stud type, cold finished carbon steel, AWS D1.1, Type B; with fluxed end conforming to ANSI/AWS D1.1.

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B. Post-Installed Concrete Anchors:

1. Expansion Anchors:

- a. Hilti Kwik Bolt TZ Anchors or approved equal. Provide galvanized carbon steel anchors unless noted otherwise.

2. Adhesive Anchors:

- a. Adhesive: Hilti HIT-RE 500-SD or approved equal.
- b. Threaded rod: Carbon steel: ASTM A36 or A307.

3. Substitute Products: Substitute post-installed concrete anchor products, if submitted, shall have current International Code Council approval for use in cracked concrete.

C. Welding Electrode:

- 1. Match filler metal requirements in conformance with ANSI/AWS D1.4.

D. Fabrication:

- 1. Welded Headed Studs: Weld to structural steel and metal fabrications in conformance with ANSI/AWS D1.1 and manufacturer's written instructions.

2.02 SOURCE QUALITY CONTROL

- A. Visually inspect all shop welds.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cast-In Concrete Anchors:

- 1. Anchor Rods: Install anchors as noted on Contract Drawings. Secure to formwork or reinforcement to prevent movement during concrete placement. Protect threads until structural steel or metal fabrication is installed.
- 2. Other Cast-In Concrete Anchors: Install anchors with fabricated assembly in conformance with manufacturer's recommendations.

B. Post-Installed Concrete Anchors:

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1. Furnish anchors as noted on Contract Drawings. Install anchors in conformance with manufacturer's written instructions.

3.02 FIELD QUALITY CONTROL

A. Post-Installed Concrete Anchors:

1. Provide special inspection of concrete anchor placement.
2. Observe and record product description, including product name, adhesive expiration date, anchor diameter and steel grade, required size of the drill bit, required hole diameter and location, required cleanliness of the hole and required adhesive application.
3. Observe anchor installation for conformance to the approved plans.

END OF SECTION

**TECHNICAL SPECIFICATION
DIVISION 3: CONCRETE
SECTION 03290: JOINTS IN CONCRETE**

PART 1 GENERAL

1.01 SUMMARY

- A. This specification section covers the following items of work:
1. Placing of all construction, contraction and expansion joints in concrete as shown on the Drawings.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of Notice Inviting Bids shall be used.
- B. American National Standards Institute (ANSI):
1. ANSI/NSF Standard 61: Drinking Water System Components – Health Effects.
- C. American Society for Testing and Materials (ASTM):
- | | |
|-----------|---|
| ASTM C570 | Standard Specification for Oil-and-Resin-Base Caulking Compound for Building Construction. |
| ASTM C864 | Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers |
| ASTM D226 | Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing. |
| ASTM D412 | Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension. |
| ASTM D449 | Standard Specification for Asphalt Used in Damp proofing and Waterproofing. |
| ASTM D624 | Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers. |
| ASTM D746 | Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact. |

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ASTM D1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

ASTM D2240 Standard Test Method for Rubber Property - Durometer Hardness.

D. Federal Specifications (FS):

1. FS FF-N-105b, Nails, Brads, Staples and Spikes: Wire, Cut and Wrought.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300, Contractor Submittals at least 60 days in advance of the relevant work commencing or materials being ordered, unless noted otherwise.

B. Submit the following Product Data information:

1. Joint fillers for horizontal, vertical, and sloped joints
2. Preformed control joints
3. Neoprene
4. Waterstops

C. Shop Drawings:

1. Details of waterstop(s) support used in concrete placements to demonstrate that the waterstop(s) will remain secure until complete encasement.
2. Location plan and details of expansion, construction, and contraction joints including type of waterstop to be used, if any.

D. Samples of splice, joint, and fabricated cross section of each size, shape, and fitting of waterstop(s).

E. Quality Control Submittals:

1. Waterstop manufacturer's printed recommendations for product shipment, storage, handling, installation, and repair.
2. Certified copies of test reports of waterstop material from a recognized testing laboratory showing that the material complies with the specifications.

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3. For joint filler and primer, manufacturer's printed recommendations for product shipment, storage, handling, application, and repair.
4. For preformed control joint, manufacturer's printed recommendations for product shipment, storage, handling, application, and repair.
5. For neoprene, manufacturer's printed recommendations for product shipment, storage, handling, application and repair.

PART 2 PRODUCTS

2.01 WATERSTOPS

A. Plastic Waterstop:

1. All waterstops for use at joints shall be made of a plastic compound formed to the size and shape designated on Drawings for the particular joint involved.
2. The basic material shall be polyvinyl chloride (PVC) resin plastic with additional resin, plasticizers, stabilizers, or other materials required to ensure that, when tested, it will be in accordance with the requirements of this specification. All material in waterstops shall be new material. The use of reworked polyvinyl chloride or other substitutes will not be permitted. Waterstop material shall be weather-resistant, shall contain nonmigrating type plasticizers, and shall not be appreciably affected by alkali, acids, or saltwater.
3. The material shall be in accordance with the following:

Table 03150-1			
Item No.	Physical Property	Requirement	ASTM Test Method
1.	Tensile strength	1,800 psi (min.) 2,500 psi (max.)	D412, using Die C
2.	Ultimate elongation	300% (min.)	D412, using Die C
3.	Hardness, using Shore "A" durometer*	70 to 80	D2240
4.	Specific gravity	1.26 (min.)	--
5.	Brittle temperature	-35°F	D746
6.	Tear resistance	300 lbs/in.	D624, using Die B
7.	Water absorption	0.15% (max.)	C570

* The reading shall be taken immediately after firm contact has been established between the presser foot and specimen.

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4. All waterstop material shall be extruded and shall have a uniform cross section. The dimensions and number of corrugations and configurations of the waterstops shall be as shown on the Drawings.
5. Waterstop material, except for factory-made fittings, shall be furnished in rolls. Materials shall be stored in covered warehouses in the manner recommended by the manufacturer. Factory-made fittings shall be stored in their original crates in a similar manner.

2.02 BOND BREAKER TAPE FOR EXPANSION JOINTS

- A. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape, which will satisfactorily adhere to the premolded joint material or concrete surface as required. The tape shall be the same width as the joint.

2.03 PREMOLDED JOINT FILLER

- A. Sponge Rubber: Sponge rubber filler material shall be of the preformed, nonextruding, resilient, nonbituminous type material of the joint dimensions detailed on the Drawings and shall be in accordance with the requirements of ASTM D1752, Type I.

2.04 NEOPRENE

- A. Neoprene shall conform to ASTM C 864 with material conforming to the following physical properties:

Table 03150-2		
Item No.	Physical Property	Requirement
1.	Tensile strength	1,000 psi (min.) 2,500 psi (max.)
2.	Ultimate elongation	350% (min.)
5.	Minimum Temperature	-20°F
6.	Maximum Temperature	170°F
7.	Water absorption	0.15% (max.)

2.05 BOND BREAKER

- A. Bond breaker, except where a tape is specifically called for, shall be either bond breaker tape as specified in this section or a bond prevention material, non-staining type, in accordance with the requirements of Section 03300, "Cast-in-Place Concrete."

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2.06 WATERPROOFING MATERIALS

- A. Hot asphalt shall be in accordance with the requirements of ASTM D449.
- B. Organic felt shall be in accordance with the requirements of ASTM D226, Type II (No. 30).

PART 3 EXECUTION

3.01 GENERAL

- A. Provide joints:
 - 1. As shown on the Drawings.
 - 2. As required for constructability.
 - 3. After favorable review of layout, sequence and concrete placement program.
 - 4. All joint materials installed at CSOS shall be ANSI/NSF Standard 61 approved.
- B. Provide minimum curing times before the second placement:
 - 1. Two days after the first concrete placement at the joint.
 - 2. Ten days after each adjacent concrete placement.
- C. During placement of the new concrete, ensure there are no interruptions to the 14-day curing time and 14-day load restriction plan for the adjacent pours.

3.02 INSTALLATION OF PLASTIC WATERSTOPS

- A. General:
 - 1. The Contractor shall install waterstops where indicated on the Drawings.
 - 2. Waterstops shall be continuous.
 - 3. Unless otherwise shown on the Drawings, all concrete joints less than six inches above adjacent finished grade or maximum water level, whichever is higher, shall conform to the following:
 - a. Horizontal joint waterstops shall be continuous.
 - b. Vertical joint waterstops shall not be terminated at an elevation less than the height mentioned above.

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4. Where construction and expansion joints are not in the same plane, the waterstop shall extend six inches into adjoining walls or slabs.
- B. Fastening Waterstops: All waterstops shall be sufficiently held in place to form a continuous watertight diaphragm in the joint unless otherwise shown on the Drawings. The method to be used to fasten waterstops shall be one of the following methods:
1. Held in place by split bulkheads.
 2. Hog rings shall be secured to the flange on the end of the waterstop.
 3. Any length of waterstop material having been extruded with its center bulb not centered on its transverse axis shall be installed such that the side containing the greater portion of the bulb is at the outside of any curve or bend through which the material is deflected.
 4. Center bulb shall be centered in the joint.
 5. Clearance between waterstops and surrounding reinforcing steel shall be greater than two times the maximum aggregate size. Clearance between waterstop and the concrete surface shall be greater than or equal to the waterstop embedment.
 6. Inserting waterstop in fresh concrete will not be permitted.
 7. Waterstop shall be held in position at right angles to the plane of the joints with hog rings and tie wires. The ends of the wire shall then be fastened to the reinforcement steel on each side of the waterstop. The maximum spacing of tie wires shall be not greater than 18 inches.
 8. Waterstops shall be clean and free from form oil, dirt, mortar, and any other foreign matter prior to installation and during concrete placement. Concrete shall be placed and consolidated in such a way that it is void-free and in intimate contact with both faces of the embedded leg of the waterstop.
- C. Splices and Intersections:
1. Care shall be used in splicing to ensure accurate alignment of configurations without offsets. Any joint showing excessive offset, which, as determined by the Owner Representative, is a result of either poor workmanship or unevenness of material, will be rejected.
 2. All waterstop splices and intersections shall be heat welded with a splicing iron approved by the manufacturer. All splices shall be done in accordance with the printed instructions of the manufacturer. All joints in the waterstop shall be carefully made by fitting the ends of the pieces, after which fusing the pieces

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together with a hot iron or plate shall join the ends. While the ends are still in a soft condition, the ends shall be quickly and tightly pressed together and held tightly until cooled. All welds shall exhibit a continuous bead of excess melted material and shall be free of pinholes and charred or burnt material.

3. Els, crosses, tees, and any other intersection configuration, both edge and flat, shall be factory-made with stub ends of sufficient length to allow for field splicing. Splices, field or shop, shall develop at least 50 percent of the specified minimum tensile strength of the material when tested in accordance with the requirements of these specifications.
4. At the start of the work, the Contractor shall train the crew to make field splices. Training shall be given by a representative of the company supplying the waterstop material.
5. Waterstop coils shall be uncoiled several days before installation.

D. Quality Assurance:

1. All waterstop shop and field joints will be subject to inspection. No waterstop shall be buried in concrete without prior approval by the Owner Representative. The Contractor shall notify the Owner Representative 24 hours in advance of inspection.
2. All joints will be inspected for misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects that would reduce the potential resistance of the material to water pressure at any point. Defects subject to rejection shall include, but not necessarily be limited to, the following:
 - a. Offsets at joints greater than 1/32-inch or 15 percent of material thickness, at any point, whichever is less.
 - b. Crack at joint due to incomplete bond.
 - c. Any combination of a. and b. above which results in a net reduction of the cross-section of the waterstop in excess of 1/32-inch or 15 percent of material thickness at any point, whichever is less.
 - d. Porosity in the weld joint.
 - e. Bubbles or inadequate bonding.

- E.** Damaged waterstops will be rejected; however, if according to the Owner Representative damaged waterstops can be repaired without sacrificing the integrity of

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the affected structural member, repair procedures recommended by the manufacturer, in writing, shall be submitted to the Owner Representative for approval prior to any repair.

3.03 JOINT PREPARATION

A. General:

1. The joints shall be accurately located and constructed to produce straight joints; and shall be vertical or horizontal, except where walls intersect sloping floors.
2. The concrete placement shall not commence until after the joint preparation has been inspected and approved by the Owner Representative.

B. Construction Joints:

1. Before depositing new concrete on or against concrete, which has hardened, clean and roughen the entire surface of the joint exposing clean coarse aggregate solidly embedded in mortar matrix. Provide typically ¼-inch roughness or amplitude of the concrete surface measured from the top of the exposed aggregate to the bottom of pockets between stones. The cleaning method shall be conducted so as not to damage waterstops.
2. Drench the prepared joint with clean water and remove prior to the concrete pour.
3. The Contractor shall roughen the surface of the hardened concrete by one of the following methods:
 - a. Abrasive blasting the concrete and reinforcing dowels after the concrete has fully cured to remove all laitance and spillage, and to expose sound aggregate.
 - b. Water blasting the concrete and reinforcing dowels after the concrete has partially cured to remove all laitance and spillage, and to expose sound aggregate.

3.04 CONSTRUCTION JOINTS

A. General:

1. Produce quality concrete, with full continuity of reinforcing and water tightness across the joints.
2. After the first concrete placement at the joint, do not walk on or disturb any reinforcing extending into the second placement area for at least 48 hours.

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3. Use special care in vibrating adjacent to construction joints to ensure thorough consolidation of the concrete around the waterstops and against the hardened portion of the joint. Additional hand tamping may be required.
4. Construction joints shall be constructed a maximum of 25 feet on center in each direction. The Contractor may install additional construction joints, provided the Contractor obtains the Owner Representative's approval and all such joints are in accordance with the requirements specified herein.
5. The use of starter walls at the base of walls is prohibited.
6. The Contractor shall not change the construction joint locations as shown on the Drawings, without the approval of the Owner Representative.

3.05 EXPANSION JOINTS

- A. The filler material shall be as indicated on the Drawings and shall be cut to the size and shape of the joint surface to be covered and securely held in place. The joints between portions of the joint filler shall be sufficiently tight to prevent mortar from seeping through. The edges of joint filler shall be placed flush with the finished surface of the concrete or to the bottom edge of the chamfers, except where polyurethane sealant is required to be placed, in which case the edge of the joint material shall be trimmed in accordance with details shown on the Drawings. Where the joint filler material abuts a waterstop, it shall be placed snugly against the waterstop to prevent grout from entering the space.
- B. Installation of Premolded Joint Filler:
 1. Expansion joint material shall be fastened by nailing, wiring, or cementing to the first section of concrete placed next to a joint in such manner that grout will not lodge behind the filler sheet or form connecting fins or ridges between the faces of concrete at the joint. After the forms are stripped, all joint fillers shall be trimmed to neat appearing lines, which shall not extend beyond the adjacent concrete surface or sealant space.
 2. Except as otherwise detailed on the Drawings, wherever joint material requires the use of nails, the nails shall be copper in accordance with the requirements of FS FF-N-105b for common copper wire nails.
- C. Joint Sealants:
 1. All expansion joints shall be filled with joint sealant and shall be provided with tapered grooves. The material used for forming the tapered grooves shall be left in place in the groove until after all forms have been removed and the floors or other adjacent areas have been cleaned and swept. After the forms have been removed

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from the grooves, all laitance and fins shall be removed and the grooves shall be abrasive blasted. The sealant shall be placed in accordance with the printed recommendations of the manufacturer; special care shall be taken to properly mix the sealant before its application.

2. Surfaces to accept sealant shall be abrasive blasted, cleaned and primed in accordance with the sealant manufacturer's printed recommendations. Adjacent surfaces shall be protected from blast media.
- D. The Contractor shall install dowels parallel to wall or slab surface and in true horizontal position by securing the dowels tightly in forms with rigid ties. Dowels shall be installed perpendicular to the joint without bending the dowel. The reinforcing steel shall be provided in the concrete as shown to protect the concrete on each side of the dowels and to resist any forces created by joint movement.

3.06 CONTRACTION JOINTS

- A. Contraction joints shall be located where indicated on the Drawings. Concrete to be placed adjacent to a contraction joint shall be smooth formed or placed directly against previously formed concrete coated with bond breaker. Reinforcement to cross the joints as indicated on the Drawings. Where contraction joints are created by formed grooves to reduce the concrete cross-sectional area for continuously placed slabs, 50 percent of the reinforcement shall cross the resulting joint. Where indicated on the Drawings, waterstops shall be placed across contraction joints.

3.07 WATERPROOFING AT JOINTS

- A. The Contractor shall place waterproofing, where shown on the Drawings, at joints in the top slabs of structures or elsewhere, consisting of hot asphalt mopped to the joint followed by two layers of 30-pound saturated felt with a mopped coat of hot asphalt between the layers of felt and another coat of hot asphalt over the top layer of felt. The extent of the waterproofing shall be in accordance with the dimensions shown on the Drawings.

3.08 PREFORMED CONTROL JOINTS

- A. Preformed control joints shall be used only where specifically called for on the Drawings or in these specifications.
- B. The preformed control joints shall be installed straight, flush, or slightly below the top of the slab, and with equipment and methods approved by the manufacturer of the joint material.
- C. Steel preformed tongue-and-groove type shall be adequately braced to withstand pressure of wet concrete.

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3.09 BONDING TO PRE-EXISTING CONCRETE

- A. Mechanically roughen the old surface to a ¼-inch amplitude, as defined in construction joint paragraph above. Apply epoxy bonding material prior to concreting, as recommended by the manufacturer.

3.10 HINGES AND TRANSVERSE JOINTS IN TUNNEL/SHAFT LININGS

- A. The Contractor shall cut the tunnel/shaft linings following the dimensions, spacing and configurations shown on the Drawings.
- B. The Contractor shall use a cutting saw to achieve the depth shown on the Drawings around the entire perimeter of the tunnel/shaft liner.

END OF SECTION

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**TECHNICAL SPECIFICATION
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PART 1 GENERAL

1.01 SUMMARY

- A. This specification section includes but is not limited to requirements for the following items of work:
 - 1. All cast-in-place structures.
 - 2. Pipe encasement, pipe bedding, and culvert headwalls.
 - 3. Pipe support footings.
 - 4. Concrete slabs.
- B. Furnish all labor, materials, tools, equipment and other services necessary for supplying, placing, and consolidating concrete for structures required for the Contract work.
- C. Provide concrete mix design, concrete placement and patching, grouting, sealants and methods of crack repair.
- D. Provide methods of concrete finishing and curing.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of Notice Inviting Bids shall be used.
- B. American Concrete Institute (ACI):
 - 1. ACI 117: Specifications for Tolerances for Concrete Construction and Materials and Commentary.
 - 2. ACI 301: Specifications For Structural Concrete.
 - 3. ACI 304: Measuring, Mixing, Transporting and Placing Concrete.
 - 4. ACI 305R: Hot Weather Concreting.
 - 5. ACI 306R-88: Cold Weather Concreting.
 - 6. ACI 308: Standard Specification for Curing Concrete.

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7. ACI 309: Guide for Consolidation of Concrete.
8. ACI 318: Building Code Requirements for Reinforced Concrete and Commentary.
- C. American Public Works Association, Southern California Chapter (APWA):
 1. Standard Specifications for Public Works Construction (SSPWC).
- D. American Society for Testing and Materials (ASTM):
 1. ASTM C31: Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 2. ASTM C33: Standard Specification for Concrete Aggregates.
 3. ASTM C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 4. ASTM C94: Standard Specification for Ready-Mixed Concrete.
 5. ASTM C117: Standard Test Method for Materials Finer than 75 μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 6. ASTM C131: Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 7. ASTM C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 8. ASTM C143: Standard Test Method for Slump of Hydraulic Cement Concrete.
 9. ASTM C150: Standard Specification for Portland Cement.
 10. ASTM C171: Standard Specification For Sheet Materials For Curing Concrete.
 11. ASTM C172: Practice for Sampling Freshly Mixed Concrete.
 12. ASTM C260: Standard Specification for Air-Entraining Admixtures for Concrete.
 13. ASTM C289: Test Method for Potential Reactivity of Aggregates (Chemical Method).
 14. ASTM C295: Standard Guide for Petrographic Examination of Aggregates for Concrete.

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15. ASTM C309: Standard Specification For Liquid Membrane-Forming Compounds For Curing Concrete.
 16. ASTM C494: Standard Specification for Chemical Admixtures for Concrete.
 17. ASTM C595: Specification for Blended Hydraulic Cement.
 18. ASTM C618: Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 19. ASTM C856: Standard Practice for Petrographic Examination of Hardened Concrete.
 20. ASTM C1077: Practice for Laboratories Testing Concrete and Concrete Aggregates for use in Construction and Criteria for Laboratory Evaluation.
 21. ASTM C1240: Standard Specification For Silica Fume Used in Cementitious Mixtures.
 22. ASTM C1260: Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Mortar-Bar Method).
 23. ASTM D994: Standard Specification For Preformed Expansion Joint Filler For Concrete (Bituminous Type).
 24. ASTM D1751: Standard Specification For Preformed Expansion Joint Filler For Concrete Paving and Structural Construction (Non-extruding and Resilient B.
 25. ASTM D1752: Standard Specification For Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers For Concrete Pavement and Structural Construction.
 26. ASTM D3406: Specification of Joint Sealant Hot Applied Elastomeric Type for Portland Cement Concrete Pavements.
 27. ASTM D2419: Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- E. State of California, Department of Transportation (CALTRANS):
1. California Department of Transportation (Caltrans): Test Method No. 109, Method for Testing of Weighing and Measuring Devices.
 2. California Department of Transportation (Caltrans): Test Method No. 217, Method of Testing for Sand Equivalent.

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- 3. Test Method No. 515, Method of Testing for Relative Mortar Strength of Portland Cement Concrete Sand.
- F. U.S. Army Corps of Engineers (USACE) Handbook for Concrete and Cement:
 - 1. CRD-C 61-89A: Test Method for Determining the Resistance of Freshly Mixed Concrete to Washing Out in Water.
 - 2. CRD-C-119: Method of Test For Flat and Elongated Particles in Coarse Aggregate.
 - 3. CRD-C-120: Method of Test For Flat and Elongated Particles in Fine Aggregate.
 - 4. CRD-C-572: Method of Test For Polyvinyl Chloride Waterstop.
 - 5. EM 1110-2-2000: Engineering and Design - Standard Practice for Concrete for Civil Works Structures Proponent.
- G. American Association of State Highway Transportation Officials (AASHTO):
 - 1. AASHTO M182: Burlap Cloth Made From Jute of Kenaf.
- H. International Building Code (IBC) 2006

1.03 SUBMITTALS

- A. Submit in accordance with Section 01300, CONTRACTOR Submittals at least 60 days in advance of the relevant work commencing or materials being ordered, unless noted otherwise.
- B. Submittals shall include the following:
 - 1. Source of fine and coarse aggregate including test results from an approved testing laboratory for all tests required by this section. Once approved, the source of fine or coarse aggregate shall not be changed without written approval of the OWNER Representative.
 - 2. Mix designs for each strength and type of concrete proposed for use. Each mix design shall show clearly where each mix will be used in the work and shall show all ingredients of the mix and shall include:
 - a. Type, brand, source and amounts of cement, silica fume, fly ash, pozzolans, admixtures or other additives. Include mill test reports for cement proposed for use on the project.
 - b. Source and amounts of water and aggregates.

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- c. Sieve analysis of coarse and fine aggregates.
 - d. Representative samples of materials for materials testing and mix proportion testing.
 - e. Combined grading of each mix design.
 - f. Specific gravity of all materials.
 - g. Results of all required tests shall be submitted with the proposed mix design. Refer to Article 1.04 for Quality Assurance requirements.
- 3. Concrete admixture material specifications, instructions for use and material safety data sheets.
- 4. Bond preventer material specifications, instructions for use and material safety data sheets.
- C. Contractor shall submit complete details of their proposed concrete supply source to allow the OWNER Representative to evaluate the acceptability of the plant. The submittal shall include, but not be limited to the following:
 - 1. Name of supplier.
 - 2. Plant location.
 - 3. Plant volume or output quantity.
 - 4. Capacity and number of transit equipment.
 - 5. Estimated travel time from plant to work site.
 - 6. Evidence of National Ready Mixed Concrete Association plant certification or equivalent industry recognized plant certification as approved by the OWNER Representative.
 - 7. Details of the offsite plant's batching and mixing facilities.
 - 8. Details of the means and methods for stockpiling and handling coarse and fine aggregates.
 - 9. Details of sorting, mixing and dispensing of chemical admixtures.

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10. Proposed procedures for mixing and transporting the concrete to the point of placement.
11. Provisions for meeting hot weather concreting requirements.
- D. Certificates of compliance for each load of cement offered for use as detailed in Article 1.04, Quality Assurance.
- E. A delivery ticket with all the information stated in Section 13 of ASTM C94, excepting actual scale weights of materials, shall be furnished to the OWNER Representative with each batch of concrete before unloading at the site.
 1. Provide a print out of the actual scale weights for all loads batched.
- F. Submit placement drawings showing locations of construction joints and control joints; lift sequence; locations of all embedded items, waterstops and block-outs; and estimated volume of concrete to be placed in each lift for the concrete structures as shown on the Drawings.
- G. Submit detailed procedures for the production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather in accordance with ACI 306R. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures. Do not begin cold weather concreting until these procedures have been reviewed and accepted.
- H. Submit the plans and data listed below prior to commencing shaft work. All drawings and calculations submitted to satisfy requirements listed below shall be prepared and stamped by a Civil or Structural Engineer registered in the State of California.
 1. Contractor's method statement for constructing the concrete linings, including transporting, placing and consolidating concrete, sequence of placement, and method of curing.
 2. Contractor's method statement for forming the concrete liner, including spacing and details of transverse construction joints, provisions to prevent uplift and lateral movement of forms, and coordination with reinforcement placement, and placement of embedded parts.
 3. Structural design calculations and drawings for any formwork system prepared by an engineer registered in the State of California.
- I. Samples: Submit any item of product data not fully assembled by a single Manufacturer.

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- J. Tremie Concrete: Submit CONTRACTOR's qualifications showing a minimum of 5 years experience with 3 similar projects in successful tremie concrete placement.

1.04 QUALITY ASSURANCE

- A. Contractor Qualifications: 10 years of experience constructing similar concrete structures.
- B. Construction Standard: Applicable requirements of the IBC, ACI 301, and recommendations of ACI 318.
- C. Concrete Products and Materials Tests: Certified by independent commercial testing laboratories. Submit certification on cementitious products and aggregates performed within the past 6 months.
- D. Concrete Mix Designs: By an independent commercial testing laboratory, complying with ASTM C1077
- E. Concrete Mix Test Results:
1. Submit result statistics of satisfactory mix designs from prior projects.
 2. Submit test results of trial batches prepared for this Contract.
- F. Field Inspection:
1. The CONTRACTOR shall advise the OWNER Representative of his readiness to proceed at least 72 hours prior to each concrete placement. No placement shall be made without the inspection and acceptance of the OWNER Representative.
 2. When forms are removed, void, stone pockets, and other defects shall not be remedied until the OWNER Representative has inspected them and given his direction.
- G. Plant Inspection:
1. The OWNER Representative will have access to and has the right to inspect and approve facilities of suppliers, manufacturers, subcontractors, and CONTRACTORS providing products. Batch plants shall have current weigh-scale certification in accordance with the requirements of Caltrans Test Method No. 109.
 2. Batch plant equipment shall be either semi-automatic or fully automatic, meeting the requirements of ACI 304.
 3. Concrete truck mixers shall be in accordance with the requirements of ASTM C94.

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- H. The CONTRACTOR shall furnish the OWNER Representative with each batch of concrete, before unloading at the site, a delivery ticket with all the information stated in Section 13 of ASTM C94.
- I. Certificates of Compliance: Acceptability of the following materials will be based upon documentation furnished by the manufacturer identifying each batch of material and certifying compliance with the requirements specified:
 - 1. Portland cement.
 - 2. Admixtures and curing materials.
 - 3. Aggregates.
 - 4. Fly ash, silica fume, and pozzolans.
- J. Concrete Tests, as Placed: Performed by Testing Laboratory:
 - 1. Test frequency: Each mix type placed, each day placed.
 - 2. Concrete Sample: ASTM C172. Provide all material required.
 - 3. Compressive strength: A set of four standard 6-inch x 12-inch concrete cylinders will be cast for each 100 cubic yards or fraction thereof.
 - a. Making, storing and initial cure of cylinders: ASTM C31.
 - b. Testing laboratory: Provided by the OWNER
 - c. Final cure and tests of cylinders: ASTM C39. Testing laboratory will transport cylinders from site, cure, test and provide report. Test two cylinders at age of 7-days, and two at 28-days.
 - 4. Slump: Test will be performed on each 50 cubic yards or fraction thereof. Test each sample used for strength tests.
 - a. Test: ASTM C143.
 - b. Results outside the limits indicate possible cause for rejection of concrete as indicated and directed by the OWNER Representative.
- K. Tremie Concrete: The CONTRACTOR or Subcontractor supplying and placing tremie concrete shall be capable of developing a mix design, and batching, mixing, handling and placing tremie concrete; and shall have a record of experience and quality of work using tremie concrete that is satisfactory to the OWNER Representative.

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1.05 TOLERANCES

- A. Tolerances on formed surfaces shall be as specified below:
1. Variation from the plumb: 1/4 inch per 10 feet.
 2. Variation from the level or grades shown on the Drawings: 1/4 inch per 10 feet; 1/2 inch per 20 feet or more.
 3. Variation of linear building lines from established position in plan: 1/4-inch per 10 feet; 1/2 inch per 20 feet or more.
 4. Variation in thickness: minus 1/4 inch; plus 1/2 inch.
 5. Variation in the sizes and locations of sleeves, floor openings and wall openings, and in the thickness' of slabs and walls: minus 1/4 inch; plus 1/2 inch.
- B. Unformed Surfaces:
1. As specified in ACI 117 and ACI 301 for the applicable surface finish.
- C. Evaluation and acceptance of concrete and concrete structures will be in accordance with ACI 301.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, storage, and handling shall be in accordance with the following specific requirements:
1. Cement:
 - a. Bins or silos shall be tight, moisture proof and provide for free movement to discharge opening. Where storage is provided for different types of cement or cementitious materials, different materials shall be isolated to prevent intermingling or contamination.
 - b. Storage bins for bulk cement shall be so constructed that there will be no dead storage and they will be of sufficient capacity to maintain an adequate supply at all times.
 - c. Sack cement or cementitious materials shall be stored in a weather-tight warehouse and cement shall not be stacked more than seven sacks high.
 - d. Upon deliver at the site, store immediately in a dry, weather-tight, properly ventilated structure/container, with adequate provisions for prevention of moisture absorption and overheating of the cement.

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2. Aggregates:
 - a. Procedures shall be implemented for unloading, stockpiling and intra-plant handling of aggregates, such as to prevent harmful segregation, breakage, and inclusion of foreign material. Stockpiles shall be located to prevent contamination and arranged to assure that each aggregate as removed from its stockpile is distinct and not intermingled with others. Separate storage bins or compartments for each size and type of aggregate shall be properly constructed and charged to prevent mixing of different sizes or types.
 - b. Dry sand shall be moistened before handling, when necessary, to prevent segregation.
 - c. For hot weather concreting, the following provisions for aggregate storage and handling, in accordance with the requirements of ACI 305R or other means submitted by the CONTRACTOR and approved by the OWNER Representative, shall be implemented individually or in combination to produce concrete within the specified temperature range:
 - d. Aggregates in storage and conveyors for aggregates shall be shaded;
 - e. Water spray or misting of coarse aggregate stockpiles for evaporative cooling effect. Adequate drainage shall be provided beneath the stockpiles;
 - f. Immersion of coarse aggregates in chilled water and/or processing fine aggregates in chilled water in its final classification;
 - g. Cooling the coarse aggregate while on the belt conveyor enroute to the batch bins by spraying with chilled water;
 - h. Chilling batch water by heat pump technology, liquid nitrogen injection or other such means as approved by the OWNER Representative; and
 - i. Use of ice as batch water provided adequate and reliable means for weighing crushing (uncrushed block ice shall not be allowed), and transporting the ice to the mixer are provided.
3. Water:
 - a. Water shall be in adequate supply, with pressures sufficiently constant or regulated to prevent interference with accuracy of measurement.
4. The CONTRACTOR shall provide facilities for obtaining samples of cement, pozzolan, aggregates, and concrete for their own quality control program and for

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use by the OWNER Representative. The facilities shall be provided at the batching plant.

PART 2 PRODUCTS

2.01 GENERAL

- A. Obtain materials from an established and experienced manufacturer or supplier. Provide new materials of ingredients guaranteed to perform the service required.

2.02 MATERIALS

A. Cement:

1. All Portland cement shall be in accordance with the requirements of ASTM C150 for low alkali cement. Type II cement shall be used unless otherwise specified or permitted by the OWNER Representative. All cement shall be procured from the same mill. The color shall not significantly alter the typical grey concrete color.
2. Pozzolan shall conform to the requirements of ASTM C618, Class N.
3. Blended Cement shall conform to ASTM C595, Type 1P(MS)
4. Fly ash shall be used only when approved by the OWNER Representative. Fly ash and its use shall be in accordance with the requirements of SSPWC, Section 201 1.2.5, Class F fly ash, including the optional requirement for reactivity with cement alkalies, unless otherwise specified. Additional requirements are:
 - a. Loss on ignition shall not exceed 4.0 percent.
 - b. Available alkalies shall not exceed 1.5 percent.
 - c. Sulfur Trioxide (SO₃) shall not exceed 3 percent
 - d. Moisture content shall not exceed 1 percent.

B. Concrete Aggregates:

1. Aggregate Source:
 - a. Fine and coarse aggregate shall be obtained only from sources approved by the OWNER Representative. The CONTRACTOR shall notify the OWNER Representative in writing not less than 30 days prior to use, naming the source of fine and coarse aggregate. Once such notification is given, the source of fine or coarse aggregate shall not be changed without prior written approval of the OWNER Representative. Approval of

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sources shall not be construed as constituting approval of all materials taken from said sources, and the CONTRACTOR shall be responsible for the specified quality of all such materials used in the work.

- b. Aggregate shall not originate from sources susceptible to producing reactive or degenerative rock products.
2. General: ASTM C33:
- a. Provide free from organic materials, waste products, clay balls, shale, and mica and thoroughly washed before use.
 - b. Provide aggregates that do not deleteriously react with the alkalies in the cement.
 - c. Grading: Submit results of sieve analysis. The grading shall conform to ASTM C33 Standard Specification for Concrete Aggregates, in Table 2.
 - d. Reactivity:
 - 1) ASTM C289. Submit graphical data showing compliance.
 - 2) Samples of coarse and fine aggregates shall be tested for alkali-silica reactivity in accordance with ASTM C289. A certification shall be submitted to the engineer for review under Article 1.03 of this Section. A petrographic examination of the coarse and fine aggregates according to ASTM C295 shall be performed to determine the presence of potentially alkali-silica reactive and alkali-carbonate reactive constituents of the aggregates. Fine and coarse aggregate containing more than the following quantities of constituents shall be considered potentially reactive:
 - a) Optically strained, microfractured, or microcrystalline quartz exceeding 5.0% (a common constituent of granite and granite gneiss)
 - b) Chert or chalcedony exceeding 3.0%
 - c) Tridymite or cristobalite exceeding 1.0%
 - d) Opal exceeding 0.5%
 - e) Natural volcanic glass in volcanic rocks exceeding 3.0%

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- 3) ASTM C1260 and ASTM C295 are to be performed by a certified and approved testing laboratory retained by the CONTRACTOR as per Section 01400, "Quality Control" in these Specifications.
 - 4) Aggregates evaluated by ASTM C1260 that exhibit mortar bar expansion at 14 days greater than 0.10%, shall be considered potentially reactive.
 - 5) Aggregates that have shown evidence of reactivity in service shall be considered potentially reactive. Determination of reactivity in structures must include:
 - a) Petrographic analysis of cores by ASTM C856
 - b) Visual examination of cracking and expansion of elements of the structure.
 - c) Evaluation of available data, including construction records
 - 6) Aggregates determined to be potentially reactive with alkalis shall not be used.
3. Coarse aggregates:
- a. When tested in accordance with the requirements of ASTM C131, shall be rejected when the loss exceeds 45 percent by weight at 500 revolutions.
 - b. The CONTRACTOR shall submit to the OWNER Representative certified test results from a certified (Caltrans, ACI or National Institute of Certification of Engineering Technologies, NICET) testing laboratory indicating compliance with the test requirements in ASTM C1260 and other requirements of these specifications.
 - c. The quantity of flat and elongated particles larger than the No. 4 sieve, as determined by USACE CRD C 119, and smaller than the No. 4 sieve, as determined by USACE CRD-C-120, shall not exceed 30 percent in any size group.
 - d. Coarse aggregate shall be gravel, crushed rock, or a combination thereof, and shall be composed of strong, hard, clean, durable uncoated rock, free from alkali. Coarse aggregate shall be washed free of organic or other deleterious matter.

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- e. Deleterious substances: Submit compliance with ASTM C33, Table 3 as follows:
 - 1) Clay lumps and friable particles: Not more than 5 percent
 - 2) Abrasion: ASTM C131: Not more than 45 percent
 - 3) Soundness: ASTM C88: Not more than 10 percent.
 - 4) Cleanness: CALTRANS Test 227. For three tests, not less than 70, with an average greater than 75.
- f. Coarse aggregate shall be washed and, if necessary, shall be uniformly moistened just before batching. Coarse aggregate shall be stored in separate batching bins and batched as required in accordance with the combined grading requirements.
- g. In no case shall the greatest dimension of any aggregate particle exceed 75 percent of the least dimension between reinforcing bars or between reinforcing bars and forms in the area where it is placed. No concrete using aggregates larger than primary size No. 2, as specified in SSPWWC, Section 200 shall be batched or delivered to the work site until the mix design has been submitted to and approved by the OWNER Representative.
- h. Maximum sizes of coarse aggregate for concrete classes shall be in accordance with Table 3300-1:

Table 3300-1	
Concrete Class Designation	Maximum Size
4000A	3/4 inch
4000B	1-1/2 inches
3000A	3/4 inch
3000B	1-1/2 inches
2000A	3/4 inch
2000B	1-1/2 inches

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- 4. Fine Aggregates:
 - a. Fine aggregate (sand) for concrete shall consist of natural or manufactured sand, or a blend of the two fine aggregates, and shall in all cases be washed. The CONTRACTOR shall do all sorting, crushing, screening, blending, washing, and other operations necessary to make the available material in accordance with said requirements. In case the finer particles from the crushed coarse aggregate are to be mixed with the sand from natural deposits, the two products shall be uniformly blended before washing or screening to ensure a combined product of constant composition.
 - b. Fine aggregate shall be of such quality as to develop relative mortar strength of not less than 90 percent when tested in accordance with the requirements of Caltrans Test Method No. 515.
 - c. Deleterious substances: Submit compliance with ASTM C33, Table 1 and as follows:
 - 1) Organic impurities: ASTM C87. Not less than 95% relative strength.
 - 2) Sand equivalent: ASTM D2419 or CALTRANS Test 217. For three tests not less than 70, with an average greater than 75.
 - d. Fine aggregate varying in any respect from the foregoing requirements shall not be used in the work.
 - e. Washed or saturated sand shall be allowed to drain for at least 24 hours to uniform water content before batching.
 - f. Dry sand shall be moistened before handling to prevent segregation.
- C. Bond preventer shall be a nonstaining type, which will provide positive bond prevention. Proposed material will be approved by the OWNER Representative.
- D. All materials required for protection of the concrete shall be available at the project site before cold weather concreting.
- E. Concrete for slabs and other flatwork exposed to cycles of freezing and thawing in a wet condition during the construction period shall be air entrained as specified in ACI 301 even though the concrete may not be exposed to freezing in service.

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2.03 WATER

- A. The water for curing and washing aggregate, and the ice and water for mixing concrete shall be potable, clean, and free from objectionable quantities of organic matter, alkali, salts, oil and other impurities which, in the opinion of the OWNER Representative, might reduce the strength, durability, or otherwise adversely affect the quality of the concrete.
- B. Water and ice shall not contain more than 1000 parts per million of chlorides as Cl nor more than 1,300 parts per million of sulfates as SO₄. In no case shall the water or ice contain an amount of impurities that will cause a change in the setting time of portland cement of neither more than 25 percent nor a reduction in the compressive strength of mortar at 14 days of more than five percent when compared to the results obtained with distilled water.
- C. Water for curing shall not contain any impurities in a sufficient amount to cause discoloration of the concrete or mortar, or produce etching of the surface.
- D. The sources of water and ice shall be approved by the OWNER Representative prior to use and any change in water or ice supply shall be tested by the CONTRACTOR and approved by the OWNER Representative prior to use.
- E. The OWNER Representative may require tests of the water should there be a question of the quality. The CONTRACTOR shall bear the costs for such tests.

2.04 ADMIXTURES

- A. Air-entraining admixture shall be in accordance with the requirements of ASTM C260.
- B. Water-reducing admixtures for concrete shall be in accordance with the requirements of ASTM C494, Type A or D. In addition, all water-reducing admixtures shall be in accordance with the requirements of the following:
 - 1. The admixture shall be a polymer type, a specially manufactured derivative of a hydroxylated carboxylic acid or a lignosulfonate base.
 - 2. The admixture shall contain no calcium chloride.
 - 3. The admixture shall contain no air-entraining agent.
 - 4. High range water reducers shall be sulfonated polymer in accordance with the requirements of ASTM C494, Type F or G second or third generation type. High range water reducing agents added at the batch plant shall be formulated to provide the extended slump retention necessary to place the concrete prior to experiencing loss of slump.

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- 5. Accelerating admixture shall comply with ASTM C494, Type C or E.
- C. No Admixture containing any chloride ions is acceptable
- D. Add admixtures to concrete mix ingredients in liquid form by a special dispensing unit, approved by the manufacturer of the admixture as suitable for accurately dispensing the admixture. Install an alarm or indicator which will immediately inform the batch plant operator if the dispensing unit malfunctions. Dispense admixtures uniformly into the mixing water as it is added to the concrete batch. Confirm that the strength of the concrete containing the admixture, at the age of 48 hours and longer, be not less than that of similar concrete without the admixture.
- E. Tremie concrete shall contain an anti-washout admixture: Master Builder's PS-802 or Sika SC-100, or approved equal.

2.05 DESIGN OF CONCRETE MIX

- A. General:
 - 1. Employ an independent commercial testing laboratory complying with ASTM C1077 and favorably reviewed by the OWNER Representative to design all concrete mixes and carry out all necessary testing.
 - 2. If the testing laboratory has satisfactory mix designs available from prior projects, submit test record statistics to demonstrate compliance with the requirements of this Section.
 - 3. If new mix designs are required, prepare a range of trial batches for each design and submit the mixes that demonstrate satisfactory test results
 - 4. Allow for the variability of concrete strength from test to test by increasing the required average compressive strength over the specified strength as specified in 2006 IBC Section 1905.3 & 1905.6.
 - 5. Design the mixes far enough ahead of concrete placement to allow completion of trial batch testing and submittal of the test results and mix design to the OWNER Representative for review.
 - 6. The CONTRACTOR shall take sole responsibility for selection of laboratory, submittal of materials to laboratory in time for all tests, and overall timing of all aspects of testing program, including submittals.
 - 7. Prepare mix designs for concrete placement by the batch process and/or by pumping, as required, and state the process on the design submittal

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8. Design the mixes to take into account hot or cold weather conditions and the time required to transport the concrete from the mixer to the site and to place within the forms. If accelerating or retarding admixtures will be required for only a proportion of the concrete placements, submit test results that include the full range of options.
 9. Do not exceed the water-cementitious material ratios. Vary the water-reducing admixtures to accomplish an increase in slump or workability time.
 10. Proportion cementitious materials, aggregates, and water by weight.
 11. Check periodically the weight of moisture contained within the stockpiled aggregates. Compensate for this water when proportioning the concrete mix and adjust when change occurs.
 12. Do not use chlorides in any concrete mix.
- B. The CONTRACTOR shall use an approved water-reducing admixture in all concrete except as approved by the OWNER Representative for specific locations.
1. A water-reducing admixture shall be added to the mix in the proportion recommended by current available printed data indicating the basic amounts required to achieve optimum water reduction. Variations in the proportions of the admixture used shall be made whenever, in the opinion of the OWNER Representative, such variations are necessary to maintain uniform requirements under variable temperature conditions. The water-reducing admixture, in suitable dilute form, shall be added to the batch with the mixing water.
 2. When approved by the OWNER Representative, a high range water- reducing admixture may be used to increase the slump above the working limit specified in this section.
- C. The materials for concrete will be proportioned to produce a concrete capable of being deposited so as to obtain maximum density. Where deposited in forms, the concrete shall have maximum smoothness of surface, and have an ultimate compressive strength, at the age of 28 days, as designated by the concrete Class number. Water-cement ratio is determined by weight of water and portland cement or portland cement plus fly ash.
- D. Additional cement will be permitted to obtain a high-early-strength concrete, but the total quantity of cement shall not exceed 700 pounds per cubic yard of concrete, unless otherwise specified or approved by the OWNER Representative. Use of high early strength cement is also acceptable with approval of the OWNER Representative.

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- E. The nominal maximum size of coarse aggregate for any part of the work shall be the largest of the specified sizes whose use is practicable from the standpoint of satisfactory placement of concrete and consolidation of the concrete by vibration.
- F. Accelerators containing chlorides shall not be used. Nonchloride accelerators and high-range water reducers may only be used where approved by the OWNER Representative.
- G. The OWNER Representative may rescind the approval for use of any admixture, which demonstrates incompatibility with the materials being used on the work. Any admixture so rejected shall be replaced with an admixture that demonstrates compatibility.
- H. A starter mix shall be used as the first batch of concrete deposited on hardened concrete in wall forms. The starter mix shall be placed to a depth of two inches over the area of hardened concrete. Starter mix shall be an over sanded mix with one-inch maximum size aggregates, an additional sack of cement (94 pounds) per cubic yard, and a five-inch slump. The total coarse aggregate shall equal 50 percent of the amount of coarse aggregate in the succeeding continuous mix.
- I. Durability:
1. Air content: Provide concrete mixes with air content based on aggregate size as follows:

Table 03300-2	
Nominal maximum size of coarse aggregate, inches	Total air content, % by volume
3/8-inch or 3/4 inch	6
1-1/2 inches	4.5
3 inches	3

2. Water-cement ratio: For concrete that will be exposed to water when the structure is completed, water-cement ratio shall not exceed $0.48 \pm 0.3\%$.
- J. Locations of use: Provide concrete mixes of the following classes for use at the indicated locations; where a specific concrete class is noted on the Drawings and is in conflict with this table, the note on the Drawings will govern:

Table 03300-3		
Location	Class	Slump
Backfill Concrete	2000B	4"

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Concrete for Pipe Bedding	2000A	4"
Tremie concrete	3000A	10"
All other structures	4000A or B	See 3.06.E.2

- K. Use the larger size aggregate unless section dimensions and clear spacing between reinforcing bars, in accordance with ACI 318 requirements, require a smaller size.
- L. Mix Test Requirements:
1. Compression: ASTM C192 for cylinder preparation. ASTM C39 for cylinder tests. Perform three tests after 7 days and three more after 28 days curing.
 2. Slump: Conform to ASTM C143.
 3. Air Content: Conform to ASTM C231.
 4. After favorable review of the mix design, no variations of the constituents are permitted during the project without prior submittal and favorable review.
 5. Tremie mix shall conform to CRD-D 61-89A.

2.06 ACCESSORY MATERIALS

- A. Curing materials:
1. Cure by fog spray, or by one of the following methods after discontinuance of the fog spray:
- B. Liquid Curing Compound: A water-based membrane-forming resin suitable for exterior and interior use as a curing and hardening compound on freshly placed concrete.
1. Provide an emulsion of synthetic resinous solids dispersed in water containing no waxes, paraffin or oils. Provide the fugitive type that will oxidize and disintegrate completely within 60 days when exposed to sunlight in exterior applications or that can be removed by washing with dilute muriatic acid or TSP in interior applications.
 2. Water retention materials: ASTM C309, Type 1 and Type 2. The solid dissolved in vehicle shall be Class B, when tested in accordance with ASTM C156.
 3. Use ASTM 309, Type 2, white pigmented material for exterior applications and use Type 1, clear or translucent material for interior applications.
 4. Comply with the applicable local air quality district.

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- 5. Exterior surfaces: Aqua Resin Cure by Burke; 1100-Clear by W.R. Meadows; or equal.
- 6. Interior surfaces: Spartan-Cote by Burke; Vocomp 20 by W.R. Meadows; or equal.
- C. Sheet Materials: ASTM C 171. Waterproof paper, plastic sheeting or white burlap-polyethylene sheet.
 - 1. Plastic sheeting: fungus-resistant, minimum 4 mil thick, clear and free of defects, having ASTM E96 perm rating of not more than 0.5.
 - 2. Water proof paper: Two layers of non-staining kraft paper laminated with latex adhesive and reinforced with glass in both directions. Seal joints with 2-inch-wide tape with water resistant adhesive.
- D. Wet Blankets: Clean cotton mats (burlap is unacceptable). Provide material free from any substance which will have a deleterious effect on the concrete. Use a thickness sufficient to retain moisture between programmed applications of water.
- E. Color admixture: For underground electrical duct bank red concrete, Conrad Sovig Permatint Integral Pigment No. 1503; or equal. Mix in accordance with manufacturer's instructions for color requirement.

2.07 EPOXY MORTAR FOR REPAIR OF CONCRETE

- A. Epoxy mortar: Non-shrink type cement mortar specifically manufactured for repairing cracked, spalled and worn concrete; Euclid Chemical Co. Epoxy #456 LV Mortar; Sika Chemical Corp., Sikadur Hi-Mod Mortar; Five Star Structural Concrete; or equal.

2.08 READY-MIX CONCRETE

- A. Supply concrete for the project using truck mixers and a ready-mix plant certified by the National Ready-Mix Concrete Association. Submit certification to the OWNER Representative before placing concrete.
- B. Alternatively, qualify the supplier according to ASTM C94 Sections 8 through 11, inclusive.

2.09 SOURCE QUALITY CONTROL

- A. Forms: Verify that components pre-assembled offsite are satisfactory for the purpose. Verify that designs, products and samples have been submitted for product review.
- B. Concrete:

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1. Verify that ready-mix batch plant delivery tickets contain all product information necessary for acceptance of the concrete delivered to site.
2. Verify that the mixing and trucking equipment have adequate capacity to deliver the concrete batches to site on time, thoroughly mixed and discharged without segregation.

PART 3 EXECUTION

3.01 GENERAL

- A. All cast-in-place concrete used in the work shall be ready-mixed concrete produced at a single offsite batching plant. All aspects of the batching, mixing, and transportation (equipment and procedures) are subject to approval by the OWNER Representative.
- B. Concrete formwork shall be in accordance with the requirements of Section 03100, "Concrete Formwork."

3.02 PROPORTIONING CONCRETE MATERIALS

- A. Place no concrete prior to favorable review of submittals for reinforcing steel, materials specified in this Section and the mix design proposed. Unfavorable results of actual pours may require a redesign of mixes.
- B. Make no substitutions to the constituents tested in the design of concrete mixes without favorable review of the revised mix and the new test results.

3.03 SEQUENCE OF PLACING CONCRETE

- A. The CONTRACTOR shall alternate placement of slab, wall, or roof areas, to allow for strength gain and volume change (shrinkage) to take place. The CONTRACTOR shall prepare a schedule for the sequence of placing concrete and obtain the approval of the OWNER Representative. All concrete joints shall be in accordance with the requirements of Section 03100, "Concrete Formwork," and this section. Construction joints for controlling shrinkage shall be provided in floor slabs and intake towers. Construction joints shall be located as shown on the Drawings, or as approved by the OWNER Representative. Intermediate slabs and wall sections shall not be placed until seven days after the adjoining slabs and walls have been placed. Corner sections of the walls shall not be placed until the contiguous wall sections have cured at least 14 days. Unless otherwise shown or approved, joints in slabs shall continue into related walls unless structural requirements dictate otherwise.
- B. When not otherwise shown or specified, concrete slabs shall be constructed in segments not larger than 30 feet by 30 feet. The long dimension of the slab panel shall not exceed

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1.5 times the short dimension unless otherwise approved by the OWNER Representative. Walls shall be constructed in segments no longer than 30 feet.

- C. At the CONTRACTOR's option, a slip form may be used to place the concrete. The CONTRACTOR shall submit all information required to clearly show his proposed overall placement plan, methods and procedures, and equipment which will be used to accomplish the intent of these specifications for the OWNER Representative's review and approval.

3.04 BATCHING AND MIXING OF MATERIALS

A. General:

1. Concrete shall conform to ASTM C94 and to these specifications, except, when a conflict exists between ASTM C94 and these specifications, these specifications shall govern.
2. Concrete shall be discharged at the job within 1-1/2 hours after the water has been added to the cement and aggregates, and prior to stiffening or initial set.
3. Do not add mixing water during hauling. Add water after delivery only when agreed by the OWNER Representative. Should water be added, revolve the mixing drum not less than 30 revolutions at mixing speed after adding and before commencing discharge.
4. Truck mixers shall be equipped with approved revolution counters by which the number of revolutions of the drum or blades may readily be verified. Counters shall be continuously registering types, each mounted in a position permitting its inspection from alongside the truck. The truck water tank system shall be equipped with gauges, which will permit accurate determination of the tank contents.
5. When mixing in a truck mixer, each batch of concrete shall be mixed for not less than 80 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. Total number of revolutions shall not exceed 300. All materials, including mixing water, with the exception of high range water reducers specified herein, shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.
6. The OWNER Representative may increase the mixing time when the discharging and mixing operations fail to produce a delivered batch in which variations of consistency, mix, or grading are within limits specified.

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7. Deliver each load at the job site accompanied by a ticket showing mix design number, volume of concrete, the weight of cement in pounds and the total weight of each ingredient in pounds. Also show the time at which the materials were batched and the reading of the revolution counter at the time the truck mixer was charged.
 8. No re-tempering of partially hardened material is permitted. Do not use partially hardened concrete in the work.
- B. Batching in adverse weather:
1. Cold Weather: Based on ACI 306R, when the air atmospheric temperature is below 55°F, or is likely to fall below 55°F during the 24-hour period after placing, heat the materials before mixing, so that the temperature of the mix when deposited shall be between 60°F and 70°F. Do not heat the mixing water over 140°F. Remove lumps of frozen material and ice from the aggregate before they are placed in the mixer.
 2. Hot Weather: Based on ACI 305R, when the air temperatures are above 90°F, reduce the temperature of the concrete mix by using ice as part of mixing water, and protecting aggregates and cement from direct rays of the sun. Do not place concrete when the air temperature exceeds 80°F.
 3. If the provisions given in 1. and 2. above are not possible or practical, postpone the batching until favorable weather conditions.

3.05 TRANSPORTATION

- A. Transporting Ready-Mixed Concrete to Site:
1. The methods and equipment used for transporting concrete to the site of work and the time that elapses during transportation shall be such as will not cause segregation of coarse aggregate or slump loss in excess of one inch in the concrete as it is delivered into the work. Any concrete that is transported an appreciable distance after mixing shall be agitated in transit, or remixed. Transit mixing and long distance transportation of mixed concrete will not be permitted in any case where control of measurement of cement, aggregates, water, concrete temperature, or any other operation affecting the quality of concrete fails to comply with the requirements set forth elsewhere. Concrete shall be placed before stiffening or initial set has occurred.
 2. Truck mixers and their operation must be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation,

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general mechanical condition of the unit, and clearance of the drum, shall be checked before use of the unit will be permitted.

3. Only the use of agitating equipment for transporting ready-mixed concrete will be permitted. The quality and quantity of materials used in ready-mixed concrete shall be subject to continuous inspection at the batching plant by the OWNER Representative.

B. Pumping of Concrete:

1. General:

- a. The type and operation of any concrete pump or of any pneumatic or other type of placing equipment used on the work shall be subject to the approval of the OWNER Representative. The equipment used in placing the concrete and the method of its operation shall be such as will permit introduction of the concrete into the forms without high velocity. Only experienced operators shall operate placing equipment.
- b. If the pumped concrete does not produce concrete conforming to these specifications, the CONTRACTOR shall discontinue the pumping operation and proceed with the placing of concrete using other methods approved by the OWNER Representative.

2. Pumping Equipment:

- a. The minimum diameter of the hose (conduit) shall be four inches, unless otherwise approved by the OWNER Representative.
- b. Pumping equipment and hoses (conduits) that are not functioning properly shall be replaced.
- c. Aluminum conduits for conveying the concrete shall not be used.

3.06 PLACING CONCRETE

A. Inspection:

1. Unless specifically waived by the OWNER Representative, all formwork shall be inspected and approved prior to placing of concrete. The CONTRACTOR shall notify the OWNER Representative at least 24 hours in advance of all inspections for concrete placements. Prior to such notification all work shall be complete and ready for inspection on that portion of the work for which concrete is to be placed. Any defective or incomplete work discovered by the OWNER Representative shall

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- be corrected in a timely fashion to allow for re-inspection and further corrective action if necessary.
2. Remove hardened concrete and foreign materials from the inner surface of the mixing and conveying equipment. Remove all debris from the space to be occupied by the concrete.
 3. Provide satisfactory redundancy in the delivery system so that work can continue in the event of a breakdown.
 4. The order of placing concrete and the number, type, position, and design of construction joints shall be approved by OWNER Representative. In formed concrete, a transverse construction joint with a roughened face shall be provided at the end of any continuous placement.
 5. Concrete shall be placed as soon as possible after leaving the mixer without segregation or loss of ingredients.
 6. Concrete shall not be dropped through reinforcement or into any deep form, whether reinforcement is present or not, so as to cause segregation, nor shall concrete be placed in any form in such a manner as to leave an accumulation of mortar on the form surfaces above the placed concrete. Hoppers and, if necessary, vertical ducts of canvas, rubber, or metal (non-aluminum) shall be used in the forms, or other means shall be employed so that the concrete is deposited, as nearly as practicable, directly in its final position. The concrete shall not be caused to flow such that the lateral movement permits or causes segregation. Clusters of coarse aggregate separated from the concrete mass shall be scattered before the concrete is vibrated. In no case shall the free fall of concrete exceed four feet below the ends of ducts, chutes, or buggies; nor shall the horizontal movement of concrete in the forms exceed five feet.
 7. Do not use aluminum materials in pumping lines, transfer hoppers or chutes longer than 12 feet. Provide conveyor belts instead of chutes when the distance is longer than 50 feet. Use a storage hopper at the start of the line.
 8. For pumped concrete, provide a hose with an angle-change to create a back-pressure at the outlet.
 9. Provide illumination if necessary inside the forms so that the placed concrete will be visible from the deck at the top of the formwork.
 10. Provide thermometer for measuring concrete temperature when weather conditions are predicted to go beyond the range of 50oF to 80oF.

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11. Precautions shall be taken to prevent overloading floors, beams, and other members, and the CONTRACTOR shall comply with the OWNER Representative's instructions respecting the loads, which may be imposed on such members during construction.
12. All concrete shall be placed in continuous, approximately horizontal layers, the depths of which generally shall not exceed 20 inches. The OWNER Representative will require lesser depths where necessary to ensure each new layer being placed while the previous layer is still soft and such that the two layers can be made monolithic by penetration of the vibrators. Concrete placement shall begin at the lowest point in each section of concrete to be placed.
13. All horizontal construction joints, which will be exposed to view, shall be made straight and level. Vertical construction joints shall be plumb.

B. Embedded Items:

1. Before any concrete is placed, reinforcement, anchor bolts, reglets, edge angles, trench angles, sleeves, drains, piping, pipe supports, mounts, electrical conduit, and any other materials and equipment shall be accurately and properly placed in accordance with approved Shop Drawings, or as directed by the OWNER Representative. They shall be secured against displacement with templates or other approved methods during placement of the concrete. Incorrectly located items to be embedded shall be reset as directed by the OWNER Representative. Embedded items shall be kept clear of the reinforcement.
2. Hot-dip galvanize all ferrous metal sleeves, inserts, anchors, and other embedded ferrous items unless shown otherwise. Set anchor bolts for equipment in templates, carefully plumbed and checked for location and elevation with an instrument, and held in position rigidly by double nutting to the template to prevent displacement while concrete is being poured.
3. Move reinforcement bars as necessary to avoid interference with other reinforcing steel, conduits, or embedded items, but not so as to impair design strengths of the member. If bars are moved more than two bar diameters, submit the resulting arrangement of bars for review.
4. Concrete placed around waterstops shall be thoroughly and systematically vibrated to avoid air entrapment and provide positive contact between the waterstop and concrete. Prior to completion of the concrete placement, the exposed portion of the waterstop shall be swept and cleaned of all foreign objects to ensure positive contact between the waterstop and concrete.

C. Surface Preparation:

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1. Immediately before placing concrete, all surfaces of foundations upon or against which the concrete is to be placed shall be free from standing water, mud, and debris. Rock surfaces shall be washed free of all loose material with air-water jets and/or vacuuming. Rock, and all other surfaces upon or against which concrete is to be placed shall, in addition to the foregoing requirements, shall be clean and free from oil; objectionable coatings; and loose, detached, or unsound fragments.
2. Earth surfaces, after being trimmed and compacted in accordance with the requirements of these specifications, shall be thoroughly moistened, but not muddled, by sprinkling prior to the placing of any concrete upon them and shall be kept moist by frequent sprinkling as required up to the time of placing concrete thereon.
3. All vertical surfaces of concrete members shall be formed unless placement of concrete against the ground is shown on the Drawings or is explicitly authorized in writing by the OWNER Representative. The dimensions of concrete members shown on the Drawings shall apply to formed surfaces except where otherwise indicated. Where concrete is permitted to be placed against trimmed ground in lieu of forms the trimmed ground line shall be a minimum of 1 inch in excess of the design lines shown on the Drawings. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to required lines and will stand securely without caving or sloughing until concrete has been placed.
4. All surfaces of forms and embedded items that have been encrusted with dried mortar or grout from concrete previously placed shall be cleaned of all such mortar or grout before the surrounding or adjacent concrete is placed.
5. Concrete surfaces upon or against which new concrete is to be placed and to which new concrete is to adhere, or where the placement of concrete has been stopped or interrupted such that, in the opinion of the OWNER Representative, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of construction joints shall be clean and rough prior to covering with fresh concrete or mortar. Cleaning shall consist of the removal of all laitance, loose or defective concrete and foreign matter. The surfaces of the joints shall be sufficiently rough to assure satisfactory bond with the new concrete. All pools of water shall be removed from the surfaces of construction joints before the new concrete is placed.
6. Where the placing of concrete is to be interrupted long enough for the concrete to take its final set, the working face shall be given a shape by the use of forms or other means that will secure proper union with subsequent work.
7. Where new concrete is to be placed against concrete in existing structures or against new concrete that is more than 30 days old or against concrete that has

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been permitted to dry out, the surfaces shall be roughened and cleaned as specified herein, and in addition thereto, the surfaces shall be kept thoroughly wet during the 24 hour period immediately prior to the placement of the new concrete. This wetting shall be accomplished by continuous sprinkling or by covering exposed surfaces with burlap, or by packing holes full of burlap and keeping the burlap wet. All existing projecting steel bars to be embedded in new concrete shall be cleaned.

8. Before new concrete is placed on old concrete, the bonding surface of the old concrete shall be roughened to enhance the joining of old-to-new concrete. The surface shall be roughened to create a profile of approximately 1/4 inch using abrasive blasting or high-pressure water blasting techniques.
9. Bond-preventer compound to be applied to the surfaces of concrete at joints to prevent bonding, as shown on the Drawings, shall be applied in accordance with the manufacturer's printed instructions, except that the compound shall be applied by brush. Care shall be taken to keep the compound off the surfaces of the grooves in which sealant is to be placed. Bond preventer shall be used only where permitted by the OWNER Representative.
10. No concrete shall be placed until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes or other means and carried out of the forms, clear of the work. No concrete shall be deposited under water nor shall the CONTRACTOR, without explicit permission, allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Tremie concrete is an exception to this requirement.
11. Placing of concrete will not be permitted to begin during any rainfall. If rain should fall during or subsequent to placement, the concrete shall be completely protected until curing is complete.
12. When concrete slabs or other unformed concrete are placed under warm, dry, dusty or windy conditions, the CONTRACTOR shall protect the concrete surfaces from rapidly drying by providing windbreaks, shading, fogging with properly designed nozzles, or any combination of these methods. Proper dust control shall be provided in the surrounding areas during such placement. If, in the opinion of the OWNER Representative, these conditions are not satisfactorily met, concrete shall not be placed.
13. No concrete shall be placed until all formwork, installation of parts to be embedded, and preparation of surfaces involved in the placing have been approved by the OWNER Representative.

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14. Remove all snow, ice, and frost from the surfaces, including reinforcement, against which the concrete is to be placed. Before beginning concrete placement, thaw the subgrade to the depth at which the subgrade is not frozen. Do not place concrete around massive embedments unless such embedments are at a temperature above freezing.

D. Temperature:

1. The temperature of concrete as placed shall not be more than 75 degrees F. Hot weather concreting shall comply with ACI 305R. When the temperature of the materials or the probability of increases in ambient air temperature indicates a temperature of concrete, as placed, above 75 degrees F, the CONTRACTOR shall employ effective means to maintain the temperature of concrete within the specified limits, such as pre-cooling aggregates and mixing water, using ice as part of the mixing water, shading of aggregates, or placing at a time of day when the ingredients will not produce concrete above 75 degrees F. Any wetting of aggregates for cooling shall be performed sufficiently in advance of delivery into the batching plant bins and in such manner that the batched material will have a uniform and stable water content.
2. The CONTRACTOR shall submit to the OWNER Representative its method of obtaining and maintaining the required concrete temperature.
3. Placement Temperature: The minimum temperature of concrete immediately after placement shall be as specified in Column 2 of Table 3300-4. The temperature of concrete as placed shall not exceed the values shown in Column 2 of Table 3300-4 by more than 20 degrees F.

Table 3300-4		
Least Dimension of Section (in)	Minimum temperature of concrete as placed and maintained during the protection period (°F)	Maximum gradual decrease in surface temperature during any 24 hour after end of protection (°F)
Less than 12	55	50
12 to less than 36	50	40
36 to 72	45	30
Greater than 72	40	20

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4. Protection temperature: Unless otherwise specified, the minimum temperature of concrete during the protection period shall be as shown in Column 2 of Table 3300-4. Temperatures specified to be maintained during the protection period shall be those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air. Measure the temperature with a surface temperature measuring device having an accuracy of $\pm 2^{\circ}\text{F}$. Measure the temperature of concrete in each placement at regular time intervals not less than twice per 24 hour period.
5. Termination of protection: The maximum decrease in temperature measured at the surface of the concrete in a 24-hour period shall not exceed the values shown in Column 3 of Table 3300-4. Do not exceed these limits until the surface temperature of the concrete is within 20 degrees F of the ambient or surrounding temperatures. When the surface temperature of the concrete is within 20 degrees F of the ambient or surrounding temperature, all protection may be removed.

E. Consistency:

1. The quantity of water entering into a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which, can be worked properly into place without segregation and which can be compacted to give the specified density, impermeability, and smoothness of surface. The quantity of water shall be changed as necessary with variations in the nature or water content of the aggregate, to uniformly produce the desired consistency.
2. Except as indicated in Article 2.05. J, the slump of the concrete immediately prior to placing shall be in accordance with the limits in the table below, measured in inches.
 - a. The slump, as indicated herein, shall be measured in accordance with the methods prescribed in ASTM C143.
 - b. The "Working Limit" is the maximum slump permissible for estimating the quantity of mixing water to be used in the concrete. The specified slump will be the minimum slump that will enable placing and consolidating concrete as specified and will be less than the "Working Limit." The "Inadvertency Margin" is the allowable deviation from the "Working Limit" for such occasional batches of concrete as may inadvertently exceed the "Working Limit." Batches of concrete with slumps above the working limit will be rejected if the frequency of their occurrence exceeds 50 percent of the slumps measured. Concrete with a slump exceeding the "Rejection Limit" shall not be used for the work. Concrete that has been rejected for failure to meet slump limits shall not be salvaged for use in the work. Increased mixing time, addition of dry

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materials, or similar modifications of a rejected batch for the purpose of conforming to slump limits will not be permitted.

Type of Concrete	Working Limit	Inadvertency Margin	Rejection Limit
Top of walls and horizontal or nearly horizontal slabs	2	1	3
Structure walls 12 inches thick or less	4	1	5
Structure walls greater than 12 inches thick	3	2	5

3. The retempering of concrete or mortar will not be permitted. Any concrete or mortar, which has stiffened so that proper placement and consolidation cannot be assured, shall be wasted.

F. Placing:

1. Transfer the concrete to the place of final deposit as rapidly as practical by methods which can prevent the separation or loss of ingredients. Under no circumstances shall partially hardened concrete be deposited. Deposit concrete in the forms as close to its final position as practical to avoid rehandling. Maintain, until the completion of the pour, a plastic concrete surface, approximately horizontal.
2. Deposit concrete without segregation of the aggregate and without displacement of the reinforcement.
3. Deposit concrete continuously or in layers 12 to 20 inches in depth so that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously as originally planned, locate construction joints during the placement.
4. Use every means to secure a dense, impervious, homogeneous concrete, free from voids or pockets. If honeycomb, air, or rock pockets occur, repair the structure to the complete satisfaction of the Engineer, and modify the placing method or mix design, to prevent recurrence of deficient concrete. Provide such repairs and modifications at no additional cost. Extensive honeycomb or pockets may be cause for rejection of the work.

- G. Time Limit:** Place all concrete in its final position in slab or forms within 1-1/2 hours of batching.

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- H. Structural concrete placement in vertical forms shall be started with a starter mix. This mix shall be placed two inches deep on the construction joint. A mortar layer shall not be used. This starter mix shall be omitted in open work in which the regular mix can be readily placed on the construction joint without loss of mortar and shall be thoroughly vibrated.
- I. The CONTRACTOR shall protect all concrete against damage from inclement weather, excessive heat, overstress, lack of moisture, or any other cause until final acceptance by the OWNER Representative. Special care shall be taken to prevent the drying out of concrete during the curing period and to avoid roughening or otherwise damaging the surfaces.
- J. Tremie Concrete Placement:
 - 1. The CONTRACTOR will be required to maintain a record of theoretical concrete quantity versus placement depth during the tremie operation, and to carefully monitor the top of concrete elevation versus the depth of tremie embedment while pulling the tremie out. The CONTRACTOR shall also verify concrete placement up to the intended level to fully encapsulate the reinforcing cage.
 - 2. At the start of tremie concrete placement, a “go-devil” such as a vermiculite plug should be used to separate the concrete and standing water in the forms or pile casings.
 - 3. Tremie shall be placed through a water-tight tube fitted with a valve or other device so that at no time does concrete in the tube come in contact with water when it is being filled.
 - 4. The means of supporting the tremie is such as to permit free movement of the discharge end and to permit its being lowered rapidly when necessary to choke off or retard the flow of concrete.
 - 5. Water shall not be permitted to enter the tremie tube.
 - 6. The discharge end of the tremie tube is completely submerged in concrete at all times and the tremie tube is always filled to a height to overcome the head of water.

3.07 CONSOLIDATION

- A. The CONTRACTOR shall consolidate all concrete, including lean concrete and sand/cement slurry, with internal vibrators having a frequency of a least 7,000 vibrations per minute, with amplitude adequate to consolidate the concrete in the section being placed. At least one standby vibrator in operable condition shall be at the placement site prior to placing the concrete. Consolidation equipment and methods

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shall be in accordance with the requirements of ACI 309. The forms shall contain sufficient windows or be limited in height to allow visual observation of the concrete and the vibrator operator shall be required to see the concrete being consolidated to ensure good quality workmanship.

- B. Concrete shall be consolidated by vibration to the maximum practicable density so that it is free from pockets of coarse aggregate and entrapped air and closes snugly against all surfaces of forms and embedded materials. In consolidating each layer of concrete, the vibrator shall be operated at regular and frequent intervals and in as nearly a vertical position as practicable.
- C. The vibrating head shall be allowed to penetrate deeply and revibrate concrete in the underlying layers. The vibrator shall then be withdrawn at a slow rate, which will allow the escape of entrapped air to the surface of the lift. The top layer of each placement shall be revibrated systematically at the latest time the concrete can be made plastic by means of vibration. Layers of concrete shall not be placed until the layers previously placed have been vibrated thoroughly as specified. Care shall be exercised to avoid contact of the vibrating head with the surfaces of the forms. Consolidation of concrete shall be by electric or pneumatic drive vibrators of sufficient power and capacity to consolidate the concrete effectively and quickly.
- D. Vibration of the formwork will not be permitted.
- E. When required by the OWNER Representative, the top two feet of walls shall be revibrated approximately one hour after placement of concrete, while a running vibrator will still sink under its own weight into the concrete and liquefy it momentarily.
- F. The number of vibrators employed shall be sufficient to consolidate the incoming concrete within 15 minutes after it is deposited in the forms.
- G. When required, supplement by hand spading and tamping. Consolidate slabs 6-inches or less in depth by hand tampers, spreading and settling with a heavy leveling straightedge.
- H. Furnish sufficient vibrators to complete the compaction as specified without causing delay in the depositing of concrete. Provide at least one spare unit for each structure when concrete is being placed and at least one vibrator for each 25 cubic yards per hour of concrete placement.
- I. Vibrate by direct action in the concrete for approximately 10 seconds at approximately 12-inch intervals, not against forms or reinforcements. Do not move concrete horizontally by vibration. Work the concrete around the reinforcement, and around embedded fixtures and into the corners of the forms. Penetrate 6 to 12 inches into previously poured layers as new layers are poured, provided the running vibrator penetrates by its own weight. To secure even and dense surfaces, free from aggregate

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pockets, honeycomb, or air pockets, supplement vibration when required by forking or spading by hand or hammering the forms lightly opposite the freshly deposited concrete. Revibrate the final layer. Stop vibrating when concrete is thoroughly compacted and has ceased to decrease in volume and give off air bubbles.

- J. When placing concrete with 8-inch or more slump, reduce the time of vibration to 5 seconds and follow the admixture manufacturer's recommendations for technique.

3.08 REPAIR OF DEFECTIVE CONCRETE

- A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground down in a satisfactory manner so as to secure a smooth, uniform, and continuous surface.
- B. Plastering or coating of surfaces to be smoothed will not be permitted.
- C. No repairs shall be made until after inspection by the OWNER Representative.
- D. Any concrete found to be damaged; or which may have been originally defective; or which becomes defective at any time prior to the final acceptance of the completed work; or which varies from the established line or grade; or which, for any other reason, is not in accordance with the specifications, shall immediately be satisfactorily repaired, or removed and replaced with acceptable concrete.
- E. Only water cure will be permitted on areas requiring treatment of surface defects until such treatment has been satisfactorily completed.
- F. Concrete containing voids, holes, honeycombing, or similar depression defects shall be completely removed and replaced; provided, that where required or approved by the OWNER Representative, defects shall be repaired with pneumatically applied mortar.
- G. Surface and near-surface air voids resulting from improperly performed vibration shall be treated as defective concrete and shall be filled with dry-packed mortar or removed and repaired when deemed appropriate in the OWNER Representative's opinion.
- H. In no case will patching of honeycombed concrete be permitted.
- I. All repairs and replacements herein specified shall be promptly executed by the CONTRACTOR.
- J. It is the intent of these specifications that repairs are made, if possible, while the base concrete is still uncured (green).
- K. Minor Defects:

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1. Clean thoroughly, including removal of any curing compound. Cut out to solid concrete but to a depth of not less than 1 inch. Prepare the edges of the cut slightly more than perpendicular to the surface of the concrete, so as to form a key.
 2. Repair with cement mortar. Use minimum water, consistent with the requirements of handling and placing. Thoroughly compact the material into place and screed off to leave the patch flush with the surrounding surface.
 3. Keep the surface damp for at least 48 hours.
 4. Feathered edges will not be permitted.
 5. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32 inch depth of the surface film from all hard portions, by means of an efficient sandblast.
 6. After cutting or sandblasting, the surfaces shall be wetted sufficiently in advance of concrete placement so that, while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the adhesion upon which a good bond depends.
 7. The material used for repair purposes shall consist of a mixture of one sack (94 pounds) of cement to three cubic feet of sand.
 8. On exposed work where required by the OWNER Representative, the cement shall contain such a proportion of an approved white Portland cement as is required to make the color of the patch match the color of the surrounding concrete.
- L. Holes left by the removal of tie rods or fasteners from the ends of the tie rods shall be properly reamed with suitable toothed reamers before being filled with dry-packed mortar.
1. After being reamed as specified, holes left by tie-rod cones or tie-rods and other imperfections having a depth greater than their least surface dimension shall be repaired in an approved manner with dry-packed mortar.
- M. Major Defects:
1. Large areas involving voids or rock pockets extending through the section may be cause for rejection of the work.
 2. For the major defects, the CONTRACTOR shall submit the fix method to the OWNER Representative for review and approval.

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3. If acceptable repairs can be made without adversely affecting the structural integrity of the work, cut out the section and either dry pack, or reform or re-pour to match the adjacent concrete. Do not cut the reinforcing but cut keyways into the adjacent sound concrete to securely fasten the patch to the original work. Prepare edges of the damaged area with a minimum of 1 inch cut perpendicular to the concrete surface.
 4. Coat all surfaces with epoxy bonding compound immediately prior to patching. Place the concrete patch before the epoxy has set. Follow the epoxy bonding manufacturer's recommendations.
 5. Provide a patch with strength and modulus of elasticity compatible with the parent concrete. Cure in accordance with this specification.
- N. All repairs shall be built up and shaped in such a manner that the completed work shall be in accordance with the requirements for concrete finishes for formed surfaces, using approved methods which will not disturb the bond or cause sagging or horizontal fractures.
- O. Surfaces shall match the finish of the surrounding concrete and shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.
- P. All repairs shall be sound and free from shrinkage cracks and drummy areas after the fillings have been cured and have dried at least 30 days.
- Q. Repairs requiring pressure injection shall be epoxy resin as follows, or equal:
1. Select Products, GP-2000.
 2. Sika Corporation, Sika Dur 35 Hi-Mod Epoxy.

3.09 CONCRETE FINISHES

- A. Finishing of concrete surfaces shall be performed only by skilled workers. Concrete surfaces will be tested by the OWNER Representative to determine that surface irregularities are within the specified limits.
- B. All finished formed surfaces shall conform accurately to the shape, alignment, grades, and sections shown on the Drawings.
- C. Increase the humidity of the air directly above the concrete surface, prior to and during finishing operations by adding a fine fog mist of water to the air with mist nozzles when atmospheric conditions (temperature, humidity, and wind) are such that rapid evaporation of mixing water from the concrete is likely to occur.
- D. Complete all patching and finishing within 10 days after stripping forms.

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- E. The surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind and shall present a finished, smooth, continuous, hard surface.
- F. Precautions shall be taken to ensure that all interior concrete surfaces, which will come in contact with flowing water, have the smooth and even texture produced by the proper use of the forms and the most current means of concrete placement as defined by ACI 304.
- G. Concrete surfaces which will not be in contact with flowing water shall likewise be finished in a good and workmanlike manner and shall be free from unsightly or injurious defects, but will not require the same care specified for the surfaces which will come in contact with flowing water.
- H. External corners shall be rounded or beveled, where required, by the use of molding strips or with suitable molding or finishing tools.
- I. Where grooves are shown on the Drawings they shall be formed by molding strips or other suitable means.
- J. Unformed Surfaces:
 - 1. Floor and flat roof surfaces where drains are provided shall be finished with slope to the drains. Also, concrete walkways and the concrete roofs of all structures shall be sloped to drain, except as otherwise shown on the Drawings. The direction of the slopes and amount of crown shall be as shown on the Drawings, but if not shown, then at a slope of not less than 1/8 inch per foot.
 - 2. The following practices will not be permitted on slab or floor finishes:
 - a. The dusting on of dry cement or sand to absorb excess moisture.
 - b. Excessive troweling or manipulation, which brings water or a large amount of fines to the surface.
 - c. Use of the floor during construction in any manner that leads to marring or staining the finish.
 - d. Addition of water to the surface during the finishing operation.
 - 3. The variation from established elevations for slab or floor surfaces shall not exceed 1/8 inch, and there shall be no offsets or visible waviness in the finished surface.
- K. Steel Trowel Finish:
 - 1. A steel trowel finish shall be provided on all unformed concrete surfaces unless otherwise specified.

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2. In placing the concrete to receive a steel trowel finish, the mix shall be adjusted to prevent water gain on the surface. The concrete shall be brought up evenly to slightly above finished grade and thoroughly compacted by vibrating, tamping, and rolling or other approved means.
 3. The top shall be struck off to accurately established grade strips or grade blocks and the surface floated to bring just enough mortar to the surface for troweling. The surface shall be tested with a straightedge and a template to detect high and low spots which, if found to exceed 1/8 inch in ten feet, shall be eliminated.
 4. As soon as any moisture sheen has disappeared from the floated surface and the concrete has hardened sufficiently to prevent drawing moisture and fine materials to the surface, the surface shall be steel troweled to produce a smooth, hard, uniform finish.
 5. A final steel troweling shall be given after the concrete is so hard that no mortar accumulates on the trowel when it is manipulated to give heavy pressure to compact and harden the surface.
 6. Machine finishing producing equally satisfactory results may be substituted for the finishing process herein prescribed subject to approval by the OWNER Representative.
 7. Excessive undulations and local irregularities in shape, although of smooth appearance, will not be permitted.
 8. The use of a special mortar-finishing coat will not be permitted, but the desired surface shall be obtained by thoroughly working the normal concrete mix. No water will be added to the surface during finishing.
- L. Wood Float Finish:
1. A wood float finish shall be provided on the following unformed concrete surfaces:
 - a. Concrete roof slabs.
 - b. Unformed surfaces of miscellaneous concrete structures not subject to foot traffic, in contact with flowing water, or exposed to view.
 2. Wood float finished surfaces shall be in accordance with the requirements of steel trowel finish except that wood floating shall be substituted for steel troweling.
- M. Broomed Finish:
1. Applies to all exposed unformed surfaces those will experience foot traffic.

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2. Complete the work required under “Preliminary Steps for Other Finishes.”
 3. Apply a second steel troweling after the concrete has set sufficiently so mortar does not adhere to the edge of the trowel and sufficient pressure can be applied to further consolidate the surface.
 4. Apply broom finishing in direction parallel to the slope.
- N. Detail work: Applies to all concrete flatwork and to exposed top edges of all formed concrete.
1. Edging Slabs: Tool a 3/8-inch radius on all exposed edges of slabs, curbs and other exposed horizontal edges unless a formed chamfered edge is called for. Repeat tooling with each floating or troweling operation
 2. Apply a trowel finish to the top of the formed walls.

3.10 CONCRETE TOLERANCES

- A. Tolerance limitations for all structures shall be in accordance with Article 1.05 except that for all elements of the structure the tolerances permitted in the several categories shall not be combined to allow a total combined tolerance greater than that allowable under a single category. :
- B. Where tolerances closer than those given above are necessary to accommodate the installation of all items or equipment, they shall be limited to values compatible with the installation requirements.
- C. Failure of concrete to meet specified tolerances will be grounds for rejection of concrete work.

3.11 CURING AND PROTECTION

- A. General: Maintain concrete above 50°F and below 90°F in a moist condition and without external loadings for 14 days after placement. After the specified initial moist cure, provide further moist curing, impervious-sheeting curing, or application of liquefield membrane-forming compound, as noted.
- B. Application of Pre-Cure Finishing Aid:
 1. Concrete flatwork subject to rapid evaporation due to hot weather, drying winds, and sunlight may be protected with a pre-cure finishing aid. The finishing aid shall form a monomolecular film on the surface of fresh, plastic concrete to retard evaporation.

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2. Immediately following screeding, pre-cure finishing aid shall be sprayed over the entire surface of fresh, plastic concrete flatwork at a rate of not less than 200 square feet per gallon, in accordance with the manufacturer's recommendations. The spray equipment shall have sufficient capacity to continuously spray finishing aid at approximately 40 psi with a suitable nozzle as recommended by the manufacturer.
3. The sprayable solution shall be prepared as recommended by the manufacturer.
4. Under severe drying conditions, additional applications of finishing aid may be required following each floating or troweling, except the last finishing operation

C. Foundations and Slabs:

1. Initial moist cure: Provide a 36-hour uniform spray treatment immediately following final troweling and before the surface can dry out, but after bleeding has stopped. Use clean water and special fog spray nozzles of type and number required to keep entire surface moist. Keep all traffic off the floor surfaces.
2. Continued cure: After 36 hours, continue fog curing, or before the surface dries out, continue curing by one of the following methods for the balance of 14 days.
 - a. Place waterproof curing paper smoothly upon the moist concrete surface with all joints and edges lapped a minimum of 4 inches and continuously sealed with tape. Do not use paper that will leave an impression on the finish. Repair, replace and reseal torn or scuffed sheets.
 - b. Install polyethylene plastic sheeting and maintain in the same manner as curing paper.
 - c. Apply liquid membrane curing compound, if favorably reviewed for this purpose. Apply while slab is still damp from the fog spray.
 - 1) Agitate compound thoroughly by mechanical means during use and apply uniformly in a two coat continuous operation by appropriate power-spraying equipment. Apply the two coats at right angles. Apply between 150 and 200 square feet per gallon of undiluted compound, total coverage. Form a uniform, continuous, coherent film that will not check, crack, or peel and free from pinholes or other imperfections. Apply an additional coat immediately to areas where the film is defective.
 - 2) Keep alternate specified covering readily available for use in the event conditions occur which prevent correct application of the compound at the proper time.

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- 3) Respray surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied (when slab reaches a moist condition and there is no standing water) with two additional coats of curing compound by the foregoing method and coverage.
- 4) Allow foot traffic only after 36 hours of cure time and only when slab is protected with paper or sheeting.
- 5) Allow building material storage only after 14 days of cure time and only on plywood sheets and wood sleepers that spread the load and protect the finish.

D. Walls:

1. When forms are in place, keep concrete damp by spraying the outside and top of the forms with water.
2. When forms are in place, but loosened, keep concrete damp by streaming water down inside the forms.
3. When forms are removed, continue curing by one of the following methods for the balance of the 14 days.
 - a. Provide continuous perforated hose sprays at the top of wall covering the entire wall, both sides, with water.
 - b. Place water-retaining blankets continuously over the wall surfaces and hose periodically with water, 24 hours a day.
 - c. Apply liquid membrane curing compound, if favorably reviewed for this purpose. Follow the procedures for slabs contained in paragraph above.

E. Other Surfaces:

1. Provide a curing program equivalent to either slab or wall system, as appropriate.
2. Include construction joint surfaces when applying curing compound.
3. Cover, or protect joint openings, exposed reinforcing, surfaces to be painted and other areas when curing compound may enter and interfere with a special finish.
4. Remove curing compound sprayed on reinforcing or construction joints by sandblasting after curing is completed, or before placing the next pour. If the cones of tie holes are sprayed with curing compound, lightly ream prior to patching.

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- F. Prevent concrete from drying during the required curing period. If water curing is used, terminate use at least 24-hours before any anticipated exposure of the concrete to freezing temperatures.
- G. Combustion heaters: Vent flue gases from combustion heating units to the outside of the enclosure.
- H. Overheating and drying: Place and direct heaters and ducts to avoid areas of overheating or drying of the concrete surface.
- I. Hot Weather Requirements: Provide additional cooling to concrete when temperatures rise to more than 20°F above the values shown in column 2 of Table 03300-4, or low humidity, wind and temperature combine to cause high surface evaporation, over 0.2 lb/sq. ft./hour:
 - 1. Provide additional water if curing by fog spray or ponding or saturated blankets.
 - 2. Provide shade to surfaces exposed to direct sunlight.
 - 3. Apply an evaporation retarder during the finishing operation, following the manufacturer's recommendation.
 - 4. Maximum air temperature: During the protection period, do not expose the concrete surface to air having a temperature more than 20°F above the values shown in Column 2 of Table 03300-4, unless otherwise specified. The protection period may be reduced to 2 days if use of one or more of the following to alter the concrete mixture is accepted:
 - a. Type III Portland cement meeting the requirements of ASTM C 150.
 - b. A strength-accelerating admixture meeting the requirements of ASTM C 494.
 - c. 100 lb/yd³ of additional cement.
- J. Cold Weather Requirements: Provide adequate equipment for heating the placed concrete during freezing or near freezing weather:
 - 1. Whenever the surrounding air temperature is below 40°F, or may fall below 40°F within the 24-hour period after pouring of concrete, maintain all freshly poured concrete at not less than 50°F for 5 days.
 - 2. Keep the housing, covering, or other protection in place and intact at least 24 hours after the artificial heating is discontinued.

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- 3. Do not use manure, salt, calcium chloride, or other chemicals on the concrete to prevent freezing.
- K. During periods not defined as cold weather, but when freezing temperatures may occur, protect concrete surfaces against freezing for the first 24-hours after placing.
- L. Protection for structural safety: If the concrete strength is required for structural safety, extend the protection period to ensure the necessary strength development. The strength required for formwork removal, for reshoring, or for continued construction shall be not less than 500 psi concrete compressive strength.
- M. Protection deficiency: If the temperature requirements during the specified protection period are not met but the concrete was prevented from freezing, continue protection until twice the deficiency of protection in degree-hours is made up. Deficient degree-hours may be determined by multiplying the average deficiency in temperature by the number of hours the temperature was below the values shown in Column 2 of Table 03300-4.

3.12 FIELD TESTING

- A. The OWNER Representative will make all quality assurance (QA) tests. The CONTRACTOR shall cooperate in the making of such tests by furnishing necessary labor to assist the OWNER Representative in obtaining, handling, protecting, and curing samples at the work site.
- B. The CONTRACTOR shall be responsible for all quality control (QC) tests to determine compliance with these specifications. The CONTRACTOR shall perform quality control tests of concrete at test locations designated by the OWNER Representative to demonstrate compliance with this specification section and Section 01400, "Inspection of the Work and Quality Control."
- C. The determination of compressive strength in pounds per square inch will be made by testing 6 inch by 12-inch cylinders fabricated and cured in accordance with the requirements of ASTM C31 and tested in accordance with the requirements of ASTM C39. The OWNER Representative will make tests and analyses of the aggregate and of the resulting concrete at frequent intervals, and the mixes used shall be changed whenever such change is necessary or desirable in order to secure the required workability, density, impermeability, surface finish, and strength.
- D. Before concrete production is started, the CONTRACTOR shall provide acceptable facilities for obtaining samples of cement, aggregates, and concrete as required. These facilities shall be provided at the batching and mixing plant. Samples of aggregate and samples of concrete shall be furnished as requested by the OWNER Representative.
- E. Frequency of testing is presented in Table 03300-5:

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Table 03300-5		
Test	Test Type	Frequency
Aggregate Testing	QC	One sample of each size aggregate per 8-hour shift. In the first month of production, several samples per shift until production control has reached uniformity
Aggregate Testing	QA	One sample of each size aggregate per every third shift after the first month of production
Aggregate Grading Correlation Tests	QC	Before start of concrete placement and twice a week thereafter while concrete is being placed.
Aggregate Grading Correlation Tests	QA	Before construction and every 60 days while concrete production continues
Aggregate Quality	QC	Initial testing and once a week while concrete is being placed.
Aggregate Quality	QA	Once every two months while concrete is being placed.
Free Moisture on Aggregates	QC & QA	Once per week while concrete is being placed
Slump & Air	QC	Twice per shift for each concrete mixture being placed
Slump & Air	QA	When cylinders for compressive strength are fabricated
Concrete Temperature	QC	Twice per shift when concrete is being placed
Compressive Strength	QC	All other concrete: Once per Shift - 4 cylinders, 1 for information age and 2 for design age as specified by USACE EM 1110-2-2000, Chapter 9
Compressive Strength	QA	One cylinder for every ten cylinders tested by the CONTRACTOR

3.13 FIELD QUALITY CONTROL

A. Concrete Placement:

1. Verify that forms and reinforcement are accurately placed and secured in position. Confirm that both forms and reinforcement have been inspected and approved with all requested corrections, re-inspected and approved.
2. Verify that tie wire ends have been bent back away from the forms.

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3. Verify that all sleeves, castings, pipes, conduits, bolts, anchors, and any other items required, are accurately and securely placed within or on the forms.
 4. Verify waterstop is correctly in place and that splices are watertight.
 5. Verify adequate vibrators used are available.
 6. Verify construction and expansion joint faces have been prepared for the next concrete placement.
 7. Check that the mix design is compatible with the method of placement of the concrete, by pump or by batch.
 8. For wall placements, verify that the modified concrete mix required at construction joints is to be delivered.
 9. Verify the concrete delivered to site is satisfactory, including checks on the batch tickets, quality assurance tests and direct observation of the batches.
- B. Concrete Curing:
1. Verify procedures and equipment are available for controlling concrete temperature during hot and cold weather conditions.
 2. Verify actual time of application of evaporation retardant, fog spray and curing materials for each placement.

3.14 CLEANUP

- A. The CONTRACTOR may be required, at any time prior to final acceptance of the work, to clean all permanently exposed surfaces of concrete.
- B. Upon completion of all work performed under this Section, remove from the site all excess materials, storage facilities and temporary facilities. Smooth and clean all debris in the areas where used for or occupied during concrete construction operations. The site condition shall be cleaned and acceptable to the OWNER Representative.

END OF SECTION

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PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Finishing concrete floors and floor toppings.
 - 2. Floor surface treatment.
- B. Related Sections:
 - 1. Section 03300 - Cast-in-Place Concrete

1.02 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.

1.03 SUBMITTALS

- A. Product Data: Submit data on sealer, curing compounds, compatibilities, and limitations.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit data on maintenance renewal of applied coatings.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.1.
- B. Exterior Flatwork Finishes: Refer to Drawings and Division 2 of specifications.
 - 1. Broom Finish
 - 2. Integral color as identified on drawings.
- C. Floor Finishes:

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1. Trowel with light broom finish.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum of three years of experience.
- B. Applicator: Company specializing in performing work of this section with minimum 3 years' experience.

1.07 MOCK-UP

- A. Construct mock-up area under conditions similar to those which will exist during actual placing, 10 feet long by 10 feet wide, with specified finishes, and coatings applied.
- B. Locate where directed by Architect/Engineer.
- C. Remove mockup when directed by Architect/Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's packaging including application instructions.

1.09 COORDINATION

- A. Coordinate the Work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.01 INTEGRAL COLORING

- A. Integral Coloring: As indicated:
 1. Substitutions: Products by other manufacturers will be considered but are subject to Architect approval and compliance with requirements. Substitutions: Products by other manufacturers will be considered but are subject to Architect approval and compliance with requirements.

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PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify floor surfaces are acceptable to receive the Work of this section.

3.02 FLOOR FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.
- B. Wood float surfaces receiving ceramic tile, with full bed setting system.
- C. Steel trowel surfaces receiving thin set ceramic tile.
- D. Steel trowel with light broom finish surfaces which are indicated to be exposed.
 - 1. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
- E. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on Drawings.

3.03 TOLERANCES

- A. Maximum Variation of Surface Flatness For Exposed Concrete Floors: 1/8 inch in 10 ft.
- B. Correct defects in defined traffic floor by removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

END OF SECTION

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03600: GROUT

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, and incidentals as shown on the Drawings, specified, and required to furnish and install grout.
2. The types of grout include the following:
 - a. Non-Shrink Grout: This type of grout is to be used wherever grout is shown on the Drawings, unless another type is specifically referenced. Two classes of non-shrink grout (Class I and Class II) and areas of application are specified herein.
 - b. Non-Shrink Epoxy Grout (Class III).
 - c. Grout Fill.
 - d. Construction Joint Grout.

B. Application: The following is a listing of typical applications and the corresponding type of grout which is to be used. Unless indicated otherwise, grouts shall be provided as listed below whether called for on the Drawings or not.

Application	Type of Grout
Beam and column (1 or 2 story) base plates and precast concrete bearing less than 16-inches in the least dimension	Non-shrink Class II
Base plates for storage tanks and other non-motorized equipment and machinery less than 30 horsepower	Non-shrink Class I
Machinery over 30 horsepower and equipment under 30 horsepower but subject to severe shock loads and high vibration	Non-shrink Class III
Filling block-out spaces for embedded items such as railing posts, gate guide frames, etc	Non-shrink Class II (Class I where placement time exceeds 15 minutes)
Fills for built-up surfaces less than 4-inches thick	Grout Fill

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Fills for built-up surfaces greater than 4-inches thick	Cast-in-place concrete in accordance with Section 03300, Cast-In-Place Concrete
Any application not listed above, where grout is called for on the Drawings	Non-shrink Class I, unless noted otherwise

1.02 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown on the Drawings or specified.
1. ACI 211.1, Practice for Selecting Proportions for Normal, Heavy-Weight and Mass Concrete.
 2. ACI 301, Specification for Structural Concrete.
 3. ASTM C 33/C 33M, Specification for Concrete Aggregates.
 4. ASTM C 109/C 109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 5. ASTM C 150, Specification for Portland Cement.
 6. ASTM C 230/C 230M, Specification for Flow Table for use in Tests of Hydraulic Cement.
 7. ASTM C 531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical- Resistant Mortars, Grouts, and Monolithic Surfacing, and Polymer Concretes.
 8. ASTM C 579, Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes.
 9. ASTM C 827, Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
 10. ASTM C 882/C 882M, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

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11. ASTM C 937, Specification for Grout Fluidifier for Preplaced-Aggregate Concrete.
12. ASTM C 939, Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
13. ASTM C 1107/C 1107M, Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
14. ASTM C 1181, Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
15. ASTM D 696, Test Methods for Coefficient of Linear Thermal Expansion of Plastics Between -30 degC and 30 degC with a Vitreous Silica Dilatometer

B. Field Tests:

1. Compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the ENGINEER to ensure continued compliance with these specifications. The specimens will be made by the ENGINEER or their representative.
2. Compression tests and fabrication of specimens for non-shrink grout will be performed as specified in ASTM C 109/C 109M at intervals during construction as selected by the ENGINEER. A set of three specimens will be made for testing at seven days, 28 days, and each additional time period as appropriate.
3. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the ENGINEER. A set of three specimens will be made for testing at seven days, and each earlier time period as appropriate.
4. The cost of all laboratory tests on grout will be borne by the OWNER, but CONTRACTOR will assist the ENGINEER in obtaining specimens for testing. However, the cost of any additional tests and investigation on work performed which does not conform to the requirements of the specifications shall be borne by CONTRACTOR. Supply all materials necessary for fabricating the test specimens.

1.03 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
 - 1. For Grout Fill and Construction Joint Grout, copies of grout design mix and laboratory test reports for grout strength tests.
 - 2. Manufacturer's specifications and installation instructions for all proprietary materials.
- B. Reports and Certificates: Submit for approval the following:
 - 1. For proprietary materials, submit copies of manufacturer's certification of compliance with the specified properties for Class I, II, and III grouts.
 - 2. Submit certified testing lab reports for ASTM C 1107/C 1107M (as revised herein) requirements for Class I and II grouts tested at a fluid consistency for temperatures of 45, 73.4, 90°F with a pot life of 30 minutes at fluid consistency.
 - 3. Submit certification that materials meet specification requirements for nonproprietary materials.
 - 4. Submit certifications that all grouts used on the project are free of chlorides or other chemicals causing corrosion.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Grout materials from manufacturers shall be delivered in unopened containers. Containers shall bear intact manufacturers' labels.
- B. Storage of Materials: Grout materials shall be stored in a dry shelter and shall be protected from moisture.

PART 2 PRODUCTS

2.01 GROUTS

- A. General: Non-shrink grout shall be a prepackaged, inorganic, flowable, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each

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class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.

B. Class I Non-Shrink Grout:

1. Class I non-shrink grouts shall have a minimum 28 day compressive strength of 7000 psi. This grout is for precision grouting and use where water tightness and non-shrink reliability in both plastic and hardened states are critical. Refer to areas of application as specified herein.
2. Shall meet the requirements of ASTM C 1107/C 1107M (as modified below) when tested using the amount of water required to achieve the following properties:
 - a. Fluid consistency (20 to 30 seconds) in accordance with ASTM C 939.
 - b. At temperatures of 45, 73.4, and 95°F.
3. The length change from placement to time of final set shall not have shrinkage greater than the amount of expansion measured at 3 or 14 days. The expansion at 3 or 14 days shall not exceed the 28-day expansion.
4. Fluid grout shall pass through the flow cone, with a continuous flow, one hour after mixing.
5. Product and Manufacturer: Provide one of the following:
 - a. Five Star Grout, by Five Star Products, Inc.
 - b. Hi-Flow Grout, by Euclid Chemical Company.
 - c. Masterflow 928, by BASF Construction Chemicals.
 - d. Or equal.

C. Class II Non-Shrink Grout:

1. Class II non-shrink grouts shall have a minimum 28-day compressive strength of 7000 psi. This grout is for general purpose grouting applications as specified herein.

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2. Shall meet the requirements of ASTM C 1107/C 1107M and the following requirements when tested using the amount of water required to achieve the following properties:
 - a. Flowable consistency (140 percent flow on ASTM C 230/C 230M, five drops in 30 seconds.)
 - b. Fluid working time of at least 15 minutes.
 - c. Flowable for at least 30 minutes.
 3. The grout when tested shall not bleed at maximum allowed water.
 4. Product and Manufacturer: Provide one of the following:
 - a. Construction Grout, by BASF Construction Chemicals.
 - b. Five Star Grout, by Five Star Products, Inc.
 - c. NS Grout, by Euclid Chemical Company.
 - d. Or equal.
- D. Class III Non-Shrink Epoxy Grout:
1. Epoxy grout shall be a pourable, non-shrink, 100 percent solids system. The epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted, unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged. The following properties shall be attained with the minimum quantity of aggregate allowed by the manufacturer.
 2. Product and Manufacturer: Provide one of the following:
 - a. Polygrout, by Euclid Chemical Company.
 - b. Five Star SP Epoxy Grout, by Five Star Products, Inc.
 - c. Or equal.

TECHNICAL SPECIFICATIONS**DIVISION 3: CONCRETE****03600: GROUT**

3. The vertical volume change at all times before hardening shall be between 0.0 percent shrinkage and 4.0 percent expansion when measured according to ASTM C 827 (modified for epoxy grouts by using an indicator ball with a specific gravity between 0.9 and 1.1). Alternately, epoxy grouts which maintain an effective bearing area of not less than 95 percent are acceptable.
4. The length change after hardening shall be negligible (less than 0.0006 in/in) and the coefficient of thermal expansion shall be less than 0.00003 in/in/F when tested in accordance to the requirements of ASTM C 531.
5. The compressive creep at one year shall be negligible (less than .001 in/in) when tested under a 400-psi constant load at 140°F in accordance to the requirements of ASTM C 1181.
6. The seven-day compressive strength shall be a minimum of 14,000 psi when tested in accordance to the requirements of ASTM C 579.
7. The grout shall be capable of maintaining at least a flowable consistency for a minimum of 30 minutes at 70°F.
8. The shear bond strength to portland cement concrete shall be greater than the shear strength of the concrete when tested in accordance to the requirements of ASTM C 882/C 882M.
9. The effective bearing area shall be a minimum of 95 percent.

E. Grout Fill:

1. Grout fill shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed as specified herein. All materials and procedures specified for normal concrete in Section 03300, Cast-In-Place Concrete, shall apply except as noted otherwise herein.
2. Grout fill shall contain a minimum of 564 pounds of cement per cubic yard with a maximum water cement ratio of 0.45.
3. Coarse aggregate shall be graded as follows:

US Standard Sieve Size	Percent by weight passing
½-inch	100
3/8-inch	99-100

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No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

4. Final mix design shall be as determined by trial mix design under supervision of the approved testing laboratory.
5. Strength: Minimum compressive strength of grout fill at the end of 28 days shall be 4000 psi.

F. Construction Joint Grout:

1. Construction Joint Grout approximates Type "1" concrete, as specified in Section 03300, Cast-In-Place Concrete, with aggregate coarser than 1/2-inch removed. The mix is to be designed as flowable with a high mortar content. It is intended to be placed over construction joints and mixed with Type "1" concrete as specified in Section 03300, Cast-In-Place Concrete. The mix requirements are as follows:
 - a. Compressive Strength: 4,500-psi minimum at 28 days.
 - b. Maximum Water Cement Ratio: 0.45 by weight.
 - c. Coarse Aggregate: ASTM C 33/C 33M, No. 8 size.
 - d. Fine Aggregate: ASTM C 33/C 33M, approximately 60 percent by weight of total aggregate.
 - e. Air Content: 8±1 percent.
 - f. Minimum Cement Content: 752 pounds per cubic yard.

G. Requirements for Grout Fill and Construction Joint Grout:

1. Proportion mixes by laboratory trial batch or field experience methods, using materials to be employed on the Project for grout required. Comply with ACI 211.1 and report to ENGINEER the following data:
 - a. Complete identification of aggregate source of supply.
 - b. Tests of aggregates for compliance with specified requirements.

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- c. Scale weight of each aggregate.
 - d. Absorbed water in each aggregate.
 - e. Brand, type, and composition of cement.
 - f. Brand, type, and amount of each admixture.
 - g. Amounts of water used in trial mixes.
 - h. Proportions of each material per cubic yard.
 - i. Gross weight and yield per cubic yard of trial mixtures.
 - j. Measured slump.
 - k. Measured air content.
 - l. Compressive strength developed at seven days and 28 days, from not less than three test specimens cast for each seven day and 28 day test, and for each design mix.
- 2. Submit written reports to ENGINEER of proposed mix of grout at least 30 days prior to start of Work. Do not begin grout production until mixes have been approved by ENGINEER.
 - 3. Laboratory Trial Batches: When laboratory trial batches are used to select grout proportions, prepare test specimens and conduct strength tests as specified in ACI 301, Section 4 Proportioning. However, mixes need not be designed for greater than 125 percent of the specified strength, regardless of the standard deviation of the production facility.
 - 4. Field Experience Method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301, Section 4.
 - 5. Admixtures: Use air entraining admixture in all grout. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities and types of admixtures as required to maintain quality control. Do not use admixtures which have not been incorporated and tested in the accepted design mix, unless otherwise authorized in writing by ENGINEER.

2.02 CURING MATERIALS

- A. Curing materials shall be as specified in Section 03300, Cast-in-Place Concrete, and as recommended by the manufacturer of prepackaged grouts.

2.03 CONSISTENCY

- A. The consistency of grouts shall be that necessary to fill the space to be grouted for the particular application completely, and shall conform to the grout manufacturer's written instructions. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as specified herein for the particular application.
- B. The slump for grout fill shall be adjusted to match placement and finishing conditions, but shall not exceed 4-inches.
- C. The slump for Construction Joint Grout shall be 7 ± 1 -inches.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine the substrate and conditions under which grout is to be placed and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.02 INSTALLATION

- A. General:
 - 1. Place grout as shown on the Drawings and in accordance with manufacturer's instructions. If manufacturer's instructions conflict with these Specifications, do not proceed until ENGINEER provides clarification.
 - 2. Manufacturers of proprietary products shall make available upon 72 hours notification the services of a qualified, full time employee to aid in assuring proper use of the product under job conditions.
 - 3. Placing grout shall conform to temperature and weather limitations in Section 03300, Cast-In-Place Concrete.

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03600: GROUT

4. Grout shall be cured following manufacturer's instructions for prepackaged grout and the requirements in Section 03300, Cast-In-Place Concrete, for grout fill.
- B. Columns, Beams, and Equipment Bases:
1. Epoxy grout: After shimming equipment to proper grade, securely tighten anchor bolts. Properly form around the base plates, allowing sufficient room around the edges for placing the grout. Adequate depth between the bottom of the base plate and the top of concrete base must be provided to assure that the void is completely filled with the epoxy grout.
 2. Non-shrink, non-metallic grout: After shimming columns, beams and equipment to proper grade, securely tighten anchor bolts. Properly form around the base plates allowing sufficient room around the edges for placing the grout. Adequate depth between the bottom of the base plate and the top of concrete base must be provided to assure that the void is completely filled with the non-shrink, non-metallic grout.
- C. Construction Joints:
1. Place a 6 inch minimum thick layer of Construction Joint Grout over the contact surface of the old concrete at the interface of horizontal construction joints as specified in Section 03251, Concrete Joints, and Section 03300, Cast-In-Place Concrete.
- D. Grout Fill
1. All mechanical, electrical, and finish work shall be completed prior to placement of grout fill. The base slab shall be given a roughened textured surface by sandblasting or hydro blasting exposing the aggregates to ensure bonding to the base slab.
 2. The base slab shall be thoroughly cleaned and wetted prior to placing grout fill. No grout fill shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat Type II cement slurry shall be broomed into the surface of the slab and grout fill shall be placed while the slurry is still wet.
 3. Grout fill shall be mixed, placed, cured, and finished as required in Section 03300, Cast-In-Place Concrete.

TECHNICAL SPECIFICATIONS**DIVISION 3: CONCRETE****03600: GROUT**

4. The minimum thickness of grout fill shall be 1-inch. Where the finished surface of grout fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3 1/2-inches wide by 2-inches deep.
5. The surface shall be tested with a straight edge to verify that the surface slopes uniformly to drain and to detect high and low spots which shall be immediately eliminated. When the grout fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. During finishing, no water, dry cement, or mixture of dry cement and sand shall be applied to the surface.

END OF SECTION

**TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04060: MASONRY MORTARING**

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies mortar for use in unit masonry structures.

B. QUALITY ASSURANCE:

1. **SPECIAL INSPECTIONS:** Special inspection of masonry work shall be performed by the Special Inspector under contract with the Owner and in accordance with CBC Chapter 17.
2. **COMPRESSIVE STRENGTH TESTS:** Test cylinders shall be provided in accordance with the CBC. The cylinder tests shall be done to verify the compressive strength of the mortar used in construction and the cost of the tests shall be borne by the Contractor.

1.02 REFERENCES

- A. REFERENCE STANDARDS:** The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of the referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall govern.

<u>Reference</u>	<u>Title</u>
ASTM C144	Aggregate for Masonry Mortar
ASTM C150	Portland Cement
ASTM C207	Hydrated Lime for Masonry Purposes
ASTM C270	Mortar for Unit Masonry
ASTM C387	Packaged, Dry, Combined Materials for Mortar and Concrete
ASTM E329	Practice for Use in the Evaluation of Testing and Inspection Agencies as Used in Construction

TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04060: MASONRY MORTARING

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):

1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviation.
2. MANUFACTURER'S DATA:
 - a. Mortar mix design, including admixtures and target strength.

B. LABORATORY TEST REPORTS:

1. Before delivery of materials, independent laboratory reports of the tests specified in the above references shall be submitted. Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project. Test reports are required for the following:
 - a. Cement
 - b. Lime
 - c. Aggregate
 - d. Mortar
 - e. Admixtures
2. The independent laboratory shall comply with the requirements of ASTM E329. The Contractor shall provide the laboratory's services at his expense.

**TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04060: MASONRY MORTARING**

PART 2 -- PRODUCTS

2.01 CEMENT

- A. Portland cement shall be ASTM C150, Type II or Type V, low alkali, containing less than 0.60 percent alkalis. Masonry cement is not acceptable and shall not be used on this job.

2.02 HYDRATED LIME

- A. Hydrated lime shall conform to ASTM C207, Type S. Quicklime or air entraining hydrated lime shall not be furnished.

2.03 AGGREGATE

- A. Aggregate for mortar shall be either natural or manufactured sand conforming to ASTM C144.

2.04 WATER

- A. Water used in mortar and grout shall be taken from a supply distributed for domestic purposes. This water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalies, and organic materials shall not contain more than 1000 mg/1 of chlorides as Cl, nor more than 1300 mg/1 of sulfates as SO₄; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the mortar at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the mortar.

2.05 ADMIXTURES

- A. Mortar shall contain an admixture of Master Builders Omicron Mortar proofing, Sonneborne Hydroxide Powder, or equal.

2.06 MORTAR

- A. Mortar shall consist of specified admixture water, aggregate, cement and hydrated lime conforming to the requirements of the proportion specification in ASTM C270; type M (2500 psi at 28 days) for exterior perimeter walls.

2.07 WATERPROOFING COMPOUND:

- A. Mortar shall contain an admixture of Master Builders Rheomix 235, Sonneborn Hydroxide Powder, or approved equal.

TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04060: MASONRY MORTARING

2.08 MORTAR TYPES:

- A. Mortar shall be ASTM C270, Type M. Waterproofing compound shall be added in accordance with manufacturer's recommendations. Where colored mortar is specified to match the masonry units, add colorant to obtain the color indicated. Colorant shall be alkali-resistant iron oxide based and shall be Sonneborn "Sonobrite," Solomon Grind-Chem Service, Inc., "Concentrated Cement Color," or approved equal.

PART 3 -- EXECUTION

3.01 GENERAL

A. ADMIXTURES

1. Admixtures shall be used in strict accordance with the manufacturer's instructions. Mortar for exposed concrete masonry walls shall have an admixture color to match the masonry units.

B. MORTAR:

1. Mortar shall be machine mixed in a motor driven mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than 5 minutes, approximately 2 minutes of which shall be for mixing the dry materials and not less than 3 minutes for hydrated lime if used for mortar requiring lime content. The Contractor shall have the option of using the dry mixed method of first converting the hydrated lime into a putty. Where the dry mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed dry materials indicates that the cementitious materials has been thoroughly distributed throughout the mass. Water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained. Mortar that has begun to set shall not be used.

C. MORTAR JOINTS:

1. Mortar joints shall be a uniform thickness of 3/8 inch unless otherwise specified. Exposed joints shall be tooled slightly concave with a round or other suitable jointer when the mortar is thumbprint hard except where otherwise required to match existing construction. For horizontal joints, jointers shall be at least 12 inches long for brickwork and 16 inches long for concrete masonry. Jointers shall be slightly larger than the width of the joint so that complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Joints that will not be exposed shall be struck flush. Vertical joints shall be tooled first. Horizontal joints shall be level; vertical joints shall be plumb and in alignment from top to bottom of wall within a tolerance of plus or minus 1/2 inch in 40 feet.

TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04060: MASONRY MORTARING

3.02 INSTALLATION

A. SURFACE PREPARATION:

1. Concrete areas to be in contact with mortar or grout shall be cleaned of all loose or foreign material that would in any way prevent bond between the mortar or grout and the concrete surfaces. All concrete block surfaces shall be flushed with water and allowed to dry to a surface dry condition immediately prior to placing the mortar or grout.

B. PLACEMENT:

1. Mortar shall completely fill and shall be tightly packed into recesses and holes, on surfaces, and under structural members. Jointing and pointing of mortar used for masonry shall conform to the HOLLOW CONCRETE UNIT MASONRY Section (04 22 36).

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

****END OF SECTION****

**TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04070: MASONRY GROUTING**

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies grout for use in unit masonry structures.

B. QUALITY ASSURANCE:

1. **SPECIAL INSPECTIONS:** Special inspection of masonry work shall be performed by the Special Inspector under contract with the Owner and in accordance with CBC Chapter 17.
2. **COMPRESSIVE STRENGTH TESTS:** Test cylinders shall be provided in accordance with the CBC. The cylinder tests shall be done to verify the compressive strength of the grout used in construction and the cost of the tests shall be borne by the Contractor.

1.02 REFERENCES

- A. REFERENCE STANDARDS:** The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of the referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall govern.

<u>Reference</u>	<u>Title</u>
ASTM C150-92	Portland Cement
ASTM C207-91 (1992)	Hydrated Lime for Masonry Purposes
ASTM C270-92a	Mortar for Unit Masonry
ASTM C387-87	Packaged, Dry, Combined Materials for Mortar and Concrete
ASTM C404-92	Aggregates for Masonry Grout
ASTM C476-91	Grout for Masonry
ASTM C1019	Sampling and Testing Grout
ASTM E329-90	Practice for Use in the Evaluation of Testing and Inspection Agencies as Used in Construction

- B. DEFINITIONS:** (Not Used)

TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04070: MASONRY GROUTING

1.03 SUBMITTALS

- A. The following information shall be submitted for review in accordance with the SUBMITTAL PROCEDURES Section (01 33 00):
1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviation.
 2. MANUFACTURER'S DATA:
 - a. Grout mix design, including lime and admixture amounts, and target compressive strength.
 - b. The 28-day compressive strength of the grout mix.
- B. LABORATORY TEST REPORTS:
1. Before delivery of materials, independent laboratory reports of the tests specified in the above references shall be submitted. Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project. Test reports are required for the following:
 - a. Cement
 - b. Lime
 - c. Aggregate
 - d. Admixtures
 2. The independent laboratory shall comply with the requirements of ASTM E329. The Contractor shall provide the laboratory's services at his expense.

PART 2 -- PRODUCTS

2.01 CEMENT

- A. Portland cement shall be ASTM C150, Type II, low alkali, containing less than 0.60 percent alkalis. Masonry cement is not acceptable and shall not be used on this job.

TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04070: MASONRY GROUTING

2.02 HYDRATED LIME

- A. Hydrated lime shall conform to ASTM C207, Type S. Quicklime or air entraining hydrated lime shall not be furnished.

2.03 AGGREGATE

- A. Aggregate for masonry grout shall be either natural or manufactured sand with or without coarse aggregate conforming to ASTM C404.

2.04 WATER

- A. Water used in mortar and grout shall be taken from a supply distributed for domestic purposes. This water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalies, and organic materials shall not contain more than 1000 mg/1 of chlorides as Cl, nor more than 1300 mg/1 of sulfates as SO₄; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the mortar at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the mortar.

2.05 ADMIXTURES

- A. Mortar shall contain an admixture of Master Builders Omicron Mortar proofing, Sonneborne Hydroxide Powder, or equal in accordance with the SUBSTITUTION REQUEST FORM Specification Section. Grout shall contain an admixture of Suconem Grout Aid, Master Builders Pozzoloth-N, or approved equal.

2.06 GROUT

- A. Grout shall consist of specified admixture, water, aggregate, cement and hydrated lime conforming to ASTM C476; Table 1, and shall be proportioned by volume to achieve a minimum 28-day compressive strength of 2,000 psi. Grout shall have sufficient workability to produce a consistency for pouring without segregation. Grout shall contain 4-6% air entrainment. Fine grout shall be composed of one part cement, not more than 1/10 part lime, and 2 ¼ to 3 parts fine aggregate. Coarse grout shall be composed of one part cement, not more than 1/10 part lime, 2 to 3 parts fine aggregate, and not more than 2 parts coarse aggregate.

**TECHNICAL SPECIFICATION
DIVISION 4: MASONRY
SECTION 04070: MASONRY GROUTING**

PART 3 -- EXECUTION

3.01 GENERAL

A. ADMIXTURES:

1. Admixtures shall be used in strict accordance with the manufacturer's instructions. Mortar for exposed concrete masonry walls shall have an admixture color to match the masonry units.

B. GROUT:

1. Grout shall be proportioned by volume and shall have sufficient water added to produce a consistency pouring without segregation. Grout shall be placed by grout pump, concrete hopper or bucket. Coarse grout shall be used in continuous grout spaces 2 inches or more wide and in cells 4 inches by 4 inches or larger. Fine grout shall be used in spaces smaller than those specified for coarse grout. Grout may be placed in the reinforced hollow concrete block wall after the units have been set for at least 24 hours. Grout spaces shall not be wet prior to pouring grout.

3.02 INSTALLATION

A. SURFACE PREPARATION:

1. Concrete areas to be in contact with mortar or grout shall be cleaned of all loose or foreign material that would in any way prevent bond between the mortar or grout and the concrete surfaces. All concrete block surfaces shall be flushed with water and allowed to dry to a surface dry condition immediately prior to placing the grout.

B. PLACEMENT:

1. Grout shall completely fill and shall be tightly packed into recesses and holes, on surfaces, and under structural members. Grouting used for masonry shall conform to the HOLLOW CONCRETE UNIT MASONRY Section (04 22 36).

3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

****END OF SECTION****

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PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. This section specifies the materials and labor required to complete all masonry work as shown on the drawings and as specified herein. Masonry work shall be constructed from concrete masonry units (CMU) in combination with reinforcing, mortar, grout control joints, calking and sealants as shown and specified. The work shall also include the setting and incorporating into the masonry of all bolts, anchors, metal lath, attachments, nailing blocks, inserts, flashing, blockouts and reinforcement as indicated on the drawings and as specified herein.

B. QUALITY ASSURANCE:

1. SPECIAL INSPECTIONS: Special inspection of masonry work shall be performed by the Special Inspector under contract with the Owner and in accordance with CBC Chapter 17.
2. PRISM TESTS: Prism tests shall be provided in accordance with the CBC. The prism test shall be done to verify the compressive strength of concrete masonry assemblage and the cost of the test shall be borne by the Contractor.

1.02 REFERENCES

- A. REFERENCE STANDARDS:** THE PUBLICATIONS REFERRED TO HEREINAFTER FORM A PART OF THIS SPECIFICATION TO THE EXTENT REFERENCED. THE PUBLICATIONS ARE REFERRED TO IN THE TEXT BY THE BASIC DESIGNATION ONLY. THE LATEST EDITION OF THE REFERENCED PUBLICATIONS IN EFFECT AT THE TIME OF THE BID SHALL GOVERN. IN CASE OF CONFLICT BETWEEN THE REQUIREMENTS OF THIS SECTION AND THE LISTED REFERENCES, THE REQUIREMENTS OF THIS SECTION SHALL GOVERN.

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CALIFORNIA CODE OF REGULATIONS TITLE 24, PART 2

<u>Reference</u>	<u>Title</u>
CBC	California Building Code

AMERICAN CONCRETE INSTITUTE

<u>Reference</u>	<u>Title</u>
530/ASCE 6/TMS 602	Building Code Requirements for Masonry Structures & Commentary
530.1/ASCE 6/TMS 602	Specification for Masonry Structures & Commentary
SP-66	ACI Detailing Manual

AMERICAN SOCIETY OF TESTING MATERIALS (ASTM)

<u>Reference</u>	<u>Title</u>
A36/A36M	Standard Specification for Carbon Structural Steel
A82/A82M	Standard Specification for Steel Wire, Plain for Concrete Reinforcement
A153/A153M	Standard Specification for Zinc Coating (Hot-Dip) on

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AMERICAN SOCIETY OF TESTING MATERIALS (ASTM)

<u>Reference</u>	<u>Title</u>
	Iron and Steel Hardware
A325/A325M	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
A563/A563M	Standard Specification for Carbons and Alloy Steel Nuts
A580/A580M	Standard Specification for Stainless Steel Wire.
A615/A615M	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
<u>A641/A641M</u>	Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
<u>A653/A653M</u>	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
<u>A666</u>	Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
<u>A951/A951M</u>	Standard Specification for Steel Wire for Masonry Joint Reinforcement
<u>B633</u>	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
C90	Standard Specification for Load-Bearing Concrete Masonry Units
<u>C91</u>	Standard Specification for Masonry Cement
<u>C109/C109M</u>	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)
C140	Standard Test Methods of Sampling and Testing Concrete Masonry Units
<u>C143/C143M</u>	Standard Test Method for Slump of Hydraulic-Cement Concrete
C426	Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units
C920	Standard Specification for Elastomeric Joint Sealants
<u>C979</u>	Standard Specification for Pigments for Integrally Colored Concrete
<u>C1093</u>	Standard Practice for Accreditation of Testing

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AMERICAN SOCIETY OF TESTING MATERIALS (ASTM)

<u>Reference</u>	<u>Title</u>
	Agencies for Masonry
C1314	Standard Test Method for Compressive Strength of Masonry Prisms
D2240	Test Method for Rubber Property - Durometer Hardness
D2287	Non-rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
E488	Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
F593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
F594	Standard Specification for Stainless Steel Nuts

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA):

<u>Reference</u>	<u>Title</u>
<u>TEK8-2A</u>	<u>Removal of Stains from Concrete Masonry</u>

B. DEFINITIONS:

1. Standard Level of Quality: High quality, but conventional, nearly free of chips, cracks, or other imperfections detracting from appearance when discernible and identified from distance of 20 feet under diffused lighting. When level of quality is not specified, Standard Level of Quality shall be assumed.
2. Mortar Smears: Mortar paste smeared across the permanent masonry construction during construction and absorbed into the masonry pores.
3. Mortar Splash: Mortar dropped splashed onto the permanent masonry construction at the base of the wall or off the scaffolding.
4. Mortar Tag: Excess mortar between masonry units worked out of the joints during tooling or striking.
5. Mortar Stains: Mortar paste left after mortar tags are removed.
6. CMU(s): Concrete masonry unit(s).
7. Exposed: Unpainted, painted, and coated masonry that is exposed to view in completed work.

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8. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.03 SUBMITTALS

- A. THE FOLLOWING INFORMATION SHALL BE SUBMITTED FOR REVIEW IN ACCORDANCE WITH THE SUBMITTAL PROCEDURES SECTION (01 33 00):
 1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviation.
 2. MANUFACTURER'S DATA:
 - a. Concrete masonry units (CMU) including all special shape blocks
 - b. Reinforcement and accessories
 - c. Control joints
 - d. Flashing
 - e. Caulking
 - f. Manufacturers' product data for proposed cleaning agent.
 - g. Submit product data for each type of product proposed for use.
 3. SHOP DRAWINGS:
 4. Shop drawings: Include elevations of each wall indicating type and layout of units, including type of mortar joints, bond pattern, reinforcing steel, connecting dowels, embedded items, joint reinforcement, grouted cells, control joints, expansion joints, penetrations, and geometry of each type of CMU profile to be used.
 5. Manufacturer's instructions:
 - a. Submit printed or written recommendations from the masonry unit manufacturer of the cleaning procedures and cleaning agents appropriate for each type of masonry unit included in the work.
 6. Quality assurance submittals:
 - a. If requested by the Engineer, submit a record of the Installer's evidence of qualifications.

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- b. If requested by the Engineer, submit a record of the Masonry Cleaner's evidence of qualifications.
- 7. TEST REPORTS:
 - a. CMU compressive strength and absorption per ASTM C140.
 - b. CMU linear shrinkage per ASTM C426.
 - c. CMU moisture content as a percentage of total absorption.
 - d. CMU total absorption.
 - e. Unit weight.
- 8. SAMPLES: Include samples of stretcher units in sufficient quantity to illustrate color range.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

1.05 UNIT RESPONSIBILITY (NOT USED)

1.06 QUALITY ASSURANCE

A. QUALIFICATIONS:

- 1. Installer qualifications:
 - a. The mason shall hold an appropriate contractor's license in the State where the work will be constructed.
 - b. The mason shall have not less than 5 years' experience and completed a minimum of 20 projects and at least 5 of which included the type of masonry units specified for this Work.
 - c. The mason shall hold current certification demonstrating successful completion of the quality certification program administered by the Concrete Masonry Association of California or the Mason Contractors Association of America.
- 2. Masonry cleaner qualifications:
 - a. The masonry cleaner shall have not less than 5 years' experience and completed a minimum of 20 projects and at least 5 of which included the type of masonry units specified for this Work.

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1.07 DELIVERY, STORAGE, AND HANDLING

- A. TRANSPORT AND HANDLE CONCRETE MASONRY UNITS AS REQUIRED TO PREVENT DISCOLORATION, CHIPPING, AND BREAKAGE.
- B. STORE MASONRY UNITS OFF THE GROUND IN A DRY LOCATION, COVERED AND PROTECTED FROM ABSORBING MOISTURE.
 - 1. Locate storage piles, stacks, and bins to protect materials from heavy traffic.
 - 2. If masonry units are delivered in shrink-wrapped packaging and condensation develops, remove shrink-wrap packaging.
- C. REMOVE CHIPPED, CRACKED, AND OTHERWISE DEFECTIVE UNITS FROM JOBSITE UPON DISCOVERY.

1.08 ENVIRONMENTAL REQUIREMENTS

A. COLD-WEATHER REQUIREMENTS

- 1. In accordance with the building codes as specified in PERMIT REQUIREMENTS Section (01 41 26), provide adequate equipment for heating masonry materials when air temperature is below 40 degrees Fahrenheit
- 2. Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions.
- 3. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602CSA A370.
- 4. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F (4 degrees C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

B. HOT-WEATHER REQUIREMENTS

- 1. In accordance with the building codes as specified in PERMIT REQUIREMENTS Section (01 41 26), when ambient air temperature exceeds 100 degrees Fahrenheit, or when ambient air temperature exceeds 90 degrees Fahrenheit and wind velocity is greater than 8 miles per hour, implement hot weather protection procedures.
- 2. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602CSA A370.

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3. Wet mortarboard before loading and cover mortar to retard drying when not being used.
4. Do not spread mortar beds more than 48 inches ahead of placing masonry units.
5. Place masonry units within one minute of spreading mortar.

1.09 SEQUENCING AND SCHEDULING

PART 2 -- A. ORDER CONCRETE MASONRY UNITS WELL BEFORE START OF INSTALLATION TO ENSURE ADEQUATE TIME FOR MANUFACTURING AND MINIMUM 28 DAYS FOR CURING AND DRYING BEFORE START OF INSTALLATION. PROTECT FROM WEATHER AFTER CURING PERIOD TO AVOID MOISTURE INCREASE.PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. HOLLOW LOAD BEARING CONCRETE MASONRY UNITS:

1. , Normal weight, double open ended standard units, meeting ASTM C 90, with minimum average net area compressive strength of 2,000 pounds per square inch.
2. Load bearing units of 12 inch width as shown on the Drawings, by 8 inches high by 16 inches long, unless otherwise indicated on the Drawings, or other sizes as needed to minimize cutting.
3. Maximum weights of individual units shall be 32 pounds. Exterior face shall be of the texture and integral colors as called for on the drawings.
4. All concrete blocks shall have a minimum net tensile strength of not less than 135 psi. All concrete blocks shall have a maximum linear shrinkage of 0.055 of 1 percent from saturated to oven dry conditions, when tested in accordance with ASTM C426.
5. CMU shall be free from substances that will cause staining or popouts and shall be fine, even texture with straight and true edges. All units shall have been wet steam cured for at least 18 hours and then air cured in covered storage for not less than 28 days before delivery.
6. All stretchers and special shape units shall be obtained from one manufacturer to insure even color and texture. Provide all special shape CMUs as required for window and door openings, bond beams, piers, lintels, control joints, and other special applications to minimize cutting.

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7. Manufacturers: One of the following or equal:
 - a. Orco Block Co.
 - b. Angeles Block Co.
- B. MASONRY MORTARING: AS SPECIFIED IN MASONRY MORTARING SECTION (04 05 13).
- C. MASONRY GROUTING: AS SPECIFIED IN MASONRY GROUTING SECTION (04 05 16).
 1. Provide mortar and grout for block wall construction as specified in the masonry mortaring section (04 05 13) and the masonry grouting section (04 05 16). Mortar for exposed concrete masonry walls shall be colored to match the masonry units in colors as called for on the drawings.
- D. ANCHOR BOLTS: AS SPECIFIED IN STRUCTURAL METAL FRAMING SECTION (05 10 00).
- E. STEEL REINFORCEMENT: AS SPECIFIED IN CONCRETE REINFORCING SECTION (03 20 00).
 1. Reinforcing steel shall be ASTM A615, Grade 60 as specified in the CONCRETE REINFORCING Section (03 20 00). Reinforcement size shall be as shown on the structural drawings. Deformed reinforcing steel wire shall conform to ASTM A82 with hot dipped galvanizing conforming to ASTM A153, Class B2 (1-1/2 ounces of zinc coating). Furnish prefabricated units with special units for corners and intersections.
- F. WALL TIES: AS SPECIFIED IN CONCRETE REINFORCING SECTION (03 20 00).
 1. Accessories shall be fabricated from steel conforming to ASTM A82 with hot dip galvanized finish conforming to ASTM A153. Accessories shall include 9-gage bar positioners, 1/2 inch square 16-gage wire mesh, 16-gage frame anchors and all other items necessary to complete the masonry construction.
 2. Furnish accessories manufactured by Dur-O-Wal, Inc., AA Wire Products Co., or equal.
- G. LOOSE FILL INSULATION: AS SPECIFIED IN CONCRETE REINFORCING SECTION (03 20 00).
- H. CONTROL JOINTS:

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1. Vertical control joint material shall be fabricated from PVC 654-4 conforming to ASTM D2287. Minimum durometer hardness shall be 85 when tested in accordance with ASTM D2240. Furnish Dur-o-Wall Rapid Poly-joint PVC, AA wire products co., Block-Tite PVC, or equal.

I. FLASHINGS

1. Foundation, head and sill flashing shall be fabricated from 20 mil PVC. Adhesive shall be specially designed to bond PVC. Furnish AA Wire Products Co. AA3250 series, or equal.

J. CALKING

1. Provide control joint and miscellaneous calking as specified in the JOINT SEALANTS Section (07 92 00).

K. WATER REPELLENT

1. Water repellent shall be Fabrishield® 653 Siloxane/Quartz Water Repellent as manufactured by Fabrikem Manufacturing Ltd., Chemstop WB Heavy Duty by Euclid Chemical, or equal. Apply to exterior side of CMU walls per manufacturers' recommendations.

PART 3 -- EXECUTION

3.01 GENERAL

A. INSPECTION:

1. Special masonry inspection as defined by Chapter 17 of the California Building Code will be provided by the District. Contractor shall notify the District Representative at least 48 hours before masonry work is begun.

B. PREPARATION:

1. Foundations for masonry work shall be straight and level. All surfaces to be bonded with masonry shall be clean and free from laitance, grease, oil, mud, dirt, mortar droppings, and other matter that will reduce bond.
2. Reinforcing dowels shall be in the correct location as shown. The placement and location of anchor ties, inserts and other embedded items in concrete or other adjoining work shall be coordinated by the Contractor to suit the masonry work.

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3. Protect adjacent construction with appropriate means from mortar droppings and other effects of laying concrete masonry units.

C. PROTECTION OF MATERIALS:

1. All perishable materials for the work of this section shall be delivered, stored, and handled so as to preclude damage of any nature. Manufactured materials specified in the MASONRY MORTARING Section (04 05 13) and the MASONRY GROUTING Section (04 05 16), such as cement and lime, shall be delivered and stored in their original containers, plainly marked with identification of material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the site.
2. All masonry shall be shipped stacked on pallets and shall be stored stacked off the ground on the site. In addition, all masonry stored on the site shall be protected from the weather and staining with the use of tarpaulins or other covering approved by the District Representative.

3.02 INSTALLATION

A. MASONRY WORK:

1. Shall conform to the requirements and recommendations of ACI 530, 531, 530.1 and 531.1, and the CBC. Masonry shall not be laid at temperature below 40 or above 100 degrees F or during wet humid weather. Maximum course height shall be 60 inches per day. All work shall be done in such a manner as to insure the proper and normal hardening of all mortar. All masonry work shall be so protected and heated that the temperature at the surface will not fall below 50 degrees Fahrenheit for a period of 72 hours after placing. During dry cold weather above 40 degrees F, follow the recommendations of ACI 530 for all masonry construction. Any completed work found to be affected by freezing shall be taken down and rebuilt by the Contractor at his expense.

B. TOLERANCES:

1. Masonry shall be constructed to meet the dimensions shown on the drawings. All courses shall be started from the corners where possible. Story poles and level lines shall be maintained at all times, and string lines shall be raised with the work.
2. Site tolerances: lay masonry plumb, true to line, and with courses level. Keep bond pattern plumb throughout. Lay masonry within the following tolerances:
 - a. Maximum variation from the plumb in the lines and surfaces of columns, walls, and in the flutes and surfaces of fluted or split faced blocks:

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- 1) In adjacent masonry units: 1/8 inch.
 - 2) In 10 feet: 1/4 inch.
 - b. In any story or 20 feet maximum: 3/8 inch.
 3. Maximum variations from the plumb for external corners, expansion joints, and other conspicuous lines:
 - a. In any story or 20 feet maximum: 1/4 inch.
 4. Maximum variations from the level or grades indicated on the Drawings for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
 - a. In any bay or 20 feet maximum: 1/4 inch.
 5. Maximum variations of the linear building lines from established position in plan and related portion of columns, walls, and partitions:
 - a. In any bay or 20 feet maximum: 1/2 inch.
 6. Maximum variation in cross sectional dimensions of columns and in thickness of walls:
 - a. Minus: 1/4 inch.
 - b. Plus: 1/2 inch.
- C. FORMS AND SHORES:
1. Where required, construct forms to the shapes indicated on the Drawings:
 - a. Construct forms sufficiently rigid to prevent deflection which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout.
 - b. Do not remove supporting forms or shores until the following requirements have been met.
 - 1) The supported masonry has acquired sufficient strength to support safely its weight and any construction loads to which it may be subjected.
 - 2) Horizontal and vertical structural framing systems are in place, fully connected and have achieved their specified design strength. This includes, but is not limited to, metal deck roof diaphragms and concrete floor systems.

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- c. Wait at least 24 hours after grouting masonry columns or walls before applying uniform loads.
 2. Wait at least 72 hours before applying concentrated loads.
- D. CONCRETE MASONRY UNITS:
1. Provide standard Level of Quality. Comply with the requirements of ACI 530.1 unless more restrictive requirements are contained in this Section.
 2. Lay concrete masonry units dry.
 3. Lay units in uniform and true courses, level, plumb, and without projections or offset of adjacent units.
 4. Lay units to preserve unobstructed vertical continuity of cells to be filled with grout or insulation.
 5. Align vertical cells to be filled with grout to maintain clear, unobstructed continuous vertical cell measuring not less than 2 by 3 inches.
 6. Place mortar with full coverage of joints at webs of all cells and face shells.
 7. Butter vertical head joints for thickness equal to face shell thickness of units, and shove joints tightly together so that mortar bonds to both masonry units
 8. Solidly fill joints from face of units to inside face of cells.
 9. Lay units to desired height with joints of uniform thickness.
 10. Bond shall be plumb throughout.
 11. Lay units to avoid formation of cracks when units are placed. Keep cells of units as free of mortar as possible as masonry wall height increases.
 12. When positions of units shift after mortar has stiffened, bond is broken, or cracks are formed, relay units in new mortar.
 13. Remove mortar, mortar droppings, debris, and other obstructions and materials from inside of cell walls to receive grout, prior to grouting.
 14. Remove mortar tags and smears daily with a non-metallic tool.
 - a. Mortar tags and smears shall be removed after they initially set, but shall not be permitted to remain more than 24 hours.

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15. Where practical, protect completed work from mortar splash by placing thin plastic sheeting around the base of walls.
 - a. Place sand, straw, sawdust or other similar material on the floor around the base of walls to protect floors and walls.
16. Turn scaffold planks over at the end of the workday to avoid mortar splashes from wet weather.
 - a. Cover tops of walls at the end of the workday and other work stoppages to prevent entry of water into the partially completed masonry.
17. Seal cleanouts after inspection and before grouting or placing insulation.

E. BOND PATTERN:

1. Lay concrete masonry units in running bond pattern, unless otherwise indicated on the Drawings.

F. MORTAR JOINTS:

1. Where fresh masonry joints totally or partially set masonry, clean and roughen set masonry before laying new units.
2. Joints for CMUs shall be 3/8 inch. Both vertical and horizontal joints shall be maintained uniform in spacing. Exterior and interior and vertical and horizontal joints shall be concave rodged. Mortar shall be thumb-print hard before tooling joints.
3. Remove mortar that protrudes more than 1/2 inch into the cells of units that are to be grouted.

G. WIRE JOINT REINFORCEMENT:

1. Lap splice longitudinal wire joint reinforcement minimum 75 wire diameters.
2. Place longitudinal wires in approximate centers of mortar beds with minimum 5/8-inch mortar cover on exposed faces.
3. Provide intersecting masonry walls with prefabricated wire joint reinforcement tees.
4. Rake intersecting joints 1/2 inch and caulk joints.

H. GROUTING AND STEEL REINFORCEMENT:

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1. Reinforcing steel shall be installed as specified in the CONCRETE REINFORCING Section (03 20 00) except as specified herein. Reinforcing steel bars shall be held in position at top and bottom. The minimum clear distance between bars, except for lapped splices, shall be 1 1/2 bar diameters at columns and 1 bar diameter elsewhere. Lap splices for reinforcing bars shall be 40 bar diameters. Reinforcing steel wire shall be lap spliced 6 inches for deformed wire. The minimum masonry cover shall be 2 inches for reinforcing bars and 5/8 inch on the exterior face for reinforcing wire. Vertical bars shall be on the wall centerline for single curtain reinforcing unless shown otherwise.
2. Splices of vertical and horizontal reinforcing bars shall meet the minimum requirements shown in the Structural Standard Detail Drawings.
3. Hold vertical reinforcing bars in position at top and bottom and at intervals not exceeding 200 bar diameters. Use steel wire bar positioners to position bars. Tie reinforcing bars to dowels with wire ties.
4. Obtain acceptance of reinforcement placement before grouting.
5. Fill all spaces and cells solidly with grout.
 - a. Low-lift grouting:
 - 1) Concrete masonry units (CMU) shall be laid in running or 1/2 bond, or 1/3 bond depending on the unit size. CMUs shall be machine sawn on panel ends. CMUs shall be laid with the bed and head joint depth from each face at least as thick as the face shells. All CMUs shall be laid in a full bed of mortar, applied to shells only. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well compacted vertical mortar joint for the full shell thickness. Units shall set with all cells in a vertical position.
 - 2) The moisture content of the units when laid shall not exceed 35 percent of the total absorption as determined by laboratory test. Cells containing reinforcing shall be fully sealed with mortar around the cell to prevent grout leakage. Cleanout openings shall be provided at the bottom of each pour which exceeds 4 feet in height. Overhanging mortar, mortar drippings, and debris shall be removed from inside the cells. The cleanout openings shall be sealed after inspection and before grouting. Grout shall be poured in lifts not more than 4 feet high. Grout shall be consolidated with a vibrator immediately after pouring. When work is stopped for more than 1 hour, the grout shall be stopped 1/2 inch below the top unit, and the horizontal steel

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shall be fully covered. All cells shall be fully grouted unless noted otherwise on the drawings. High lift grouted construction shall not be used on this job.

3) Slushing with mortar will not be permitted.

b. High-lift grouting:

1) Hollow unit masonry shall be allowed to cure at least 24 hours before grouting.

2) Grout shall be placed in lifts not to exceed 6 feet in depth.

3) Each lift shall be allowed to set for 10 minutes after initial consolidation of grout before successive lift is placed.

4) The full height of each section of wall shall be grouted in 1 day.

6. Grout in cells shall have full contact with surface of concrete footings.

7. After placement, consolidate grout using mechanical immersion vibrators designed for consolidating grout.

8. Placement:

a. Use a hand bucket, concrete hopper, or grout pump.

b. Place grout in final position within 1-1/2 hours after mixing. Place grout so as to completely fill the grout spaces without segregation of the aggregates.

c. Do not insert vibrators into lower grout placements that are in a semi-solidified state.

d. Remove grout spills immediately by hand washing with a bucket and brush.

I. BOND BEAMS:

1. Starting courses at bottom of walls shall be bond beams.

2. Place horizontal reinforcement and solidly grout bond beam units in place.

3. Provide wire mesh at openings in bottom of bond beams to support grout where walls are not grouted solid.

J. CUTTING CONCRETE MASONRY UNITS:

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1. When possible, use full units of the proper size in lieu of cut units. Cut units as required to form chases, openings, for anchorage, and for other appurtenances.
2. Cut and fit units with power-driven carborundum or diamond disc blade saw.

K. CONTROL JOINTS:

1. Control joints shall be installed at the intersection of masonry walls with structural concrete and elsewhere as detailed on the drawings. Control joints shall be constructed with special shape units that provide a structural interlocking shear key. Joints shall be raked out to a depth of 3/4 inch for the full height of the wall.
2. Joints shall be caulked watertight as specified in the JOINT SEALANTS Section (07 92 00). Control joints shall be equal in width to the standard mortar joint.
3. Run bond beams and bond beam reinforcing bars continuously through control joints.
4. Insert control joint filler in joints as wall is constructed.

L. CONCRETE MASONRY UNIT LINTELS AND BOND BEAMS:

1. Special units, lintels, and bond beams shall have cells filled solidly with grout or concrete, and provided with not less than two No. 5 reinforcing bars, unless otherwise specified. Bond beams and reinforcing shall terminate on each side of expansion joints. Concrete masonry units used for lintels and bond beams shall have exposed surfaces of the same material and texture as the adjoining masonry units. Bond beam units shall be produced from standard vertically-voided units with precast knock-out cross walls. Lintels shall be straight and true and shall have at least 8 inches of bearing at each end unless indicated otherwise in the construction drawings. Lintels shall set at least 6 days before shoring is removed.
2. Place horizontal reinforcement in fully grouted bond beam units.
3. Use lintel block units where underside of lintel will be exposed.
4. Embed reinforcing bars minimum 24 inches or 48 bar diameters, whichever is longer, into wall past edges of openings or as indicated on the Drawings:
 - a. At corners, provide 90-degree bend with equivalent total embedment.

M. STEEL LINTELS:

1. Steel lintels shall be furnished under the METAL SPECIALTIES Section (05 59 00) and installed under this section. Lintels shall be set in a full bed of mortar and

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supported by solid or mortar filled hollow concrete blocks as detailed on the drawings. Where not otherwise indicated, lintels shall bear on masonry a minimum of 8 inches on each end.

N. STEEL DOOR FRAMES, BLOCKOUTS AND MISCELLANEOUS ITEMS:

1. Install all frames required to be set in masonry. Set masonry tightly against frames, build in all frame anchors, and fill frames with grout. Anchor and fully grout jambs and head of steel doorframes connected to concrete unit masonry.
2. Fill frames with grout as each 2 feet of concrete unit masonry is laid.
3. The Contractor shall build in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate divisions, including reglets, lintels, ties, sleeves, vents, grilles, anchors, and shall cooperate with other trades whose work is to be installed in the block walls.
4. All masonry slots, chases, or openings required for the proper installation of the work of other sections shall be constructed as indicated on the drawings or in accordance with information furnished before the work is started at the points affected. No chase shall cut into any wall constructed of hollow units after it is built.

O. BEARING PLATES:

1. Provide minimum of 12 inches of grouted concrete unit masonry below steel bearing plates and beams bearing on masonry walls.

P. ANCHOR BOLTS:

1. Hold anchor bolts in place with template during grouting to assure precise alignment.
2. Do not cut or ream members being anchored or use other means to accommodate misaligned anchor.

Q. ENCLOSURES:

1. Where concrete masonry units enclose conduit, pipes, stacks, ducts, and similar items, construct chases, cavities, and similar spaces as required, whether or not such spaces are indicated on the Drawings.
2. Point openings around flush mounted electrical outlet boxes with mortar, including flush joints above boxes.

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3. Do not cover enclosures until inspected and when appropriate, tested.

R. OTHER EMBEDDED ITEMS:

1. Build in wall plugs, accessories, flashings, pipe sleeves, and other items required to be built-in as the masonry work progresses.

S. PATCHING

1. Patch exposed concrete masonry units at completion of the Work and in such manner that patching will be indistinguishable from similar surroundings and adjoining construction.

T. WATER CURING:

1. Protect concrete masonry units from drying too rapidly by frequently fogging or sprinkling so walls will always be visibly damp for minimum 3 days.

U. MISCELLANEOUS:

1. Build in required items, such as anchors, flashings, sleeves, frames, structural steel, lintels, anchor bolts, and metal fabrications, as required for complete installation.

V. WATER REPELLENT:

1. Apply water repellent as specified in PAINTING AND COATING Section (09 90 00).

W. ANTI-GRAFFITI COATING:

1. Apply anti-graffiti coating as specified in PAINTING AND COATING Section (09 90 00).

X. GROUTING EQUIPMENT:

1. Grout pumps:
 - a. Do not pump grout through aluminum tubes.
 - b. Operate pumps to produce a continuous stream of grout without air pockets.
 - c. Upon completion of each days pumping, eject grout from pipeline without contamination or segregation of the grout:
 - 1) Remove waste materials and debris from the equipment.

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- 2) Dispose of waste materials, debris, and all flushing water outside the masonry.

2. Vibrators:

- a. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout.
- b. Maintain at least 1 spare vibrator, at the site at all times.
- c. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine.
- d. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation.

Y. BONDING AND ANCHORING:

1. Bonding and anchoring shall comply with the following procedures unless otherwise specified.
 - a. At corners of load bearing walls, provide a true masonry bond in each course.
 - b. At intersections of load bearing walls, provide a true masonry bond in each course, or anchor with rigid steel anchors not more than 2 feet apart vertically.

Z. LIQUID WATERPROOFING:

1. Waterproofing shall be furnished and applied as specified in the COLD FLUID-APPLIED WATERPROOFING Section (07 14 16).

AA. CLEANING AND PROTECTION:

1. Exposed faces of all masonry shall be kept clean as the work progresses. Mortar and grout stains shall not be allowed to dry on the faces. Clean water and fiber brushes only shall be used for cleaning. Muriatic acid shall not be used. Holes or defects in mortar joints shall be filled and pointed up when necessary. All masonry work shall be protected from damage or staining until acceptance of the work, and all damaged units have been replaced and approved by the District Representative.

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3.03 TESTING (NOT USED)

3.04 TRAINING (NOT USED)

3.05 FIELD QUALITY CONTROL

A. SITE TESTS:

1. Owner will have tests performed by an independent laboratory.
2. Have minimum 3 concrete masonry units of each type proposed for Project tested in accordance with ASTM C 90, C 140, and C 426 to verify conformance to Specifications.
3. Tests shall include compressive strength, linear shrinkage, moisture content as percent of total absorption, total absorption, and unit weight.

B. SPECIAL INSPECTION:

1. Special inspection shall be as specified in CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES Section (01 45 33).
2. District will employ a qualified masonry special inspector for inspection of the masonry work as outlined in the Statement of Special Inspections. Acceptance by a state or municipality having a program of examining and certifying masonry inspectors will be considered adequate qualifications.
3. Keep complete record of inspections, and distribute records as required by Section 01 45 23.

3.06 FINAL CLEANING

A. GENERAL:

1. Final cleaning shall be performed within 7 to 14 days after construction of masonry work.
2. Protect adjacent materials and equipment that may be damaged by cleaning.
3. Pre-wet masonry before applying cleaning agent, but do not saturate masonry.
4. Remove mortar stains, smears, and splash, efflorescence, and grout stains on exposed surfaces with the submitted cleaning agent as directed by the masonry unit manufacturer's recommendations.

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5. Do not use muriatic acid as cleaning agent.
6. Cleaning agents shall be applied when the masonry surface and air temperatures are at least 50 degrees Fahrenheit.
 - a. Dilute cleaning agents in accordance with manufacturer's recommendations.
 - b. Do not allow cleaning agents to dry on the masonry.
7. Clean wall from the top to the bottom, without overlapping areas being cleaned for consistency.
8. If pressure cleaning equipment is used, the following limitations shall be observed:
 - a. Apply cleaning agent to pre-wetted wall with low pressure (less than 50 pounds per square inch).
 - b. Use a 25° to 50° flared-tip nozzle (not a pointed tip).
 - c. Maintain a consistent distance from the spray nozzle to the masonry surface no closer than 12 inches.
 - 1) Masonry cleaner shall use a combination of pressure, nozzle, and distance from tip to masonry that does not damage the masonry surface.
9. Rinse cleaning agents off the wall with potable water.
10. Dispose of debris, refuse, and surplus material offsite legally.

3.07 PROTECTION

- A. PROVIDE TEMPORARY PROTECTION FOR EXPOSED MASONRY CORNERS SUBJECT TO DAMAGE.
- B. BRACING:
 1. Unless wall is adequately supported by permanent supporting elements so wall will not overturn or collapse, adequately brace masonry walls over 8 feet in height to prevent overturning and to prevent collapse.
 2. Keep bracing in place until permanent supporting elements of structure are in place.
- C. LIMITED ACCESS ZONE:
 1. Establish limited access zone prior to start of masonry wall construction.

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2. Zone shall be immediately adjacent to wall and equal to height of wall to be constructed plus 4 feet by entire length of wall on unscaffolded side of wall.
3. Limit access to zone to workers actively engaged in constructing wall. Do not permit other persons to enter zone.
4. Keep zone in place until wall is adequately supported or braced by permanent supporting elements to prevent overturning and collapse.

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 5: METALS
05051: ANCHOR BOLTS AND ADHESIVE ANCHORS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment and incidentals as shown on the Drawings, specified, and required to furnish and install anchor bolts (cast-in place) and adhesive anchors.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before anchor bolt or adhesive anchor work.

C. This Section includes all anchor bolts (cast-in-place) and adhesive anchors required for the Work, but not specified under other Sections.

D. The types of Work using anchor bolts (cast-in-place) and adhesive anchors include, but are not limited to the following:

1. Hangers and brackets.
2. Equipment.
3. Piping.
4. Tanks.
5. Grating and floor plate.
6. Electrical, Plumbing and HVAC Work.
7. Metal, wood, and plastic fabrications.
8. Partitions and ceilings.
9. Shelf angles and masonry lintels.
10. Structural members and accessories.

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1.02 QUALITY ASSURANCE

- A. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as shown on the Drawings or specified otherwise.
 - 1. ASTM F 593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - 2. ASTM F 594, Specification for Stainless Steel Nuts.
 - 3. 2012 International Building Code.

1.03 SUBMITTALS

- A. Samples: Representative samples of anchor bolts (cast-in-place) and adhesive anchors as may be requested by ENGINEER. Review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.
- B. Shop Drawings: Submit for approval the following:
 - 1. Setting drawings and templates for location and installation of anchorage devices.
 - 2. Copies of manufacturer's specifications, load tables, dimension diagrams, and installation instructions for the devices.
 - 3. Copies of ICC, UL, or FM Reports certifying load carrying capacities and installation requirements for the anchorage devices.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

- A. When the size, length or load carrying capacity of an anchor bolt or adhesive anchor is not shown on the Drawings, provide the following:
 - 1. For anchor bolts (cast-in-place), provide the size, length, and capacity required to carry the design load based on the values and requirements for concrete given in the 2012 International Building Code.

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2. For adhesive anchors, provide the size, length, type, and capacity required to carry the design load based on the values and requirements given in the ICC Evaluation Report, or similar certifications by UL or FM, for the anchor to be used. Alternately, the capacity may be based on independent testing lab capacities for tension and shear strength using a minimum safety factor of four. Consideration of reduced capacity due to spacing and edge distance shall be made.
- B. Determine design loads as follows:
1. For equipment anchors, use the design load recommended by the equipment manufacturer and approved by ENGINEER.
 2. For pipe hangers and supports, use one half of the total weight of: pipe, fittings, and water contained in pipe, plus the full weight of valves and accessories located between the hanger or support in question, and the next adjacent pipe hanger or support, in both directions along the pipe.
 3. Allowances for vibration are included in the safety factor specified above.
 4. Anchor bolts (cast-in-place) and adhesive anchors shall develop ultimate shear and pull out loads of not less than the following values in 4,000 psi concrete:

Bolt Diameter (Inches)	Max. Pull-Out Load (Pounds)	Min. Pull-Out Load (Pounds)
½	5,000	7,600
5/8	8,000	12,000
¾	11,500	17,000
7/8	15,700	20,400
1	20,500	28,400

2.02 APPLICATION

- A. Where a concrete anchor is shown on the Drawings, either install an adhesive anchor or anchor bolt (cast-in-place).
- B. Anchor Bolts (Cast-in-Place):
 1. Use in concrete or grout filled masonry.

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2. Where an anchor bolt is indicated, only a cast-in-place anchor bolt shall be used, unless another anchor type is accepted by the ENGINEER.
 3. Provide anchor bolts as shown on the Drawings or as required to secure structural steel to concrete or masonry.
- C. Adhesive Anchors:
1. Use in concrete or masonry.
 2. Use where subject to vibration or where buried or submerged.
 3. Use for pipe supports.
 4. Shall not be used for vertical overhead installations.

2.03 MATERIALS

- A. Anchor Bolts:
1. Unless otherwise indicated, provide stainless steel bolts complete with washers and nuts, complying with ASTM F 593 and ASTM F 594, AISI Type 316.
 2. For equipment, provide anchor bolts which meet the equipment manufacturer's requirements for size, material, strength, embedment length, and projection.
 3. Locate and accurately set the anchor bolts using templates or other devices as required.
- B. Adhesive Anchors in Concrete or Grout Filled Masonry:
1. Provide stainless steel adhesive anchors complete with washers and nuts, complying with ASTM F 593 and ASTM F 594, AISI Type 316.
 2. Anchors shall be of the size required for the concrete strength specified.
 3. Adhesive anchors shall consist of threaded rods anchored with an adhesive system into hardened concrete or grout-filled masonry. The adhesive system shall use a two-component adhesive mix.

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Adhesive shall be injected with a static mixing nozzle following manufacturer's instructions. The embedment depth of the threaded rod shall provide a minimum allowable bond strength that is equal to the allowable steel tensile capacity of the threaded rod, unless noted otherwise on the Drawings.

4. Adhesive Anchors in concrete:
 - a. Product and Manufacturer: Provide one of the following:
 - (1) HIT-RE 500-SD Epoxy Adhesive Anchor System, by Hilti, Inc.
 - (2) SET-XP Epoxy Adhesive Anchor System, by Simpson Strong-Tie Company, Inc.
 - (3) Or equal.
5. Adhesive Anchors in grout filled masonry:
 - a. Product and Manufacturer: Provide one of the following:
 - (1) HIT-HY 150 MAX Adhesive Anchor System, by Hilti, Inc.
 - (2) SET Adhesive Anchor System, by Simpson Strong-Tie Company, Inc.
 - (3) Or equal.
- C. Powder activated fasteners and other types of bolts and fasteners not specified herein shall not be used, unless approved by ENGINEER.
- D. Expansion anchors will not be allowed.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine areas and conditions under which anchor bolt (cast-in-place) and adhesive anchor Work is to be installed, and notify ENGINEER, in writing, of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

TECHNICAL SPECIFICATIONS
DIVISION 5: METALS
05051: ANCHOR BOLTS AND ADHESIVE ANCHORS

3.02 INSTALLATION

- A. Protect anchor bolt (cast-in-place) and adhesive anchor threads and shank from damage during installation of equipment and metal framing.
- B. Adhesive Anchors in Concrete or Grout Filled Masonry:
 - 1. Holes shall be drilled in hardened concrete or grout to the adhesive anchor system manufacturer's recommended diameter and depth to develop the required pullout resistance but shall not be greater in diameter than 1/4-inch more than the anchor diameter nor less than 12 times the anchor diameter in depth, unless shown otherwise on the Drawings.
 - 2. Holes shall be drilled by methods which do not interfere with the proper bonding of the adhesive. Use rotary percussion drilling with carbide bit to avoid cutting reinforcing steel embedded in the concrete.
 - 3. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any existing reinforcing bars. Holes in adjusted locations may be drilled only after approval by the ENGINEER.
 - 4. Holes shall be brushed and blown clean with clean, dry compressed air to remove all dust and loose particles. Conform to the adhesive system manufacturer's written instructions.
 - 5. Adhesive shall be injected into the hole through the injection system-mixing nozzle (and any necessary extension tubes) placed to the bottom of the hole. The discharge end shall be withdrawn as resin is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that ensures that excess material is expelled from the hole during dowel placement.
 - 6. Anchor rods shall be twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with adhesive. Anchor rods shall be inserted slowly to avoid developing air pockets.
 - 7. Adhesive anchor manufacturer's representative shall observe and demonstrate the proper installation procedures for the adhesive anchors and adhesive material at no additional expense to OWNER.

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Each installer shall be certified in writing by the manufacturer to be qualified to install the adhesive anchors.

3.03 CLEANING

- A. After embedding concrete is placed, remove protection and clean anchor bolts.

3.04 FIELD QUALITY CONTROL

- A. Testing of Adhesive Anchors:
 - 1. Employ the services of an independent testing laboratory to perform field quality testing of adhesive anchors. A minimum of 10 percent (but no less than 15 anchors) shall be chosen at random by the testing laboratory and confirmed by the ENGINEER. Unless otherwise directed by the ENGINEER, adhesive anchors shall be tensioned to 60 percent of the specified yield strength. Where adhesive anchors are located less than eight dowel diameters from the edge of concrete the ENGINEER will determine the tensile load required for the test.
 - 2. Provide access for the testing agency to places where Work is being produced so that required inspection and testing can be accomplished.
 - 3. CONTRACTOR shall be responsible for the failure of any adhesive anchor. If any anchor fails, the testing shall be increased to 20 percent (but no less than 30 anchors), and may be increased further after review by the ENGINEER.
 - 4. Correct improper workmanship, remove and replace, or correct as directed by the ENGINEER, all adhesive anchors found unacceptable or deficient, at no additional cost to the OWNER.
 - 5. Pay for all corrections and subsequent tests required to confirm the integrity of the adhesive anchors.
 - 6. The independent testing and inspection agency shall complete a report for each area. The report shall summarize the observations made by the Inspector and be submitted to the ENGINEER.

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05051: ANCHOR BOLTS AND ADHESIVE ANCHORS

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 5: METALS
05120: STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes structural steel framing members,

1.02 REFERENCES

- A. American Institute of Steel Construction:
1. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges.
- B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc- Coated, Welded and Seamless.
- C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 2. AWS D1.1 - Structural Welding Code - Steel.
- D. Research Council on Structural Connections:
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.

1.03 SUBMITTALS

- A. Section 01300 - Submittals: Submittal requirements.
- B. Shop Drawings:
1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

TECHNICAL SPECIFICATIONS
DIVISION 5: METALS
05120: STRUCTURAL STEEL

- 2. Connections not detailed.
- 3. Cambers.
- 4. Indicate welded connections with AWS A2.4 welding symbols.
Indicate net weld lengths.
- C. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC S303.
- B. Perform Work in accordance with AISC S303, Section 10.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Steel Members: ASTM A36/A36M.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Pipe: ASTM A53/A53M, Grade B.
- D. Anchor Bolts: ASTM A307.
- E. Welding Materials: AWS D1.1; type required for materials being welded.
- F. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.02 FABRICATION

- A. Fabricate connections for bolt, nut, and washer connectors.
- B. Develop required camber for members.

2.03 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP 3.

TECHNICAL SPECIFICATIONS
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05120: STRUCTURAL STEEL

- B. Shop prime structural steel members.

PART 3 EXECUTION

3.01 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on Drawings.
- C. Do not field cut or alter structural members without approval of Architect/Engineer.
- D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.02 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From Alignment: 1/4 inch (6 mm).

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 5: METALS
05310: STEEL DECK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Roof deck.

1.03 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Welding certificates.
- D. Research/Evaluation Reports: For steel deck.

1.04 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- B. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

TECHNICAL SPECIFICATIONS
DIVISION 5: METALS
05310: STEEL DECK

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Drawings are base on the product and manufacturer named. Information on Drawings and in Specifications establishes requirements for product's aesthetic effects and performance characteristics. Products by other manufacturers will be considered but are subject to Architect approval and compliance with requirements. Products by other manufacturers shall be submitted for Architect/Engineer review and approval.
 - 1. Steel Deck: Verco Manufacturing Co.

2.02 ROOF DECKING

- A. Roof Deck: Fabricate panels with the minimum section properties indicated, and with the following:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 40 (230), G60 zinc coating.
 - 2. Profile Depth: 3 inches, Type N.
 - 3. Design Uncoated-Steel Thickness: 20 gage.
 - 4. Span Condition: As indicated.
 - 5. Refer to General Structural Notes for additional requirements.

2.03 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Galvanizing Repair Paint: ASTM A 780.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.02 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.03 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

TECHNICAL SPECIFICATIONS
DIVISION 5: METALS
05310: STEEL DECK

END OF SECTION

TECHNICAL SPECIFICATION
DIVISION 5: METALS
SECTION 05500: MISCELLANEOUS METALWORK

PART 1 - GENERAL

SUMMARY

- A. This specification section includes the following items of work:
1. Furnishing and installing Miscellaneous Metal Work as shown on the Drawings including but not limited to:
 - a. Ladders.
 - b. Handrails.
 - c. Metal Grating.
 - d. Stairways/Treads.
 - e. Platforms, except at SAOS.
 - f. Walkways.
 - g. Trashracks.
 - h. Access hatches.
 - i. Decking for removable roof for SAOS and CSOS structures.
 - j. Aluminum metalwork.
 - k. Miscellaneous brackets and connectors.

REFERENCES

- B. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of Notice Inviting Bids shall be used.
- C. American Society for Testing and Materials (ASTM):
1. ASTM A6: Revision A, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 2. ASTM A36: Standard Specification for Carbon Structural Steel.
 3. ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 4. ASTM A123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

TECHNICAL SPECIFICATION
DIVISION 5: METALS
SECTION 05500: MISCELLANEOUS METALWORK

5. ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
7. ASTM A276: Standard Specification for Stainless Steel Bars and Shapes.
8. ASTM A296: Standard Specification for Corrosion-Resistant Iron-Chromium, Iron-Chromium-Nickel, and Nickel-Base Alloy Castings for General Application.
9. ASTM A307: Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
10. ASTM A312: Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
11. ASTM A314: Standard Specification for Stainless Steel Billets and Bars for Forging.
12. ASTM A325: Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
13. ASTM A385: Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
14. ASTM A500: Revision A, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
15. ASTM A501: Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
16. ASTM A563: Standard Specification for Carbon and Alloy Steel Nuts.
17. ASTM A572: Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
18. ASTM A588: Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance.
19. ASTM A740: Standard Specification for Hardware Cloth (Woven or Welded Galvanized Steel Wire Fabric).
20. ASTM A780: Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
21. ASTM A786: Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
22. ASTM A1011: Revision B, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

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23. ASTM B633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 24. ASTM F436: Standard Specification for Hardened Steel Washers.
 25. ASTM F593: Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 26. ASTM F594: Standard Specification for Stainless Steel Nuts.
 27. ASTM F738M: Standard Specification for Stainless Steel Metric Bolts, Screws, and Studs.
 28. ASTM F836M: Standard Specification for Style 1 Stainless Steel Metric Nuts.
- D. American Welding Society (AWS):
1. D1.1, Structural Welding Code--Steel.
 2. D1.2, Structural Welding Code--Aluminum.
 3. D1.3, Structural Welding Code--Sheet Steel.
 4. D1.6, Structural Welding Code--Stainless Steel.
- E. International Code Council (ICC):
1. IBC, International Building Code, 2006.
- F. California Occupational Safety and Health Administration (CAL/OSHA).
- G. National Association of Architectural Metal Manufacturer's (NAAMM):
1. MBG 531, Metal Bar Grating Manual.
- H. American Institute of Steel Construction (AISC):
1. AISC 303, Code of Standard Practice for Steel Buildings and Bridges for tolerances and material identification only.
 2. AISC 325, Steel Construction Manual.
 3. AISC 360, Specifications for Structural Steel Buildings
- I. American National Standards Institute (ANSI):
1. ANSI B18.2.1, Square and Hex Bolts and Screws Inch Series.
 2. ANSI B18.2.3.8M, Metric Hex Lag Screws.
 3. ANSI B18.6.3, Machine Screws and Machine Screw Nuts.
 4. ANSI B18.21.1, Lock Washers (Inch Series).

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- 5. ANSI B18.22.1, Plain Washers-Reaffirmation and Redesignation of ASA B27.2-196
- 6. ANSI B18.22M, Metric Plain Washers.
- J. Federal Specifications (FS):
 - 1. FS FF-B-588, Bolt, Toggle; and Expansion Sleeve, Screw.
- K. Uniform Federal Accessibility Standards (UFAS) / Americans with Disabilities Act – Accessibility Guidelines (ADAAG):
 - 1. Part 36, Appendix A, Section 4.26, Handrails, Grab Bars, and Tub and Shower Seats

SUBMITTALS

- L. Submit in accordance with Section 01300, “Submittals” at least 60 days in advance of the relevant work commencing or materials being ordered, unless noted otherwise.
- M. Product Data: Submit product data for manufactured items, including paint products and grout.
- N. Shop Drawings: Submit shop drawings for all fabricated metal items including but not limited to ladders, safety rail, steel handrails, steel stairs, steel gratings, trashrack, access hatches, removable roof decking, and other miscellaneous metal items indicated on the Drawings.
 - 1. Detail materials, profiles, sizes, connection attachments, reinforcing, anchorage, hardware, size and type of fasteners and accessories.
 - 2. Include assembly drawings, framing plan (including member-member connection details), grating plan, sections, elevations and details where applicable.
 - 3. Indicate welded connections using standard AWS welding symbols; indicate net weld lengths and proposed field welds.
 - 4. Submit proposed location of all field welds. Approval required from City Representative for all field welds.
 - 5. Show all material types referenced to ASTM standards and show shop finish.
- O. Certifications: Submit evidence of welder qualification showing date of qualification; and qualified positions and processes..
- P. Quality Control Submittals:
 - 1. Submit fabricator’s quality control plan.
 - 2. Submit Welding Procedure Specifications for all welds in accordance with the applicable AWS code.

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- Q. Material Test Data: Provide certified laboratory test reports for all materials.
- R. Design Calculations: Submit stamped design calculations for fabricated items requiring designs by a Professional Engineer registered in the State of California.

QUALITY ASSURANCE

- S. To ensure proper fitting of the work, field-verify critical dimensions at the jobsite prior to preparation of shop drawings and before product fabrication begins. Field fabrication will not be permitted.

PART 2 - PRODUCTS

MATERIALS

- A. Basic Ferrous Metal – All steel shall be galvanized or coated as indicated unless otherwise noted.
 - 1. Steel Pipe or Pipe Sleeves: ASTM A53, Schedule 40, black or hot dip galvanized.
 - 2. Steel Plates, Angles, Channels, and Bars: Carbon steel, ASTM A36.
 - 3. Steel Wide Flange Shapes: ASTM A992.
 - 4. Hinges: Hinges provided for the grating panels shall have the design capacity to support 100 psf live load and the dead load of the grating.
 - 5. Bird screen and insect screen: ASTM A740, hot dip galvanized after weaving; 1/8-inch size mesh screen.
 - 6. Floor plate; checkered plate; raised pattern plate: ASTM A786, high strength low alloy carbon steel, flat back style, standard raised pattern No. 1, 4, or 5. Plate thickness as shown on the Drawings. Provide all plate in a single pattern and hot dip galvanized.
 - 7. Pulling eyes: Smooth steel round bar, hot dip galvanized, sized and bent as shown on the Drawings.
- B. Fasteners:
 - 1. If stainless steel fasteners, bolts, washers, or nuts are specified, they shall conform to ASTM F593 or ASTM F594, alloy Group 1 or Group 2.
 - 2. Welding stud anchors: AWS D1.1.. Size and type as shown on the Drawings.
 - 3. Machine Screws: ANSI B18.6.3.
 - 4. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
 - 5. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
 - 6. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

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7. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.
- C. Stainless Steel: At locations identified on the Drawings.
 1. Type: ASTM A276, Type 304 or 304L, unless otherwise indicated.
 2. Bar Stock: For railings use ASTM A314, Type 302/304, No. 4 finish. For all other use ASTM A276.
 3. Plate: ASTM A167.
 4. Sheet: ASTM A167.
 5. Structural Shapes: ASTM A276, Type 304 or 304L.
 6. Castings: ASTM A296, iron-chromium-nickel alloy.
 7. Pipe: ASTM A312.
 8. Stainless Steel Diamond Floor Plate (checker plate): ASTM A276.
- D. Welding materials: AWS D1.1, D1.2, D1.3 or D1.6; type required for materials being welded.

FABRICATED ITEMS

- E. Ladders:
 1. The ladders shall be fabricated of stainless steel plates, bars and angles to the dimensions shown on the Drawings.
 2. Ladder rungs shall be 1 5/8 inch wide fabricated of 16-gauge stainless steel.
 3. Install the ladders with stainless steel epoxy anchor bolts conforming to the requirements of the specifications for epoxy anchor bolts.
 4. The safety posts shall be attached securely to ladder rungs.
- F. Fall Arrest Protection System:
 1. All ladders shall comply with the current SFPUC fall protection design requirements.
 2. Ladders over 20 feet in height shall be equipped with CAL/OSHA approved harness safety equipment attachment with the following characteristics:
 - a. Working load: 250 pounds.
 - b. Permit user to ascend or descend hands free.
 - c. Maximum possible fall length: 6 inches.
 3. The main support rail shall be continuous, notched, and mounted permanently to ladder.

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4. The slide or safety sleeve shall be equipped with locking mechanism for making connection between rail and safety belt.
 5. All components shall be stainless steel.
- G. ARV Enclosure
1. Stainless Steel ARV enclosure shall be Guard Shack Lift Off Model CGS-1 or approved Equal.
- H. Handrails:
1. All rails and posts shall be ASTM A53, schedule 40.
 2. Handrails shall be designed, fabricated and installed in accordance with applicable CAL/OSHA requirements, 29 CFR Part 1910, Section 1910.23.
 3. Unless noted otherwise on the Drawings, the handrail height shall be 3'-6" as measured from working surface with horizontal rails spaced as shown on the Drawings. Post spacing shall not be greater than 6'-0". Posts shall be a single, unspliced length. Lower rails shall be a single unspliced length between posts. Top rails shall be continuous whenever possible, and a single, unspliced length shall, whenever possible, be attached to a minimum of three posts.
 - a. Unless noted otherwise on the Drawings, any handrails with the potential for personnel to be present on levels below the handrail shall be a three rail system with a kick plate.
 - b. Unless noted otherwise on the Drawings, handrails located above spaces with no personnel access shall be a four rail system without a kick plate.
 4. Expansion joints shall be installed in all rails as per manufacturer's recommendations.
 5. Posts, Rails and Toe Boards: Hot dip galvanized.
 6. Provide bracket or plate attachments as indicated on the Drawings.
 7. All fasteners except anchor bolts used to anchor the handrails shall be stainless steel. All anchor bolts shall be stainless steel.
 8. Design of handrails shall comply with applicable UFAS, ADAAG, and CAL/OSHA Standards.
- I. Structural Steel Framed Stairs/Treads:
1. Fabricate stairs to conform to sizes and locations shown on the Drawings.
 2. Materials as specified under Paragraphs 2.02-A and B of this specification.
 3. Treads in all stairs shall be welded steel bar grating. Design treads to support a uniform load of 100 lb/sq. ft., or a concentrated load of 300 pounds located to produce maximum stress condition.

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4. Fabricate grating treads with corrugated angle nosing on one edge and with steel angle or steel plate carrier at each end for stringer connections.
 5. Posts and railing for stairs shall be made in accordance with Paragraph 2.02.C.
 6. Provide steel framing, posts, railings, clips, brackets, bearing plates and other components for the support of the stairs and as required to anchor and contain the stairs on the supporting structure.
 7. Coatings:
 - a. Treads: See Paragraph 2.02 E, Steel Gratings.
 - b. Posts and railings for stairs: see Paragraph 2.02C, Handrails.
 - c. Steel framing and other components not stainless or galvanized: paint with coating system No.3, Section 09900, "Paints and Coatings."
 - d. Surfaces that are damaged shall be repaired or replaced at no cost to the City.
- J. Steel Gratings:
1. Fabricate walkways and platforms to conform to sizes and locations shown on approved Shop Drawings.
 2. All grating shall be hot dip galvanized welded steel bar grating fabricated from material consistent with ASTM A1011 standard.
 3. Use stainless steel fasteners, inserts, and anchors. A minimum of four fasteners (maximum spacing between fasteners 5 feet) shall be utilized for attaching each grating panel, and the grating shall be removable from the grating walkway or platform surface.
 4. Dimension all gratings that require openings to reflect the Drawings. Any deviation from these will be cause for rejection and re-fabrication will be at Contractor's expense
 5. Provide grating so that bearing bars or structural shapes traverse the shorter (span) direction or as identified on the Drawings.
- K. Roof Hatch: Bilco Type "E" Roof Hatch or equal.
- L. Access (Roof) Hatch: Type S Roof Hatch or approved equal, sizes as indicated on the Drawings.
1. Cover Material: 14 gauge type 304 stainless steel .
 2. Cover Support Frame Material: ASTM 276 type 304
 3. Cover: Breakformed, hollow-metal design with 1 inch concealed fiberglass insulation, 3 inch beaded, overlapping flange, fully welded at corners, and internally reinforced for 40 psf live load.

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4. Curb: 12 inches in height with integral capflashing, 1 inch fiberboard insulation, fully welded at corners, and 3-1/2 inches mounting flange with 7/16 inch holes provided for securing frame to concrete roof deck.
5. Hatch Gasket: Extruded EPDM rubber gasket permanently adhered to cover and hatch.
6. Hinges: Heavy-duty pintle hinges with 3/8 inch type 316 stainless steel hinge pins.
7. Latch: Slam latch with interior and exterior turn handles and padlock hasps.
8. Lift Assistance: Compression spring operators enclosed in telescopic tubes. Automatic hold-open arm with grip handle release.
9. Hardware: Stainless Steel, Type 316.
10. Safety Post: Device shall be steel, hot dipped galvanized, and designed with a telescoping tubular section that locks automatically when fully extended. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions. Bilco LadderUP® Safety Post, model LU-2 or approved equal.

M. 6 inch Floor Drain: NEENAH R-4030-6 $\frac{1}{2}$ drain grate or approved equal.

FABRICATION

N. General:

1. Fabricate items of the material specified and with joints tightly fitted and secured.
2. Fit and shop assemble metal fabrications in largest practical sections for delivery to site, or as required to fit the specific locations.
3. Remove burrs from all exposed cut edges, remove spatter and grind exposed welds to match adjacent surface.
4. Supply all components required for anchoring the fabricated items as they are specified in the Construction Drawings, and of the specified material for each item. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

O. Shop Finish:

1. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
2. Do not prime surfaces which will be in direct contact bond with concrete or where field welding is required.
3. Prepare fabricated metal to receive finishes in accordance with 09900 - Paints and Coatings.

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4. Where metal fabrications are shop primed as part of the manufacturer's standard procedures, provide field painting in accordance with 09900 - Paints and Coatings.
5. All galvanizing shall be hot dip after fabrication unless indicated otherwise. Hot dip galvanize items to minimum 2.0 oz/sq ft zinc coating in accordance with ASTM A123, A153, and A385, as applicable.

PART 3 - EXECUTION

PREPARATION

- A. Examine surfaces for defects that would impair installation.
- B. Obtain City Representative's approval before site-cutting, field-welding, or making non-scheduled adjustments.
- C. Clean steel items to bare metal where site welding is scheduled.
- D. Prepare for erection loads with temporary bracing; keeping work in alignment.
- E. Supply setting templates for items required to be cast into concrete and confirm placement with a supplementary measurement at the location of installation.

INSTALLATION

- F. Fastening to In-Place Construction: Provide anchorage devices, fasteners, and manufacturer's templates where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required. Refer to manufacturer's specifications for proper installation procedures.
- G. Install all items in accordance with manufacturer's published instructions and as shown on the Drawings.
- H. Install items plumb and level, accurately fitted, and free from distortion or defects.
- I. Perform field welding in accordance with the applicable AWS Code: AWS D1.1, AWS D1.2, AWS D1.3, or D1.6 and ASTM A6. Comply with the following requirements:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.

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- 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- J. After installation, touch-up field welds and scratched or damaged sections as specified or as directed by the City Representative.
- K. Grating Installation:
 - 1. Comply with recommendations of NAAMM Metal Bar Grating Manual for installation of gratings, including installation clearances and standard anchoring details.
 - 2. Secure removable units to supporting members with type and size clips and fasteners recommended by grating manufacturer for type of installation conditions shown.
- L. UCSD Trashracks:
 - 1. Install lower culvert inlet trashrack mounting plate on top of lower culvert inlet tower with stainless steel bolts as indicated on the Drawings; Attach trashrack grate to mounting plate using stainless steel bolts that can be readily removed in the event the valve requires servicing.
 - 2. Install lower culvert vertical shaft outlet trashrack flange to HDPE elbow flange as indicated on the Drawings;
 - 3. Attach floats with stainless steel cables for future locating of inlet and outlet.

COATING

- M. Repair paint on metal fabrications in accordance with 09900, "Paints and Coatings."
- N. Repair damaged and uncoated areas of hot dip galvanized coating according to ASTM A780.

END OF SECTION

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**TECHNICAL SPECIFICATION
DIVISION 6: WOOD AND PLASTICS
SECTION 06100: ROUGH CARPENTRY**

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

A. SCOPE:

1. Rough carpentry.

1.02 REFERENCES

- A. **REFERENCE STANDARDS:** The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and the listed references, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
THE ENGINEERED WOOD ASSOCIATION	
APA	The Engineered Wood Association
APA PRP-108	Performance Standards and Qualification Policy for Structural Use Panels.
APA U450E	Storage and Handling of APA Trademarked Panels.
APA Y510T	Plywood Design Specification
ASTM INTERNATIONAL	
ASTM D2898	Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
ASTM D4442	Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
ASTM D4444	Standard Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters.
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials.

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<u>Reference</u>	<u>Title</u>
ASTM E136	Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 DegC.
AMERICAN WOOD PROTECTION ASSOCIATION (AWPA):	
AWPA U1	Use Category System: User Specification for Treated Wood.
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)	
NIST PS-1	Construction and Industrial Plywood.
NIST PS-2	Performance Standard for Wood-Based Structural-Use Panels.
NIST PS-20	American Softwood Lumber Standard.
UNDERWRITERS LABORATORIES INC. (UL)	
UL 723	Standard for Test for Surface Burning Characteristics of Building Materials
CALIFORNIA CODE OF REGULATIONS (CCR)	
Title 24, Part 2	California Building Code

B. DEFINITIONS: (Not Used)

1.03 SUBMITTALS

- A.** The following information shall be submitted for review in accordance with CONTRACTOR'S SUBMITTALS Section (01300):
1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
 2. Shop Drawings:
 - a. Fabrication drawings of all fabricated items.
 - b. Product technical data including:
 - 1) Acknowledgement that products submitted meet requirements of standards referenced.
 - 2) Manufacturer's installation instructions for all products specified.
 - c. Certifications:

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- 1) Chemicals used in treatment process are registered with and approved by EPA.
- 2) Moisture content of material prior to treatment: 25 percent maximum.
- 3) Material has been kiln-dried after treatment (KDAT) to the moisture content specified.
- d. Documentation of treatment of preservative and fire retardant treated material in accordance with standards referenced.

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS (NOT USED)

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1.05 QUALITY ASSURANCE

A. QUALIFICATIONS:

1. Wood Treatment Plant: AWP A M3.
2. Treated Wood Inspection: AWP A M2.

B. MISCELLANEOUS:

1. Factory marking:
 - a. Lumber:
 - 1) Identify type, grade, moisture content, inspection service, producing mill, and other qualities specified.
 - 2) Marking may be omitted, as allowed by CCR Title 24, Part 2, California Building Code, if certificate of inspection is provided for each shipment.

1.06 DELIVERY AND STORAGE

A. Delivery, storage and handling of untreated wood products:

1. Lumber: As recommended by the grading agency indicated on the grade stamp.
2. Plywood: APA U450E.

B. Delivery, storage, handling and disposal of treated wood products: AWP A M4.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. General:

1. Lumber (for framing, blocking, nailers, furring, grounds and similar members):
 - a. NIST PS-20.
 - b. Species:
 - 1) Treated material: As indicated in the appropriate AWP A standard.

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- 2) Untreated material:
 - i. For nominal sizes up to and including 2 by 4 inches: Douglas Fir or Spruce/Pine/Fir.
 - ii. For nominal sizes up to 2-inches thick and wider than 4-inches: Douglas Fir.
- c. Grade:
 - 1) For nominal sizes up to and including 2 by 4 inches: Standard and better.
 - 2) For nominal sizes up to 2-inches thick and wider than 4-inches: #2 and better.
 - 3) For nominal sizes greater than 3-inches thick and wider than 4-inches: Select Structural.
- 2. Structural plywood:
 - a. NIST PS-1, NIST PS-2.
 - b. APA PRP-108, APA Y510T.
- 3. Non-structural plywood (Telephone backboard):
 - a. NIST PS-1.
 - b. C-D plugged:
 - 1) Exposure: INT.
 - 2) Thickness: 5/8 IN.
 - 3) Touch sanded.
 - c. Appearance Grade A-D:
 - 1) Exposure: INT.
 - 2) Thickness: 5/8 inch.
 - 3) Sanded.
- 4. Moisture content:

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- a. Kiln-dry, ASTM D4442 and ASTM D4444.
- b. Lumber, 19 percent maximum.
- c. Wood structural panels plywood, 15 percent maximum.

B. Preservative Treated Material:

- 1. Moisture content:
 - a. Prior to treatment: 25 percent.
 - b. Kiln-dry after treatment (KDAT), ASTM D4442 and ASTM D4444:
 - 1) Lumber: 19 percent maximum.
 - 2) Plywood: 18 percent maximum.
- 2. Preservative:
 - a. Waterborne, AWPA P5.
 - b. As indicated in the appropriate AWPA standard.
- 3. Pressure-treat material in accordance with AWPA U1 and the following:
 - a. Lumber: AWPA U1.
 - b. Plywood: AWPA U1.
- 4. Wherever practicable, material to be treated shall be manufactured in its final form prior to treatment.

C. Fire-Retardant Treated Material (FRTM):

- 1. Maximum moisture content:
 - a. Prior to treatment: 25 percent.
 - b. Kiln-dry after treatment (KDAT), ASTM D4442 and ASTM D4444:
 - 1) Lumber: 19 percent (KDAT).
 - 2) Plywood: 15 percent (KD-15).
- 2. Fire-retardant preservative:

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- a. Provide protection against decay:
 - 1) EPA registered for use as a wood preservative.
 - b. Shall not bleed-through or adversely affect bond of any finish.
 - 3. Pressure-treat material in accordance with AWP A U1 and the following:
 - a. Lumber: AWP A U1.
 - b. Plywood: AWP A U1.
 - 4. Maximum flame spread rating: 25, ASTM E84.
 - 5. Wherever practicable, material to be treated shall be manufactured in its final form prior to treatment.
- D. Fasteners and Anchors:
- 1. Proper type, size, material, and finish for application.
 - 2. Plywood sheathing
 - a. Fire retardant treated plywood, UL classified FR-S, UL 723.
 - b. Thickness as shown on the Drawings.
 - c. Provide minimum B/C face with "B" face installed on the exterior side.
- E. Lumber:
- 1. Species: Douglas fir or SPF.
 - 2. Grade: #2 and better.
 - 3. Design trusses, connections, bracing, bridging and end bearings to resist loads shown on Drawings.
 - 4. Design and fabricate wood trusses to meet requirements of:
 - a. AF&PA NDS.
 - b. TPI 1.
 - c. CCR Title 24, Part 2, California Building Code.

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DIVISION 6: WOOD AND PLASTICS
SECTION 06100: ROUGH CARPENTRY**

PART 3 -- EXECUTION

3.01 GENERAL

- A. Verify measurements, dimensions, and shop drawing details before proceeding.
- B. Coordinate location of studs, nailers, blocking, grounds and similar supports for attached work.
- C. Eliminate sharp projections which would puncture roofing, flashing or underlayment material.

3.02 INSTALLATION

A. GENERAL:

- 1. Provide treated material in accordance with appropriate AWP standard for intended end use.
 - 2. Provide preservative treated material for all wood used:
 - a. Outside building.
 - b. Below grade.
 - 3. Provide fire-retardant treated material for all wood used:
 - a. Inside building.
 - b. Within exterior building walls including parapets.
 - c. In roof construction.
 - d. For roofing nailers.
- B. Attach work securely by anchoring and fastening as indicated or required to support applied loading.
- 1. Provide washers under bolt heads and nuts.
 - 2. Fasten plywood in accordance with APA recommendations.
 - 3. Use galvanized nails and fasteners unless indicated otherwise.
 - a. When anchoring treated wood material use appropriately treated fasteners for corrosion protection against the chemicals used in the wood treatment process.

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4. Use common wire nails or screws for general work.
 5. Use fasteners of size that will not penetrate members where opposite side will be exposed to view or receive finish materials.
 6. Install fasteners without splitting of wood; predrill as required.
 7. Do not drive threaded friction type fasteners.
 8. Tighten bolts and lag screws at installation and retighten as required.
- C. Set work to required levels and lines, plumb, true.
1. Shim as required.
 2. Cut and fit accurately.
- D. Provide wood grounds, nailers, or blocking where required for attachment of other work and surface applied items.
1. Form to shapes indicated or required.
 - a. Field-treat cuts and holes in preservative and fire-retardant treated material in accordance with AWPAC M4 and manufacturer's published recommendations.
 - 1) FRTM lumber:

Do not rip or mill.

Cross-cutting and drilling are allowable in accordance with manufacturer's recommendations and UL requirements.

Resurfacing, planing or fabrication of special shapes or profiles shall be done prior to treatment.
 - 2) FRTM plywood:

Cross-cutting, ripping and drilling are allowable in accordance with manufacturer's recommendations and UL requirements.
 - 3) Light sanding as permitted by UL to remove raised grain or prepare for finishing is allowable.

TECHNICAL SPECIFICATION
DIVISION 6: WOOD AND PLASTICS
SECTION 06100: ROUGH CARPENTRY

2. Grounds:
 - a. Dressed, key beveled lumber minimum 1-1/2 inch wide of thickness required to bring face of ground even with finish material.
 - b. Remove temporary grounds when no longer required.
3. Install roofing nailers as indicated:
 - a. Install per roofing manufacturer's recommendations.
 - b. Match height of nailers to insulation.
 - c. Anchor nailers to resist force of 75 PLF unless required otherwise by roofing manufacturer.
 - 1) Metal decking attachment:
 - i. Attach base nailer to metal roof deck using self-tapping stainless steel sheet metal screws (STSMS) with plate washers or with minimum 3/8-inch Type 304 stainless steel hex head bolts with nuts and washers.
 - ii. Countersink heads of bolts flush with top of nailer.
 - iii. Provide size and spacing of STSMS as required to meet loading criteria specified.
 - iv. Provide spacing of minimum 3/8-inch hex head bolts as required to meet loading criteria specified.
 - d. Provide 1/2-inch vent spaces between lengths of nailers.
 - e. Install nailers over vapor retarder where indicated.
- E. Install wood furring plumb and level with closure strips at all edges and openings.
- F. When wood has been exposed to moisture allow to completely dry out prior to covering with additional wood or another material.
- G. Correct or replace wood which shows bowing, warping or twisting to provide a straight, plumb and level substrate for applications of other materials.

3.03 TESTING (NOT USED)

**TECHNICAL SPECIFICATION
DIVISION 6: WOOD AND PLASTICS
SECTION 06100: ROUGH CARPENTRY**

3.04 TRAINING (NOT USED)

****END OF SECTION****

**TECHNICAL SPECIFICATION
DIVISION 6: WOOD AND PLASTICS
SECTION 06160: SHEATHING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Roof sheathing.
- B. Related Requirements:
1. Section 06100 "Rough Carpentry"

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Shop Drawings: For sheathing assemblies.
1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
 2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 3. Include details of interfaces with other materials.

**TECHNICAL SPECIFICATION
DIVISION 6: WOOD AND PLASTICS
SECTION 06160: SHEATHING**

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Submit experience record for previous 5 years.
- B. Product Certificates: Submit product and grade.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and experienced in sheathing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Panels as specified.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.2 ROOF SHEATHING

- A. Plywood Sheathing: Exterior Exposure 1, Structural I sheathing.
 - 1. Span Rating: Not less than 48/24.
 - 2. Nominal Thickness: Not less than 15/32 inch.

**TECHNICAL SPECIFICATION
DIVISION 6: WOOD AND PLASTICS
SECTION 06160: SHEATHING**

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

2.4 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Not allowed.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.

TECHNICAL SPECIFICATION
DIVISION 6: WOOD AND PLASTICS
SECTION 06160: SHEATHING

- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing and Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier and water-resistant glass-mat gypsum sheathing, accessories, and installation are subject to inspection for compliance with requirements.
 - 1. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 - 2. Compatible materials have been used.
 - 3. Transitions at changes in direction and structural support at gaps have been provided.
 - 4. Connections between assemblies (sheathing and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - 5. All penetrations have been sealed.

****END OF SECTION****

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07110: BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing.
- B. Related Requirements:
 - 1. Section 04220 "Concrete Unit Masonry" for masonry surfaces.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.04 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary damp proofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.02 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

TECHNICAL SPECIFICATIONS
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07110: BITUMINOUS DAMPPROOFING

1. APOC, Inc.; a division of Gardner-Gibson.
 2. BASF Construction Chemicals - Building Systems; Sonneborn Brand Products.
 3. Brewer Company (The).
 4. ChemMasters, Inc.
 5. Euclid Chemical Company (The); an RPM company.
 6. Gardner-Gibson, Inc.
 7. Henry Company.
 8. Karnak Corporation.
 9. Koppers Inc.
 10. Malarkey Roofing Products.
 11. Meadows, W. R., Inc.
- B. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
- C. VOC Content: 30 g/L or less.

2.03 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

TECHNICAL SPECIFICATIONS
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- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Mask or screed the CMU masonry surface to produce a straight and level top edge of the dampproofing as indicated.
- B. Protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- C. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- D. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.03 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat. Do not exceed height indicated. Maintain a straight and level top edge of dampproofing.

3.05 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07110: BITUMINOUS DAMPPROOFING

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07130: SHEET WATERPROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes sheet membrane waterproofing; drainage panels and protective cover.

1.02 SUBMITTALS

- A. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- B. Product Data: Submit data for surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
- C. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Waterproofing Manual.
- B. Test material samples in accordance with ASTM D449.
- C. Maintain one copy of each document on site.

1.04 QUALIFICATIONS

- A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with minimum three years documented experience.
- B. Applicator: Company specializing in performing work of this section approved by manufacturer.

1.05 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing work of this section.

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07130: SHEET WATERPROOFING

1.06 WARRANTY

- A. Furnish five year manufacturer warranty for waterproofing failing to resist penetration of water.
- B. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS (NOT USED)

2.01 SHEET MEMBRANE WATERPROOFING

- A. Manufacturers: Protecto Wrap, "Jiffy Seal," 140/60
- B. Products by other manufacturers will be considered but are subject to Architect approval and compliance with requirements.

2.02 COMPONENTS

- A. Modified Bituminous Membrane: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, reinforced with inert reinforcement. The reinforcement shall be sandwiched between 2 layers of rubberized asphalt.

Properties	Test	Results
Tensile Strength	ASTM D412	600
Elongation	ASTM D412	500
Water Absorption		0.23

- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashings: As recommended by membrane manufacturer.
- D. Surface Conditioner: compatible with membrane.
- E. Adhesives: As recommended by membrane manufacturer.
- F. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

TECHNICAL SPECIFICATIONS
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07130: SHEET WATERPROOFING

- G. Sealant: As recommended by membrane manufacturer.
- H. Protection Board: 1/4 inch thick polystyrene foam sheet.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- B. Verify items penetrating surfaces to receive waterproofing are securely installed.
- C. Verify substrate surface slopes to drain for horizontal waterproofing applications.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing
- B. Clean and prepare surfaces to receive waterproofing. Vacuum substrate clean.
- C. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.
- D. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.
- E. Apply surface conditioner at manufacturers recommended rate. Protect conditioner from rain until dry.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's written recommendations.

3.04 INSTALLATION - PROTECTION BOARD

- A. Place protection board directly against membrane; butt joints.
- B. Adhere protection board to substrate to tacky dampproofing surface. Scribe and cut boards around projections, penetrations, and interruptions.

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07130: SHEET WATERPROOFING

3.05 FIELD QUALITY CONTROL

- A. On completion of horizontal membrane installation, dam installation area in preparation for flood testing.
- B. Flood with clean water. After 48 hours, inspect for leaks.
- C. When leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect/Engineer; repeat flood test. Repair damage to building.
- D. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION OF INSTALLED CONSTRUCTION

- A. Do not permit traffic over unprotected or uncovered membrane.
- B. Protect membrane from damage by adhering protection board over membrane surface. Scribe and cut boards around projections and interruptions

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07311: ASPHALT SHINGLES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide the fiber glass asphalt shingle roofing system and all appurtenant work, complete and in place, in accordance with the Contract Documents.
- B. Roofing system appurtenances include embedment of sheet metal, nailers, flashings, cants, vents, ventilators, skylights, hatches, expansion joints, roofing, and other roofing appurtenances. Roofing WORK shall be watertight and the deterioration rate shall not exceed the manufacturer's published limitations.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Federal Specifications:

SS-C-153C	Cement, Bituminous, Plastic
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B. Commercial Standards:

ASTM D 249	Asphalt Roll Roofing (Organic Felt) Surfaced with Mineral Granules
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ASTM D 2626	Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing
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ASTM D 3018	Class A Asphalt Shingles Surfaced with Mineral Granules
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ASTM D 3161	Test Method for Wind-Resistance of Asphalt Shingles
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ASTM D 3462	Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules
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ASTM E 108	Method for Fire Tests of Roof Coverings
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1.3 CONTRACTOR SUBMITTALS

- A. **General:** All submittals shall be in accordance with the requirements of Section 01300 - Contractor Submittals.
- B. **Samples:** Shingle color samples.
- C. **Manufacturer's Information:** The manufacturer's specifications, literature, and published installation instructions for each major roofing element, product, or system.

TECHNICAL SPECIFICATIONS
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07311: ASPHALT SHINGLES

- D. **Contractor Approval:** Roofing shall be applied by a roofing contractor approved by the roofing manufacturer in writing, with a copy of the approval letter submitted to the ENGINEER.
- E. **Affidavit:** After installation of the roofing, the CONTRACTOR shall furnish to the ENGINEER a signed affidavit that the roof complies with the requirements of these Specifications and the manufacturer's recommendations for the class and type of roof specified.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Manufactured materials shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. **Storage:** All materials shall be carefully stored in an area that is protected from the elements, and in a manner recommended by the material manufacturer.

1.5 GUARANTEE

- A. The CONTRACTOR shall provide a written 2-year guarantee on roofing and associated work performed under this Section. The CONTRACTOR shall guarantee to repair or replace, at its own expense, any and all materials or workmanship which are faulty or deficient. The CONTRACTOR shall also be responsible for the repair or replacement of other damage which results from a failure of its work or materials.
- B. Manufacturer shall furnish not less than a [5] []-year limited warranty against wind/hail damage.
- C. Manufacturer shall provide a [25] []-year limited warranty that the roofing is free from manufacturing defects in material and workmanship.

PART 2 -- PRODUCTS

2.1 MATERIALS REQUIREMENTS

- A. **UL Approval:** Materials and roofing systems shall be provided which have been tested, listed, and labeled by UL for the specific class or rating of roofing. Other materials used within the system shall be acceptable to the approved shingle manufacturer.
- B. **System Rating:** The fiber glass asphalt shingle roofing system shall be a Class A fire and wind resistant system and shall meet ASTM D 3018 Type 1; ASTM D 3161; ASTM D 3462; and ASTM E 108 specifications.

2.2 ROOFING MATERIALS

- A. **Underlayment:** Underlayment shall be Type 15 Asphalt Felt Underlayment.

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- B. **Base Sheet:** Base sheet (43 lbs) shall conform to ASTM D 2626 Type I (coated).
- C. **Cap Sheet:** Mineral-surfaced cap sheets shall conform to ASTM D 249 minimum weight No. 90.
- D. **Plastic Cement:** Plastic cement shall conform to Federal Specification SS-C-153C.
- E. **Mechanical Fasteners:** Mechanical fasteners shall be approved by roofing and insulation manufacturers.
- F. **Shingles:** Shingles shall be heavyweight, two-ply laminate, asphalt impregnated, inorganic glass fiber felt, with ceramic coated granule. Shingles weight shall be 300 pounds per square (min) and be of random cut design; UL Class A fire resistance and wind rating with self sealing tabs.
- G. **Manufacturers, or Equal:**
 - 1. **Celotex "Dimensional III"**
 - 2. **GAF "Timberline".**

PART 3 -- EXECUTION

3.1 GENERAL

- A. **WORK:** The installation shall conform to applicable codes and the manufacturer's published or written recommendations, specifications, and published installation instructions for the type of work being performed.
- B. **Authorized Installer:** Roofing work shall be performed by an installer authorized and approved by the roofing system manufacturer.
- C. **Substrate Acceptance:** The CONTRACTOR shall investigate the substrate and the conditions under which roofing work is to be performed, and shall not proceed until unsatisfactory conditions have been corrected.
- D. **Coordination:** The CONTRACTOR shall coordinate the construction, materials, and items to be embedded within the roofing system but provided by the trade, such as sheet metal work, mechanical work, plumbing and piping, insulation, and equipment to be installed on top of the roofing system. The CONTRACTOR shall check and coordinate the providing of prefabricated curbs with those furnished within the mechanical and sheet metal work to avoid conflicts and duplication of materials and products.

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07311: ASPHALT SHINGLES

3.2 INSTALLATION AND CONSTRUCTION REQUIREMENTS

- A. **Installation:** Underlayment, flashings, valley reinforcement, and other items shall be installed in strict accordance with the manufacturer's written recommendations, specifications, and Code requirements.
- B. **Ridge and Hip Conditions:** Ridge and hip shingles shall match roof shingles in color and weight per manufacturer's recommendations.
- C. **Valleys:** Valleys shall be not less than 22 gage, 30-inch wide with inverted "V" at center for bending and expansion or a 36-inch wide, 90 pound, granular base sheet with 6-inch end laps, centered over the valley and nailed 12 inches o.c., 1-inch in from each outside edge. Valley shingles shall be laid over the base sheet by applying on both roof areas at the same time, weaving each course in turn over the valley. First course shall be laid along the eaves of one roof area up to and over the valley, extending along the adjoining roof area for at least 12 inches. The first course is laid along the eaves of the intersecting roof area and extended over the valley on top of the previously applied shingle. Succeeding courses shall be then laid alternately, first along one roof area and then along the other, weaving the valley shingles over each other. Press shingles tightly into the valley; nail no closer than 6 inches to the valley center line, with two nails located at the end of terminal strip.
- D. **Coordination:** Objects to be embedded into the roofing systems such as sheet metal, vent pipes, flashings, etc., shall be coordinated with item manufacturer and roofing manufacturer's written instructions.
- E. **Painting:** The CONTRACTOR shall paint all sheet metal and other metal items projecting through (or part of) the roofing system that are exposed to view. The color of painting shall be similar to the selected shingle color.

- END OF SECTION -

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07550: APP-MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. APP-modified bituminous membrane roofing.
 - 2. Roof insulation.
- B. This Section includes the installation of acoustical roof deck rib insulation strips furnished under Division 5 Section "Steel Deck."

1.03 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F, measured at the mop cart or mechanical spreader immediately before application.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

TECHNICAL SPECIFICATIONS
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07550: APP-MODIFIED BITUMINOUS MEMBRANE ROOFING

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
- C. Samples for Verification: For the following products:
 - 1. 12-by-12-inch square of, of color specified.
 - 2. 12-by-12-inch square of walkway pad or walkway cap sheet.
- D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of meeting performance requirements.
- E. Qualification Data: For Installer and manufacturer.
- F. Research/Evaluation Reports: For components of roofing system.
- G. Maintenance Data: For roofing system to include in maintenance manuals.
- H. Warranties: Special warranties specified in this Section.
- I. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Manufacturer Qualifications: A qualified manufacturer that has UL listing and 25 year old installations of roofing system identical to that for this Project.
- C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07550: APP-MODIFIED BITUMINOUS MEMBRANE ROOFING

- D. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.
- E. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
 - 2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.
- F. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section 01210. Review methods and procedures related to roofing system including, but not limited to, the following:
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07550: APP-MODIFIED BITUMINOUS MEMBRANE ROOFING

7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation. 9. Review roof observation and repair procedures after roofing installation.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.08 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.09 WARRANTY

- A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
 1. Special warranty includes roofing membrane, base flashings, and other components of roofing system.

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2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Performance Roof Systems, Inc., "Derbigum GP."
 2. Firestone Building Products Company "APP 170."
 3. U.S. Intec, Inc., "Brai Supreme APP Smooth."

2.02 APP-MODIFIED ASPHALT-SHEET MATERIALS

- A. Roofing Membrane Sheet: ASTM D 6222, Grade S, Type I or II, polyester-reinforced, APP- modified asphalt sheet; smooth surfaced; suitable for application method specified.
 1. UV resistant APP modified bitumen membrane that does not require a granule surfacing or a roof coating for protection.
- B. Roofing Membrane Cap Sheet: ASTM D 6222, Grade S, Type I or II, polyester-reinforced, APP-modified asphalt sheet; smooth surfaced; suitable for application method specified.

2.03 COATING MATERIALS

- A. Roof Coating: ASTM D 6083, acrylic elastomer emulsion coating, formulated for use on bituminous roof surfaces.
 1. Color: Buff.
 2. Available Manufacturer: Protect EC-100. Products by other manufacturers will be considered but are subject to Architect approval and compliance with requirements.

2.04 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
- B. Asphalt Primer: ASTM D 41.

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- C. Roofing Asphalt: ASTM D 312, Type as recommended by roofing system manufacturer for application.
- D. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two- part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
- E. Mastic Sealant: Polyisobutylene, plain or modified bitumen, non-hardening, non-migrating, non-skinning, and nondrying.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- G. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing membrane.
- H. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.05 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1 aluminum foil facer on both major surfaces.
 - 1. Available Manufacturers:
 - a. Celotex Corporation.
 - b. Firestone Building Products Company.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope indicated.

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- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.06 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Cant Strips: ASTM C 728, perlite insulation board.
- D. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- E. Wood Nailer Strips: Comply with requirements in Division 6 Section "Miscellaneous Carpentry."
- F. Substrate Joint Tape: 6- or 8-inch- wide, coated, glass-fiber joint tape.

2.07 WALKWAYS

- A. Walkway Pads: Mineral-granule-surfaced, reinforced asphaltic composition, slip-resisting pads, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 7/8 inch thick, minimum.
 - 1. Pad Size: As indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.

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2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 Section "Steel Deck."
4. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - a. Test for moisture by pouring 1 pint of hot roofing asphalt on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if test sample foams or can be easily and cleanly stripped after cooling.
6. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.
7. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. and allow primer to dry.
- D. Install acoustical roof deck rib insulation strips, specified in Division 5 Section "Steel Deck," according to acoustical roof deck manufacturer's written instructions.

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3.03 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Nailer Strips: Mechanically fasten 4-inch nominal- width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
 - 1. 16 feet apart for roof slopes greater than 1 inch per 12 inches but less than 3 inches per 12 inches.
 - 2. 48 inches apart for roof slopes greater 3 inches per 12 inches.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- D. Install tapered insulation under area of roofing to conform to slopes indicated.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- F. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- G. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

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3.04 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Where roof slope exceeds 1/2 inch per 12 inches, install roofing membrane sheets parallel with slope.
- D. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- E. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- F. Asphalt Heating: Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F (14 deg C) of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.
- G. Asphalt Heating: Heat and apply SEBS-modified roofing asphalt according to roofing system manufacturer's written instructions.

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- H. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.05 APP-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
 - 1. Torch apply to substrate.
 - 2. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 - 1. Repair tears and voids in laps and lapped seams not completely sealed.
 - 2. Apply roofing granules to cover exuded bead at laps while bead is hot.
- C. Install roofing membrane sheets so side and end laps shed water.

3.06 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
 - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 - 2. Flashing Sheet Application: Torch apply flashing sheet to substrate.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

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- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 - 1. Seal top termination of base flashing.
- D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.
- E. Roof Drains: Set 30-by-30-inch metal flashing in bed of roofing-manufacturer-approved asphaltic adhesive on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 4 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
 - 1. Install stripping according to roofing system manufacturer's written instructions.

3.07 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads in cold-applied adhesive, using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
- B. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:
 - 1. Approximate quantities of components within roofing membrane will be determined according to ASTM D 3617.
 - 2. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

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- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- D. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.09 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07620: SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes flashings and counterflashings.

1.02 SUBMITTALS

- A. Product Data: Submit data on manufactured components metal types, finishes, and characteristics.

1.03 QUALIFICATIONS

- A. Installer: Company specializing in sheet metal work with minimum three years documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials causing discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET METAL FLASHING AND TRIM

- A. Galvanized Steel: ASTM A924/A924M, Grade A, or ASTM A653/A653M, G90 zinc coating; 0.018 inch 24gage thick steel.

2.02 ACCESSORIES

- A. Fasteners: Galvanized steel.
- B. Protective Backing Paint: FS TT-C-494, Bituminous.
- C. Sealant: Type E butyl sealant
- D. Plastic Cement: ASTM D4586, Type I.
- E. Solder: ASTM B32; type suitable for application and material being soldered.

TECHNICAL SPECIFICATIONS
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07620: SHEET METAL FLASHING AND TRIM

2.03 FABRICATION

- A. Form sections shape indicated on Drawings, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet metal, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18 inch long legs; solder for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- H. Seal metal joints.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Paint concealed metal surfaces with protective backing paint to minimum dry film thickness of 15 mil.

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners.
- B. Apply plastic cement compound between metal flashings and felt flashings.

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07620: SHEET METAL FLASHING AND TRIM

- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
- E. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

- A. Inspection will involve surveillance of Work during installation to ascertain compliance with specified requirements.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 7: THERMAL AND MOISTURE PROTECTION
07900: JOINT SEALERS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- B. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.
- C. Warranty: Include coverage for installed sealants and accessories failing to achieve watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

1.02 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

1.03 MOCKUP

- A. Construct mockup with specified sealant types and with other components noted.
 - 1. Determine preparation and priming requirements based on manufacturers recommendations; take action necessary for correction of failure of sealant tests on mock-up.
 - 2. Verify sealants, primers, and other components do not stain adjacent materials.
- B. Locate where directed by Architect/Engineer.
- C. Incorporate accepted mockup as part of Work.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

TECHNICAL SPECIFICATIONS
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07900: JOINT SEALERS

1.05 COORDINATION

- A. Coordinate Work with sections referencing this section.

PART 2 PRODUCTS

2.01 JOINT SEALERS

- A. Manufacturers:

1. Dow Corning Corp.
2. GE Silicones
3. Mameco International Inc.
4. Pecora Corp.
5. Sika Corp.
6. Substitutions: Section 01600 - Products Requirements.

- B. Products Description:

1. High Performance General Purpose Exterior (Nontraffic) Sealant: Silicone; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.
 - a. Color: Colors as selected by Architect from manufacturers full range.
 - b. Applications: Use for:
 - (1) Joints between concrete and other materials.
 - (2) Joints between metal frames and other materials.
 - (3) Other exterior nontraffic joints for which no other sealant is indicated.
2. General Purpose Traffic Bearing Sealant: Polysulfide; ASTM C920, Grade P, Class 25, Use T; single or multi- component.
 - a. Color: Colors as selected by Architect from manufacturers full range.

TECHNICAL SPECIFICATIONS
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07900: JOINT SEALERS

- b. Applications: Use for exterior and interior pedestrian and vehicular traffic bearing joints.
- 3. Exterior Metal Lap Joint Sealant (Sealant): Butyl or polyisobutylene, non-drying, non-skinning, non-curing.
 - a. Type: manufactured by.
 - b. Applications: Use for concealed sealant bead in sheet metal work and concealed sealant bead in siding overlaps.
- 4. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.
 - a. Color: Colors as selected by Architect from manufacturers full range.
 - b. Applications: Use for interior wall and ceiling control joints, joints between door and window frames and wall surfaces, and other interior joints for which no other type of sealant is indicated.
- 5. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses M and A; single component, mildew resistant.
 - a. Applications: Use for joints between plumbing fixtures and floor and wall surfaces, and joints between kitchen and bathroom toilet room counter tops and wall surfaces.
- 6. Acoustical Sealant: Butyl or acrylic sealant; ASTM C920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.

2.02 CLEANING

- A. Clean adjacent soiled surfaces.

2.03 PROTECTION OF INSTALLED CONSTRUCTION

- A. Protect sealants until cured.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08110: STEEL DOORS AND FRAMES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

The CONTRACTOR shall provide steel doors, frames, and related items, complete and operable, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

Commercial Standards

ASTM A 653	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 1008	Steel, Sheet, Cold Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability
ASTM B 117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D 1735	Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
ASTM E 90	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ANSI A115 Series	Door and Frame Preparation
UL	Underwriters' Laboratories, Inc.

Trade Standards

National Association of Architectural Metal Manufacturers (NAAMM).

Manufacturers' Standards: In addition to the standards listed above, steel doors and frames and installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.3 CONTRACTOR SUBMITTALS

Furnish submittals in accordance with Section 01300 - Contractor Submittals.

Shop Drawings

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08110: STEEL DOORS AND FRAMES

Show details of the products and systems and connections to adjoining materials. Include schedules showing sizes, types, and locations of door louvers and glass and manufacturer's installation instructions.

Manufacturer's literature and any engineering calculations that may be required elsewhere in this Section.

Calculations by a registered civil or structural engineer showing that the doors, frames, and structural connections are designed to meet code requirements and loads.

Sound Doors and Frames: Shop Drawings, manufacturer's literature, installation recommendations, and certification of Sound Transmission Class (STC) rating shall be submitted for sound door and frame assemblies.

PART 2 -- PRODUCTS

2.1 MATERIALS AND FABRICATION - GENERAL

Shop Fabrication and Assembly: Steel doors and frames shall be shop fabricated and shop assembled, where possible. Temporary stiffeners, spacers, and other accessories necessary to facilitate handling and accurate erection shall be provided. After fabrication, tool marks and other surface imperfections shall be filled and ground smooth.

Fire Rating and Labelling: Doors and frames indicated as fire-rated shall bear a UL label indicating the type of rating for which certified. Designs and construction of such products shall have specific UL approval according to current procedures for the fire rating, either 3 hour, 1-1/2 hour, 3/4 hour, or 20 minute as indicated. Hollow steel doors and frames for fire-rated openings shall conform to Underwriters' Laboratories listing and shall be UL labeled.

Materials for Doors and Frames: Exterior doors and frames shall be fabricated entirely of steel galvanized to G60 in ASTM A 653.. Other doors and frames, unless otherwise indicated, shall be fabricated from prime quality, commercial grade, cold-rolled steel conforming to ASTM A 1008, Type II or III.

Priming and Painting: Doors and frames shall be chemically treated to ensure maximum paint adhesion and shall have all exposed surfaces painted with a rust-inhibitive primer after fabrication. Prime coat shall be capable of passing a 120 hour salt spray test in accordance with ASTM B 117 and a 250 hour humidity test in accordance with ASTM D 1735.

Hardware: Doors and frames shall be reinforced and drilled or tapped for fully templated mortised hardware; and shall be reinforced with plates for surface-mounted hardware, meeting ANSI A115 Series requirements. Hardware shall be as indicated in Section 08710 - Finish Hardware and as indicated.

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08110: STEEL DOORS AND FRAMES

2.2 METAL FRAMES

Pressed Metal Frames: Pressed steel frames for doors and other openings shall be combination buckled frame and trim of type and sizes indicated. Metal shall not be lighter than 16 gauge steel. Frames shall be of the welded unit type. Special frames, oversized frames, and frames with transom shall be provided where indicated.

Frame Jamb Depths, Trim Profile, Stops, and Backbends: Frame jamb depths, trim profile, stops, and backbends shall be as indicated.

Windows: Window frames shall be provided complete with anchors and metal stops for glazing. Stops shall be miter-cut and dipped for countersunk flathead fasteners.

2.3 FRAME ANCHORS

Floor Anchors: Floor anchors shall be welded inside each frame jamb head, and holes shall be provided for floor anchorage. Minimum thickness of floor anchors shall be 14 gauge.

Anchors for Masonry/Concrete Installations: Frames for installation in masonry and concrete walls shall be provided with adjustable jamb anchors of the T-strap, stirrups and strap, or wire type. The number of anchors provided per frame jamb and head shall be as follows:

Frames up to 7-feet 6-inches in height: 3 anchors.

Frames over 7-feet 6-inches to 8-feet 0-inches in height: 4 anchors.

Frames over 8-feet 0-inches in height: One anchor for each 2-feet 0-inches or fraction in height.

Frame head anchors shall be not less than those required by the Reference Standards.

Anchors for Stud Wall Installation: Frames for installation in stud partitions shall be provided with steel anchors of suitable design for job conditions. They shall be not less than 18 gauge thickness; and shall be securely welded inside each jamb and head as follows:

Frames up to 7-feet 6-inches in height: 3 anchors.

Frames over 7-feet 6-inches to 8-feet 0-inches in height: 5 anchors.

Frames over 8-feet 0-inches in height: 5 anchors plus one additional for each 2-feet 0-inches or fraction over 8-feet 0-inches.

Frame head anchors shall be not less than those required by the Reference Standards.

TECHNICAL SPECIFICATIONS
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Anchors to Existing Construction: Frames to be anchored to previously placed concrete, masonry, or structural steel shall be provided with anchors of suitable design to meet job requirements or as indicated.

2.4 DUST COVER BOXES AND MORTAR GUARDS

Dust cover boxes or mortar guards of not less than 24 gauge steel shall be provided at hardware mortises on frames to be set in masonry, concrete, or plaster walls.

2.5 SILENCER HOLES

Appropriate holes for silencers shall be provided in the door frames which are not designated to receive weatherstripping, seals, or sound seals.

2.6 STEEL DOORS

Design and Construction: Steel doors shall be of hollow metal construction and shall be full flush design with no visible seams. Face sheets shall be not less than cold-rolled, stretcher-levelled, 18 gauge steel. Doors shall have flush seamless face sheets with continuously and fully welded seam edges. Doors shall be rigid and neat in appearance, and shall be free from warpage or buckle. Corner bends shall be true and straight and shall be of not less than the minimum radius for the gauge of metal used. The door top and bottom shall be internally reinforced by steel members welded in place. Tops of exterior doors shall be provided with flush, water- and weather-tight top enclosures.

Transom Panels: Transom panels shall be provided where indicated and shall be of same construction as doors.

Door and Transom Cores: Doors and transom cores shall be water-resistant honeycomb. Fire rated doors shall be solid or fiber mineral core doors as required to meet code and Reference Standards requirements.

Monorail Doors: Monorail doors shall be constructed similar to the other steel doors except that they shall be notched for the monorail, provided with a T-type astragal, and be specially engineered for their size and application. Engineering shall include reinforcement for hardware and anchors and anchor sizing. Neoprene weatherstripping flaps shall be provided at the monorail penetration. Shop Drawings shall include manufacturer's engineering calculations if requested by the ENGINEER.

Double Doors: Double doors shall be provided with a "T" type steel astragal unless otherwise indicated in Section 08710 - Finish Hardware.

Manufacturers, or Equal

Forderer Cornice Works

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08110: STEEL DOORS AND FRAMES

Krieger Steel Products Co.

Overly Manufacturing Co.

Trussbuilt, Inc.

2.7 SOUND DOORS AND FRAMES

Door and Frame Assemblies: Sound doors and frames shall be complete, factory-built, and laboratory-tested assemblies, complete with perimeter compression seals and automatic, door-bottom seals at sill.

STC Rating: Sound door assemblies shall have a minimum STC rating of 40 dB. The CONTRACTOR shall provide a written certification by the door manufacturer stating that the STC rating is in accordance with ASTM E 90 as conducted by a qualified acoustical products testing laboratory.

Door Construction: Doors shall be formed of 16 gauge steel face sheets jointed by welding along the vertical edges. Door tops and bottoms shall be reinforced and completely closed with die-formed, 16 gauge steel channels welded in place. The core shall be an incombustible, noncoupling filler. An astragal shall be provided at pairs of doors. Exterior doors shall be provided with flush, water- and weather-tight top enclosures.

Frame Construction: Frames shall be fabricated from 14 gauge steel with the corners mitered, welded, and ground smooth. Strike, hinge, and other hardware reinforcement shall be of not less than 3/16-inch thick steel. The frame shall be provided with welded floor anchors at each jamb, and with a minimum of 3 wall anchors per jamb.

Perimeter Seals: Perimeter seals shall be made of sturdy vinyl with a magnetic tape insert. The hinge side shall be constructed so as to avoid pinching or other distortion of the seal from opening and closing of the door.

Automatic Door Bottoms: Automatic door bottoms shall close the entire gap between the door and the floor. The seal shall be 50 - 60 durometer neoprene, and the actuating mechanism shall compress or retract the seal properly when the outer face of the door is within 2-inches of the strike jamb.

Cleaning and Priming: Doors, frames, and seal retainers shall be thoroughly cleaned, phosphatized, and factory primed with rust-inhibitive primer. The primer shall be compatible with the finish coating in Section 09800 - Protective Coating.

Manufacturers, or Equal

Krieger Steel Products Co.

Overly Manufacturing Co.

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08110: STEEL DOORS AND FRAMES

Sonicbar by Rysdon Products Co.

PART 3 -- EXECUTION

3.1 PRODUCT DELIVERY, STORAGE, AND HANDLING

Doors and frames shall be shipped and stored with temporary stiffeners and spacers in place to prevent distortion.

Doors and frames shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

Doors and frames shall be carefully stored on wood blocking in an area that is protected from the elements. Storage shall be in a manner that will prevent damage or marring of finish.

3.2 CONSTRUCTION

General: WORK shall be in accordance with manufacturer's published recommendations and specifications.

WORK shall be coordinated with appropriate related subcontractors to assure a proper installation. Field conditions and dimensions shall be verified prior to fabrication.

3.3 FRAME INSTALLATION

Frames shall be set plumb and square in a true plane, and be securely anchored to the adjoining construction. Steel shims shall be provided, set tight and rigidly attached between frame anchors and structure. Finished metal frames shall be strong and rigid; neat in appearance; and square, true, and free from defects, warp, or buckle.

Molded members, trims, and stops, shall be clean cut, straight, and shall be of a uniform profile throughout their lengths.

Corner joints shall have contact edges tightly closed with trim faces mitered, welded, and finished smooth. The use of gussets will not be permitted.

3.4 DOOR INSTALLATION

Doors shall be installed plumb, square, and level. Doors shall operate freely, but not loosely. They shall be free from rattling while in a closed position.

Door clearances shall be plus 3/32-inch or minus 1/32-inch and shall not exceed the limits in the manufacturer's printed recommendations.

Any door that becomes warped more than 3/16-inch out-of-plane shall be replaced by the CONTRACTOR.

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08110: STEEL DOORS AND FRAMES

3.5 FINISH HARDWARE

Finish hardware shall be installed in accordance with hardware manufacturer's standard templates and printed instructions. Operable parts shall be adjusted for correct function and operation.

3.6 EXISTING CONSTRUCTION

Frames that are dimpled for fasteners required for installation into previously placed (existing) concrete, masonry, or steel structures shall have the fasteners and fastener frame dimples filled with auto putty or an equal filler material. Fasteners and fillers at dimple holes shall be ground smooth (non-visible) before painting. Fastener locations shall not be visible after the painting is finished.

- END OF SECTION -

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08360: OVERHEAD DOORS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide overhead door assemblies and frames and all appurtenant work, complete and operable, including manual drive systems and power drive systems, including locking hardware, and control systems, all in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Federal Specifications:

QQ-S-775E, Int. Amd. 1	Steel Sheets, Carbon, Zinc-Coated (Galvanized) By The Hot-dip Process
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B. Commercial Standards:

NEMA	National Electric Manufacturers' Association
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NEC	National Electric Code
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C. Trade Standards:

Aluminum Association:	Anodizing Systems
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- D. **Manufacturers' Standards:** In addition to the standards listed above, the overhead doors and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.3 CONTRACTOR SUBMITTALS

- A. **General:** All submittals shall be in accordance with the requirements of Section 01300 - Contractor Submittals.
- B. **Manufacturer's Information:** Manufacturer's literature, wiring diagrams, manufacturer's installation instructions, and any engineering calculations that may be required elsewhere in this Section shall be submitted. Calculations by a registered civil or structural engineer shall be submitted which show that the overhead door systems and their structural connections are designed to meet code requirements and loads.
- C. **Shop Drawings:** Shop drawings showing details of the products and systems and connections to adjoining materials shall be submitted along with any manufacturer's installation instructions. Schedules showing sizes, types, and locations of louvers and glass shall be submitted.

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08360: OVERHEAD DOORS

- D. **O and M Instructions:** Upon completion, the CONTRACTOR shall deliver to the ENGINEER complete operation and maintenance instructions for the overhead door assemblies.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Manufactured materials shall be delivered in original and unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. **Storage:** All materials shall be carefully stored in an area that is protected from the elements. Storage shall be in a manner that will prevent damage or marring of the door and its finish.

PART 2 -- PRODUCTS

2.1 ROLL-UP DOORS

- A. **General:** Roll-up doors shall be of the metal-curtain slat design and shall be [chain-operated] [motor-operated], and shall be weather and dust-resistant. [Wiring diagrams shall be submitted for motor-operated doors.] Doors shall be provided complete with slats, guides, hoods, reduction gears, galvanized hand chain, operating mechanism, motors, controls, wiring, brackets, gears, head, bottom and side weather stripping, hardware, and all other items necessary for their installation and operation.
- B. **Wind Loading:** The doors shall be designed to withstand a windload of [20] [] lb/sq ft.
- C. **Curtain Slats:** Curtain slats shall be roll-formed from galvanized steel sheet conforming to FS QQ-S-775-E Int. Amd. 1, Type I, class D. Curtain slats shall be flat **Cookson No. 5; Kinnear No. 17; or equal**, and shall be of a gage size suitable for dimension and loading of the opening, but shall be not lighter than 20 gage. [Slats shall be insulated.]
- D. **Endlocks:** Endlocks shall be continuous malleable iron castings, designed to provide for curtain alignment and security against lateral movement.
- E. **Bottom Bar:** The bottom bar shall consist of 2 angles galvanized and bolted back-to-back on each side of curtain, to suit floor profile. A replaceable flexible vinyl or neoprene gasket shall be provided as a weather seal and cushion bumper. [A reversing footpiece shall be provided at motor-operated doors unless otherwise shown.]
- F. **Guides and Stops:** Guides shall consist of a galvanized steel angle assembly of proper size to retain the curtain. Guides shall be provided with weatherstripping. Angle thickness shall be minimum 3/16-inch. Jamb angles shall be anchored to the supporting walls with 3/8-inch bolts spaced at 30 inches on centers, and extending above door opening head to support the coil brackets. Removable stops on guides to prevent over-travel of curtain and a continuous bar for holding windlocks, where required, shall be provided.

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- G. **Barrel Assembly and Balancing Mechanism:** The barrel shall be a steel pipe of sufficient diameter and thickness to support the roll-up curtain without distortion of slats, and to limit deflection of the barrel to not more than 0.03-inch per foot of span under full load. The barrel shall have a minimum diameter of 4 inches. The spring balance shall consist of one or more helical torsion springs of oil-tempered heat-treated steel to transfer full load to a single steel torsion bar in the barrel. Rotating members shall turn on self-lubricating graphite or grease-sealed ball bearings, with adjustment for counterbalance springs accessible from outside barrel. Brackets shall be 5/16-inch-thick, cold-rolled steel plate, or equal strength cast iron, attached to the jamb angle guide with 1/2-inch bolts. Brackets shall have a bell-mouth guide groove for the curtain.
- H. **Hood:** The hood shall be manufactured of 24-gage galvanized steel sheet with bonderized treatment. The hood shall fit over the end brackets. Top and bottom edges of hood shall be rolled and reinforced for stiffness, and intermediate supports shall be provided as necessary. The hood baffle shall be of neoprene and sheet metal.
- I. **Chain Holder:** A chain holder shall be provided on wall with provision for padlocking.
- J. , sprocket, and reduction gearing to the barrel, designed to require not more than a 35-lb pull on the chain to move curtain. Sprockets and gears shall have machine cut teeth, or shall be machine-molded. Bearings shall be lubricated for life and self-aligning, either self-lubricating graphite bearings or grease-sealed precision ball bearings, depending on size of door. Operating chain shall be hot-dip galvanized, located at side of door as shown on the approved shop drawings, and shall be continuous loop design that extends to a point approximately 24 inches above the floor. Chain and gear guards shall be provided as necessary for protection against malfunction or personal hazard.
- K. **Motor Operation Features:** Motor operation shall be pushbutton control unless otherwise specified or shown. Electrically-operated doors shall be driven by an integral power unit that has been approved by Underwriters Laboratories. The unit shall consist of, but not be limited to, the following principal components, all enclosed in a weathertight housing:
1. Gear reducer, totally enclosed and operating in an oil bath.
 2. Emergency hand chain operator and electrical interlock.
 3. High torque, totally enclosed motor with thermal protective device.
 4. Disc brake.
 5. Power supply shall be []-volt, []-phase, []-Hz.
 6. Combination starter, prewired when permitted under the National Electric Code.

TECHNICAL SPECIFICATIONS
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7. Motor and brake shall be removable without affecting chain operator or limit switch setting. Power unit shall connect to operating shaft to raise and lower the door at approximately one foot per second without the use of external gears, belts, or chain. Electrical leads between motor, brake, protective device, interlock, and limit switch shall be factory prewired. The motor-operated doors shall be equipped with an electrical device to stop downward travel of door on contact with an object.
8. Operators shall be equipped with a NEMA motor controller, complete with overcurrent protection and 3-button pushbutton station marked "Open," "Close," and "Stop." At interior locations, NEMA 1 motor controllers shall be used; and at exterior locations, NEMA 4 motor controllers shall be used.
9. The motor-operated doors, motors, controls, safety devices, and wiring shall conform to requirements of governing codes and authorities.]

L. **Manufacturers, or Equal:**

1. Cookson, ["Weatherbar FC"] ["Type FC"] ["Type FCM Motor"]
2. Kinnear, ["Extr-tite FC-20".] ["FH-20".] ["FPO-20".]

- M. **Wicket Doors:** Wicket doors, where shown, shall be 1-3/4-inch thick, 3-ft wide by 7-ft high unless otherwise shown, [conforming to Specification Section [08110], "Steel Doors and Frames."] [of manufacturer's standard design.] Wicket door frames shall be of all-welded construction of heavy angle steel. Wicket door frames shall be secured in closed position by means of heavy-duty cane bolt into the floor slab. Doors shall be provided with heavy-duty stainless steel hinges, shop painted, and shall be adapted, reinforced, and cut for finish hardware as specified in Section 08710 - Finish Hardware.

- N. **Primer and Priming:** Curtains and wicket doors shall be provided with a baked acrylic which is compatible with the finish paint specified in Section 09800 - Protective Coating or Section 09900 - Architectural Paint Finishes, as applicable. All other metal parts, exposed and concealed, and doors, shall be shop-primed with primer which is compatible with finish paint specified. The inside working area of the guides shall not be painted.

2.2 **OVERHEAD SECTIONAL DOORS**

- A. **General:** Overhead sectional doors shall be of the heavy-duty [aluminum] [rolled galvanized steel] type, upward-acting, complete with stiles and rails, hardware, locks, panels, tracks, weatherstripping, and glass. Doors shall be [high] [standard] [low] lift type doors.
- B. **Wind Load and Deflection:** Doors shall be engineered to withstand a 20 lb/sq ft wind load and a maximum 1/120 of door width deflection with door in horizontal position.

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- C. **Power Drive:** Power-drive doors shall be provided with power unit, operators, controls, conduit and wiring; all meeting applicable codes. Door bottom shall be equipped with safety edge device providing automatic stop and reverse.
- D. **Door Construction:** Doors shall be made up of [aluminum] [heavy-gage steel] stiles, and rails shall be made into a number of equal sections and panels. [Panels in lower sections shall be of aluminum plate; upper sections shall be glazed.] [Eye-level panel sections shall be provided with [3] [4] [] gasket type window lites.] Doors shall be provided with inside padlocking hardware. Tracks shall be not less than 3-inch galvanized steel tracks.
- E. **Glazing:** Glass shall be wire-reinforced glass unless specified otherwise in Section 08800 - Glazing.
- F. **Power Unit:** Power unit shall be heavy-duty, [1/2] []-hp []-volt, []-phase motor. Operators shall be equipped with a NEMA motor controller, complete with overcurrent protection and 3-button pushbutton station marked "Open," "Close," and "Stop." At interior locations, NEMA 1 motor controllers shall be used; and at exterior locations, NEMA 4 motor controllers shall be used. The motor-operated doors, motors, controls, safety devices, and wiring shall conform to requirements of governing codes and authorities.
- G. **Primer and Finish:** [Aluminum shall have 0.7-mil minimum thickness hard coat anodic finish conforming to Aluminum Association System AA-M10C22A42, dark bronze color.] [All exposed non-aluminum metal shall be shop painted with manufacturer's standard primer.]
- H. Manufacturers, or Equal:
 - 1. **Clopay Square Corporation, ["900"] ["670"].**
 - 2. **Overhead Door Corporation, ["520"] ["420"] Insulated Series**

PART 3 -- EXECUTION

3.1 GENERAL

- A. Installation shall be in accordance with the manufacturer's printed recommendations and instructions.

3.2 INSTALLATION

- A. Doors and frames shall be accurately cut, fitted, and installed level, square, plumb, and in alignment. Fasteners shall be of sufficient length, and shall be sized for loads imposed. Doors and frames shall be provided with accurately made cutouts, and shall be reinforced

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for strength where necessary. Doors shall be adjusted to provide smooth, unbinding operation with all hardware fully operable.

- END OF SECTION -

TECHNICAL SPECIFICATIONS
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08710: DOOR HARDWARE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Section 08114, Standard Steel Doors.
 - 2. Section 08115, Standard Steel Frames.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 80 - Fire Doors and Windows.
 - 4. NFPA 101 - Life Safety Code.
 - 5. NFPA 105 - Installation of Smoke Door Assemblies.
 - 6. State Building Codes, Local Amendments.

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- E. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series
 - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.03 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.

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- f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - 2. Electrical Coordination: Coordinate with related Division 26 Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the

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manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.04 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
 - 1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- D. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

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2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - (1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - (2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 3. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.
 4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and

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inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.

- a. Test Pressure: Positive pressure labeling.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards. G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings."
- G. Keying conference to incorporate the following criteria into the final keying schedule document:
- 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01, Section 01210 with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
- 1. Prior to installation of door hardware, arrange for manufacturers' representatives to hold a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.

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- 4. Review and finalize construction schedule and verify availability of materials.
- 5. Review the required inspecting, testing, commissioning, and demonstration procedures.
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.06 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the

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specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.07 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Ten years for mortise locks and latches.
 - 2. Five years for exit hardware.

1.08 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

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- B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
 - 1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- B. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.02 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.

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- c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
- 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - (1) Out-swinging exterior doors.
 - (2) Out-swinging access controlled doors.
 - (3) Out-swinging lockable doors.
- 5. Acceptable Manufacturers:
 - a. Hager Companies (HA).
 - b. Stanley Hardware (ST).

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2.03 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified automatic, self-latching, and manual flush bolts and surface bolts. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - 1. Acceptable Manufacturers:
 - a. Ives (IV).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).

2.04 CYLINDERS AND KEYING

- A. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- B. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified patented cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
 - 1. Acceptable Manufacturers:
 - a. Stanley Best (BE) - Best
 - b. No Substitution – Facility Standard.
- C. Master keys shall be sealed in tamper-proof packaged boxes when shipped from the factory to the owner via Registered Mail.

2.05 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified mortise locksets furnished in the functions as specified in the Hardware Sets. Locksets to be manufactured with a corrosion resistant, stamped 12 gauge minimum formed steel case and be field-reversible for handing without disassembly of the lock body. Lockset trim (including knobs, levers, escutcheons, roses) to be the product of a single manufacturer. Furnish with standard 2 3/4" backset, 3/4" throw anti-friction stainless steel latchbolt, and a full 1" throw stainless steel bolt for deadbolt functions.
 - 1. Acceptable Manufacturers:
 - a. Stanley Best (BE) – 40H Series.
 - b. No Substitution – Facility Standard.
- B. Lock Trim Design: As specified in Hardware Sets.

2.06 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
 - 4. Dustproof Strikes: BHMA A156.16.

2.07 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - a. Fire Exit Removable Mullions: Provide keyed removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions to be used only with exit devices for which they have been tested.
 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 4. Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
 5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty trim with cold forged escutcheons, beveled edges, and four threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.

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- b. Where function of exit device requires a cylinder, provide an interchangeable core type keyed cylinder (Rim or Mortise) as specified in Hardware Sets.
 - 6. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.
 - 7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 - 8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 - 9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 - 10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.
- 1. Acceptable Manufacturers:
 - a. Von Duprin (VD) - 35A/98 XP Series.
 - b. No Substitution – Facility Standard.

2.08 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
 - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

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2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
 - b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
 - c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
 - d. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.
 5. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable

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backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Acceptable Manufacturers:
 - a. LCN Closers (LC) - 4040XP Series.
 - b. No Substitution – Facility Standard.

2.09 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following.
 - a. Stainless Steel: .050-inch thick, with countersunk screw holes (CSK).
 - b. Brass or Bronze: .050-inch thick, with countersunk screw holes (CSK).
 - c. Laminate Plastic or Acrylic: 1/8-inch thick, with countersunk screw holes (CSK).
4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.
5. Metal Door Edging: Door protection edging fabricated from a minimum .050-inch thick metal sheet, formed into an angle or "U" cap shapes, surface or mortised mounted onto edge of door. Provide appropriate leg overlap to account for protection plates as required. Height to be as specified in the Hardware Sets.

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- 6. Acceptable Manufacturers:
 - a. Rockwood Manufacturing (RO).
 - b. Trimco (TC).

2.10 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Acceptable Manufacturers:
 - 1. Pemko Manufacturing (PE).
 - 2. Zero International (ZE).

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2.11 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.12 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.02 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

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3.03 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so

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that the completion of the work will not be delayed by hardware losses before and after installation.

3.04 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.05 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.06 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.07 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.08 DOOR HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included

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in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Manufacturer's Abbreviations:

1. ST - Stanley Works
2. ST - Stanley Security Solutions Inc (CL)
3. ST - Stanley Security Solutions Inc (CH)
4. RO - Rockwood
5. VD - Von Duprin
6. BE - Stanley Security Solutions Inc (BE)
7. IV - Ives
8. LC - LCN Closers
9. PE - Pemko
10. 00 - Other

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 8: DOORS AND WINDOWS
08800: GLAZING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Interior Windows.

1.02 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.03 QUALITY ASSURANCE

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Glazing Manual."
- B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

PART 2 PRODUCTS

2.01 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

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2.02 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: Kind FT, ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

2.03 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - 1. Neoprene complying with ASTM C 864.
 - 2. EPDM complying with ASTM C 864.
 - 3. Silicone complying with ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

2.04 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
 - 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.05 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 EXECUTION

3.01 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

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- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.02 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 9: FINISHES
09200: STUCCO PLASTER FINISH

PART 1 -- GENERAL

1.1 THE REQUIREMENT

The CONTRACTOR shall provide lathing, plastering, stucco, and related work, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

Federal Specifications

FF-N-105B(3) INT AMD 4	Nails, Brads, Staples and Spikes: Wire, Cut and Wrought
QQ-W-461H	Wire, Steel, Carbon (Round, Bare, and Coated)
SS-C-161A	Cement, Keene's
UU-B-790A INT AMD 1	Building Paper, Vegetable Fiber, (Kraft, Waterproofed, Water Repellant and Fire Resistant)

Commercial Standards

ASTM C 5	Quicklime for Structural Purposes
ASTM C 37	Gypsum Lath
ASTM C 61	Gypsum Keene's Cement
ASTM C 150	Portland Cement
ASTM C 206	Finishing Hydrated Lime
ASTM C 841	Installation of Interior Lathing and Furring
ASTM C 842	Application of Interior Gypsum Plaster

Trade Standards

"Lathing and Plastering Reference Specifications" as compiled by the California Lathing and Plastering Contractor's Association (CLPCA).

"Handbook for Ceramic Tile Installation" (HCTI) by the Tile Council of America.

Manufacturers' Standards: In addition to the standards listed above, lathing and plastering products and installation shall be in accordance with the manufacturer's published recommendations and specifications.

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09200: STUCCO PLASTER FINISH

1.3 CONTRACTOR SUBMITTALS

Furnish submittals in accordance with Section 01300 - Contractor's Submittals.

Samples: Samples of integral color exterior plaster shall be submitted for color selection. When requested by the ENGINEER, a 12-inch by 12-inch sample panel of exterior cement plaster in the selected colors shall be submitted for approval. Samples of metal lath, metal furring devices, trim, and plastering accessories shall be submitted for approval.

Manufacturer's Information: Manufacturer's literature, specifications, installation instructions, technical data, and general recommendations for the lathing and plastering materials shall be submitted.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

Delivery of Materials: Manufactured products shall be delivered in original, unbroken, packages, containers or bundles bearing the name of the manufacturer.

Storage: Products shall be carefully stored as recommended in the Trade Standards in an area that is protected from the elements. Storage shall be in a manner that will prevent damage to the products or marring of their finishes.

PART 2 -- PRODUCTS

2.1 PLASTER MATERIALS

General: The materials for lath and plaster work shall conform to the applicable requirements of ASTM C 841 and ASTM C 842.

Exterior Plaster: Exterior plaster surfaces shall be a combination of portland cement scratch and brown coats and prepared integral colored finish coat. Thickness of exterior plaster shall be not less than 7/8-inch. Exterior cement plaster over concrete block shall consist of a bonding agent applied to wall, application of a portland cement scratch coat, and application of a prepared, integral-colored finish coat.

Backing: Plaster backing for tile work shall be portland cement scratch coat with surface cross-scratched to provide adequate bond. Membranes, metal lathing, and accessories shall be not less than specified within HCTI system W 231-87 and W 241-87. Welded wire fabric lath shall be used as backing behind tile work.

Interior Plaster: Interior plaster materials shall conform to the following requirements:

Interior cement plaster shall be portland cement plaster for the scratch, brown, and finish coats.

Interior Keene's cement plaster shall be Keene's cement plaster over (scratch and brown) coats of gypsum plaster, 3 coat system.

Interior gypsum plaster shall be 3/8-inch thick gypsum lath and 1/2-inch thick gypsum plaster finish coat.

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Plasters: Plasters shall conform to the following requirements:

Cement for portland cement plaster shall be Type I or Type II portland cement as specified in ASTM C 150.

Integral colored finish coat plaster shall be factory-prepared, colored plaster, "Finish Coat Portland Cement (Stucco)," complying with ASTM C 150.

Keene's cement plaster shall be a high-strength, white, gypsum plaster used with finish lime putty for extremely hard, dense surfaces conforming to ASTM C 61, and Federal Specifications SS-C-161A, Type 1.

Lime or hydrated lime shall conform to ASTM C 206, and quicklime shall conform to ASTM C 5. Lime putty shall weigh no less than 33 lb/cu ft and shall be made of hydrated lime or quicklime.

Bonding agents shall be a non-water-deteriorating, non-oxidizing, non-crystallizing, liquid, resinous water-emulsion designed for exterior use. Bonding agent shall provide a permanent bond for gypsum, lime putty, cement, or acoustical plaster finishes to gypsum, cement plaster, concrete, masonry, wood, or steel, whether the surfaces are painted or unpainted, old or new, damp or dry. It shall be free from any tendency to harden or craze crack. It shall be non-toxic, vermin proof, and non-combustible. Bonding agents shall be certified to be non-deteriorating as shown by minimum 2 year controlled laboratory test. Bonding agents shall be **"Weldcrete" by Larsan Products Corporation; "Enco Weld" by Enco Products;** or equal.

Gypsum plaster shall conform to ASTM C 28.

Cement shall conform to ASTM C 61, or Federal Specification SS-C-161A.

Finish coat sand for exterior cement plaster finish coat shall be No. 30. Sand for interior cement plaster finish coat shall be No. 200

2.2 METAL LATH AND WIRE PRODUCTS

Rib Lath: Rib lath shall be 3.4 lb/sq yd with 3/8-inch metal rib and shall be expanded from copper-bearing-steel and coated with rust-inhibitive paint after fabrication. Galvanized metal lath shall be used for construction within one mile of oceans.

Flat (or Self-Furring) Diamond Mesh: Flat or self-furring diamond mesh shall be 3.4 lb/sq yd and shall be expanded from copper-bearing steel sheets either coated with rust-inhibitive paint or hot-dip galvanized after fabrication.

Welded Wire Fabric: Welded wire fabric, with backing, shall be fabricated from minimum 16-gauge galvanized wire, with openings not to exceed 2-inch by 2-inch, and welded at all intersections. Backing shall comply with Federal Specifications UU-B-790A, Int. Amd. 1.

Paper Backing (Weather-Resistive Barrier): Paper backing for use as a weather-resistive barrier with metal plaster bases shall comply with Federal Specifications UU-B-790A, Int. Amd. 1, It

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shall be either Building Paper or Vegetable Fiber which is waterproofed, water repellent, and fire resistant and of the style and grade applicable or specified for the intended use. Paper shall be securely held in place by or attached to the metal plaster base. Paper shall permit full 1/8-inch plaster embedment, for not less than 1/2 of the total length of the wire strands and 1/2 of the total weight of the metal.

2.3 GYPSUM LATH

Gypsum lath, either perforated or plain, shall conform to ASTM C 37.

Perforated gypsum lath shall be 1/2-inch thickness, unless otherwise indicated.

Type "X" plain gypsum lath for fire rated construction shall be 1/2-inch thick, unless otherwise indicated.

2.4 ACCESSORIES

Metal and welded wire shapes used as base screeds, casing beads, ventilating screeds, weep screeds, control joints, etc., shall be of such size and dimension as to provide for the full required plaster thickness. Accessories shall be fabricated of minimum 24-gauge galvanized steel or minimum 19-gauge galvanized wire.

Corner beads, control joints, and ventilating expansion screed with short or expanded flanges shall be fabricated from minimum 26-gauge galvanized steel.

Drip screed or weep screed and casing beads shall be fabricated from minimum 24-gauge galvanized steel.

Expansion joint trim shall be either **No. J-4-U by Superior; No. 40 by Inryco**; or equal.

External corner reinforcement for Portland cement plaster applications shall be fabricated either from large-opening, expanded metal or from welded, minimum 18-gauge, copper-bearing wire and shall be galvanized after fabrication.

Extruded aluminum vent screeds and reveal shall be as indicated.

2.5 SUSPENSION SYSTEM

Channels: Channels shall be hot-rolled or cold-rolled steel, free of rust, and shall be provided with a corrosion-resistant protective coating. Furring channels for gypsum board construction shall be in accordance with Section 09250 - Gypsum Board.

Tie Wire and Clips: Tie wire and/or clips used for attaching lath to supports and for securing cross furring to primary members shall be galvanized, soft-annealed steel wire, and the weight of galvanizing shall be not less than Class 1 as set forth in Federal Specifications QQ-W-461H.

Hangers: Supporting hangers for main beams or runners in suspended ceilings shall be steel hanger wire of gauges set forth in the UBC and Class 1 galvanized as set forth in Federal Specification QQ-W-461H.

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2.6 MISCELLANEOUS MATERIALS

Nails: Nails shall conform to Federal Specifications FF-N-105B(3) Int. Amd. 4.

Staples: Staples shall be USS 14-gauge, flattened, galvanized wire staples conforming to Federal Specifications FF-N-105B(3) Int. Amd. 4.

Unspecified Materials: Unspecified materials and fasteners shall meet or exceed the requirements of UBC and other referenced standards. In case of conflict, the most stringent requirements shall govern.

PART 3 -- EXECUTION

3.1 GENERAL

The application and finishing of lath and plaster work shall conform to the applicable requirements of ASTM C 842 and ASTM C 841 and other referenced standards.

3.2 INSTALLATION

General: The applied methods procedures and materials shall reflect job conditions such as temperature, humidity, ventilation, and surface type and condition and shall conform to the requirements of the referenced specifications, codes, and standards.

Metal Accessories: Metal accessories shall be set plumb, level, and true and shall be shimmed where necessary for a true, tight, and secure application. Corners shall be mitered and exposed joints shall be accurately and tightly fitted. Sections shall be installed in the maximum practical lengths and splices shall be held to a minimum. Corner beads and casing beads shall be securely fastened at spacings of not more than 12-inches.

Control Joints: Install control joints at locations where panel sizes or dimensions change. Joints shall extend the full width or height of the plaster membrane. For exterior cement plaster, install control joints to create panels no larger than 144-square feet with no dimension exceeding 18-feet or a length to width ratio of 2-1/2 to 1.

Tile Backing: Welded wire fabric lath shall be provided as part of the cement plaster backing behind the tile WORK.

Edges and Boundaries: Plaster surfaces shall be finished to metal casings, sheet metal shapes, or wood grounds. (Wood grounds may be used only where covered by other finish work.) Where joining other materials in locations exposed to view, the edges or boundaries of all plaster surfaces shall be finished with metal casing beads.

3.3 CEILING SUSPENSION SYSTEM

The ceiling suspension system shall be provided for plaster ceilings unless otherwise indicated. The suspension system shall include hangers, anchors, channels, wires, and furring to form a complete system that meets or exceeds the requirements of the referenced specifications, codes, and standards.

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3.4 PLASTER FINISHES

Exterior: Exterior (Stucco) plaster finish texture shall be float finish, as indicated in the referenced standards, and approved by the ENGINEER, unless otherwise indicated.

Interior: Interior plaster shall have a putty coat finish.

Cement: Cement plaster shall be given a fine float finish.

Keene's Cement: Keene's cement plaster shall have a smooth, putty coat finish.

- END OF SECTION -

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PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall provide protective coatings, complete and in place, in accordance with the Contract Documents.
- B. Definitions
1. The term "paint," "coatings," or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and all other protective coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.
 2. The term "DFT" means minimum dry film thickness, without any negative tolerance.
- C. The following surfaces shall not be protective coated:
1. Concrete, unless required by items on the concrete coating schedule below or the Drawings.
 2. Stainless steel
 3. Machined surfaces
 4. Grease fittings
 5. Glass
 6. Equipment nameplates
- D. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the Drawings are used to show or extend the limits of coating schedules, to show exceptions to the schedules, or to clarify or show details for application of the coating systems.
- E. Where protective coatings are to be performed by a subcontractor, the subcontractor shall provide 5 references which show that the painting subcontractor has previous successful experience with the indicated or comparable coating systems. Include the name, address, and the telephone number for the owner of each installation for which the painting subcontractor provided the protective coating.

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- F. **Architectural Coatings:** Wood, drywall and plaster surfaces shall be coated in accordance with Section 09900 – Paints and Coatings. All other surfaces of buildings shall be coated as indicated in this Section.

1.02 CONTRACTOR SUBMITTALS

- A. **General:** Submittals shall be furnished in accordance with Section 01300 – Contractor Submittals, unless indicated otherwise below.
- B. Submittals shall include the following information and be submitted at least 30 days prior to protective coating work:
1. Coating Materials List: Eight copies of a coating materials list showing the Manufacturer and the coating number, keyed to the coating systems herein. The list shall be submitted prior to or at the time of submittal of samples.
 2. Paint Manufacturer's Information: For each coating system to be used, the following data:
 - a. Paint Manufacturer's data sheet for each product proposed, including statements on the suitability of the material for the intended use.
 - b. Technical and performance information that demonstrates compliance with the system performance and material requirements.
 - c. Paint Manufacturer's instructions and recommendations on surface preparation and application.
 - d. Colors available for each product (where applicable).
 - e. Compatibility of shop and field applied coatings (where applicable).
 - f. Material Safety Data Sheet for each product used.
- C. Samples
1. Samples of all paint, finishes, and other coating materials shall be submitted on 8-1/2-inch by 11-inch sheet metal. Each sheet shall be completely coated over its entire surface with one protective coating material, type, and color.
 2. Two sets of color samples to match each color selected by the ENGINEER from the Manufacturer's standard color sheets. If custom mixed colors are indicated, the color samples shall be made using color formulations prepared to match the color samples furnished by the ENGINEER. The color formula shall be shown on the back of each color sample.

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3. One fifteen pound sample of each abrasive proposed to be used for surface preparation for submerged and severe service coating systems.

1.03 SPECIAL CORRECTION OF DEFECTS REQUIREMENTS

- A. **Warranty Inspection:** A warranty inspection may be conducted during the eleventh month following completion of all coating and painting work. The CONTRACTOR and a representative of the coating material Manufacturer shall attend this inspection. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the OWNER. The OWNER may, by written notice to the CONTRACTOR, reschedule the warranty inspection to another date within the one-year correction period, or may cancel the warranty inspection altogether. If a warranty inspection is not held, the CONTRACTOR is not relieved of its responsibilities under the Contract Documents.

PART 2 PRODUCTS

2.01 GENERAL

- A. **Suitability:** The CONTRACTOR shall use suitable coating materials as recommended by the manufacturer. Materials shall comply with Volatile Organic Compound (VOC) limits applicable at the Site.
- B. **Material Sources:** Where manufacturers and product numbers are listed, it is to show the type and quality of coatings that are required. If a named product does not comply with VOC limits in effect at the time of bid opening, that product will not be accepted, and the CONTRACTOR shall propose a substitution product of equal quality that does comply. Unless indicated otherwise, proposed substitute materials will be considered as indicated above. Coating materials shall be materials that have a record of satisfactory performance in industrial plants, manufacturing facilities, and water and wastewater treatment plants.
- C. **Compatibility:** In any coating system only compatible materials from a single Manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.
- D. **Containers:** Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, and name of manufacturer, all of which shall be plainly legible at the time of use.
- E. **Colors:** All colors and shades of colors of all coats of paint shall be as indicated or selected by the ENGINEER. Each coat shall be of a slightly different shade, to

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facilitate inspection of surface coverage of each coat. Finish colors shall be as selected from the manufacturer's standard color samples by the ENGINEER.

F. Substitute or "Or-Equal" Products

1. To establish equality under Section 01600 - Products, Materials, Equipment and Substitutions, the CONTRACTOR shall furnish satisfactory documentation from the manufacturer of the proposed substitute or "or-equal" product that the material meets the indicated requirements and is equivalent or better in the following properties:
 - a. Quality
 - b. Durability
 - c. Resistance to abrasion and physical damage
 - d. Life expectancy
 - e. Ability to recoat in future
 - f. Solids content by volume
 - g. Dry film thickness per coat
 - h. Compatibility with other coatings
 - i. Suitability for the intended service
 - j. Resistance to chemical attack
 - k. Temperature limitations in service and during application
 - l. Type and quality of recommended undercoats and topcoats
 - m. Ease of application
 - n. Ease of repairing damaged areas
 - o. Stability of colors
2. Protective coating materials shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. Where requested, the CONTRACTOR shall provide the ENGINEER with the names of not less than 10 successful

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applications of the proposed manufacturer's products that comply with these requirements.

3. If a proposed substitution requires changes in the WORK, the CONTRACTOR shall bear all such costs involved as part of the WORK.

2.02 INDUSTRIAL COATING SYSTEMS

A. **System 1 - Not Used**

B. **System 2 - Not Used**

C. **System 3 - Not Used**

D. **System 4 - Aliphatic Polyurethane:** Two component aliphatic acrylic polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, resistance to chemical fumes and severe weathering and with a minimum solids content of 58 percent by volume. Primer shall be a rust inhibitive two component epoxy coating with a minimum solids content of 68 percent by volume.

1. Prime coat DFT = 4 mils, **Ameron 385, Carboline 893, Tnemec 69**, or equal.
2. Finish coat (one or more, DFT = 3 mils), **Ameron Amershield, Carboline 134 HS, Tnemec 74**, or equal.
3. Total system DFT = 7 mils.
4. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.

E. **System 5 - Not Used**

F. **System 6 - Not Used**

G. **System 7 - Acrylic Latex:** Single component, water based acrylic latex with a fungicide additive shall have a minimum solids content of 35 percent by volume. Prime coat shall be as recommended by manufacturer. The coating material shall be available in the ANSI safety colors.

1. Prime coat DFT = 2 mils, as recommended by manufacturer.
2. Finish coats (2 or more, DFT = 6 mils), **Ameron Amercoat 220, Carboline 3359, Tnemec 6**, or equal.
3. Total system DFT = 8 mils.

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- H. **System 8 - Epoxy, Equipment:** Two component, rust inhibitive polyamide cured epoxy coating material shall provide a recoatable finish that is available in a wide selection of colors. The coating material shall have a minimum solids content of 66 percent by volume and be resistant to service conditions of condensing moisture, splash and spillage of lubricating oils, and frequent washdown and cleaning.
1. Prime coat DFT = 3 mils, **Ameron 385, Tnemec 69**, or equal.
 2. Prime coat, where shop applied. (DFT = 3 mils), universal primer, **Ameron 185 HS, Tnemec 50-330 or 161**, or equal.
 3. Finish coats (2 or more, DFT = 6 mils), **Ameron 385, Tnemec 69**, or equal.
 4. Total system DFT = 9 mils.
- I. **System 9 - Not Used**
- J. **System 10 - Acrylic, Concrete:** The acrylic coating material shall be a single component, industrial grade, high molecular weight, waterborne acrylic material with a solids content of at least 35 percent by volume. The filler-sealer shall be a two component epoxy masonry sealer for wet and exterior exposure, with a solids content of at least 64 percent by volume. A 100 percent solids epoxy surfacer shall be used to fill holes and patch the concrete surface after abrasive blasting.
1. Prime coat (filler-sealer), applied in two coats to the entire surface and worked into the surface with a squeegee to achieve a smooth, void-free surface, **Tnemec 54-660, Ameron Nu-Klad 105A** followed by **Nu-Klad 114A (2 coats)** or equal.
 2. Finish coats (2 or more, DFT = 6 mils), **Tnemec 6, Ameron Amercoat 220**, or equal.
- K. **System 11 – Aliphatic Polyurethane, Concrete:** Two component aliphatic polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, resistance to chemical fumes and severe weathering, and contain a minimum solids content of 65 percent by volume. Filler-sealer compound shall be a two component epoxy material used to provide a smooth surface for the epoxy intermediate coat. The filler-sealer is applied to the entire concrete surface and worked into the concrete surface with a wide blade putty knife or squeegee. The intermediate coat shall be a high-build epoxy coating with a minimum solids content of 70 percent by volume.
1. Prime coat (Filler-sealer), **Ameron Nu-Klad 105A** followed by **Nu-Klad 114, Tnemec 54-660**, or equal.
 2. Intermediate coat DFT = 4 mils, **Ameron Amerlock 400, Tnemec 104 HS**, or equal.

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3. Finish coats (2 or more, DFT = 3 mils), **Ameron Amershield, Tnemec 74**, or equal.
- L. **System 12 - Aliphatic Polyurethane, Fiber Glass:** Two-component aliphatic polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, and resistance to chemical fumes and severe weathering. A primer, tie coat, or mist coat shall be used as recommended by the manufacturer.
1. Prime coat (Tie coat), **Ameron 385, Tnemec 66**, or equal.
 2. Finish coats (2 or more, DFT = 3 mils), **Ameron Amershield, Tnemec 74**, or equal.

2.03 SUBMERGED AND SEVERE SERVICE COATING SYSTEMS

- A. **Materials Sources:** The manufacturers' products listed in this paragraph are materials which satisfy the material descriptions of this paragraph and have a documented successful record for long term submerged or severe service conditions. Proposed substitute products will be considered as indicated above.
- B. **System 100 - Amine Cured Epoxy:** High build, amine cured, epoxy resin shall have a solids content of at least 80 percent by volume, and shall be suitable for long-term immersion service in potable water and municipal wastewater. For potable water service, the coating material shall be listed by the NSF International as in compliance with NSF Standard 61 - Drinking Water System Components - Health Effects.
1. Prime coat and finish coats (3 or more, DFT = 16 mils), **Ameron 395, Tnemec 139**, or equal.
 2. For coating of valves and non-submerged equipment, DFT = 12 mils.
- C. **System 101 - Not Used**
- D. **System 102 - Polyamide Cured Epoxy:** High build, polyamide epoxy resin shall have a solids content of at least 56 percent by volume, and shall be suitable for long-term immersion in potable water and municipal wastewater. For potable water service, the coating material shall be listed by the NSF International as in compliance with NSF Standard 61.
1. Prime coat and finish coats (3 or more, DFT = 12 mils), **Tnemec 20**, or equal.
- E. **System 103 - Not Used**

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F. **System 104 - Not Used**

G. **System 105 - Not Used**

H. **System 106 - Fusion Bonded Epoxy:** The coating material shall be a 100 percent powder epoxy, certified as compliant with NSF Standard 61, applied in accordance with the ANSI/AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines, except that the surface preparation shall be as specified in the coating system schedule of this Section. The coating shall be applied using the fluidized bed or electrostatic spray process.

1. Coating DFT = 16 mils, **Scotchkote 134 or 206N**, or equal.
2. For coating of valves, DFT - 12 mils.
3. Liquid Epoxy: For field repairs, the use of a liquid epoxy will be permitted, applied in not less than 3 coats to provide a DFT of 15 mils. The liquid epoxy shall be a 100 percent solids epoxy recommended by the powder epoxy manufacturer.

I. **System 107 - Not Used**

J. **System 108 - Epoxy, Concrete:** The coating material shall be an amino cured epoxy material suitable for long-term immersion in water and wastewater and for service where subjected to occasional splash and spillage of water and wastewater treatment chemicals. The finish coating material shall have a minimum solids content of 80 percent by volume. If used for potable water service the finish coating material shall be listed by the NSF International as in compliance with NSF Standard 61, and shall conform with state and local health regulations and policies for service in potable water. The filler-sealer shall be a 100 percent solids amine-cured epoxy material with silica and inert fillers. A 100 percent solids epoxy surfacer shall be used to fill holes and patch the concrete surface after abrasive blasting.

1. Filler-sealer: Plasite 9029 (applied by squeegee): **Tnemec 69-1211** (6-8 mils) followed by **Tnemec 63-1500; Ameron Nu-Klad 105A followed by Nu-Klad 114A (two coats)** or equal.
2. Finish coats (2 or more, DFT = 12 mils): **Plasite 9133; Tnemec 69; Ameron Amercoat 395**, or equal. On walking surfaces use a non-skid additive such as **Ameron 886** in the final coat.

K. **System 109 - Not Used**

L. **System 110 - Not Used**

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M. **System 111 - Not Used**

2.04 SPECIAL COATING SYSTEMS

- A. **System 200 - PVC Tape:** Prior to wrapping the pipe with PVC tape, the pipe and fittings first shall be primed using a primer recommended by the PVC tape manufacturer. After being primed, the pipe shall be wrapped with a 20-mil adhesive PVC tape, half-lapped, to a total thickness of 40 mils.
- B. **System 201 - Rich Portland Cement Mortar:** Rich portland cement mortar coating shall have a minimum thickness of 1/8-inch, followed by enclosure in an 8-mil thick polyethylene sheet with all joints and edges lapped and sealed with tape.
- C. **System 203 - Not Used**
- D. **System 204 - Not Used**
- E. **System 205 - Polyethylene Encasement:** Application of polyethylene encasement shall be in accordance with ANSI/AWWA C105 using Method C.
- F. **System 206 - Cement Mortar Coating:** A 1-1/2-inch minimum thickness mortar coating reinforced with 3/4-inch galvanized welded wire fabric shall be provided. The cement mortar shall contain no less than one part Type V cement to 3 parts sand. The cement mortar shall be cured by a curing compound meeting the requirements of "Liquid Membrane Forming Compounds for Curing Concrete," ASTM C 309, Type II, white pigmented, or by enclosure in an 8-mil thick polyethylene sheet with all edges and joints lapped by at least 6 inches.
- G. **System 207 - Not Used**
- H. **System 208 - Aluminum Metal Isolation:** Two coats of a high build polyamide epoxy paint, such as **Tnemec 66**, or equal (8 mils). Total thickness of system DFT = 8.0 mils.
- I. **System 209 - Not Used**
- J. **System 210 - Not Used**
- K. **System 211 - Not Used**

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PART 3 EXECUTION

3.01 MANUFACTURER'S SERVICES

- A. The CONTRACTOR shall require the protective coating manufacturer to furnish a qualified technical representative to visit the project site for technical support as may be necessary to resolve field problems attributable or associated with the manufacturer's products.

3.02 WORKMANSHIP

- A. Skilled craftsmen and experienced supervision shall be used on all WORK.
- B. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough cleaning and an adequate thickness of coating material. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given to insure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.
- C. All damage to surfaces resulting from the WORK shall be cleaned, repaired, and refinished to original condition.

3.03 STORAGE, MIXING, AND THINNING OF MATERIALS

- A. **Manufacturer's Recommendations:** Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed.
- B. All protective coating materials shall be used within the manufacturer's recommended shelf life.
- C. **Storage and Mixing:** Coating materials shall be stored under the conditions recommended by the Material Safety Data Sheets, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together.

3.04 PREPARATION FOR COATING

- A. **General:** All surfaces to receive protective coatings shall be cleaned as indicated prior to application of coatings. The CONTRACTOR shall examine all surfaces to be coated,

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and shall correct all surface defects before application of any coating material. All marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any coating application. Surfaces to be coated shall be dry and free of visible dust.

- B. **Protection of Surfaces Not to be Coated:** Surfaces that are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.
- C. All hardware, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.
- D. Care shall be exercised not to damage adjacent work during blast cleaning operations. Spray painting shall be conducted under carefully controlled conditions. The CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blast cleaning or coating operations.
- E. **Protection of Painted Surfaces:** Cleaning and coating shall be coordinated so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

3.05 SURFACE PREPARATION STANDARDS

- A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:
 - 1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.
 - 2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.
 - 3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.
 - 4. White Metal Blast Cleaning (SSPC-SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.

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5. Commercial Blast Cleaning (SSPC-SP6): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.
6. Brush-Off Blast Cleaning (SSPC-SP7): Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint.
7. Near-White Blast Cleaning (SSPC-SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.

3.06 METAL SURFACE PREPARATION (UNGALVANIZED)

- A. The minimum abrasive blasting surface preparation shall be as indicated in the coating system schedules included at the end of this Section. Where there is a conflict between these specifications and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.
- B. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit.
- C. All oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC-SP1 - Solvent Cleaning prior to blast cleaning.
- D. All sharp edges shall be rounded or chamfered and all burrs, and surface defects and weld splatter shall be ground smooth prior to blast cleaning.
- E. The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular coating and service conditions. Abrasives for submerged and severe service coating systems shall be clean, hard, sharp cutting crushed slag. Automated blasting systems shall not be used for surfaces that will be in submerged service. Metal shot or grit shall not be used for surfaces that will be in submerged service, even if subsequent abrasive blasting is planned to be one with hard, sharp cutting crushed slag.
- F. The abrasive shall not be reused unless an automated blasting system is used for surfaces that will be in non-submerged service. For automated blasting systems, clean oil-free abrasives shall be maintained. The abrasive mix shall include at least 50 percent grit.

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- G. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.
- H. Compressed air for air blast cleaning shall be supplied at adequate pressure from well maintained compressors equipped with oil and moisture separators that remove at least 95 percent of the contaminants.
- I. Surfaces shall be cleaned of all dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming, or another approved method prior to painting.
- J. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.
- K. Damaged or defective coating shall be removed by the specified blast cleaning to meet the clean surface requirements before recoating.
- L. If the specified abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC-SP2 or SSPC-SP3 be used.
- M. Shop applied coatings of unknown composition shall be completely removed before the indicated coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC-SP1 before the abrasive blast cleaning work has been started.
- N. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.

3.07 SURFACE PREPARATION FOR GALVANIZED FERROUS METAL

- A. Galvanized ferrous metal shall be alkaline cleaned per SSPC-SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system to be used, followed by brush off blast cleaning per SSPC-SP7.
- B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.08 SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS, EXCLUDING STEEL RESERVOIR INTERIORS

- A. **General:** All grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.

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- B. **Abrasive Blast Cleaning:** The CONTRACTOR shall provide the degree of cleaning specified in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not indicated in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC-SP6. Areas of tightly adhering coatings shall be cleaned to SSPC-SP7, with the remaining thickness of existing coating not to exceed 3 mils.
- C. **Incompatible Coatings:** If coatings to be applied are not compatible with existing coatings the CONTRACTOR shall apply intermediate coatings per the paint manufacturer's recommendation for the indicated coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.
- D. **Unknown Coatings:** Coatings of unknown composition shall be completely removed prior to application of new coatings.
- E. **Water Abrasive or Wet Abrasive Blast Cleaning:** Where specified or where job site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged and severe service coating systems unless indicated.

3.09 CONCRETE AND CONCRETE BLOCK MASONRY SURFACE PREPARATION

- A. Surface preparation shall not begin until at least 30 days after the concrete or masonry has been placed.
- B. All oil, grease, and form release and curing compounds shall be removed by detergent cleaning per SSPC-SP1 before abrasive blast cleaning.
- C. Concrete, concrete block masonry surfaces and deteriorated concrete surfaces to be coated shall be abrasive blast cleaned to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface equivalent to the surface of the No. 80 grit flint sandpaper.
- D. If acid etching is required by the coating application instructions, the treatment shall be made after abrasive blasting. After etching, rinse surfaces with water and test the pH. The pH shall be between neutral and 8.

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- E. Surfaces shall be clean and as recommended by the coating manufacturer before coating is started.
- F. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as **Delmhorst Model DB**, or equal.

3.10 PLASTIC, FIBER GLASS AND NONFERROUS METALS SURFACE PREPARATION

- A. Plastic and fiber glass surfaces shall be sanded or brush off blast cleaned prior to solvent cleaning with a chemical compatible with the coating system primer.
- B. Non-ferrous metal surfaces shall be solvent-cleaned SSPC-SP1 followed by sanding or brush-off blast cleaning SSPC-SP7.
- C. All surfaces shall be clean and dry prior to coating application.

3.11 ARCHITECTURAL CONCRETE BLOCK MASONRY SURFACE PREPARATION

- A. The mortar surfaces shall be cured at least 14 days before surface preparation work is started.
- B. Dust, dirt, grease, and other foreign matter shall be removed prior to abrasive blasting.
- C. The masonry surfaces shall be prepared in accordance with the material manufacturer's printed instructions.

3.12 SHOP COATING REQUIREMENTS

- A. Unless otherwise indicated, all items of equipment, or parts of equipment which are not submerged in service, shall be shop primed and then finish coated in the field after installation with the indicated or selected color. The methods, materials, application equipment and all other details of shop painting shall comply with this section. If the shop primer requires topcoating within a specified period of time, the equipment shall be finish coated in the shop and then touch-up painted after installation.
- B. All items of equipment, or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have all surface preparation and coating work performed in the field.
- C. The interior surfaces of steel water reservoirs, except for Part A surfaces, shall have all surface preparation and coating work performed in the field.

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- D. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switchgear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the indicated quality in the field. Such equipment shall be primed and finish coated in the shop and touched up in the field with the identical material after installation. The CONTRACTOR shall require the manufacturer of each such piece of equipment to certify as part of its shop drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the shop drawings for the equipment.
- E. For certain small pieces of equipment the manufacturer may have a standard coating system that is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the shop drawing submittals. Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.
- F. Shop painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 2 months before being topcoated, or less time if recommended by the coating manufacturer.
- G. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.
- H. The CONTRACTOR shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment shop drawings.

3.13 APPLICATION OF COATINGS

- A. The application of protective coatings to steel substrates shall be in accordance with SSPC-PA1 - Paint Application Specification No. 1.
- B. Cleaned surfaces and all coats shall be inspected prior to each succeeding coat. The CONTRACTOR shall schedule such inspection with the ENGINEER in advance.
- C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same working day.
- D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and this Section, whichever has the most stringent requirements.

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- E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to be present. Use stripe painting for these areas.
- F. Special attention shall be given to materials that will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.
- G. Finish coats, including touch-up and damage repair coats shall be applied in a manner that will present a uniform texture and color matched appearance.
- H. Coatings shall not be applied under the following conditions:
 - 1. Temperature exceeding the manufacturer's recommended maximum and minimum allowable.
 - 2. Dust or smoke laden atmosphere.
 - 3. Damp or humid weather.
 - 4. When the substrate or air temperature is less than 5 degrees F above dewpoint.
 - 5. When air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.
 - 6. When wind conditions are not calm.
- I. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychrometric tables.
- J. Unburied steel piping shall be abrasive blast cleaned and primed before installation.
- K. The finish coat on all work shall be applied after all concrete, masonry, and equipment installation is complete and the work areas are clean and dust free.

3.14 CURING OF COATINGS

- A. The CONTRACTOR shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the most stringent, prior to placing the completed coating system into service.
- B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.

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3.15 IDENTIFICATION OF PIPING

- A. Identification of piping shall be in accordance with Section 15005 - Piping Identification.
- B. Every valve or connection, where it may be possible for a worker to be exposed to a hazardous substance, shall be labeled per OSHA Occupational Safety and Health Standards 29CFR1910.1200.
- C. All unburied pipes in structures and in chemical pipe trenches shall be color-code painted. Colors shall be as selected by the ENGINEER, or as indicated.

3.16 SHOP AND FIELD INSPECTION AND TESTING

- A. General: The CONTRACTOR shall give the ENGINEER a minimum of 3 days advance notice of the start of any field surface preparation work or coating application work, and a minimum of 7 days advance notice of the start of any shop surface preparation work.
- B. All such work shall be performed only in the presence of the ENGINEER, unless the ENGINEER has granted prior approval to perform such work in its absence.
- C. Inspection by the ENGINEER, or the waiver of inspection of any particular portion of the WORK, shall not relieve the CONTRACTOR of its responsibility to perform the work in accordance with these Specifications.
- D. Scaffolding shall be erected and moved to locations where requested by the ENGINEER to facilitate inspection. Additional illumination shall be furnished to cover all areas to be inspected.
- E. **Inspection Devices:** The CONTRACTOR shall furnish, until final acceptance of such coatings, inspection devices in good working condition for the detection of holidays and measurement of dry-film thicknesses of protective coatings. Dry-film thickness gages shall be made available for the ENGINEER'S use at all times while coating is being done, until final acceptance of such coatings. The CONTRACTOR shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the ENGINEER.
- F. **Holiday Testing:** The CONTRACTOR shall holiday test all coated ferrous surfaces inside a steel reservoir, other surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures and surfaces coated with any of the submerged and severe service coating systems. Areas that contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested.

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1. Coatings With Thickness Exceeding 20 Mils: For surfaces having a total dry film coating thickness exceeding 20 mils: pulse-type holiday detector such as **Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20**, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.
 2. Coatings With Thickness of 20 Mils or Less: For surfaces having a total dry film coating thickness of 20 mils or less: **Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog**, or equal shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as **Kodak Photo-Flo**, or equal, shall be added to the water prior to wetting the detector sponge.
- G. **Film Thickness Testing:** On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC "Paint Application Specification No. 2" using a magnetic-type dry film thickness gage such as **Mikrotest model FM, Elcometer model 111/1EZ**, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gage.
- H. **Surface Preparation:** Evaluation of blast cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standards TM-01-70 and TM-01-75.

3.17 COATING SYSTEM SCHEDULES - FERROUS METALS

- A. Coating System Schedule, Ferrous Metal - Not Galvanized:

	Item	Surface Prep.	System No.
FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Commercial blast cleaning SSPC-SP6	(4) aliphatic polyurethane
FM-2	Surfaces in chemical storage room.	Commercial blast cleaning SSPC-SP6	(100) amine-cured epoxy

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	Item	Surface Prep.	System No.
FM-3	Surfaces of equipment and ferrous surfaces submerged or intermittently submerged in potable water, utility water, and wastewater including all surfaces lower than 2 feet above high water level in hydraulic structures, and all surfaces inside enclosed hydraulic structures and vents (excluding shop-coated valves, couplings, pumps).	White metal blast cleaning SSPC-SP5	(100) amine-cured epoxy
FM-6	Buried small steel pipe.	Removal of dirt, grease, oil	(200) PVC tape
FM-7	Where indicated, ferrous surfaces in water passages of all valves 4- inch size and larger, exterior surfaces of submerged valves.	White metal blast cleaning SSPC-SP5	(102) polyamide-cured epoxy
FM-8	Where indicated, ferrous surfaces in water passages and submerged surfaces of all pumps which have discharge size of 4 inches or larger.	White metal blast cleaning SSPC-SP5	(100) amine-cured epoxy
FM-9	Ferrous surfaces of sleeve-couplings and interior surfaces of above-grade steel pipe wellhead facilities.	Solvent cleaning SSPC- SP1, followed by white metal blast cleaning SSPC- SP10	(106) fusion-bonded epoxy

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Item	Surface Prep.	System No.
FM-10 All ferrous surfaces of sluice gates, flap gates, and shear gates, including wall thimbles.	White metal blast cleaning SSPC-SP5	(102) polyamide-cured epoxy
FM-11 Buried surfaces that are not indicated to be coated elsewhere.	Near white metal blast cleaning SSPC-SP10	(100) amine-cured epoxy
FM-16 Surfaces of indoor equipment not submerged and exterior surfaces of above-grade steel pipe wellhead facilities.	Commercial blast cleaning SSPC-SP6	(8) epoxy, equipment
FM-18 Buried pipe couplings, valves, fittings, and flanged joints (where piping is plastic).	Removal of dirt, grease, oil	(201) rich portland cement mortar
FM-19 Buried pipe couplings, valves, and flanged joints (where piping is ductile or cast iron, not tape-coated), including factory-coated surfaces.	As specified by reference specification	(205) polyethylene encasement
FM-20 Buried pipe couplings, valves, and flanged joints (where piping is mortar-coated steel or reinforced concrete), including factory-coated surfaces.	Removal of dirt, grease, oil	(206) cement-mortar coating

- B. **Coating System Schedule, Ferrous Metal - Galvanized:** Pretreatment coatings, barrier coatings, or washes shall be applied as recommended by the coating manufacturer. All galvanized surfaces shall be coated except for the following items which shall be coated only if required by other Sections: (1) Floor gratings and frames, (2) Handrails, (3) Stair treads, (4) Chain link fencing and appurtenances.

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Item	Surface Prep.	System No.
FMG-1 All exposed surfaces indoors and outdoors, except those included below.	Solvent cleaning SSPC-SP1	(4) aliphatic polyurethane
FMG-2 Surfaces in chemical storage room.	Solvent cleaning SSPC-SP1	(100) amine-cured epoxy
FMG-3 Buried small steel pipe.	Removal of dirt, grease, oil	(200) PVC tape
FMG-4 Surfaces buried or submerged in water or wastewater, including all surfaces lower than two feet above high water level and all surfaces inside enclosed hydraulic structures and vents.	Solvent cleaning SSPC-SP1 followed by brush-off grade blast cleaning SSPC-SP7	(100) amine-cured epoxy

3.18 COATING SYSTEM SCHEDULE, NON-FERROUS METAL, PLASTIC, FIBER GLASS

- A. Where isolated non-ferrous parts are associated with equipment or piping, the CONTRACTOR shall use the coating system for the adjacent connected surfaces. Do not coat handrails, gratings, frames or hatches. Only primers recommended by the coating manufacturer shall be used.

Item	Surface Prep	System No.
NFM-1 All exposed surfaces, indoors and outdoors, except those included below.	Solvent cleaned SSPC- SP1	(4) aliphatic polyurethane
NFM-2 Chlorination room, chlorine storage room.	Solvent cleaned SSPC- SP1	(100) amine-cured epoxy

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Item	Surface Prep	System No.
NFM-3 Aluminum surfaces in contact with concrete, or with any other metal except galvanized ferrous metal.	Solvent cleaned SSPC- SP1	(208) aluminum metal isolation
NFM-4 Polyvinyl chloride plastic piping, indoors and outdoors, or in structures, not submerged.	Solvent cleaned SSPC- SP1	(7) acrylic latex
NFM-5 Fiber glass surfaces	Per paragraph 3.10	(12) aliphatic polyurethane fiber glass

3.19 COATING SYSTEM SCHEDULE – CONCRETE

Item	Surface Prep	System No.
C-3 Floor slab and walls, exposure to chemicals, where indicated	Per paragraph 3.9	(108) epoxy, concrete

END OF SECTION

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TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALTIES
10200: VENTILATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies materials and installation of wall louvers and fan.
- B. Related Sections:
 - 1. Section 01300 – Contractor Submittals.
 - 2. Section 01400 – Quality Control.
 - 3. Section 05500 – Miscellaneous Metalwork.
 - 4. Section 09800 – Protective Coatings.

1.02 REFERENCES

- A. Air Movement and Control Association (AMCA), Standard 500.
- B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), Architectural Sheet Metal Manual.

1.03 SUBMITTALS

- A. General: Make submittals in accordance with Section 01300 - Contractor Submittals.
- B. Product Data:
 - 1. Submit dimensional drawings and manufacturer's catalog data for louvers.
 - 2. Submit manufacturer's specifications; catalog cut sheets; certified test data, where applicable; and installation instructions for required products, including finishes.
 - 3. Submit drawings for fabrication and erection of louver units and accessories. Include plans, elevations, and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery, and other information to determine compliance with specified requirements. Submit color chart for selection by Owner.
- C. Qualifications:
 - 1. Performance Requirements: Where louvers are indicated to comply with specific performance requirements, provide units whose performance ratings

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have been determined in compliance with Air Movement and Control Association (AMCA) Standard 500.

2. AMCA Certification: Where indicated, provide louvers with AMCA Certified Ratings Seal evidencing that product complies with above requirement.
3. Comply with Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Architectural Sheet Metal Manual recommendations for fabrication, construction details, and installation procedures, except as otherwise indicated.

D. Field Measurements:

Verify size, location, and placement of louver units prior to fabrication, wherever possible.

E. Shop Assembly:

Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustment, splicing, mechanical joints, and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.04 QUALITY CONTROL

- A. Plan: Identify how the quality of materials and installation will be controlled (e.g. measurements, inspections, testing, etc.) in accordance with Section 01400 – Quality Control.
- B. Workforce Qualifications: Submit verification that the workforce is qualified to complete the work of this Section (licenses, certifications, etc.) and that the work has been effectively supervised (manager, foreman, etc.).
- C. Single-Source Responsibility: For each separate type of vent and/or louver required, obtain vents and/or louvers from one source from a single manufacturer.
- D. Design Criteria: The Drawings indicate sizes, profiles, and dimensional requirements of vents and/or louvers. Other vents and/or louvers with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept. The burden of proof of equality is on the proposer.

1.05 WARRANTY

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Furnish and submit a two-year warranty for all work covered by this Section.

PART 2 - PRODUCTS

2.01 GENERAL

Coordinate ventilation installation with structural cast-in-place concrete construction. Wall and roof penetration require integral security equipment, as described below and in the drawings.

2.02 CENTRIFUGAL ROOF EXHAUST FANS

- A. All exhaust fans shall be sized as shown on the Drawings.
- B. Acceptable Manufacturer: Greenheck Fan Corporation, Schofield, Wisconsin.
 - 1. Models: GB-200, 2,087 CFM w/ 0.5 in WG, 665 RPM, 1/3 HP.
 - 2. Options:
 - a. Hinge Kit
 - b. Roof Curb and seal
 - c. Disconnect Kit
 - d. Dampers
 - e. Bird screen
 - f. Speed Controllers
 - g. Tie Downs

2.03 INTAKE ACOUSTIC LOUVER

- A. All intake vents shall be rectangular and sized as shown on the Drawings.
- B. Constructed of 16 gauge galvanized steel outer casings, 22 gauge galvanized steel airfoil configuration splitter blades (baffles), and packed with inert, vermin and moisture proof mineral fiber.
- C. Minimum acoustic performance:

Octave Band Center Frequency (Hz)	63	125	250	500	1K	2K	4K	8K
Transmission Loss (dB)	7	9	12	24	31	33	29	30

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Transmission Loss tested in accordance with ASTM E90.

D. Acceptable Manufacturer: IAC Acoustics

1. Noishield Acoustic Louver Model SL-24
2. Accessories: bird/insect screen.

2.04 Intake Sound Attenuator

- A. All intake vents shall be rectangular and sized as shown on the Drawings.
- B. Airfoil design for efficient aerodynamic performance.
- C. Constructed of galvanized steel and an absorbent, inorganic mineral glass fiber acoustical fill.
- D. Minimum acoustic performance at 1,000 fpm:

Octave Band Center Frequency (Hz)	63	125	250	500	1K	2K	4K	8K
Transmission Loss (dB)	2	7	14	22	31	38	27	17

E. Acceptable Manufacturer: Commercial Acoustics

1. 3HP-EE

2.05 FASTENINGS

- A. Use same materials as items fastened, unless otherwise indicated. Fasteners for exterior applications must be stainless steel. Provide types, gauges, and lengths to suit unit installation conditions.
- B. Use security screws for exterior fasteners.
 1. Acceptable Manufacturer: Tamperproof screws, <http://www.tamperproof.com>
- C. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations. Use galvanized steel expansion bolt devices for drilled-in-place anchors. Provide inserts to be set into concrete or masonry work.

2.06 FABRICATION

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- A. Fabricate frames and sills with tolerances for installation, including application of sealants in joints between louvers and adjoining work.
- B. Include supports, anchorages, and accessories required for complete assembly.
- C. Join frame members to one another and to stationary louver blades, duct barrier grill and/or dampers by welding, except where indicated otherwise or where field bolted connections between frame members are made necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

2.07 SCREENS

- A. Provide screens of 1/2-inch square mesh, 10 gage type 304 stainless-steel wire, or equivalent, for exterior louvers and/or vents.
- B. Fabricate screen frames of same metal and finish as louver and/or duct barrier grill units to which secured, unless otherwise indicated.

2.08 METAL FINISHES

- A. General: Comply with National Association of Architectural Metal Manufacturers Metal Finishes Manual for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are assembled. Protect finishes on exposed surfaces with protective covering prior to shipment. Remove scratches and blemishes which are visible after completing finishing process from exposed surfaces.
- B. Aluminum Finishes: Medium matte etched finish with 0.7-mil minimum thick anodic coating, AA-C22-A42 dark bronze anodized.

PART 3 - EXECUTION

3.01 PREPARATION

Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION

- A. Locate and place louver and/or vent units plumb, level, and in proper alignment with adjacent work.

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- B. Use concealed anchorages wherever possible. Provide washers fitted to screws to protect metal surfaces and to make a weathertight connection.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers.
- D. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finish so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make alterations, and refinish entire unit or provide new units, at Contractor's option.

3.03 PAINTING AND COATING

Coat nonferrous metal surfaces in contact with concrete, masonry, or dissimilar metals per Section 09900, "Paints and Coatings".

3.04 FIELD QUALITY CONTROL

- A. Quality control will be performed under the provisions of Section 01400.
- B. Products: Submit verification that the installed products are authentic (delivery receipts, bill of lading, etc.).
- C. Execution: Submit verification that the work was installed correctly (inspection records, as-built drawings, etc.).
- D. Testing and Inspection:
 - 1. The Contractor's QC program shall be responsible for the performance of all inspections and testing.
 - 2. The Contractor shall provide access to the Engineer or Testing Agency for inspection and testing of pumps.
- E. Inspections by the Contractor will include:
 - 1. Reviewing manufacturer's recommended application procedures.
 - 2. Continuously inspect installation for conformance with Contract Documents and manufacturer's recommendations.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALTIES
10400: IDENTIFICATION DEVICES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals, as shown, specified and required to furnish and install all identification device Work.
2. The extent of identification devices is specified herein and shown.
3. The type of identification device Work includes, but is not necessarily limited to, the following:
 - a. Fire extinguisher location signs.
 - b. Fire protection placards and chemical area safety signs.
 - c. Right-to-know labels and tags.
 - d. Miscellaneous mechanical fasteners and supports.
 - e. No smoking signs.
 - f. Diesel fuel signs.
 - g. Booster pump start-up with stand-by generator operation

1.02 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication where possible to ensure proper fitting of the Work.
- B. Inserts and Anchorages:
1. Furnish inserts and mechanical anchoring devices which must be set in concrete for the installation of identification devices and related Work.
 2. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

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- C. Shop Assembly: Preassemble items in the shop to the greatest extent possible. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.03 SUBMITTAL

- A. Samples: Submit for approval samples of each color and finish of exposed materials and accessories required for identification devices. OWNER'S review of samples will be for color and texture only. Compliance with all other requirements is the exclusive responsibility of CONTRACTOR.
- B. Shop Drawings: Submit for approval the following:
 - 1. Shop Drawings for fabrication and erection of identification devices. Include plans, elevations, and full-size graphic layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.
 - 2. Copies of manufacturer's technical data and installation instructions for each type of device required.
 - 3. Complete selection of specified manufacturer's standard and custom colors.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHER LOCATION SIGNS

- A. Material: Subsurface silk screened graphics on a transparent acrylic sheet, 0.08-inches thick with Helvetica Medium alphabet and matching arrows type face. Provide 2-inch high upper case letters and 1 -inch high lower case letters.
- B. Fire Extinguisher Identification Sign: Provide 15-inch by 15-inch with 1-inch radius corners, unframed. Provide one for each surface mounted fire extinguisher. Background color shall be red with white lettering. Signs shall incorporate a white directional arrow as located by OWNER.
- C. Product and Manufacturer: Provide one of the following:
 - 1. ASI/SPE NM (Four Corners) Plaque by ASI Sign Systems, Incorporated.

2. Or equal.

2.02 FIRE PROTECTION PLACARDS AND CHEMICAL AREA SAFETY SIGNS

- A. Fire Protection Placards: Provide diamond-shaped placards: 12-inches square of
 1. 125-inch rigid polyethylene. The placard shall provide recognition information as follows:
 2. The colored background.
 3. The symbol at the top.
 4. The United Nations hazard class number at the bottom.
 5. The hazard class wording or the identification number in the center.
 - a. Color:
 - (1) orange indicates explosive.
 - (2) red indicates flammable.
 - (3) green indicates nonflammable.
 - (4) yellow indicates oxidizing material.
 - (5) white indicates poisonous material.
 - (6) white with vertical red stripes indicates flammable solid.
 - (7) yellow over white indicates radioactive material.
 - (8) white over black indicates corrosive material.
 - b. Symbols:
 - (1) the bursting ball symbol indicates explosive.
 - (2) the flame symbol indicates flammable.
 - (3) the slash W (--) indicates dangerous when wet.

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- (4) the skull and crossbones indicates poisonous material.
 - (5) the circle with the flame indicates oxidizing material.
 - (6) the cylinder indicates nonflammable gas.
 - (7) the propeller indicates radioactive.
 - (8) the test tube/hand/metal symbol indicates corrosive.
 - (9) the word Empty indicates that the product has been removed but a harmful residue may still be present.
 - c. United Nations Hazard Class Numbers:
 - (1) Explosives
 - (2) Gases
 - (3) Flammable Liquids
 - (4) Flammable Solids
 - (5) Oxidizing Substances
 - (6) Poisonous and Infectious Substances
 - (7) Radioactive and Infectious Substances
 - (8) Corrosive Substances
 - (9) Miscellaneous Dangerous Substances
 - (10) Hazard Class or Identification Number.
 - d. Product and Manufacturer: Provide one of the following:
 - (1) W.H. Brady Company
 - (2) Seton Name Plate Company
 - (3) Or Equal
6. Placards shall conform to NFPA Standard No. 704 and UFC Standard No. 79.3

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALTIES
10400: IDENTIFICATION DEVICES

- B. Chemical Area Safety Signs:
 - 1. Provide safety signs for the following chemical areas:
 - a. Chlorine Storage, Feed and Analyzer Rooms
 - 2. Safety signs shall comply with the following standards:
 - a. Occupational Safety and Health Administration (OSHA), Standards for General Industry, Subparts 1910.200 Hazard Communication (July, 1986).
 - b. National Fire Protection Association (NFPA) Standard No. 704 - Label System.
 - c. Uniform Fire Code, Latest Edition.
 - d. Uniform Fire Code Standard 79-3.
 - 3. Safety signs shall be of height and width required by layout and shall be formed from semi-rigid butyrate, polyethylene or fiberglass compatible with chemicals being handled. They shall be attached with four stainless steel screws or anchor bolts as required for substrate. Lettering shall be 3-inches high and 1/2-inch in stroke.

2.03 RIGHT-TO-KNOW LABELS AND TAGS

- A. Provide right-to-know target organ labels for each chemical. Provide right-to-know tags along chemical pipelines.
- B. Right-to-know labels including those for the fuel storage tank shall be adhesive backs and shall be provided with stick-on numbers/symbols and legends. Labels shall provide information such as chemical name and/or CAS number, fire and health hazard, reactivity, personnel protection and target organ legends.
- C. Provide right-to-know tags for attaching to pipelines and fill lines. Locate tags at 25 feet maximum center to center distance within range on each side of through-wall pipe penetrations and as directed by OWNER. Tags shall be constructed of laminated plastic and furnished with nylon tie fasteners.
- D. Quantity:
 - 1. Right-To-Know Labels: As required.

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALTIES
10400: IDENTIFICATION DEVICES

2. Right-To-Know Tags: As required based on criteria specified and installed lengths of pipelines and fill lines.
- E. Product and Manufacturer: Provide one of the following:
1. Right-To-Know Organ Style RTY, 3TV Labels and Style RTK-T2 Tags by Seton Name Plate Company.
 2. Or Equal.

2.04 MISCELLANEOUS SIGNS

- A. Provide “No Smoking” signs on each door into the Electrical Room and Well Pump Enclosure. Provide “Diesel Fuel” signs on each side of the above ground fuel storage tank. Provide signage at the stand-by generator and the well pump control panel that indicates “Stand-By Generator Operation Will Allow Pumping Equipment Start-up.”
- B. Provide the miscellaneous signs to be of the same material and size as the fire extinguisher location signs specified above. Provide appropriate sized letters. Submit signage materials, lettering and location placement for approval prior to fabrication.

PART 3 EXECUTION

3.01 INSPECTION

- A. CONTRACTOR and his installer shall examine the substrates and conditions under which the devices are to be installed and notify OWNER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to OWNER.

3.02 INSTALLATION

- A. Install placards, signs and components at the locations shown on the Drawings or, if not shown, as directed by OWNER, securely mounted with concealed theft-resistant fasteners. Attach signs to substrates in accordance with the manufacturer's instructions, unless otherwise shown.
- B. Use stainless steel fasteners.

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALTIES
10400: IDENTIFICATION DEVICES

- C. Install level, plumb, and at the proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by OWNER.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALITIES
10425: SIGNS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section covers furnishing and installing the following types of signs under the Contract Documents:
- B. The Contractor shall provide miscellaneous signs for the project as directed by the Owner or Engineer. Signs may be needed during several stages of the project, including: pre-construction, during construction, and post-construction.
- C. Related Sections:
 - 1. Section 01300 – Contractor Submittals.
 - 2. Section 01400 – Quality Control.
 - 3. Section 09900 – Paints and Coatings.

1.02 REFERENCES

- A. Reference standards include but are not limited to:
 - 1. FHWA 2004 Standard Highway Signs Book.
 - 2. FHWA Clearview Typeface Supplement.
 - 3. California Sign Specifications, 2006.
 - 4. Respective Owner and county Standard Specifications through which the pipeline is installed.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Section 01300, Contractor Submittals.
- B. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
- C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALITIES
10425: SIGNS

5. Provide message list for each sign required, including large-scale details of wording and layout of lettering.

1.04 QUALITY CONTROL

- A. Plan: Identify how the quality of materials and installation will be controlled (e.g. measurements, inspections, testing, etc.) in accordance with Section 01400 – Quality Control.
- B. Workforce Qualifications: Submit verification that the workforce is qualified to complete the work of this Section (licenses, certifications, etc.) and that the work has been effectively supervised (manager, foreman, etc.).
- C. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

1.05 PROJECT/SITE CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 PRODUCTS

2.01 SIGN TYPES

- A. As directed by the Owner or Engineer, including but not limited to:
 1. Access Control: Mounted on posts or fences.
 2. Facility Identification: Mounted on a structure.
 3. Safety Signs.
 4. Roadway markers and reflectors.

2.02 SIGN SIZES AND QUANTITIES

- | | |
|---|-----------|
| A. Small Signs: Approximately 6" x 6" | 100 units |
| B. Medium Signs: Approximately 12" x 12" | 50 units |
| C. Large Signs: Approximately 36" x 36" | 25 units |
| D. Extra Large Signs: Approximately 36" x 36" | 12 units |

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALITIES
10425: SIGNS

- E. Road Markers with reflectors 100 units

2.03 MATERIALS

- A. Aluminum – Caltrans type traffic sign rated.
- B. Vinyl Lettering.
- C. Color – In general, two colors will be sufficient per sign, but colors will vary.
- D. Content: Confirm with Owner Representative.
- E. Attach sign with anti-theft fasteners.

PART 3 EXECUTION

3.01 GENERAL

- A. Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

3.02 INSTALLATION

- A. Fence Mounted: Attach to fence with stainless steel fasteners.
- B. Post Mounted: Attach to posts using manufacturer's recommendation.
- C. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
1. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
- D. Road Markers: along access roads.

3.03 FIELD QUALITY CONTROL

- A. Quality control will be performed under the provisions of Section 01400.

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALITIES
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- B. Products: Submit verification that the installed products are authentic (delivery receipts, bill of lading, etc.).
- C. Execution: Submit verification that the work was installed correctly (inspection records, as-built drawings, etc.).
- D. Testing and Inspection:
 - 1. The Contractor's QC program shall be responsible for the performance of all inspections and testing.
 - 2. The Contractor shall provide access to the Engineer or Testing Agency for inspection and testing.
- E. Inspections by the Contractor will include:
 - 1. Reviewing manufacturer's recommended application procedures.
 - 2. Continuously inspect installation for conformance with Contract Documents and manufacturer's recommendations.
 - 3. Finished installations shall be carefully inspected for proper anchoring.
- F. Defective WORK shall be repaired.
- G. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner Representative.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALTIES
10523: FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes fire extinguishers and brackets for wall mounting.

1.02 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for purpose specified and indicated.

1.03 SUBMITTALS

- A. Section 01300 - Submittals: Submittal procedures.
- B. Product Data: Submit extinguisher operational features, color and finish, anchorage details.
- C. Manufacturer's Installation Instructions: Submit special criteria and wall opening coordination requirements.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01760 – Post Final Inspection: Closeout procedures.
- B. Operation and Maintenance Data: Submit test, refill or recharge schedules and re-certification requirements.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not install extinguishers when ambient temperatures are capable of freezing extinguisher ingredients.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

- A. Provide at least two (2) fire extinguishers meeting all applicable codes inside and outside the pump station.
- B. Manufacturers:
 - 1. Ansul Incorporated

TECHNICAL SPECIFICATIONS
DIVISION 10: SPECIALTIES
10523: FIRE EXTINGUISHERS AND CABINETS

2. General Fire Extinguisher Corp.
 3. Grinnell Corp.
 4. JL Industries
 5. Kidde Fire Extinguishers
 6. Larsen's Manufacturing Co.
 7. Potter Roemer
- C. Dry Chemical Type: Cast steel tank, with pressure gage; UL-rated 4-A:80-B:C, 10-lb nominal capacity, in enameled steel container.
- D. Extinguisher Finish: Steel, enamel to color as selected.

2.02 FIRE EXTINGUISHER MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked enamel finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01300 – Contractor Submittals: Coordination and project conditions.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install brackets plumb and level on wall.
- B. Secure rigidly in place.
- C. Place extinguishers on brackets.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

PART 1- GENERAL

1.1 SCOPE

- A. Pumps that are supplied under this specification shall be vertical turbine open lineshaft design with product lubrication, including a bowl assembly, column assembly, suction can, discharge head and driver. The discharge head shall be designed to carry the entire weight of the bowl and column assembly along with the specified driver without excessive vibration or noise. All of the supplied equipment shall conform to this specification.
- B. The required units shall be Gould's Water Technology Model 12CMC with 3 stages, or an approved equal.

1.2 QUALITY ASSURANCES

A. Warranty

The manufacturer shall warrant their pumps to be free of defects for a period of one year after the product is put into operation or eighteen months from the shipment date, whichever occurs first.

B. Certifications

- 1. The pump manufacturer shall be certified to the ISO 9001 standard for design and manufacture of vertical turbine pumps.
- 2. The manufacturer shall be capable of producing vertical turbine pumps certified to NSF/ANSI 61 & 372.
- 3. Pressure containing fabrications shall be welded only by those whom are qualified on ASME code section IX. Welder certification shall be provided with the submittal package.

C. Foundry

The manufacturer shall own and operate its own U.S. based foundry producing vertical turbine components.

D. Testing Standards

All vertical turbine pumps shall conform to ANSI/AWWA E101-88 and to the most current edition of Hydraulic Institute Standards

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TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
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1.3 SUBMITTALS

- A. With the proposal, the contractor shall submit complete fabrication and assembly drawings together with detailed specifications covering materials, parts, devices, and accessories. The data and specifications for each pumping unit shall include, but not be limited to the following:

1. Name of Manufacturer
2. Type and Model
3. Design Rotational Speed
4. Number of Stages
5. Type of Bowl Bearings
6. Type of line shaft bearings
7. Size of Shafting
8. Size of Pump Column
9. Size of Discharge Outlet
10. OD of Pump Bowls
11. Can Diameter
12. Can Length
13. Size and location of suction inlet
14. Weight
15. Type of Finish
16. Total Weight
17. Total Pump Length

Complete performance curves showing capacity versus head, NPSH required, efficiency, and BHP plotted scales consistent with performance requirements

PART 2 – PRODUCT SELECTION

2.1 MANUFACTURER

- A. Goulds Water Technology, A Xylem Brand
- B. Or an approved equal
- C. The equipment covered by this specification shall be standard products of a manufacturer with a minimum of 20 years' experience in the production of such equipment. All pumps and pump components specified in this specification shall be supplied by a single pump manufacturer. The pump manufacturer shall be required to supply the pumps and drivers, and shall be responsible for their compatibility only.
-

TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

- D. A factory authorized service facility shall have trained service technicians and be able to show evidence of parts inventory for routine maintenance items such as bearings, gaskets, shafts, and sleeves.

2.2 OPERATION SELECTION

- A. Stated total dynamic head (TDH) includes lift and all system pressure. Pump manufacturer shall include pump's internal losses.
1. Pump item number:
 2. Number of required units: 3
 3. Condition "A"
Capacity, GPM: 1,200
TDH, head in feet: 178
 4. Condition "B"
Capacity, GPM: 960
TDH, head in feet: 215
 5. Condition "C"
Capacity, GPM: 0
TDH, head in feet: 259
 6. Condition "D"
Capacity, GPM: 1,350
TDH, head in feet: 150
 7. Driver horsepower: 75
 8. Minimum bowl efficiency,
Percent (design point): 87.7%
 9. Maximum pump operating speed: 1,770 RPM
 10. Minimum column and discharge diameter, inches: 8
 11. NPSHR not to exceed (design point): 17 FT
- B. Condition "A" as listed above is the design point and will be used for any performance evaluation in accordance with the 1B grade standards of the Hydraulic Institute.
- C. The pump horsepower requirements for any point on the curve shall not utilize the service factor nor exceed the motor nameplate horsepower rating.
- D. The suction can shall be sized such that the internal velocities do not exceed the standards recommended by the Hydraulic Institute.
- E. The inlet shall be designed such that it is in keeping with the Hydraulic Institute recommendations with regard to flow velocity and vertical centerline relationship between inlet nozzle and suction bell.
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TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

2.01 SERVICE CONDITIONS

Liquid to be pumped:
Pumping temperature: 60 deg F
Specific gravity at PT: 1.0
Viscosity at PT: 1 cps
Pumping Liquid pH: 7.0
Suction pressure: 66 – 80 psi
Site elevation: 61 FT

2.02 MATERIALS AND CONSTRUCTION

- A. The vertical turbine lineshaft can pump shall conform to the materials of construction for open lineshaft design.

TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

DISCHARGE HEAD ASSEMBLY			
Description	MC	Material Description	ASTM
Discharge Head	6501	Steel	A53
Coupling Assembly	5932	Carbon Steel	A108 C10180
Seal Housing	1003	Cast Iron	A48 CL30
Seal Housing Bearing	1109	Bronze	B584 C90300
Mechanical Seal		John Crane 5610 Cartridge Seal	
Stuffing Box Gasket	5136	Acrylic Gasket	Garlock Blue Guard
COLUMN AND LINE SHAFT ASSEMBLY			
Barrel	9645	Steel	A53
Column Pipe (FLG)	9645	Steel	A53
Clean-Out Pipe	9645	Steel	A53
Column Bolting	2298	Grade 8	SAE J429 GR8
Lineshaft	2227	SST 416	A582 S41600
Lineshaft Coupling	2265	SST 416	A582 S41600
Bearing Retainer	1003	Cast Iron	A48 CL30
Lineshaft Bearing	1109	Bronze	B584 C90300
BOWL ASSEMBLY			
Shaft	2227	SST 416	A582 S41600
Intermediate Bowl	6911	Coated Cast Iron	A48 CL30
Inter Bowl Bearing	1109	Bronze	B584 C90300
Impeller	1398	Bronze	B584 C87600

TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

DISCHARGE HEAD ASSEMBLY			
Description	MC	Material Description	ASTM
Impeller Taper Lock	2242	Steel 1018	A108 G10180
Wear Rings (optional)	1128	Bronze	B148 C95200
Suction Bowl / Bell	1003	Cast Iron	A48 CL30
Suction Bearing	1109	Bronze	B584 C90300
Sand Collar	1205	SST 304	A744 S30400
Suction Strainer	6952	Galvanized Steel	A108 G10180
Plug	1046	Mal Iron	A197
Hex Bolt	2298	Grade 8	SAE J429 GR8

B. Bowl Assembly

1. The suction bell shall be designed to provide conservative entrance velocities and direct the flow to the first stage impeller. The inner surface of the suction bell shall be smooth and free of sharp projections which could cause turbulence or cavitation. The suction bell shall be designed to house the suction bell bearing by means of four vanes.
2. The bowls shall be smooth and free of sharp projections and shall have register fits for alignment and be connected by flanged and bolted construction. Bowl sizes 6" to 15" shall be porcelain enameled on the bowl interior. Bowl sizes 16" and larger shall be epoxy-lined.
3. The impellers shall be machined and finished smooth to insure proper performance. They are to be balanced prior to assembly. The impellers shall be connected to the bowl shaft by means of keyed design

C. Column Assembly

1. The column shall include flanged connections and shall be of open lineshaft design with product lubrication.
2. The bearing spacing shall be selected to insure operation at a minimum of 25%
.....
above or below the first critical speed. Bearing spacing shall not exceed 5 feet.

TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

3. For 3"-12" product lubricated column assemblies, the column shall be designed with drop-in stainless steel or cast-iron bearing retainers. The interior of the column shall be free of offsets, burrs, discontinuities and irregularities..
4. The lineshaft shall be of adequate size to transmit the full power of the pump without slip, excessive vibration or elongation, and shall have threaded joints. Lineshaft lengths shall not exceed 10 feet. The lineshaft shall have left hand threads that tighten during pump operation.

D. Discharge Head Assembly

1. The discharge head shall be fabricated steel type T.
2. For above ground service, the discharge head shall be fitted with a flanged discharge connection. The flange shall be a 300 LB R.F. ANSI flange for fabricated steel heads. The discharge head shall be designed to carry the entire weight of the complete pump and driver without distortion when spanning an opening of sufficient size to permit removal of the complete pump assembly. The discharge head shall be provided with a coupling guard. Lifting lugs shall be provided as standard.
3. The seal housing shall be designed to accept a John Crane type 5610_mechanical seal

E. Motors

1. Motors shall be designed and coordinated with the driven equipment and shall be located as indicated on the drawings. The pump manufacturer shall coordinate with motor supplier and VFD supplier for proper selection of motor and VFDs for the selected pumps.
 2. Full load current of the motor shall not exceed and comply with NEC (National Electric Code) Table 430.25- Full Load Current, Three Phase Motors.
 3. The pump motor shall be sized so that the name plate horsepower rating, without considering the service factor, shall not be exceeded at any point along the pump performance profile.
 4. Name plate shall be provided identifying that the motor meets NEMA MG-1- Part 31 requirements. Inverter-Duty name plate with data associated service factor and VFD application. Name plate shall indicate the grounding ring details, and type of insulated/isolated bearings.
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TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

5. Submittals: Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming part of the motor shall be submitted. The drawing and data shall include, but shall not be limited to the following:
 - Name of the manufacturer
 - Type and Model
 - Type of bearing and method of lubrication
 - Rated size of motor in hp and service factor.
 - Temperature rise and insulation rating.
 - Full load rotative speed.
 - Full load current.
 - Locked rotor current.
 - Space heater wattage
 - Motor Temperature switch data
 - Seismic Design Requirements.
 6. The pump motors shall be powered from Variable Frequency Drives, as shown on the drawings. All pump motors shall be inverter duty and specifically selected for service with Variable Frequency Drives. The motors shall be derated, if required to compensate for harmonic heating effect and reduced self-cooling capacity, at low speed operation. Motors also shall be designed for full voltage or reduced voltage, solid-state starting.
 7. Motor insulation shall be minimum Class F and shall not exceed Class B temperature rise. All motors, supplied by VFDs shall be supplied with full phase insulation on the end turns and shall meet the requirement of NEMA MG 1, Part 31. Motors shall be designed to continually pulsed at the motor terminals with a voltage of 1600 volts ac. Insulation treatment shall be at least a double treatment of either polyester or epoxy resin. The treatment can be applied by either dip and bake or vacuum pressure impregnation. Extra paper shall be used between each coil set to prevent arcing and failure.
 8. Design Requirements: Motor Voltage, frequency, service factor, efficiency, and insulation class shall be as follows.
 - Motor Voltage: 460 V, 3-Phase
-
- Frequency: 60 Hz

TECHNICAL SPECIFICATIONS
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- Efficiency: Premium Efficiency
 - Service Factor: 1.15
 - Insulation Class and Temperature Rise: Class F with 90°C Rise at service factor 1.15
 - Enclosure: Totally Enclosed Fan-Cooled (TEFC) type. Separate over-sized termination outlets for power connections as well as for 120 V AC devices (motor winding thermostats, anti-condensation heaters etc.).
9. Bearings: All bearings shall be self-lubricating, shall have provision for relubrication and shall be designed to operate at any position or at any angle. Motor bearing type shall be antifriction type with L₁₀ life rating 40,000 hrs in accordance with ABMA Standards.
10. As all pump motors will be driven by VFDs, motors shall be furnished with one insulated bearing. The insulated bearing shall be on the non-drive end of the motor.
11. Motor Shaft Grounding Ring: Each motor controlled by VFDs shall be furnished with a maintenance free, conductive micro fiber, shaft grounding ring with circumferential micro fibers to discharge electrical shaft currents within the motor. Motor shaft grounding ring shall be installed on the drive end on the motor shaft. Shaft grounding rings shall be installed by the motor's manufacturer in accordance with grounding ring manufacturer's recommendation.
12. Motors shall be grounded to true ground along with a ground run to the grounding stud of the VFD. The grounding rings shall be part of an approved grounding system for the pump motors so that the stray voltages are directed fully to the ground. The overall grounding system shall be fully described diagrammatically as part of Contractor's submittal. The grounding system for the pump station shall be in accordance with NEC Section 250.
13. Motor Space Heaters: All Pump motors shall be provided with space heater element to prevent condensation on the core and windings. The space heaters shall be suitable for 120 V, 60 Hz, single phase power supply.
14. Space heaters shall be switched off automatically and confirmed off by interlock before starting of the motors. Alarms SCADA if power outage to automatically reset the heaters upon power restart. Datalogger collects data of heater On/Off time period.
15. Temperature Sensing Device: Each motor shall be furnished with at least one thermostat per phase. Temperature switch shall be rated 5 amps at 120 volts ac. Thermostat shall be bi-metallic, snap action device wired back to VFD for tripping the motor in the event of motor over temperature. Over temperature signal shall be transmitted to SCADA/RTU for alarm reporting. The thermostat setting shall be in accordance with NEMA MG1-2016, Part 31.4.1.1 and Table 31-2.
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TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

16. Efficiency: All motors shall be premium efficiency type and shall be determined in accordance with IEEE 112, Test Method B.
17. Each electric motor shall be designed to accept the total unbalanced thrust imposed by the pump. Where rotating parts are joined by threaded connections, a non-reverse-type ratchet mechanism shall be provided to lock the shaft against reverse rotation.
18. Motors shall be precision balanced and tested in accordance with IEEE 112.
19. Motor Testing: Motors shall be tested in accordance with IEEE 112-2017 for a routine test and in accordance with NEMA MG1-2016, Part 12 for the procedure and acceptance limits set therein. The test results shall be provided to the driven equipment manufacturer and the Owner prior to the arrival of the driven equipment of which those motors are a component part. The motor test results shall be provided in a format equivalent to IEEE 112-2017.
20. Acceptable Manufacturers: US Motors, Baldor or approved equal.

F. Driver

The driver will be a VHS electric motor. The driver and any related equipment will ship unmounted from the pump to ship.

G. Can

The can diameter shall be sized such that the velocity in the can does not exceed the standards recommended by the Hydraulic Institute. The suction can shall be supplied by the manufacturer.

2.03 COATING

- A. The bowl assembly exterior shall be coated with Goulds Water Technology Standard Blue Enamel.
- B. The column assembly interior and exterior shall be coated with Goulds Water Technology Standard Blue Enamel.
- C. The head assembly interior and exterior shall be coated with Goulds Water Technology Standard Blue Enamel.
- D. The suction can interior and exterior shall be coated with Goulds Water Technology Standard Blue Enamel.

2.04 TESTING

TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

- A. All factory testing shall conform to the most current edition of the Hydraulic Institute Standards. All pump performance testing shall be performed at the manufacturer's facility. (Specify if there are any additional standards)
- B. Performance testing shall be witnessed and performed on the bowl assembly only with lab motor. The test shall cover seven points including the design point (HI 14.6). The design point shall be used for any performance evaluation.
- C. Hydrostatic testing shall be witnessed in compliance with HI14.6. Hydro testing is to be performed on the pressure containing components. Certified test results shall be provided for approval prior to shipment.
- D. A standard 10 business days' notice shall be given to the engineer before starting any witness testing..
- E. A written approval for all witness testing is required prior to release for shipment. All non-witness testing shall require written prior to release for shipment.
- F. Field/functional testing will be performed by the contractor to insure proper mechanical operation at the jobsite. All testing data to be used for evaluation shall be performed at the pump manufacturer's facility.
- G. Motor tests and test reports shall be provided as required in accordance with the motor specification.

PART 3 - EXECUTION

3.01 SHIPPING

Pumps that are less than 30 feet in length shall be shipped fully assembled with the driver, suction can, and shaft seal unmounted. The discharge flange shall be protected with a wooden flange cover.

3.02 STORAGE, HANDLING, AND INSTALLATION

The skidded pump and related equipment shall be unloaded, stored, and installed in agreement with the Manufacturer's operation and installation manuals. If storage is planned to be longer than six months or in harsh environment, long term storage practices should be followed per the Manufacturer's operation and installation manuals.

3.03 START-UP FIELD SERVICES

TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

The pump manufacturer shall include two days of start-up field services with the proposal for the purpose of supervising the start-up and instructions of proper maintenance and operations.

Service Provided By Factory Representative

Time on Site

Inspect and Approve Installation

½ Day

Supervise Initial Adjustment

½ Day

Supervise Field Run Test

½ Day

Instruct Owner in Proper Start-Up and O&M

½ Day

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11106: VERTICAL TURBINE PUMP

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TECHNICAL SPECIFICATIONS
DIVISION 11: EQUIPMENT
11200: EQUIPMENT TAGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals, as shown, specified and required to furnish and install equipment tags for the project equipment designated by the OWNER.
2. All equipment shown on the P&ID contact drawings shall be tagged by the CONTRACTOR. The extent of the equipment tags will include the pumps, valving, ventilation equipment, instrumentation, appurtenances, etc., as directed by the OWNER.
3. The type of equipment tag system includes, but is not necessarily limited to, the following:
 - a. Device tags.
 - b. Miscellaneous mechanical fasteners.

B. Related Sections:

1. Division 10. Specialties.
2. Division 11, Equipment.
3. Division 13, Special Construction.
4. Division 15, Mechanical.
5. Division 16, Electrical.

C. Equipment Tags:

1. Equipment Tags shall contain device numbers and name descriptions.
 - a. Tag numbers shall be in accordance with OWNER'S requirements and approved by OWNER prior to installation.
 - b. Device descriptions shall consist of three to four lines with a maximum of 55 letters.
2. Device numbers and name descriptions shall be furnished by the OWNER to the CONTRACTOR for inscription on the tags prior to installation.

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1.02 QUALITY ASSURANCE

- A. Source Quality Control: Provide equipment tags by a single manufacturer.

1.03 SUBMITTAL

- A. Samples: Submit for approval samples for color and finish of materials and accessories required for the equipment tag system. OWNER'S review of samples will be for color and texture only. Compliance with all other requirements is the exclusive responsibility of CONTRACTOR.
- B. Shop Drawings: Submit for approval the following:
 - 1. List of all devices including tag number with device and signal name description.
 - 2. Anchorage and accessory items.
 - 3. Samples of actual equipment tags for five (5) devices.

PART 2 PRODUCTS

2.01 EQUIPMENT TAGS

- A. Tags shall be approximately 2-inches by 4-inches and made from Type 316 stainless steel material having a maximum of 55 letters and one 7 digit identification number. Letters and digits shall be embossed and shall not be smaller than 3/16-inch high.
- B. All tags shall be fastened with Type 316 stainless steel pins, screws or chains, as approved by the OWNER.

PART 3 EXECUTION

3.01 INSPECTION

- A. CONTRACTOR and his installer shall examine the substrates and conditions under which the equipment tags are to be installed and notify OWNER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to OWNER.

3.02 INSTALLATION

- A. Install equipment tags and components at the locations shown or, if not shown, as directed by OWNER; securely mount with concealed theft-resistant fasteners.

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- B. Use Type 316 stainless steel fasteners.
- C. Install level, plumb, and at the proper height. Repair or replace damaged units as directed by OWNER.

END OF SECTION

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TECHNICAL SPECIFICATION
DIVISION 13: SPECIAL CONSTRUCTION
13300: INSTRUMENTATION AND CONTROL GENERAL

PART 1 – GENERAL

1.1 WORK OF THIS SECTION INCLUDES:

- A. The WORK of this Section includes the general specification and requirements for the instrumentation and control WORK under this and other applicable Specifications. The WORK also includes providing instrumentation and all related wiring as shown in the Contract Documents.
- B. The CONTRACTOR shall provide (furnish and install), test, and place into service the operating process instrumentation, control systems, and all appurtenant work, all in accordance with the requirements of the Contract Documents. The Contractor shall procure equipment and obtain the services of a qualified Control System Supplier.
- C. Systems specified as a part of Division 13 shall be furnished, manufactured, wired and tested as a complete system by a qualified Control System Supplier (CSS). The CSS shall provide all equipment, materials, instrumentation and assemblies complete. The WORK provided by the CSS shall include, but not necessarily be limited to, installation coordination, factory testing, configuration testing, system commissioning, training and final acceptance.
- D. The CSS shall provide the pump electrical and control systems including the Service Entrance, pump drives, instrumentation, and Control System complete as assembled and tested system at the CSS facility.
- E. The CSS shall be responsible for the detailed design, procurement, installation coordination, testing, commissioning, training, and documentation of electrical, instrumentation and control systems provided under this Contract.
- F. The CSS shall be responsible for interfacing with existing American Water's Supervisory Control and Data Acquisition (SCADA) communications systems and components. The CSS shall provide all hardware, test software, installation, factory testing, commissioning and training for new system. The CSS shall coordinate all field and point testing with the local Programmable Logic Controller (PLC) programming and SCADA configuration applications to verify all I/O.
- G. The CSS shall provide all PLC and Human Machine Interface (HMI) Panel configuration programming, operation screens, historical data logging, and coordinate the SCADA system programming as indicated in Section 13370.
- H. The Contractor shall note that the equipment loop, logic, system, PLC and elementary diagrams are not manufacturer model or part number specific and are based on system supplier and vendor information to indicate a general scope of supply from the Equipment Manufacturers. The specifications address functional requirements, features and operation that may require additional options or components from the Contractor to provide for a complete and functional system.
- I. The CSS shall coordinate all requirements with the equipment manufacturers suppliers at bid time to provide for a complete and operable system and shall include all costs in its bid to add additional instruments, wiring, computer inputs/outputs, controls, conduit, interlocks, electrical hardware, drawing revisions, etc., into the design based on Equipment Manufacturer's requirements and final certified prints to meet the specifications. Such changes to

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instrumentation and electrical work to meet the specification requirements shall be incorporated into the scope of work at no additional cost to the Owner.

- J. Per specified submittal requirements the CSS shall be responsible for the generation of panel wiring diagrams equipment interconnection diagrams, network diagrams and loop drawings which depict the interconnection between instruments, control panels, field panels, electrical equipment, control equipment, motorized equipment, and packaged systems.
- K. The CSS shall generate a complete analog and digital loop drawing for each measuring and/or control loop. The loop drawing shall include information as specified in the submittal requirements for loop drawing preparation.
- L. All control system field tests, including factory tests, loop tests, site commissioning, operational readiness testing, plant startup, and final acceptance shall be the responsibility of the Contractor. The Contractor shall be responsible for providing field and facility personnel to perform factory and field testing of all systems associated with the SCADA. The Contractor shall be responsible for providing all personnel and equipment (current drivers, jumpers, read out devices, oscilloscopes, voltage-resistance meters, etc.) required to perform the loop test simulations. All devices used shall be traceable to the National Institute of Standards and Technology (NIST).
- M. The Contractor shall perform field engineering as required for mounting and supporting all field mounted components. The Contractor shall develop any additional schematic and interconnection diagrams required to interface with existing systems, PLC and instrumentation equipment, which may be required for a complete and operable instrumentation and control system.
- N. The CSS shall procure, fabricate, assemble, program and configure the instrumentation and control system based on the requirements of Divisions 13, 16, and related Mechanical and Civil Divisions.
- O. Instrumentation materials, process wetted parts and installations shall be designed to be compatible with the process media, area environment and classification in which it shall operate.
- P. Instrument installation shall provide for unobstructed access to the instruments for calibration, diagnostics and process display. Instrumentation displays shall be protected from direct sunlight exposure and shall be provided with sunshields as required to provide legible display viewing during daylight hours at a 24" viewing distance.
- Q. The CSS shall design, procure, program, factory test, install, commission and support a PLC system that shall integrate all process controls required to provide a complete and operational system. The PLC system shall be designed in accordance with Owner standards for SCADA and PLC systems. The CSS shall coordinate the I/O grouping and arrangement with the Cal Am during the submittal process.
- R. The CSS shall field verify the operation of switches and interlocking logic to operate in either the Normally Open or Normally Closed states. The Contractor shall provide interposing relays and wiring necessary to meet the operational requirements specified.

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- S. The CSS shall be a U.L. 508 panel shop and shall label all assemblies produced with their U.L. listing or registration number.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK with respect to interfacing electrical, instrumentation and control systems packaged under the mechanical and civil specification sections.
- B. Division 16 - Electrical
- C. Division 13 - Special Construction
- D. Division 1 – General Requirements

1.3 CODES

WORK of this Section shall comply with the current editions of the following codes:

- A. Uniform Fire Code
- B. National Electrical Code
- C. California Electrical Code
- D. City and County Service and Electrical Requirements

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

- A. ISA-RP60.6: Nameplates, Labels, and Tags for Control Centers
- B. ISA-RP12.6: Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations
- C. ISA-S5.1: Instrument Symbols and Identification
- D. ISA-S5.4: Instrument Loop Diagrams
- E. ISA-S20: Specification Forms for Process Measurement and Control Instrumentation; Primary Elements and Control Valves.

1.5 SUBMITTALS

- A. Submittals shall be supplied in accordance with section 01300, 16010 and as supplemented or modified by this specification section.
- B. Control panel submittals

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1. Control panel submittals shall be grouped by location, area and process. Bill of Materials and fabrication drawings shall be individually grouped by facility, area and control panel.
2. A separate technical brochure or bulletin shall be included for each instrument, and equipment item, system, and other element. The brochures shall be indexed by systems or loops. If, within a single system or loop, a single item is employed more than once, one brochure may cover all identical uses of that item in the system. Each brochure shall include a list of tag numbers to which it applies. System groups shall be separated by labeled tags.
3. Schematic and wiring diagrams for control circuits shall be submitted in two stages. Initially, schematic control diagrams shall show complete details on the circuit interrelationships of all devices within and outside each Control Panel. Subsequent to acceptance of all schematic control diagrams, by the Engineer, piping and wiring diagrams shall be submitted. The diagrams shall consist of component layout drawings to scale, showing numbered terminals on components together with the unique number of the wire to be connected to each terminal. Piping and wiring diagrams shall show terminal assignments from all primary measurement devices, such as flow meters, and to all final control devices, such as pumps, valves, chemical feeders and local control panels. Wiring diagrams shall include VFD panels, SCADA Panel, circuit and breaker number for each power feed
4. Assembly and construction drawings for each alarm annunciator, local indicating panel, process control panel and for other special enclosed assemblies for field installation. These drawings shall include dimensions, identification of all components, surface preparation and finish data, and nameplates. These drawings also shall include enough other details, including photographs, to define exactly the style and overall appearance of the assembly.
5. Installation, mounting, and anchoring details for all components and assemblies to be field-mounted, including conduit connection or entry details.
6. Complete control panel layouts, all drawn to a 1-1/2 inch=1 foot scale showing:
 - a. Physical arrangements which define and quantify the physical groupings of PLC components, hand stations, recorders, indicators, pilot lights and all other instrumentation devices associated with control panel sections, auxiliary panels, subpanels and racks.
 - b. All cutout locations fully dimensioned.
 - c. All outside panel dimensions shall be shown.
 - d. Locations of back-of-panel stiffeners.
 - e. Backpanel equipment layout and terminal point locations for all panel and back-of-panel piping and wiring connections. Terminations shall be coded with identifiers for wiring and piping connections for all electric, hydraulic and pneumatic terminations.

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7. Bill of Material: A complete and detailed bill of material list shall be submitted for each field mounted device or assembly as well as cabinet assemblies and subassemblies. Bills of material shall include all items within an enclosure. An incomplete submittal shall be rejected and no further evaluation performed until a complete and detailed bill of material is submitted.
 8. Panel Power Calculations: Provide local calculations and back-up power capacity for all DC power supplies and Uninterruptible Power Systems (UPS). Power requirements shall state required voltages, currents, and phases.
 9. Cooling and Heating: Provide heating and cooling calculations. Calculations shall include heat dissipation, and operating temperature. Heat dissipation shall be at maximum and shall be stated in BTU per hour or watts. Operating temperature shall be calculated at specified ambient temperatures or at 40 degrees C, if no other ambient temperature is specified. If ventilation fans are used, provide audible sound level for the fans.
- C. Required Submittals
1. Factory Acceptance Test Plan and Schedule four (4) weeks prior to the Factory Acceptance Test.
 2. PLC program with documentation four (4) weeks prior to the Factory Acceptance Test.
 3. HMI Screens 4 weeks prior to Factory Acceptance Test.
 4. PLC Control Panel Layout Drawings.
 5. Interconnection Drawings.
 6. Loop Drawings.

1.6 FIELD INSTRUMENTATION

- A. Instrumentation Summary/Schedule and Bill of Material
- B. Technical brochures, bulletins and data sheets containing:
1. Fully completed ISA S20 data sheets
 2. Technical Specification Data Sheets
 3. Component functional descriptions
 4. Locations or assembly at which component is to be installed
 5. Materials of a component's parts which will be in contact with process fluids or gases
- C. Instrumentation Loop Diagrams per ISA S-5.4

1.7 PLC CONFIGURATION

- A. The CSS shall provide a SCADA I/O database referencing all PLC I/O points, internal registers accessed by the SCADA and associated PLC setpoints. The Database shall utilize the same format and structure utilized by Cal Am in an Excel Spreadsheet.

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- B. The CSS shall provide a PLC and HMI applications programming submittal fully documented and annotated as specified in section 13350. Submittal shall be provided in a three ring binder and electronically as a Modicon Proworx program file, or as directed by Cal Am.
- C. Programming of the PLC shall utilize the same methods, procedures and format as that of existing PLC programs to maintain program uniformity.

1.8 SCADA CONFIGURATION

The CSS shall coordinate the SCADA programming and configuration requirements with Cal Am to insure that the system I/O, Internal Registers and communications protocols are consistent with the requirements for SCADA monitoring and control.

1.9 SYSTEM START-UP AND COMMISSIONING

The CSS shall provide comprehensive-testing procedures, forms and reports complete. Testing submittals shall address the testing and commissioning requirements of Divisions 13, and 16.

1.10 PROJECT MEETINGS

Attend meetings as specified.

1.11 OWNER'S MANUAL

Information included in the OWNER'S MANUAL shall comply with the requirements of specifications with the following exceptions:

- A. Two copies of the OWNER'S MANUAL shall be submitted after acceptance of all submittals under Paragraph 1.5. One set will be returned to the CONTRACTOR with comments.
- B. Final copies (6) of the OWNER'S MANUAL, after revision, shall be submitted to the ENGINEER 15 days prior to startup.
- C. The following shall be included in the OWNER'S MANUAL:
 - 1. Installation, connection, operating, troubleshooting, maintenance, and overhaul instructions from the manufacturer.
 - 2. Exploded or details views of all instruments, assemblies, and accessory components.
 - 3. Parts lists and ordering instructions.
 - 4. Wiring diagrams.
 - 5. A list of spare parts for 1 year operation recommended by the manufacturers of all analog equipment.

1.12 AS-BUILT DRAWINGS

- A. As-built drawings shall be prepared in accordance with Section 01720 with the following exceptions and changes:

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- B. The Contractor shall keep current an approved set of complete analog and digital loop diagrams and schematic diagrams which shall include all field and panel wiring, all piping and tubing runs, all routing, all mounting details, all point-to-point diagrams with cable, wire, tube and termination numbers. These drawings shall include all instruments and all instrument elements for the complete instrument loop as provided under Divisions 13 and 16 of this Contract.
- C. One set of original drawings and two copies of each as-built drawing under this Section shall be submitted to the ENGINEER after completion of field checkout but before placing the systems in service for the OWNER'S use.
- D. Drawings shall also be submitted in electronic format as AutoCAD files. PDF format is not acceptable for project specific drawings unless agreed in advance by the Owner. PDF may only be used for mass produced equipment. PDF files submitted shall be from original programs files, not optically scanned paper. PDF files from optical scans shall not be accepted.

1.13 COORDINATION

The CSS shall coordinate protective circuit requirements with the pump and motor supplier. The CSS shall obtain from the pump supplier the protective devices required by the manufacturer to maintain the warranty of the pump and motor. The CSS shall install and wire, pump supplier furnished protective circuitry in accordance with the manufacturers requirements.

1.14 SERVICES OF MANUFACTURER

- A. Calibration, Testing and Startup: The contractor shall provide the services of technical service representative of the manufacturer who shall visit the site and perform the following on all flow meters and chemical system analyzers.
 - 1. Inspection, checking and calibrating the equipment.
 - 2. Startup and field testing for proper operation.
 - 3. Performing field adjustments to ensure that installation and operation comply with the Specifications.
- B. Instruction of OWNER'S Personnel: The manufacturer's technical service representative shall instruct the OWNER'S personnel

1.15 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Products delivered to the site for incorporation into the WORK of this Section shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.
- C. Installed Equipment: Equipment installed in place for periods exceeding 24 hours prior to the field wiring and commissioning of electrical and electronic equipment shall be protected from dust and exposure to the elements.

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- D. Shipment: Panels shall be crated for shipment using a heavy framework and skids. Panel sections shall be cushioned to protect the finish of the instruments and panel during shipment. Instruments, which are shipped with the panel, shall have suitable shipping stops and cushioning material installed to protect instrument parts from mechanical shock damage during shipment. Each panel crate shall be provided with removable lifting lugs to facilitate handling.

1.16 ENVIRONMENTAL CONDITIONS

- A. General: All instrumentation and control system components and associated wiring shall be suitable for use in an environment where there may be high energy AC fields, DC control pulses, and varying ground potentials between transducers and system components. The system design shall be adequate to provide proper protection against interferences from all such possible situations.
- B. Field Located Equipment: The system design shall be adequate to provide proper protection in the environment typically associated with these facilities. As a minimum, the instrumentation and control systems shall be designed and constructed for satisfactory operation and low maintenance requirements under the following environmental conditions:
1. Temperature Range: 0 through 60 degrees C (32 - 144 degrees F)
 2. Thermal Shock: 0.55 degrees C per minute (1.0 degrees F per minute)
 3. Relative Humidity: 20 - 95 percent (non-condensing)
- C. Noise Tolerance: The instrumentation and control system components shall not exceed a noise level of 55dB(A) when monitored 3-feet away from the devices. If upon testing it is found that this limit is exceeded at the option of the ENGINEER and at no additional cost to the OWNER, devices shall be replaced in order to achieve a maximum level of 55 dB(A) or sound absorption materials shall be added in a manner acceptable to the Owner.

1.17 CABLE NUMBERING

- A. All cables and conductors shall be permanently marked with a unique cable identifier.
- B. The first characters shall denote the facility or area number.
- C. The second group of characters identifies the field device being served ISA or equipment tag reference.
- D. The third section is the loop or equipment number.
- E. The fourth section uses one of the four suffixes in the table below. Where multiple circuits of the same type are routed to the same endpoint, the suffix will be P1, P2, as required.
- F. At each device or termination point, the circuit identification number is appended with the individual wire number. For Direct Current (DC) circuits only, wire polarity is shown in parentheses as (+) or (-). Spaces are not allowed. Letters shall be in upper case.

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SUFFIX	CIRCUIT TYPE	EXAMPLE
(S) - Signal	24 vdc analog (4-20 mA)	FIT2101S1+
(C) – AC Control	120 volt AC control	YIA2101C2
(D) – DC Control	24vdc digital status or control	LSH2101D1+
(P) – Power	Power (480V, 5 kV, 15 kV, etc.)	RWP2101P2
(L) – Power	Power (120/240 volt)	RWP2101P2
(T) - Communications	Communications	FON2101T2

1.18 GENERAL

- A. All meters, all instruments, and all other components shall be of the most recent field-proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise indicated.
- B. Outdoor instrumentation shall be suitable for operation in the ambient conditions at the equipment installation locations. Heating, cooling, and dehumidifying devices shall be incorporated with the outdoor instrumentation in order to maintain it within its rated environmental operating ranges.
- C. The Contractor shall provide all power wiring for these devices.
- D. Outdoor enclosures suitable for the environment shall be provided at the specified locations.
- E. All instrumentation in hazardous areas shall be intrinsically safe or be approved for use in the particular hazardous classification in which it is to be installed.
- F. Mercury switches and components containing liquid mercury shall not be used.
- G. Analog measurements and control signals shall be electrical and shall vary in direct linear proportion to the measured variable, except as indicated. Electrical signals outside control board(s) shall be 4-20 mA DC except as noted. Signals within enclosures shall be 1-5 volts DC unless otherwise specified. Dropping resistors shall be installed at all panel side terminations in the control panels to ensure loop integrity.
- H. The accuracy of each instrumentation system or loop shall be expressed as a probable maximum error; this shall be the square-root of the sum of the squares of certified "accuracies" of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of ± 0.5 percent of full scale and a minimum repeatability of ± 0.25 percent of full scale unless otherwise indicated. Instruments that do not conform to or improve upon these criteria are not acceptable.
- I. Each control loop shall be individually fused.

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1.19 INSTRUMENTATION AND CONTROL PANELS

A. General:

1. Control panels shall be provided as specified in Section 13340.
2. Equipment Framework and Supports:
 - a. The rear of each control panel section or Instrument wall panel shall have a steel framework for supporting conduit, tubing, wireways, switches, air piping and all instrument accessory items such as relay or terminal enclosures, transducers, pressure switches, valves and air relays. The main frame work shall be constructed of standard structural shapes. Special shapes such as "Unistrut" may be used for secondary supports. Framework must not interfere with instrument connections or access needed for maintenance or adjustments.
 - b. Preparation: The front and rear face of the panel, both sides and the edges of all flanges, and the periphery of all openings shall be prepared as follows:
 - 1) All high spots, burrs, and rough spots shall be ground smooth.
 - 2) The surfaces shall be sanded or sandblasted to a smooth, clean bright finish.
 - 3) All traces of oil shall be removed with a solvent.
 - c. Finishing:
 - 1) A 3-mils dry coat of Amercoat 185 or equal primer shall be applied over the entire panel surface immediately after solvent cleaning.
 - 2) Wet sand, dry, and then quick glaze spot putty on the front of the panel only. Dry, then wet sand again and dry.
 - 3) Apply a second 3-mils dry coat of alkyd enamel primer to the front of the panel.
 - 4) Wet sand to smooth clear finish, and then dry.
 - 5) At least two 3-mil dry coats of air-dry, satin finish, alkyd enamel shall be applied over the entire surface. Color to be as selected by Owner.
 - 6) The CONTRACTOR shall furnish two 1-pint containers of the enamel to the Owner.

1.20 INSTRUMENT MOUNTING

- A.** The Contractor shall provide field cut-outs, installation mounting racks, mounting brackets, bracing, shelving and stanchions, and shall mount all instrument and control items indicated, including any instruments indicated to be furnished by the Owner or other manufacturers.

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- B. The Contractor shall also mount, behind existing panels, other instrument accessory items as indicated or necessary for interfacing with existing equipment.
- C. Control Panel Requirements:
1. Controls panels shall be wired and fabricated in accordance with section 13340.
 2. Field modifications of existing panels shall adhere to the requirements of section 13340.
 3. The Contractor shall provide all wiring, conduit, wireways, and switches required to make instruments and other panel electrical devices operational.
 4. Conduit, wireways, junction boxes and fittings shall be installed for all signal and control wire. Provide in accordance with Division 16.
 5. Each terminal connection shall have a plastic plate with a terminal and instrument tag number. All wiring shall be identified with stamped tubular heat shrink wire markers.
 6. Unless otherwise specified, wiring methods and materials for all panels shall be in accordance with the NEC requirements.
 7. Wire for 115-volt control circuits shall be No. 14 AWG stranded with Type XHHW/XHHW-2 insulation. All terminals for external wiring connections shall be suitable for No. 10 AWG wire.
 8. Flexible conduit shall be utilized only for short transitions (36") from instrument or equipment.
 9. Conduit fittings shall be cast fittings.
 10. Soldered or pressure crimped wire splicing in conduits is an NEC violation and shall not be acceptable.
 11. For case grounding, panels shall be provided with a 1/4-inch by 1-inch copper ground buss completed with solderless connector for one No. 4 AWG bare stranded copper cable. The Contractor shall connect the copper cable to a system ground loop.
- D. Instrumentation Requirements:
1. Instruments located on a single panel section that serve one process unit may be connected to a common branch power circuit. The number of branch circuits shall be such that no circuit load exceeds 10 amps. Different panel sections and instruments serving different process units shall not use common branch circuits. A 15-amp, two-pole circuit breaker shall be provided in each branch circuit.
 2. When instruments not equipped with integral fuses, the contractor shall furnish and install fuses as required for the protection of individual instruments and equipment against fault currents. Fuses shall be mounted on the back of the panel, in a fuseholder, with each fuse identified by a service name tag.

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3. Each potentiometer type instrument, electronic transducer, controller or analyzer shall have an individual disconnect switch. Disconnect switches shall have metal or plastic tags listing the associated instrument tag numbers. Individual plug and cord set power supply connections may be used without switches when indicated.
- E. Field Signal Wiring:
1. Signal cable shall be constructed of No. 16 AWG copper signal wires with XLP/PVC 600V insulation.
 2. Control conductors shall be 14 AWG minimum routed in conduit or troughs. Control conductors shall be XLP/PVC (XHHW-2) insulation.
 3. Wire color code for instrument signal wiring and control wiring shall be:
 - a. Positive - Black (+)
 - b. Signal Ground Negative – Clear/White (-)
 - c. Equipment Ground – Green
 - d. Ungrounded – Red
 - e. Energized by AC voltage found external to panel – Yellow
 - f. 24V DC circuit – 24P – Pink; 24N - Black
 - g. AC Control – Violet
 4. See Section 16120 for additional cable color code requirements.
 5. Multi-conductor signal cables where indicated shall consist of No. 16 AWG copper signal wires twisted in pairs, with 300 volt insulation. A copper drain wire shall be provided for the bundle with a wrap of aluminum polyester shield. The overall bundle jacket shall be PVC. Multi-conductor cables, wireways and conduit shall provide for 20 percent allocation of spare, unused signal wires in addition to the indicated requirements.
 6. Remote I/O (RIO), Modbus Plus (MB+), and Ethernet cabling shall be provided, installed and terminated in accordance with the manufacturers cabling and termination procedures. Wiring for other systems shall follow manufacturer's requirements.
- F. Color Conventions: Lens covers/LED's for indicating lights on all panels will be colored as follows:
1. Red-ON when;
 - a. Motor not running (STOPPED)
 - b. Valve CLOSED (not fully opened)
 - c. Device not energized.

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- d. Circuit breaker OPENED
- 2. Green-ON when;
 - a. Motor running in forward direction (fast speed for multi-speed motors).
 - b. Valve OPEN (not fully closed)
 - c. Device energized.
 - d. Circuit breaker CLOSED
- 3. White-ON when;
 - a. Power available
 - b. System in AUTOMATIC mode.
 - c. Monitoring taking place.
- 4. Amber-ON when;
 - a. Malfunction trip.
 - b. Equipment locked out.
 - c. Alarm condition

1.21 NAMEPLATES

- A. Nameplates shall be provided for instruments, function titles for each group of instruments, and other components mounted on the front panel(s) as indicated. A nameplate shall be provided for each signal transducer, signal converter, signal isolator, and electronic trip mounted inside the panel(s). Nameplates shall be descriptive to define the function and system of such element. These nameplates shall be of the same material as those on the front of the panel(s). Nameplates shall be attached with two stainless steel screws per 16010-2.2-A. Nameplates shall be fabricated from black face white-center laminated engraving plastic. Where adhesive attachment is specifically allowed by the Owner, painted surfaces shall be prepared to allow permanent bonding of adhesives. Colors, lettering, styles, abbreviations and sizes shall be in conformance with ISA_RP60.6 with an intended viewing distance of 3 feet to 6 feet.
- B. Equipment Interior Nameplates - Nameplate material shall be clear plastic with black machine printed lettering as produced by a KROY or similar machine; except caution, warning, and danger nameplates shall have red lettering. The size of the nameplate tape shall be no smaller than 1/2" in height with 3/8" lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on a clean surface using the adhesion of the tape. Add additional clear glue to hold the nameplate securely in place when necessary. For each device with a specific identity (relay, module, power supply, fuse, terminal block, etc.) mounted in the interior of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate

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inscription providing the name and number of device used on the submittal drawings. Stamp the nameplates with the inscriptions as approved by the Engineer in the submittal.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Equipment and materials shall be products of reputable, experienced manufacturers. Similar items in the project shall be the products of the same manufacturer. All equipment shall be of industrial grade, a standard of construction, shall be of sturdy design and manufacture, and shall be capable of long, reliable, trouble-free service.
- B. The control panels shall be fabricated to house, controllers, instrumentation and communications equipment specified elsewhere and as indicated on the contract drawings. Control panels shall be fabricated and wired in accordance with Section 13340 and applicable specification sections.
- C. Instrumentation control equipment shall be UL listed.

2.2 FIELD INSTRUMENTATION

Provide Field Instrumentation in accordance with Section 13330, Instrumentation.

2.3 COMPONENTS GENERAL

- A. Field Terminal Blocks: Terminal blocks shall be molded plastic with barriers and box lug terminals, and shall be rated 25 amperes at 600 volts. White marking strips, fastened securely to the molded sections shall be provided and wire numbers or circuit identifications shall be marked thereon with permanent marking fluid.
- B. Indicators: Indicators shall be provided at the locations specified and shall be rated for the voltage required. Indicators shall be full-voltage Push-To-Test high brightness LED.

2.4 GENERAL INSTRUMENTATION AND CONTROL COMPONENTS

- A. General instrumentation components shall be provided as specified in Section 13330 Instrumentation and 13340 SCADA Control Panel.
- B. Signal Isolators, Converters, and Power Supplies: Signal isolators shall be provided in each measurement and control loop, wherever required, to match adjacent component impedances, provide signal amplification or splitting, or where feedback paths may be generated or to maintain loop integrity when the removal of a component of a loop is required. Signal converters shall be provided where required to resolve any signal incompatibilities. Signal power supplies shall be provided to supply sufficient power to each loop component.
- C. Power supply and conversion modules shall be supplied as required to provide the required equipment operational voltage and current. Power supplies shall be sized to provide 125 percent of the maximum current requirements.
- D. General Purpose Relays: General purpose relays in the Control Panels shall be plug-in type with contacts rated 10 amperes at 120 volts ac; quantity and type of contacts shall be as indicated.

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Each relay shall be enclosed in a clear plastic heat and shock resistant dust cover with LED status indicator. Sockets for relays shall have touch-safe screw type terminals.

- E. Industrial Control Relays: Industrial control relays shall be 20 Amp rated with four-pole convertible contacts. The coil voltage shall be as required to interface with the required control logic. The ICR shall be capable of providing eight contacts with the addition of a four-pole module mounted to the deck assembly.
- F. Time Delay Relays: Time delay relays shall be electronic on-delay or off-delay type with contacts rated 10 amperes at 120 volts AC. Units shall include adjustable dials with graduated scales covering the indicated time range. Timers shall be provided with status and timing LED indication.
- G. Slave Relays: Slave relays shall be provided when the number or type of contacts indicated exceeds the contact capacity of the indicated relays and timers.
- H. Circuit Breakers: Circuit breakers shall be single pole, 120 volt, 15 ampere (minimum) rating or as required to protect wiring and equipment. Circuit breakers shall be mounted inside the panels as shown. Trip curves and trip points shall be selected to provide a coordinated system localizing trips to the breaker closest to the fault.

PART 3 - EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall employ qualified installers who are skilled and experienced in the installation and connection of all elements, all instruments, all accessories, and all assemblies provided under this Contract.
- B. The CONTRACTOR shall install all instruments according to the manufacturer's installation instructions and provide the following:
 - 1. Perform field engineering as required for mounting and supporting all field mounted components.
 - 2. Prepare any additional schematic and interconnection diagrams required for installation.
 - 3. Assemble and interconnect instrument components disconnected for shipping purposes.
 - 4. Remove all temporary supports, bracing, and padding inserted in instrument control panels and other equipment to prevent damage during shipping, storage, or installation

3.2 PROCESS TUBING AND PIPING

- A. The CONTRACTOR shall provide for all chemical sample piping and chemical analysis system piping/tubing installations in accordance with Owner standards. All flow thru, tee and insertion instrumentation sensors shall be installed with hot-tap assemblies or valving systems that allow the instrument to be removed from the system without disruption of the process.

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- B. Adequately support and protect capillary tubing. All extra tubing shall be carefully coiled, tied, and protected at the instrument location.
- C. Instrument tubing and conduit shall be installed level and parallel with, or at right angles to, the structural members of buildings and support systems. Vertical runs shall be straight and plumb and installed with adequate strain relief to prevent damage and separation of tubing and tubing support systems.
- D. All tubing installations shall allow clear and unobstructed access to equipment, doorways, controls, control panels, and field devices. Tubing and conduit installations shall allow easy removal of components or equipment. Components in tubing, but shall be separately supported by a specified wall or stanchion equipment mounting system.
- E. All installations of piping, tubing, mounting hardware and equipment enclosures shall be field measured prior to fabrication and erection. Any significant discrepancies between drawings and field conditions shall be reported to the Engineer. The Owner will not be responsible for any costs to the Contractor for rework because of Contractor failure to take measurements prior to fabrication.

3.3 CONDUIT AND WIRE

- A. It is the intent of the Contract Documents that all installation of conduit and wiring external to Control Panels is provided under the requirements of Division 16. Further, it is the general intent that all 4-20 mA signal circuits, process equipment control wiring, signal wiring to field instruments, and Control Panel input and output wiring, be provided under Division 16.
- B. Wire terminations and installation integrity shall be verified and tested under Division 13.
- C. The CONTRACTOR's attention is directed to the electrical and mechanical schematics and details of this project. Referral to these portions of the Contract Documents shall be required in order to understand the full intent and scope of work required.
- D. Monitoring and control system configurations are diagrammatic only. Locations of equipment are approximate unless dimensioned on the drawings. The contractor shall determine exact locations and routing of wiring and cables, which shall be governed by structural conditions, physical interferences, area classifications and locations of electrical terminations on equipment.
- E. All instruments shall be located and installed for ready access by the OWNER'S operation and maintenance staff. Instruments shall be installed with due regard for servicing and maintainability. The OWNER reserves the right to require minor changes in location of equipment prior to roughing without any additional cost to the OWNER.

3.4 FIELD SIGNAL AND CONTROL CIRCUIT WIRING

- A. Wiring Installation: All wires shall be in plastic wireways except (1) field wiring, (2) wiring between mating blocks in adjacent sections, (3) wiring from components on a swing-out panel to components on the fixed structure, and (4) wiring to panel-mounted components. Wiring from components on a swing-out panel to other components on fixed panels shall be tied into bundles

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with nylon wire ties, and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.

- B. Wiring to control devices on the front panels shall be tied together at short intervals with nylon wire ties and secured to the inside face of the panel using adhesive mounts.
- C. Wiring to rear terminals on panel-mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.
- D. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be permanently marked heat-shrink plastic.

3.5 INSTRUMENT CABLE TESTS

- A. General: The following tests shall be performed on each instrumentation and control system cable. All tests shall be end-to-end tests of installed cables with the ends supported in free air, not adjacent to any grounded object. All test data shall be recorded on forms, which are available from the Engineer. Complete records of all tests shall be made and delivered to the Engineer. The Owners Representative who witnessed the testing shall sign each form.
- B. Continuity tests shall be performed by measuring wire/shield loop resistance of each signal cable as the wires, taken one at a time, are shorted to the channel shield. No loop resistance measurement shall vary by more than plus or minus 2 ohms from the calculated average loop resistance value.
- C. Insulation resistance tests shall be performed by using a 500 volt megometer to measure the insulation resistance between each channel wire, between each channel wire and the channel shield, between individual channel shields in a multi-channel cable, between each individual channel shield and the overall cable shield in a multi-channel cable, between each wire and ground, and between each shield and ground. Values of resistance less than 10 megohms shall be unacceptable.

3.6 FACTORY OPERATIONAL READINESS TEST

- A. Factory Inspection:
 - 1. Instrumentation and control panels shall be inspected for compliance with requirements at the factory prior to comprehensive system factory testing and before shipment to the site. The Contractor shall notify the Owner at least four weeks in advance of the witnessed factory testing date. The Owner or a representative of the Owner will visit the factory to witness a complete factory test prior to shipment to the jobsite.
- B. The Contractor shall perform the following tests prior to arrival of the Engineer:
 - 1. All control wiring and interlock circuits rung out to determine their operability.
 - 2. Electrical circuits checked for continuity and where applicable, operability.

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3. Nameplates checked for correct spelling and correct size of letters.
4. Other tests required to place the panel in an operating condition.
- C. It shall be the responsibility of the Contractor to furnish all necessary testing devices and sufficient manpower to perform the tests required by the Engineer to determine conformance to the requirement of the Contract documents.
- D. If the above tests have not been performed prior to the arrival of the Engineer, the Contractor shall reimburse the OWNER for the cost of the extra time required for the inspector's services and travel expenses
- E. General: The complete control system shall be tested at the factory prior to installation of the PLC, communications and SCADA system. The Factory Operational Readiness Tests (FORT) for the entire system shall be conducted at the manufacturer's facilities as a complete and operable system including the HMI and PLC's.
- F. The CSS shall provide the service of a qualified PLC technician to setup, configure and test each system to verify equipment operation prior to the FORT. The technician shall be experienced in the programming, configuration and testing of PLC systems employing the communications protocols utilized. The CONTRACTOR shall coordinate all shipping, set-up, configuration and testing tasks related to the FORT. The OWNER and Engineer shall witness the FORT.
- G. Tests shall be conducted to exercise all process variables and confirm setpoint trip points, process permissives, process interlocks, alarming and control functions. The CONTRACTOR shall provide the necessary personnel to operate, test and confirm all SCADA and PLC associated functions pertaining to graphical displays, setpoint interaction, PLC control strategies, alarm monitoring and manual control of the equipment.
- H. The CSS shall prepare a FORT test procedure in the form of I/O checklists, calibration sheets for analog I/O and step by step process control strategy tests that exercise all normal, emergency and alternative control modes. I/O checklist shall reference each I/O by type, tag and description with a checkbox to verify PLC operation, Communication, DCS Display, Alarm Function and Command function with a comment field for testing notes.
- I. Process control test forms shall be provided for each control strategy and subdivided into individual process loops and modes of operation contained within the process control strategy. The test procedure shall be provided on a step-by-step basis addressing each process on a loop-by-loop and function-by-function basis. A signature and comments box shall be provided for each procedure.
- J. The factory test shall demonstrate all graphics, report generation and alarm functions of the system.

3.7 INSTALLATION

- A. Installation and Connection:

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1. The CONTRACTOR shall install and connect all field-mounted components, equipment enclosures and assemblies under the following criteria:
 - a. Process sensing lines and air signal tubing shall be installed to the installation of conduit indicated under Section 16010. Individual tubes shall be run parallel and near the surfaces from which they are supported. Supports shall be used at intervals not longer than 3 feet of tubing.
 - b. Bends shall be formed with the proper tool and to uniform radii and shall be made without deforming or thinning the walls of the tubing. Plastic clips shall be used to hold individual plastic tubes parallel. Ends of tubing shall be square-cut and cleaned before insertion into fittings. Bulkhead fittings shall be provided at all panels requiring pipe or tubing entries.
 - c. All flexible cables and all capillary tubing shall be provided in flexible conduits. Lengths shall be sufficient to withdraw the cables and tubing for periodic maintenance.
 - d. RTD/Thermocouple lead wire shall be provided in dedicated conduit or wireway from the thermocouple to the control panel. Conduit or wireway shall be sized in accordance with the capacity of the instrument.
 - e. All power and all signal wires shall be terminated with spade type lugs.
 - f. All connectors shall be, as a minimum, watertight.
 - g. After all installation and connections have been completed, a technical field representative of the CONTRACTOR shall check the WORK for polarity of electric power and signal connections, leaks at all process connections, and conformance with requirements. The technical field representative shall certify in writing to the ENGINEER that each loop and system meets requirements.
 - h. All wire and all cable shall be connected from terminal to terminal without splices, arranged in a neat manner and securely supported in cable groups. All wiring shall be protected from sharp edges and corners.
 - i. At least [30] days before installation testing begins, the CONTRACTOR shall submit to the ENGINEER a detailed description, in duplicate, of the installation tests to be conducted to demonstrate correct installation of the instrumentation and control system and the anticipated dates the testing will occur.

3.8 SYSTEM COMMISSIONING

A. Instrument Calibration

1. All analog and discrete instrumentation and all control system equipment shall be field calibrated and tested after installation to verify that requirements are satisfied. The CONTRACTOR shall provide all necessary labor, tools, and equipment to calibrate and test each instrument in accordance with the manufacturer's instructions. Each instrument

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shall be calibrated at a minimum of three points using test equipment to simulate inputs and read outputs.

2. All test equipment and all instruments used to simulate inputs and read outputs shall be suitable for the purpose intended and shall have accuracy better than the required accuracy of the instrument being calibrated. Test equipment shall have accuracies traceable to the NIST as applicable. All analog instruments shall be calibrated and tested in place without removal.
3. Test data, applicable accuracy requirements, all instrument manufacturer published performance specifications and all permissible tolerances at each point of calibration shall be entered on test forms available from the ENGINEER. These test forms shall verify compliance with all.
4. A calibration report shall be delivered to the ENGINEER for each instrument, certifying that the instrument has been calibrated in the presence of the Owners designated representative and meets contract and system requirements.

B. Point Testing

1. Analog Loop Tests: The CONTRACTOR shall be responsible for loop checking and testing all instrumentation loops with this project. The CONTRACTOR shall coordinate all loop check functions with the SCADA system, final element, PLC logic and intermediate equipment to ensure that a single total loop check is conducted. The intent of the loop checks is to confirm and document each loop's component specification conformance up to and including all field-situated devices.
2. The CONTRACTOR shall provide all control room personnel to witness and confirm loop check results at the SCADA display level.
3. The CONTRACTOR shall provide all necessary labor, tools, and equipment to field test, inspect and adjust each instrument to its indicated performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirement, or any published manufacturer performance specification for functional and operational parameters, whether or not indicated in the Contract Documents, shall be repaired or replaced, at the discretion of the ENGINEER at no additional cost to the OWNER.
4. Programmable Controllers, HMI Units, and electronic function modules, shall be tested and exercised by the CONTRACTOR to demonstrate correct operation, first individually and then collectively as functional analog networks. Each hardwired analog control network shall be tested to verify proper performance within indicated accuracy tolerances. Accuracy tolerances for each analog network are defined as the root-mean-square summation of individual component accuracy tolerances. Individual component accuracy tolerances shall be as indicated by contract requirements, or by published manufacturer accuracy specifications, whenever contract accuracy tolerances are not indicated.

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5. Each analog network shall be tested by applying simulated inputs to the first element(s). Simulated sensor inputs corresponding to 10 percent, 50 percent, and 90 percent of span shall be applied, and the resulting outputs read to verify compliance to network accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation of discrete devices. Temporary settings shall be made on controllers, alarms, etc., during analog loop tests. All analog loop test data shall be recorded on test forms, which include calculated root-mean-square summation system accuracy tolerance requirements for each output.
 6. When installation and loop tests have been successfully completed for all individual instruments and all separate analog control networks, a certified copy of all test forms signed by the Owner's representative as a witness, with test data entered, shall be submitted together with a clear and unequivocal statement that all instrumentation has been successfully calibrated, fully inspected, and fully tested.
- C. System Pre-commissioning:
1. The CONTRACTOR shall be responsible for demonstrating the operability of all systems provided under this specification. Pre-commissioning shall commence after acceptance of all wire, all calibrating and loop tests, and all inspections have been conducted. Pre-commissioning shall demonstrate proper operation of all systems with process equipment operating over full operating ranges under actual operating conditions.
 2. The CONTRACTOR shall develop and submit to the ENGINEER for approval a Pre-Commissioning Plan which describes detailed test procedures, checklists, blank forms and data to be recorded, test equipment to be used and calculated tolerance limits.
 3. System pre-commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under start-up and steady-state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. All hardwired and software control circuit interlocks and alarms shall be operational.
 4. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady-state operation of final control elements running under the control of field mounted automatic analog controllers or software based controllers shall be assured by adjusting the controllers, as required, to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any) and making necessary controller adjustments, as required, to eliminate excessive oscillatory amplitudes and decay rates.

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5. All electronic control stations incorporating proportional, integral or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset or rate setting(s) as required to achieve a proper response. Measured final control element variable position/speed setpoint settings shall be compared to measured final control element position/speed values at 10 percent, 50 percent and 90 percent of span and the results checked against indicated accuracy tolerances. Accuracy tolerances are defined as the root-mean-square summation of individual component accuracy tolerances.
6. Individual component accuracy tolerances shall be as indicated in the Contract Documents or as specified by published manufacturer accuracy specifications whenever not indicated.
7. The CONTRACTOR shall submit an instrumentation and control system pre-commissioning completion report which shall state that all Contract requirements have been met and which shall include a listing of all instrumentation and all control system maintenance and repair activities conducted during the pre-commissioning testing. The ENGINEER must accept the instrumentation and control system pre-commissioning testing before the 14 day operational testing may begin. Final acceptance of the control system shall coincide with final acceptance of the WORK.

D. Operational Testing

1. 14-Day Operational Testing: The CONTRACTOR shall furnish his own personnel, electrical personnel, and any instrument manufacturer's representatives as required during the testing period to produce and maintain a fully operational system.

3.9 OPERATIONS AND MAINTENANCE MANUALS:

- A. The CONTRACTOR shall furnish to the OWNER 6 complete sets of operation and maintenance manuals. The manuals shall include data, information drawings, etc., for the system, subsystem, and all components, and shall include names, addresses and telephone numbers of equipment suppliers, representatives and repair facilities.
- B. This shall include a complete description of the recommended operating procedures, maintenance procedures, and spare/replacement parts list for equipment items with catalog data, diagrams, and drawings or cuts describing the equipment. Each set shall include full size assembly and wiring diagrams; drawings showing "as-built" conditions shall be furnished to the OWNER.

3.10 TRAINING

- A. Instruction: The CONTRACTOR shall train the OWNER'S personnel in the maintenance, calibration and repair of all instruments provided under this contract.
- B. The training shall be scheduled a minimum of 3 weeks in advance of the first session. The training shall be performed concurrent with the pre-commissioning.

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- C. The training shall be performed by qualified representatives of the instrument manufacturers and shall be specific to each instrument model provided. Instructors shall have at least 2 years of training experience.
- D. Each training class shall be a minimum of 4 hours in duration and shall cover Operational Theory, Maintenance, Trouble Shooting/Repair, and Calibration of the instrument.
- E. Proposed training material, including resumes for the proposed instructors and a detailed outline of each lesson shall be submitted to the ENGINEER at least 30 days in advance of when the lesson is to be given. The ENGINEER shall review the submitted data for suitability and provide comments that shall be incorporated into the course.
- F. **Operator Training:** Operating training has the following goals:
- 1) Use HMI workstations and keyboards
 - 2) Retrieve and interpret all standards displays including graphics, overview displays, group displays, trends, point summaries, and alarm summaries.
 - 3) Enter data manually.
 - 4) Change control parameters and set points.
 - 5) Assume manual control of equipment and control it from the HMI.
 - 6) Print Reports.
 - 7) Acknowledge Alarms.
 - 8) Respond to software and hardware errors.
 - 9) Historical Data Collection, archival and retrieval.
 - 10) Capabilities and configurability of: reports, alarm reporting, setting passwords, system hardware configuration.
 - 11) Database back up and recovery
- G. **Maintenance Training:** This training provides Water Company personnel with the skills required to diagnose, trouble shoot, and repair the components of the system. As a minimum, maintenance training shall provide technicians with the ability to:
- 1) Power-up, boot strap, and shut down all of the hardware devices.
 - 2) Perform scheduled maintenance functions on all components.
 - 3) Describe the theory of operation for all circuit boards.
 - 4) Setup and use off-line diagnostics to determine hardware failures to the fault board or module.
 - 5) Use HMI workstations, keypads, or keyboards to retrieve and interpret displays which shall provide on-line diagnostic information
 - 6) Remove and replace all removable boards/modules.
 - a. Maintenance training shall be at least 75% hands-on instruction and shall be designed for personnel that do not have any familiarity with the equipment furnished.

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- H. **Supervisor Training:** This training is for personnel who will need to make access changes to the system. This training consists of the following basic tasks:
- 1) Log-on and log-off to the HMI.
 - 2) Setting and clearing passwords.
 - 3) Configuring access levels for various process parameters and set points.
 - 4) Printing and configuring reports.
- I. **Calibration:** It is expected that a detailed calibration plan will be developed during the construction phase of the project. The Engineer will review the instrumentation installed and provide guidance to the Water Company as to the number of follow-up visits for calibration, the type of calibration documentation to be furnished, and the calibration equipment to be furnished to allow Water Company personnel to maintain the equipment after project completion.
- J. Within 10 days after the completion of each training lesson the CONTRACTOR shall present to the ENGINEER the following:
1. A list of all OWNER personnel that attended the lesson.

3.11 FINAL ACCEPTANCE TEST (FAT)

- A. After start up and commissioning has been completed, the System shall undergo a 30-day Final acceptance test (FAT).
- B. The FAT shall not commence until all training is complete and the operations and maintenance manuals approved as-noted
- C. The System must run continuously for 30 consecutive days. During this period, all System functions shall be exercised by the Owner. Any System interruption and accompanying component, subsystem, or program failure shall be logged for cause of failure, as well as time of occurrence and duration of each failure.
- D. A failure shall cause termination of the 30-day acceptance test. Continuation of the FAT shall be based on the following criteria:
1. A minor (No Equipment Shutdown) malfunction or error that is identified and corrected within 4 hours of the event. The FAT shall be stopped and restarted at the time of correction.
 2. An equipment shutdown or failure that is non-essential to system operation shall stop the FAT until the cause is identified and corrected. Three shutdown events shall stop the FAT and it shall be restarted from the beginning.
 3. A system shutdown event that initiates a plant, process or system shutdown. Shall terminate the FAT.
 4. An operational error that requires operator action, which is not normal to the operation of the system to monitor and conduct operations, shall terminate the FAT.

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- E. When the cause of a failure has been corrected, a new 30-day acceptance test shall be started. Each time the CONTRACTOR'S technician is required to respond to a System malfunction, he must complete a report that shall include details concerning the nature of the complaint or malfunction and the resulting repair action required and taken.

**** END OF SECTION ****

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PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Provide all devices, wiring, terminal blocks, accessories, and enclosures as specified herein and as shown on Contract Drawings for the instrumentation system. The Contract Documents are intended as an outline for the work and are descriptive of the type of hardware and software configuration to be provided. Any error or omission of detail shall not relieve the Contractor from the obligations there under to provide and install in correct detail any and all materials necessary for a complete operational instrumentation system, at no additional cost to the Owner.
- B. The contract documents are not intended to cover every detail of materials, software, hardware, configuration, or construction. The Contractor shall furnish all tools, temporary utilities, materials, setup, parts, labor, and other incidentals necessary to fully complete the entire work, whether or not said details are particularly shown or specified, all at no additional cost to the Owner.

1.02 RELATED WORK

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK with respect to interfacing electrical and control system packaged under the mechanical and civil specification sections.
- B. Installations of primary elements which require placement into or taps off of a process flow line shall meet the requirements of Division 15.

1.03 SUBMITTALS

Provide submittals and drawings as specified in Section 13300 Instrumentation and Control and Section 16010 Electrical.

1.04 OPERATING INSTRUCTIONS

Provide operating instructions as specified in Section 16010.

PART 2 PRODUCTS

2.01 QUALITY

- A. Quality includes that specified in Section 13300 and Section 16010.
- B. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting or operator interaction when power is restored. All instrumentation shall

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be provided with non-volatile memory to retain all programming and configuration in the event of a power interruption.

- C. Signal transmission from remote or field electric and electronic devices shall be 4-20 mA, sourced by a 24 V DC loop supply from the panel that is to receive the signal. Nonstandard transmission methods such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted.
- D. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission.

2.02 PRESSURE INDICATING TRANSMITTER

- A. The pressure indicating transmitter shall be a two wire 4-20 mA linear transmitting device proportional to the applied direct pressure. Each transmitter shall have the following standard features: independent zero and span adjustments, adjustable dampening 0.0 to 36.0 seconds, integral solid state circuitry, RFI filtering and shielding, 100 to 1 turndown, elevated zero range of 100% upper limit, capability to drive 0 to 500 ohm loads at 24 V DC. The transmitter shall have accuracy +/- 0.075% of span. Minimum operating temperature range shall be -40 to 185°F.
- B. Process wetted materials shall be 316 stainless steel. Process flanges and diaphragm seals shall be 316 stainless steel. Process connections shall be 1/2" NPT. The transmitter shall be setup with the proper span and a zero suppression (or elevation). The transmitter shall have instrument mounted 4-digit LCD meter with HART programming. The pressure transmitter shall be Endress Hauser PMP 71, Rosemount 3051TG, or approved equal.
- C. The Contractor shall setup all programming and configuration prior to the start of field tests. The pressure transmitters shall be calibrated to the ranges as directed by the Owner or as listed below.
- D. Pressure transmitters shall be supplied with 316 SS block and bleed valves for maintenance and calibration. Process wetted materials shall be compatible for the service application specified. Block and bleed valves shall be SMAR, Hex, Anderson Greenwood or approved equal.
- E. Locate remote pressure display in the SCADA cabinet as indicated in the plans.
- F. Pressure transmitters shall be powered by telemetry panel power source.

2.03 PRESSURE GAUGE

- A. Gauges shall have Type 316 stainless steel movement and stainless steel or phenolic case. Except as otherwise indicated, gauges shall have a 4-1/2-inch dial, 1/2-inch threaded

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connection, a Type 316 stainless steel snubbed adapter, and a shut-off valve. Gauges shall be calibrated to read with an accuracy of ± 1 percent to 150 percent of the indicated pressure. Gauges shall be vibration and shock resistant. Gauges on liquid service should have cases filled with a suitable liquid.

- B. Gauges attached to systems containing chemical solutions, corrosive fluids, sludge, sewage, or other liquids containing solids, shall be equipped with diaphragm seals, or equal protective pressure or vacuum sensing devices, and comply with the following:
 - 1. Seals shall be fabricated with Type 316 stainless steel, with stainless steel diaphragm for pressures over 15 psi, and elastomer diaphragm for pressures of 15 psi and below with Type 316 stainless steel nuts and bolts, fill connection and valved flush port size ¼-inch N.T.P., capable of disassembly without loss of filler fluid.
- C. Combined pressure gauge and switch assemblies PI/PSHH shall be provided as a complete assembly by the System Integrator for installation by the contractor.
- D. Pressure gauges shall be Wika, Ashcroft, or approved equal.

2.04 FLOWMETER (MAGMETER)

- A. The flowmeter shall consist of a flow tube flow element (FE) and a local or remotely mounted indicator/totalizer FQ/FIT with a 4-20 mA transmitter and pulse output, complete with all necessary interconnecting cables and conduits.
- B. Flowmeter shall read and have bi-directional totalization.
- C. Flow tube shall be ANSI 150 pound service.
- D. Remote transmitter assembly shall be provided where indicated.
- E. Indicator/Register shall provide an analog signal output to the PLC. Register shall be provided with two displays: a continuous flow display and totalizer.
- F. The FQ/FIT shall provide both a 4-20 mA analog signal output proportional to the flow rate and pulsed output programmable in gallons. The flow rate indicator and totalizer shall be remotely mounted from the flowmeter assembly when flowmeter is outside main plant floor area. The flowmeter shall be Sparling, Tigermag EP, with local or remote transmitter, or approved equal.
- G. Electrode Material shall be 316 Stainless Steel.
- H. Provide grounding rings.
- I. Liner Material shall be polyurethane.

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- J. Sensor Cable: The sensor cable shall be a multi-conductor, abrasive resistant, polyurethane jacketed cable flexible to -40°F. The sensor cable shall be permanently bonded to the sensor. Cable length shall be coordinated with the Contractor for connection to the remote transmitter.
- K. Pressure/Temperature Limits: -40 to 266°F
- L. The flow meter shall operate at pressures up to 300 psi.
- M. Power Requirements: 24V DC. Power consumption shall not exceed 20 Watts.
- N. The meter shall have flanged connections conforming to ANSI B16.5, Class 150. Meter size shall be as shown on the Contract Drawings.
- O. The meter accuracy shall be at least 0.5% of flow rate over a 33:1 turndown at all flow rates above 1 foot-per-second (fps). Accuracy shall be verified by calibration in a flow laboratory traceable to the U.S. National Institute of Standards and Technology.
- P. The exterior of the flow meter shall be factory epoxy painted.
- Q. Flowmeter ranges shall be approved during submittal.
- R. Locate remote display, interface, controller, batcher in the telemetry cabinet as shown in the plans.
- S. Flowmeters shall be powered by telemetry cabinet power source.

PART 3 EXECUTION

3.01 WORKMANSHIP

- A. All instrumentation work in this contract shall conform to the codes and standards specified in Section 16010 and Section 13300.
- B. The Contractor shall employ personnel who are skilled and experienced in the installation and connection of all elements, equipment, devices, instruments, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improper installations at no additional expense to the Owner.
- E. The Owner reserves the right to halt any work that is found to be substandard or being installed by unqualified personnel.

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- F. Rejected equipment or equipment without approved submittals shall be immediately removed from the delivery or job site by the Contractor.

3.02 INSTALLATION

- A. Contract Drawings are intended to show the basic functional requirements of the instrumentation system and do not relieve the Contractor from the responsibility to provide a complete and functioning system.
- B. All wires shall be identified with machine printed labels. Plastic wire gutters shall be used for routing of wire bundles. Wiring shall be neat and laced with plastic tie wraps.
- C. Install and supply all products necessary, at no additional cost to the Owner, to provide an operational system. This shall include the following:
1. Provide relays, signal converters, isolators, boosters, power conditioners, circuit cards, and other miscellaneous devices as required for the proper interface.
 2. Provide analog loop isolators where required to eliminate "ground loops."
 3. The instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the Drawings or as approved by the Engineer. When manufacturer's installation literature specifies a particular location or orientation in a process line due to measurement accuracy considerations, the installation shall be in conformance with the manufacturer's instructions.
 4. Engineering scales and charts for all instruments shall be provided that match the range of instruments that monitor the process. All displays and scales shall read in engineering units.
- D. Instrument installation methods.
1. Install instruments at the location shown on the Plans or approved by the Owner. Instruments shall be NEMA rated enclosures for the installed location.
 2. Install level and plumb.
 3. All instruments shall be provided with floor stands, stanchions or wall brackets as shown or required for operation.
 4. Mounting hardware, stands, channels, and spacers shall be either stainless steel, or non metallic to match the NEMA rated location.
 5. All screws and bolts shall be stainless steel.

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E. Wiring and raceway installation methods.

1. Instrumentation wiring shall be carried in conduits provided in compliance with the Division 16. All analog circuits shall be run as twisted pairs or triads. In no case shall a circuit be made up using conductors from different pairs or triads. Triads shall be used wherever three wire circuits are required. Triads are not to be formed by using two pairs. Terminal blocks shall be provided at all instrument cable junctions and all wires shall be identified at such junctions. Instrumentation wiring shall be run without splices between instruments, terminal boxes, or panels.
2. The number of signal wires listed on the drawings is approximate only, and the Contractor shall determine the required number of signal pairs or triads to properly connect the system furnished, especially when substituting equipment.

F. Wiring, grounding, and shielding methods.

It is important to observe good grounding and shielding practices in the generally noisy environment in this application. The following practices shall be observed unless modified by manufacturer's standards:

1. Each electronic equipment chassis shall be grounded to power ground.
2. All analog signals shall be transferred over shielded twisted pair cables.
3. All communication signals shall be transferred over shielded cables.
4. All shields of analog inputs to the PLC shall be connected at the PLC unit only. They shall not contact ground at any other point including the transmitters.
5. All shields of analog outputs from the PLC shall be grounded only at the receiving device. They shall not contact ground at any other point including the PLC.
6. Status and alarm signals routed through noisy environment shall be transferred over shielded twisted pair cables.
7. Each shield which is not connected to ground shall be covered with a heat shrink insulating boot. Shields shall be connected together at each transition from one cable to another for a continuous effective shield circuit. All shields shall be connected on terminal blocks.

3.03 SUPPLIER SERVICES

- A. The Contractor shall be responsible for each supplier of equipment to provide the following minimum services for each type of instrument supplied. The supplier shall use

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a qualified instrumentation field technician (sales representatives are not acceptable) to perform services listed herein.

1. Advise and instruct Contractor on application and installation requirements.
 2. Check, calibrate, and place equipment in operation.
 3. All programmable of field devices shall be programmed and tested prior to startup. Programming shall be adjusted or changed as directed by the Owner or Engineer, at no additional cost.
 4. Coordinate with the Owner and setup all alarm, process, and operation setpoints.
 5. Perform the acceptance tests.
 6. Visit the job as often as required and spend as much time as necessary to ensure an operational instrumentation system.
 7. Be readily available by telephone to answer all questions on supplied equipment.
 8. Provide training as specified.
- B. The Contractor shall insure each supplier of instrumentation assumes the responsibility for providing primary elements in a timely manner, for insertion into the process line, coordinating size and material type when applicable, overseeing the actual installation, calibration, and acceptance testing.
- C. Manufacturer Services
1. The CSS shall obtain factory service from the chlorine analyzer supplier to:
 - a. Certify Installation
 - b. Program Analyzer
 - c. Calibrate Analyzer
 - d. Test and Commission

3.04 TRAINING

Each supplier shall provide a minimum of one (1) hour of training to instruct Owner personnel in the use, operation, calibration, programming, and maintenance on each different type of "field" instrument.

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3.05 SPARE PARTS

Provide additional spare parts as specified in Section 16010.

3.06 WARRANTY

- A. Provide warranty of 12 months after notice of completion.
- B. Each time the Supplier's repair person responds to a system malfunction during the warranty period, he or she must contact the designated Owner maintenance supervisor for scheduling of the work, access to the jobsite, and permission to make repairs. Operation of facilities necessary to test equipment shall only be performed by or under the direction Owner staff. The Owner reserves the right at its sole discretion to deny operations requested by the Supplier.

3.07 FINAL ACCEPTANCE

- A. Provide final acceptance as specified in Section 13300 and 16010.
- B. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Supplier shall provide the following to the Owner:
 - 1. Each "operation and maintenance" manual shall be modified or supplemented by the Supplier to reflect all field changes and as-built conditions.

****END OF SECTION****

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PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The SCADA Control Panel shall be manufactured as an integral part of the Booster Pump Station control and communication system. Panel shall be rated NEMA 12 for indoor service with possible water spray. Panel shall be mounted on platform above the floor to avoid flooding, as indicated on the Contract drawings. The SCADA RTU programming shall provide complete pump control functions, allowing both local (on-site) and remote (via SCADA) operation.
- B. The Control System Supplier (CSS) shall furnish and install all necessary control panels complete, assembled, tested and ready for use including all necessary control components, wiring, interconnecting cables, all accessories, and all appurtenances as indicated herein or as required for proper operation of the system.
- C. The entire project shall be bid as a whole facility, fully furnished and installed by the Contractor. There shall be no expectation that Cal Am has any responsibility to perform any of the SCADA scope of work.
- D. The CSS shall provide a fully functioning monitoring and control SCADA system of hardware, software, and all necessary programming. Cal Am will not perform any SCADA work as part of this project. The scope of services shall include, but not be limited to:
 - 1. hardware/software systems,
 - 2. the integration of systems for monitoring and control of pumps, motors, valves, instruments, drives, and LCP's,
 - 3. data acquisition, programming and development of controls for PLC, HMI panels, and a dedicated desktop computer with Iconics control screens
- E. Control panels shall be provided as specified herein and indicated on the contract drawings. Control panels shall be manufactured by a UL-508 shop and shall be UL listed. Control panel supplier shall submit UL file certification as a listed panel manufacturer.
- F. Where indicated, control panels shall be provided with all required taps, fittings, conduit entries, mounting assemblies, control wiring and alarm interlocks. Dimensions shall be in accordance with manufacturer's requirements. Elevations and horizontal spacing shall be subject to Owners Representative approval.
- G. Panels shall be fabricated, assembled, piped and wired by fully qualified workmen who are properly trained, experienced and supervised. Only field wiring for external connections is allowed; all other wiring shall be done in the UL-508 shop.
- H. Control panels shall be provided as required to fully monitor and control each process specified.
- I. All panel meters, all instruments, and all other components shall be of the most recent field-proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise indicated. Like equipment shall be provided by a single manufacturer.

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- J. All materials and components making up the control panel shall be new, of current manufacture, and shall not have been in prior service except as required during factory testing. All active electronic devices shall be solid-state. All relays shall be provided with dust covers.
- K. Panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be of one manufacturer.

1.2 RELATED SECTIONS

Section 13350 and 13370

Division 16 Electrical.

1.3 SUBMITTALS

- A. Submittals shall be provided as specified in Sections 01300, 13300, and 16010.
- B. Contractor shall confirm in the proposal their acceptance of the functional design specification, Section 13370.
- C. Contractor shall provide a complete task description of all SCADA system scope of services that are proposed by Contractor and the CSS.

1.4 CONTROL PANEL ASSEMBLY

- A. Rear of panel mounted equipment shall be installed with due regard to commissioning adjustments, servicing requirements and cover removal. Components, terminal blocks and equipment items shall be mounted at least 9 inches above the base of the control panel.
- B. Control panel components shall be arranged on sub-panels and within the panel to optimize weight distribution, heat dissipation and component spacing for wiring and maintenance. Components and terminal strips shall be vertically and horizontally segregated with wire gutters utilizing a 2.0" minimum spacing between the component terminal connections.
- C. All fixed position components shall be mounted utilizing stainless steel screws, brackets and fasteners such that no exterior panel extrusions occur. Backpan components shall be individually identified with a unique identifier per IEEE and ISA recommended practices.
- D. Component DIN rails shall be provided for snap on mounting of terminal blocks, fuse blocks, relays, timers, and signal conditioners. DIN rail shall be zinc plated, yellow chromated steel. Twenty five percent additional rail space shall be provided to allow for system expansion.
- E. Nameplates for panel-mounted devices shall be laminated plastic, black on white, with engraving through the black surface to form 3/16-inch high white letters. Relays and other devices mounted inside the control panels shall be identified with permanent nonferrous tags. Croy labeling for interior panels where there is space is permitted with approved submittals of layout, etc. All tags shall match device numbers shown on contract plans.

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- F. Front panel components shall be arranged by function and group with a 2" minimum spacing for panel-mounted devices. Operator switches and pilot lights shall utilize a 2.5" on center minimum spacing for wire connections. Where future provisions are necessary control operator switch and pilot light positions shall be pre-punched and plugged for easy modification and expansion. All front panel mounted components shall be provided with a neoprene gasket seal.
- G. To ensure proper grounding within the control panel a copper ground bus bar shall be provided. All grounding terminal blocks, equipment chassis and source grounds shall be connected to the ground bus bar to provide a common ground reference within the control panel.
- H. All panels shall be protected from internal corrosion by the use of corrosion-inhibiting vapor capsules and shall be manufactured by Saginaw Control Engineering, Hoffman Engineering, or approved equal.
- I. Freestanding and wall mount panels shall be provided with louvers and/or forced ventilation as required to prevent temperature buildup due to operation of electrical devices mounted in or on the panel. Submit analysis of cooling requirements and predictions of temperature rise under operating conditions with planned ventilation.
- J. Intake louvers shall be mounted on the lower side, rear or front section of an unobstructed panel face. Louvers shall be provided with removable and washable filter grills mounted on the interior side of the louver. Forced-ventilation exhaust fans, where used, shall be provided at an opposing elevated location from the intake louvers. Unless otherwise indicated, fan motors shall operate on 120-volt, 60-Hz power. For control panels located in control rooms, the total audible sound level of the fans shall be less than 45 dB(A).
- K. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC Tables 312.6(A) and (B).
- L. Future device and component mounting space shall be provided on the door, backpan, and subpanel where detailed on the Drawings. Where no detail is shown, provide a minimum of 15 percent usable future space.
- M. Equipment provided with status and diagnostic displays, LED's, programming pads, buttons or dials shall be mounted with the display and keypad facing the panel front. Shelving, brackets and associated mounting hardware shall be provided to mount the equipment in readily accessible and viewable location within the panel.
- N. Each cabinet interior shall be equipped with a 120 A fluorescent lamp, one 20-ampere GFCI outlet minimum, and two single pole 120-volt, 20-ampere circuit breakers minimum.

1.5 CONTROL PANEL WIRING

- A. Control panel shall be wired per the latest revision of NEC, NEMA, IEEE and UL-508 standard wiring guidelines for electrical systems.
- B. Wires shall be identified at each end utilizing the specified wire marking procedure. Wire size shall per the latest requirements of NEC or the specification, whichever is the most stringent, based on wire type and application.

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- C. All internal wiring shall be routed through plastic wire ways (Panduit) and spiral wrapped when transitions to front panels or additional sections are required. Wire routing shall be separated and grouped by function, voltage and signal type to minimize noise and maximize maintainability.
- D. Instrumentation signal cables shall be of the type used for process control with shielded pairs or triads with polyvinyl jacket and overall shield over the multiple pairs or triads. The instrumentation cable shall be rated 600 volts at 90°C or better. The size of the instrumentation cable shall be AWG No. 18 minimum, unless otherwise specified elsewhere. All instrumentation cables shall meet all the requirements of IPCEA S-61-402 and shall be UL listed. Instrument cabling shall be isolated from power cabling.
- E. Control wiring shall be 600V AWG No. 14 XLP/PVC. Inner panel control wiring may be 600V AWG No. 14 MTW. Main power (120V AC) to the panels and inner panel utility shall be wired using color coded AWG No. 12 XHHW-2. Wires shall be color coded in accordance with Section 16120 and the following table:
- | | | |
|----|-------------|---|
| 1. | Black | L1 (AC hot) |
| 2. | White | N (neutral) |
| 3. | Red | AC Control Circuits |
| 4. | Violet | AC Control Circuits (Field Wiring) |
| 5. | Blue | DC Control Circuits |
| 6. | Black | DC Signal (+) (shielded pair) |
| 7. | Clear/White | DC Signal (-) (shielded pair) |
| 8. | Yellow | Interlock control circuits, Foreign Voltage |
| 9. | Green | Equipment ground |
- F. AC Power to all system power supplies, CRTs, printer, and disk drives, shall be accomplished using molded 3-wire plug cords.
- G. A maximum of 60 percent plastic (Panduit) of allowable wireway fill shall be maintained to allow for future expansion and panel modification. A minimum 1.5 inch clearance shall be maintained in front of each wireway cover to allow for easy access to panel wiring. All interfacing between the cabinets and the field shall be accomplished at a field connection terminal strip (TB). The terminal strip shall have a dedicated field wiring side; no internal panel wiring shall be connected to terminals on the "field side" of TB. Likewise, no field wiring shall be connected to terminals on the "panel side" of the TB. Power shall not be run in duct with signals.
- H. No more than two conductors shall be terminated at a single termination point which shall be rated for two terminations. Terminations shall not be used for more conductors than their listing permits. A common terminal block shall be provided for every two common or neutral conductors contained within the panel.

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- I. When required, precision (1%) 250-ohm resistors shall be installed at the panel wiring side terminal strip when each incoming 4-20 mA analog signal is converted to a voltage signal (1 to 5 volt DC) and there is no resistor built into the equipment.
- J. Wiring run from components on a swing-out panel to other components on a fixed panel shall be made up in tied bundles. These shall be tied with nylon wire ties and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at terminals. Anchor points shall not be attached with foam adhesive. Epoxy anchors (Click-bond) or mechanical fasteners using drilled and tapped holes in the backpan shall be used.
- K. Wiring run to control devices on the front panels shall be tied together at short intervals and secured to the inside face of the panel using Panduit adhesive mounts with Eastman No. 910 adhesive. Wiring to rear terminals on panel-mount instruments shall be run in plastic wireways mechanically secured to horizontal brackets run above or below the instruments in about the same plane as the rear of the instruments.
- L. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be permanently marked on all conductors at every terminal using white numbered wire markers which shall be permanently marked heat shrink plastic.
- M. In addition to the spare power termination capacity indicated on the drawings, each panel shall be provided with two spare fused AC power and DC power terminations to power future equipment items and field devices.

1.6 ENVIRONMENTAL

- A. The control panel shall be rated for continuous operation under ambient environmental conditions of 0°C to 60°C dry bulb and 5 to 95 percent relative humidity, non-condensing. Instrumentation and control elements shall be rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered for the installed location.
- B. The control panel shall be environmentally controlled with the use of exhaust fans, heaters and AC units as required to maintain the environmental conditions specified. The heating/cooling equipment shall be sized to maintain the temperature below a maximum of 122 degrees and above minimum of 34 degrees Fahrenheit within the control panel. Heating and cooling load calculations shall be provided for review and approval. Calculations shall utilize a maximum ambient temperature of 90 degrees F for indoor application and 120 degrees F for outdoor applications. Calculations shall include watt losses for all components and solar heat gain for the area of installation. Ventilation shall be favored over mechanical cooling to control temperature rise provided provision is made to prevent dust accumulation within enclosures.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Equipment and materials shall be products of reputable, experienced manufacturers. Similar items in the project shall be the products of the same manufacturer. All equipment shall be of

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industrial grade, a standard of construction, shall be of sturdy design and manufacture, and shall be capable of long, reliable, trouble-free service.

- B. The control panels shall be fabricated to house PLC's, controllers, instrumentation and communications equipment specified elsewhere and as indicated on the contract drawings. Control panels shall be fabricated and wired in accordance with this and applicable specification sections.
- C. The manufacturer of the control panels shall be UL recognized facility with current UL procedure files listed with UL. The final assembly shall carry a UL 508 listing. All equipment provided shall be UL Listed or Recognized for the intended service and application.

2.2 CIRCUIT BREAKERS

Control power and equipment disconnects shall be provided as indicated on the drawings. Circuit breakers shall be the energy limiting design and shall be UL rated for 120/240 VAC/60 VDC with an interrupting rating of 10 kAIC. Circuit breakers shall be sized in accordance with NEC. Disconnects shall be DIN rail mounted. Circuit breakers shall be Allen Bradley 1492-GH or CB, Merlin Gerin Multi 9, or approved equal

2.3 TERMINAL BLOCKS

- A. General: Terminal blocks, fuseblocks and disconnects shall be specially designed for safety, installation ease, and ruggedness. Features shall include the following:
 - 1. Nickel-plated terminals and stainless steel screws.
 - 2. High copper content copper-alloy.
 - 3. Four-sided wire funnel guides for easy wire insertion.
 - 4. Finger-safe housings to prevent accidental contact with live circuits.
 - 5. Terminal blocks and relays, timers, disconnects, signal conditioners and other such devices shall be DIN Rail-mounted.
 - 6. Self-extinguishing, polyamide 6.6 housing material with UL 94-V2 flammability rating.
 - 7. Backed out screws for fast wiring.
- B. Terminal blocks shall be DIN rail mounted, compression clamp style, UL rated for 30 amps at 600 volts. Terminal blocks shall be high-density type molded plastic with barriers and box lug terminals. Terminal marking shall be white marking strips, fastened securely to the molded sections and shall be provided with printed wire numbers or circuit identifications.
- C. Power Distribution Fuse blocks (250 Volt and below) shall be DIN rail mounted, compression clamp style, rated for 15 amps at 300 VAC. Fuse-blocks shall be provided to accept 1/4"x1 1/4" fuses. Fuseblocks shall be provided with a swing arm touch safe fuseholder for easy removal of fuses. The fuseblock shall be provided with blown fuse indication.

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- D. Control outputs and foreign control voltages present within the control panel shall be identified and supplied with disconnecting means. Foreign control voltages shall be supplied with pull-apart or knife edge compression clamp or disconnect plug component terminal blocks, rated for 20 amps at 600 volts and shall be labeled with the voltage, the source of the voltage, and circuit function. Foreign voltages are not allowed in motor controllers except for that from a listed Class 2 power supply. Disconnect terminals shall be DIN rail mounted, compression clamp style, rated for 20 amps at 600 volts. Terminal blocks shall be high-density type molded plastic with barriers and box lug terminals.
- E. Ground termination blocks shall be provided for all signal grounding and shield connections. Ground terminals shall be Din rail mounted, compression clamp style, rated for 20 amps at 600 volts. Terminal blocks shall be high-density type molded plastic with barriers and box lug terminals. Ground terminals shall be color-coded green/yellow for grounding identification.
- F. Signal and control wiring fuseblocks (120 volt and below) shall be supplied with pull-apart disconnect fuse plug component terminal blocks, rated for 20 amps at 600 volts. Disconnect terminals shall be DIN rail mounted, compression clamp style, rated for 20 amps at 600 volts. Fuseplug shall accept 5 x 20 mm fuses and shall be provided with blown fuse indication. Fuseblocks shall be high-density type molded plastic with barriers and box lug terminals
- G. Terminal and fuseblock manufacturer shall be Allen Bradley, Entelelec, Phoenix Contact.

2.4 CONTROL RELAYS

- A. Control Relays (CR) shall be “ice cube” type general purpose relays utilizing 10 amp rated contacts at the specified control voltage. Relays shall be provided as DPDT or 3PDT to meet application requirements. Relay base configurations shall be DIN rail mounted touch-safe and selected such that AC and DC control relays are not interchangeable, thereby preventing accidental damage to relay coils as a result of incompatible voltages. Relays shall be provided with one spare NO/NC contact. Relays shall be provided with an operational status LED providing positive status of relay energization. Relays shall be IDEC, RELECO or equal.
- B. Control Timers (TD/TE) shall be DIN rail mount solid state adjustable timer circuits supplied as time delay on energize or time delay on de-energize as indicated on the drawings. Timer control voltages shall be as indicated on the drawings and shall be provided with DPDT, form C contacts (a normally open and normally closed contact). Timers shall be 10-ampere, 240-volt, pin or blade style, plug-in type with dust cover, LED “on” and applicable “timeout” indication, and sockets. Timers shall have an adjustable time range and time setting with indication of the full time range and of the time setting. Time delays shall be provided with LED status indicators for energization and timer function status. Solid-state timers shall be IDEC, RELECO or equal.
- C. Industrial Control Relays (ICR) shall be provided as indicated on the contract drawings and for loads that exceed the normal contact inrush and constant current capacity rating for “ice cube” type relays. Relays shall be provided with convertible cartridges for NO/NC configuration and shall be stackable to a maximum of eight contacts with the addition of a top mounted expansion module. Contacts shall be 20 amp rated bifurcated spanner and nickel-silver plated. Industrial control relays shall be Allen Bradley 700, Type PK series or equal.

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- D. Intrinsically Safe Relays (ISR) shall be DIN rail mount provided as indicated on the contract drawings and for all loads contained in designated hazardous locations. ISR components shall be UL or Factory Mutual listed and installed in accordance with UL and NEC requirements for component spacing, isolation for all other systems, and interconnection. Intrinsically safe relays shall be selected for the Class, Division and Group category application of the hazardous equipment location. Input resistance, inductance and capacitance shall be compatible with the switching device and meet the limits for application within the defined hazardous location. Control circuit interface for non-hazardous equipment side terminations shall be voltage/current compatible with the control equipment. Intrinsically Safe Relays shall be TURCK Series MK, GEMS Safepak, or equal.
- E. Moisture/Level Probe Relay (MR) shall be DIN rail mount provided as indicated on the contract drawings. The relay shall be an adjustable resistive sensing relay for liquid sensing probe applications. The sensitivity (resistance of liquid) shall be adjustable from 0.2-100 k ohms. The relay shall be provided with coarse settings and fine adjustments potentiometers. The relay shall be provided with an integral time delay function. The output circuit shall consist of a SPDT contact. The relay shall be provided with LED indication for power "ON" and Energized State. Control circuit interface shall be voltage/current compatible with the control equipment. Intrinsically Safe Relays shall be TURCK Series MK, SSAC Series LLC, or Equal.

2.5 OPERATOR CONTROLS AND INDICATORS

- A. Operator controls and indicators (switches, push-buttons, pilot lights) shall be 30.5 mm, NEMA Type 4X rated.
1. Pushbuttons, selector switches, and indicating lights shall be heavy-duty oil tight, manufactured to the requirements of NEMA ICS.
 2. Unless noted otherwise, pushbuttons shall be momentary contact and shall have the number and type of contacts as indicated or as required. One spare NO and NC contact shall be provided for each pushbutton.
 3. Unless noted otherwise, selector switches shall be maintained contact, shall have the number of positions indicated, and shall have the number and type of contacts as indicated or as required. One NO spare contact shall be provided for each switch and position.
 4. Indicating lights shall be full voltage high brightness LED push-to-test.
 5. Pushbuttons, selector switches, and indicating lights shall be Allen-Bradley Bulletin 800T; Westinghouse Industrial Type PB or equal.

2.6 EMI LINE FILTER AND SURGE SUPPRESSION

- A. EMI/RFI FILTER
1. Control panels shall be provided with power line filters that are effective in the control of line to line as well as line to ground EMI/RFI interference. The standard line filters shall be rated for 28 dB at 1 MHz Line filters shall be Corcom, or equal.

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B. Power Surge Protection

1. The surge protectors shall be tested in accordance with the requirements of ANSI/IEEE C62.41 standards for Categories A, B, and C environments and shall be a UL 1449, latest version, listed component.
2. Surge protection components shall be as manufactured by Leviton, Hubbell or Liebert.

C. Telco/Data communications Line Surge Protection

1. Surge protection devices shall be supplied for the protection of all communications circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.
2. Communication line surge protection shall be UL-497 Listed. The surge protection device shall be sized for voltage, current and frequency requirements listed on the contract plans and shall provide independent conductor-ground surge protection. Surge protection shall be installed on the incoming communications for the control panel.
3. The protector module shall be failsafe and contain a three-electrode Maximum Duty gas tube, a fail short mechanism, and an air gap back-up device, which converts the gas tube protector to an air gap protector in the unlikely event that the gas tube vents.
4. The surge protection shall be TII or equal.

D. Data Highway Communications (Modbus Plus, RS-485)

1. Surge protection devices shall be supplied for the protection of all communications circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.
2. Communication line surge protection shall be UL-497B Listed. The surge protection device shall be sized for voltage, current and frequency requirements listed on the contract plans and shall provide independent conductor-ground surge protection. Surge protection shall be installed on the incoming RIO (remote I/O) communications for the control panel.
3. Data highway surge suppressors shall be Leviton 3803-DP, or equal.

2.7 POWER SUPPLIES

A. General

1. Power Supplies and converters shall be provided as required to meet the input power, voltage and amperage requirements for the equipment supplied.

B. DC Power Supply

1. Control panel DC power shall utilize linear power supplies for primary control power. Standard power supplies shall be provided with automatic current limit and foldback.

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Power supplies shall be sized to power the equipment at rated voltage and current with an additional 25 percent power capacity.

2. Power supply voltage shall be as required to power supplied control panel equipment and as indicated on the contract drawings.
3. Powers supplies shall be Power One, Acopian or equal.

C. DC/DC Power Supply

1. DC/DC converters shall maintain the required DC voltage to within the regulated output envelope. The DC conversion step up or step down shall be provided as indicated on the contract drawings and required to provide the supplied equipment input power.
2. The DC output shall be sized to provide 125% of load current required to operate the supplied equipment.
3. The converter shall be EMI/RFI shielded and provided with input filtering and reverse voltage protection. The converter shall be housed in an enclosure with terminal connections for input, output and ground. The DC/DC converter shall be provided as follows:
 - a. Accuracy: +/- 1%
 - b. Regulation: +/- 0.5%
 - c. Isolation Voltage: 500 VDC
 - d. Operating Temperature 25 to 85 degrees C
4. DC/DC converter shall be Kepco, Wall, or equal.

D. UPS Power Supply

1. The SCADA control panel shall be provided with a UPS power supply for the main 120V panel circuits, as required in Section 16440. The UPS shall be mounted adjacent to the SCADA panel.
2. UPS shall provide regular/conditioned 120V AC power to control circuits and panel power converters.
3. UPS "On" and "Fail" alarm status functions shall wired to PLC for alarm indications.

2.8 PANEL INTRUSION SWITCH

- A. Intrusion switches shall be provided for all control panels. Each panel compartment shall be provided with a panel intrusion switch that provides entry notification to the panel PLC and intrusion notification system.
- B. The switch shall activate whenever entry to the panel is made. The switch shall be a magnetic reed switch with 10 amps NO/NC rated.

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- C. The intrusion switch shall be Sentrol or equal.

2.9 CELLULAR COMMUNICATION FOR SCADA

The programmable logic controller (PLC) / Remote Terminal Unit (RTU) shall communicate with Cal-Am SCADA system through a cellular modem.

The CSS shall coordinate the procurement, installation, and programming of the modem with Cal-Am personnel. The cellular modem shall be Sierra Wireless, Model GX450, no exception. Contractor shall verify installation of modem and antenna with Cal-Am.

2.10 PROGRAMMABLE LOGIC CONTROLLER

The PLC system shall be provided as specified in Section 13350. Programming shall be provided as required in Section 13370.

2.11 SPARE PARTS, CONSUMABLE ITEMS, AND TOOLS

- A. For additional spare parts, refer to additional requirements as called for elsewhere in Division 13.
- B. Fuses: Provide 20 percent of each size and type used rounded to the next whole number, but no less than five of each size and type.
- C. Indicating Light Bulb: Provide 10 percent of each color, size and type used rounded to the next whole number, but no less than 5 of each type. This requirement applies to annunciator light bulbs as well, if any are supplied under this Section.
- D. Indicator switch cover plates, two lens covers for each type of switch and color combination shall be provided. Lens covers shall not be printed.
- E. Spare contact blocks 5 spare NO and NC for each type of switch contact block utilized.
- F. Power Supplies: Two of each size and type.
- G. Corrosion-Inhibiting Vapor Capsules: Two-year supply.
- H. Relays: Provide one relay and timer for each type and voltage utilized.

PART 3 – EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall furnish all installation materials, labor, wiring, cabling, and terminations, for the complete installation and operation of the control panels.
- B. Craftsmen skilled in the particular trade shall perform assembly, wire and fabrication in a workmanlike manner. Work shall be performed in accordance with the Plans, Specifications, manufacturers' recommendations, and the best practice of the trade. Completed work shall present a neat and finished appearance.

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- C. Qualified, experienced personnel who are technically skilled in their trades, are thoroughly instructed, and are competently supervised shall do all work, including installation, connection, calibration, testing and adjustment. The resulting complete installation shall reflect professional quality work, employing industrial standards and methods. Any and all defective material or inferior workmanship shall be corrected immediately to the Satisfaction of the Owners Representative at no additional cost to the Owner.

3.2 MATERIALS SUPPLIED BY PUMP MANUFACTURER

- A. Coordinate with pump supplier all requirements for motor protective relay (MPR) circuitry and the installation of pump manufacturer supplied materials to maintain the specified warranty.
- B. Install and wire protective circuit components and materials supplied by the pump manufacturer. Provide wiring and installation methods in accordance with the pump manufacturers requirements.

3.3 FACTORY TESTING

- A. Prior to shipment, the control panels shall be thoroughly factory tested. The manufacturer shall notify the owner two weeks prior to testing for owner witnessing of the test to be conducted.
- B. The factory test shall verify installation, conformance with plans, wiring continuity and operation of all panel displays and control components. See testing requirements in Section 13300.
- C. Programmed equipment and instruments shall be exercised to verify proper range, scale, and trip points and control functions.
- D. Additional factory testing shall be provided as specified in Section 13300, 13350, 13370, and Division 16.
- E. Certified factory test forms shall be provided prior to shipment.

3.4 WARRANTY AND CUSTOMER SUPPORT

All control panel assemblies and associated control components shall be provided with a 1 year service warranty and a 2 year replacement warranty from date of project acceptance.

****END OF SECTION****

TECHNICAL SPECIFICATION
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PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. General: This Section covers PLC based programmable control systems, complete. The CSS shall furnish, install, program, test, calibrate, fully configure and place into operation Programmable Logic Controllers (PLC's), Microcontroller Remote Telemetry Units (RTU's), and PLC communications hardware as specified herein.
- B. The CSS shall furnish all necessary interconnecting cables, all accessories, and all appurtenances as indicated herein or as required for proper operation of the system. All major components of the system shall be of the same manufacturer.
- C. Programmable control systems are a part of the instrumentation and controls system. In addition to the requirements in this Section, the supplier of the programmable control systems shall meet all the applicable requirements of Section 13300 Instrumentation and Controls, and 13340 Control Panels, except where those requirements are modified by this Section.
- D. The CSS shall furnish, install and wire PLC, communications modules, processors and I/O modules as indicated on the contract plans.
- E. This section covers the furnishing of PLC hardware, software, firmware, communications addressing and configuration, system software, system installation, implementation, testing and start-up.

1.2 RELATED SECTIONS

- A. The CSS shall provide hardware and software compatible with equipment, systems and services specified in the following sections:
 - 1. Division 13
 - 2. Division 16

1.3 SUBMITTALS

- A. Submittals shall be supplied in conformance with section 16010 and 13300.

1.4 REFERENCED STANDARDS

- A. American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE):
 - 1. C62.90.2, trial-use standard withstand capability of relay systems to radiated electromagnetic interference from transceivers.
 - 3. C62.41, IEEE recommended practice on surge voltages in low-voltage AC power circuits.

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4. C62.45, IEEE guide on surge testing for equipment connected to low-voltage AC power circuits.
- B. Electronic Industries Association (EIA):
 1. TIA-232-E, interface between data terminal equipment and data circuit-terminating equipment employing serial binary data interchange.
 2. 422-A, electrical characteristics of balanced voltage digital interface circuits.
- C. International organization for standardization (ISO):
 1. ISO 9001, quality systems-model for quality assurance in design, development, production, installation and servicing.
- D. National Electrical Manufacturers Association (NEMA):
 1. ICS 1, general standards for industrial control and systems.
 2. ICS 4, terminal blocks for industrial use.
 3. ICS 6, enclosures for industrial controls and systems.
 4. LS1, low voltage surge protection devices.
 5. Publication No.250, enclosures for electrical equipment (1000 V maximum).
- E. National Fire Protection Association (NFPA):
 1. National Electrical Code (NEC).
- F. Underwriters Laboratories, Inc. (UL):
 1. UL 1283, standard for safety-electromagnetic interference filters.
 2. UL 1449, standard for transient voltage surge suppressors.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The PLC system shall operate in ambient conditions of 32 to 140°F temperature and 5 to 95 percent relative humidity without the need for purging or air conditioning.

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- B. Where the PLC is utilized to control multiple trains of equipment, the PLC components (I/O modules, power supplies, etc.) shall be assigned so that the failure of one component does not affect equipment of all trains. I/O modules shall be segregated on a train basis unless required otherwise for safety reasons.
- C. The PLC program module shall dictate control output states to known and safe manner prior to running of control program, under PLC fault conditions, and PLC run errors.
- D. Protect access to PLC program loading with password protection or with locked, key operated selector switches.
- E. PLC system shall be designed with high noise immunity to prevent occurrence of false logic signals resulting from switching transients, relay and circuit breaker noise or conducted and radiated radio frequency interference.
- F. The controller shall be grounded to the panel ground bus with a separate ground conductor sized per the manufacturers grounding requirements the minimum ground connection shall be #12 AWG.
- G. All conductors, power, signal, control, etc. shall be rated 600V including network cabling and cabling to operator interface panel.

2.2 REMOTE TELEMETRY UNIT (MICROCONTROLLER/PLC)

- A. The microcontroller system and subsystem components shall be Allen-Bradley CompactLogix L3x controller, as required for Cal Am-wide system compatibility, with no "or equal".
- B. Construction: The microcontroller shall be of solid-state design. All CPU operating logic shall be contained within an integral control chassis. Microcontroller terminal base units shall allow for the easy removal and replacement of the controller. The controller shall be capable of operating in a hostile industrial environment (i.e., heat, electrical transients, RFI, vibration, etc.) without fans, air conditioning, or electrical filtering (up to 60 degrees C and 95 percent humidity).
- C. Power: The Microcontroller and all associated equipment shall be 24 VDC powered. The power shall be conditioned and regulated as required to maintain the voltage within the operating limits of the PLC. A PLC power supply(s) shall be provided to supply 24 VDC power to the PLC system and shall be sized to accommodate the PLC system load plus an additional 50 percent. Power supply shall be a listed Class 2 device to eliminate foreign voltage issues monitoring contacts in motor controllers.
- D. Design: The I/O subsystem shall be furnished with I/O (input/output) modules, terminal base and termination blocks suitable for the interface with the specified field devices. The I/O base units shall be 4-20 mA signals for analog input and analog output channels. The discrete I/O shall accept dry contact closure for discrete inputs and relay dry contact

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for discrete outputs. The I/O processor shall provide internal fault analysis with a fail-safe mode of operation.

- E. Input/Output Terminals: All I/O terminal and I/O modules shall be of rugged construction with modules in place. Sufficient input and sufficient output modules shall be provided with the distributed I/O panel to implement the specified control functions plus a reserve capacity of 20 percent of each type provided.
1. Discrete Inputs: Defined as contact closure inputs from devices external to the microcontroller. Input modules shall be shielded from short time constant noise and 60-Hz pickup. Individual inputs shall be optically isolated for low energy common mode transients to 1500 volts peak from user's wiring or other I/O channels. The input channels shall have LED lights to indicate a discrete input.
 2. Discrete Outputs: Defined as dry contact closure outputs for ON/OFF operation of devices external to the programmable logic controller module. The outputs shall be integrally fused. The output modules shall be optically isolated from inductively generated, normal mode and low energy, common mode transients to 1500 volt peak. All output modules shall have LED lights to indicate output has been cycled ON by the controller.
 3. Analog Input Modules: Defined as analog inputs for 1 to 5 VDC or 4 to 20 mA dc signals, where an analog to digital conversion is performed and the digital result is entered into the processor. Inputs shall be differentially isolated. The analog input channel shall have a minimum 14 bit resolution.
 4. Analog Output Modules: Defined as analog output for 1 to 5 VDC or 4 20 mA dc signals, where a digital to analog conversion is performed and the analog result is produced as an output.
- F. Communications ports. The Microcontroller shall be provided with two serial communications ports (RS-232 and RS-485) ports configurable for either Full or Half-Duplex operation, and one Ethernet port.
1. Port one RS-232 shall be configured for serial based communications as an RTU slave responding to polled queries from a SCADA master.
 2. Port two shall be configured to interface with a panel mounted HMI for monitoring and control.
 3. The microcontroller shall support MODBUS RTU and DNP communications for use in SCADA systems as a remote terminal unit (RTU). The protocol shall allow the RTU to communicate as a responder (slave) node on a MODBUS master/slave or DNP network. The RTU communications messaging shall be configured for radio based communications with a defined master PLC located at the Cities Corporation Yard.

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4. The RTU shall be provided with an Ethernet communications port. Ethernet module communications shall support Ethernet Modbus TCP or DNP communications between the processor modules and SCADA.

2.3 CABLING AND CONNECTORS

- A. Cables and connector shall rated 600V and shall be supplied by the PLC manufacturer and fabricated for the required interface connection. Cables shall be fabricated at the required length, unspliced with factory installed terminations at both ends.
- B. Trunk, bus, drop and tap off cables and conductors shall be factory certified for use with the specified communication and interface media requirements.
- C. Termination, Data segment and Tee boxes shall be certified by the manufacturer and installed in accordance with the manufacturer's requirements.
- D. Connectors and terminators shall be provided with the correct connection interface without the use of additional adapters or fittings. Terminators shall be installed by the factory at the appropriate cable ends.
- E. All terminations shall be provided with screw type terminal connectors.
- F. Common Bus Bar connectors shall be utilized for ground and common connections for system power and grounding.

2.4 COMMUNICATIONS EQUIPMENT

- A. The Microcontroller/PLC system shall be provided with communications components compatible with the Cal Am's communications network. The current configuration shall be compatible with a Frame Relay networked system that supports high speed data communications.
- B. The communications modem shall support Ethernet communications with a Fiber Optic port for future fiber optic based communications. The Ethernet Module shall be provided with a minimum of 3 Ethernet Ports and one Fiber Optic port.
- C. The CSS shall coordinate the interface requirements Multimode or Singlemode with the Owner based on the type of frame relay interface to be provided.
- D. The Ethernet Module shall be B&B Electronics Elinx Series, Lantronix Xpress-Pro Series, or approved equal

2.5 PLC HUMAN MACHINE INTERFACE PANEL

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- A. The Microcontroller/PLC system shall be provided with a front panel mounted Human Machine Interface (HMI) panel. The interface panel shall be weatherproof and operate at 24 VDC.
- B. The HMI shall be provided complete with all hardware, software, firmware and communications modules configured to operate with the specified system. HMI software shall be Iconics Gen32.
- C. The HMI shall be a graphical based system configured to graphically display the process, alarms, trends and provide for operator control and interaction with the Microcontroller/PLC system. Screens: Each screen shall utilize the Water Company's standard color conventions for stop, run, open, closed, and intermediate conditions. Text-based screens shall be considered in the design. Water Company to provide sample screens to establish the minimum acceptable level of graphic detail.
- D. The HMI shall be configured to communicate with the PLC system via a serial communications interface.
- E. Memory: The HMI shall be provided with sufficient memory to meet the I/O and configuration requirements specified plus an additional 50 percent.
- F. The HMI shall be furnished complete with all software and development tools necessary for screen development and system configuration. The HMI shall have a 10" Dual Color Scan Touchscreen, 1024x600 VGA resolution.
- G. The HMI Panel shall be Allen-Bradley, PanelView Plus 7 Performance Terminal, Touch Screen, 10 SVGA, TFT Color, Ethernet DLR, 24V DC, Windows CE OS License Pro, Performance Model,, or approved equal.
- H. Reports: Each report that is generated by the Water Company shall be incorporated into the system. Reporting shall be from an interface that is consistent with currently generated reports for sites of the same type. When data that is not generated by the system is required on certain forms, the operator shall have the capability to manually enter this information into the report, or overwrite data that the system has downloaded. The Water Company will provide a list of all reports to be developed by the CSS.
- I. Alarms: An alarm summary table will be provided to the CSS by the Engineer, after review by the Water Company. The table will include specific initial values for all high and low alarm set points. Analog set points shall be configurable on the graphic displays. Alarm conditions shall be sent to the wireless communication link for notification of off-site personnel. Operators shall not have access to modify alarm set points without special authorization.

PART 3 - EXECUTION

3.1 GENERAL

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- A. The CSS shall furnish all PLC programming labor, communications wiring, cabling, terminations, equipment, modules, converters and interface components to provide for a complete and operational PLC control and SCADA communications interface.
- B. SCADA workstation and Master PLC/RTU controllers shall be reconfigured and programmed to allow access to RTU data by Cal Am. The CSS shall coordinate the programming requirements with Cal Am SCADA programming staff and the following Contractor:

Tak Koo, Telstar Instruments, Inc.
Office (916) 646-1999
Mobile (510) 385-5377
Email: tkoo@telstarinc.com
- C. The CSS shall conduct a 4-hour meeting dedicated to the coordination and definition of the programming requirements for project operation and its implementation with Cal Am SCADA system.
- D. The PLC shall be configured and programmed to operate within the existing system infrastructure. General program functions shall include:
 - 1. The programming shall implement the control functions and I/O specified within the process control strategies, shown on the drawings and specified under applicable specification sections.
 - 2. PLC control systems shall be configured to operate independent of SCADA workstation and master PLC status. The PLC shall be configured to operate failsafe in the event of a PLC failure.
 - 3. PLC control system shall communicate with SCADA via the cellular link and an existing SCADA network. The SCADA system shall be programmed and configured by the CSS as required to provide for the SCADA interface and communication between the site PLC and the existing Cal Am SCADA system.

3.2 PLC APPLICATION PROGRAMMING DOCUMENTATION

- A. The CSS, PLC programmer, shall provide programming documentation that fully describes the application program function and application. The programming documentation shall clearly identify all programming functions, configurations, set-up and as-programmed ladder-logic rungs, function blocks, modules and structured text blocks. Documentation shall be prepared to present the information to both an experienced and inexperienced programming audience.

Standard self commenting/documenting programs may be utilized to generate the specified lists and cross reference files provided they utilize the ISA tag references, equipment #'s and descriptions specified herein to be included with the documentation.

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The printouts will not be accepted as a substitute for the required system overview and control description narratives specified.

- B. A comprehensive control description shall be provided for operations personnel inexperienced in PLC programming. The control description shall be prepared in a narrative format that explains the operation of the program based on a process-by-process and loop-by-loop basis. The programming documentation shall be provided in three ring binders with a table of contents and tabbed accordingly. At a minimum the following sections shall be provided for each program:
1. System Overview: The system overview shall briefly describe the primary operation of the PLC and its functions. It shall identify the primary equipment and systems monitored and controlled by the PLC and delineate any communications requirements with additional PLC's or computing systems.
 2. Control Descriptions: The control description shall be written as an operator's narrative of the control program broken into process and loop descriptions clearly identifying the operation of each loop. The control descriptions will define the following:
 - a. Loop Elements and their function within the process. Loop elements will include all external and internal PLC references and their limits associated with the control requirements.
 - b. Operational setpoints shall be clearly identified by a tag reference their function within program clearly stated. Variables utilized via communications from other PLC's shall be clearly denoted within the control descriptions.
 - c. Output controls shall be clearly identified as to what initiates and output command. The output control shall reference all status bits, setpoint trips, faults, overrides, permissive and shutdown conditions both external and internal to the PLC program.
 3. Operator Setpoint Cross Reference: All setpoints shall be listed by their tag # with a given range of acceptable input values for operation.
 4. PLC I/O Cross Reference: All physical I/O shall be listed with their associated I/O address equipment and ISA tag# and description. In addition analog points shall be clearly labeled by tag#, range of operation and scaling within the control program.
 5. PLC Communication Reference: The communications reference shall clearly delineate all points utilized within the control program required for operation that contained within additional PLC accessed via the communications media. The Reference shall clearly identify the source PLC address, register, description, I/O type and tag reference.

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6. PLC Configuration: A PLC configuration table shall be provided to identify the hardware and software configurations utilized by the PLC program.
7. PLC Applications Program: A copy of the PLC applications program shall be provided with project specific comments as follows:
 - a. Descriptive comments shall be provided for each line of code, task, function block and module utilized within the program. Descriptive operators shall utilize equipment descriptions, ISA tag and equipment numbers to clearly identify the equipment for which the program function operates. Obscure comments, codes or references that are not relevant to a descriptive function of the process shall not be utilized unless clearly defined within a cross reference table.
 - b. Each line and ladder rung shall clearly identify the I/O address, equipment descriptor and designation # for which the I/O is associated. Internal bits, registers, timers and counters shall clearly identify their function by description and tag # for which the equipment is operated. Examples:
 - 1) Input/Output I:00:01 Pump #1 (P001) On, YS-001
 - 2) Timer Reference T4:19 Pump #1 (P001) On Delay
 - 3) Internal Bit B:10 Pump #1 (P001) Ready, YL-001
 - 4) Internal Register N7:30 Pump #1 (P001) Run Time
 - c. Read/Write blocks shall clearly identify the data transferred within the block and shall be provided with a unique identifier, sufficient information shall establish the purpose of the block transfer.
 - d. Subroutines and function blocks shall identify source and destination tags, pages or sections of code for which they are utilized. Each block shall be provided with a unique identifier and clearly delineate its operation within the program.

3.3 FACTORY TESTING

- A. Factory testing shall be conducted with the PLC's mounted in their associated control panels fabricated in accordance with Section 13340. The factory test shall be in accordance with Section 16010, 13300 and 13340.
- B. The test shall demonstrate all PLC programming and operations.

3.4 IMPLEMENTATION

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- A. The CSS shall install and test all PLC components and communications equipment contained within their associated control panels. The CSS shall provide a test plan that will address testing of the PLC control strategies and verify PLC communications from each node to the master communications PLC and SCADA servers/workstations.
- B. The PLC I/O list in the Contract Drawings shall be used by the Contractor as the initial requirement. Based on final equipment being provided, the I/O list shall be revised for changes to process monitoring, spare I/O requirements, and any process control changes.
- C. The test plan shall include sign off sheets that will verify operation of the control strategy and the PLC communications integrity. The following tests shall be conducted at each location:
 - 1. PLC system diagnostics
 - 2. I/O Point Testing
 - 3. Control Loop Testing
 - 4. SCADA point testing and control operations

3.5 TRAINING

- A. Provide Training per Sections 16010 and 13300.

3.6 WARRANTY AND CUSTOMER SUPPORT

- A. All PLC, RTU, and HMI hardware and software shall be provided with a 1 year replacement warranty from date of project acceptance
- B. The CSS shall provide one year of warranty service for the correction of operational errors resulting from configuration and programming errors.

*** * END OF SECTION * ***

**TECHNICAL SPECIFICATION
DIVISION 13: SPECIAL CONSTRUCTION
13370: APPLICATION PROGRAMMING**

PART 1 – GENERAL

1.1 GENERAL

- A. The Control System Supplier (CSS) shall provide all programming associated with the pump station's control system PLCs, local HMIs and coordinate the programming and communications requirements with California American Water programmers for California American Water's existing Master PLC and SCADA system components.
- B. The CSS shall provide all programming services referenced and contained within the Project Plans and Specifications. The systems programming effort shall be provided complete, ready for use and operational by the CSS in accordance with the Project Plans and Specifications. In addition to the programming services, the CSS shall provide all services required to complete the following:
 - 1. PLC and Local HMI Programming
 - 2. SCADA and Master PLC Coordination Submittals
 - 3. Factory Testing
 - 4. Operational Testing
 - 5. System Commissioning
 - 6. Operator, Maintenance, and Supervisor Training (see Section 13300)
 - 7. Programming Documentation
- C. Provide PLC and Local HMI programming specified.
- D. The CSS shall provide complete and comprehensive services for the programming; implementation and support of a PLC based SCADA system incorporating Allen-Bradley PLCs, Iconics Gen 32 HMI software, and cellular communication software. Programming services shall include the programming, configuration and implementation of the following systems:
 - 1. Pump Station site PLC and HMI programming.
 - 2. SCADA/Master PLC system coordination for communications register configuration.
- E. Cal Am shall provide the CSS with supplemental data during the course of the contract as required to address alarms, permissives, calibration ranges, and remote reservoir level data. The CSS shall incorporate this data into the final control strategies developed for operation of the SCADA and PLC systems.

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- F. Development of the final control descriptions for the pump station shall be a coordinated effort between the CSS, Engineer and Cal Am. The final control system requirements shall be established with programming configuration meetings and submittals as specified.
- G. Before any work is performed on SCADA servers or terminal servers, integrators must follow the corporate scan directive. In addition to the scan directive, if changes are made to the system all related databases must be backed-up before work is started. Integrators will be given a unique username and password that will be at an administrator level. Any software installation or removal on SCADA servers MUST have prior approval by SCADA Engineering group.
- H. California American Water District in Carmel shall use ICONICs Gen32 suite with Hyper Historian, as identified in the California American Water standard SCADA system. New site pages will require backup of pages and shall be logged. AlarmWorx32 is the California American Water Standard alarm monitoring and reporting system.

1.2 PROJECT MEETINGS

- A. The CSS shall provide for a minimum of two (2) PLC, HMI and SCADA configuration meetings with Cal Am and Operations Personnel to address programming and configuration requirements, submittal review comments and to coordinate project implementation.
- B. The CSS shall meet with Cal Am to obtain the latest, tagging, HMI and PLC programming formats and configurations for implementation. The CSS shall modify and update the control descriptions and system I/O list in cooperation with Cal Am.
- C. The CSS shall attend all required programming specific meetings as they pertain to coordination for Factory Testing and Commissioning efforts.

1.3 SUBMITTALS

- A. The CSS shall prepare detailed programming submittals for the PLC, HMI and coordination of the SCADA system, hardware and software systems specified. The CSS shall provide the systems submittals as follows:
 - 1. The system configuration submittal shall provide sufficient data to illustrate that the system shall be programmed and configured in accordance with the specified requirements. Configuration submittal shall include a Table of Contents with the following:
 - a. Drawing Index
 - 2. System Control Descriptions
 - a. Detailed and comprehensive control strategies shall be developed and submitted for review by the CSS in the specified formats and in

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accordance with the specifications. The CSS shall detail and delineate all control systems and parameters on a process-by-process, loop-by-loop basis. The control strategies shall include the generalized control requirements, additional support system control requirements, existing control systems and any vendor supplied system controls that are necessary to fully understand the operational parameters and control functions to be provided.

- b. The CSS shall provide a SCADA I/O database referencing all PLC I/O points, internal registers accessed by the SCADA and associated PLC setpoints. The Database shall utilize the same format and structure provided by the Owner in an Excel Spreadsheet.

3. SCADA and HMI System Configuration

- a. System Navigational and Graphic Screen Configurations: Sample graphic screen configurations shall be submitted based on the requirements established during the preliminary graphics development meetings and for the displays listed within applicable sections.
- b. Two sets of color graphic screens shall be submitted for review.
- c. References to either the HMI or the SCADA system within the control descriptions applies to both the HMI and SCADA system for programming and configuration requirements.

4. SCADA SYSTEM I/O DATABASE

- a. Physical I/O
- b. Internal Registers
- c. Communications Registers

5. PLC APPLICATION PROGRAMMING DOCUMENTATION

- a. Provide Documentation per Section 13350.
- b. The CSS shall provide a PLC applications programming submittal fully documented and annotated as specified in section 13350. Submittal shall be provided in a three ring binder and electronically as a program file.

PART 2 - STANDARD PROGRAMMING METHODS

2.1 GENERAL

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- A. The pump station's PLC shall be programmed to operate independent of the status of the connected SCADA system. The PLC shall be programmed to provide monitoring and control data to the workstation via the indicated communications network.

2.2 CONTROL STRATEGIES

- A. These control strategies are not intended to be all-inclusive operational procedures for the complete system. Generalized control strategies for PLC control programs and SCADA configurations are provided to establish a general understanding of system operation and supplement application specific requirements referenced in other sections.
- B. The CSS shall be responsible for reviewing the Cal Am's existing program and configuration documentation standards and confirming existing systems prior to their modification for implementation within the overall system. The control strategies, Project P&ID's, Plans, Specifications and I/O drawings are complimentary and supplemental to one another. Information contained within these documents shall comprise the requirements for a complete control system.

2.3 GENERAL CONTROL AND MONITORING

- A. In general, control and monitoring functionality shall be as follows:
 - 1. Provide PLC and HMI programming services for monitoring and control of site specific functions.
 - 2. The CSS shall coordinate all specified configuration and development requirements with the owner. Coordination shall be achieved with specified configuration meetings and submittals to establish an acceptable configuration format and operational methods that meet the intent of the contract documents.
 - 3. The CSS shall submit a complete Tag name database for all physical, internal and virtual I/O points for review and discussion with the owner. The CSS shall coordinate the I/O functionality, Alarm Priority (Status, Alarm, and Shutdown), event log, log frequency, trending requirements, engineering units and operational function on a point by point basis.
- B. The SCADA system shall be configured to access all registers contained within the PLC for Setpoints, Time Delays, Process Data and system I/O. The PLC shall be configured to make all information available to the SCADA.

2.4 COMMON SCADA/PLC FUNCTIONS

- A. Common functions and terms for basic monitoring and control operations are provided as a standard of implementation for the control system. These terms and functions address items that are typical for process control loops and most operator initiated actions. These functions are not necessarily repeated in each individual control strategy. Unless otherwise stated they are considered a part of each control strategy implemented.

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- B. The following terms are used in the descriptions of SCADA/PLC functions:
1. Operator Settings (Setpoints): Operator/user set or entered values that are adjustable or set from operator displays. Examples of operator set or entered values are controller Setpoints, batch setpoints, timers, counters, mode selection, etc. Specific values that are normally required to be operator settable shall be noted in the process control strategy descriptions. The CSS shall provide a list of all operator settable parameters that are required for normal monitoring, control, alarming and process troubleshooting to be available at the HMI and SCADA workstations. Operator settable parameters shall be provided for:
 - a. Process control setpoints (Flow, Level, Pressure, Analytical)
 - b. Process mode selection, equipment sequencing and selection.
 - c. Non-critical system control override and manual equipment operation.
 - d. Manual control setpoints for equipment speed and stroke operations.
 - e. High-High, High, Low and Low-Low alarm setpoints that will vary with process dynamics, time of use, energy conservation and seasonal modes of operation.
 - f. Operational parameters required for providing normal operation of the control system from the SCADA system. The operator shall not be required to leave the control room to conduct any monitoring, control and alarm acknowledgement functions.
 2. Tunable Values (Setpoints): Tunable values are setpoints that are adjustable at password protected Engineer level displays without requiring any PLC or SCADA software reconfiguration. Tunable values are also identified and their preliminary values are shown when available. Examples of tunable values are:
 - a. Tunable time settings,
 - b. Tunable alarm setpoints,
 - c. PID tuning constants
 - d. Deadband Percentages
 - e. Filter Constants
 - f. Alarm Enable/Disable Operations

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3. Fixed Values: Fixed values are constants that are contained within the PLC or SCADA control logic normally inaccessible by the SCADA system. Modification of fixed values requires a modification to the control logic via the PLC programming, configuration and diagnostics software package.
4. Displayed Values: The term displayed means that the value, or information referred to, is displayed in an easily read and understood format on the HMI and SCADA workstation. Values shall be identified by their device tag reference and associated equipment number. For analog variables the value is tagged (ISA Standard) and its associated engineering units are displayed.
5. Hardware Interlocks: Hardware interlocks refer to interlocks directly wired within the electrical control circuits of equipment that, when activated, will cause the equipment to shut down or otherwise prevent operation of the equipment. Hardware interlocks do not necessarily pass through or depend on the PLC or SCADA to be operable.
 - a. Hardware interlocks may also be derived by local control panels or switches wired directly to the PLC to provide direct hardwired alarm status to the PLC for processing.
6. Software Interlocks: Software interlocks refer to interlocks that are generated by the PLC or SCADA logic or otherwise pass through the PLC. Software interlocks are not operable when the PLC is not operable or if for some reason equipment is operated while bypassing the PLC logic.
7. Hardware Generated Alarms: Hardware generated alarms are alarms that are generated external to the SCADA/PLC by equipment such as local control panels, analytical devices and process switches.
 - a. Direct wired alarms that do not depend on the PLC or SCADA to be operable.

An example would be a High H₂S level signal from the H₂S monitor and wired directly to an alarm light or horn.

- D. Direct PLC wired alarms such as a High-High pressure switch that interfaces directly with the PLC inputs.
 1. Software Generated Alarms: Alarms that are processed or generated by PLC or SCADA logic are referred to as software generated. Software generated alarms are displayed on the SCADA workstation alarm screens and are available for archiving.
 2. Local Manual Control Mode: Local manual control refers to the mode where operators can control equipment from the equipment location. Examples are an

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air compressor that may be stopped or started from the compressor's local control panel (LCP), or a gate that may be opened or closed from the gate operator.

3. Local Automatic Control Mode: Local automatic control refers to control logic performed in a local control panel independent of the PLC or SCADA. An example is a standalone air compressor package that, when in the local automatic control mode, automatically controls the compressors to maintain air pressure within a fixed deadband.
4. Remote Manual Control Mode: Remote manual control refers to the remote manual control of equipment from the SCADA workstation. In this mode, the operators override the PLC automatic control logic while safety interlock logic remains in effect. The SCADA shall set a control status at the PLC signifying that the SCADA has assumed control of the equipment. The PLC shall provide positive feedback that SCADA is selected and display at the workstation. The SCADA control status shall remain in effect until removed by the SCADA or an override condition occurs.
5. Remote Automatic Control Mode: In automatic mode equipment is controlled automatically per predetermined control schemes residing in the SCADA, without operator intervention. However, in some cases the operators may be required to initiate certain automatic functions. An example of this would be the operator initiation of the pump auto-start command. All setpoint registers shall be contained within PLC logic. PLC logic shall provide automatic control parameters (setpoints, modes of operation, equipment sequences, alarm interfacing, manual controls) and shall be accessible from the SCADA workstation. The SCADA workstation shall have access to all timers, counters, registers and control parameters.
6. SCADA Override Control: SCADA override control refers to the ability to override specific software interlocks and initiate control actions. Software interlocks or permissives that can be overridden are identified within the individual control strategies. Override control is an abnormal control operation and a "SAFETY INTERLOCK OVERRIDE ALARM" shall be initiated for the specific override condition whenever an override command is in effect.

2.5 COMMON SCADA/PLC SOFTWARE FUNCTIONS

- A. To provide for a standard of implementation various software control and monitoring functions are defined. The standard functions may not be fully delineated within each individual control strategy, however unless otherwise stated to be excluded, the standard functions shall be provided for the defined alarm, action, display, variable or control action.
- B. In general all automatic and semi-automatic controls are resident within the PLC. The PLC is configured as the primary control system for all alarm monitoring; pump

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start/stop sequencing, filter controls, backwash sequencing, shutdown and interlock and basic process control functions.

- C. When delineated within individual control strategies as SCADA controlled or SCADA logic, the control program is resident within the SCADA system. Non-control related calculations; status indication, complex pump control algorithms, energy management, optimization algorithms and historical data calculations are normally performed by the Communications Data Concentrator or SCADA system. SCADA logic is noted within the individual control strategies and tables as SCADA Manual or Automatic Control.
- D. The following provides for common PLC and SCADA software functions:
 - 1. All equipment status items monitored by the PLC and generated within the PLC control strategies are displayed at the HMI and SCADA. Unless otherwise specified the following is displayed for each equipment item:
 - a. Equipment REMOTE or AUTO status
 - b. Equipment LOCAL or HAND status
 - c. Equipment RUNNING or ON status
 - d. Equipment READY Status
 - e. Equipment OFF status
 - f. Equipment OUT OF SERVICE
 - g. Specific Equipment Fail Alarm(s) (Overload, High Torque, High Temp)
 - 2. All analog inputs shall have instrument failure alarms when the input is below 0 percent or above 100 percent for a tunable time initially set at 10 seconds.
 - 3. All discrete alarm and failure inputs are alarmed by the PLC application software and displayed at the SCADA. Each discrete alarm input shall have a unique associated alarm delay setpoint that prevents nuisance tripping. A discrete alarm will be generated based on a tunable setpoint [e.g., 10 seconds] time after the discrete event is initiated.
 - 4. Where alarms are specified as shutdown in the control strategy descriptions, those alarms are initiated by the PLC control logic based on the applicable analog input signals.
 - 5. Each alarm shall be provided with an Enable/Disable status at the PLC. When disabled the alarm logic is disabled and the status is indicated only for SCADA monitoring. When the alarm condition is disabled all associated shutdown interlocks are disabled.

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6. User adjustable trip points shall be provided for each analog input to establish High-High, High, Low, Low-Low, and Rate-Of-Change events. Each trip point shall be provided with a user tunable deadband for set and reset operations. Individual signal trip points shall be provided with a unique tunable delay to alarm activation.
7. SCADA alarm activation and annunciation shall adhere to a priority hierarchy that is established and maintained at the SCADA system. Each alarm shall have an associated priority level defined as:
 - a. Level 0 - Life Threatening or Danger Conditions.
 - b. Level 1 – Critical process alarms that will create a plant shutdown condition cause a critical process failure or severely hinder plant operation.
 - c. Level 2 – Minor process alarms associated with warning conditions and minor equipment failures.
 - d. Level 3 – Informational alarms and status that will not hinder operation or cause equipment failure.
 - e. Level 4 – 10 Non-critical alarm and event levels shall be coordinated with Cal Am.
8. All process related analog inputs shall be trended based on a continuous one, 12 and 24-hour trends additional trend times may be selected at the discretion of the operator utilizing historical trend configuration and evaluation tools.
9. All flow inputs and equipment run times shall be totalized, recorded and displayed at the SCADA workstation. Totalizers shall be resettable at the engineer level only.
10. Process alarms shall be provided with adjustable setpoints and interlocks to prevent nuisance alarms and totalization operations as follows:
 - a. When associated flow producing equipment is off, the No Flow Alarm and Flow Totalization shall be disabled and the flow value set to zero.
 - b. Process related alarms shall be disabled when process is, paused, shutdown or operating in an abnormal mode. Example, filter turbidity, and related filter influent and effluent alarms are disabled during a backwash sequence or the plant is offline.
 - c. When the flow value is less than a no totalization setpoint value, the flow shall be zeroed to disable totalization when equipment is not operational.

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11. Graphic displays shall be grouped functionally for ease of operation. Both analog and discrete functions associated with an item of equipment or a group of equipment shall be provided on the same display and tagged by its associated equipment or ISA reference.
12. Control logic that employs step sequencing of process control equipment such as Filter Backwash and Drain to Waste operations shall be provided with user adjustable step durations for individual step sequences.
13. Discrete output control is processed by the PLC based on the PLC control algorithm or SCADA commands. All interlocks, permissives and start sequences shall be provided at the PLC level. Unless otherwise stated or shown, all discrete outputs shall be provided as follows:
 - a. For equipment RUN/START PLC functions, the PLC shall issue a maintained START command until a RUNNING state is no longer detected or the START command is removed.
 - b. For equipment OPEN/CLOSE PLC functions, the PLC shall issue a maintained OPEN/CLOSE command until the command is removed.
 - c. When a momentary command is required, the PLC shall issue the command for a minimum two (2) seconds, and then remove the signal.
 - d. Where pulsed outputs are utilized for valve positioning control, pulse width and rates shall be based on the valve control dynamics. Pulsed controls shall be provided with a user adjustable pulse width in seconds and a minimum off time in seconds.
14. For equipment that the PLC is allowed to control, the PLC shall provide a CONTROL TIME OUT (CTO) alarm if the equipment fails to comply with a PLC command signal (START, STOP, OPEN, CLOSE) that has been present for more than a tunable time period. In this event, the command shall be removed subsequent to the expiration of the tunable time period. Equipment that is operated that has not been commanded to operate by the PLC shall produce an UNCOMMANDED START (UNK) alarm.
15. In the event of a SCADA system failure the PLC will retain the last command from the SCADA system for all equipment that is in service. All PLC interlocks shall remain enabled during a SCADA communications or systems failure.
16. All PID control functions (P, PI, and PID) shall be provided with standard analog controller functions and SCADA operator interfaces including, but not limited to, the following:

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- a. AUTO/MANUAL mode selection: In AUTO, the output of controller shall be based on the PID control calculation resident in the PLC. In MANUAL, the output of the controller shall be operator adjustable. Transfer between operational modes shall be bumpless.
 - b. LOCAL/REMOTE set point selection: In LOCAL, the set point shall be operator adjustable from the equipment. In REMOTE, the set point shall be adjustable from a SCADA set point input.
 - c. Set point, process variable, and controller output shall be displayed at the SCADA workstation. The display shall be represented as a dynamic bargraph with the associated value displayed in engineering units.
 - d. Deadband limits shall be placed on PID control algorithms to avoid hunting and continuous change actions. Deadband limits shall maintain a constant control until the process variable exceeds the deadband boundaries. A deadband value of zero will disable the deadband. Provisions shall be included to prevent reset windup.
 - e. PID controls shall be provided with a setpoint deviation alarm. The alarm condition shall be generated when the controller cannot sustain the desired setpoint within a user definable deadband for a tunable time delay.
 - f. Bumpless transition shall be provided when PID is invoked after a transition from manual to PID control or when pump start logic utilizes minimum speed controls for starting applications. The transition from current speed to calculated speed shall be provided as a user tunable setpoint percentage per second value.
 - g. PID control systems employing external setpoint controllers as back-up or local automatic control equipment shall interface with the PLC control logic based on the following:
 - 1. Local/Remote mode control of the Setpoint Controller shall be capable of selecting “local automatic”, “local manual” and “remote” control of the setpoint controller. In the remote control mode the setpoint controller receives output control signals from the PLC to maintain the desired setpoint or position.
 - 2. Alternate mode select, in remote control the setpoint controller shall receive an alternate mode control condition from the PLC. This mode shall freeze the control output at its current state or drive the controller to produce a 0 output until the alternate mode condition is removed.
- E. The setpoint controller shall provide a mode status condition to the PLC indicating that is in the local or remote HOST mode of operation.

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1. When equipment is tagged OUT OF SERVICE, a SCADA function, all associated equipment and devices are automatically placed in OUT OF SERVICE status and their associated alarms inhibited until the tagged equipment is re-tagged IN SERVICE. The PLC shall receive an “Out of Service” status from the SCADA and remove all associated equipment from operation at the PLC control level.
2. Instrument “OUT OF SERVICE” tagging. When an instrument is failed or removed from service, the operator at the SCADA may block the instrument signal at the PLC to prevent nuisance alarm and abnormal control conditions. When an instrument signal is blocked at the PLC, associated alarms and controls are disabled. The operator shall be capable of entering substitute values for monitoring and control while in the blocked mode of operation.
3. SCADA manual control shall be provided for all PLC controlled equipment. SCADA manual equipment control shall utilize two state (bit) control operation for equipment start-stop and valve open-close functions. When the control action is selected it shall be highlighted in accordance with the owner’s standard color code conventions.
4. Equipment operating in SCADA manual mode shall have the manual control action removed when an associated shutdown condition is in effect. On a shutdown condition the equipment shall be stopped and removed from SCADA manual mode. The operator shall be required to reset the alarm and restart the pump manually in SCADA mode.
5. Valve and gate controls provided with positive feedback for Opened and Closed states shall be provided with the following features:
 - c. When commanded to Open/Close and the valve is not Opened/Closed the SCADA shall display an equipment traveling status.
 - d. When both the equipment Opened/Closed states are present an equipment alarm shall be generated at the SCADA.

2.6 SYSTEM CONTROL HIERARCHY

- A. The SCADA control system provides for all monitoring, alarming, interlocking and control functionality of the plant control systems. It provides the means in which the SCADA monitors and controls the system at the operator level. Equipment items throughout the plant are provided with numerous levels of control ranging from local manual to SCADA initiated controls. To establish a control hierarchy the following control precedence shall be in effect unless otherwise specified within individual control strategies:

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1. Hardwired Interlock and Lock Out Stop (LOS)
 2. Local Manual Control
 3. Local Automatic Control
 4. Remote Manual PLC Automatic and HMI Control
 5. Remote Automatic SCADA Automatic Control through the PLC
- B. For equipment that is controllable from a PLC, a control mode status signal shall be present at the PLC to indicate when the PLC is allowed to control the equipment. The PLC monitors the switch position status (LOCAL/ REMOTE, HAND-OFF-AUTO) of each equipment item and is able to control only the equipment that is in the REMOTE or selected PLC mode.
- C. SCADA control (Auto or Manual) can occur only when the PLC is in either the AUTO or selected PLC mode for the equipment item and it is placed into the SCADA AUTO/MANUAL control mode. Under SCADA mode the SCADA system provides for all start/stop, open/close, speed and position control based on operator initiated actions or control algorithms resident within the SCADA system.
- D. All interlocks, start sequences, stop sequences and permissives shall be retained in the PLC and remain active in the SCADA mode. Exceptions to this are those alarms listed as overrideable alarms by the SCADA.
- E. There shall be three levels of PLC initiated control once the equipment is placed into the remote or PLC mode of operation. The control hierarchy for PLC operation is as follows.
1. Equipment placed into service and not under SCADA AUTO/MANUAL mode is directly controlled by the PLC without SCADA intervention.
 2. Equipment placed into SCADA MANUAL is controlled at the SCADA workstation based on local or remote operator initiated control actions.
 3. Equipment placed into SCADA AUTO is controlled by a control strategy resident within the SCADA. Control data is sent to the PLC based on SCADA calculated control requirements.
 4. Equipment placed into SCADA AUTO with various modes of control is controlled by a control strategy resident within the SCADA. Control data is sent to the PLC based on SCADA calculated control requirements for the control mode selected.

PART 3 - CONTROL STRATEGIES

3.1 GENERAL

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- A. The pumping systems shall be controlled based on level and flow rates, with pressure monitored to limit unsafe conditions. Pumps shall be started based on flow being requested, based on receiving reservoir levels, including level control PID control, or manual flow rate scheduling.
- B. Individual pump speed shall be controlled to maintain a desired flow rate setting or range, based on total plant flow required. The pump shall be stopped on decreasing flow rate, or if minimum pump speed is reached, for a definable period of time,.

3.2 INSTRUMENTATION MONITORING AND CONTROL

A. OVERVIEW:

- 1. This control strategy describes pump station control.

B. HARDWIRED FUNCTIONS:

- 1. Monitor analog flow rate and pressure on outlet manifold, indicate locally at the HMI, and transmit to SCADA.
- 2. Monitor analog discharge pressure at the pump inlet and outlet, indicate locally at the HMI, and transmit to SCADA.
- 3. Monitor discharge pressure switch status ahead of check valve and interlock with pump controls. Provide High-High discharge pressure alarm and shutdown pump through PLC control.
- 4. Monitor analog pump discharge flow rate at the pump's discharge manifold, indicate locally at the HMI, and transmit to SCADA.

C. SOFTWARE FUNCTIONS:

- 1. Analog pressure monitoring shall be utilized for alarming and control of the pumps when pressure values go out of the normal range.
- 2. Analog flow monitoring shall be utilized for alarming, totalization, control of the pumps, and interlocking the pumps being operated. Flow data shall be utilized for SCADA monitoring and control.
- 3. Pump Control Strategy: Segunda tank water level is the process variable to plant PLC level control setpoint. The control output from the level controller is the input to the plant flow controller. The plant flow controller with start pumps as needed, control pump speed to either maintain pump rate, ramp up/down, or start/stop pumps. The main PLC flow controller shall ensure that the pumps are equally loaded, based on pump discharge flow rate.

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4. There will be a pump flow rate schedule that increases/decreases flow based on water demands. A pump schedule corresponding to the pump activation/deactivation levels shall be developed, with adjustment during commissioning. A scale factor shall be assignable to program changes based on seasonal variations in demand, with lower scale factor in the spring, higher scale factor in the summer. The pump rate schedule objective is to meet the demand and maintain the tank at the target water level consistently without wild fluctuations in water level, and to avoid frequent pump start/stops.

3.3 PUMP MONITORING AND CONTROL

A. General

1. The pump station VFDs are controlled based on pump discharge header flow rate.

B. Local Manual Control

1. A SCADA panel Hand-Off-Auto switch for each pump allows the pump to be started in the Hand mode. In this mode of operation the pump runs until mode selector switch is turned to the Off position or the following hardwired interlock occurs:
 - a. High Discharge Pressure Switch

C. Pump Status

1. Pump Running – Provide pump running status when pump is called to run and a run status is received from the VFD at the PLC.
2. Pump Elapsed Time – Provide indication of elapsed time in tenths of hours. Provide a resettable and non-resettable elapsed time meter for each pump.
3. Pump Start Counter – Provide indication of the number of starts for each pump. Provide a resettable and non-resettable start counter. Provide an alarm when the pump exceeds a setpoint number of starts within an hour.
4. Pump Fail to Operate – When a pump VFD is called to run and the pump running condition is not received (run contact to PLC) within a user adjustable time delay. A pump “fail to operate” alarm is generated by the PLC. A pump fail to operate shall require a manual reset by the operator.
5. VFD Fault – When a VFD fault is detected the motor is stopped and a VFD fault alarm generated.

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6. Pump Failure – Provide a pump failure alarm and shutdown the pump based on the following hardwired status points:
 - a. High Discharge Pressure Switch
 7. Station Power Failure – On station power/phase failure a Station Power Failure Alarm shall be generated by the PLC. The pump motor will be stopped and a shutdown alarm generated.
- D. PLC Automatic
1. For automatic pump control to occur the pump motor's H-O-A switch shall be selected to Auto, Auto contact presented to the PLC, no shutdown conditions active and the pump selected for Auto control via the SCADA/HMI.
 2. Pump station system pressure is monitored at the site for monitoring high plant discharge pressure.
 3. Pump flow rate is monitored for controlling the pump speed based on the required flow rate. As the flow rate required by the plant increases above a Pump Start Setpoint, the pump is started and shall continue to run until the flow rate decreases below Pump Off Setpoint. The VFD speed will be controlled based on flow rate utilizing a PID control algorithm as referenced in 2.5.D.16.

3.4 HUMAN MACHINE INTERFACE PANEL

- A. The HMI shall be configured to monitor and control the pump systems based on the following:
1. Process Graphic Screens
 - a. Graphic screens shall be provided in P&ID format to represent the sump level and pump status. The graphical screens shall display the operational data and process parameters.
 - b. Booster Pump Station graphic screens shall include the following:
 1. Pump motor controls and set point
 2. Source and discharge tank level display and set points
 3. Inlet and discharge pressure with set points
 4. Discharge flow and set points
 5. Discharge valve control and status
 6. Totalizer values for pump runtime and starts

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2. Pump Control Graphic Screens

- a. A pump control screen shall be provided to allow the operator to manually start and stop the pump via the HMI. At the HMI display a Hand-Off-Auto button shall be provided to allow the operator to select the desired pump mode. In the Auto position the pump is controlled by the PLC. In the off mode the pump is stopped and remains off until selected to either the Auto or Hand Mode. In the Hand mode the pump is started by the PLC and runs till selected to the Off or Auto Mode. In the Hand mode pump shutdown conditions will remain active.
- b. A plant control screen shall be provided to allow the operator to see all plant pumps, plant process values, select pumps for control, and monitor remote reservoir levels via the HMI.

3. Setpoint Control Screen

- a. A setpoint control screen shall be provided with all operator adjustable setpoints displayed. Setpoints accessed and modified by the operator via the Setpoint Control Screen.

4. Alarm Summary Screen

- a. Alarms shall be displayed on the Process Graphics display and logged to the alarm summary screen. The operator shall be capable of viewing, acknowledging and resetting alarms from the alarm summary screen.

3.5 SCADA CONFIGURATION

- A. Contractor shall provide coordination of the SCADA system configuration, complete. Provide communications read and write register for SCADA/Master PLC monitoring and control of the pumping system. The CSS shall coordinate register assignments and SCADA operations requirements with Cal Am.
- B. The CSS shall furnish all necessary testing and commissioning services necessary to confirm SCADA system operation with Cal Am programming staff.

*** * END OF SECTION * ***

**TECHNICAL SPECIFICATIONS
DIVISION 15: MECHANICAL
15000: PIPING GENERAL**

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall provide all piping systems indicated, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section shall apply to all piping sections in Divisions 2 and 15.
- C. The mechanical drawings define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are **not** pipe construction or fabrication drawings. Where pipe supports and spacings are indicated on the Drawings and referenced to a Standard Detail, the CONTRACTOR shall use that Detail. Where pipe supports are not indicated on the Drawings, it is the CONTRACTOR's responsibility to develop the details necessary to design and construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide all spacers, adapters, and connectors for a complete and functional system.
- D. CONTRACTOR shall conform to the CAW Construction Standards.

1.02 CONTRACTOR SUBMITTALS

- A. **General:** Submittals shall be furnished in accordance with Section 01300 – Contractor Submittals.
- B. **Shop Drawings:** Shop Drawings shall contain the following information:
 - 1. Drawings: Layout drawings including all necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate all spacers, adapters, connectors, fittings, and pipe supports to accommodate the equipment and valves in a complete and functional system.
 - 2. Thermoplastic Pipe Joints: Submit solvent cement manufacturer's catalog indicating that the recommended product is suitable for each fluid service application.
 - 3. Gasket Material: Submit gasket manufacturer's catalog indicating that the recommended product is suitable for each fluid service application.
- C. **Samples:** Performing and paying for sampling and testing as necessary for certifications are the CONTRACTOR'S responsibility.

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D. Certifications

1. All necessary certificates, test reports, and affidavits of compliance shall be obtained by the CONTRACTOR.
2. A certification from the pipe fabricator that all pipes will be manufactured subject to the fabricator's or a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the manufacture of any pipe.

PART 2 PRODUCTS

2.01 GENERAL

- A. **Extent of Work:** Pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable Sections of Divisions 2 and 15 and as indicated. Materials in contact with potable water shall be listed as compliant with NSF Standard 61.
- B. **Pipe Supports:** Pipes shall be adequately supported, restrained, and anchored in accordance with Section 15006 - Pipe Supports, and as indicated. Supports shall resist stresses created by a seismic load in an amount of 34 percent of maximum weight.
- C. **Lining:** Application, thickness, and curing of pipe lining shall be in accordance with the applicable Sections of Division 2 unless otherwise indicated.
- D. **Coating:** Application, thickness, and curing of pipe coating shall be in accordance with the applicable Sections of Division 2, unless otherwise indicated. Pipes above ground or in structures shall be field-coated in accordance with Section 09800 - Protective Coating.
- E. **Inspection:** Pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with requirements.
- F. **Tests:** Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. Welds shall be tested as indicated. The CONTRACTOR shall be responsible for performing material tests.
- G. **Welding Requirements:** Qualification of welding procedures used to fabricate pipe shall be in accordance with the provisions of ANSI/AWS D1.1 - Structural Welding Code. Welding procedures shall be submitted for the ENGINEER'S review.

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DIVISION 15: MECHANICAL
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- H. **Welder Qualifications:** Welding shall be done by skilled welders and welding operators who have adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 or the ASME Boiler and Pressure Vessel Code, Section 9, by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. Qualification testing of welders and materials used during testing are part of the WORK.

2.02 PIPE FLANGES

- A. **General:** Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small pipes shall be in accordance with the standards indicated for these pipes.
- B. **Pressure Ratings**
1. 150 psi or less: Flanges shall conform to either ANSI/AWWA C207 - Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In., Class D, or ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings, 150 lb class.
 2. 150 psi to 275 psi: Flanges shall conform to either ANSI/AWWA C207 Class E or Class F, or ANSI/ASME B16.5 150 lb class.
 3. 275 psi to 700 psi: Flanges shall conform to ANSI/ASME B16.5, 300 lb class.
 4. Selection based on test pressure: AWWA flanges shall not be exposed to test pressures greater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.
- C. **Blind Flanges:** Blind flanges shall be in accordance with ANSI/AWWA C207, or as indicated for miscellaneous small pipes. Blind flanges for pipe sizes 12-inches and greater shall be provided with lifting eyes in the form of welded or screwed eye bolts.
- D. **Flange Coating:** Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.
- E. **Flange Bolts:** Bolts, nuts, and washers shall be 316 Stainless Steel. Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All- thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.
- F. **Insulating Flanges:** Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter, and shall be in conformance with CAW Construction Standard.

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- G. **Insulating Flange Sets:** Insulating flange sets shall be provided where indicated. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a stainless steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2 inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2 inch, insulating sleeves and washers shall be 2 piece and shall be made of polyethylene or phenolic material. Stainless steel washers shall be in accordance with ASTM A 325 - Structural Bolts, Stainless Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength. Insulating gaskets shall be full-face.
- H. Insulating Flange Manufacturers, or equal
1. Calpico
 2. Maloney Pipeline Products Co., Houston
- I. Flange Gaskets
1. Gaskets for flanged joints used in general water and wastewater service shall be full-faced type, with material and thickness in accordance with ANSI/AWWA C207, suitable for temperatures to 700 degrees F, a pH of one to eleven, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted, unless otherwise indicated. Flange gaskets shall be as manufactured by **John Crane, Style 2160, Garlock, Style 3000**, or equal.
 2. Gaskets for flanged joints used in water with chloramines shall be **Gylon, Style 3500** as manufactured by **Garlock** or by **Crane**, or equal.
 3. Gaskets for flanged joints used in chemicals, air, solvents, hydrocarbons, steam, chlorine and other fluids shall be made of materials compatible with the service, pressure, and temperature.

2.03 THREADED INSULATING CONNECTIONS

- A. **General:** Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.
- B. **Materials:** Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.04 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

- A. Manufacturers of Couplings for Steel Pipe, or equal

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1. Gustin-Bacon (Aeroquip Corp.) (banded or grooved)
2. Victaulic Style 41 or 44 (banded, flexible)
3. Victaulic Style 77 (grooved, flexible)
4. Victaulic Style 07 or HP-70 (grooved, rigid)

B. Manufacturers of Ductile Iron Pipe Couplings, or equal

1. Tyler
2. US Pipe

Note: Ductile iron pipe couplings shall be furnished with flush seal gaskets.

C. Manufacturers of Couplings for PVC Pipe, or equal

1. Tyler
2. US Pipe

Note: Couplings for PVC pipe shall be furnished with radius cut or standard roll grooved pipe ends.

2.05 SLEEVE-TYPE COUPLINGS

- A. Construction:** Sleeve-type couplings shall be provided where indicated, in accordance with ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. Couplings shall be steel with steel bolts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch thick or at least the same wall thickness as the pipe to which the coupling is connected. If the strength of the middle ring material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe. The coupling shall be either 5 or 7-inches long for sizes up to and including 30- inches and 10-inches long for sizes greater than 30-inches, for standard steel couplings, and 16-inches long for long-sleeve couplings. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to the requirements of Section 05500. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

- B. Pipe Preparation:** Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance

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of 12-inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof- test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:
 - a. Color - Jet Black
 - b. Surface - Non-blooming
 - c. Durometer Hardness - 74 plus and minus 5
 - d. Tensile Strength - 1000 psi Minimum
 - e. Elongation - 175 percent Minimum
2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Where sleeve couplings are used in water containing chloramine or other fluids which attack rubber materials, gasket material shall be compatible with the piping service and fluid utilized.

D. Insulating Sleeve Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a sleeve of an insulating compound material compatible with the fluid service in order to obtain insulation of all coupling metal parts from the pipe.

E. Restrained Joints: Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be designed by the pipe manufacturer in accordance with Manual M11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed. Where harness sets are installed near the suction and discharge of the pump, harness bolts shall have zero elongation to prevent misalignment of the pump imparted by the thrust within the piping system. Mechanical joint restraints shall be used per the CAW Construction Standards for all buried pipe.

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F. Manufacturers, or equal

1. Mega Lug
2. TR Flex
3. Dresser, Style 38
4. Ford Meter Box Co., Inc., Style FC1 or FC3
5. Smith-Blair, Style 411

2.06 FLEXIBLE CONNECTORS

- A. **Low Temperatures:** Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment, and where indicated. Flexible connectors for service temperatures up to 180 degrees F shall be flanged, reinforced Neoprene or Butyl spools, rated for a working pressure of 40 to 150 psi, or reinforced, flanged duck and rubber, as best suited for the application. Flexible connectors for service temperatures above 180 degrees F shall be flanged, braided stainless steel spools with inner, annular, corrugated stainless steel hose, rated for minimum 150 psi working pressure, unless otherwise indicated. The connectors shall be a minimum of 9-inches long, face-to-face flanges, unless otherwise indicated. The final material selection shall be approved by the manufacturer. The CONTRACTOR shall submit manufacturer's shop drawings and calculations.
- B. **High Temperature:** Flexible connectors shall be installed in engine exhaust piping and where indicated. Connectors shall be sufficient to compensate for thermal expansion and contraction and also to isolate vibration between the engine and the exhaust piping system. Connectors shall be stainless steel bellows type, flanged, and rated for minimum 150 psi, 2000 degrees F.

2.07 EXPANSION JOINTS

- A. Piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be flanged end, stainless steel, Monel, rubber, or other materials best suited for each individual service. The CONTRACTOR shall submit detailed calculations and manufacturer's Shop Drawings of all proposed expansion joints, piping layouts, and anchors and guides, including information on materials, temperature and pressure ratings.

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2.08 PIPE THREADS

- A. Pipe threads shall be in accordance with ANSI/ASME B1.20.1 - Pipe Threads, General
- B. Purpose (inch), and be made up with Teflon tape unless otherwise indicated.

2.09 PIPE INSULATION

- A. All liquid piping, flues, and engine exhaust piping shall be insulated.

2.10 AIR AND GAS TRAPS

- A. Air and gas pipes shall slope to low points and be provided with drip legs, shut-off valves, strainers, and traps. The traps shall be piped to the nearest drain. Air and gas traps shall be not less than 150 lb iron body float type with copper or stainless steel float. Bracket, lever, and pins shall be of stainless steel. Drain traps shall have threaded connections.
- B. Manufacturers, or equal
 - 1. Armstrong International, Inc.
 - 2. Spirax Sarco, Inc.

PART 3 EXECUTION

3.01 MATERIAL DELIVERY, STORAGE, AND PROTECTION

- A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. Defective or damaged materials shall be replaced with new materials.

3.02 GENERAL

- A. Piping, fittings, and appurtenances shall be installed in accordance with the requirements of applicable Sections of Division 2 and Division 15. Care shall be taken to insure that piping flanges, mechanical-type couplings, sleeve-type couplings, flexible connectors, and expansion joints are properly installed as follows:
 - 1. Gasket surfaces shall be carefully cleaned and inspected prior to making up the connection. Each gasket shall be centered properly on the contact surfaces.
 - 2. Connections shall be installed to prevent inducing stress to the piping system or the equipment to which the piping is connected. Contact surfaces for flanges, couplings, and piping ends shall be aligned parallel, concentric, and square to each axis at the piping connections.

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3. Bolts shall be initially hand-tightened with the piping connections properly aligned.
 4. Bolts shall be tightened with a torque wrench in a staggered sequence to the AISC recommended torque for the bolt material.
 5. After installation, joints shall meet the indicated leakage rate. Flanges shall not be deformed nor cracked.
- B. **Core Drilling:** Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and reinforcing bars.
- C. **Cleanup:** After completion of the WORK, cuttings, joining and wrapping materials, and other scattered debris shall be removed from the Site. The entire piping system shall be handed over in a clean and functional condition.

END OF SECTION

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TECHNICAL SPECIFICATIONS
DIVISION 15: MECHANICAL
15004: POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the requirements for Poly Vinyl Chloride (PVC) pipe and fittings.
- B. Related Sections:
 - 1. Section 01300 – Contractor Submittals
 - 2. Section 01400 – Quality Control

1.02 REFERENCES

All PVC pipe and fittings shall be manufactured in accordance with one of the following Standard Specifications:

- A. ASTM D1785, “Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120”
- B. ASTM D2241, “Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)”

1.03 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings showing piping layouts, sizes, types, valves, drains, and cleanouts.
- B. Product Data: Submit manufacturers' product data for specified materials and equipment.
- C. Operation and Maintenance Data: Submit manufacturer's printed operating and maintenance instructions in accordance with
- D. Test Reports: Submit certified test results and certificates of compliance as necessary to verify conformance with specified requirements.
- E. Installation
 - 1. Plan: Identify how the quality of materials and installation will be controlled (e.g. measurements, inspections, testing, etc.) in accordance with Section 01400 – Quality Control.
 - 2. Workforce Qualifications: Submit verification that the workforce is qualified to complete the work of this Section (licenses, certifications, etc.) and that the work has been effectively supervised (manager, foreman, etc.).

1.04 QUALITY CONTROL

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15004: POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. Production staff shall check each length of pipe produced for the items listed below. The results of all measurements shall be recorded on production sheets, which become part of the manufacturer's permanent records.
 - 1. Visually check pipe, inside and out for cosmetic defects (grooves, pits, hollows, etc.).
 - 2. Pipe outside diameter shall be measured using a suitable periphery tape to ensure conformance with ASTM F679 or ASTM D1785, whichever is applicable.
 - 3. Pipe wall thickness shall be measured at 12 equally spaced locations around the circumference at both ends of the pipe to ensure conformance with ASTM F679 or ASTM D1785, whichever is applicable.
 - 4. Pipe length shall be measured.
 - 5. Pipe marking shall be examined and checked for accuracy.
 - 6. Pipe ends shall be checked to ensure they are cut square and clean.
 - 7. Subject inside surface to a "reverse bend test" to ensure the pipe is free of oxidation (brittleness).

1.05 COMPATIBILITY

Contractor is responsible for compatibility between pipe materials, fittings and appurtenances.

1.06 WARRANTY

The pipe Manufacturer shall provide a warranty against manufacturing defects of material and workmanship for a period of ten years after the final acceptance of the project by the Owner. The Manufacturer shall replace at no expense to the Owner any defective pipe/fitting material including labor within the warranty period.

PART 2 - MATERIALS

2.01 PIPE MATERIAL

- A. PVC pipe shall be made from new rigid unplasticized polyvinyl chloride and shall be normal impact Type 1, Grade 1, class 12454, Schedule 80, listed as compliant with NSF Standard 61, unless otherwise indicated, in accordance with ASTM D 1785-Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- B. Perforated Pipe shall be utilized in the drain fields. This pipe shall be manufactured similarly, but have slots or holes for drainage. The perforated pipe shall be covered with a geotextile filter

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fabric to prevent silt accumulation inside the pipe and the pipe shall be buried in clean aggregate as shown in the Drawings.

2.02 PIPE JOINTS

- A. Pipe joints shall be solvent-welded type with solvent cement and primer as recommended by the pipe manufacturer for the chemical in the pipe.
- B. Screwed joints that are necessary to match up to threaded valves or fittings shall be made up with appropriate thread sealant, either paste or tape.
- C. Flanged joints shall be made with solvent-welded PVC flanges, drilled to ASME B 16.5 - Pipe Flanges and Flanged Fittings, Class 150, unless otherwise indicated. Gaskets shall be ANSI 150 lb. full face, 1/8-inch thick Neoprene for water or wastewater service. Gasket material for chemicals shall be suitable for the chemical service.

2.03 FITTINGS

- A. Solvent Welded and Threaded Fittings: Solvent-welded and threaded fittings shall be Schedule 80 PVC fittings in accordance with ASTM D 2467 - Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- B. Flanged Fittings: Flanged fittings shall be Schedule 80 fabricated PVC fittings with 150 lb. flanges to ASME B 16.5.

2.04 VALVES

- A. Isolation Valves – Contractor shall provide isolation (ball) valves as shown in the drawings.
- B. Check Valves – Contractor shall provide check valves as shown in the drawings.

2.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.
- B. All materials shall be delivered and distributed at the site by the Contractor. In distributing pipe and fittings at the site of work, each piece shall be unloaded with care opposite or near the place where it is to be laid in the trench. Under no circumstances shall such material be dropped, skidded or rolled against pipe or fittings already on the ground. Should any part of coating or lining of the pipe or fitting be damaged, the repair shall be equal to or better than the original coating or lining and the repair shall be done in accordance with the manufacturers recommendation or in accordance with the applicable standards specified for the work.

2.06 TRACER WIRE

- A. All buried plastic pipe shall have a tracer wire installed for future locating.

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- B. Install tracer wire test station at nearest Portal.

2.07 BURIED PIPE WARNING TAPE

All buried pipe shall have a plastic warning tape placed at 2-feet above pipe.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: PVC pipe shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipe shall afford maximum headroom and access to equipment, and where necessary, piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. It is recommended that the CONTRACTOR obtain the assistance of the pipe manufacturer's field representative to instruct the pipefitters in the correct installation and support of PVC piping.
- B. Supports and Anchors: Piping shall be firmly supported with fabricated or commercial hangers, Unistrut or approved equal. Where necessary to avoid stress on equipment or structural members, the pipe shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature changes.
- C. Valves and Unions: Unless otherwise indicated, connections to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection. Valves and flanges attached to PVC pipe shall be provided with adequate supports.

3.02 PIPE PREPARATION

- A. Prior to installation, each pipe length shall be carefully inspected, flushed clean of any debris or dust, and be straightened, if not true. Ends of threaded pipes shall be reamed and filed smooth. Pipe fittings shall be equally cleaned before assembly.

3.03 PIPE JOINTS

- A. Threaded Joints: Pipe threads shall conform to ASTM F 1498 - Taper Pipe Threads 60 Degrees for Thermoplastic Pipe and Fittings, and shall be full and cleanly cut with sharp dies or molded. Joints shall be made with Teflon tape or thread sealant.
- B. Solvent-Welded Joints: Solvent-welded joints shall be made with fresh primer and solvent cement on clean, dry pipe ends. The primer and cement cans shall be kept closed at all times and the joints shall be made up at the recommended ambient temperatures, to the pipe or cement manufacturer's written recommendations. Pipe ends shall be inserted to the full depth of the socket.

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- C. Flange Joints: Flanged joints shall be made with gaskets and Type 316 stainless steel bolts and nuts. Care shall be taken not to over-torque the bolts, in accordance with the manufacturer's written recommendations.

3.04 FIELD QUALITY CONTROL

- A. Quality control will be performed under the provisions of Section 01400.
- B. Products: Submit verification that the installed products are authentic (delivery receipts, bill of lading, etc.).
- C. Execution: Submit verification that the work was installed correctly (inspection records, as-built drawings, etc.).
 - 1. Provide survey coordinates for all buried tees, bends and valves (top operating nut).
 - 2. Provide photographs for all buried products.
- D. Testing and Inspection :
 - 1. The Contractor's QC program shall be responsible for the performance of all inspections and testing.
 - 2. The Contractor shall provide access to the Engineer or Testing Agency for inspection and testing.
- E. Inspections by the Contractor will include:
 - 1. Reviewing manufacturer's recommended application procedures.
 - 2. Continuously inspect installation for conformance with Contract Documents and manufacturer's recommendations.
 - 3. Finished installations shall be carefully inspected for proper joints and sufficient supports, anchoring, interferences, and damage to pipe, fittings, and coating. Defective WORK shall be repaired.
- F. Field Testing: The CONTRACTOR shall allow adequate time for the solvent cement joints to cure. Curing time shall be per the solvent cement manufacturer's recommendation. Prior to enclosure or burying, piping systems shall be pressure tested as required in the Piping Schedule, for a period of not less than one hour, without exceeding the tolerances listed in the Piping Schedule. Caution - Do not use air or gas for testing PVC pipe. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. The CONTRACTOR shall furnish test equipment, labor, materials, and devices.
- G. Leakage shall be determined by loss of pressure. Fixtures, devices, or other accessories that would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines shall be plugged or capped as appropriate during the testing procedures.
- H. Leaks shall be repaired, and the piping shall be re-tested until no leaks are found.

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END OF SECTION

**TECHNICAL SPECIFICATIONS
DIVISION 15: MECHANICAL
15005: PIPING IDENTIFICATION**

PART 1 PART 1 -- GENERAL

1.01 THE REQUIREMENT

The CONTRACTOR shall provide identification for exposed piping and valves, complete and in place, in accordance with the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

Commercial Standards: ANSI A13.1 Scheme for the Identification of Piping Systems

1.03 CONTRACTOR SUBMITTALS

- A. Submittals shall be in accordance with Section 01300 - Contractor Submittals.
- B. Shop Drawings: A list of suggested wording for each valve tag, prior to fabrication.
- C. Samples: One sample of each type of identification device.

PART 2 PRODUCTS

2.01 IDENTIFICATION OF PIPING

- A. Except as indicated below for very short pipe lengths, identify exposed piping larger than 2-inches nominal size for the pipe contents and direction of flow.
 - 1. Marker Type
 - a. Snap Around: Vinyl or polyester sheet with UV- resistant ink, preshaped and sized to tightly curl around the pipe and remain in position.
 - b. Adhesive: Vinyl or polyester sheet with UV- resistant ink, shaped similar to pipe curvature and coated with pressure sensitive adhesive.
 - c. Stencil: Lettering painted directly on surface of pipe inside color coded marker area.
 - 2. Marker Area: Sized per pipe size according to ANSI A13.1; color from the table below.
 - 3. Lettering: Sized per pipe size according to ANSI A13.1; color from the table below.
 - 4. Arrows: at least 2 arrows at each marker area, showing direction of flow.

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- B. Pipe 2-inches and smaller shall be identified by plastic plates made from laminated 3-layer plastic with engraved black letters on white background.
- C. Pipe identification shall be as manufactured by Brady, Seton, or equal.

2.02 EXISTING IDENTIFICATION SYSTEMS

In installations where existing piping identification systems have been established, the CONTRACTOR shall follow the existing system. Where existing identification systems are incomplete, utilize the existing system as far as practical and supplement with the indicated system.

2.03 IDENTIFICATION OF VALVES AND SHORT PIPE LENGTHS

- A. Identifying devices for valves and the sections of pipe that are too short to be identified with markers and arrows shall be identified with metal or plastic tags.
- B. Metal tags shall be stainless steel with embossed lettering. Plastic tags shall be solid black plastic laminate with white embossed letters. Tags shall be designed to be firmly attached to the valves or short pipes or to the structure immediately adjacent to such valves or short pipes.
- C. Wording on the valve tags shall describe the exact function of each valve.

PART 3 EXECUTION

3.01 GENERAL

Markers and identification tags shall be installed in accordance with the manufacturer's printed instructions, and shall be neat and uniform in appearance. Tags and markers shall be readily visible from all normal working locations.

3.02 VALVE TAGS

Valve tags shall be permanently attached to the valve or structure by means of 2 stainless steel bolts or screws.

3.03 MARKER LOCATIONS

Each pipe shall be marked at:

- A. Intervals of 20-feet in straight runs.
- B. At least once in every room.
- C. Within 2-feet of turns, elbows, and valves.

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15005: PIPING IDENTIFICATION

- D. On the upstream side of tees, branches, and other distribution points.
- E. On both sides of walls and floors through which the piping passes.

3.04 IDENTIFICATION COLORS

Conform to the following color codes.

Color Schedule				
Pipe Contents		Pipe Color	Marker Color	Letter Color
Abbreviation	Identification			
A	Air		Blue	White
BD	Bottom drain		Green	White
BP	Plant bypass		Green	White
C	Condensate		Yellow	Black
D	Chemical drain and vent		Yellow	Black
CL	Chlorine (gas or liquid state)		Yellow	Black
CLS	Chlorine solution		Yellow	Black
CV	Chlorine vent & detection line		Yellow	Black
FE	Final effluent		Green	White
FI	Filter influent		Green	White
FSP	Fire protection sprinkler system		Red	White
IA	Instrument air		Blue	White
LO	Lube oil		Yellow	Black
LSP	Landscape sprinkler system		Green	White
NG	Natural gas		Yellow	Black
OF	Overflow		Green	White
PA	Plant air		Blue	White
PD	Plant drain		Green	White
PI	Plant influent		Yellow	Black

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Color Schedule				
Pipe Contents		Pipe Color	Marker Color	Letter Color
Abbreviation	Identification			
PW	Potable water		Green	White
RW	Raw water		Green	White
SA	Sample lines		Yellow	Black
SC	Spare chemical		Yellow	Black
so	Sanitary drains and vents		Yellow	Black
SDR	Storm drain		Green	White
ss	Sanitary sewer		Yellow	Black

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 15: MECHANICAL
15006: PIPE SUPPORTS

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall provide pipe supports, hangers, guides, and anchors, complete, in accordance with the Contract Documents.
- B. Where pipe support systems are not indicated on the Drawings, the CONTRACTOR shall design and provide the supports in accordance with this Section.

1.02 CONTRACTOR SUBMITTALS

- A. **General:** Submittals shall be in accordance with Section 01300 - Contractor Submittals.
- B. **Shop Drawings:** Shop Drawings shall include the following information:
 - 1. Drawings of pipe supports, hangers, anchors, and guides
 - 2. Calculations for special supports and anchors.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. **Code Compliance:** All piping systems and pipe connections to equipment shall be properly anchored and supported to prevent undue deflection, vibration, dislocation due to seismic events and line pressures, and stresses on piping, equipment, and structures. All supports and parts thereof shall conform to the requirements of ANSI/ASME B31.1 - Power Piping, except as supplemented or modified below. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code or local administration requirements.
- B. **Structural Members:** Wherever possible, pipes shall be supported from structural members. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided by the CONTRACTOR. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction and shall be acceptable to the ENGINEER.
- C. **Pipe Hangers:** Pipe hangers shall be capable of supporting the pipe in all conditions of operation, allowing free expansion and contraction of the piping, and preventing excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed to prevent becoming disengaged by any movement of the supported pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the

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actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading only.

- D. **Hangers Subject to Horizontal Movements:** At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than 1/2-inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.
- E. **Spring-Type Hangers:** Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping. All spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions encountered. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the compression of the spring. Supports shall be capable of accommodating at least 4 times the maximum travel due to thermal expansion.
- F. **Thermal Expansion:** Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or expansion joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints permitting the piping to expand and contract freely in directions away from the anchored points. All components shall be structurally suitable to withstand all loads imposed.
- G. **Heat Transmission:** Supports, hangers, anchors, and guides shall be so designed and insulated, that excessive heat will not be transmitted to the structure or to other equipment.
- H. **Riser Supports:** Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.
- I. **Freestanding Piping:** Free-standing pipe connections to equipment such as chemical feeders and pumps shall be firmly attached to steel frames fabricated from angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps securing the pipes.
- J. **Materials of Construction:**
 - 1. General: All pipe support assemblies, including framing, hardware, and anchors, shall be steel construction, galvanized after fabrication, unless otherwise indicated.
 - 2. Submerged Supports: All submerged piping, as well as piping, conduits, and equipment in hydraulic structures within 24-inches of the water level, shall be

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supported with support, assemblies, including framing, hardware, and anchors, constructed of Type 316 stainless steel, unless otherwise indicated.

3. Corrosive: All piping in chemical and corrosive areas shall be supported with support assemblies, including framing, hardware, and anchors, constructed of Type 316 stainless steel or FRP, unless otherwise indicated.
- K. **Point Loads:** Any meters, valves, heavy equipment, and other point loads on PVC, FRP, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on PVC, FRP, and other plastic piping shall be equipped with extra wide pipe saddles or galvanized steel shields.
- L. **Concrete Anchors:** Unless otherwise indicated, concrete anchors for pipe supports shall be according to the following table. Consult the ENGINEER for any anchor applications not on the table. Anchor embedment shall comply with Section 05500.

Pipe Support Application	Type of Concrete Anchor
New Concrete	Use embedded concrete insert anchors on a grid pattern. Use Grinnell (Anvil International), Tolco, or equal.
Existing Concrete	Use non-shrink grouted anchors, metallic type expansion anchors, or epoxy anchors. Exceptions: Metallic type expansion anchors and epoxy anchors are not permitted for pipe supports subject to vibrating loads. Epoxy anchors are not permitted where the concrete temperature is in excess of 100 degrees F or higher than the limiting temperature recommended by the manufacturer. Epoxy anchors are not accepted where anchors are subject to vibration or fire.
Vibratory Loads and High Temperature Conditions	Use non-shrink grouted anchors

- M. **Noise Reduction:** To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar, suitable material at each pipe support, bracket, clip, or hanger.

2.02 SUPPORT SPACING

- A. Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending, and shear stresses in the piping, with

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special consideration given where components such as flanges and valves impose concentrated loads. Pipe support spacing shall not exceed the maximum spans in the tables below. For temperatures other than ambient temperatures, or those listed, and for other piping materials or wall thicknesses, the pipe support spacings shall be modified in accordance with the pipe manufacturer's recommendations. Vertical supports shall be provided to prevent the pipe from being overstressed from the combination of all loading effects.

B. Where support spacing is not indicated on the Drawings, the CONTRACTOR shall use the spacing below.

1. Support Spacing for Schedule 40 and Schedule 80 Steel Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
1/2	6
3/4 and 1	8
1-1/4 to 2	10
3	12
4	14
6	17
8 and 10	19
12 and 14	23
16 and 18	25
20 and greater	30

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2. Support Spacing for Welded Fabricated Steel Pipe: Maximum Spans for Pipe Supported in Minimum 120 degree Contact Saddles (feet)

Nominal Pipe Diameter (inches)	Wall Thickness (inches)									
	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
24	33	37	41	43	45	47				
26	34	38	41	44	46	48				
28	34	38	41	44	47	49				
30	34	38	42	45	48	49				
32	34	39	42	45	48	50				
34	35	39	43	46	48	50				
36	35	39	43	46	49	51	55			
38	35	39	43	46	49	51	55			
40	35	40	43	47	49	52	56			
42	35	40	44	47	50	52	56			
45	--	40	44	47	50	53	57			
48	--	40	44	47	50	53	58	61		
51	--	40	44	48	51	53	58	62		
54	--	40	44	48	51	54	58	62		
57	--	41	45	48	51	54	59	63		
60	--	41	45	48	52	54	59	63	67	70
63	--	41	45	49	52	55	60	64	67	71
66	--	41	45	49	52	55	60	64	68	71
72	--	41	45	49	52	55	61	65	69	72
78	--	41	46	49	53	56	61	66	69	73
84	--	41	46	50	53	56	62	66	70	74
90	--	41	46	50	53	56	62	67	71	74
96	--	42	46	50	54	57	62	67	71	75

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For steel pipe sizes not presented in this table, the support spacing shall be designed so that the stress on the pipe does not exceed 5,000 psi. Maximum deflection of pipe shall be limited to 1/360th of the span and shall be calculated by using the formula:

$$L = (7500tD/(32t+D))^{1/2}$$

where: t = Thickness (inches)
 D = Diameter (inches)
 L = Maximum span (feet)

3. Support Spacing for Ductile-Iron Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
All Diameters	Two supports per pipe length or 10 feet (one of the 2 supports located at joint)

4. Support Spacing for Copper Tubing:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
1/2 to 1-1/2	6
2 to 4	10
6 and greater	12

5. Support Spacing for Schedule 80 PVC Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (at 100 degrees F) (feet)
1/2	4
3/4	4.5
1	5
1-1/4	5.5
1-1/2	5.75
2	6.25
3	7.5
4	8.25

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Nominal Pipe Diameter (inches)	Maximum Span (at 100 degrees F) (feet)
6	10
8	11
10	12.25
12	13.25

2.03 MANUFACTURED SUPPORTS

- A. **Stock Parts:** Where not specifically indicated, designs which are generally accepted as exemplifying good engineering practice and use stock or production parts, shall be utilized wherever possible. Such parts shall be locally available, new, of best commercial quality, designed and rated for the intended purpose.
- B. **Manufacturers, or Equal:**
1. **Basic Engineers Inc.**, Pittsburgh, PA;
 2. **Bergen-Paterson Pipesupport Corp.**, Woburn, MA;
 3. **Grinnell Corp. (Anvil International)**, Cranston, RI;
 4. **NPS Products, Inc.**, Westborough, MA;
 5. **Power Piping Company**, Pittsburgh, PA.
 6. **Tolco Incorporated**, Corona, CA

2.04 COATING

- A. **Galvanizing:** Unless otherwise indicated, all fabricated pipe supports other than stainless steel or non-ferrous supports shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. **Other Coatings:** Other than stainless steel or non-ferrous supports, all supports shall receive protective coatings in accordance with the requirements of Section 09800 - Protective Coating.

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PART 3 EXECUTION

3.01 INSTALLATION

- A. **General:** All pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1 - Power Piping. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.
- B. **Appearance:** Pipe supports and hangers shall be positioned to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

3.02 FABRICATION

- A. **Quality Control:** Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available. Fabricated supports shall be neat in appearance without sharp corners, burrs, and edges.

END OF SECTION

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PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install and test all buried piping, fittings, and specials. The Work includes, but is not limited to, the following:
 - a. All types and sizes of buried piping, except those specified under other Sections including the Transmission Mains.
 - b. Piping beneath structures. (Does not include piping embedded in concrete.)
 - c. Supports and restraints.
 - d. Pipe encasements.
 - e. Work on or affecting existing piping.
 - f. Testing.
 - g. Cleaning and disinfecting.
 - h. Installation of all jointing and gasketing materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods and all other work required to complete the buried piping installation.
 - i. Incorporation of valves, meters and special items shown or specified into the piping systems as required and as specified in the appropriate Division 15, Mechanical, Sections.
 - j. Unless otherwise specifically shown, specified, or included under other Sections, all buried piping Work required begins at the outside face of structures or structure foundations and extending away from structure.

B. Coordination:

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1. Review installation procedures under other Sections and coordinate with the Work that is related to this Section.
 2. Section 15051, Buried Pipe Installation, specifies the installation of all buried piping buried in Sections of Division 15, Mechanical. Coordinate with these Sections.
- C. Related Sections:
1. Section 02200, Earthwork.
 2. Section 02490, Precast Concrete Manholes and Vaults.
 3. Section 03300, Cast-in-Place Concrete.
 4. Section 09800, Protective Coating.
 5. Section 09900, Paints and Coatings.
 6. Division 15, Mechanical.

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
1. Comply with requirements of NFPA Standard No. 24 for "Outside Protection" where applicable to water pipe systems used for fire protection.
 2. Comply with requirements of UL, FM and other jurisdictional authorities, where applicable.
 3. Refer to the General and Supplementary Conditions regarding permit requirements for this Work.
 4. Applicable building codes.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. ASTM D2321, Practice for Underground Installation of Flexible Thermoplastic Pipe.
 2. ASTM D2774, Practice for Underground Installation of Thermoplastic Pressure Piping.

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3. AWWA C105, Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
4. AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C206, Field Welding of Steel Water Pipe.
6. AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
7. AWWA C606, Grooved and Shouldered Joints.
8. AWWA C651, Disinfecting Water Mains.
9. AWWA M9, Concrete Pressure Pipe.
10. AWWA M11, Steel Pipe - A Guide for Design and Installation.
11. AWWA M23, PVC - Design and Installation.
12. ASCE MOP No. 37, Design and Construction of Sanitary and Storm Sewers.
13. Concrete Pipe Handbook, American Concrete Pipe Association.
14. NFPA 24, Private Fire Service Mains and Their Appurtenances.
15. NFPA 54, National Fuel Gas Code.

1.03 SUBMITTAL

- A. Shop Drawings: Submit for approval the following:
 1. Laying schedules for all piping.
 2. Full details of piping, specials, manholes, joints, harnessing and connections to existing piping, structures, equipment and appurtenances.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Prepare and submit report for each test.
- C. Certificates: Submit certificates of compliance with referenced standards.

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- D. Record Drawings:
 - 1. During progress of the Work, keep an up-to-date set of Record Drawings showing field and shop drawing modifications.
 - 2. Submit Record Drawings prior to the time of Substantial Completion.

1.04 PRODUCT DELIVERY. STORAGE AND HANDLING

- A. Deliver materials to the site to ensure uninterrupted progress of the Work.
- B. Handle all pipe, fittings, specials and accessories carefully with approved handling devices. Do not drop or roll material off trucks. Do not otherwise drop, roll or skid piping.
- C. Store pipes and fittings on heavy wood blocking or platforms so they are not in contact with the ground.
- D. Unload pipe, fittings and specials opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign matter.
- E. Inspect delivered pipe for cracked, gouged, chipped, dented or other damaged material and immediately remove defective pipe from site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Required pipe materials are listed in the Piping Schedule. Refer to applicable Sections for material specifications.
- B. General:
 - 1. Marking Piping:
 - a. Clearly mark each piece of pipe or fitting with a designation conforming to those shown on the laying schedule and/or Shop Drawings.
 - b. Cast or paint material, type and pressure designation on each piece of pipe or fitting 4-inches in diameter and larger.

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- c. Pipe and fittings smaller than 4-inches in diameter shall be clearly marked by manufacturer as to material, type and rating.
- C. CONTRACTOR shall be responsible to coordinate compatible materials of construction for all elastomer components for all seats, seals, gaskets, etc., for each process application.

2.02 DETECTABLE PIPE LOCATING TAPE

A. General:

- 1. CONTRACTOR shall furnish OWNER any information upon request so that the products furnished may be properly evaluated for acceptance or rejection. Only products of approved manufacture will be accepted.
- 2. Detectable pipe locating tape shall consist of a minimum 5.0 mil thickness, inert polyethylene plastic which is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil, with a minimum 1/3mil metallic foil. The tape shall be at least six inches in width and shall have the following identifying print in permanent letters:

"CAUTION - BURIED PIPELINE BELOW"

The identifying lettering shall be minimum one inch high and repeated continuously the full length of the tape. In no instance shall the spacing of the individual segment of the identifying message be greater than eight inches.

- 3. All detectable pipe locating tape shall be color coded by service, as directed by OWNER. CONTRACTOR shall submit color chart to the OWNER for approval, identifying lettering shall match the buried piping schedule. Refer to Paragraph 3.8 of this Section 4. Tape shall be located in accordance with the City of Scottsdale Standards.
- B. Product and Manufacturer: Provide one of the following:
- 1. Reef Industries, Inc.
 - 2. Alarmatape

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3. Linetec, Inc.
4. Or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

1. Installation of all pipe, fittings, valves, specials and appurtenances shall be subject to the review and/or approval of the OWNER.
2. Install piping as shown, specified and as recommended by the manufacturer and in conformance with referenced standards, and approved Shop Drawings.
3. Request instructions from OWNER before proceeding if there is a conflict between the manufacturer's recommendations and the Contract Documents.
4. All piping shall be inspected by the OWNER prior to installation. OWNER'S inspection will not relieve CONTRACTOR or manufacturer from responsibility for damaged products.
5. All piping shall be carefully examined for cracks, damage or other defects before installation. Any piping that is defective, including but not limited to, cracked, damaged, in poor condition, or with damaged linings or improper markings shall be rejected unless the product can be repaired in a manner acceptable to the manufacturer and OWNER. Any piping found to be broken or defective after it has been installed shall be removed, replaced or repaired at CONTRACTORS expense.
6. Minimum earth cover over the piping shall be as shown on the Drawings, specified or directed by the OWNER, but in no case shall the earth cover be less than 3-feet-6-inches for all piping, except drains.
7. Required earthwork shall be as specified in applicable Sections of Division 2, Site Work.

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8. Present all conflicts between piping systems and equipment, structures or facilities to OWNER for determination of corrective measures before proceeding.
9. Take field measurements, where required, prior to installation to ensure proper fitting of Work. The CONTRACTOR shall uncover the existing pipelines sufficiently in advance of the proposed Work in order that the type and location of the existing pipes and joints and other information required to fabricate the proposed piping can be determined. It shall be the responsibility of the CONTRACTOR to obtain whatever information is required to complete the connections of the proposed pipelines to the existing pipelines. Refer to Paragraph 3.3 of this Section, as applicable.
10. Interior of all piping and mating surfaces shall be inspected and all dirt, gravel, sand, debris or other foreign material shall be completely removed from the interior and mating surfaces before installation. Measures shall be taken to maintain the interior of all piping clean until acceptance of the completed Work. Care shall be taken to prevent foreign matter from entering joint space. Bell and spigot mating surfaces shall be wiped clean immediately before piping is laid. For ductile-iron pipe, the bell and spigot mating surfaces shall be thoroughly cleaned with a wire brush.
11. Install piping accurately to line and grade shown, specified or directed, unless otherwise approved by the OWNER. Accurate means of determining and checking the alignment and grade shall be used, which shall be subject to the approval of the OWNER. Any modifications to the Contract Documents to suit the pipe manufacturer's standard shall be approved by the OWNER. Remove and relay piping that is incorrectly installed, at CONTRACTOR'S expense.
12. Do not lay piping in water, unless otherwise specified in these Specifications or approved by the OWNER. Ensure that the water level in the trench is at least 6-inches below the bottom of piping. Maintain a dry trench until jointing and backfilling are complete, unless otherwise specified in these Specifications or approved by the OWNER.
13. Where unforeseen conditions will not permit the installation of piping as shown or specified, no piping shall be installed without

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approval of the OWNER. Do not modify structures or facilities without approval of the OWNER.

14. Start laying piping at lowest point and proceed toward the higher elevations, unless otherwise approved by the OWNER. Slope piping uniformly between elevations shown on the Drawings or as otherwise directed by the OWNER.
15. Place bell and spigot piping so that the bells face the direction of laying, unless otherwise approved by the OWNER.
16. Piping shall be installed so that the barrel of the piping, and not the joints, receives the bearing pressure from the trench bottom or other bedding condition.
17. No piping shall be brought into position until the preceding length, valve, fitting, or special has been bedded and secured in place.
18. Whenever pipe laying is not actively in progress, the open ends of the piping shall be closed by a temporary plug or cap to prevent soil, water and other foreign matter from entering the piping.
19. Field cutting of metallic piping, where required for inserting valves, fitting, specials, and closures, shall be made with a machine specially designed for cutting piping and in accordance with the manufacturer's instructions. Cuts shall be carefully done, without damage to piping, so as to leave a smooth end at right angles to the axis of the piping. Cut end shall be tapered and sharp edges filed off smooth. Flame cutting shall not be permitted. Piping damaged by CONTRACTOR by improper or careless methods of cutting shall be replaced or repaired at his expense.
20. Blocking under piping shall not be permitted unless specifically approved by OWNER for special conditions.
21. Protective linings and coatings shall be touched up prior to installation, where required.
22. Except where bends, wyes or similar fittings are used, changes in alignment and grade of the piping shall be made by deflecting joints or with beveled pipe. Permissible joint deflection shall not exceed 75 percent of the amount allowed by the manufacturer.

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23. All joints shall be made in the presence of the OWNER or his duly authorized representative, except as otherwise approved.
24. Special care shall be taken to ensure that each section of piping abuts against the next in such a manner that there will be not shoulder or unevenness of any kind along the piping invert.
25. Piping shall be rotated as required to place outlets in proper position.
26. Blind flanges and cleanouts shall be provided at locations shown on the Drawings, specified or required. Cleanouts on buried piping shall include all pipe, fittings and appurtenances required to bring cleanout to finished grade and terminate in a flange and blind flange or suitably capped piping as shown. Cleanout piping shall be same as that specified for the main run.
27. All gravity lines shall pitch uniformly at the grade shown or as specified or approved.
28. Short pipe stubs, maximum 4-feet-0-inch in length, shall be used at all manholes and other wall faces, except as otherwise specified.
29. Field painting shall be accomplished after joints are made.
30. All piping shall be plugged watertight with a suitable cap or plug securely fastened to the end of the piping at all contact interfaces.
31. CONTRACTOR shall notify OWNER in advance of backfilling operations.
32. On steep slopes, take measures acceptable to OWNER to prevent movement of the pipe during installation.
33. Thrust Restraint: During the installation of the pipe, tied joints, or proprietary restrained joint systems shall be provided wherever required for thrust restraint. Thrust restraint shall conform to the applicable requirements of Paragraph 3.2. of this Section. Thrust blocks are not permitted except where identified on contract drawings.
34. Exercise care to avoid flotation when installing pipe in cast-in-place concrete.

B. Manufacturer's Installation Specialist:

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1. Provide the services of a competent installation specialist of the pipe manufacturer when pipe laying begins if CONTRACTOR is not experienced in laying and jointing a particular type of pipe.
 2. Retain installation specialist at the site for a minimum of two days or until competency of the pipe laying crew has been satisfactorily demonstrated.
- C. Separation of Sewers and Potable Water Pipe Lines:
1. Conform to requirements of Arizona Wastewater Disposal Regulations, R18-9-811, as published by The Bureau of National Affairs, Inc.
- D. Plugs:
1. Temporarily plug installed pipe at the end of each day's work or other interruption to the installation of any pipe line. Plugging shall prevent the entry of animals, liquids or persons into the pipe or the entrance or insertion of deleterious materials.
 2. Install standard plugs into all bells at dead ends, tees or crosses. Cap all spigot ends.
 3. Fully secure and block all plugs and caps installed for pressure testing to withstand the specified test pressure.
 4. Where plugging is required for phasing of the Work or for subsequent connection of piping, install watertight, permanent type plugs.
- E. Bedding Pipe: Bed pipe as specified below and in accordance with the details shown.
1. Trench excavation and backfill and bedding materials shall conform to the requirements of Section 02220, Excavation and Backfill, as applicable.
 2. Where the existing bedding material is deemed unsuitable by OWNER, remove and replace it with approved granular materials. Payment for the additional excavation and granular material refill will be made at the unit prices bid in the Bid Form.

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3. Where pipe is installed in rock excavation, provide a minimum of 3-inches of crushed stone or gravel under pipes smaller than 4-inches in diameter and a minimum of 6-inches of crushed stone or gravel under pipes 4-inches in diameter and larger.
4. Excavate trenches below the pipe bottom by an amount specified. Remove all loose and unsuitable material from the trench bottom.
5. Carefully and thoroughly compact all pipe bedding with hand held pneumatic compactors.
6. Do not lay pipe until the OWNER approves the bedding condition. If a conflict exists, obtain clarification from OWNER before proceeding.
7. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.

F. Laying Pipe:

1. Conform to manufacturer's instructions and requirements of the standards listed below, where applicable:
 - a. Ductile-Iron Pipe: AWWA C600, AWWA C105.
 - b. Steel Pipe: AWWA M11, AWWA C206.
 - c. Thermoplastic Pipe: ASTM D 2774.
 - d. ASCE Manual of Practice No. 37.
 - e. Concrete Pressure Pipe: AWWA M9.

G. Polyethylene Encasement:

1. Provide polyethylene encasement for all buried pipe, fittings and valves to prevent contact between the pipe and surrounding bedding material and backfill.
2. Polyethylene may be supplied in tubes or in sheet material.
3. Polyethylene encasement materials and installation shall be in accordance with the AWWA and the pipe manufacturer's

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recommendation. Provide the color blue for potable water lines, as approved by the OWNER.

H. Jointing Pipe:

1. Ductile-Iron Mechanical Joint Pipe:

- a. Wipe clean the socket, plain end and adjacent areas immediately before making joint. Make certain that cut ends are tapered and sharp edges are filed off smooth.
- b. Lubricate the plain ends and gasket with soapy water or an approved pipe lubricant, in accordance with AWWA C 111, just prior to slipping the gasket onto the plain end of the joint assembly.
- c. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end.
- d. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
- e. Push gland toward socket and center it around pipe with the gland lip against the gasket.
- f. Insert bolts and hand tighten nuts.
- g. Make deflection after joint assembly, if required, but prior to tightening bolts. Alternately tighten bolts 180 degrees apart to seat the gasket evenly. The bolt torque shall be as follows:

Pipe Size (inches)	Bolt Size (inches)	Range of Torque (ft-lbs)
3	5/8	45-60
4-24	3/4	75-90
30-36	1	100-120
42-48	1-1/4	120-150

- h. All bolts and nuts shall be heavily coated with two 10-mil minimum coats of coal-tar epoxy coating as manufactured by Tnemec in accordance with Section 09900, or equal.

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- i. Restrained mechanical joints shall be in accordance with Section 15061, Ductile-Iron Pipe.
- 2. Steel Pipe Joints:
 - a. Joints in steel pipe shall be butt welded joints, except that flexible couplings, mechanical couplings, or flanged connections shall be provided at connections to valves, meters and similar equipment.
 - b. Welding shall conform to the requirements of AWWA C206. Pipe 36-inches in diameter and larger shall be welded both inside and outside of the pipe.
 - c. After welding, the joint and the surrounding damaged or uncoated area shall be coated with the same material and to the same thickness as the shop applied coating.
 - d. Where flanged connections or couplings are provided, the flanges, couplings, bolts and nuts shall be coated with two 8-mil coats of high-build epoxy coating as manufactured by Tnemec, or equal.
- 3. Thermoplastic Pipe Joints:
 - a. Solvent Cement Joints:
 - (1) Bevel pipe ends and remove all burrs before making joints. Clean both pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F or above 90 degrees F when exposed to direct sunlight or in wet conditions.
 - (2) Use solvent cement supplied or recommended by the pipe manufacturer.
 - (3) Apply joint primer and solvent cement and assemble joints in strict accordance with the recommendations and instructions of the manufacturer of the joint materials and the pipe manufacturer.
 - (4) Observe safety precautions with the use of joint primers and solvent cements. Allow air to circulate freely through pipelines to permit solvent vapors to

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escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.

4. Copper Tubing Joints:

- a. Assemble copper tubing with soldered joints. Solder shall be 95-5 tin-antimony solder conforming to ASTM B 32.
- b. Ream or file pipe to remove burrs.
- c. Clean and polish contact surfaces of joints.
- d. Apply flux to both male and female ends.
- e. Insert end of tube into full depth of fitting socket.
- f. Heat joint evenly.
- g. Form continuous solder bead around entire circumference of joint.
- h. Runs shall contain unions at connection to equipment and at reasonable distances along the lengths of runs to permit convenient disassembly of piping and removal of equipment.

I. Backfilling:

1. Conform to the applicable requirements of Section 02200, Earthwork.
2. Place backfill as construction progresses. Backfill by hand and use power tampers until pipe is covered by at least one foot of fill.

J. Connections to Valves and Hydrants:

1. Install valves and hydrants as shown.
2. Provide suitable adapters when valves or hydrants and piping have different joint types.
3. Provide thrust restraint at all hydrants and at valves at pipeline terminations.

K. Transitions from One Type of Pipe to Another:

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1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
- L. Closures:
1. Provide all closure pieces shown or required to complete the Work.

3.02 THRUST RESTRAINT

- A. Provide thrust restraint on all pressure piping systems and where otherwise shown and specified. All piping and appurtenances of the Work shall be restrained the complete length including all fittings, valves and appurtenances. Pipe joints shall be restrained as specified in Paragraph 3.2.C. below.
- B. Thrust restraint shall be accomplished by means of restrained pipe joints. Concrete thrust blocks are not permitted except where identified on the contract drawings. Thrust restraints shall be designed for the axial thrust exerted by the test pressure given in the Buried Piping Schedule.
- C. Restrained Pipe Joints:
1. Pipe joints shall be restrained by means suitable to the type of pipe being provided as shown unless otherwise directed by the OWNER or required.
 - a. Concrete cylinder and steel pipe shall be restrained utilizing welded joints. Concrete pipe requiring restraint shall have sufficient longitudinal steel reinforcement provided to handle the thrust forces at a maximum design stress of 12,500 psi. The thrust forces in the longitudinals must be transmitted directly to the steel joint bands using welded connections sufficient to carry the stresses involved. No allowance for the concrete to handle any tensile forces is permitted. Concrete cylinder pipe thrust restraint shall be in accordance with AWWA Manual M-9, Chapter 7.
 - b. Ductile-iron mechanical joints shall be restrained utilizing a proprietary restrained joint system such as American Lok-Ring, Lok-Fast, Lok-Set U.S. Pipe Field Lok Gasket, U.S. Pipe TR Flex System, lugs, and tie rods, or other system approved by OWNER.

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- c. Steel pipe shall have butt-welded joints, flanged joints, or flexible or mechanical harnessed couplings. Tie rods connected to ears welded to the steel pipe shall be provided for restraint at all flexible coupling connectors.
- d. Thermoplastic and copper piping shall generally be installed with soldered, solvent weld, threaded, flanged, or similar type joints. Where push-on type or other non-restrained joints are provided, the CONTRACTOR shall provide tie rods or other suitable joint restraint system for these joints, subject to the approval of OWNER.
- e. Harnessed lengths for buried pipe shall be determined by the pipe manufacturer in accordance with the formula for determination of harnessed lengths.

3.03 WORK AFFECTING EXISTING PIPING

A. Location of Existing Piping:

- 1. Locations of existing piping shown should be considered approximate.
- 2. CONTRACTOR shall determine the true locations of existing piping to which connections are to be made, and locations of other facilities which could be disturbed during earthwork operations, or which may be affected by CONTRACTOR'S Work already installed.
- 3. Conform to applicable requirements of Division 1, General Requirements, pertaining to cutting and patching and connections to existing facilities.

B. Work on Existing Pipelines:

- 1. Cut or tap pipes as shown or required with machines specifically designed for this Work.
- 2. Install temporary plugs to prevent entry of mud, dirt, water and debris.
- 3. Provide all necessary adapters, fittings, pipe and appurtenances required to complete the Work.

3.04 TESTING OF PIPING

A. General:

1. Test all piping, except as otherwise authorized by OWNER.
2. Notify OWNER 48 hours in advance of testing.
3. Provide all testing apparatus, including pumps, hoses, gages, and fittings.
4. Unless otherwise noted, pipelines shall hold specified test pressure for two hours.
5. Repair and retest pipelines that fail to hold specified test pressure or which exceed the allowable leakage rate.
6. Unless otherwise specified, test pressures required are at the lowest elevation of the pipeline section being tested.
7. Conduct all tests in the presence of OWNER.
8. Advise local authorities having jurisdiction if their presence is required during testing.

B. Schedule of Pipeline Tests:

1. Test piping at the test pressure listed in the Buried Piping Schedule.
2. All piping shall be water tested after installation, except as otherwise specified or directed by OWNER.
3. For piping not included in the Schedule, the OWNER will notify CONTRACTOR, in writing, of the test pressure to be used.

C. Pressure Test Procedure:

1. Complete backfill and compaction at least to the pipe centerline before testing, unless otherwise required or approved by OWNER.
2. Fill section to be tested slowly with water and expel all air. Install corporation cocks, if necessary, to remove all air.
3. Test only one section of pipe at a time.

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4. Apply specified test pressure for two hours and observe pressure gage. Check carefully for leaks while test pressure is being maintained.
- D. Leakage Testing:
1. Conduct leakage test for all liquid piping after satisfactory completion of pressure test.
 2. Allow concrete pipe to stand full of water at least 12 hours prior to starting leakage test.
 3. Maintain test pressure constantly for the minimum test period and accurately measure the amount of water which must be added to maintain the test pressure.
 4. Allowable Leakage Rates (in gallons per hour per 1,000 feet per inch diameter):
 - a. DIP Mechanical Joints: 0.075
 - b. Concrete, Pressure: 0.2
 - c. Concrete, Reinforced: 1.0
 - d. Copper, Steel, FRP, and Thermoplastic: None
 5. Leakage Test Procedure:
 - a. Examine exposed pipe, joints, fittings and valves. Repair visible leakage or replace the defective pipe, fitting or valve.
 - b. Refill the line under test to reach the required test pressure.
 - c. Provide a test container filled with a known quantity of water at the start of the test. Attach the test pump suction to the test container.
 - d. Pump water from the test container into the line with the test pump to hold the specified test pressure for the test period. Water remaining in the container shall be measured and the amount used during the test shall be recorded on the test report.

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- e. Perform all repair, replacement, and retesting as directed by the OWNER because of failure to meet testing requirements.
 - f. Leakage shall be less than rate specified above.
- E. Vertical Deflection Test for Thermoplastic Pipe:
 - 1. After completion of backfill and at a time approved by OWNER, CONTRACTOR shall manually pull a pin-type vertical gage mounted on a sled through the pipe. Gage shall be set so that if vertical deflection of pipe exceeds 5 percent, it will stop. CONTRACTOR shall excavate and relay all such piping. Gage shall be as manufactured by Quality Test Products, or equal.

3.05 DISPOSAL OF WATER

- A. CONTRACTOR shall provide suitable means for disposal of test and flushing water so that no damage results to facilities or waterways.
- B. Means of disposal of test and flushing water shall be subject to the approval of OWNER, local governing authorities and regulatory agencies.
- C. CONTRACTOR shall be responsible for any damage caused by his water disposal operations.

3.06 CLEANING AND DISINFECTION

- A. Cleaning:
 - 1. Thoroughly clean all piping and flush prior to placing in service in a manner approved by the OWNER.
 - 2. Piping 24-inches in diameter and larger shall be inspected from inside and all debris, dirt and foreign matter removed.
 - 3. If piping that requires disinfection has not been kept clean during storage or installation, CONTRACTOR shall swab each section individually before installation with a 5 percent hypochlorite solution, to ensure clean piping.
- B. Disinfection:
 - 1. Disinfect all potable water piping.

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2. Disinfection shall conform to the requirements of Section 15492, Disinfection, Plumbing.

3.07 INSTALLATION OF DETECTABLE PIPE LOCATING TAPE

A. Underground Pipe Locating Tape:

1. Detectable pipe locating tape shall be placed above all underground pipelines three inches in diameter or greater. Tape shall be buried 12 inches below finished grade directly above entire pipeline length.

3.08 PIPING SCHEDULE

The following abbreviations are used in the Buried Piping Schedule included at the end of the Section.

A. Material Abbreviations

Cast Iron	CI	Polyvinyl Chloride	PVC
Fiberglass Reinforced Plastic	FRP	Double Containment Chlorinated Polyvinyl Chloride	DCCPVC
Ductile Iron	DI	Prestressed Concrete	
Copper	C	Cylinder Pipe	PCCP
Carbon Steel	CS	Double Containment High Density Polyethylene	HDPE
Reinforced Concrete Pipe	RCP		
Stainless Steel	SST	Double Containment Fiberglass Reinforced Plastic	DCFRP
Polyethylene	PE		

B. Lining/Coating Abbreviations

Cement Mortar Coated	CC	Galvanized	Galv
Cement Mortar Lined	CL	Plastic Lined	PL
Glass Lined	GL	Painted	P
Bituminous Coated	BC	Polyethylene	
Encasement	PE		
Epoxy Lined	EL	Tape Wrap	TW
CLSM Encasement	CLSM		

C. Joint Abbreviations

Bell and Spigot	BS		
Compression flange Adapter Soldered	CFA Sd	Flanged	Flg
Mechanical Joint or Push-on Joint	MJ	Brazed Screwed Fittings	Bz S
Grooved or Shouldered			

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End Couplings	GSEC	Compression	
Sleeve			
Butt Welded	BW	Coupling	CSC
Solvent Welded	SW		

END OF SECTION

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PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install and test all exposed piping, fittings, and specials.

The Work includes, but is not limited to, the following:

- a. All types and sizes of exposed piping, except those specified under other Sections.
- b. Piping embedded in concrete within a structure or foundation will be considered as exposed and included herein.
- c. Supports, restraints, thrust blocks and other anchors.
- d. Work on or affecting existing piping.
- e. Testing.
- f. Cleaning and disinfecting.
- g. Installation of all jointing and gasketing materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, and all other Work required to complete the exposed piping installation.
- h. Incorporation of valves, meters and special items shown or specified into the piping systems as required and as specified in the appropriate Division 15, Mechanical Sections.
- i. Unless otherwise specifically shown, specified, or included under other Sections, all exposed piping Work required, beginning at the outside face of structures or structure foundation and extending into the structure.

B. Coordination:

1. Review installation procedures under other Sections and coordinate with the Work that is related to this Section.

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2. Section 15052, Exposed Piping Installation, specifies the installation of all exposed piping materials specified in Division 15, Mechanical. Coordinate with these Sections.
- C. Related Sections:
1. Section 03300, Cast-In-Place Concrete.
 2. Section 09900, Painting.
 3. Section 15006, Pipe Supports.
 4. Division 15, Mechanical.

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
1. Comply with applicable requirements of NFPA Standard No. 14 for "Standpipe and Hose Systems" used for fire protection.
 2. Comply with requirements of UL, FM and other jurisdictional authorities, where applicable.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. ANSI B 13.1, Code for Pressure Piping.
 2. ANSI B 16.3, Malleable-Iron Threaded Fittings, Classes 150 and 300.
 3. ANSI B 16.4, Cast Iron Threaded Fittings, Classes 125 and 250.
 4. ANSI B 16.5, Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
 5. ANSI B 16.9, Factory-Made Wrought Steel Butt Welding Fittings.
 6. ANSI B 16.11, Forged Steel Fittings, Socket-Welding and Threaded.
 7. ANSI B31.1, Power Piping.
 8. ANSI B31.8, Gas Transmission and Distribution Piping Systems.
 9. ANSI D1.1, Structural Welding Code.
 10. AWWA C 111, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

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11. AWWA C206, Field Welding of Steel Water Pipe Joints.
12. AWWA C600, Installation of Ductile Iron Water Mains and Their Appurtenances.
13. AWWA C606, Grooved and Shouldered Type Joints.
14. AWWA C651, Disinfecting Water Mains.
15. AWWA M11, Steel Water Pipe Design and Installation.
16. AWWA M23, PVC Piping.
17. AWS D10.9, Standard for Qualification of Welding Procedures and Welders for Piping and Tubing.
18. ASME Boiler and Pressure Vessel Code.

1.03 SUBMITTAL

- A. Shop Drawings: Submit for approval the following:
 1. Detailed drawings, in plan and section, and laying schedules.
 2. Details of piping, valves, supports, accessories, specials, joints, harnessing, and connections to existing pipes and structures.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of test report for each test.
- C. Certificates: Submit certificates of compliance with referenced standards.
- D. Record Drawings:
 1. Submit Record Drawings prior to the time of Substantial Completion.

1.04 PRODUCT- DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site to ensure uninterrupted progress of the Work.
- B. Handle all pipe, fittings and accessories carefully with approved handling devices. Do not drop or roll pipe off trucks. Do not otherwise drop, roll or skid piping.
- C. Store pipes and fittings on heavy wood blocking or platforms so they are not in contact with the ground.

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- D. Unload pipe, fittings and specials opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign matter.
- E. Inspect delivered pipe for cracked, gouged, chipped, dented or other damaged material and immediately remove damaged materials from site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Required pipe materials are listed in the Piping Schedule. Refer to applicable Sections for material specifications.
- B. General:
 - 1. Marking Piping:
 - a. Clearly mark each piece of pipe or fitting with a designation conforming to that shown on the Shop Drawings.
 - b. Cast or paint material, type and pressure designation on each piece of pipe or fitting 4-inches in diameter and larger.
 - c. Pipe and fittings smaller than 4-inches in diameter shall be clearly marked by manufacturer as to material, type and rating.
- C. Pipe Identification Markers and Arrows: Refer to Section 09900, Painting.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Install piping as shown, specified and as recommended by the manufacturer.
 - 2. If there is a conflict between manufacturer's recommendations and the Contract Documents, request instructions from OWNER before proceeding.
- B. Manufacturer's Installation Specialist:
 - 1. Provide the services of a competent installation specialist of the pipe manufacturer when pipe installation begins for the following:

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- a. Thermoplastic pipe.
 - 2. Retain installation specialist at the site for a minimum of two days or until competency of the pipe installation crew has been satisfactorily demonstrated.
- C. Piping Installation:
- 1. Install straight runs true to line and elevation.
 - 2. Install vertical pipe truly plumb in all directions.
 - 3. Install piping parallel or perpendicular to building walls. Piping at angles and 45 degree runs across comers will not be accepted unless specifically shown or approved.
 - 4. Install small diameter piping generally as shown when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, and other obstructions.
 - 5. Install piping so as to leave all corridors, walkways, work areas, and like spaces unobstructed unless otherwise approved, provide a minimum headroom clearance under all piping of 7- feet 6-inches.
 - 6. Protect and keep clean water pipe interiors, fittings and valves.
 - 7. Provide temporary caps or plugs over all pipe openings at the end of each day's work, and when otherwise required or directed by OWNER.
 - 8. Cutting: Cut pipe from measurements taken at site, not from Drawings.
 - 9. Install dielectric unions or dielectric flange kits with sleeves and washers wherever dissimilar metals are connected, except for bronze or brass valves in ferrous piping.
 - 10. Provide a union downstream of each valve with screwed connections.
 - 11. Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.
 - 12. Additional requirements for thermoplastic piping:
 - a. Support all valves independently of the piping system.
 - b. Utilize wide band supports, as recommended by manufacturer and approved by OWNER, to minimize localized stresses.

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- c. Provide piping passing through walls with a sleeve of wearing material to prevent abrasion damage to piping.
- d. When anchors are required at locations other than equipment or tanks, they shall be placed at elbows, valve locations and at bends in pipeline.
- e. Spacing of supports shall be in accordance with the manufacturer's published recommendations at the maximum design operating temperature of the pipe and requirements of Section 15220, Pipe Hangers and Supports.
- f. Use "U" clamps with wide band circumferential contact.
- g. Use guides on long runs of piping to maintain alignment and reduce chance of elastic failure of pipe. Space guides as recommended by manufacturer or 18 to 24-inches on center and 12 to 18-inches from expansion joints..
- h. Expansion compensation shall comply with the requirements of Section 15006, Pipe Supports.
- i. Do not install pipe when ambient temperature is less than 60 degrees F.

D. Joints:

1. General:

- a. Make joints in accordance with the pipe manufacturer's recommendations and the requirements below.
- b. Cut piping accurately and squarely and install without forcing or springing.
- c. Ream out all pipes and tubing to full inside diameter after cutting. Remove all sharp edges on end cuts.
- d. Remove all cuttings and foreign matter from the inside of pipe and tubing before installation. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.

2. Flanged Joints:

- a. Assemble flanged joints using 1/8-inch ring-type gaskets for raised face flanges. Use full face gaskets for flat face flanges, unless otherwise approved by OWNER. Gaskets shall be suitable for the

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service intended in accordance with the manufacturer's ratings and instructions. Gaskets shall be properly centered.

- b. Bolts shall be tightened in a sequence ensuring equal distribution of bolt loads.
- c. The length of bolts shall be uniform, and they shall not project beyond the nut more than 1/4-inch or fall short of the nut when fully taken up. The ends of bolts shall be machine cut so as to be neatly rounded. No washers shall be used.
- d. Bolt threads and gasket faces for flanged joints shall be lubricated prior to assembly.
- e. Alternately tighten bolts 180 degrees apart to compress the gasket evenly.

3. Steel Pipe Joints:

- a. Joints in steel pipe shall be butt welded, flanged, or threaded joints, except that flexible couplings, mechanical couplings, or Ranged connections shall be provided where shown on the Drawings.
- b. Welding shall conform to the requirements of AWWA C206. Pipe 36-inches in diameter and larger shall be welded both inside and outside of the pipe.
- c. After welding, the joint and the surrounding damaged or uncoated area shall be coated with the same material and to the same thickness as the shop applied coating.
- d. For threaded joints, use standard, right hand tapered full depth threads on steel piping and apply an approved joint compound, to the male threads only, before installation. Remove all cuttings and foreign matter from the inside of the pipe. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.

4. Thermoplastic Pipe Joints:

a. Solvent Cement Joints:

- (1) Bevel pipe ends and remove all burrs before making joints. Clean both pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F or above 90 degrees F when exposed to direct sunlight nor in wet conditions.

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- (2) Use solvent cement supplied or recommended by the pipe manufacturer.
- (3) Apply joint primer and solvent cement and assemble joints in strict accordance with the recommendations and instructions of the manufacturer of the joint materials and the pipe manufacturer.
- (4) Observe safety precautions with the use of joint primers and solvent cements. Allow air to circulate freely through pipelines to permit solvent vapors to escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.

5. Copper Tubing Joints:

- a. Assemble copper tubing with soldered joints. Solder shall be 95-5 tin-antimony conforming to ASTM B32.
- b. Ream or file pipe to remove burrs.
- c. Clean and polish contact surfaces of joints.
- d. Apply flux to both male and female ends.
- e. Insert end of tube into full depth of fitting socket.
- f. Heat joint evenly.
- g. Form continuous solder bead around entire circumference of joint. Runs shall contain unions at connections to equipment and at reasonable distances along the lengths of runs to permit convenient disassembly of piping and removal of equipment.

E. Installing Valves and Accessories:

- 1. Provide supports for large valves, flow meters and other heavy items as shown or required.
- 2. Install floor stands as shown and as recommended by the manufacturer.
- 3. Provide lateral restraints for extension bonnets and extension stems as shown and as recommended by the manufacturer.
- 4. Provide steel sleeves where operating stems pass through floor. Extend sleeves 2 inches above floor.

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5. Position valve operators as shown. When the position is not shown, install the valve so that it can be conveniently operated and as approved by OWNER. Avoid placing operators at angles to the floors or walls.
 6. Position flow measuring devices in pipe lines so that they have the amount of straight upstream and downstream runs as recommended by the manufacturer, unless specific location dimensions are shown. Position swing check valves so that they do not conflict with the discs of butterfly valves.
- F. Unions:
1. Install dielectric unions wherever dissimilar metals are connected, except for bronze or brass valves, in ferrous piping.
 2. Provide a union downstream of each valve with screwed connections.
 3. Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.
- G. Eccentric Reducers: Use eccentric reducers where shown and where air or water pockets would otherwise occur in mains because of a reduction in pipe size.
- H. Transitions from One Type of Pipe to Another:
1. Do not take pipelines out of service unless specifically named below, or approved by OWNER.
 2. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
- I. Taking Existing Pipelines Out of Service:
1. Notify OWNER at least forty-eight (48) hours prior to taking pipeline out of service.
- J. Work on Existing Pipelines:
1. Cut or tap pipes as shown or required with machines specifically designed for this work.
 2. Install temporary plugs to keep out all dirt, water and debris.
 3. Provide all necessary adapters, fittings, pipe and appurtenances required.

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3.02 THRUST RESTRAINT

- A. Provide thrust restraint on all pressure piping systems and where otherwise shown or specified.
- B. Thrust restraint may be accomplished by means of restrained pipe joints. Thrust restraint shall be designed for the axial thrust exerted by the test pressure specified in the Exposed Piping Schedule.
- C. Restrained Pipe Joints:
 - 1. Pipe joints shall be restrained by means suitable for the type of pipe being installed. Provide restraint as shown and as directed by the OWNER.
 - a. Restrain concrete pipe joints utilizing welded joints.
 - b. Restrain ductile-iron mechanical joint pipe utilizing tie rods and clamps or proprietary restrained joint system such as American Lok-Fast, Fast-Tite, U.S. Trim-Tite or equal.
 - c. Restrain ductile iron pipe connected by flexible couplings or flanged coupling adapters by harnessing across the coupling or adapter using tie rods or extended bolts connecting between flanges as detailed on drawings.
 - d. Steel pipe shall have butt-welded joints, flanged joints, or flexible or mechanical coupling connectors. Provide tie rods connected to ears welded to the steel pipe for restraint at all flexible coupling connectors.

3.03 PAINTING

- A. Field painting shall conform to the requirements of Section 09900, Painting.

3.04 TESTING OF PIPING

- A. General:
 - 1. Test all piping as specified below, unless otherwise authorized by OWNER.
 - 2. Notify OWNER forty-eight (48) hours in advance of testing.
 - 3. Provide all testing apparatus including pumps, hoses, gages, and fittings.
 - 4. Pipelines shall hold the specified test pressure for two (2) hours.

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5. Repair and retest pipelines which fail to hold specified test pressures or which exceed the allowable leakage rate.
 6. Test pressures required are at the lowest elevation of the pipeline section being tested, unless otherwise specified.
 7. Follow special test procedures below for gaseous chemical and liquid chlorine lines.
 8. Conduct all tests in the presence of the OWNER. Repeat tests in the presence of local authorities having jurisdiction, if required.
- B. Schedule of Pipeline Tests:
1. Test piping at the test pressure listed in the Exposed Piping Schedule.
 2. For piping not included in the Schedule, the OWNER will notify CONTRACTOR in writing of the test pressure to be utilized.
- C. Pressure Test Procedure:
1. Ensure that all supports and restraint protection are securely in place.
 2. Fill section to be tested slowly with water and expel all air. Install cocks, as directed by the Owner, to ensure removal of air.
 3. Test only one section of pipe at a time.
 4. Apply specified test pressure required for two (2) hours and observe pressure gage. Check carefully for leaks while test pressure is being maintained.

3.05 TESTING OF DRAINAGE PIPING

- A. General:
1. Test all drainage piping installed under this Section.
 2. Provide all testing apparatus required.
 3. Notify OWNER forty-eight (48) hours in advance of test.
 4. Conduct all tests in presence of OWNER.
- B. Procedures:

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1. Perform test on entire system or on individual sections as approved by OWNER.
2. Completely seal all openings except highest opening in system or section to be tested.
3. Fill with water completely and test with at least ten (10) feet of water above highest point.
4. Allow water to stand in system for at least fifteen (15) minutes. Inspect for leaks and repair all leaks found. Retest repaired sections.

3.06 CLEANING AND DISINFECTION

A. Cleaning:

1. Thoroughly clean all piping and flush prior to placing in service in a manner approved by OWNER.
2. Piping 24-inches in diameter and larger shall be inspected from inside and all debris, dirt and foreign matter removed.
3. If piping that requires disinfection has not been kept clean during storage or installation, CONTRACTOR shall swab each section individually with a five percent hypochlorite solution, to ensure clean piping.

B. Disinfection:

1. Disinfect all potable water piping. Disinfection shall conform to the requirements of Section 15492, Disinfection, Plumbing.

3.07 IDENTIFICATION OF PIPING

- A. Piping markers shall conform to the requirements of Section 09900, Painting.

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END OF SECTION

TECHNICAL SPECIFICATIONS
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15103: GATE VALVE

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all materials, equipment and incidentals required and install, complete for operation, all gate valves, appurtenances and miscellaneous items as shown on the Drawings and/or specified herein.

1.02 QUALIFICATIONS/RESPONSIBILITIES

The equipment specified under this Section shall be furnished by manufacturers who are fully experienced, reputable, qualified and regularly engaged in the manufacture of the equipment to be furnished, and shall have a minimum of five years experience in the manufacture of specified equipment.

1.03 SUBMITTALS, OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Submit to the Engineer within seven calendar days after the Notice to Proceed, a list of materials to be furnished and the date of delivery of materials to the job site.
- B. Submit to the Engineer for review as provided in Section 01300, complete shop drawings and pertinent information relating to the installation of the valve. The submitted information shall include, but not limited to:
 - 1. Literature and drawings, describing the valve in sufficient detail, including catalog cuts, parts list, dimension of materials, and details of construction and installation.

1.04 QUALITY ASSURANCE

- A. The manufacturers shall be required to furnish the Engineer with a certified statement that all the requirements of the Specifications referred to herein have been complied with.
- B. Inspection of the units shall be made by the Engineer after delivery. The equipment shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though submittal data may have been accepted previously.

PART 2 - PRODUCTS

2.01 GATE VALVE

- A. Gate valves shall be in accordance with AWWA C509 "Standard Specification for Resilient-

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seated Gate Valves" and shall also be UL listed and FM approved. Gate valve shall be NRS and rated for 250 psi and maximum design flow of 30 cfs. The valves shall be NRS for all buried applications and OS&Y for all above ground applications. For buried service valves, provide stem extension as shown in the drawings.

- B. The valve shall have the name of the maker, the nominal size, date of manufacture, and its serial number, and the working pressure for which they are designed, permanently marked upon some appropriate part of the body. The valve shall have an arrow cast on the operating nut or handwheel showing opening direction. The valve shall open counterclockwise.
- C. The gate shall be fully encapsulated with EPDM -P rubber. The disc shall have a cast ASTM B-62 alloy C83600 bronze stem nut to prevent twisting or angling of the stem. Designs with loose stem nuts are unacceptable.
- D. Flange ends shall be drilled per ANSI B161.1.
- E. The valve stem shall be made of bronze ASTM B-132 alloy C67600 bar stock material. The stem shall have at least one "anti-friction" thrust washer above the stem collar and one below to reduce turning torque. The structural design of the valve shall be such that if excessive torque is applied to the stem in the closing direction with the disc seated, failure of the pressure retaining parts shall not occur. Stem failure under such conditions shall occur externally at such a point as to enable the operation of the valve with a pipe wrench or other readily available tool. The stem material shall provide 70,000 psi tensile strength with 15% elongation and a yield strength of 30,000 psi. Valves with cast stems are unacceptable
- F. The valve body, bonnet, stuffing box, and disc shall be composed of ASTM A-126 Class B grey iron. The body and bonnet size shall also adhere to the minimum wall thickness as set forth in Table 2, section 4.3.1 of AWWA C509.
- G. The valves shall have bolts and nuts for the stuffing box and bonnet with one of the following compositions:
 - 1. Steel, ASTM A-307, Grade B zinc plated.
 - 2. Type 304 stainless steel.
 - 3. Type 316 stainless steel
- H. The NRS valves shall be provided with a 2" square operating nut and OS&Y valves shall be provided with a handwheel. The bolt that attaches the operating nut to the stem shall be recessed into the operating nut so as not to interfere with operation.
- I. Valve lining and coating shall be fusion epoxy confirming to N.S.F. 61 Standard for contact

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with potable water. Minimum lining thickness shall be min. 10 mils.

- J. The NRS valves shall have a stuffing box that is o-ring sealed. Two o-rings shall be placed above and one o-ring below the stem thrust collar. The thrust collar shall be factory lubricated. The thrust collar and its lubrication shall be isolated by the o-rings from the waterway and from outside contamination, providing permanent lubrication for long term ease of operation. Valves without a stuffing box are unacceptable. Valves without at least three stem o-rings are also unacceptable.
- K. The valve body and bonnet shall be sealed by a full bolt pattern and gasket. The number of bolts and nuts required are list after the nominal size of the pipe: 2" (qty 4), 2-1/2" (qty 6), 3" (qty 6), 4" (qty 8), 6" (qty 8), 8" (qty 10), 10" (qty 12), and 12" (qty 12). Valves that utilize o-rings as the sealing method between the body and bonnet are unacceptable.
- J. Gate valve shall be the 2360 Series as manufactured by Mueller, or approved equal.

PART 3 - EXECUTION

3.01 SHOP TESTING

All parts of the valve shall be assembled to ensure that mating parts fit properly and operate correctly. Unless otherwise directed, all tests shall be made in the presence of the Engineer.

3.02 SHOP INSPECTION AND TESTING

Prior to shipment, all valves and actuators shall be subjected to hydrostatic, leakage and performance tests as specified in AWWA Standards C509 (Section 5.1). Certification of tests and copies of the test reports shall be furnished.

3.03 PROTECTIVE COATING AND LINING

The coatings and linings shall conform to AWWA C550. The coating shall be applied in strict accordance with manufacturer's direction. The coating and lining shall be free of pin holes or holidays. Appropriate "return" shall be incorporate at all juncture lines of coated and uncoated surface such as valve bore to valve flange to prevent lifting of the coating. NOTE Drawings submitted for design approval must describe these "return" and the surfaces to be coated.

3.04 TESTING

Prior to testing the valves, manufacturer's representative shall verify proper installation. The

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Contractor shall test the valves under the conditions outlined in Sections 2.01 and 2.02. The Contractor shall test both manual and motorized operation, and local and remote operation.

END OF SECTION

TECHNICAL SPECIFICATIONS
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15200: VALVES GENERAL

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall provide all valves, actuators, and appurtenances, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section shall apply to all valves and valve actuators except where otherwise indicated. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls indicated in other Sections of the Specifications.
- C. Where a valve is to be supported by means other than the piping to which it is attached, the CONTRACTOR shall obtain from the valve manufacturer a design for support and foundation that satisfies the criteria in Section 15006 – Pipe Supports. The design, including drawings and calculations sealed by an engineer, shall be submitted with the Shop Drawings. When the design is approved, the support shall be provided.
- D. **Unit Responsibility:** A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing of each valve; however, the CONTRACTOR shall be responsible to the OWNER for compliance with the requirements of each valve section. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.
- E. **Single Manufacturer:** Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.02 CONTRACTOR SUBMITTALS

- A. **General:** Submittals shall be furnished in accordance with Section 01300 – Contractor Submittals.
- B. **Shop Drawings:** Shop Drawings shall contain the following information:
 - 1. Valve name, size, Cv factor, pressure rating, identification number (if any), and specification section number.
 - 2. Complete information on valve actuator, including size, manufacturer, model number, limit switches, and mounting.
 - 3. Cavitation limits for all control valves.
 - 4. Assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, handwheels, position indicators, limit switches, integral control systems, needle valves, and control systems.

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- 5. Data in accordance with Section 16460 - Electric Motors for all electric motor-actuated valves.
 - 6. Complete wiring diagrams and control system schematics.
 - 7. Valve Labeling: A schedule of valves to be furnished with stainless steel tags, indicating in each case the valve location and the proposed wording for the label.
- C. **Technical Manual:** The Technical Manual shall contain the required information for each valve.
- D. **Spare Parts List:** A Spare Parts List shall contain the required information for each valve assembly, where indicated.
- E. **Factory Test Data:** Where indicated, signed, dated, and certified factory test data for each valve requiring certification shall be submitted before shipment of the valve. The data shall also include certification of quality and test results for factory-applied coatings.

PART 2 PRODUCTS

2.01 PRODUCTS

- A. **General:** Valves and gates shall be new and of current manufacture. Shut-off valves 6-inches and larger shall have actuators with position indicators. Buried valves shall be provided with valve boxes and covers containing position indicators and valve extensions. Manual shut-off valves mounted higher than 7-feet above working level shall be provided with chain actuators.
- B. **Valve Actuators:** Unless otherwise indicated, valve actuators shall be in accordance with Section 15201 - Valve and Gate Actuators.
- C. **Protective Coating:** The exterior surfaces of all valves and the wet interior surfaces of ferrous valves of sizes 4-inches and larger shall be coated in accordance with Section 09800 - Protective Coating. The valve manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications. Flange faces of valves shall not be epoxy coated.
- D. **Valve Labeling:** Except when such requirement is waived by the ENGINEER in writing, a label shall be provided on all shut-off valves and control valves except for hose bibs and chlorine cylinder valves. The label shall be of 1/16-inch plastic or stainless steel, minimum 2-inches by 4-inches in size, as indicated in Section 15005 - Piping Identification, and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER.

TECHNICAL SPECIFICATIONS
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15200: VALVES GENERAL

- E. **Valve Testing:** As a minimum, unless otherwise indicated or recommended by the reference Standards, valves 3-inches in diameter and smaller shall be tested in accordance with manufacturer's standard and 4-inches in diameter and larger shall be factory tested as follows:
1. **Hydrostatic Testing:** Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valves rating pressures shall be at 100 degrees F and plastic valves shall be 73 degrees, or at higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.
 2. **Seat Testing:** Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves and drop- tight for resilient seated valves.
 3. **Performance Testing:** Valves shall be shop operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.
- F. **Certification:** Prior to shipment, the CONTRACTOR shall submit for valves over 12-inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.
- G. **Valve Marking:** Valve bodies shall be permanently marked in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

2.02 MATERIALS

- A. **General:** Materials shall be suitable for the intended application. Materials in contact with potable water shall be listed as compliant with NSF Standard 61. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:
1. **Cast Iron:** Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

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2. **Ductile Iron:** ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 – Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
3. **Steel:** ASTM A 216 - Steel Castings, Carbon Suitable for Fusion Welding for High- Temperature Service, or to ASTM A 515 - Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service.
4. **Bronze:** ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.
5. **Stainless Steel:** Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 316 stainless steel.
6. **PVC:** Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454.
7. **CPVC:** Chlorinated Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447.
8. **NSF Standard 14:** Materials shall be listed for use in contact with potable water.

2.03 VALVE CONSTRUCTION

- A. **Bodies:** Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bodies shall be done by certified welders and shall be ground smooth. Valve ends shall be as indicated, and be rated for the maximum temperature and pressure to which the valve will be subjected.
- B. **Valve End Connections:** Unless otherwise indicated, valves 2-1/2 inches diameter and smaller may be provided with threaded end connections. Valves 3-inches and larger shall have flanged end connections.
- C. **Bonnets:** Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, temperature, and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes.
- D. **Stems:** Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, Chevron V-type packing, or other suitable seal.

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- E. **Stem Guides:** Stem guides shall be provided, spaced 10-feet on centers unless the manufacturer can demonstrate by calculation that a different spacing is acceptable. Submerged stem guides shall be 304 stainless steel.
- F. **Internal Parts:** Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.
- G. **Nuts and Bolts:** Nuts and bolts on valve flanges and supports shall be in accordance with Section 05500 - Miscellaneous Metalwork.

2.04 VALVE ACCESSORIES

Valves shall be furnished complete with the accessories required to provide a functional system.

2.05 SPARE PARTS

The CONTRACTOR shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the OWNER, after expiration of the correction of defects period.

2.06 MANUFACTURERS

Manufacturer's Qualifications: Valve manufacturers shall have a successful record of not less than 5 years in the manufacture of the valves indicated and shall be approved by the owner for the appropriate service.

PART 3 EXECUTION

3.01 VALVE INSTALLATION

- A. **General:** Valves, actuating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as indicated. Gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.
- B. **Access:** Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, or other equipment.
- C. **Valve Accessories:** Where combinations of valves, sensors, switches, and controls are indicated, the CONTRACTOR shall properly assemble and install such items so that

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systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop Drawing submittals.

END OF SECTION

TECHNICAL SPECIFICATIONS
DIVISION 15: MECHANICAL
15202: BUTTERFLY VALVES

PART 1 GENERAL

1.01 REQUIREMENT

The CONTRACTOR shall provide butterfly valves and appurtenances, complete and operable, in accordance with the Contract Documents.

1.02 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300.
- B. Shop Drawings
 - 1. Complete Shop Drawings of butterfly valves and actuators.
 - 2. Drawings showing valve port diameter complete with dimensions, part numbers, and materials of construction.
 - 3. Certified statement of proof-of-design tests from the valve manufacturer. Valve manufacturer shall state that the valves proposed for this project will be manufactured with identical basic type of seat design and materials of construction to the prototype evaluated under the proof of design testing.
 - 4. Manufacturer's certification that the valve complies with applicable provisions of AWWA C504 – Rubber-Seated Butterfly Valves.

1.03 QUALITY ASSURANCE

Valves shall be subjected to performance, leakage, and hydrostatic tests in accordance with procedures and acceptance criteria established by AWWA C504.

PART 2 PRODUCTS

2.01 RUBBER SEATED BUTTERFLY VALVES (AWWA)

- A. **General:** Butterfly valves for steady-state water working pressures and steady-state differential pressure up to 250 psi and for fresh water service having a pH range from 6 to 10 and temperature range from 33 to 125 degrees F shall conform to AWWA C504 and be as indicated. If the operating conditions such as flow, velocity, and differential pressures are not indicated, the valve body and shaft shall be sized for the pressure class rating of the valve.
- B. **Valves** shall be of the body type, pressure class, end joint, and actuator indicated.

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- C. **Construction:** Unless otherwise indicated, materials of construction shall be in accordance with AWWA C504, suitable for the service. Seats shall be positively clamped or bonded into the disc or body of the valve, but cartridge-type seats that rely on a high coefficient of friction for retention shall not be acceptable. Seat material shall be guaranteed to last for at least 75 percent of the number of cycles in the AWWA C504 proof-of-design test without premature damage.

Description	Material Standards
Valve Bodies	Ductile Iron ASTM A536
End Flanges	Ductile Iron ASTM A536
Valve Shafts	Stainless Steel Type 316
Valve Discs	Ductile Iron
Rubber Seats	New Natural or Synthetic Rubber
Seat Mating Surfaces	Stainless Steel Type 316
Clamps and Retaining Rings	Type 316 Retaining Rings and Cap Screws.
Valve Bearings	Self-Lubricating Materials per AWWA C504
Shaft Seals	Resilient Non-Metallic Materials Suitable for Service
Painting and Coating	Refer to Section 15110 – General Valves

- D. **Manual Actuators:** Unless otherwise indicated, manually-actuated butterfly valves shall be equipped with a handwheel and 2-inch square actuating nut and position indicator. Screw-type (traveling nut) actuators will not be permitted for valves 30-inches in diameter and larger.
- E. **Worm Gear Actuators:** Valves 30-inches and larger, as well as submerged and buried valves, shall be equipped with worm-gear actuators, lubricated and sealed to prevent entry of dirt or water into the housing.
- F. Manufacturers, or Equal
1. DeZURIK Water Controls, Corporation
 2. Kennedy Valve
 3. M & H Valve Company

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- 4. Mueller Company
- 5. Henry Pratt Company
- 6. Rodney Hunt Company (24-inches and larger)

PART 3 EXECUTION

3.01 INSTALLATION

- A. Exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator. Installation shall be in accordance with Section 15200.
- B. Buried butterfly valves shall be installed with risers, valve boxes, and H-20 covers to operate the manual actuator nut.

3.02 SERVICES OF MANUFACTURERS

- A. Inspection, Startup, and Filed Adjustment: The service representative of the valve Manufacturer shall be present at the site for 0.5 work days, to assist the CONTRACTOR in the installation and adjustment of the valve(s).
- B. Instruction of OWNER's Personnel: The training representative of the valve Manufacturer shall be present at the site for 0.5 work days to instruct the personnel in the operation, adjustment, and maintenance of the valves(s).

END OF SECTION

TECHNICAL SPECIFICATIONS
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TECHNICAL SPECIFICATIONS
DIVISION 15: MECHANICAL
15218: PRESSURE RELIEF VALVES

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall provide pressure relief valves and appurtenances, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 15200 – Valves, General, apply to this Section.

1.02 CONTRACTOR SUBMITTALS

The CONTRACTOR shall furnish submittals in accordance with Section 15200.

PART 2 PRODUCTS

2.01 TEMPERATURE AND PRESSURE RELIEF VALVES

- A. **Valve Construction:** Temperature and pressure relief valves for cold and hot water, steam, and air service, unless otherwise indicated, shall have a minimum pressure rating of 250 psi, bronze, steel, or stainless steel bodies, adjustable spring action, screwed or flanged connections, and trim to suit individual applications. Settings shall be adjusted for each specific condition.
- B. Manufacturers, or Equal
 - 1. A.W. Cash Valve Mfg. Corp.
 - 2. Consolidated (Dresser Industries Valve Division)
 - 3. Fisher Controls Company
 - 4. Kunkle Valve Division
 - 5. Masoneilan (Dresser Industries Valve and Controls Division)
 - 6. Watts Regulator Company
 - 7. Wilkins Regulator (A Division of Zurn Industries)

2.02 PLASTIC PRESSURE RELIEF VALVES, SIZES 1/2 THROUGH 1-1/2 INCHES

- A. Plastic pressure relief valves shall be suitable for the fluid service and shall be designed for a maximum of 150 psi water working pressure. For chemicals and all corrosive fluids, solenoid valves shall be of PVC, CPVC, polypropylene (PP), polyvinylidene fluoride (PVDF), or teflon, as recommended by the manufacturer for the specific application.

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B. **Characteristics:** Pressure relief valves shall open when the inlet pressure exceeds a set maximum level. It shall maintain that pressure and gradually close as the inlet pressure drops below the maximum pressure. Valves shall be spring or hydraulically operated, direct acting, adjustable, diaphragm or piston type globe or angle valve, as indicated.

C. Manufacturers, or Equal

1. Corrosive fluids

a. Plast-O-Matic Valves, Inc.

2.03 PRESSURE RELIEF / SURGE ANTICIPATOR CONTROL VALVE

A. **FUNCTION:** The Pressure Relief / Surge Anticipator Control Valve shall control high pressures and power failure surges by bypassing system pressure that exceeds the high pressure control setting and also by opening a preset amount when sensed pressure decreases below a preset minimum in anticipation of a surge.

B. Materials:

Component	Material
Body & Cover	Ductile Iron-ASTM A536
Main Valve Trim	Stainless Steel
Disc Retainer	Cast Iron
Diaphragm Washer Seat	Stainless Steel
Stem, Nut and Spring	Stainless Steel
Seal Disc	Buna-N Rubber
Diaphragm	Nylon Reinforced Buna-N Rubber
Internal Trim Parts	Stainless Steel
Connection	Flange
Pressure Rating	Class 150 lb. (250psi Max.)
Coating & Lining	NSF 61 Approved
Flow Limiter Body	Brass
Flow Limiter Adjustment Tube	Brass
Flow Limiter O-Rings	Buna-N Rubber
Flow Limiter Stem	Stainless Steel
Pilot Body & Cover	Stainless Steel
Pilot Trim	Brass & Stainless Steel
Pilot rubber	Buna-N Rubber
Pilot Connections	FNPT
Pressure rating	400 psi Max
Temperature Range	Water to 180°F Max
Control Tubing	Stainless Steel
Control Fittings	Stainless Steel

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C. Manufacture

1. Main Valve: The main valve shall be hydraulically operated, single diaphragm actuated, globe or angle pattern. The valve shall consist of three major components; the body with seat installed the cover with bearing installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from line pressure. Packing glands, stuffing boxes and/or rolling diaphragm technology will not be permitted and there shall be no pistons operating the main valve or pilot controls. No fabrication or welding shall be used in the manufacturing process. Y-pattern valves shall not be permitted. Main valve shall comply with NSF/ANSI Standard 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.
2. Main Valve End Connections: End Connections for control valve shall be flanged per ASME/ANSI B16.42, Class 150.
3. Main Valve Body:
 - a. No separate chamber(s) below the diaphragm shall be allowed between the main valve cover and body. No fabrication or welding shall be used in the manufacturing process.
 - b. The valve shall contain a resilient, synthetic rubber disc with a rectangular cross-section contained on three and one half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the discs firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hours-glass shaped disc retainers shall be permitted and no V-type or slotted-type disc guides shall be used.
 - c. The diaphragm assembly containing a non-magnetic 303 stainless steel stem; of sufficient diameter to withstand high hydraulic pressures and shall be fully guided at both ends by a bearing in the main valve cover and an integral bearing in the valve seat. The valve seat shall be a solid, one-piece design and shall have a minimum five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm

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assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from the line pressure. No bolts or cap screws shall be permitted for use in the construction of the diaphragm assembly.

- d. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm's center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 X per layer of nylon fabric and shall be cycled tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully opened or fully closed position. Bellofram type rolling diaphragms shall not be permitted.
- e. The main valve seat and stem bearing in the valve cover shall be removable. The cover bearing and seat in the 6" and smaller size valve shall be threaded into the cover and body. The valve seat in the 8" and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No "pinned" covers to the valve body shall be permitted. Cover bearing, disc guide and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. The valve shall be designed such that both the cover assembly and internal diaphragm assembly can be disassembled and lifted vertically straight up from the top of a narrow opening/vault. Y-pattern valves shall not be permitted. The seat shall be of the solid one piece design. Two piece seats or seat inserts shall not be permitted. Packing glands and/or stuffing boxes shall not be permitted.

4. Pilot Control System

- a. High Pressure Surge Relief Pilot: The pressure relief/sustaining pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds the adjustable spring setting. The pressure relief pilot control is normally held closed by the force of the compression in the spring above the diaphragm and it opens

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when the pressure acting on the underside of the diaphragm exceeds the spring setting. Pressure relief pilot control sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked. Pilot shall comply with NSF/ANSI 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.

- b. Low Pressure Pilot: The pressure reducing pilot control shall be a direct-acting, adjustable, spring-loaded, normally open, diaphragm valve designed to open when the sensed pressure falls below the control setting and close when pressures are normal. The pilot control is held open by the force of the compression on the spring above the diaphragm and it closes when the delivery pressure acting on the underside of the diaphragm exceeds the spring setting. The pilot control system shall include a fixed orifice. The pilot control shall have a second downstream sensing port which can be utilized to install a pressure gauge. Pilot shall comply with NSF/ANSI 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.
- c. Flow Limiter: The pilot system shall contain an adjustable flow limiter to limit main valve travel during low pressure opening without affecting high pressure relief valve travel. This unique hydraulically operated flow limiter has two calibrated orifices, each positioned proportional to valve position, to vary main valve cover control chamber operating pressure. The hydraulically operated flow limiter regulates flow through main valve pilot systems based on valve position to prevent main valve exceeding predetermined flow. A manually adjustable orifice provides reference valve position. Valve position is linked to an integral sensor orifice. When valve position is below reference set-point of the hydraulically operated flow limiter, it allows unhindered pilot system flow. As valve position rises and approaches the reference control setting, the hydraulic flow limiter limits pilot system outward flow to build pressure in the main valve control chamber. Pressure continues to build until flow equals and hydraulically locks the valve at the flow limiters valve position set-point. Mechanical flow limiters shall not be permitted.
- d. The pilot controls shall be hard piped or bracket mounted to the main valve.
- e. The pilot control system shall include a strainer, an adjustable closing speed and all required control accessories, equipment, control tubing and fittings. The pilot system shall include isolation ball valves on sizes as standard equipment. A full range of spring settings shall be available in ranges of 0 to 400 psi. Pilots to be manufactured by control valve manufacturer.

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- f. The Pressure Relief / Surge Anticipating Control Valve shall include a visual position indicator assembly on all sizes, as standard equipment.
- 5. Factory Assembly:
 - a. Each control valve shall be factory assembled.
 - b. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008.
 - c. For all control valves, the factory assembly shall include the complete main valve, pilot valve(s), and all associated accessories and control equipment.
 - d. During factory assembly the control valve manufacture shall make all necessary adjustments and correct any defects.
- 6. Nameplates:
 - a. Each Control Valve and associated pilot(s) shall be provided with an identifying nameplate.
 - b. Nameplates, depending on type and size of control valve, shall be mounted in the most practical position possible, typically on the inlet side of the valve body.
 - c. Nameplates shall be brass and a minimum of 3/32" thick, 3/4" high and 2-3/4" long.
 - d. Pertinent control valve data shall be etched or stamped into the nameplate. Data shall include control valve Catalog number, function, size, material, pressure rating, end-connection details, type of pilot controls used and control adjustment range.
- 7. Factory Testing:
 - a. Each control valve shall be factory tested.
 - b. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008
 - c. Tests shall conform to approved test procedures.
 - d. The standard factory tests shall include a valve body and cover leakage test, seat leakage test and a stroke test. Control valves and pilot valves, in the partially open position, with both ends closed off with blind flanges

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(valves) and pipe plugs (pilots), shall be subject to an air test. The applied air pressure shall be 90 psi minimum. All air pressure tests shall be applied for a minimum of 15 minutes. No visible leakage is permitted through the valve seat, the pressure boundary walls of the valve body, valve cover, pilot body, pilot cover or the body-cover joint.

- e. Control valve manufacturer shall, upon request, offer additional testing, such as high pressure hydrostatic testing, positive material inspection testing, ferrite testing, liquid penetration inspection testing, magnetic particle examination testing and radiographic examination testing.

D. PRODUCT DATA

1. The following information shall be provided:
 - a. Control Valve manufacturer's technical product data.
 - b. Control Valve manufacturer's Installation, Operation and Maintenance manual (IOM).
2. Provide specific information on all optional features specified above and confirm that these items are provided.
3. The valve manufacturer shall be able to supply a complete line of equipment from 2-1/2" through 16" sizes and a complete selection of complementary accessories and equipment.
4. The control valve manufacture shall provide a computerized cavitation analysis report which shows flow rate, differential pressure, and percentage of valve opening. Cv factor, system velocity, and if there will be cavitation damage.

PART 3 EXECUTION

3.01 INSTALLATION

Valves shall be installed in accordance with provisions of Section 15200.

3.02 SERVICES OF MANUFACTURER

- A. **Inspection, Startup, and Field Adjustment:** The service representative of the valve manufacturer shall be present at the Site for 1/2 work days, to assist the CONTRACTOR in the installation and adjustment of the valve(s).

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- B. **Instruction of OWNERS Personnel:** The training representative of the valve manufacturer shall be present at the Site for 1/2 work days to instruct the personnel in the operation, adjustment, and maintenance of the valve(s).
- C. For the purpose of this paragraph, a work day is defined as an eight hour period, excluding travel time.

END OF SECTION

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PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Contractor shall provide (furnish and install), complete and ready for use, the electrical systems as specified herein and as shown on the Contract Drawings. This document describes the function and operation of the systems and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as necessary to provide a completely operable and reliable system for accomplishing the functions and meeting the performance requirements set forth hereinafter.
- B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, shipping, transportation, test equipment, incidentals and services to provide complete and operational electrical systems as shown on the Contract Drawings, included in these Specifications, or as necessary for fully operating facilities.
- C. Contractor shall examine the Specifications and Drawings for mechanical equipment and provide all circuit breakers, switches, pushbuttons and appurtenances which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitely stated to be erected by others, furnish and install conduit, wire and cable and make connections required to place all equipment in complete operation.
- D. The major areas in the scope of work shown on Contract drawings which includes both furnishing and installation for each pump station include the following:
 - 1. Utility Service, Utility Metering, Generator Termination Cabinet, Automatic Transfer Switch, Pump Control (VFD) Panels, and Control Panel Assembly.
 - 2. Engage the services of a qualified Control System Supplier (CSS) to provide all major Electrical, Instrumentation and Controls systems as specified in Divisions 13 and 16.
 - 3. Microcontroller/PLC System and Human Machine Interface Panel (HMI) for monitoring and controlling the booster pumps.
 - 4. Wireless Communications, Secure Entry System, and PLC System.
 - 5. Coordinate and test in conjunction with PLC Programming and SCADA Configuration supplied under Division 13.

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6. Instruments and devices supplied under Section 13330 Field Instrumentation.
 7. Conduits, grounding system and the field interconnection wiring between the instruments, field devices, and electrical equipment enclosures.
 8. All necessary instrument supports, piping and valves to complete installation of any of the instruments listed herein.
 9. All necessary miscellaneous shut off, sample and calibration valves to sensors.
 10. Trenching, backfilling, compaction and resurfacing for all underground conduit routes.
 11. Coordination with California American Water.
 12. Site power distribution, generator termination cabinet, electrical devices, lights, receptacles, and devices for a complete and operable power and control system.
- E. The following specifications incorporate specific equipment and devices that are preferred by the Owner because of their serviceability, because of the local availability of labor, parts and materials, or because of the ability of the Owner to umbrella the equipment under existing maintenance contracts.
- F. All electrical equipment and materials, including installation and testing, shall conform to the applicable codes and standards listed in this and other Sections. All electrical work shall conform with the latest National Electric Code (NEC) issue and the California Electrical Code (CEC). Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.

1.2 RELATED WORK IN OTHER SECTIONS

- A. Contract documents are a single integrated document, and as such all divisions and sections apply. It is the responsibility of the Contractor and equipment suppliers to review all sections to insure a complete and coordinated project.
- B. The following are covered in other sections in the Contract documents and are part of Divisions 13 and 16.
1. Section 13300 – Instrumentation and Control.

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2. Section 13330 – Field Instrumentation
3. Section 13340 – SCADA Control Panel.
4. Section 13350 – Programmable Controls Systems.
5. Section 13370 – System Programming
6. Section 16110 – Conduit Raceways.
7. Section 16120 – Wire and Termination.
8. The contents of this section apply to all "electrical, control and instrumentation" equipment suppliers and manufacturers doing work listed in other sections as required.

1.3 CONTRACT DOCUMENTS

- A. The Contract drawings and specifications are intended to be descriptive of the type of electrical system to be provided; any error or omissions of detail in either shall not relieve the Contractor from the obligations there under to install in correct detail any and all materials necessary for a complete operational system, at no additional cost.
- B. The equipment specifications have been prepared on the basis of the equipment first named in the Specifications. The Contractor shall note that the second named equipment, if given, is considered acceptable and equal equipment, but in some cases additional design, options, or modifications may be required to meet Specifications all at no additional cost to the Owner.
- C. The Contract drawings are generally diagrammatic; exact locations of electrical products shall be verified in the field with the Engineer. Except where special details on drawings are used to illustrate the method of installation of a particular piece or type of equipment or materials, the requirements or descriptions in this Section shall take precedence in the event of conflict.
- D. Location at facilities of equipment, inserts, anchors, panels, pull boxes, conduits, stub-ups, and fittings for the electrical system are to be determined by the Contractor and Engineer during submittals and at time of installation. Contractor shall make minor adjustments to locations of electrical equipment required by existing conditions and coordination with other trades at no additional cost.

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- E. The Contractor shall examine the architectural, mechanical, structural, and electrical and instrumentation equipment provided under other Sections of this Contract in order to determine the exact routing and final terminations for all conduits and cables. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the physical location of wire terminations on equipment. Conduits shall be stubbed up as near as possible to equipment terminals.
- F. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. The Engineer reserves the right to require minor changes in location of equipment, without incurring any additional costs.
- G. Where conduits are shown as "home runs" on the Contract drawings or stated to be furnished, but not explicitly shown, as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc. as required for completion of the raceway system in compliance with the NEC and the applicable specifications in this contract.
- H. No changes from the Contract drawings or specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for favorable review.
- I. The resolution of conflicting interpretation of the Contract documents shall be as determined by the Engineer.
- J. The Contractor shall maintain a neatly and accurately marked full size set of Contract Drawings recording the as-built locations and layout of all electrical and instrumentation equipment, routing of raceways, junction and pull boxes, and other diagram or drawing changes.

1.4 COORDINATION

- A. The Contractor shall coordinate the electrical work with the other trades, code authorities, utilities, and the Engineer; with due regard to their work, towards promotion of a rapid completion of the project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provisions, then the Contractor shall bear expense of such changes as necessary to be made in work of others.
- B. Manufacturer's directions and instructions shall be followed in all cases where such is not shown on the Contract Drawings or herein specified.

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- C. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the California American Water it is necessary to do so.
- D. The Contractor shall schedule a minimum of one (1) mandatory coordination meeting(s) during the submittal phase of the project. The meetings shall be held at the jobsite and include, as a minimum, attendance by the Contractor, and Engineer.
 - 1. The meeting shall be held after the review of the first comprehensive submittal has been completed by the Owner. The purpose of the meeting is to discuss comments made on the submittal package, to update the project schedule, and coordinate the testing, training, and installation phases of the project.

1.5 UTILITY SERVICES COORDINATION

A. Service Power

- 1. Coordinate all work with the serving Power Utility (Pacific Gas and Electric, PG&E) and California American Water for the work shown on Contract Drawings. The Contractor shall obtain the required inspections and provide the following:
 - a. Submit to the Power Utility the proposed metering details and utility service or service modification plans. Provide a written statement from the Utility that shows approval of the proposed metering and other project details.
 - b. Coordination of utility service access. The contractor shall coordinate service location, conduit routing and service installation requirements for utility service connection.
 - c. All work associated with material and installation for the Utility power service not paid by the Utility shall be borne by the Contractor. The Contractor shall provide and install all material, conduits, wiring, pull ropes, pole risers, transformer pads, bollards, etc. as shown on Utility engineered drawings for a new or modified power service.
 - d. All fees and charges of the Utility power for service connection will be paid by the Contractor.

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1.6 SUPERVISION

- A. The Contractor shall schedule all activities, manage all technical aspects of the project, coordinate submittals and drawings, and attend all project meetings associated with this Section.
- B. The Contractor shall supervise all work in this Section, including the electrical system general construction work, from the beginning to completion and final acceptance.
- C. The Contractor shall supervise and coordinate all work in this Section to insure each phase of the project, submittal, delivery, installation, and acceptance testing, etc. is completed within the allowable scheduled time frames.
- D. The Contractor shall be responsible for obtaining, preparing, completing, and furnishing all paper work for this Section; which shall include transmittals, submittals, forms, documents, manuals, instructions, and procedures.

1.7 INSPECTIONS

- A. All work or materials covered by the Contract documents shall be subject to inspection at any and all times by the Owner. If any material does not conform to the Contract documents, or does not have a favorably reviewed submittal status; then the Contractor shall, within three days after being notified by the Owner, remove said material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.
- B. Work shall not be closed in or covered over before inspection and approval by the Engineer. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.
- C. The Contractor shall cooperate with the Engineer and provide assistance at all times for the inspection of the electrical system under this Contract. The Contractor shall remove covers, provide access, operate equipment, and perform other reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.

1.8 JOB CONDITIONS

- A. The Contractor shall make all arrangements and pay the costs thereof for temporary services required during construction of the project, such as temporary electrical power and telephone service. Upon completion of the project, remove all temporary services, equipment, material and wiring from the site as the property of the Contractor.

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- B. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction. Equipment and materials shall be completely covered with two layers of plastic and set on cribbing six inches above grade so that they are protected from weather, wind, dust, water, or construction operations. Equipment shall not be stored outdoors without the approval of the Engineer.
- C. Where equipment is stored or installed in moist areas, such as unheated buildings, etc., provide an acceptable means to prevent moisture damage, such as a uniformly distributed heat source to prevent condensation.

1.9 SUBMITTAL REQUIREMENTS

A. GENERAL

- 1. Shop documents, calculations and drawings shall be submitted for all materials, devices and components in the electrical and instrumentation system.
- 2. The Contractor shall ensure all equipment suppliers provide the submittal documentation required in this and other related sections. The major equipment suppliers are the Control System Supplier and Electrical System Suppliers. Submittals shall be complete, neat, orderly, and indexed. The Contractor shall check all submittals required under this Division for the correct number of copies, adequate identification, correctness, and compliance with the Contract Specifications and Drawings, and initial all copies certifying compliance.
- 3. The Contractor shall coordinate submittals with the work so that project will not be delayed. This coordination shall include scheduling the different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals.
- 4. No material or equipment shall be allowed at the job site until the submittal for such items has been reviewed by the Engineer and marked "no exceptions taken" or "make corrections noted".
- 5. The Contractor shall include in writing on a separate submittal cover sheet any proposed departures from the Contract documents, and the reasons therefore. Incorporate no such departures into the work without prior written approval of the Engineer. The approval of departures which substantially deviate from the Contract documents shall be evidenced by a "change order"

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directive by the Engineer. Any cost differential associated with this change order must be negotiated with the Engineer to amend the Contract to reflect the costs or savings.

6. Exceptions to the Specifications or Drawings shall be clearly defined by the equipment supplier. Submittal data shall contain sufficient details so a proper evaluation may be made by the Engineer.
7. The decision of the Engineer governs what is acceptable as a substitution. If the Engineer considers it necessary, tests to determine equality of the proposed substitution shall be made, at the Contractor's expense, by an unbiased laboratory that is satisfactory to the Engineer.

B. SUBMITTAL FORMAT

1. Each submittal shall be bound in a three ring binder, which is sized such that when all material is inserted the binder is not over 3/4 full. Binder construction shall allow easy removal of any page without complete manual disassembly; spiral ring type binders are not acceptable.
2. Each binder shall be appropriately labeled on the outside spine & front cover with the project name, contract number, equipment supplier's name, specification section(s), and major material contained therein.
3. An index shall be provided at the inside of the front cover. This index shall itemize the contents of each tab and subtab section. Also list the project name, contract number and equipments supplier's name, address, phone number, and contact person on the index page.
4. Field equipment shop documents, panel equipment shop documents, drawings, and bill of materials shall be grouped under separate tabs. Shop documents shall be ordered in the same sequence as their corresponding Contract specification subsection.
5. Complete Materials list shall be provided at the inside of the front cover. The Contractor shall provide Material list providing name of project, location of equipment, specification section, quantity, description, manufacturer, full part number and tag number.
6. All spare parts shall be listed separately at the end of the Bill of Materials list. Generic names or part numbers used by a distributor or Systems House are not acceptable; originating manufacturer's name and part number shall be listed.

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7. Data summary sheets shall be provided to subtab all shop documents for each individual piece of equipment. Data summary sheets shall be bright yellow or blue for easy identification.

The data summary sheets shall have the following information preceding their corresponding shop documents:

- a. Product identification; name used herein and on the Contract Drawings.
 - b. The manufacturer's model number, part number or other designation. This shall include the specific numbers of all proposed options
 - c. Tag name/number per the drawings or schedules.
 - d. Location of assembly at which it is installed.
 - e. Range, span, engineering units, input and output characteristics.
 - f. Contract specification subsection number.
8. Drawings that are "C" or "D" size shall be folded with the title block visible and placed in reinforced clear plastic pockets.

C. EQUIPMENT DATA SUBMITTALS

1. The equipment submittals shall be clean printouts or clearly copied from originals. No facsimile (FAX) copies, reductions or illegible documents are allowed. Color copies shall be provided when black and white copies do not show adequate clarity. Shop documents shall include the following:
- a. Complete catalog cuts with full description of equipment. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified. Each catalog cut sheet shall be identified with the applicable Section & subsection numbers.
 - b. Equipment technical specifications, ratings and listings.
 - c. Physical size with dimensions and mounting details.

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- d. Quantity and quality requirements for electric power, air, and/or water supply.
- e. Materials of components in contact with or otherwise exposed to the process.
- f. Calibration, performance or accuracy curves.

D. NAMEPLATE SCHEDULES

- 1. Submit full size drawing of all nameplates and tags, as specified herein, to be used on project. The Engineer has the right to adjust nameplate engraving titles during submittals at no additional cost to the Owner. Submittal to include the following:
 - a. Dimensions of nameplate.
 - b. Exact lettering and font for each nameplate.
 - c. Color of nameplate.
 - d. Color of lettering.
 - e. Materials of construction.
 - f. Method and materials for attachment.
 - g. Drawing showing location of nameplate on each panel.

E. SHOP DRAWINGS

- 1. All drawings shall be generated with AutoCAD 2000 or later CAD program. All drawings shall be prepared and engineered specific to the project requirements. Standard preprinted or typical drawings simply marked to indicate applicability to the Contract will not be acceptable.
- 2. Drawings shall be prepared in a professional manner and shall have borders and a title block identifying the project, system, drawing number, AutoCAD file name, project engineer, date, revisions, and type of drawing. Drawings shall be no smaller than 11" x 17" and printed with a laser jet printer or plotted in ink on vellum. The lettering shall be legible and no smaller than 0.075 inch in height.

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3. The Contractor shall submit for approval the proposed drawing format for each type of drawing or diagram specified. The Contractor shall not go into production with the drawings or diagrams for this project until the Engineer has given written approval of the submitted proposed drawing format submittal.
4. All drawings shall be prepared utilizing the Contract Documents naming conventions, equipment numbers and ISA tags specific to the project. Manufacturer standard naming or labeling is not acceptable. Equipment shown on the contracts without a tag shall be tagged in accordance with the contract document naming procedures and conventions.
5. The shop drawings shall include:
 - a. Electrical three line diagrams detailing all devices associated with the power distribution system. The following applicable information or data shall be shown on the three-line diagram: location, size and amperage rating of bus; size and amperage rating of wire or cable; breaker ratings, number of poles, and frame sizes; utility metering, voltage, amperage, number of wires and phases; ground size and connections; neutral size and connections; voltage, amperage and wattage monitoring instruments; power fail and other protective devices; fuse size and type; distribution transformers; panelboards; starters; contactor size and overload range; motor full load amperage of submitted motor and horsepower; rating for miscellaneous loads; etc. Submit of all equipment motor voltage, phase and full load amps provided for this project for verification of accuracy of submitted one line drawings.
 - b. Enclosure layout diagrams; show all front panel and backpan devices drawn to scale. Show fabrication methods and details; including material of construction, paint color, support & latching mechanisms, fans & ventilation system, and conduit entrance areas.
 - c. Control Schematic and Wiring Diagrams
 - d. Equipment Connection Diagram
 - 1) An equipment connection diagram shall be furnished for each electrical and instrumentation system, even if one was not shown explicitly on the Contract Drawings.

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- 2) The equipment connection diagrams shall be utilized in the preparation of Interconnection Wiring Diagrams and utilized by the electrician during all phases of installation and connection of all conductors to ensure coordination of the equipment interconnect.
- 3) The connection diagram shall indicate all field connection terminations with a unique label and reference the connection is a from/to format that identifies the field connection point by equipment tag, connection type, voltage and minimum/maximum connection parameters.

6. INTERCONNECTION WIRING DIAGRAMS

- a. Interconnection diagrams shall be submitted and approved by the Engineer for each electrical and instrumentation system. The Contractor shall not pull any wires into conduits that do not have approved interconnects. If the Contractor pulls in wire without Engineer approval of associated interconnect drawings, the Contractor will not be reimbursed for labor for re-pulling in wires even if there was an error in wire fill or sizing. Also, if the Contractor pulls in wire without Engineer approval of associated interconnect drawings, then all progress payments for that particular area of work will be withheld until approved interconnect drawings are in use.
- b. The diagrams shall show all other Contract and Supplier drawing numbers, for reference, that are associated with each device that is interconnected. Attached with each interconnect, a copy of all the support documents used in preparing interconnects. This includes current issues of panel schematics, connection diagrams, terminal block diagrams, submittals, contract drawings, vendor drawings and all other data used to develop the interconnection diagram as noted in the "Reference Documents" corner of interconnect drawings.
- c. All interconnection diagrams shall be prepared under the supervision of or by a Registered Electrical Engineer and shall bear that Engineer's professional stamp and signature on each and every interconnect drawing submitted for approval and on as-built interconnect drawings. All deletions and additions of equipment, wire and cables shall be clearly shown. Interconnects shall include list of all applicable reference drawings, request for clarifications, field instructions and change orders.

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- d. Provide a notes section on each interconnect drawing. In the note section list any variances from the Contract conduit schedule necessary for completing the interconnections. Change orders regarding wire fill, conduit schedule and errors in plans regarding conduits and wires may not be processed until interconnect drawings have been received for such work.
- e. Interconnections shall be shown point to point with identified lines. Diagrams of the wireless or wire schedule type are not acceptable. Bundled wires shall be shown as a single line with the direction of entry/exit of individual wires clearly shown.
- f. All terminations points on the diagram shall be shown with the actual equipment identification terminal number or letter. This identification of terminations includes terminal blocks, junction boxes, all devices, computer I/O points, etc.
- g. Diagrams shall include raceway numbers, raceway size, cable numbers, wire color code, and wire numbers.
- h. Each wire and cable size and color code shall be shown. Each conduit route with the conduit label and conduit size shall be shown. Wire and cable routing through conduits, wireways, manholes, handholes, junction boxes, terminal boxes and other electrical enclosures shall be shown with the appropriate equipment labels. All spare wires, cable, and termination points shall be shown. Cable shields shall be shown.
- i. Labeling codes for terminal blocks, terminals, wires, cables, panels, cabinets, instruments, devices, and equipment shall be shown.
- j. Schematic symbols shall be used for field devices, showing electrical contacts. Signal and DC circuit polarities shall be shown.
- k. The diagrams shall show all other contract and supplier drawing numbers, for reference, that are associated with each device that is interconnected.
- l. Field wiring shall not start before the interconnection drawing have been submitted by the Contractor and approved by the Owner.

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- m. Do not show the same wires or jumpers on the elementary or loop and interconnection diagrams. All jumper, shielding, and grounding termination details not shown on the connection diagrams shall be shown on the interconnection diagrams.

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PART 2 - PRODUCTS

2.1 QUALITY

- A. It is the intent of the Contract specifications and drawings to secure the highest quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product.
- B. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed and braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble free service. Light duty, fragile and competitive grade devices of doubtful durability shall not be used.
- C. Products that are specified by manufacturer, trade name or catalog number established a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are favorably reviewed by the Engineer prior to installation.
- D. Underwriters Laboratories (UL) or other NRTL listing is required for all substituted equipment when such a listing is available for the first named equipment.
- E. When required by the Contract Specifications or requested by the Engineer, the Contractor shall submit equipment or material samples for test or evaluation. The samples shall be furnished with information as to their source and prepared in such quantities and sizes as may be required for proper examination and tests, with all freight and charges prepaid. All samples shall be submitted before shipment of the equipment or material to the job site and in ample time to permit the making of proper tests, analyses, examinations, rejections, and resubmissions before incorporated into the work.

2.2 NAMEPLATES & TAGS

- A. Equipment exterior nameplates - Nameplate material shall be rigid laminated black phenolic with beveled edges and white lettering; except for caution, warning, and danger nameplates the color shall be red with white lettering. The size of the

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nameplate shall be as shown on the drawings. No letters are allowed smaller than 3/16". All phenolic nameplates located outdoors shall be UV resistant. Securely fasten nameplates in place using two stainless steel screws if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable. Engrave the nameplates with the inscriptions as approved by the Engineer in the submittal.

1. For each major piece of electrical equipment provide a manufacturer's nameplate showing the Contract specified equipment name and number designation, the manufacturer's name, model designation, part number, serial number, and pertinent ratings such as voltage, amperage, # of phases, range, calibration, etc.
 2. For each device with a specific identity (pushbutton, indicator, instrument, etc.) mounted on the exterior or deadfront of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device.
- B. Equipment Tags - When there is no space or it is impractical to attach an engraved phenolic nameplate with screws, as is the case with most field devices and instruments, the Contractor shall attach a tag to the equipment with the same inscriptions as specified above in paragraph A. The tag shall be made from stainless steel material and the size of the nameplate shall be no smaller than 3/8"H x 2"W with 3/16" machine printed or engraved lettering unless otherwise approved by the Engineer. The tag shall be attached to the equipment with stainless steel wire of the type normally used for this purpose.

2.3 SITE LIGHTING

- A. General
1. Provide building exterior lighting as indicated on contract drawings.
 2. No general site lighting is required.
- B. Fixtures
1. Provide lighting fixtures as indicated on the contract drawings. All outside lighting fixtures shall be Dark Sky compliant

2.4 STANDBY GENERATOR TERMINATION CABINET

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- A. Provide generator termination cabinet as indicated on the contract drawings.
- B. The termination cabinet shall be UL listed and housed in a weatherproof NEMA 3R enclosure. Provide separate three phase, ground, and neutral terminations, rated 400A, with camlock, color coded connectors, as shown on the drawings. Provide matching generator cable connectors for connecting the generator to the termination cabinet. Generator termination cabinet shall be Cutler-Hammer Generator Quick Connect, (400A), or approved equal, compatible with the assigned CAW portable generator.

2.5 LOCAL CONTROL PANELS

- A. General
 - 1. Furnish and install local control panels as indicated on the contract drawings.
 - 2. Panels shall be sized to house the required components to meet the operational requirements indicated.
 - 3. Control components, operator switches and displays shall be furnished, installed and wired to provide for the indicated functionality.
 - 4. Local control panels materials and fabrication methods shall be provided in accordance with Section 13340 Control Panels.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards outlined herein.
- B. The Contractor shall employ personnel that are skilled and experienced in the installation and connection of all elements, equipment, devices, instruments, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improper installations at no additional expense to the Owner.

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- E. The Engineer reserves the right to halt any work that is found to be substandard or being installed by unqualified personnel.
- F. Keep the premises free from accumulation of waste material or rubbish on a daily basis. Upon completion of work, remove materials, scraps, and debris from the premises and from the interior and exterior of all devices and equipment. Refinish damaged surfaces to new condition using skilled craftsmen of the trades involved at no additional cost to the Owner.
- G. All equipment installed by the Contractor shall be in accordance with the Drawings and the manufacturer's recommendations & instructions and shall operate to the Engineer's satisfaction. Follow all manufacturers' instructions for handling, receiving, installation, and pre-check requirements prior to energization. After energization, follow manufacturer's instructions for programming, set-up and calibration of equipment. The Contractor shall be responsible for, and shall correct by repair or replacement, at his own expense, equipment that, in the opinion of the Engineer has been caused by faulty mechanical or electrical assembly by the Contractor. Necessary tests to demonstrate that the electrical and mechanical operation of the equipment is satisfactory and meets the requirements of these Specifications shall be made by the Contractor at no additional cost to the Owner.

3.2 CONSTRUCTION METHODS, GENERAL

- A. All field wires and panel wires shall have wire markers as specified in the "WIRE" Section.
- B. All wire and cable runs shall be continuous without a splice. No wires shall be spliced without prior approval by the Engineer.
- C. Where splices are allowed or approved by the Engineer they shall conform with the following:
 - 1. Wire splicing devices shall be sized according to manufacturer's recommendations.
 - 2. Splices of #10 and smaller, including fixture taps, shall be made with see-thru nylon self-insulated twist on wire joints; T & B "Piggys", Ideal "Wing-Nut" or approved equal.
 - 3. Splices of #8 and larger shall be hex key screw two way connectors, with built in lock washers; T & B "Locktite", O-Z type XW or approved equal, insulated with 3M Scotch Super #88, Plymouth or approved equal.

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- 4. Splices in underground pullboxes shall be insulated and moisture sealed with 3M "Scotchcast" cast resin splice kits, Plymouth splice kits, or approved equal. The kits shall have a date marking their shelf life and shall be used prior to expiration date.
- D. Equipment shall be wired and piped by the manufacturer or supplier. Major field modifications or changes are not allowed without the written "change order" authority by the Engineer. When field changes are made, the components, materials, wiring, labeling, and construction methods shall be identical to that of the original supplied equipment. Contractor's cost to replace or rework the equipment to match original manufacturer or supplier methods shall be done at no additional cost to the Owner.
- E. Mating fittings, bulkhead fittings, plugs, connectors, etc. required to field interface to the equipment and panels shall be provided by the supplier when the equipment is delivered.
- F. All electrical and instrumentation drawings associated with the equipment shall be provided with the equipment when it is delivered to the job site. Drawings for each piece of equipment shall be placed in clear plastic packets of sufficient strength that will not tear or stretch from drawing removal and insertion.

3.3 DAMAGED PRODUCTS

- A. Damaged products will not be accepted. All damaged products shall be replaced with new products at no additional cost to the Owner.

3.4 FASTENERS

- A. Except in listed chemical areas, fasteners for securing equipment to walls, floors, and the like shall be stainless steel. Fasteners shall be sized in accordance with the manufacturer's installation requirements and per the Seismic anchoring calculations. The minimum size fastener shall be 3/8 inch diameter.
- B. Concrete housekeeping pads shall secure freestanding equipment with stainless steel anchor bolts.

3.5 INSTALLATION, GENERAL

- A. Install all products per manufacturer's recommendations and the Drawings.
 - 1. Contract Drawings are intended to show the basic functional requirements of the electrical and instrumentation system and do not relieve the

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Contractor from the responsibility to provide a complete and functioning system.

2. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections. The following shall be done by the Contractor at no additional cost to the Owner:
 - a. Provide additional devices, wiring, conduits, relays, signal converters, isolators to complete interfaces of the electrical and instrumentation system.
 - b. Changing normally open contacts to normally closed contacts or visa versa
 - c. Adding additional relays to provide more contacts as necessary.
 - d. Install interposing relays as required to provide dry contact connection and isolation with packaged system suppliers.

B. Panels and enclosures:

1. Install all panels in accordance with the approved Seismic anchoring requirements.
2. Install panels and enclosures at the general location shown on the plans or approved by the Owner/Engineer.
3. Install all materials level and plumb.
4. Seal all enclosure openings to prevent entrance of insects and rodents.
5. Seal all conduits.
6. Provide sealing fittings rated for the hazardous location and penetration requirements per NEC.

C. Conduits and Ducts:

1. Install all conduits and ducts per Section 16110

D. Wiring, Grounding, and Shielding:

1. Install all wiring and termination per Section 16120

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2. It is important to observe good grounding and shielding practices in the generally noisy environment in this application. The shield of shielded cables shall be terminated to ground at one end only, the origination end. The shield at the other end shall be encased in an insulated material to isolate it from ground.

E. Cutting and Patching:

1. The Contractor shall do all cutting and patching required to install his work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching.

F. Cleaning and Touch up:

1. At the completion of the work, all parts of the installation, including all equipment, exposed conduit, and fittings, shall be thoroughly cleaned of grease and metal cuttings. Any discoloration or other damage to parts of the building, the finish, or the furnishings, due to the Contractor's failure to properly clean the system, shall be repaired by the Contractor without cost to the Owner.
2. The Contractor shall thoroughly clean any of his exposed work requiring same.
3. Vacuum and clean the inside of all enclosures prior to applying power.
4. The Contractor shall paint scratched or blemished surfaces with the necessary coats of quick drying paint to match existing color, texture and thickness. This shall include all prime painted electrical equipment including but not limited to enclosures, poles, boxes, devices etc.

3.6 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. At time of completion, the Contractor shall provide a period of not less than 4 hours training for instruction of operation and maintenance personnel in the use of systems. Instruct all personnel at one time in one session. Make necessary arrangements with manufacturer's representative. Provide product literature and application guides for user's reference during instruction.

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- B. Provide six (6) Operation and maintenance manuals bound in a three ring binder and shall provide at least the following as a minimum.
 - 1. A comprehensive index.
 - 2. A complete "Record" set of favorably reviewed electrical submittals as provided under subsection 1-9 Submittal and Drawing Requirements illustrating all components, piping, and electrical connections.
 - 3. A complete list of the equipment supplied, including serial numbers, ranges, catalog cuts, and pertinent data.
 - 4. Full specifications on each item.
 - 5. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts lists with stock numbers shall be provided on the components that make up the assembly. All of these shall be originals, no copies.
 - 6. No photo copies are allowed of standard published manuals available from manufacturers. All of the hardware and software manuals shall be originals.
 - 7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
- C. At the end of the project these manuals shall be updated to show "as-built" conditions.
- D. Provide two (2) sets of compact disk (CD) containing all drawings prepared for this project in AutoCAD format, updated to reflect as-built conditions. Also include all Word files generated for this project, program listings of PLC and OIT programming in original formats (typically Word or txt), and for documents only available in PDF format, PDF files (typically standard manuals, maintenance instructions, etc.). NO OPTICALLY SCANNED PDF FILES ARE ALLOWED. All PDF files shall be rendered from original files, not paper copies.

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3.7 TESTING

A. GENERAL REQUIREMENTS

1. It is the intent of these tests to assure that all equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design plans and specifications.
2. The first set of tests to be performed shall determine the suitability for energization and shall be completed with all power turned off.
3. Prior to any field testing and final inspection, Interconnection Drawings and Operation & Maintenance Manuals shall have been submitted by the Contractor and approved by the Engineer.
4. The test forms shall be completed by the testing person for field checkout, testing and calibration of all equipment. All tests shall be witnessed by the Engineer and/or Owner personnel. All filled in test forms shall be given to the Engineer and/or Owner the day of the test. Fill in two sets of test forms if Contractor wants to keep a copy.
5. The Contractor shall give the Engineer 10 days notice of the dates and time for inspections and testing.
6. Include test results in the Maintenance Manual.
7. Prepare and submit formal test procedures and start-up forms to the Owner at least two weeks prior to the start of testing. Testing shall not commence until the test procedures have been reviewed and approved by the Owner. Submit separate test procedure submittals for factory and field tests. The factory test procedure shall be in a separate binder from the field test procedure.
8. If the results of any of tests are unacceptable to the Engineer, the Contractor shall make corrections and perform the tests again until they are acceptable to the Engineer; these additional tests shall be done at no additional cost to the Owner.

B. SAFETY

1. Testing shall conform to the respective manufacturer's recommendations. All manufacturers' safety precautions shall be followed.

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2. The procedures stated herein are guidelines for the intended tests, the Contractor shall be responsible to modify these tests to fit the particular application and ensure personnel safety. Absolutely no tests shall be performed that endanger personal safety.
3. California Electrical Safety Orders (ESO) and Occupational Safety and Health Act (OSHA): The Contractor is cautioned that testing and equipment shall comply with ESO and OSHA as to safety, clearances, padlocks and barriers around electrical equipment energized during testing.

C. ELECTRICAL FIELD TESTS

1. **PRE-ENERGIZATION TESTS:** These tests shall be completed prior to applying power to any equipment.
 - a. **INSPECTIONS:**
 - 1) Visual and Mechanical:
 - a) Inspect for physical damage, proper anchorage, and grounding.
 - b) Compare equipment nameplate data with design plans and starter schedule.
 - c) Compare overload setting with motor full load current for proper size.
 - 2) The Contractor shall compile, by visual inspection of equipment installed for each motor, the following data in neatly tabulated form:
 - a) Equipment driven.
 - b) Motor horsepower.
 - c) Nameplate amperes.
 - d) Service factor.
 - e) Temperature rating.
 - f) Overload catalog number.

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- g) Overload current range and setting.
 - h) Circuit breaker rating.
 - i) Circuit breaker trip setting, for magnetic only circuit breakers.
- b. **TORQUE CONNECTIONS:**
 - 1) All electrical, mechanical and structural threaded connections inside equipment shall be tightened in the field after all wiring connections have been completed. Every worker tightening screwed or bolted connections shall be required to have and utilize a torque screwdriver/wrench at all times. Torque connections to the value recommended by the equipment manufacturer. If they are not available, use NEC 2002 110-14 as guidelines. Connections shall only be tightened – loosening and then re-tightening is not allowed. Mark each connection after checking torque with a colored permanent marker to indicate a successful check.
- c. **WIRE INSULATION & CONTINUITY TESTS:**
 - 1) Contractor shall prepare a test log listing each wire or device being tested with space for date and result and remedial result. The log shall be submitted as part of the project record.
 - 2) All devices that are not rated to withstand the 500V megger (megohmmeter) potential shall be disconnected prior to the megger tests.
 - 3) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for ten seconds. Make tests with circuits installed in conduit and isolated from source and load. Each conductor shall be meggered conductor to conductor and conductor to ground. These tests shall be made on cable after installation with all splices made up and terminators installed but not connected to the equipment.
 - 4) Megger insulation resistances of all motor leads using a 500 volt megger for thirty seconds. Make these tests with motors

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installed in place and not connected to any other wiring. Each motor lead shall be tested conductor to ground.

- 5) Each megger reading shall not be less than 10 Megohms. Corrective action shall be taken if values are recorded less than 10 Meg-ohms.
- 6) Continuity Tests: Each instrumentation conductor twisted shielded pair shall have the conductor and shield continuity measured with an ohmmeter. Conductors with high ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.
- 7) Values of different phases of conductors in the same conduit run showing substantially different Megohm values, even if showing above 10 Meg-ohms shall be replaced

d. GROUNDING SYSTEM TESTS:

- 1) Visual and Mechanical Inspection.
 - a) Verify ground system is in compliance with drawings and specifications.
- 2) Electrical Tests
 - a) Before making connections to the ground electrodes, and before placement of sidewalks, landscape and paving, measure the resistance of each electrode to ground using a ground resistance tester. Perform the test not less than two days after the most recent rainfall and in the afternoon after any ground condensation (dew) has evaporated.
 - b) After all individual ground electrode readings have been made, interconnect as required and measure the system's ground resistance.
 - c) Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

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- d) The grounding test shall be in conformance with IEEE Standard 81.
 - e) Plots of ground resistance shall be made and submitted to the Engineer for approval.
 - f) The current reference rod shall be driven at least 100 feet from the system under test.
 - g) Measurements shall be made at 10 feet intervals beginning 25 feet from the test electrode and ending 75 feet from it in a direct line between the system being tested and the test electrode.
 - h) The resistance between the main grounding electrode and ground shall be no greater than five ohms for commercial or industrial systems for generating or transmission station grounds per IEEE Standard 142.
- 3) Test Values
 - a) Investigate point-to-point resistance values that exceed 0.5 ohms.
- e. PANELBOARD TEST:
 - 1) Visual and Mechanical Inspection:
 - a) Inspect for physical damage, proper anchorage and grounding.
 - b) Compare equipment nameplate data with design plans and starter schedule.
 - c) Compare overload heaters with motor full load current for proper size.
 - d) Check torque of bolted connections.

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f. BREAKER TEST:

- 1) All breakers shall be checked for proper mounting, conductor size, and feeder designation. Operate circuit breaker to ensure smooth operation. Inspect case for cracks or other defects. Check tightness of connection with torque wrench in accordance with manufacturer's recommendations. Only tighten the connection – do not loosen.

2. POST ENERGIZATION TESTS:

a. INSTRUMENTATION TESTS

- 1) Instrumentation tests shall be conducted per the following criteria:
 - a) As a minimum, all the tests indicated/specified shall be recorded on a calibration/test form submitted to Engineer for each of the following types of instruments:
 - i) Level Transmitter.
 - ii) Pressure Transmitters.
 - iii) Flow Transmitter
 - iv) Switching Devices.
- 2) Test equipment used for testing shall be of suitable quality so as not to mask performance deficiencies. All test equipment shall be traceable to National Bureau of Standards and have been calibrated within six months of test date.
- 3) Testing using simulated inputs is not allowed except with prior written approval of the Owner.
- 4) The overall accuracy of each instrument loop shall be checked to ensure that it is within acceptable tolerance.
- 5) All the I/O points for the control/SCADA system shall be tested by the CSS with assistance from Contractor for proper panel wiring. Where practical, the final element shall be used, i.e., trip the intrusion switch or change levels. During this task the Contractor shall have:

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- a) Qualified field technician with experience in the startup of similar systems to operate the control/ SCADA system and other field devices.
- b) Test instruments as required.
- c) A pair of radios for communication.
- 6) Calibration stickers shall be supplied for all equipment and instruments. Calibration stickers shall list the following information:
 - a) Tag number.
 - b) Calibrated by (name), firm, city and telephone number.
 - c) Date calibrated.
 - d) Calibration range.
 - e) Comments.
- 7) The Contractor shall provide a minimum of two (2) hours of field acceptance testing for each instrument. If any instrument has not been fully tested during its allotted time, the Contractor shall provide additional hours for finishing testing of the instrument, to be paid by the Contractor.

D. Operational Testing:

- 1. After all the previous tests in this subsection are complete, the Contractor shall conduct operational testing.
- 2. For the operational testing the new equipment shall be activated to automatically run for 5 days, Monday through Friday. During this five day period the Owner will run the different combinations of the pump control options. If equipment failure occurs during the 5 days of operational testing, the Contractor shall repair or replace the defective equipment and shall begin another 5 day operational test, Monday through Friday. This shall be continued until the new equipment functions acceptably for 5 consecutive days.

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E. Final Acceptance Trial Period:

The system shall not be "final" accepted unless the system functions without hardware failures or software problems during a 30 day trial period, to the satisfaction of the Owner. The Owner reserves the right to restart the 30 day trial period, at their discretion, when a major hardware failure has occurred or a software problem has been identified. The Owner will notify the Contractor when the 30 day trial period has been satisfactory completed.

F. The completion of the above tests does not relieve the Contractor from warranties specified herein.

3.8 SPARE PARTS

A. The Contractor shall supply all spare parts prior to start of field tests. All parts shall be sealed in plastic bags and delivered to the site in a heavy duty plastic storage bag. Bag shall be clearly labeled with part name & number and the corresponding equipment tagname.

B. The Contractor shall make available any replacement parts that are not manufacturer's normal stock items for immediate service and repair of all the instrumentation equipment throughout the warranty period.

3.9 WARRANTY

A. The Contractor shall warrant all electrical and instrumentation equipment & software for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.

**** END OF SECTION ****

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PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Contractor shall provide conduit, devices, boxes, & grounding system as specified herein. This document describes the function and operation of the system and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as required to provide a completely operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter.
- B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals, and services to provide a complete and operational conduit, devices, boxes, & grounding system as shown on the Drawings, included in these Specifications, or required for fully operating facilities.
- C. Work includes providing Conduits and Raceways for all devices and equipment required by the Contract documents.
- D. The conduit, devices, boxes, & grounding system scope of work includes:
 - 1. Provide and install trenching, conduits, junction boxes, field interconnection wiring, and associated hardware.
 - 2. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections.
 - 3. Provide disconnect switches at all control panels and motors to disconnect all sources of power.

1.2 SUBMITTALS AND DRAWINGS

- A. Provide submittals and drawings as specified in Section 16010 - Electrical.

PART 2 - PRODUCTS

2.1 CONDUIT, RACEWAYS, AND WIREWAYS

- A. GENERAL - Conduit, raceways, and wireways, wiring methods, materials, installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications:

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1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.
2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings; which shall take precedence over any general methods and materials specified in this Section.
3. Minimum conduit size:
 - a. Exposed RMC (GRS) - $\frac{3}{4}$ "
 - b. Underground PVC, RMC-PVC – 1"
4. Conduit stubs for future use shall have pull wire and shall be capped with coupling, nipple, and plug.
5. Conduits to be abandoned that protrude above grade shall be cut flush and filled with grout.

B. CONDUIT MARKING

1. All conduits (except receptacle and lighting) shall have conduit tags at both terminations of each conduit.
2. Tag material shall be rigid laminated red phenolic with white lettering. The size of the tag shall be 2" diameter. No letters are allowed smaller than 7/16". Tags shall be heat and UV resistant, stain proof, electrically non-conductive and non-corroding. Securely fasten tags in place using plastic tie-wraps. Engrave the tags, on both sides, with the conduit number as listed in the Contract Documents. Labeling shall be neatly installed for visibility and shall be clearly legible. Conduit tags shall be Brady Custom B-1 or approved equal.

C. GALVANIZED RIGID STEEL (GRS) or RIGID METALLIC CONDUIT (RMC)

1. Standard weight, zinc coated on outside by hot-dipping or sherardizing process, with either zinc coated or other approved corrosion resistant coating on inside. Fabrication shall be hot-dip galvanized after fabrication, conforming to NEMA RN 1.
2. Provide galvanized rigid steel factory elbows for 90 degree transitions.

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3. Fittings shall be hot dipped galvanized steel or galvanized cast ferrous metal. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable.
4. All joints shall be treated with T & B "Kopr-Shield".
5. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

D. PVC COATED RIGID STEEL CONDUIT (GRS-PVC)

1. Standard weight, galvanized conduit with a 40-mil thick polyvinylchloride coating bonded to both the outside and urethane interior coating. Conduit shall be hot-dip galvanized conforming to NEMA RN 1. GRS-PVC conduit to be Robroy Plasti-bond Red, or approved equal.
2. Provide PVC coated galvanized rigid steel factory elbows for 90 degree transitions.
3. Fittings shall be hot dipped galvanized steel or galvanized cast ferrous metal with a PVC 40 mils thick coating. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable.
4. All joints shall be treated with T & B type CP "Kopr-Shield", LPS No. 3 rust inhibitor, or approved equal.
5. All junction and metal pull boxes shall be galvanized with exterior surfaces PVC coated to 40 mils thickness.
6. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

E. PVC CONDUIT (PVC)

Nonmetallic conduit, couplings, bends and expansion fittings shall be polyvinyl chloride (PVC), Schedule 40. Solvent weld plastic fittings with solvent cement and primer in accordance with manufacturer's recommendations. Acceptable manufacturers: Carlon; Condux; or equal.

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F. LIQUID TIGHT FLEXIBLE METAL CONDUIT – LFMC (FLEX)

1. Minimum trade size $\frac{3}{4}$ ".
2. Connectors: Appleton "STB" or approved equal through two inches (2") trade size. Appleton "ST", O-Z "4Q", or equal with insulated bushings for over two inches (2") trade size.
3. Suitable for connection of indoor or outdoor motors, controls, and mechanical equipment.
4. Shall be used for conduit coupling to all vibrating and shifting equipment.
5. Flexible conduit lengths shall not be greater than 36 inches.
6. Flexible metallic conduit shall not be considered as a ground conductor, install a separate wire for equipment bonding.
7. Flexible conduit shall only be installed in exposed or accessible locations.
8. Final connections to vibrating equipment such as motors and fans shall be made with flexible conduits.

2.2 SEALING FITTINGS

- A. Sealing fittings shall be installed in conformance with NEC requirements for hazardous locations and as indicated on the contract drawings. Sealing fittings and compounds shall be certified and UL listed for the Hazardous location class, division and group.
- B. Sealing fittings shall be Crouse Hinds EYS, Appleton EYS, or Equal.

2.3 PULL BOXES

Pull boxes for outdoor use shall be manufactured of stainless steel. Cover shall be attached with stainless steel screws. No devices, screws, rivets, or bolts shall protrude through the exterior surface unless specifically shown on the drawings. Boxes shall be Circle AW, or approved equal.

2.4 UNDERGROUND BOXES

Underground pull boxes, where shown or required by length or accumulation of bends of conduit runs, shall be prefabricated concrete type with the size shown on the Drawings or

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larger to allow for adequate pull area. Extension sections shall be provided as necessary to reach the depth of underground conduits. All boxes shall have galvanized steel hold down bolts and hardware. Boxes located in paved areas or other areas which vehicles may travel shall be H-20 loading rated and have bolt-down steel traffic covers. Steel covers or lids shall be galvanized. Pull box covers shall be labeled power, signal, utility, telephone, whichever applies. Pull boxes shall be Christy Concrete Products, Brooks or approved equal.

2.5 GROUNDING SYSTEM

- A. Grounding system shall meet the requirements of Section 16170 and the following requirements.
- B. The utility service entrance ground bus shall be tied to a ground grid consisting of a ground rod type grounding system as per Contract E-Series Drawing, a concrete embedded electrode in contact with foundation footing rebar for at least forty feet, building structural steel and any metallic pipe entering the building from underground (water, gas).
- C. The ground rod shall consist of not less than 10 continuous feet of 3/4 inch copper coated electroplated high grade carbon steel. The ground rod shall be a NEHRING type NCC, Weater 348 or approved equal. Ground rods shall be installed in a concrete ground well (valve box) with a cover marked "Electrical Ground" and shall be driven below grade sufficient to allow the cover to fit correctly. A UL approved ground clamp on the ground rod shall be used to connect the grounding electrode conductor to the ground bus.
- C. The main grounding electrode conductor (GEC) from the ground system shall extend up into the utility service entrance section of the switchboard for the visible connection with a UL approved ground lug attached to the system ground bus. The main ground bonding conductor shall be #2/0 copper.
- D. Network ground bond wires shall be connected from the switchboard ground bus and other points shown on the Contract drawings. The network ground bonding wires shall be #1/0 copper minimum.
- E. Ground clamps shall be bolt-on type as manufactured by ILSCO type AGC, O-Z Gedney type GRC, or approved equal.
- F. Equipment grounding conductors shall be sized as shown on the Plans or in accordance with NEC Table 250.122, whichever is larger.

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- G. Grounding and bonding conductors shall be installed in all PVC conduits and nonmetallic raceways and connected to the ground bus and all equipment. Bonding conductors shall be installed in metallic raceway where called out in plans or in specifications.
- H. Each ground bus shall be copper. Screw type fasteners shall be provided on all ground busses for connection of grounding conductors. Ground bus shall be a Challenger GB series, ILSCO CAN series or approved equal.
- I. One side of the secondary on all transformers shall be grounded to the ground bus.
- J. All raceways, raceway systems, supports, enclosures, panels, motor frames, and equipment housings shall be permanently and effectively grounded.
- K. All receptacles shall have their grounding contact connected to a grounding conductor.
- L. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding such as bonding bushings. Mounting, support, or bracing bolts shall not be used as an attachment point for ground conductors. Paint shall be removed from all ground connections.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards specified in Section 16010.
- B. The Supplier shall employ personnel that are skilled and experienced in the installation of conduits, devices, boxes, grounding system, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improper installations at no additional expense to Cal Am.

3.2 INSTALLATION

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- A. System:
 - 1. Install all products per Section 16010.
- B. Conduits and Ducts:
 - 1. Except as expressly indicated or approved, all conduits shall be concealed in walls and located below floor slabs. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Pipes shall have precedence over conduits for space requirements. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.
 - 2. All spare conduits shall have 3/8" nylon pull ropes installed.
- C. Excavation and Back Filling:
 - 1. Trenches for all lines below floor slabs and all underground electrical lines shall be excavated to the required depths. Conduits under floor slabs shall have trenches no deeper than is required to properly contain bends within walls.
 - 2. Underground conduits outside of structures, excluding utility conduits, shall have a minimum cover of 18 inches except under roadways where minimum cover shall be 24 inches or when concrete encased. Back filling shall be done only after conduits have been inspected. Material for back filling shall be sand covered by compacted earth back fill. Excavation and back fill of lines and conduits shall conform to the requirements of the Earthwork Section of these Specifications, unless modified on plans, and to other entities as required.
 - 3. At all times during the installation of the electrical distribution system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.
- D. Device Mounting Heights:
 - 1. Mounting heights of fixtures and devices shall be as follows unless otherwise indicated or when height has to be adjusted to be over or under counter tops.

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Wall switches	=>	48 inches
Convenience outlets	=>	18 inches
Bracket fixtures	=>	7 feet 6 inches

E. Cutting and Patching:

1. The Contractor shall do all cutting and patching required to install this work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching. Any penetrations of fire-rated assemblies shall be closed and patched with listed fire-rated patching materials applied per manufacturer's instructions.

- F. Conduit entrances: Seal each conduit entrance from below grade into the panel and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents. Conduits between the Power & Control Connection Boxes and the panel shall be sealed with plugging compound sealant on each end. Plugging compound sealant shall be non-hardening such as Dux-seal, Courtaulds Aerospace, Semco PR-868 or approved equal.

3.3 WARRANTY

- A. Provide warranty as specified in Section 16010- Electrical, WARRANTY.

**** END OF SECTION ****

**TECHNICAL SPECIFICATION
DIVISION 16: ELECTRICAL
16120: WIRE AND TERMINATION**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Contractor shall provide the electrical and instrumentation system with all conductors, wiring, fuses and terminal blocks as specified herein.
- B. Furnish all required labor, materials, tools, test equipment, incidentals, and services to provide a complete and operational electrical and instrumentation system with wire and electrical devices as shown on the Drawings, included in these Specifications, or required for fully operating facilities.
- C. Work includes providing wiring and all devices and equipment required by the Contract documents.

1.2 SUBMITTALS AND DRAWINGS

- A. Provide submittals and drawings as specified in Section 16010.

PART 2 - PRODUCTS

2.1 WIRING AND ELECTRICAL DEVICES

A. GENERAL

- 1. The electrical and instrumentation system vendor shall provide the wiring and electrical devices specified below and install field and internal panel wiring as shown on the Contract Drawings. This section applies to all wires or conductors used internal (non-field) for all electrical equipment or external for field wiring. Wire quantity and size shall be as shown on the Contract Drawings. Contractor shall provide all additional wiring that may be required to complete the operational requirements of the equipment and shall update and submit the Cable and Conduit Schedules with any changes.

B. POWER DISTRIBUTION

- 1. Each control and instrumentation device shall be wired to terminal blocks and fuses for 120 VAC power supply connections. A spare duplex outlet wired to a separate circuit shall be provided in each control and instrumentation panel. This outlet shall remain available for future use, shall be labeled "CONVENIENCE RECEPTACLE" and shall not be used to power any equipment installed by the Control and Instrumentation panel vendor.

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C. ANALOG SIGNALS

1. Analog signal transmission between electric or electronic instruments shall be 4-20 milliamperes (mA) and shall operate at 24 volts DC unless otherwise specified. Milliampere signals shall be current regulated and shall not be affected by changes in load resistance within the unit's rating. Provide isolated current amplifiers wherever the loop load resistance exceeds the current signal transmitter's rating. Associated shunt resistors shall be located on rail-mounted terminal blocks. Exposed resistor leads shall be insulated with heat-shrink tubing.

D. LOW VOLTAGE WIRE AND CABLE (through 600V except instrument signals)

1. General: Low voltage conductors shall be used for power, control, lighting and miscellaneous circuits. This Section applies to all wires or conductors used internal for all electrical equipment or external for field wiring. Wire shall be new, plainly marked with UL label, gauge, voltage, type of insulation, and manufacturer's name.
2. Control and Power Wiring:
 - a. NEMA standards WC3 and WC5 UL listed 600V single conductor jacketed flame-retardant cable with rated conductor temperature, 90 degrees C; all cable capable of passing vertical flame resistance test, IEEE 383.
 - b. Insulation: Moisture and heat-resistant thermoplastic, Jacket: PVC or Nylon.
 - c. Conductors: Annealed copper in accordance with ASTM B3, B33 or B189. Conductor stranding shall be ASTM B8, concentric Class B. Solid conductors may be used for lighting and receptacle circuits.
 - d. Insulation type shall be moisture and heat resistant thermoplastic NEC Type XHHW/ XHHW-2, rated 90°C in dry locations and 75°C in wet locations, for #8 AWG or smaller. Conductors #6 AWG and larger shall be XHHW-2 insulation.
 - e. Field wire minimum AWG sizes:
 - 1) #12 for wires used for individual conductor circuits 100 volt and above, except for PLC I/O which may be #14 AWG.
 - 2) #14 for wires used for individual conductor circuits below 100 volt.
 - f. Non-field or equipment wire minimum AWG sizes:

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- 1) #16 for wires used for individual conductor circuits 100 volt and above.
 - 2) #18 for wires used for individual conductor circuits below 100 volt.
 - g. Insulation of all conductors and cables shall be rated 600 volt or higher.
- 3. Instrument wiring:
 - a. Field: Instrument cables shall have 600V tray cable (TC) rated insulation and 100% individual shielded twisted pair #16 conductors with drain wire. Single twisted shielded pair (T.S.PR.) cables shall be Belden 9342, or approved equal.
 - b. Non-Field: Instrument cables shall also have 600V rated insulation and 100% individual shielded twisted pair #18 conductors with drain wire. Single twisted shielded pair (T.S.PR.) cables shall be Belden 9341, 1120A, 3088A, etc, or approved equal.
- 4. Manufacturer Supplied Cables: Cables and wiring for special systems provided by the manufacturer with the equipment shall be installed per the manufacturer's recommendations. Such wiring shall either conform to NEC requirements (generally 600V) or the equipment shall have a UL listing for the cable used in the assembly.
- 5. VFD Cables
 - a. Acceptable Manufacturers, included herein to identify basis of material design for these special cables. Refer to AW Acceptable Manufacturers List for additional/supplemental information:
 - 1) Belden 29 Series (600VAC Rated Cable); wire gauge as indicated on the Drawings.
 - 2) AmerCable, Inc. – CIR Type (600VAC Rated) VFD Power Cable Gexol Insulated; wire gauge as indicated on the Drawings.
 - b. Description: Three-conductor plus ground with cross-linked polyethylene or polyolefin listed insulation with fully-rated and identified equipment grounding conductor(s); 90 degree C listed for Wet or Dry applications with outer PVC jacket.
 - c. Conductor: Tinned-Copper, multi-conductor cable, size as indicated on the Drawings.

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16120: WIRE AND TERMINATION**

E. COLOR CODE

1. The color code of all wire shall conform with the following table:

WIRES COLOR CODE TABLE

DESCRIPTION	PHASE/CODE LETTER	FIELD WIRE OR TAPE COLOR	NON-FIELD WIRE COLOR
480 V, 3 PHASE	A	BROWN	BROWN
	B	ORANGE	ORANGE
	C	YELLOW	YELLOW
240 V or 208 V, 3P	A	BLACK	-
	B	RED (ORANGE if high leg)	-
	C	BLUE	-
240 / 120 V, 1 P	L1	BLACK	BLACK
	L2	RED	-
24V POSITIVE	24P	PINK	PINK
24V NEGATIVE	24N	BLACK	BLACK
AC CONTROL		VIOLET	RED (YELLOW FOR FOREIGN CIRCUITS)
DC CONTROL		BLUE	BLUE
NEUTRAL	N	WHITE	WHITE
GROUND	G	GREEN	GREEN
SHIELDED PAIR	+	BLACK	BLACK
	-	CLEAR (WHITE)	CLEAR (WHITE)

2. All wires #8 and below shall have wire insulation the color specified. Wires #6 and larger may be black with color tape, however #6 ground conductors shall have green insulation – tape marking is not allowed.
3. No other colors shall be used without prior approval of Cal Am.
4. The same color shall be connected to the same phase throughout the panel.
5. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.

F. WIRE MARKING

1. All panel, enclosure and field wiring (except receptacle and lighting wiring) shall have wire labels at both terminations of each wire. The wire labels shall be machine printed with indelible ink, heat shrink type by Brady or equal. Labeling

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shall be neatly installed for visibility and shall be clearly legible. Each conductor of instrument signal wiring shall be labeled.

2. Wire identification - all wires, field and interior to equipment, shall be identified with machine printed sleeve markers or clip-on markers covered with clear plastic heat shrinkable tubing. Hand lettered wire labels are not acceptable and shall be replaced at the Contractor's expense. All wires that are electrically the same (connected to common termination points) and do not pass through a contact or other switching device shall have the same wire identification. The wire labeling code for each end of the same wire shall be identical. Tubing shall be sized for the wire and shrunk into place with the properly sized heat gun.
3. The wire identification code for field and panel wiring shall be the number/letter designated on the "Contract elementary" and "Supplier loop" diagrams. Wire labels shall be T&B SM series, Pass & Seymour CAB3, or approved equal.
4. Wire labeling may be omitted on locally interconnected neutral wires such as jumpers between adjacent auxiliary relay coil neutral terminals. "Locally" is defined as wires no longer than 8".

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards specified in Section 16010 - Electrical.
- B. The Supplier shall employ personnel that are skilled and experienced in the installation of wire electrical devices, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improper installations at no additional expense to Cal Am.

3.2 INSTALLATION

- A. System:
 1. Install all products per 16010 - Electrical, INSTALLATION, GENERAL.
 2. The panels shall be completely factory wired and tested before shipment.
 3. A minimum of 20% spare unwired terminals shall be provided.
- B. Wiring Methods:

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1. **WIRING SEPARATION:** Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wire ways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles. Signal wiring shall be separated from power wiring. Intrinsically safe circuits shall be separated from all other circuits.
2. **HARNESS:** All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by screw attached retainers. Where space is available, all wiring shall be run in slotted plastic wireways or channels with dust covers. Wireways or channels shall be sized such that the wire fill does not exceed 60%. Tie-wraps shall be T&B TY-RAP or approved equal.
3. **HINGE LOOPS:** Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N or approved equal. Attachment on either side of the hinge shall be by screw attached retainers or epoxy anchored threaded studs (Click-bond).
4. **RETAINERS:** Wire ways, retainers, and other devices shall be screw mounted with round-head 316 stainless steel screws or mechanically mounted by push-in or snap-in attachments. Glue or sticky back attachment of any type or style shall not be used. Epoxy fastened anchors such as Click-bond are allowed. Retainers shall be T&B TC series or approved equal.
5. **ROUTING:** Wiring in panels shall be routed in slotted plastic wireways with snap covers. Wires carrying 120 VAC shall be separated as much as possible from other wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible. Ducts for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined ducts shall be minimized. Wires and cable shall be routed along the shortest route between termination points, excepting routes which would result in routing 120 VAC and other wires and cables in the same duct. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable. There shall be no splices within wireways or in cable bundles. Wires and cables shall be placed in the ducts in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.

Wiring not routed in duct work shall be neatly bundled, treed, and laced with plastic ties. Wiring across door hinges shall be carefully made up and supported to avoid straining and chafing of the conductors or from putting any strain on their terminals.

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16120: WIRE AND TERMINATION

6. TERMINATIONS: Single wire and cable conductors shall be terminated according to the requirements of the terminal device.
- a. Provide 2-1/2" minimum separation between wireway and terminal blocks. Installation of wireways too close to terminal blocks will be required to be completely reworked to the satisfaction of Cal Am.
 - b. For captive screw pressure plate type terminals, the insulation shall be removed from the last 0.25 inches of the conductor. The conductors shall be inserted under the pressure plate to full length of the bare portion of the conductor and the pressure plate tightened without excess force. No more than two conductors shall be installed in a single terminal, however no terminal shall contain more conductors than it's UL listing allows. All strands of the conductor shall be captured under the pressure plate.
 - c. For screw terminals, appropriately sized locking forked spade lugs shall be used. Lugs shall be crimp-on type that form gas tight connections. All crimping shall be done using a calibrated crimping tool made specifically for the lug and size being crimped.
 - d. Shielded cable drain wires shall be covered with insulating tubing along the full bare length between the cable jacket and the terminal lug or terminal pressure plate.
 - e. For screwless terminals, wire shall be stripped back and inserted per the manufacturer's instructions. When stripping insulation from conductors, do not score or otherwise damage conductor. Nicked conductors shall be required to be restripped and the connection remade.
 - f. Heat shrink shall be placed on ends of shielded cable to cover foil.
 - g. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (i.e. solenoid valves, level probe, etc.) The connecting means shall be listed for such installation or a suitable connecting means shall be used.

3.3 WARRANTY

- A. Provide warranty as specified in Section 16010- Electrical, WARRANTY.

END OF SECTION

TECHNICAL SPECIFICATION
DIVISION 16: ELECTRICAL
16170: GROUNDING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. A ground grid system consisting of the indicated configuration of copper wires, and ground rods, or concrete encased grounding electrodes (“UFERs”) shall be provided to minimize station potential gradient irregularities and drain leakage and fault currents to earth.
- B. Whether indicated on the Drawings or not, neutral conductors, cable shields, metallic conduits, cable terminations, junction boxes, poles, surge arresters, and other noncurrent-carrying metallic parts of equipment shall be grounded.

1.02 SUBMITTALS

- A. Products shall be submitted in accordance with Section 16000, and elsewhere in the Contract Documents, prior to installation.

1.03 REFERENCES

- A. National Electrical Code (NEC) Article 250.
- B.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Contractor shall provide complete grounding system for pumping plant, including ground grid, equipment grounding, and panel grounding.

2.02 GROUND RODS

- A. Ground rods shall be copper-clad steel conforming to UL 467, 3/4 inch in diameter by 10 feet in length.

2.03 CONNECTIONS

- A. Connections above grade shall be made with bolted solderless connectors, and those below grade shall be made by a fusion-welding process. In lieu of a fusion-welding process, a compression ground grid connector of a type which uses a hydraulic compression tool to provide the correct circumferential pressure may be used. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

2.04 GROUNDING ELECTRODE CONDUCTOR

- A. Service entrance ground wires shall be sized in accordance with NEC Table 250.66, unless otherwise indicated on the Drawings. After being located to provide maximum physical protection, exposed ground wires shall be securely attached to structural

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supports at not more than 2-foot intervals with suitable fasteners. Bends greater than 45 degrees in ground wires are not permitted. Routing of ground conductors through concrete should be avoided, except where specifically called for in these Documents. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit, so as to provide an opening for the ground wire. The opening shall be sealed with a suitable compound after installation of the ground wire.

2.05 EQUIPMENT GROUNDING CONDUCTOR

- A. Neutral conductors shall be grounded where indicated. Equipment grounding conductors shall be sized in accordance with NEC Table 250.122, unless otherwise indicated. Ground wires shall be protected by conduit, where such wires run exposed above grade in nonfence-enclosed areas, or are run through concrete construction. Where concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit, so as to provide an opening for the ground wire. The opening shall be sealed with a suitable compound after installation of the ground wire. Bends greater than 45 degrees in ground wire connections to the ground rods, or counterpoises are not permitted.

2.06 EQUIPMENT GROUNDING

- A. Equipment frames of motor housings, metallic tanks, metallic equipment enclosures, metal splicing boxes, chain-link fencing, and other metallic noncurrent-carrying metal items, shall be grounded. Connections to earth shall be made in the same manner as required for system grounding. Equipment or devices operating at less than 750 volts may be connected to secondary neutral grounding electrodes.

2.07 SURGE ARRESTER GROUNDING

- A. Surge arresters shall be grounded. Resistance to ground for intermediate-class arresters shall be not more than 10 ohms and for distribution-class arresters shall be not more than 25 ohms. Ground wire connections shall be not less than No. 4 AWG for distribution arresters and No. 1/0 AWG for intermediate arresters. Connections to earth shall be made in the same manner as required for neutral conductors. Surge arrester grounds may use the same ground wires provided for equipment operating at more than 750 volts. Surge arrester and secondary neutral grounds shall be separate from and independent of each other but both grounds shall be bonded together below grade at the ground rods or may utilize a common counterpoise.

2.08 LIGHTING POLE GROUNDING

- A. Base of lighting poles shall be connected to an adjacent ground rod as indicated on Drawings. A ground connection from poles back to neutral ground points shall also be provided utilizing equipment grounding conductor.

2.09 METALLIC STRUCTURES

- A. Metallic structures and buildings shall be grounded per NEC.

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2.10 GROUNDING RINGS

- A. When required, grounding rings shall be installed using bare copper cable with ground rods at least 25 feet intervals using thermoweld connecting means as indicated on Drawings in accordance with NEC requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. It is the intent of these Contract Documents that all device and equipment grounds shall be run as a separate conductor in the conduit from the equipment to the distribution panels or system ground. Wireways and enclosures shall be properly bonded and grounded, and ground conductors shall be run for all circuits.
- B. Equipment cases and devices shall be grounded. Ground rods shall be driven, and concrete encased conduits installed, before a building, or structure is built, and ground conductors brought through the concrete to accessible points for grounding equipment. These systems shall be installed at each structure, where transformers, switchboards, panelboards, and MCCs are installed.
- C. Duct banks shall contain a concrete encased system bare copper ground conductor. The system ground conductors shall run continuously in duct banks, through handholes and other raceway boxes. The system ground shall be connected to the structure grounding systems to provide a continuous grounding system. Each metallic raceway, panel, switchboard, and other metallic devices associated with the electrical and control systems shall be bonded to this grounding system.
- D. Ground rod shall be installed not less than 6 inches below grade. In counterpoise systems, tops of ground rods shall be approximately at elevations of counterpoises. Where the specified ground resistance cannot be met with the indicated number of ground rods, additional ground rods, longer ground rods, or deep-driven sectional rods shall be installed and connected until the specified resistance is obtained, except that not more than three additional ground rods shall be required at any one installation. Ground rods shall be spaced as evenly as possible at least 6 feet apart and connected below grade. Equipment, neutral, and surge arrester ground wires shall be connected to the ground grid as indicated.
- E. A resistance of not greater than 25 ohms shall be provided, unless otherwise specified. Ground resistances shall be measured as herein described. Resistances of systems requiring separate ground rods, rather than a counterpoise, shall be measured separately before bonding below grade. The combined ground resistance of separate systems bonded together below grade may be used to meet the specified ground resistance, but the minimum number of rods indicated must still be provided.

3.02 TESTS

- A. Test the grounding and bonding system in accordance with Specification 16920 –

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ELECTRICAL ACCEPTANCE TESTING.

- B. No part of the electrical system shall be energized until all station grounding system components have been tested and demonstrated to comply with the requirements specified, and until associated test reports have been submitted and approved.

3.03 TEST RESULTS

- A. Perform the above tests and submit a certified test report prior to energizing the equipment.

**** END OF SECTION ****

**TECHNICAL SPECIFICATION
DIVISION 16: ELECTRICAL
16190: SUPPORTING DEVICES**

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Supports, anchors, sleeves, and seals, are indicated on the Drawings, schedules, and specified in other sections of these Specifications.
- B. Types of supports, anchors, sleeves and seals specified in this section include the following:
 - 1. One-hole Conduit Straps
 - 2. One-Hole Conduit Straps with Clamp Backs
 - 3. Two-Hole Conduit Straps
 - 4. Conduit Hangers
 - 5. I-beam Clamps
 - 6. Channel Clamps
 - 7. Round Steel Rods
 - 8. Drop-in Anchors
 - 9. Wedge Type Anchor Bolts
 - 10. Lead Expansion Anchors
 - 11. Toggle Bolts
 - 12. Wall and Floor Seals
 - 13. Cable Supports
 - 14. U-Channel Strut System
 - 15. Sleeves

1.02 SUBMITTALS

- A. Products shall be submitted in accordance with Section 16010, and elsewhere in the Contract Documents, prior to installation.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide supporting devices that comply with manufacturers standard materials, design, and construction, in accordance with published product information, and as required for complete installations, and as specified herein.

2.02 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following: Abbeon Cal Inc., Ackerman Johnson Fastening Systems Inc., Elcen Metal Products Co., Ideal Industries, Inc., Joslyn Mfg and Supply Co., McGraw Edison Co., Rawlplug Co. Inc., Star Expansion Co., U.S. Expansion Bolt Co., Allied Tube and Conduit Corp., B-Line Systems, Inc., Greenfield Mfg Co., Inc., Midland-Ross Corp., O-Z/Gedney Div; General Signal Corp., Power-Strut Div.; Van Huffer Tube Corp., and

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Unistrut Div; GTE Products Corp., and Robroy Industries.

2.03 SUPPORTS

- A. Provide supporting devices of types, sizes, and materials indicated, and having the following construction features:
1. One-Hole Conduit Straps: For supporting electrical metallic tubing, and liquidtight flexible conduit; zinc plated steel, stainless steel or galvanized steel; snap-on, heavy duty.
 2. One-Hole Conduit Straps with Clamp Backs: For supporting rigid metal conduit, and intermediate metal conduit; cast galvanized steel.
 3. Two-Hole Conduit Straps: For supporting electrical metallic tubing, rigid metal conduit, and intermediate metal conduit; zinc plated steel, stainless steel or galvanized steel.
 4. Conduit Hangers: For supporting electrical metallic tubing, rigid metal conduit, and intermediate metal conduit; zinc plated steel, stainless steel or galvanized steel.
 5. I-Beam Clamps: Electroplated zinc or hot dipped galvanized malleable iron.
 6. Channel Clamps: Electroplated zinc or hot dipped galvanized steel.
 7. Round Steel Rod: National coarse thread, electroplated.

2.04 ANCHORS

- A. Provide anchors of types, sizes, and materials indicated, with the following construction features:
1. Lead Expansion Anchors: For CMU walls, 1/4"-20 threads, set tool required.
 2. Toggle Bolts: Electroplated steel, size as required.
 3. Drop-in Anchors: Stainless steel, size as required.
 4. Anchor Bolts: Stainless steel, size as required.
 5. Half-round head, non-removable anchor bolts shall not be used.

2.05 SEALS

- A. Provide seals of types, sizes and materials indicated; with the following construction features:
1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sized indicated; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.
 2. Conduit sealing bushings shall be manufactured by O-Z/Gedney, Model CSMI, or equal.
 3. The conductor sealing bushings shall be manufactured by O-Z/Gedney, Model CSBG, or equal.

2.06 CONDUIT CABLE SUPPORTS

- A. Provide cable supports with insulating wedging plug for non-armored type electrical

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cables in risers; construct 2" rigid metal conduit; 3-wires, type wire as indicated; construct body of malleable-iron casting with hot-dip galvanized finish.

2.07 U-CHANNEL STRUT SYSTEM

- A. Provide U-channel strut system for supporting electrical equipment, 12-gage hot-dip galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with the following fittings that mate and match with U-Channel:
1. Fixture hangers
 2. Channel hangers
 3. End caps
 4. Beam clamps
 5. Wiring stud
 6. Thinwall conduit clamps
 7. Rigid conduit clamps
 8. Post Bases
 9. U-bolts

2.08 PIPE SLEEVES

- A. Provide pipe sleeves from the following:
1. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

2.09 PVC COATED U-CHANNEL STRUT SYSTEM

- A. Provide PVC Coated U-channel strut system for supporting electrical equipment, 20 mil PVC coated steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with all Stainless Steel hardware, and the following fittings that mate and match with PVC Coated U-Channel:
1. PVC Coated Strut nut
 2. PVC Coated Pipe straps
 3. Touch up compound (Gray)

2.10 STAINLESS STEEL U-CHANNEL STRUT SYSTEM

- A. Provide Stainless Steel U-channel strut system for supporting electrical equipment, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with all stainless steel hardware, and the following stainless steel fittings that mate and match with Stainless Steel U-Channel:
1. Fixture hangers
 2. Channel hangers
 3. End caps
 4. Beam clamps
 5. Wiring stud
 6. Post bases
 7. Rigid conduit clamps

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8. U-bolts

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices.
- B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of 2 or more parallel runs of conduits to be supported together on channel type hangers where possible. Install supports with spacing indicated and in compliance with NEC requirements.
- D. Torque sleeve seal nuts, complying with manufacturer's recommended values. Ensure that sealing grommets expand to form watertight seal.
- E. Comply with manufacturer's recommendations for touch up of field cut ends or damaged PVC coated U-channel and fittings.
- F. Remove burrs and apply a cold zinc galvanizing paint to field cut galvanized U-channel strut.

* * End of Section * *

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes automatic load transfer switch rated 600 V and less, including the following:
 - 1. Power quality meter
 - 2. Local annunciator system.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switch.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
 - 2. Include material lists for each switch specified.
 - 3. Single-Line Diagram: Show connections between transfer switch, power sources, and load; and show interlocking provisions for combined transfer switch.
 - 4. Riser Diagram: Show interconnection wiring between transfer switch, and local annunciator.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.
- C. Manufacturer Seismic Qualification Certification: Submit certification that transfer switch accessories, and components will withstand seismic forces as required for automatic transfer switch installed in Carmel Valley, CA
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

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- b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.
 - 1. Include all typical "Operation and Maintenance Data," including the following:
 - a. Features and operating sequences, both automatic and manual.
 - b. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Member company of NETA.
 - a. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 12 months from date of acceptance testing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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- B. Comply with NEMA ICS 1.
- C. Comply with NFPA 110.
- D. Comply with UL 1008 unless requirements of these Specifications are stricter.
- E. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, unless otherwise indicated.
- F. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
- G. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- H. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- I. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switch for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.
- J. Neutral Terminal: Solid and fully rated unless otherwise indicated.
- K. Heater: Equip switch exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.
- L. Annunciation, Control, and Programming Interface Components: Devices at transfer switch for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.
- M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed shrinkable sleeve markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."
 - 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 - 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 - 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
 - 4. Accessible via front access.

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- N. Enclosures: General-purpose NEMA 250, Type 3R for outdoor use, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCH

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Firetrol.
 2. Asco.
 3. Or approved equal.
- B. Comply with Level 2 equipment according to NFPA 110.
- C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Electrical Characteristics: 600A 3 pole, 480V, 3Ø wye with ground and neutral busses, AIC 42kA, NEMA 3R.
 2. Limitation: Switch using molded-case switch or circuit breakers or insulated-case circuit-breaker components are unacceptable
 3. Switch Action: Double throw; mechanically held in both directions.
 4. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
 5. Conductor Connectors: Suitable for use with conductor material and sizes.
 6. Material: Hard-drawn copper, 98 percent conductivity.
 7. Main and Neutral Lugs: Compression type.
 8. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 9. Connectors shall be marked for conductor size and type according to UL 1008.
- D. Automatic Open-Transition Transfer Switch: Interlocked to prevent the load from being closed on both sources at the same time.
1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
- E. Electric Non-automatic Switch Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.
- F. Digital Communication Interface: Matched to capability of annunciator and control panel.
- G. Automatic Transfer-Switch Controller Features:
1. Controller shall operate through a period of loss of control power.

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2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is unavailable.

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2.3 POWER QUALITY METER

Contractor shall provide a power quality meter in the ATS, including connectors, instrument transformers, and supports. Current transformers shall be provided to meet revenue quality requirements. Power quality meter shall be solid state type, SEL-735-V, meter Form 9, with MV-90 communication protocol, including 120V AC power source (Slot A). Provide fused disconnect for 120V power at meter location. Provide internal communication module for CAT 6 connection to Owner's SCADA panel.

2.4 TRANSFER SWITCH ACCESSORIES

A. Local Annunciator System:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Functional Description: Local annunciator panel shall annunciate conditions for indicated transfer switch.
3. Annunciation panel display shall include the following indicators:
 - a. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
 - b. Switch position.
 - c. Switch in test mode.
 - d. Failure of communication link.
4. Annunciator Panel: LED-lamp type with audible signal and silencing switch.
 - a. Indicating Lights: Grouped for each transfer switch monitored.
 - b. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
 - c. Mounting: Flush, modular, steel cabinet unless otherwise indicated.
 - d. Lamp Test: Push-to-test or lamp-test switch on front panel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Floor-Mounting Switch: Anchor to concrete pad by bolting.
- B. Annunciator and Control Panel Mounting: Surface on wall.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

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B. Perform the following tests and inspections:

1. After installing equipment, test for compliance with requirements according to NETA ATS.
2. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with Drawings and Specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, grounding, and required clearances.
 - d. Verify that the unit is clean.
 - e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - f. Verify that manual transfer warnings are attached and visible.
 - g. Verify tightness of all control connections.
 - h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:
 - 1) Use of low-resistance ohmmeter.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
 - i. Perform manual transfer operation.
 - j. Verify positive mechanical interlocking between normal and alternate sources.
 - k. Perform visual and mechanical inspection of surge arresters.
 - l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.
3. Electrical Tests:
 - a. Perform insulation-resistance tests on all control wiring with respect to ground.
 - b. Verify settings and operation of control devices.
 - c. Calibrate and set all relays and timers.
 - d. Verify phase rotation, phasing, and synchronized operation.
 - e. Perform automatic transfer tests.
 - f. Verify correct operation and timing of the following functions:
 - 1) Normal source voltage-sensing and frequency-sensing relays.

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- 2) Engine start sequence.
 - 3) Time delay on transfer.
 - 4) Alternative source voltage-sensing and frequency-sensing relays.
 - 5) Automatic transfer operation.
 - 6) Interlocks and limit switch function.
 - 7) Time delay and retransfer on normal power restoration.
 - 8) Engine cool-down and shutdown feature.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
 5. After energizing circuits, perform each electrical test for transfer switch stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switch and retransfer from emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
 - f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
- C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
 - D. Transfer switch will be considered defective if it does not pass tests and inspections.
 - E. Remove and replace malfunctioning units and retest as specified above.
 - F. Prepare test and inspection reports.

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- G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch rated more than 400 amps. Remove all access panels so joints and connections are accessible to portable scanner.
 - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies switch checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and observations after remedial action.

3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain transfer switch and related equipment.
- B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

*** * END OF SECTION * ***

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**TECHNICAL SPECIFICATION
DIVISION 16: ELECTRICAL
16420: SERVICE ENTRANCE SECTION**

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This section covers the utility service metering panel and related service equipment.

1.02 SUBMITTALS

- A. Product data shall be submitted in accordance with Section 16010 and with utility (PG&E) requirements, and as required elsewhere in the Contract Documents, prior to installation.
- B. The contractor shall submit shop drawings, catalog cuts, single line diagram, component layout drawings and equipment elevation. Shop drawings must indicate all ratings, bus bracing, phasing, and utility requirements.
- C. Catalog cuts must be submitted for the service metering panel and components within. Each catalog cut must be properly identified with catalog number and indexed for easy reference.
- D. Single line diagram must be complete with circuit numbers to match the Drawings. Components must be sized and shown in a bill of materials.
- E. A wiring diagram must be submitted to show connection of devices. Wiring diagram must include component numbers, matching the bill of materials.
- F. Service metering panel must be approved for connection by the serving utility company prior to Engineer's review.
- G. The metering panel must be UL listed as a complete assembly suitable for Service Entrance Duty.

PART 2 - PRODUCTS

2.01 SERVICE METERING PANEL

- A. The incoming service metering panel shall be provided to meet utility requirements. The unit shall be a single panel, on which shall be mounted a deadfront mounting plate, and metering equipment.
- B. The service panel shall be a one-piece enclosure with front accessibility unless otherwise required. The panel shall have provisions for utility current transformers, meter socket, factory installed test blocks, utility meter base, and an underground pull section, as indicated on the drawings; all of which shall comply with the requirements of the serving utility (PG&E).
- C. The enclosure shall be zinc coated steel, minimum 12 gauge thickness. Cabinet shall be protected against corrosion in accordance with U.L. 50, Cabinets and Boxes, Section 13.

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Exterior cover to be minimum 14 gauge steel, and shall have padlocking provisions. Deadfront shall be a hinged type, 16 gauge minimum, and shall not require the use of a tool to expose interior components for installation or servicing. Factory installed components shall be U.L. listed. Factory installed conductors shall be copper, size and type to conform to NEC and U.L. requirements (minimum size #14 AWG). Construction shall be such to prevent the entry of rodents into the interior. Ventilation openings shall be provided.

- D. Unless otherwise indicated on the Drawings, the enclosure shall be rated NEMA 3R for outdoor use.
- E. Bus bars (including neutral and ground) shall be silver or tin plated solid copper and braced to withstand short circuit amps as directed by the utility or as indicated on the Drawings.
- F. The metering panel shall have a steel nameplate stamped indicating the equipment voltage, amperage and short circuit withstand rating, mounted on the outside of the enclosure.
- G. A panel electrical hazard safety label shall be provided as required by NFPA 70E.
- H. The service metering panel shall be as manufactured by Square D, Cutler-Hammer, General Electric, Siemens, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The service metering panel shall be installed per manufacturer's instructions, as indicated on the drawings, per all applicable NEC and local codes and regulations, and shall comply with serving utility's requirements.
- B. Grounding shall be provided as required by the NEC, and as indicated on the Drawings. Service ground shall be bonded to building counterpoise system.

3.02 TESTING

- A. Test in accordance with Specification 16920, ELECTRICAL ACCEPTANCE TESTING.

* * End of Section * *

TECHNICAL SPECIFICATION
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16440: MISCELLANEOUS ELECTRICAL DEVICES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This section covers miscellaneous electrical devices, including electrical disconnecting switches, UPS for SCADA panel, and surge protective devices.

1.02 SUBMITTALS

- A. Product data and information for approval shall be submitted in accordance with Section 16010, and elsewhere in the Contract Documents, prior to purchase and installation.

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

- A. Disconnect switches shall be heavy-duty safety switches with a quick-make, quick-break operating mechanism, with full cover interlock, and indicator handle. The disconnect switches shall be furnished with fuses of the size indicated on the Drawings. One set of spare fuses shall be furnished for each fused disconnect switch. Disconnect switches shall be NEMA type HD heavy duty construction, UL 98 listed.
- B. Enclosures shall be rated NEMA 12 for indoor use, and NEMA 3R for outdoor use, unless otherwise indicated on the Drawings.
- C. Disconnect switch handle shall be padlockable.
- D. Disconnect switches shall be as manufactured by Square D, Cutler Hammer, Allen-Bradley, General Electric, or equal.

2.02 120/240V AC Uninterruptible Power Supply (UPS)

- A. Contractor shall provide an uninterruptible power supply (UPS) system in separate NEMA 12 enclosures as shown on the Drawings.
- B. Manufacturer:
 - a. APC
 - b. Eaton, Powerware.
 - c. General Electric
 - d. Liebert
 - e. Or approved equal.
- C. On-line, double conversion UPS.
- D. Connections
 - a. Input 120/240V, single phase, 3 wire power connection from Panel LP-1 shall be hardwired to UPS.
 - b. NEMA 5-15P, 5-20P, and 5-30P receptacles for load connections. Suitable for all connected loads connected to a single receptacle.

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- E. UPS system shall have 120/240V AC output and shall sustain 15 minutes run time at full load. CONTRACTOR shall verify that size of UPS will power 125 percent of all connected loads.
- F. Additional batteries and charger compartment(s) shall be provided to provide an additional 15 minutes of run time for UPS operation at full load, for a total of 30 minutes.
- G. Submit load and running time calculations.
- H. The UPS shall consist of a ferroresonant transformer, a microprocessor-controlled static inverter, battery charger, batteries to store emergency power, and an integrally mounted manual isolated break-before-make test / bypass switch.
- I. Operating Conditions:
 - a. Under normal operating conditions, the load shall be powered by normal 120/240V AC line supply that has been filtered through the ferroresonant transformer. When AC line power is present, the inverter shall be off and the battery charger shall be off if the batteries are fully charged.
 - b. When AC line power fails, the inverter shall supply AC power to the transformer from the batteries. There shall be no measurable break in the output of the system during transfer from normal 120/240V AC line supply to the inverter battery supply or back to line.

2.03 Surge Protective Devices

- A. Provide SPD units as indicated on the Drawings and specified herein. The Contractor shall furnish and install the SPD equipment having the electrical characteristics and ratings to maximize performance and reliability and to obtain the lowest possible let-through voltages. The ac surge protection shall be integrated into electrical distribution equipment such as panelboards. Subject to compliance with the Contract Documents, the following manufacturers are acceptable, or approved equal:
 - 1. MCG
 - 2. Liebert
 - 3. Advanced Protection Technologies "XDS" Series
 - 4. Cutler Hammer "SPD" Series
 - 5. Square D
 - 6. Or Approved Equal
- B. Electrical Requirements
 - 1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
 - 2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
 - 3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for all distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards. End of life mode to be open circuit. Unit with end of life short-circuit mode are not acceptable.
 - 4. Unit shall operate without the need for an external overcurrent protection device (OCPD), and be listed by UL as such. Unit must not require external OCPD or replaceable internal OCPD for the UL Listing.
 - 5. Protection Modes – The SPD must protect all modes of the electrical system being utilized.

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6. Nominal Discharge Current (In) – All SPDs applied to the distribution system shall have a 20kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an In less than 20kA shall be rejected.
7. ANSI/UL 1449 4th Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 4th Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277
L-N; L-G; N-G	700	1200
L-L	1200	2000

C. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable single-mode modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
3. Electrical Noise Filter – Each Type 2 unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.
 - a. Type 2 units with filtering shall conform to UL 1283 5th Edition
 - b. Type 1 units shall not contain filtering or have a UL 1283 5th Edition Listing.
4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.

D. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:

1. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
 - a. For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye

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- configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
- b. For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes
 - c. The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.
2. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.
- E. Thermal MOV Protection – The unit shall contain thermally protected MOVs. These self-protected MOVs shall have a thermal protection element integrated with the MOV and a mechanical disconnect with arc quenching capabilities in order to achieve overcurrent protection of the MOV. The thermal protection assembly shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.
- F. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. The use of plug in single-mode modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.
- G. Safety Requirements – The SPD shall minimize potential arc flash hazards by containing no single-mode plug in user serviceable / replaceable parts and shall not require periodic maintenance. SPDs containing items such as replaceable single-mode plug in modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
- H. The SPD applications include distribution and branch panel locations. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

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1. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category

Category	Application	Per Phase	Per Mode
A	Branch Locations (Panelboards)	120 kA	60 kA

- I The SPD application includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.
 1. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.
 2. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
 3. The panelboard shall be capable of re-energizing upon removal of the SPD.
 4. The SPD shall be integral to the panelboard and connected directly to the bus. Alternately, an integral SPD can be connected to a circuit breaker for disconnecting purposes, in the case a disconnect is required.
 5. The SPD shall be included and mounted within the panelboard by the manufacturer of the panelboard.
 6. The SPD shall be of the same manufacturer as the panelboard.
 7. The complete panelboard including the SPD shall be UL67 listed.
- 2.04 MAIN CIRCUIT BREAKER
 - A. Main incoming circuit breaker shall be individually mounted in a separate NEMA 3R gasketed panel, wall mounted near the ATS. Enclosure shall be complete with SN and grounding terminations.
 - B. Acceptable manufacturers:
 1. Square D, with Mircollogic 5 Series trip unit
 2. Cutler-Hammer/Eaton, Type KD, with Optim 550 trip unit
 3. ABB, Type S5H, with SACE PR12 trip unit
 - C. Breaker shall be service-entrance rated, with solid-state adjustable Long Time, Short Time, Short Time Delay, I2T In/Out (L, S) and where possible also Instantaneous Setting

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Capability (L, S, I).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Disconnect switches shall be installed as indicated on the Drawings.
- B. SPDs shall be provided on the main 480V panel, MDP-1, and the lighting panel, LP-1.
- C. Main service entrance breaker shall be installed as indicated on the Drawings.

3.02 TESTING

- A. All devices shall be provided and installed according to manufacturer guidelines.
- B. Devices shall be grounded per NEC, and Section 16170.
- C. Devices shall be tested as recommended by manufacturer and as required in Section 16920, ELECTRICAL ACCEPTANCE TESTING.

* * End of Section * *

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PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. This section includes requirements for motor control centers (MCC) and all required power distribution and control devices as shown on the contract drawings and specified to be part of the Booster Pump Station electrical and control systems.
- B. The Contractor shall furnish all materials required and install Motor Control Centers and Switchboard furnished by the CSS complete with utility metering, power distribution and control panels, where indicated on the drawings. The Contractor shall furnish all installation services and materials to install the MCC as specified in Division 16.
- C. Installation shall include providing seismically adequate housekeeping pads, setting in place, seismically adequate anchoring and installing all conduit and wire as required to provide a completed system. Contractor shall make all final terminations per the interconnection drawings furnished by the CSS.

1.2 UNIT DESIGN RESPONSIBILITY

- A. The MCC supplier unless otherwise specified shall be the CSS. Engineered motor control centers shall be by the listed MCC manufacturer.
- B. The MCC shall be provided by the CSS as a complete system, assembled, wired and tested as a complete assembly at the CSS manufacturing facility.
- C. The CSS and MCC manufacturer shall comply with other Sections of the Specifications describing components such as dry-type transformers, panelboards, relays, circuit breakers, motor circuit protectors, magnetic starters, pilot devices, Variable Frequency Drive, transient voltage surge suppression, transfer switches, control and other such equipment which will be part of well pump electrical and control systems.

1.3 RELATED SECTIONS

- A. Contract documents are a single integrated document, and as such all divisions and sections apply. It is the responsibility of the equipment supplier to review all sections to insure a complete and coordinated project.
- B. Section 13340 Pump Control Panels.

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1.4 REFERENCES

- A. The Motor Control Centers and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA, ANSI and UL 845.

1.5 SUBMITTALS

- A. Reference Section 16010 for general submittal requirements.
- B. Provide the following submittal data for each MCC assembly:
 - 1. Master Drawing index
 - 2. Front and Side view elevation
 - 3. Plan and Top View
 - 4. Utility Metering Section Details
 - 5. Three Line Diagram
 - 6. Three Line Unit wiring diagrams depicting all remote device interface requirements
 - 7. Equipment and project specific unit wiring and control diagrams
 - 8. Nameplate schedule
 - 9. Starter and component schedule
 - 10. Conduit entry/exit locations
 - 11. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 - d. Circuit breaker coordination (i.e. coordination study)

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12. Component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings (shall be in excess of available fault current)
13. Cable terminal sizes
14. Product data sheets.
15. Sequence of Operation for all starter compartments, Main/Generator Breaker Interlocks, Variable Frequency Drive Controls, Bypass Contactors, and Relay Compartment Control Logic.

1.6 SUBMITTALS (Operations and Maintenance)

- A. Submit installation manuals to include:
 1. As-built drawings
 2. Unit Wiring Diagrams
 3. Interconnection Diagrams
 4. Certified production test reports
 5. Installation methods and procedures
 6. Seismic certification and equipment anchorage details.
 7. Coordination study
 8. Arc Flash Study and Hazard Warning Labeling.

1.7 QUALIFICATIONS

- A. The manufacturer of the Motor Control Center and Utility/Distribution Switchboard assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

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- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.8 SEISMIC REQUIREMENTS

- A. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of California Building Code (CBC) for the specific site. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, UBC: a peak of 2.15g's (3.2–11 Hz), and a ZPA of 0.86g's applied at the base of the equipment. The tests shall fully envelop this response spectrum for all equipment natural frequencies. These requirements shall be modified as required by latest adopted version of the C.B.C.
- B. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
- C. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a civil engineer licensed in the state of California. Mounting recommendations shall be provided by the manufacturer based upon approved shake table tests used to verify the seismic design of the equipment.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.10 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.

PART 2 – PRODUCTS

2.1 Manufacturers:

- A. Cutler-Hammer

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- B. Allen Bradley
- C. General Electric
- D. Siemens

2.2 RATINGS

- A. The Motor Control Center(s) shall be 600 volt class suitable for operation on a three-phase, 4-wire, 60 Hz system. The system operating voltage and number of wires shall be as indicated on the Contract Drawings.

2.3 BUS

- A. Each MCC section shall contain a main horizontal copper silver-plated bus, with ampere ratings as indicated on the contract drawings. The horizontal bus shall be rated at 65 degrees C temperature rise over a 40 degree C ambient in compliance with UL standards. Vertical bus feeding unit compartments shall be copper and shall be securely bolted to the horizontal main bus. All joints shall be front-accessible for ease of maintenance. The vertical bus shall have an ampere rating as indicated on the contract drawings for front-mounted units and fully rated for incoming feeder amperes.
- B. The vertical bus shall be completely isolated and insulated by means of a labyrinth design barrier. It shall effectively isolate the vertical buses to prevent any fault-generated gases to pass from one phase to another. The vertical bus shall include a shutter mechanism to provide complete isolation of the vertical bus when a unit is removed.
- C. Isolation of the vertical bus compartment from the unit compartment shall be by means of a full height insulating barrier. This barrier shall be a single sheet of glass-reinforced polyester with cutouts to allow the unit stabs to engage the vertical bus. Provide snap-in covers for all unused openings.
- D. Buses shall be braced for 42,000 amperes rms symmetrical, and shall be braced for the higher current if the utility fault current is higher than 42kAIC.
- E. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.
- F. A copper ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the motor control center.

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- G. Each structure shall contain tin plated vertical ground bus rated 300 amperes. The vertical ground bus shall be directly connected to the horizontal ground bus via a tin-plated copper connector. Units shall connect to the vertical bus via a tin-plated copper stab.

2.4 WIRING AND TERMINATION

- A. Wiring shall be NEMA Class II, Type B.
- B. When Type B wiring is specified, all starter units shall be provided with unit control terminal blocks. Each compartment shall be provided with a minimum of 20 percent spare unused terminal blocks for future additions.
- C. Control circuit wiring shall be 14 AWG, MTW, 90 Degree Celsius rated. Control conductors shall be red uniquely labeled at each end. Foreign voltage conductors shall be yellow uniquely label at each end.
- D. Terminal blocks shall be the pull-apart type 600 volt and rated at 25 amps. All current carrying parts shall be tin plated. Terminals shall be accessible from inside the unit when the unit door is opened. Terminal blocks shall be DIN rail mounted with the stationary portion of the block secured to the unit bottom plate. The stationary portion shall be used for factory connections, and shall remain attached to the unit when removed. The terminals used for field connections shall face forward so they can be wired without removing the unit or any of its components.
 - 1. When Type C wiring is specified, all starter units shall be provided with unit control terminal blocks as described for Type B wiring. An additional set of identical terminal blocks shall be provided in a terminal compartment located in each section. These terminal blocks shall be pre-wired to the unit terminals so that all field control connections can be made at the terminal compartments.
- E. Provide 25 Percent spare terminal blocks and termination capacity for each compartment.

2.5 ENCLOSURES

- A. The complete assembly shall be rated NEMA 4x for possible flooding.
- B. The type of enclosure shall be in accordance with NEMA standards for type 4x non-walk-in. All enclosing sheet steel, wireways and unit doors shall be gasketed.
- C. Provide Pump Control Panel Section in conformance with Section 13340.

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2.6 MCC CONSTRUCTION

- A. The Motor Control Center enclosure shall be NEMA 4x.
- B. Each MCC shall consist of one or more vertical sections of heavy gauge steel bolted together to form a rigid, free-standing assembly. A removable structural steel lifting angle shall be mounted full width of the MCC lineup at the top. Removable bottom channel sills shall be mounted underneath front and rear of the vertical sections extending the full width of the lineup. Vertical sections made of welded side-frame assembly formed from a minimum of 12 gauge steel. Internal reinforcement structural parts shall be of 12 and 14 gauge steel to provide a strong, rigid assembly. The entire assembly shall be constructed and packaged to withstand normal stresses included in transit and during installation.
- C. Structures shall be totally enclosed deadfront, free-standing assemblies. They shall be 90 inches high and 21 inches deep for front-mounted units. Structures shall contain a horizontal wireways at the top and bottom, isolated from the horizontal bus and shall be readily accessible through a hinged cover. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference.
- D. Each standard section shall have all the necessary hardware and bussing for modular plug-in units to be added and moved around. All unused space shall be covered by hinged blank doors and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters.
- E. Compartments for mounting control units shall be incrementally arranged and mounted within each vertical structure. Guide rails shall be provided for each drawout compartment.
- F. A vertical wireway shall be provided in each MCC section that accepts modular plug-in units. The vertical wireway shall connect with both the top and bottom horizontal wireway and shall be isolated from unit interiors by a full height barrier. Access to the wireways shall not require opening control unit doors. The vertical wireway shall be adjacent to each vertical unit and shall be covered by a hinged access door. The vertical wireway shall be a minimum of 4 inches wide.

2.7 COMPARTMENTS

- A. All full voltage starter units through NEMA Size 5 shall be of the drawout compartment type. Drawout provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus.

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Drawout units shall have a tin-plated stab assembly for connection to the vertical bus. No wiring to these stabs shall extend into the bus compartment.

- B. Interior of all units shall be painted white for increased visibility. Units shall be equipped with side-mounted, positive latch pull-apart type control terminal blocks rated 600 volts. Knockouts shall be provided for the addition of future terminal blocks. In addition, a master terminal block, when Type C wiring is specified, shall be drawout and shall be located in the top wireway, readily accessible through a hinged cover.
- C. All drawout units shall be secured by a spring-loaded quarter turn indicating type fastening device located at the top front of the unit. Each unit compartment shall be provided with an individual front door.
- D. All conducting parts on the line side of the unit disconnect shall be shrouded by a suitable insulating material to prevent accidental contact with those parts.
- E. The plug-in unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.
- F. An operating mechanism shall be mounted on the primary disconnect of each starter unit. It shall be mechanically interlocked with the unit door to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect. A second interlock shall be provided to prevent removal or reinsertion of the unit while in the ON position.
- G. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one (1) to three (3) padlocks with the door open or closed. In addition, means shall be provided to padlock the unit in a partially withdrawn position with the stabs free of the vertical bus.

2.8 CONTROL EQUIPMENT

- A. The control panel shall be an integral part of the Motor Control Center furnished by the CSS. The control panel shall be factory wired and tested with the MCC as a complete system at the CSS facility.
- B. Control panel fabrication, wiring and assembly shall be in accordance with Section 13340.
- C. Control components shall be provided in accordance with Section 13340.

2.9 UTILITY METERED AND NON-METERED POWER DISTRIBUTION PANELS

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A. General

1. Where indicated on the drawings, furnish a separate barriered-off utility metering compartment complete with hinged sealable door. Bus work shall include provisions for mounting utility company current transformers and potential transformers or potential taps as required by the utility company. Provide service entrance label and necessary applicable service entrance features per NEC and local code requirements.
2. Utility metering section shall be manufactured per EUSERC standards and guidelines and in conformance with the City and County requirements.
3. Switchboard shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides and rear shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide adequate ventilation within the enclosure.
4. All sections of the switchboard shall align at the rear with depth as shown on the drawings. All protective devices shall be compartmentalized with line and load bus connections. Devices shall be front removable and load connections rear accessible. Insulated rigid copper bus connections shall extend from the load side of overcurrent feeder devices into rear compartment where outgoing cable connections may be made without reaching into or near the main horizontal or vertical buses. Distribution sections shall be sectionalized to provide a front device section, an intermediate bus section and a feeder cable section. There shall be a vertical barrier of glass polyester between the device compartment and the bus compartment.
5. The assembly shall be provided with adequate lifting means.
6. Provide a rear compartment vertical insulating barrier between the cable compartment and the main bus to protect against inadvertent contact with main or vertical bus bars.
7. The switchboard shall be suitable for use as service entrance equipment and be labeled in accordance with UL requirements.

B. Meter Section

1. The electric service meter compartment shall be arranged as shown to meet the electric utility company requirements. A dedicated metering

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section shall be provided with a meter base, test perch with test by-pass and other materials, as required by the serving electric utility, for installation of metering equipment and attachment of service conductors.

2. The enclosure shall be provided with an isolated service pull section with removable cover for access to the service entrance conductors. A protective guard over power company watt-hour meter with hinged access cover that has a hasp for utility company padlock shall be provided. The pull section and utility compartments shall be accessible only by the utility company.
3. The service shall be provided as indicated on the Contract Drawings. Incoming lugs shall be provided as required by the serving utility. A neutral bar and ground bus shall be provided in the service equipment. Screw type lugs shall be provided for connection of equipment grounding conductors. Provide wire and lugs for service entrance as required by utility company.

C. Power Distribution Section

1. The power distribution section shall be provided with a Main Circuit breaker, Feeder Breakers and Branch Circuit Breakers, and components as indicated on the contract drawings.

D. Generator Receptacle

1. Where indicated, Generator feed cables shall be terminated on a watertight plug connector with matching receptacle for a portable generator connection.
2. Plug/receptacle assembly shall be watertight with neoprene covered housing with $\frac{3}{4}$ turn pin and groove threads. A neoprene protective sleeve with worm gear driven stainless steel clamps shall protect the connection housing and terminal area.
3. Connection point shall be provided with molded O-ring with bronze contacts bonded to a molded body.
4. Connector assembly shall be 3 conductor, with ground terminal and two pilot circuit connections.
5. Plug and receptacle shall be provided with a watertight cap when disconnected.

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6. Plug and receptacle assembly shall be Crouse Hinds, Quik-Loc series, or approved equal as required to mate with the assigned portable generator.
- E. Main Circuit Breaker
1. Main Circuit Breaker (MCB) and Standby Generator Circuit Breaker shall be provided with the number of poles and current ratings indicated on the contract drawings. Protective devices shall be molded case circuit breakers with inverse time and instantaneous tripping characteristics.
 2. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
 3. Distribution and Generator Circuit Breakers shall be provided with a mechanical slide bar interlock preventing both breakers from being closed at the same time, Kirk Key or approved equal. Utility circuit breaker lock-off shall be independent of the mechanical interlock for generator applications. For distribution/standby generator circuit breakers rated greater than 600 amperes, provide additional electrical interlock controls, using power receptacle auxiliary switch and Kirk Key, MD Series, Type S, contacts.
 4. Circuit breakers 400 amps and greater shall be solid state adjustable circuit breakers with adjustable Long (L), Short (S), Instantaneous (I) Current and Delay settings for breaker coordination with upstream devices.
 5. Provide Ground Fault Protection for all Circuit Breakers rated 600 amps and greater.
 6. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings.
 7. Circuit breakers shall be Cutler-Hammer Series C, GE or approved equal.

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F. Feeder Circuit Breaker (FCB)

1. Feeder Circuit Breakers shall be provided with the number of poles and current ratings indicated on the contract drawings. Protective devices shall be molded case circuit breakers with inverse time and instantaneous tripping characteristics.
2. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
3. Feeder Circuit breakers 400 amps and greater shall be solid state adjustable circuit breakers with adjustable Long (L), Short (S), Instantaneous (I) Current and Delay settings for breaker coordination with upstream devices.
4. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings.
5. Circuit breakers shall be Cutler-Hammer Series C, GE or approved equal
6. Circuit breakers supplied shall be cable of adjustment or shall be factory adjusted to produce a coordinated system at Main, Feeder and Branch levels such that tripping is as close to the fault as possible and does not occur upstream of the breaker that is supposed to trip. Selection shall be the result of the required coordination study.

2.10 COMBINATION MOTOR STARTER AND BYPASS CONTACTOR UNITS

A. General

1. All combination starters shall utilize a unit disconnect as indicated on contract drawings. Magnetic starters shall be furnished in all combination starter units. All starters or bypass contactors shall utilize NEMA rated contactors. Starters and contactors shall be provided with a three-pole, external manual reset, overload relay for the type of thermal overload indicated.
2. Control power transformers (CPT) shall include two primary protection fuses and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all

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connected control circuit loads. The transformer rating shall be fully visible from the front when the unit door is opened.

3. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation. One (1) spare NO and one (1) spare NC contact shall be provided above that which indicated on the contract drawings.
4. Combination motor starters shall be full-voltage non-reversing (FVNR), or as indicated on the Contract Drawings.
5. Provide each starter compartment with an adjustable Motor Circuit Protector (MCP), Motor Starter, Overload and associated control components as indicated on the contract drawings.
6. Each combination unit shall be rated 42,000 AIC symmetrical at 480V.
7. Provide a mechanical interlock on reversing or multispeed contactors of the lever-type mechanism in addition electrical interlocking contacts to prevent closing of one contactor when the other is closed.

B. Motor Circuit Protector

1. The MCP shall provide adjustable magnetic protection and be provided with pin insert to limit magnetic adjustment to a maximum of 1700% motor nameplate full load current to comply with NEC requirements. All MCP combination starter units shall have a "tripped" position on the unit disconnect and a push-to-test button on the MCP. Type MCP motor circuit protectors shall include transient override feature for motor inrush current.

C. Motor Starters and Bypass Contactors

1. Provide motor starters and contactors of the electromechanical type with the coil controlled by an application-specific microprocessor (PLC).
2. Provide an application-specific microprocessor with the following features:
 - a. Microprocessor shall measure control circuit voltage and prevent closing of the coil on voltages below 78V AC and/or voltages above 135V AC.

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- b. Microprocessor shall apply voltage to the coil such that a guaranteed maximum of two (2) milliseconds of main contact bounce occurs on contactor closure.
- D. Microprocessor shall continuously measure coil circuit voltage and current so as to maintain constant coil power at a level to maintain main contact closure and minimize coil power consumption.
- E. Provide electronic circuitry that isolates the coil and is isolated from surges.
- F. Microprocessor shall wait for three (3) half-cycles of control start signal prior to activating a close to prevent starts resulting from momentary voltage spikes, switching transients, fluttering contacts, and shorted programmable logic control outputs. The phase angle of the power in the control circuit is to be compared with the phase angle of the input start signal to prevent starts resulting from capacitively coupled or inductively coupled signals.
- G. Motor starter shall be designed to accommodate two (2) auxiliary contact blocks, each capable of a combination of up to four (4) normally closed or four (4) normally open auxiliary contacts. Contacts to be color-coded; black designating NC and silver designating NO.
- H. Auxiliary contacts shall be rated ten (10) amperes continuous, 7200 VA make, 720 VA break for 120 through 600V AC, and 69 VA make and break for 125 through 300V DC. Provide a minimum of one (1) spare NO contact and one (1) spare NC contact in addition to any auxiliary contacts required and indicated on the Contract Drawings.
- I. Solid State Overload Relay
 - 1. Solid state overload relay (SSOR) shall be self-powered with current sensing accurate to 2% for each phase to provide motor running overload protection that yields a time-current curve closely paralleling that of the respective motor heating damage boundary. Running overload protection shall be DIP switch selectable for the specific motor full load amperes.
 - 2. Provide DIP switch selectable overload trip class of 10, 20 and 30.
 - 3. Provide phase loss protection and phase unbalance protection. If the phase unbalance on any of two phases is greater than 30% of the DIP switch selected trip rating, a phase loss/unbalance trip occurs.

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4. Provide ground fault protection set at 20% of maximum continuous ampere rating with a start delay of 17 seconds, and a run delay of 0.4 seconds to prevent nuisance tripping on startup.
5. Provide a reset and trip indicator for remote mounting. Reset and trip indicator pushbutton. Reset and trip indicator shall have overload alarm indication and trip indication.
6. Provide a bell alarm module with two (2) NO and one (1) NC contact rated five (5) amperes continuous, 120 volts, 2880 VA make and 480 VA break.
7. SSOR shall provide:
 - a. Manual or automatic reset
 - b. Test button that operates the normally closed contact
 - c. Test trip function that trips both the NO and NC contacts
 - d. Ambient temperature compensated
 - e. Jam/Stall protection. Relay shall trip at 400% of full load ampere setting, after inrush.
 - f. The overload relay shall be modular in design, be an integral part of a family of relays to provide a choice of levels of protection, be designed to directly replace existing electromechanical overload relays, and be listed under UL Standard 508.

J. Controls

1. Each starter compartment shall be equipped with a fused control power transformer (CPT) sized to meet the control system power consumption requirements plus and additional 50%.
2. Indicating lights and operator switches shall be installed as indicated on the contract drawings. A device panel shall have space to accommodate six (6) oiltight pilot-control devices or indicating ammeters, voltmeters, or elapsed time meters.
3. Relays, times and control components shall be provided as indicated on the Contract Drawings.

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4. Control components shall be provided as specified in Section 13340.

2.11 VARIABLE FREQUENCY DRIVE

- A. Variable Frequency Drive (VFD) shall be provided where shown on the contract drawings. The VFD starter shall be UL and CSA listed in the motor control center.
- B. VFD units shall be provided as specified in Section 16484.

2.12 CIRCUIT BREAKERS

- A. Circuit Breakers
 1. Individual feeder breakers shall have a minimum interrupting capacity of 42 kAIC at rated voltage. This rating shall be increase if available fault current is higher.
 2. Main Circuit Breaker shall be provided with an adjustable trip unit for Long, Short and Instantaneous settings.
 3. Circuit breakers 400 amps and greater shall be provided with adjustable trip units for long, short and instantaneous adjustments. Provide Adjustable ground trip for all breakers 1000 amps.
 3. Provide ground fault trip for breakers less than 1000 amps as indicated on the contract drawings.
 4. Provide the breakers necessary to produce a coordinated system.

2.13 INCOMING FEEDER TERMINATIONS

- A. Incoming cables shall terminate within the control center on a main lug or main breaker termination point. Main lug terminations shall have adequate dedicated space for the type and size of cable used and the lugs shall be compression-type with antiturn feature. Main breakers shall be provided as indicated on the drawings and shall be molded case.

2.14 NAMEPLATES

- A. Each unit will have a 1.0 x 2.5-inch engraved nameplate. The lettering shall be black 3/16-inch high, on a white background.

2.15 FINISH

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- A. The control center shall be given a phosphatizing pretreatment. The paint coating shall be a polyester urethane, thermosetting powder paint. Manufacturer's standard color shall be used.
- B. The control center finish shall pass 600 hours of corrosion-resistance testing per ASTM B 117.

PART 3 – EXECUTION

3.1 MANUFACTURER FACTORY TESTING

- A. The motor control centers shall have been tested in a high-power laboratory to prove adequate mechanical and electrical capabilities.
- B. All factory tests required by the latest ANSI, NEMA and UL standards shall be performed.
- C. A certified test report of all standard production tests shall be available to the Engineer upon request.
- D. Factory tests as outlined above shall be at the discretion of the owner, witnessed by the owner's representative.
- E. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed.

3.2 SYSTEM FACTORY TEST

- A. A complete and comprehensive factory test shall be conducted by the CSS at the CSS facility.
- B. Completed MCC, Power Distribution and Control Panel assembly shall be factory tested at the CSS facility per the requirements of Section 13330.

3.3 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the contractor in installation and startup of the equipment specified under this section. The manufacturer's representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

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- B. The following minimum work shall be performed by the Contractor under the technical direction of the manufacturer's service representative:
1. Rig the MCC assembly into final location and install on level surface.
 2. Check all removable cells and starter units for easy removal and insertion.
 3. Perform insulation tests on each phase and verify low-resistance ground connection on ground bus. Submit test forms for review prior to start-up of the MCC panel.
 4. Connect all power wiring and control wiring and verify basic operation of each starter from control power source.
 5. Torque all bolted connections made in the field and verify all factory bolted connections. Only tighten each connection – do not loosen any. Mark each checked connection with a permanent colored marker.
 6. Calibrate any solid-state metering or control relays for their intended purpose and make written notations of adjustments on record drawings. Perform startup of any solid-state starters and adjustable frequency drives.
 7. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.4 MANUFACTURER'S CERTIFICATION

- A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations. Equipment shall be inspected prior to the generation of any reports.
- B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.5 TRAINING

- A. The Contractor shall provide a training session for up to five (5) owner's representatives for one (1) normal workdays at the jobsite or other office location chosen by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative.
- C. The training program shall consist of the following:

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1. Review of the MCC one-line drawings and schedules
2. Review of the factory record shop drawings and placement of the various cells
3. Review of each type of starter cell, components within, control, and power wiring
4. Review contactor coil replacement and contact replacement procedures.
5. Discuss the maintenance timetable and procedures to be followed in an ongoing maintenance program.
6. Provide three-ring binders to participants complete with copies of drawings and other course material covered.

3.6 EXAMINATION

- A. Installing Contractor to fully inspect shipments for damage and report damage to manufacturer and file claim upon shipper, if necessary.
- B. Overload relay heater ratings must be properly sized and coordinated for each motor starter unit.
- C. Installing Contractor to verify NEC clearances as dictated on the contract drawings prior to installation. Verify UL labeling of the assembly prior to installation.

3.7 INSTALLATION

- A. Contractor to follow the installation instructions supplied by the manufacturer.
- B. Control wiring shall be as shown on the contract drawings except as modified by the approval and submittal process. Interface all local and remote devices into the control wiring and operational systems for each load
- C. All SWB and MCC, etc. anchors shall be installed – none shall be skipped. Holes for anchors shall be marked, drilled and cleaned prior to setting the equipment in place. NO HOLES SHALL BE DRILLED FROM WITHIN THE EQUIPMENT..

3.8 FIELD ADJUSTMENTS

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- A. Follow the manufacturer's instructions, field operational requirements and the contract documents concerning any Motor Circuit Protection, short-circuit device, heater selection, solid state overload, Solid State Components and timing relay adjustments at the time of startup.
- B. Modify adjustments as required to meet final site operational requirements.

3.9 FIELD TESTING

- A. Follow the minimum requirements as stipulated in the NETA testing procedure for this type of motor control center assembly.
- B. Generate a field report on tests performed, test values experienced, etc., and make available to owner upon request.

****END OF SECTION****

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16484: VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. This section provides specification requirements for pre-engineered, free-standing Heavy Duty Variable Frequency Drives (VFDs) for use with NEMA B design AC motors.
- B. The VFD panels shall be designed and fabricated to meet Cal Am requirements and standards. Cal Am will review submittals to confirm strict compliance with Cal Am standards, control options, and panel features.
- C. The VFD unit manufacturer shall furnish, field test, adjust and certify all installed VFD units for satisfactory operation. The VFD shall be mounted in a full height, painted steel panel, NEMA 12 enclosures.
- D. The Contractor shall install VFDs on platform supports as indicated on the drawings. The Contractor shall furnish all installation services and materials to install the VFD's as specified in Division 16.
- E. Contractor shall provide Ethernet card, integrated with VFD controls, to allow full network control of the VFD as required, as well as full manual control.
- F. Generators: in the proposal, provide generator characteristics, sizing, and essential requirements that are necessary for:
 - 1. AFE drives
 - 2. 6-Pulse Width Modulation drives.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Contract Documents are a single integrated document, and as such all Divisions and Sections apply. It is the responsibility of the CONTRACTOR and its Sub-Contractors to review all sections to insure a complete and coordinated project.
- B. Section 16010 – Electrical General.
- C. Unit Responsibility: drive manufacturer shall coordinate with the pump and motor manufacturers to ensure that the selection of the motor is compatible with the VFD drive.
- D. All work shall comply with American Water technical specifications.

1.3 DEFINITIONS

- A. Definitions: Definitions of terms and other electrical considerations as set forth in the:
 - 1. National Electrical Code.

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2. Institute of Electrical and Electronic Engineers, standard 519-1992.
3. Instrument Society of America.
4. National Fire Protection Association.

1.4 SYSTEM DESCRIPTION

A. Environmental

1. In accordance with Section 16010, for damp indoor mounted, NEMA 12 enclosures.

B. Power Source

1. Standard commercial utility secondary power.
 - a. Voltage Levels – nominal 480V, 3 phase.
 - b. Available fault current: shall be suitable for the rating of the switchboard, devices in the panelboards feeding the VFDs, or suitable remediation such as changing the required kAIC rating of equipment shall be taken.
2. Standby Power: It is the intent of Cal Am to utilize portable generators when utility power is unavailable. Drive manufacturer shall describe in the proposal what generator requirements are needed to avoid AFE drive/generator tripping due to reactive currents in the L-C-L filter capacitors. Drive manufacturers shall describe in the proposal how the drive vendor has resolved this specific issue, and any other current issues with AFE drives in use with portable generators.

C. Equipment:

1. As indicated on the Drawings.
2. Spare Parts: The proposal shall include the following spare parts for each drive:
 - a. 3 Fuses
 - b. 1 Bridge Rectifier Kit
 - c. 1 Base Driver/Power Supply PCB Kit
 - d. 1 Main Control PCB Kit
 - e. 1 pre-charge PCB Kit
 - f. 1 pre-charge Switch Kit
 - g. 1 Surge Suppressor Kit
 - h. 1 Transistor Kit
 - i. 5 of each type/color Pilot Light Bulbs with special tool to remove bulb
 - j. 4 Fuses for each type and size utilized

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3. The drive manufacturer shall certify in the proposal that:
 - a. the service center is within 4 hours travel time of Monterey, CA.
 - b. response time shall be within 72 hours from notice by Cal Am when service is requested,
 - c. provide per diem charges for an authorized factory technician to repair the drive
 - d. price list of major components with the proposal
 - e. Drive manufacturer to provide confirmation of acceptance of these criteria.
- D. Manufacturer coordination requirements:
 1. It is the responsibility of the Manufacturer to coordinate the drive with the motor and the installed cable length to ensure that no damage can occur to the motor as a result of standing waves, high carrier frequency, high levels of dV/dt, etc. Features that may be required to protect motors against EDM damage to bearings include insulated bearings, shaft grounding, filtering, etc. Motors shall be inverter duty rated per latest NEMA published specifications.
 2. The manufacturer shall coordinate the connection requirements and equipment ratings between the pump supplier, motor supplier and Contractor to insure a complete and operable VFD system compatible with the equipment being controlled.

1.5 SUBMITTALS

- A. Contractor shall provide a minimum of two drive manufacturers for the proposal. One of the drive manufacturers shall be Allen Bradley/Rockwell Automation. Contractor shall provide two different drive options:
 1. Pulse width modulation (PWM) drive with harmonic mitigation, and
 2. Active Front End (AFE) drive with harmonic mitigation.
- B. Furnish complete submittals in accordance with Section 16010.
 1. Submittals shall be custom prepared by the VFD manufacturer for this specific application.
 2. Submittals shall include bypass contactor and thermal overload protection information.
 3. Submittal information shall be included with electrical submittal data.
- B. Submittal information shall include, but not be limited to:
 1. Equipment dimensions.

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2. Catalog cuts of major components.
3. Spare parts list, per paragraph 1.11 of this Section.
4. Certifications, including:
 - a. Certification statement stating that the VFD, Motor, and Driven equipment constitute a fully and completely matched system for the application and the installed conditions.
 - b. Power Factor shall be stated in the proposal. Provide power factor of the drive at half and full-load for both drive types. The drive shall present a displacement power factor of 0.95 or better to the AC line at any speed or load.
5. Complete wiring and interconnection drawings.
6. Confirmation that the drive is sized for the full motor horsepower, at minimum, and for the installed altitude and for 50°C ambient temperature.
- C. Operations and maintenance manual
 1. Complete English language narrative describing operation, set-up, start-up, and trouble shooting of drive.
 2. Complete wiring diagrams.
 3. Complete parts list.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements
 1. Local Laws and Ordinances.
 2. State and Federal Laws.
 3. NFPA-70, National Electric Code.
 4. American National Standards (ANSI).
 5. National Electrical Manufacturers Association (NEMA).
 6. Institute of Electrical and Electronics Engineers (IEEE).
 7. Listings and labeling: Drive assembly shall be UL listed and inspected with label.

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- B. The VFD system shall be factory assembled and system tested to assure a properly coordinated system.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Variable Frequency Drives shall be protected from the elements during storage, and must be stored indoors in dry heated areas.

1.8 PROJECT/SITE CONDITIONS

- A. Refer to Section 16010.

1.9 WARRANTY

- A. Variable Frequency Drive.
 - 1. Provide a full warranty that shall cover all parts and labor needed to replace any and all components in the variable frequency drive for a period of two years from complete and final acceptance of the total project.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable drive manufacturers:
 - 1. Allen-Bradley
 - 2. ABB.
 - 3. Eaton C-H
 - 4. Square D

2.2 EQUIPMENT

- A. The VFD system, in order to meet the requirements of these specifications, shall consist of: 5% line reactor, converter (rectifier) section, output inverter, load reactor/filter (for non-inverter rated motors), and control logic section. All components listed including reactors shall be integral to the VFD, factory wired and tested as a complete system.
- B. Drive Cabinet Design: the design of the drive unit shall have the transformers fully separated from and above the VFD drive components. An alternative is to have the transformer placed in a separate enclosure next to the drive components.

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- C. Input circuit breaker will be located in the power distribution panel that is supplying power to the VFD panel, as indicated on the plans.
- D. Input voltage unbalance of 5% shall not cause the VFD to go off-line on fault – it shall continue to convert incoming power and drive the motor with balanced output voltage. Only when power supply ripple, rectifier operating currents or heatsink temperature are approaching limits shall the VFD turn off on a fault.
- E. VFD system shall maintain a 0.95 minimum true power factor throughout the entire speed range.
- F. The VFD system shall be designed to operate a motor at a distance of up to 100 feet. If required in the plans, the VFD supplier shall furnish all equipment and make the necessary adjustments to the VFD system to operate the motor reliably at the indicated distance. For this project the expected feeder length from VFD to motor is ~50'.
- G. Contractor shall verify dv/dt filters & separation distance. The separation distance between the drive and pump motor is estimated to be less than 100 feet. Drive manufacturer shall include in the proposal: reasons why the dv/dt filter is or is not needed, and provide a chart of separation distance vs. magnitude of the voltage spike.
- H. PWM drive selection: Rockwell Automation/Allen Bradley is one of the drive manufacturers, who is being considered for the drive. The drive manufacturer shall provide in the proposal the following information
 1. PWM heavy-duty AC drive, temperature rating of 50°C or derate the drive if desired temperature rating is unavailable
 2. Frame size
 3. NEMA 12 enclosure
 4. Output amps continuous, 1 min, 3 sec
 5. HP for heavy duty application
 6. Catalog No.
 7. Provide product data sheets in the proposal as necessary to evaluate the drive type
- I. Harmonic Mitigation: Drive manufacturers are required to complete a harmonic study, and to provide harmonic mitigation as required to meet IEEE 519. More than 75% of the total connected load is non-linear load from the drive. The proposed harmonic reduction equipment shall be described fully in the proposal. The maximum allowable total demand distortion (TDD) is 5% for these drives. TDD shall be less if needed for the drive to properly perform.
- J. Power System Analysis: drive manufacturer shall provide a power system analysis during preliminary design. This analysis shall be included as part of the submittals for the drive during construction submittals review.

2.3 COMPONENTS

- A. Variable Frequency Drives

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1. General:
 - a. Industrial/Heavy Duty rated for 50°C ambient location.
 - b. Insulated Gate Bipolar Transistor (IGBT) Drive, 6 pulse.Free standing enclosure, mounted to access platform.
 - c. Minimum of 7 preset speeds.
 - d. Voltage or Current input signal control.
 - e. Ground fault protection.
 - f. Continuous duty, 24 hours per day, 7 days per week.
2. Operator interface.
 - a. Drive/door mounted.
 - b. Hand held operation.
 - c. 2-line x 16- character backlit LCD display.
 - d. Scalable units of measure.
- 3.Minimum integral protection furnished with the drive:
 - a. Under and overvoltage protection.
 - b. Output phase-to-phase short circuit.
 - c. Output phase to ground.
 - d. I²T motor overload protection.
 - e. Drive thermal protection.
- 4.Control outputs:
 - a. Minimum of four programmable discrete dry contact outputs.
 - 1) Drive running.
 - 2) Drive failed.
 - 3) Auxiliary Output (Programmable)

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4) Auxiliary Output (Programmable)

b. Minimum of two programmable analog isolated 4-20 mA output.

1) Drive output speed.

2) Drive output speed.

5. Control Inputs:

a. Minimum of eight programmable inputs

1) Drive Start/Stop Input Source A

2) Drive Start/Stop Input Source B

3) Speed Source A or B Select

4) Drive Shutdown/Stop

5) Drive Reset

6) Auxiliary Input

7) Drive Hand Control (Local Panel Operator Speed Select)

b. Minimum of two analog 4-20 mA analog inputs

1) Speed Source A Control

2) Speed Source B Control

6. Input specifications, unless otherwise indicated on the Drawings:

a. Three Phase 480 VAC.

b. Frequency: 60 Hz.

c. Power interruption ride through: 15 msec.

d. Harmonics: Comply with IEEE 519 at the point of common coupling.

7. Output specifications:

a. Voltage: Fully programmable from 0 to nominal input voltage.

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- b. Frequency range: 0-60 Hz. Operating range estimated to be 40 to 60Hz for the connected load.
- c. Frequency resolution: 0.01 Hz.
- d. Continuous current: 100% of rated current.
- e. Intermittent Current: 150% of rated current for 60 seconds.
- f. Current trip: 200% of rated current.

8. Drive adjustments

- a. Accel/Decel Time: 0.0-3600 Seconds in 0.1 second Increments.
- b. Accel/Decel Type: Linear or S-ramp.
- c. Minimum frequency: 0 to 50 Hz.
- d. Maximum frequency: 30 to 60 Hz.
- e. Stop mode: Coast/ramp/DC Brake to Stop.
- f. Current Limit: 20 to 150%.
- g. Motor overload: 20 to 115%.
- h. DC Boost: 0-25% of input voltage.
- i. Adjustable Start Delay

9. Audible Noise

- a. The VFD shall have a PWM carrier randomizing scheme to reduce drive whine to below the normal acoustical noise level of the motor and pump combination without the loss of efficiency caused by a high carrier frequency. Raising the carrier frequency in an effort to reduce acoustic noise at the expense of efficiency and excessive motor winding temperature is no longer acceptable..

10. Ambient operating temperatures

- a. NEMA 12 enclosure: 0-50°C.

11. Control Scheme:

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- a. As indicated in Division 13 and as shown on the P&IDs and/or control drawings.

12. Drive Options

- a. Provide the following options/modifications to the VFD. All special features shall be factory mounted and wired within the VFD enclosure unless otherwise specified.

- (1) Dual port Ethernet card for daisy-chain of Ethernet communication scheme.

- (2) Device level ring function

- (3) Input EMI/RFI filter

- (4) Output EMI/RFI filter

- b. No bypass is required.

13. Manufacturer coordination requirements:

- a. It is the responsibility of the Manufacturer to coordinate the drive with the motor and the installed cable length to ensure that no damage can occur to the motor as a result of standing waves, high carrier frequency, high levels of dV/dt , etc. Any changes such as insulated bearings or shaft grounding bushings that may need to be made in order to protect the equipment shall be made by the Manufacturer at no additional costs to the OWNER.

2.4 MOTOR PROTECTIVE UNIT

- A. As shown on the contract drawings, each VFD shall be provided with an integrally mounted SEL 849 motor protective unit (MPU).
- B. MPU shall be installed in VFD panel and wired to current and potential circuits. Contractor shall program the MPU based on final criteria from Owner.
- C. Monitoring and Reporting shall include motor start reports, motor start trends, load profile monitoring, motor operating statistics, and event summaries. Metering capabilities for real-time current, voltage, harmonic currents and voltages, frequency, power, power factor, energy quantities, maximum and minimum quantities, and demand and peak demand current values.
- D. Automation functions shall include eight remote control logic points, eight latching logic points, eight counters, eight math variables, eight logic variables, and eight timers, with control equations capability for logic and control. Communications/Integration protocols shall include Modbus RTU, Telnet, HTTP, HTTPS, FTP, SNTP, Modbus TCP, and IEC 61850. Outputs shall include at least one EIA 232 or EIA 485 port and one 10/100BASE T copper Ethernet port.

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2.5 ACCESSORIES

- A. As required to meet the operation as defined by the P&IDs, control wiring schematics, electrical single lines and loop descriptions.

2.6 SPARE PARTS

- A. Provide the following spare parts for each size and type of drive system:
 - 1. Controller Board
 - 2. Driver Output Board
 - 3. Input Diode Bridge
 - 4. Fuses
 - 5. Option Card (I/O, Communications)

PART 3 – EXECUTION

3.1 CONFIGURATION

- A. The drive controller shall be programmed and configured to meet the project requirements prior to factory testing. The VFD inputs and outputs shall be programmed to perform the desired functions as indicated on the control wiring diagrams and referenced in the sequence of operation.
- B. The drive shall be programmed to operate the motor at the indicated load for the type of drive unit utilized.
- C. The drive shall be programmed such that when it is switched to manual control via a panel H-O-A switch, the drive speed is controlled by the local operator interface panel.

3.2 SOURCE QUALITY CONTROL

A. Variable Frequency Drives, Factory Testing.

- 1. Component tests.
 - a. Incoming inspection of components and raw materials based on strategic supplier base and experience. Sampling plans based on MIL STD 105E.
 - b. MIL STD 45662 calibration system.

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- c. All products subject to 100% testing and final inspection; no sampling plans permitted.

B. Variable Frequency Drives, Factory Testing.

1.Component tests.

- a.All components shall be 100 percent tested.
- b.All printed circuit boards shall be burned-in continuously for 50 hours at 50 °C.
- c.The printed circuit boards shall be tested after burn-in to insure proper performance, with specified tolerances.
- d.Control power shall be applied to microprocessors, printed circuit boards, diagnostic boards, and similar devices including software to test for proper operation, sequencing, logic and diagnostics.
- e.All wiring shall be checked for continuity and for compliance with the wiring diagrams.

2.System tests.

- a.Testing shall proceed in the order as follows:
 - b.Motor test.
 - 1) The VFD and a representative motor shall be tested with the system logic and a dynamometer load to simulate field operation conditions at 25, 50, and 100 percent full load current.
 - c.Load test.
 - 1)After the motor test is complete, the VFD shall be load tested in a heated room maintained at 40°C for 24 hours. The motor shall be loaded at 100 percent full load current for 6 hours.
 - (a)The motor and dynamometer need not be in the elevated temperature room with the VFD.

3.3 INSTALLATION

- A.Furnish all cables, conduit, lugs, bolts, expansion anchors, sealants, and other accessories needed to completely install the VFD for the line, load and control connections.

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- B. Assemble and install the VFD in the locations and with the layouts shown on the Drawings and in complete conformance with the manufacturer's recommended procedures.
- C. Furnish all components, drills, tools, etc., as required to complete the installation.
- D. Replace any hardware lost or damaged by the installation or handling to provide a complete installation.
- E. Provide openings in bottom of the VFD for conduit only, no additional openings will be allowed.
 - 1. Mis-cut holes will require that the entire vertical bay or removable panel be replaced. No hole closers or patches will be allowed.
- F. Bundle circuits together and terminate in each unit.
 - 1. Tie with nylon wire ties. Refer Section 16120.
 - 2. Power conductors from VFD to PUMP motor shall be shielded VFD cable. See Section 16120 and cable schedule.
 - 3. Label all wires at each end with wire numbers shown on the approved control drawings.
 - 4. All connections to and from the VFD enclosure must be made via dedicated field terminal blocks.
 - 5. Wire SEL 849 motor protective unit to SCADA panel for monitoring, trending and archiving.
- G. Furnish all mounting brackets, stands, etc. that may be required to physically mount the VFD.
- H. Tolerances
 - 1. Install the VFD so that it is plumb and level to within $\pm 1/16$ inch across its entire dimension.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer shall provide the services of a factory technician for installation coordination, start-up, technical assistance and training.
 - 1. Testing, checkout, and startup of the variable frequency drive equipment in the field shall be performed under the technical direction of the Manufacturer's Service Engineer.

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2. Adjust program and modify the drive as required based on the actual load and operational requirements in the field.
3. Under no circumstances are any portions of the drive system to be energized without authorization from the Manufacturer's Representative.

3.5 ADJUSTING

- A. Make all adjustments as necessary and recommended by the manufacturer, ENGINEER, or testing firm.

3.6 CLEANING

- A. Clean and vacuum all enclosures to remove all metal filings, surplus insulation, and visible dirt, dust, and other matter before starting system or energization of equipment.
- B. Do not use compressors or air blowers for cleaning.

3.7 DEMONSTRATION

- A. Demonstrate the operation to the OWNER's satisfaction.

3.8 PROTECTION

- A. Protect all equipment from damage or degradation after testing is complete until such time as the Project is substantially completed and accepted by the OWNER.

**** END OF SECTION ****

TECHNICAL SPECIFICATION
DIVISION 16: ELECTRICAL
16920: ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for electrical acceptance testing of electrical equipment and materials.
2. It is the intent of the tests described herein to assure that all electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.
3. Acceptance testing performed by equipment vendors at the point of manufacturer must conform to all requirements of this specification. Testing performed at the point of manufacture which conforms to generally accepted industry practices is also acceptable so long as adequate test result documentation is provided.
4. Equipment and devices provided under Division 13 shall meet Division 13 requirements and the following requirements.

B. Scope

1. All of the Acceptance Tests are required to be performed whether they are described in this Section or other applicable Sections. At a minimum, the following electrical systems are to be tested:
 - a. Service Entrance Section
 - b. Automatic Transfer Switch
 - c. Feeders
 - d. Surge Protective Devices
 - e. Grounding and Bonding System
 - f. Other systems as listed under Part 3 of this specification

C. Related Documents

1. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to the work of this section.
2. All work performed under this Section of the work is subject to all requirements contained under Section 16000 "General Electrical Requirements".
3. All Division 16 specifications for electrical equipment provided for this project that requires electrical acceptance testing.

1.02 REFERENCES

- A. NETA ATS – Acceptance Testing Specifications, 2013 Edition
- B. NFPA 70 – National Electrical Code, 2017 Edition
- C. Incorporated by reference all Codes, Standards, and Specifications referred to in the "APPLICABLE REFERENCES" section of NETA ATS-2013.

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1.03 DEFINITIONS

- A. NETA National Electrical Testing Association Inc.
- B. NEC National Electrical Code

1.04 SYSTEM DESCRIPTION

- A. Conditions
 - 1. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein including all labor, materials, equipment and incidentals necessary and required for Electrical Acceptance Testing.
 - 2. Following established procedures, equipment shall be energized after certification by the testing organization that the installation is satisfactory.
 - 3. Correct or replace any current-carrying circuit, electrical equipment, or system which is defective or grounded and correct all other troubles encountered by these tests. All defects, whether through faulty workmanship or materials furnished, shall be corrected under this Section at the Contractors expense.

1.05 SUBMITTALS

- A. Test Report Forms
 - 1. All test reports shall be submitted using NETA or approved similar format and, where appropriate, test forms. Reports shall be legible using permanent ink. Pencil is not acceptable.
 - 2. Provide for engineers review and approval a copy of each test form to be used on the project. No testing shall be started prior to approval of all test forms.
 - 3. All test reports shall include the following information:
 - a. Summary/Description of the Project
 - b. Description of equipment tested.
 - c. Description of the tests.
 - d. Test data and analysis of the data indicating whether the equipment passed or failed the test.
 - 4. All test data records shall include the following minimum requirements:
 - a. Equipment identification including tag numbers.
 - b. Humidity, temperature, and other conditions that may affect the results of the tests and/or calibrations.
 - c. Date of inspections, tests, maintenance, and/or calibrations.
 - d. Identification of the testing technician and their employer.
 - e. Indication of inspections, tests, maintenance, and/or calibrations to be performed and recorded.
 - f. Indication of expected results when calibrations are to be performed.
 - g. Indication of “as-found” and “as-left” results, as applicable.
 - h. Sufficient spaces to allow all results and comments to be indicated..

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B. Closeout Submittals

1. Provide one copy each to engineer and owner of all testing reports organized as follows:
 - a. Bind report in 3-ring binder(s).
 - b. Identify project name, description, testing organizations name, and submittal date on front face and back cover of binder.
 - c. Provide all test reports, organized by equipment tag number.
 - d. Separate different equipment numbers with colored or numbered tabs.
 - e. Provide an index/table of contents.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Any materials provided as part of the testing shall be new, unused, and in manufacturer's original packing.

2.02 TEST INSTRUMENT CALIBRATION

- A. Contractor performing the testing shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy for each test instrument calibrated.
- B. Contractor performing the testing shall maintain up-to-date instrument calibration instructions and procedures for each test instrument calibrated.
- C. It is preferred that instrument calibration accuracy be directly traceable to the national Institute of Standards and Technology (NIST).
- D. Instruments shall be calibrated in accordance with the following frequency schedule:
 1. Field instruments: Analog, 12 months maximum. Digital, 12 months maximum
 2. Laboratory instruments: 12 months maximum
 3. Leased specialty equipment: 12 months maximum.
- E. Dated calibration labels shall be visible on all test equipment.
- F. Records, which show date and results of instruments calibrated or tested, must be kept up to date.
- G. Calibrating standard shall be better accuracy than that of the instrument tested.

PART 3 - EXECUTION

3.01 QUALIFICATIONS

- A. It is preferred that the testing organization shall be an independent, third party entity which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems being evaluated. When

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such testing organization is used, it must meet the following requirements:

1. The testing organization shall be regularly engaged in the testing of electrical equipment, devices, installations, and systems.
 2. The testing organization shall use technicians who are regularly employed for testing purposes.
 3. The testing organization shall be a member of NETA or be able to prove qualifications equal to or better than required for membership in NETA.
 4. Submit appropriate documentation demonstrating that the testing organization meets the requirements listed above.
 5. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make a judgment on the serviceability of the specific equipment.
 6. Technicians shall be certified in accordance with ANSI/NETA ETT-2015, "Standard for Certification of Electrical Testing Personnel". Each on-site crew leader shall hold a current certification, Level III or higher, in electrical testing.
- B. Contractor may perform the electrical acceptance testing under the following conditions:
1. Contractor's personnel performing the testing and their testing equipment meets all other requirements of this specification.
 2. Written approval is received from engineer after review of testing personnel qualifications. At a minimum, contractor's testing personnel must have specific instruction on the testing instruments, accessories, and tests being performed and must be able to evaluate the test results.

3.02 NOTIFICATION

- A. Notify engineer and construction manager at least 14 days prior to testing so that they may be present during testing.

3.03 SAFETY AND PRECAUTIONS

- A. Safety practices shall include, but are not limited to, the following requirements:
1. Occupational Safety and Health Act OSHA
 2. Accident Prevention Manual for Industrial Operations, National Safety Council, Chapter 4
 3. Applicable State and Local safety operating procedures
 4. NETA Safety/Accident Prevention Program
 5. National Fire Protection Association –NFPA 70E
 6. ANSI Z244.1 American National Standards for Personnel Protection
- B. All tests shall be performed with apparatus de-energized except where otherwise specifically specified.

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- C. The testing firm shall have a designated safety representative on the project to supervise operations with respect to safety.

3.04 EQUIPMENT TESTING REQUIREMENTS

- A. The intent of this specification is not to duplicate testing performed at the point of manufacture or to impose additional burden on the contractor which does not benefit the project. The intent is to verify that electrical equipment has been securely fastened down, supported, and installed in accordance with the manufacturer's requirements. The intent is also to verify that all electrical connections are correctly torqued, properly aligned, properly insulated, and properly supported and that equipment is clean and ready for operation.
- B. Except as noted below or as approved by engineer, test the following equipment and assemblies in full accordance with NETA-ATS 2013.
- C. Cables, Low-Voltage, 600 Volt Maximum
 - 1. Perform tests only on cables size #4 AWG and larger.
- D. Circuit Breakers, Air, Insulated-Case, Molded-Case
 - 1. Perform visual and mechanical inspections in accordance with NETA for all circuit breakers.
 - 2. Perform electrical tests only on circuit breakers rated 100 amps or higher provided in power distribution and lighting/receptacle panelboards.
 - 3. No testing is required for circuit breakers provided as part of any of the following:
 - a. A UL listed control panel.
 - b. UL listed factory supplied motor control centers.
 - c. Stand-alone combination motor starters.

3.05 CONSTRUCTION

- A. Interface with Other Work
 - 1. Coordinate all testing activities with other disciplines. Retest any equipment disturbed or damaged in any manner after initial testing.

3.06 CLOSEOUT REPORT

- A. Provide comprehensive bound test report in accordance with Part 1 of this specification.

* * End of Section * *

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Appendix C-3

General Avoidance and Minimization Measures



Denise Duffy & Associates, Inc.

PLANNING AND ENVIRONMENTAL CONSULTING

Memorandum

DATE: April 10, 2020
TO: Cory Barringhaus, Environmental Science Associates
FROM: Matt Johnson, DD&A
CC: Tim O'Halloran, California America Water
Peter Taormina, Monterey Peninsula Engineering
Tyler Potter, J.D., AICP, DD&A
SUBJECT: Carmel Valley Pump Station NTPR-3: MM 4.6-1c General Avoidance & Minimization Measures

Monterey Peninsula Engineering (MPE), is currently contracted with California America Water (CalAm) to construct the Carmel Valley Pump Station (Project), a component of the Monterey Peninsula Water Supply Project. The purpose of the following memorandum is to document how the Project will comply with the requirements of Mitigation Measure 4.6-1c: General Avoidance and Minimization Measures.

Mitigation Measure 4.6-1c: General Avoidance and Minimization Measures

In addition to the general environmental minimization measures identified in the CalAm Carmel Valley Pump Station Technical Specifications prepared by AECOM, dated October 2019 (see **Appendix C-3** of NTPR-3), MPE will implement the following general avoidance and minimization measures, to the extent they are applicable, consistent with the requirements of Mitigation Measure 4.6-1c: General Avoidance and Minimization Measures. They will be implemented as follows:

1. The construction footprint, staging areas, equipment access routes, and disposal or temporary placement of spoils, shall be delineated with stakes and flagging prior to construction to avoid natural resources outside of the project area. Any construction-related disturbance outside of these boundaries, including driving, parking, temporary access, sampling or testing, or storage of materials, shall be prohibited without explicit approval of the Lead Biologist.
 - **Pre-Construction Monitoring Action:** Prior to the initiation of construction-related activities, MPE, in coordination with DD&A, will stake and flag the construction footprint, staging areas, equipment access routes, and areas identified for the disposal or temporary placement of spoils to avoid natural resources. All MPE construction personnel will be made aware of this boundary and that any disturbance outside of this boundary will not be in compliance with the environmental documentation shown during the Worker Environmental Awareness Program. Entrance to the areas outside of the delineated project area will be prohibited without explicit approval of the Lead Biologist.
2. New access driveways shall not extend beyond the delineated construction work area boundary. Construction vehicles shall pass and turn around only within the delineated construction work area boundary or local road network. Where new access is required outside of existing roads or the construction work area, the route shall be clearly marked (i.e., flagged and/or staked) prior to being used, subject to review and approval of the Lead Biologist.

- **Construction Monitoring Action:** No new access driveways are proposed as part of this NTP. In the event that the need arises MPE will request prior approval from DD&A, Environmental Science Associates (ESA), and the California Public Utilities Commission (CPUC).
3. Vehicle speeds within the project area shall not exceed 15 miles per hour on roads within the sites.
- **Construction Monitoring Action:** MPE will ensure that vehicle speeds within the project area do not exceed 15 miles per hour by posting signage around the project site. Please also refer to the Fugitive Dust Control Plan, prepared by MPE and dated November 2019 (see **Appendix C-8** of NTPR-3).
4. Excavated soils shall be stockpiled in disturbed areas lacking native vegetation. Stockpile areas shall be marked by the Lead Biologist to define the limits where stockpiling can occur.
- **Construction Monitoring Action:** All material will be stockpiled within stockpile areas within the construction footprint boundary that have been designated by Lead Biologists/Biological Monitors, prior to being hauled to the off-site location.
5. Standard best management practices (such as setbacks and use of silt fences and fiber rolls) shall be employed to prevent loss of habitat due to erosion caused by project related impacts (i.e., grading or clearing for new roads). All detected erosion shall be remedied immediately upon discovery.
- **Construction Monitoring Action:** Construction activities associated with the Carmel Valley Pump Station will be confined to the existing construction footprint. Where necessary, MPE will implement standard Best Management Practices (BMP's) and DD&A will ensure these are implemented to prevent the loss of habitat. Please also refer to the grading plans, which identified erosion control measures consistent with the intent of this measure.
6. Fueling of construction equipment shall take place within existing paved areas, and at least 50 feet from drainages (including streams, creeks, ditches, culverts, or storm drain inlets) and native habitats. Contractor equipment shall be checked for leaks prior to operation and repaired when leaks are detected. Fuel containers shall be stored within appropriately sized secondary containment barriers.
- **Construction Monitoring Action:** MPE will fuel all construction vehicles off-site. If fueling must occur on-site, an area will be at least 50 feet from drainage will be identified with signage, staked, and/or flagged, prior to the start of construction. Where necessary, MPE will implement standard Best Management Practices (BMP's) and DD&A will ensure these are implemented to prevent the loss of habitat. Please also refer to the grading plans, which identified erosion control measures consistent with the intent of this measure.
7. The introduction of exotic plant species shall be avoided through physical or chemical removal and prevention. Measures to prevent the introduction of exotic plants into the construction site via vehicular sources shall include implementing track clean or other method of vehicle cleaning for vehicles coming to the site and leaving the site. Earthmoving equipment shall be cleaned prior to transport to the project area. Weed-free rice straw or other certified weed-free straw shall be used for erosion control. Weed populations introduced into the site during construction shall be

eliminated by chemical and/or mechanical means approved by California Department of Fish and Wildlife (CDFW) and the United States Fish and Wildlife Service (USFWS).

- **Construction Monitoring Action:** MPE will implement track cleaning practices for construction equipment entering the construction site to avoid the spread of exotic plants. DD&A will evaluate for the introduction of exotic plants into the construction area, and if necessary, require the contractor to clean or otherwise remove the suspected material to the satisfaction of the CalAm Site Supervisor or their designee. Where straw materials are required for erosion control, only weed-free straw will be used.
8. Use of herbicides as vegetation control measures shall be used only when mechanical means have been deemed ineffective. All uses of such herbicidal compounds shall observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and state and federal legislation as well as additional project-related restrictions deemed necessary by the CDFW and/or USFWS. No rodenticides shall be used.
- **Construction Monitoring Action:** Any vegetation controls required will be performed using mechanical means under the supervision of the Lead Biologist and the CalAm Site Supervisor (also a qualified biologist).
9. Prior to the start of construction at any proposed facility site where special-status amphibians, reptiles and mammals have a moderate or high potential to occur, the construction work area boundary shall be fenced with a temporary exclusion fence to prevent special-status wildlife from entering the site during construction (see Table 4.6-6 for the list of special-status species that could be significantly impacted at each project facility site). The exclusion fencing shall be constructed of metal flashing, plastic sheeting, or other materials that will prohibit California horned lizards, Monterey shrews, and other special-status reptiles, amphibians, and rodents from climbing the fence. If meshing is used it shall be of a size that would not catch wildlife. The fencing shall be buried a minimum of 6 inches below grade to secure the fence and extend a minimum of 30 inches above grade. The fencing shall be inspected by the Lead Biologist or qualified biological monitor on a daily basis during construction activities to ensure fence integrity. Any needed repairs to the fence shall be performed on the day of their discovery. Fencing shall be installed and maintained during all phases of construction. Final fence design and location shall be determined in consultation with USFWS and CDFW. Exclusion fencing shall be removed once construction activities are complete.
- **Pre-Construction Monitoring Action:** The FEIR states that California red-legged frog are known in the Carmel River adjacent to the project site and that non-native grassland at the CVPS station is suitable upland habitat for this species. Wildlife exclusion fencing will be installed, as directed by the CalAm Lead Biologist or ESA/CPUC.
10. If special-status wildlife species are found on the site immediately prior to construction or during project construction, construction activities shall cease in the vicinity of the animal until the animal moves on its own (if possible, as determined by the Lead Biologist or biological monitor) outside of the project area. Additional mitigation measures specific to special-status plants; Smith's blue butterfly; black legless lizard, silvery legless lizard, and coast horned lizard; western burrowing; American badger; Monterey dusky-footed woodrat, California red-legged frog and California tiger salamander are described in Mitigation Measures 4.6-1f, 4.6-1g, 4.6-1h, 4.6-1j, 4.6-1k, and 4.6-1o. The Lead Biologist and Lead Agencies shall consult with wildlife resource agency(ies) with jurisdiction over the species regarding any additional avoidance, minimization, or mitigation measures that may be necessary if the animal does not move on its own. A report shall be prepared by the Lead Biologist to document the activities of the animal within the site; all

fence construction, modification, and repair efforts; and movements of the animal once again outside the exclusion fence. This report shall be submitted to the CPUC and pertinent wildlife agencies with jurisdiction over the wildlife species.

- **Pre-Construction/Construction Monitoring Action:** DD&A will enforce this minimization measure along with the specific mitigation measures for the special-status plants and species. A report shall be prepared by the Lead Biologist to document the activities of the animal within the site; all fence construction, modification, and repair efforts; and movements of the animal once again outside the exclusion fence.
11. Vegetation removal and grading activities shall be conducted during daylight hours. Immediately prior to conducting vegetation removal or grading activities inside fenced exclusion areas, the Lead Biologist or a qualified biologist shall survey within the exclusion area to ensure that no special-status species are present. The Lead Biologist or a qualified biologist shall also monitor vegetation removal or grading activities inside fenced exclusion areas for the presence of special-status species. If special-status species are present, then measure 10 above shall be implemented.
- **Construction Monitoring Action:** The Lead Biologist or a qualified biologist will monitor to ensure off-site vegetation adjacent to the work area are marked or fenced if they contain special-status species.
12. To prevent the inadvertent entrapment of special-status wildlife during construction, all excavated, steep-walled holes or trenches more than 2 feet deep shall be covered with plywood or similar materials at the close of each working day, or escape ramps constructed of earth fill or wooden planks shall be positioned within the excavations to allow special-status wildlife to escape on their own. Before such holes or trenches are filled, they shall be thoroughly inspected for trapped animals. If trapped animals are observed, escape ramps or structures shall be installed immediately to allow escape. If listed species are trapped, they shall only be relocated with authorization from USFWS and/or CDFW, as appropriate.
- **Construction Monitoring Action:** All excavated holes or trenches will be covered each day, or escape ramps for wildlife provided in accordance with the Lead Biologist or CalAm Field Supervisor. Prior to filling of such holes or trenches, they will be thoroughly inspected for trapped animals, and escape ramps installed immediately to allow escape. If listed species are trapped, they will be relocated with authorization from the USFWS and/or CDFW, as may be applicable.
13. All construction pipes, culverts, or similar structures that are stored at a construction site for one or more overnight periods and with a diameter of 4 inches or more shall be inspected for special-status wildlife before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a special-status animal is discovered inside a pipe, that section of pipe shall not be moved until the appropriate resource agency, with jurisdiction over that species, has been consulted to determine the appropriate method for relocation. If necessary, under the direct supervision of the qualified biologist, the pipe may be moved once to remove it from the path of construction activity until the animal has escaped.
- **Construction Monitoring Action:** DD&A will ensure that all construction pipes, culverts, or similar structures that are stored at a construction site for one or more overnight periods and with a diameter of 4 inches or more will be inspected for special-status wildlife before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a special-status animal is discovered inside a pipe, that section of pipe will not be moved until the appropriate resource agency. If necessary, under the direct supervision of the qualified

biologist, the pipe may be moved once to remove it from the path of construction activity until the animal has escaped.

14. All vertical tubes used in project construction, such as chain link fencing poles or signage mounts, shall be temporarily or permanently capped at the time they are installed to avoid the entrapment and death of special- status birds.
 - **Construction Monitoring Action:** DD&A will observe and confirm all vertical tubes used in project construction, such as chain link fencing poles or signage mounts, are or permanently capped at the time they are installed to avoid the entrapment and death of special-status birds.
15. Water used for dust abatement shall be minimized in an effort to avoid the formation of puddles that could attract common ravens and other predators to the construction work areas.
 - **Construction Monitoring Action:** Dust control techniques for proposed work in paved roadways will generally involve daily sweeping; however, DD&A will ensure water used for dust abatement is minimized so that common ravens and other predators are not attracted to the work area. Please also refer to the Fugitive Dust Control Plan, prepared by MPE and dated November 2019 (see **Appendix C-8** of NTPR-3).
16. No vehicle or equipment parked in the project area shall be moved prior to inspecting the ground beneath the vehicle or equipment for the presence of wildlife. If present, the animal shall be left to move on its own.
 - **Construction Monitoring Action:** DD&A and other trained workers will inspect the ground beneath vehicles and equipment prior to movements on-site and allow any such wildlife to move on its own.
17. All vehicles and equipment shall be in proper working condition to ensure that there is no potential for fugitive emissions of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. The Lead Biologist shall be informed of any hazardous spills within 24 hours of the incident. Hazardous spills shall be immediately cleaned up and the contaminated soil shall be properly disposed of at a licensed facility.
 - **Construction Monitoring Action:** Please refer to the Accident Prevention and Safety Program and Site-Specific Safety Plan, prepared by MPE (see **Appendix C-5** of NTPR-3). DD&A monitors will be notified of any potential hazardous material spills during construction. All construction personnel shall have access to and know the location of a spill response kit.
18. A trash abatement program shall be implemented during construction. Trash and food items shall be contained in closed containers and removed from the construction site daily to reduce the attractiveness to opportunistic predators such as common ravens, coyotes, and feral dogs.
 - **Construction Monitoring Action:** MPE will install trash receptacles on the construction site and within work trucks, as needed. DD&A will ensure that trash and food items are contained in closed containers and removed from the construction site daily. Please also refer to the Construction Waste Reduction and Recycling Plan, prepared by MPE and dated November 2019 (see **Appendix C-10** of NTPR-3).
19. Workers shall be prohibited from feeding wildlife and bringing pets and firearms to the construction work areas.

- **Construction Monitoring Action:** DD&A will observe and ensure that workers are aware that they are not to feed wildlife or bring pets and firearms to the construction work areas.
20. Intentional killing or collection of wildlife species, including special-status species in the project area and surrounding areas shall be strictly prohibited.
- **Construction Monitoring Action:** DD&A will observe and ensure that intentional killing or collection of wildlife species by project workers, including special-status species in the project area and surrounding areas, does not occur.
21. All temporarily disturbed areas shall be returned to pre-project conditions or better. Existing access roads within the CEMEX site shall be returned to their existing use.
- **Construction Monitoring Action:** DD&A will observe and ensure that disturbed areas are returned to pre-project conditions or better, or as required by permits from the affected local jurisdiction.

If you have any questions or comments, please do not hesitate to contact me to discuss further. Thank you.

Appendix C-4

County of Monterey Encroachment Permit

MONTEREY COUNTY

RESOURCE MANAGEMENT AGENCY

PUBLIC WORKS AND FACILITIES

1441 Schilling Place, 2nd Floor-South Wing, Salinas, CA 93901

831-755-4800

<http://www.co.monterey.ca.us/rma>



ENCROACHMENT PERMIT 19EP0232

Notify the Department of Public Works at least 48 hours, exclusive of Saturdays, Sundays, and legal holidays, before starting any permit work. Contact Robert Palomino @831-755-4800

THE USE OF THIS PERMIT IS PRIMA FACIE EVIDENCE THAT THE PERMITTEE HAS READ AND UNDERSTANDS THE TERMS.

APPLICATION DATE: 07/24/2019	DISTRICT: 2-Monterey
PERMIT ISSUE DATE: 08/08/2019	ASSOCIATED BUILDING PERMIT:
PARCEL NO. (if any): 111-111-111-111	UTILITY WORK ORDER:
PROJECT ADDRESS: Carmel Valley Road	
LOCATION DESCRIPTION: Between Rancho San Carlos and Via Petra.	
PERMITTEE: Donald Monette	
ORGANIZATION: California American Water Company	
PERMITTEE ADDRESS: 511 Forest Lodge Road, #100, Pacific Grove, CA 93950	
PERMITTEE PHONE: 831-646-3290	
PERMITTEE EMAIL: donald.monette@amwater.com	

In compliance with your request and subject to the existing County Encroachment Ordinance, and to all other terms, conditions, and restrictions written below, printed on or attached to any part of this permit, Permission is hereby granted to:

Excavate 100 feet +/- ten feet wide trench to install (2) 24 inch underground water pipelines including any traffic signal loop detectors damaged during construction located on subject road per attached plans titled "Monterey Peninsula Water Supply Project - Carmel Valley Pump Station".

In order for this encroachment permit to be acknowledged as complete, work shall be in accordance with the above mentioned plan, all pertinent sections of Chapter 14.04 of the Monterey County Code, together with any other applicable provisions of the Monterey County Code, the forms listed below, and other attachments:

Forms

* LT-Lateral Trenching

Unless specified, no permit work or activity is to take place after: 12/31/2020

CEQA Status: Categorical Exemption

CEQA Section: 15301

CEQA Class: 1 (b)

Fees Assessed: \$420.00

Copy: Permittee Job Site Inspector File District Superintendent Finance

Appendix C-5

Accident Prevention and Safety Program and Site-Specific Safety Plan



Monterey Peninsula Engineering



Accident Prevention and Safety Program



MPE ACCIDENT PREVENTION AND SAFETY PROGRAM

TABLE OF CONTENTS

- MANAGEMENT POLICY STATEMENT
- IDENTIFICATION OF PLAN ADMINISTRATORS
- RESPONSIBILITIES
- DISCIPLINARY PROCEDURES
- WORKER SKILL ASSESSMENT AND TASK TRAINING
- SAFETY TRAINING
- SAFETY RULES
- PERSONAL PROTECTIVE EQUIPMENT (PPE)
- HEARING CONSERVATION
- ERGONOMICS
- HAZARD ASSESSMENT, INSPECTIONS & CORRECTIVE ACTION
- LADDERS
- FALL PROTECTION
- TOOL SAFETY
- SAFETY COMMUNICATION
- ACCIDENT INVESTIGATIONS AND REPORTS
- HAZARDOUS COMMUNICATIONS –GHS / MATERIALS
- TRENCHING AND EXCAVATION
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- LOCKOUT / TAGOUTS
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- ALCOHOL AND DRUGS IN THE WORKPLACE
- HEAT ILLNESS PREVENTION PROGRAM
- FIRE PROTECTION AND PREVENTION
- HOT WORK
- EMERGENCY ACTION PLAN
- SUBCONTRACTOR SAFETY MANAGEMENT
- RECORDKEEPING

UPDATED September 25, 2019



MONTEREY PENINSULA ENGINEERING

CONTRACTORS & ENGINEERS
P.O. BOX 2317
MONTEREY, CA 93942
(831) 384-4081

"There is no job so important - nor any service so urgent - that we cannot take time to work safely."

- Bart J. Bruno, Founder

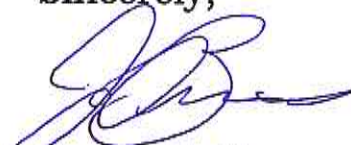
It is the policy of Monterey Peninsula Engineering that every employee is entitled to a safe and healthful place in which to work. To this end, every reasonable effort will be made in the interest of Accident prevention, Fire protection, and Health Preservation.

The management concept of Monterey Peninsula Engineering is not productions and safety; it is production with safety. When production with safety is achieved, production with efficiency is attained simultaneously.

We at Monterey Peninsula Engineering have a basic responsibility to make the safety of our personnel and the public a part of our daily, hourly concern. We will be counting on you to do your part in making our program an effective one.

The successful operation of Monterey Peninsula Engineering will depend not only on sales and services, but also how safely each job is performed. I consider the safety of our personnel to be of prime importance, and I expect your full cooperation in making our program effective.

Sincerely,



James B. Bruno



Peter J. Taormina



Paul B. Bruno

IDENTIFICATION OF PLAN ADMINISTRATORS

The following persons are responsible for implementing the accident prevention plan for Monterey Peninsula Engineering.

<u>NAME</u>	<u>FUNCTION</u>
JAMES B. BRUNO	OPERATIONS
PAUL B. BRUNO	ADMINISTRATION
PETER J. TAORMINA	ENGINEERING/ESTIMATING

The Plan Administrators may be contacted by radio or at the office, 831-384-4081.

Emergency evening and weekend contact is available as follows:

James B. Bruno	mobile 831-277-6114
Paul B. Bruno	mobile 831-277-6110
Gino Castro	mobile 831-277-6116

RESPONSIBILITIES

MANAGERS:

In effectively executing their safety responsibilities, managers will:

1. Familiarize themselves with the safety program and ensure its effective implementation.
2. Give maximum supports to all programs and committees whose function is to promote safety and health.
3. Review serious accidents to ensure that proper reports are completed and appropriate action is taken to prevent repetition.

SUPERVISOR & FOREMAN:

Our supervisors are the foundation of the program. Their responsibilities are to:

1. Familiarize themselves with company safety policies, programs and procedures.
2. Be aware of all safety considerations when introducing a new process, procedure, machine or material to the workplace.
3. Verify employee's training and skill and provide complete safety training to employees prior to the assignment of duties.
4. Consistently and fairly enforce all company safety rules.
5. Investigate injuries to determine cause and take action to prevent repetition.
6. See that all injuries are treated immediately and referred to the personnel office to ensure prompt reporting to the insurance carrier.
7. Inspect work areas often to detect unsafe conditions and work practices.

EMPLOYEES:

Employee responsibilities for safety include the following:

1. Adhere to all safety rules, regulations, and standard industry safety practices.
2. Wear appropriate safety equipment as required.
3. Maintain equipment in good conditions, with all safety guards in place when in operation.
4. Report all injuries immediately to a supervisor and the office.
5. Encourage co-workers to work safely.
6. Report unsafe acts and conditions to the supervisor

DISCIPLINARY PROCEDURES

Employees who disregard safe work practices, commit unsafe acts or fail to comply with the safety rules will be subject to disciplinary action up to and including termination. Based upon circumstances, employee may be terminated for a first offense.

Supervisors and Foreman will be subject to disciplinary action for the following reasons:

1. Unsafe acts or a disregard for the safety of crew or the public
2. Repeated safety rule violation by their department employees.
3. Failure to provide adequate training prior to job assignment.
4. Failure to report accidents and provide medical attention to employees injured at work.
5. Failure to control unsafe conditions or work practices.
6. Failure to maintain good housekeeping standards and cleanliness on their job sites.

The above shall not be construed to limit the Company's rights nor does it in any way alter the "AT-WILL" employment arrangement.

WORKER SKILL ASSESSMENT AND TASK TRAINING

Each employee must be trained in the safe work practices and in the hazards and safety precautions applicable to the job. Task training can be in the form of a Safety/Training Huddle.

Supervisors and Foremen must assess each employee and verify that they have the specific training and skill necessary to complete the assigned task. For machinery and equipment operation, a qualified person is one who, by reason of training, experience, or instruction, has demonstrated the ability to perform safely the assigned duties.

In the absence of personal knowledge of the employee's specific skills, verification of prior experience can be accomplished through an employee interview prior to assigning the task. This should be coupled with direct observation and monitoring as the task is being performed.

SAFETY TRAINING

The goal of our safety training program is to develop safe work habits and attitudes. It is critical that workers understand how to perform a job safely prior to performing the work. Supervisors are responsible for providing safety training to their crews utilizing the job instruction training (JIT) method described below.

HOW TO GET READY TO INSTRUCT:

1. Have a timetable – how much skill you expect them to have, by what date.
2. Break down the job – list important steps, pick out the key points. (Safety is always a key point.)
3. Remember – when teaching adults, the following points are important –
 - a. Adults learn best in a warm, friendly atmosphere.
 - b. Adults don't like to waste time.
 - c. Adults respond quickly to praise and attention.

JOB INSTRUCTION TRAINING (JIT) – HOW TO INSTRUCT:

1. Prepare–put the worker at ease. Define the job and find out what is already known about it. Get the person interested in learning the job. Place in correct position.
2. Present–tell, show, and illustrate one IMPORTANT STEP at a time. Stress each KEY POINT.
3. Try out Performance–have person do the job and correct errors. Have person explain each key point to you as the job is done again. Make sure the person understands. Continue until YOU know the person knows.
4. Follow-up–put them on their own. Designate to whom to go for help. Check frequently. Encourage questions. Taper off extra coaching and close follow-up. Safety is always a key point.

RECORDKEEPING:

Training is to be recorded in the “New Operations/Training” section of the “Safety/Training Meeting” form. Employees are to sign the form upon completion of the training session.

SAFETY RULES

For the protection and safety of all employees, the Company has compiled some general safety rules designed to help prevent accidents and injuries. Compliance with Company policy, procedures and work rules is mandatory.

1. Proper footwear and clothing will be worn at all times.
2. Do not wear loose clothing, jewelry or keep long hair in a down position where there is a danger of catching such articles in moving machinery.
3. Do not report to work under the influence of alcohol or other controlled substances.
4. Horseplay, running, fighting, or any activity that may result in injury or waste will not be tolerated.
5. Eye protection is required when performing any task that could produce flying particles.
6. All required safety guards must be in place when using abrasive wheel machinery and/or other rotating equipment.
7. Operate machinery with all guards in place. Tampering with safety devices is cause for disciplinary action.
8. Portable electrical and power tools must be used in accordance with their manufacturer instructions. All tools must be inspected prior to use. Only properly grounded power cords in good condition shall be utilized. Frayed or damaged cords must be discarded.
9. Do not operate any machine you do not know how to operate safely.
10. Any defects in materials, machinery, tools and equipment must be reported immediately to a supervisor.
11. Do not leave tools, materials or other objects on the floor which might cause others to trip and fall.

12. Avoid risk of rupture, internal injury or back injury in attempting to lift or push excessive loads. If an object is too heavy to move without strain, ASK FOR HELP.

13. Observe the correct position for lifting. Stand with your feet slightly apart, assume a squatting position with knees bent and tuck your chin. Tilt head forward, grasp the load with both hands and gradually push up with your legs, keeping your back straight and avoiding any abrupt movement.

14. Do not allow oil, water, or any other material to remain in the floor where you or others may slip. Report spills to your supervisor.

15. When handling hazardous material, read the Material Safety Data Sheet to insure that you follow prescribed safety procedures and use required safety equipment.

16. Use gloves when handling materials with sharp or jagged edges which may result in lacerations.

17. Do not attempt to complete tasks or operate machinery for which you are not trained.

18. Unnecessary and excessive haste is the cause of many accidents. Exercise caution at all times. **DO NOT RUN!**

19. Observe standard industry safety practices. Stay mentally alert and use common sense. Make job safety a priority.

20. All work related injuries and accidents must be reported immediately to your supervisor and the office.

It is important that all employees become thoroughly familiar with the above safety rules. The above is not an all-inclusive list of rules. Be aware that failure to comply with any lawful company policy, procedure and work rule, written or unwritten, currently in effect or promulgated in the future can result in disciplinary action, including termination.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment includes both Company provided (i.e. hardhats, vests, safety glasses, earplugs, gloves, etc.) and personally owned items (i.e. work boots, coveralls, sunscreen, etc.). Employees must know when and how to wear PPE and are required to wear the appropriate PPE for each type of exposure they anticipate encountering while completing an assigned task.

Head Protection: Hard hats must be worn if employees could be struck by falling objects, are in danger of striking their heads on fixed objects, or there is a shock hazard from working near exposed electrical conductors.

Eye and Face Protection: Employees shall wear eye and/or face protection when there is a risk of receiving eye injuries such as punctures, abrasions, contusions, or burns as a result of coming in contact with flying particles, hazardous substances, projections, or injurious light rays which are inherent to the work or environment.

Body Protection: Protection may be necessary where splashing of hazardous materials or other substances would pose a risk to the employee. Flying metal particles or molten metal are examples of hazards that could penetrate normal clothing and injure the employee, requiring leather protective sleeves and/or vests. In all cases, clothing appropriate for the work being done shall be worn. Loose sleeves, tails, ties, lapels, cuffs, or other loose clothing which can become entangled in moving machinery will not be worn.

Hand Protection: Gloves will be worn as precaution from chemicals, cuts, and hot work. You must select the appropriate glove for the job. Where there is risk of injury from glove entanglement, use other methods to protect their hands from injury. Rings, watches and jewelry should not be worn. Never wear metallic jewelry or other objects when working around electrically energized equipment.

Foot Protection: Employees shall wear properly fitting work boots. For work in areas where feet are in danger of being struck by falling, or heavy rolling objects and crushed or penetrated, steel-toed shoes, or steel covers are recommended.

Hearing Protection: Hearing protection will be made available to all employees exposed to sources of noise 85 dB or greater. In general, anytime someone must elevate their voice to be heard, hearing protection will be worn.

HEARING CONSERVATION

MPE's goal is to protect workerd from the hazards of noise on the job. Where appropriate, MPE will provide engineering controls to reduce noise exposure. Due to the complexity of most job sites, it is difficult to institute effective engineering controls for most noise exposures. In these situations, employees will be required to wear suitable hearing protection.

Employees will be made aware of the impacts of noise on hearing and will be instructed on how to use of personal hearing protection equipment. If applicable, employees will be advised how to clean and maintain the hearing protection equipment

The project supervisor is responsible to monitor noise levels and noise producing activities on the job. They are also responsible to observe their crews and ensure that suitable hearing protection is utilized.

Noise levels can be expected to exceed 85 dB when working on certain kinds of heavy equipment (100 dB). Hearing protections should be worn when operating heavy equipment.

There are also will be jobs or types of work that generally produces noise level that intermittently or for short durations exceed the permissible TWA. In our type of work, noise levels exceeding 85 dB are experienced intermittently or for short periods of time, when working with air compressors (95 dB), grinders (100 dB), cut off saws (107 dB), or any type of pneumatic chipper or hammer (110 dB). It is the policy of MPE to require all workers who are engaged in these jobs to wear hearing protectors.

MPE will provide and will require employees to utilize hearing protectors if his/her 8 hour TWA is above the 85dB. These hearing protectors may be commercially available ear muffs. They can also be in the form of single use disposable ear plugs. Most ear plugs have a noise reduction rating (NRR) on the package. When worn properly, most ear plugs have NRR of about 30.

Employees are free to choose the type of hearing protection that best suits their particular assignment and personal preference. Each employee that may be required to wear hearing protection is responsible for carrying hearing protection on his/her person. Hearing protection is furnished at no cost to employees.

ERGONOMICS

Ergonomics is the study of people and their job tasks. It addresses wear and tear illnesses that can affect muscles, nerves, tendons, ligaments, joints, cartilage, blood vessels or spinal discs of the body. Exceeding the body's capabilities can result in musculoskeletal disorder (MSD).

To help avoid MSDs, work demands should not exceed the physical capabilities of the worker. MSDs are also known by several other names including: CTDs (cumulative trauma disorders), RSIs (repetitive stress or repetitive strain injuries), RMIs (repetitive motion injuries), and Overuse syndrome

It is the policy of MPE to provide all employees with a safe and healthy workplace by applying ergonomic principles to the workplace in an effort to reduce the number and severity of MSD.

MPE's program includes the following components:

1. Management Leadership. The management is committed to the ergonomics process. It will support an effective MSD reporting system and will respond promptly to reports.
2. Employee Participation. Employees will be solicited for their input and assistance with identifying ergonomic risk factors, worksite evaluations, development and implementation of controls, and training.
3. Identification of Problem Jobs. MPE will endeavor to identify injury and illness trends using both active and passive approaches. Passive activities include reviewing records, such as first aid logs, workers' compensation claims, and dispatch records. Active tasks include such things as observations, interviews, and worksite evaluation tools to identify specific high-risk activities
4. Worksite Evaluations. A worksite evaluation would be triggered if an employee reports a job-related MSD sign or symptom. Evaluations would also be considered if jobs, processes, or work activities have been identified to have heightened work-related ergonomic risk or if a walk-through inspection has uncovered potential MSD hazards.

Work-related risk factors to be considered in the evaluation process include physical risk factors such as force, postures, static loading and sustained exertion, fatigue, repetition, contact stress, extreme temperatures, and vibration. Evaluations will also consider administrative issues (such as staffing, overtime, breaks, deadlines, training, work pace, etc.) and environmental risk factors (such as noise,

lighting, glare, air quality, temperature, humidity, personal protective equipment, etc.)

5. Setting Priorities. Worksite evaluations will be prioritize jobs, processes, or operations which has contributed to a worker's current MSD over jobs, processes, operations, or workstations that may have the potential to cause MSDs.

6. Worksite Evaluations Methods. Methods used to evaluate problem jobs may include walk-through and observations, employee interviews, survey and questionnaires, checklists, etc.

7. Control of the Ergonomic Risk Factors. MPE's goal is to address ergonomic risk factors and reduce hazards by using engineering controls, administrative controls, and personal protective equipment (PPE). While PPE does not take the place of engineering or administrative controls, there are acceptable forms of PPE, which include kneepads and anti-vibration gloves.

8. Training. MPE wants its team to recognize work-related ergonomic risk factors and to understand and apply appropriate control strategies. Training in the recognition of ergonomic risk factors will be given to new employees during orientation. Ongoing training opportunities include when assuming a new job assignment or when new jobs, tasks, tools, equipment, machinery, workstations, or processes are introduced. Training can be provided in oral presentations, videos, distribution of educational literature, or hands-on equipment and work practice demonstrations.

9. Program Evaluation and Follow-Up. Monitoring and evaluation will be conducted on an on-going basis.

HAZARD ASSESSMENT, INSPECTIONS & CORRECTIVE ACTION

The purpose of the pre-work Hazard Assessment is to identify potential hazards related to that specific job and to develop a work plan for safely completing the assignment. By engaging in this process, you will be prepared to accomplish the assigned task efficiently and safely.

The plan is developed by analyzing the project's plans and specifications and then walking the job, giving consideration to all elements of the assignment. You must take note of all existing and/or potential hazards and consider the appropriate action to eliminate or minimize identified hazards. The person conducting the assessment should identify all equipment that will be used and evaluate PPE requirements. They must ensure each person on the crew understands his/her role relating to the tasks at hand and that they are properly trained for their assignment(s). And, most importantly, in the event conditions change, they must adjust the work plan to eliminate or minimize the newly identified hazards.

Ongoing inspection works because it is an essential part of hazard control. It is an important management tool, not a gimmick. Post-accident inspections will be viewed as a fact-finding process, not faultfinding.

All personnel will be responsible for continuous, ongoing inspection of the workplace. When uncovered, potentially hazardous conditions will be corrected immediately or a report will be made to initiate corrective actions.

Periodic inspections will be made by the Plan Administrators, or other designated individuals, as a follow up to the foremen's inspections.

These inspections, along with Incident Investigation Reports, are important for hazard abatement. It is the Company's goal to eliminate all hazards and unsafe work practices. Priority should be given to severe and imminent hazards. Employees are not to enter imminent hazard areas without prior specific approval of a supervisor.

LADDERS

Ladders pose a risk for serious injury if not used properly. Under no circumstances are portable ladders to be used unless conditions are considered safe, secure and in compliance and company procedures and safe work practices.

The safe use of ladders requires the employee to utilize basic common sense including, but not limited to, the following -

1. Ladders should be maintained in good condition.
2. Inspect ladders prior to use. Tag and place defective ladders out service.
3. Do not use broken ladders (missing rungs, broken side rails, etc.,
4. Face the ladder and do not carry items while ascending or descending.
5. Do not load the ladder beyond the maximum intended load or rated capacity.
6. Make sure to place the ladder on clean and secure footing.
7. Take care so that the pitch of the ladder is not such that it will slide out
8. Do not place ladder in front of doors, unless door is blocked or barricaded.
9. Do not place ladder on scaffold, boxes, barrels, or other unstable bases.
10. Ladders shall not be spliced together.
11. Do not stand on the topcap or the step below the topcap of a stepladder.
12. Ladders should extend at least 3 feet above the trench edge.
13. Portable metal ladders should not be used in connection with electrical work.
14. Ladders should be equipped with non-slip bases if a slipping hazard exists.
15. All ladders will be tied off on top, blocked or otherwise secured to prevent movement before work is performed from them.
16. All ladders must have a minimum width of 12 inches. All ladders must have a distance of 12" between rungs.
17. Extension ladders shall be equipped with positive stops.
18. Ladders shall be maintained in good condition.
19. Only one employee is to work on or climb a ladder at the same time.

FALL PROTECTION

Work activities where employees may be subject to falls and/or falling objects shall be conducted safely with associated hazards eliminated and/or controlled.

Employees shall be provided fall protection training that is applicable to the type of work that they perform. This includes understanding the nature of fall hazards in the typical work area, the installation, use and maintenance of conventional and non-conventional fall protection systems, and the role of the employee in monitoring safety systems. Toolbox talks or safety huddles shall be conducted periodically.

Fall protection must be taken into account on all company work sites where field construction related activities involve exposure to heights greater than or equal to six (6) feet and/or falling objects exist. Specific fall protection requirements of the job will be taken into account in the pre-work Hazard Assessment.

Task shall be carried out such that working near the edge of an excavation 6 feet or more deep is avoided. Where appropriate, fall protections such as guardrails or coves will be installed. Where walk-ways are provided to permit employees to cross over excavations, guardrails are required on the walkway if the fall would be 6 feet or more to the lower level.

When guardrail systems are constructed of wood, the top rails and midrails shall be at least ¼ inch diameter or thickness. The guardrail shall be free of sharp edges and burrs to protect against punctures or lacerations and to prevent clothing from snagging. Guardrail systems shall be capable of withstanding a force of at least 200 pounds of force applied within 2 inches of the top edge in any outward or downward direction. Hole covering material shall support at least two times the potential weight that will cross over it. If plywood is chosen as the cover material, it shall be of at least ¾ inch in thickness. Hole covers shall be secured in place in such a manner as to not easily be displaced.

TOOL SAFETY

Various types of tools and equipment are used in the workplace, such as portable hand tools, power tools, and pneumatic tools.

Employees should only use/operate tools if they are trained and/or experienced in the use of the tool. Tools and equipment should not be modified and are to be used only for their designed purpose. Employees are responsible to inspect tools and equipment prior to use and to use all tools and equipment in a safe manner.

Supervisors should observe employees to ensure that tools are being used properly and safely. Employees observed abusing, altering, modifying or misusing tools or equipment may be subject to disciplinary action.

The safe use of tools requires the employee to utilize common sense and to follow standard industry safety practices including, but not limited to, the following -

1. Wear appropriate personal protective equipment for the task.
2. Select the right tool for the task instead to make the wrong one fit.
3. Take proper care of your tools and equipment. Keep them stored where they will not get damaged and will not present a hazard.
4. Check your tools and equipment prior to use for defects, wear, or damage.
5. GFCI's are to be used with all portable electric equipment. GFCI's are to be inspected and tested prior to each use.
6. Do not connect electrical power unless the operating switch is turned off.
7. Employee shall avoid loose fitting clothing when operating power tools.
8. Protective guards on power tools shall not be removed, altered or modified.
9. All air hoses exceeding 1/2" inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.
10. Attachments on air tools shall be secured by retainer pins and rings.
11. Powered tools shall not be hoisted or carried by their hoses or cords.

Abrasive Wheel Machinery - Abrasive wheels shall be used only on machines with safety guards in place. The safety guard shall be mounted so as to maintain proper alignment with the wheel, and the strength of the fastenings shall exceed the strength of the guard. Abrasive wheel machinery guards shall meet the design specifications of ANSI B7.1-1970, which is incorporated by reference as specified in Sec. 1910.6.

SAFETY COMMUNICATION

Monterey Peninsula Engineering recognizes that open, two-way communication is essential to an injury free, productive workplace. The following system is designed to facilitate the flow of information.

NEW EMPLOYEE ORIENTATION-The new employee orientation will include a review of safety issues including the Accident Prevention and Safety Program and company bulletin board.

THE SAFETY RULES-These rules are posted on the bulletin boards and are occasionally distributed with the paychecks.

SAFETY POSTINGS- Safety subjects, news clippings regarding accidents, and other safety related items will be conspicuously posted in the dispatch office.

TAILGATE SAFETY MEETINGS-Foreman will be responsible for holding crew safety meeting on a regular basis. Employee attendance and discussion topics will be documented.

SAFETY / TRAINING HUDDLES- Foremen will be responsible for calling a safety / training huddle when introducing a new process, procedure, machine or material into the workplace or when other changes in conditions warrant. Huddles do not need to be documented.

SUPERVISOR MEETINGS – Foremen and Superintendents shall meet on a regular basis with Management. A portion of the meeting will be set aside to discuss safety topics and to review incidents and accidents.

As always, we encourage employee safety and safety training suggestions. We also encourage employees to report perceived workplace hazards to their supervisors. If the employee wishes, an anonymous suggestion or report may be left in the suggestion box next to the back door of the office, just outside dispatch.

ACCIDENT INVESTIGATIONS AND REPORTS

It is the policy of Monterey Peninsula Engineering to carry out a thorough program of accident investigation. Supervisory personnel will be primarily responsible for making an investigation of all accidents in their areas of responsibility. Accidents involving fire, death, serious injury, or extensive property damage will be investigated jointly by the Supervisor, and management personnel.

The primary goal of the accident investigation program is the prevention of future similar accidents through the use of knowledge derived from the investigations. Additionally, the investigation will be used to prepare reports required by Federal and State law as well as the Worker's Compensation Insurance Carrier. These reports are critical in establishing the Company's and the Supervisor's liability under the law.

When an employee is injured at work, the supervisor is responsible for taking emergency action to have first aid administered, to obtain professional medical attention as soon as possible and protect other employees and equipment. The supervisor must then begin to investigate the circumstances of the accident. The following procedures have been found to be effective when investigating accidents:

- A. GO to the scene of the accident at once.
- B. TALK with the injured person, if possible. Talk to witnesses. Stress getting the facts, not placing blame or responsibility. Ask open-ended questions.
- C. LISTEN for clues in the conversations around you. Unsolicited comments often have merit.
- D. ENCOURAGE people to give their ideas for preventing similar accidents.
- E. STUDY possible causes-unsafe conditions, unsafe practices.
- F. CONFER with interested persons about possible solutions.
- G. WRITE your accident report giving a complete, accurate account of the accident.
- H. FOLLOW UP to make sure conditions are corrected. If they can not be corrected immediately, report this to your supervisor.
- I. PUBLICIZE to corrective action taken so that all may benefit from the experience.

In order for the Supervisor's Report to be effective, it should contain as a minimum a detailed answer to the following questions:

A. What was the Employee Doing?-Explain in detail the activity of the employee at the time of the accident.

B. What Happened?-Indicated in detail what took place, describe the accident, the type of injury, the parts of the body affected and whether the employee was wearing appropriate safety equipment.

C. What Caused the Accident?-Explain in detail the condition, act, malfunction, etc., that caused the accident. Remember that it is possible to have more than one reason or cause for an accident.

D. What Can be Done to Prevent a Similar Accident?-Indicate corrective action to prevent recurrence.

The Supervisor's Report, along with the Employee Report, must be submitted to the Office not later than 24 hours after the accident. Each supervisor must maintain an adequate supply of the Incident Investigation Report forms, which may be obtained from the Office.

HAZARD COMMUNICATION - GHS / MATERIALS

HAZARD EVALUATION

The Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (HCS) 29 CFR 1910.1200 (General Industry) and 29 CFR 1926.59 (Construction Industry) require a hazard communication program when employees may be exposed to any chemical in the workplace under normal conditions of use or in a foreseeable emergency. MPE's Hazard Communication Program (HCP) aligns with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) per OSHA HCS 2012.

Chemical manufacturers and importers are required to review the available scientific evidence concerning the hazards of the chemicals they produce, then report that information to the employers who purchase their product. In most cases, Monterey Peninsula Engineering will choose to rely on the evaluation performed by our suppliers. If, for some reason, we do not trust the evaluation of the manufacturer, we will arrange for additional testing.

We will consider any chemical listed in one of the following sources to be hazardous:

- 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA)
- Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American Conference of Governmental Industrial Hygienists (ACGIH), or
- Those hazardous substances prepared pursuant to Labor Code Section 6382.

RESPONSIBILITIES

All MPE employees are responsible to take an active role in job safety. This is for their own protection and the protection of those around them. With regard the HCP, each should identify hazards before starting the job. Each should read container labels and the SDSs. Supervisors should be promptly notified a SDS is missing or if a container's label is missing, torn, or illegible. Each employee is responsible to use the appropriate PPE and to follow instructions and warnings pertaining to chemical handling and use.

SAFETY DATA SHEETS (SDS)

The project foremen shall obtain a SDS for each chemical used in the workplace. The SDSs will be readily available to employees during the workshift. Each SDS will include the specific chemical identity of the chemical involved and the common names.

Each data sheet will provide information on the physical and chemical characteristics of the chemical; known acute and chronic health effects and related health information; exposure limits; whether the chemical is considered to be a carcinogen; precautionary measures; emergency and first aid procedures; and the identification of the organization responsible for preparing the sheet

CHEMICAL INVENTORY LIST

A list of all hazardous chemicals known to be present in the workplace will be compiled and maintained. The list will include the product identified that is referenced on the appropriate SDS, where it used, and the PPE and precautions to be used when handling the chemical. The list will be updated as new chemical products are introduced.

LABELS & OTHER FORMS OF WARNING

Each container should be adequately labeled to identify the hazardous chemicals contained therein. The label should include the product identifier, signal word, hazard statement(s), pictogram(s), precautionary statement(s), and the contact information of the manufacturer or other responsible party.

Exceptions to this rule are as follows:

- We are permitted to post signs, placards, process sheets, or such written materials which convey the hazard information if there are a number of stationary containers in a given area which have similar contents and hazards.
- We are not required to label portable containers, as long as the transferred chemical is for immediate use by the employee who made the transfer. The use of unlabeled transfer containers should be avoided whenever possible. Food and beverage containers should never be used as portable container or for chemical storage.

HAZARD COMMUNICATION TRAINING

It is the goal of Monterey Peninsula Engineering's HCP to provide hazard communication training whenever a new chemical is introduced to a given work area. A review of MPE's HCP will be included the new employee orientation. Supervisors and foremen should be familiar with any chemicals introduced into the work environment. If they are not, they should contact the supplier or the office for additional instructions and/or training prior to introduction. Prior to exposure, supervisors and foremen are responsible for training their crews about the hazards of the materials being used in connection with their work. Reviewing the SDSs is just the first step. The goal is for the employee to have a full understanding of the risks, precautions, and applicable protective measures to be taken so that they can work safely. This training should be updated whenever a new chemical hazard is introduced to their work area. They should verify that their crew understands the information that is being conveyed in the SDS and observe worker activities on an ongoing basis to ensure that appropriate safety precautions are implemented.

Performing nonroutine tasks adds additional risk factors. If appropriate, supplemental, task specific training should be carried out prior to engaging in such activities.

MULTI-EMPLOYER WORKSITES

Supervisors and foremen must be mindful that they may be working at a multi-employer project and that others contractors may have introduced hazardous materials into the worksite. Inquiries should be made of other contractors sharing the site about what hazardous materials are being used in their work processes. If there is a potential for contact with these hazardous materials introduced by others, they must ensure that the crew is advised and adequately protected.

TRENCHING AND EXCAVATION

All excavations are hazardous because they are inherently unstable. If they are restricted spaces they present the additional risks of oxygen depletion, toxic fumes, and water accumulation. If you are not using protective systems or equipment while working in trenches or excavations at your site, you are in danger of suffocating, inhaling toxic materials, fire, drowning, or being crushed by a cave-in.

Pre-job planning is vital to accident-free trenching; safety cannot be improvised as work progresses. The following concerns must be addressed by a competent person:

- Evaluate soil conditions and select appropriate protective systems.
- Evaluation should be conducted by visual and manual tests. Common manual tests include plasticity, dry strength, and thumb penetration,
- Each soil and rock deposit shall be classified by a competent person as stable rock, Type A, Type B, or Type C in accordance with industry standards. In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.
- Construct protective systems in accordance with the standard requirements.
- Preplan; contact utilities (gas, electric) to locate underground lines, plan for traffic control if necessary, determine proximity to structures that could affect choice of protective system.
- Test for low oxygen, hazardous fumes and toxic gases, especially when gasoline engine-driven equipment is running, or the dirt has been contaminated by leaking lines or storage tanks. Insure adequate ventilation or respiratory protection if necessary.
- Provide safe access into and out of the excavation.
- Provide appropriate protections if water accumulation is a problem.
- Inspect the site daily at the start of each shift, following a rainstorm, or after any other hazard-increasing event.
- Keep excavations open the minimum amount of time needed to complete operations.

Excavated materials (spoils) at your site are hazardous if they are set too close to the edge of a trench/excavation. The weight of the spoils can cause a cave-in, or spoils and equipment can roll back on top of workers, causing serious injuries or death. Provide protection by one or more of the following:

- Set spoils and equipment at least 2 feet back from the excavation.
- Use retaining devices, such as a trench box, that will extend above the top of the trench to prevent equipment and spoils from falling back into the excavation.
- Where the site does not permit a 2-foot set back, spoils may need to be temporarily hauled to another location.

Trench Access/egress can be hazardous. To avoid fall injuries during normal entry and exit of a trench or excavation at your job site, ladders, stairways, or ramps are required. In some circumstances, when conditions in a trench or excavation become hazardous, survival may even depend on how quickly you can climb out.

- Provide stairways, ladders, ramps, or other safe means of egress in all trenches that are 4 feet deep or more.
- Position means of egress within 25 lateral feet of workers.
- When two or more components form a ramp or runway, they must be connected to prevent displacement, and be of uniform thickness. Ramp or runway components must be attached in a way that would not cause tripping.
- Structural ramps used in place of steps must have a non-slip surface.
- Use earthen ramps as a means of egress only if a worker can walk them in an upright position, and only if they have been evaluated by a competent person.

CONFINED SPACES

Procedures shall be implemented to ensure the safety of employees who are required to enter confined spaces. Only those employees who have received training on confined space entry shall be allowed to enter and/or attend a confined space.

Employees shall be informed of identified permit required confined spaces for the work site as they are identified. Only authorized personnel may be permitted to enter a permit required confined space.

A pre-job assessment must be completed for each potential confined space identified where entry is planned. Confined spaces shall be considered as permit required confined spaces until a competent person conducts an initial evaluation of the work site to identify permit required confined spaces. Confined spaces shall be classified as 1) nonhazardous; 2) hazardous due to work task; or 3) hazardous due to internal condition. The responsible supervisor shall ensure that a Confined Space Entry Form is completed prior to the entry of any permit required confined space.

Atmospheric conditions of a confined space shall be tested with calibrated equipment prior to entry of personnel. Atmospheric testing shall be completed noting oxygen content, combustible gas and vapors, toxic gases, and airborne combustibles (i.e. dusts). Entrants and/or attendants may request additional monitoring at any time

Powered ventilation shall occur before entry into permit-required confined space and continue until after the employees have left the space. Layout of ventilation equipment will be made in such a manner that the air is being sent throughout the entire confined space. Forced air ventilation shall come from a clean source and may not increase hazards.

A confined space attendant shall remain at the entry point of the confined space while personnel are inside any permit required confined space. The attendant shall ensure that only authorized personnel enter the confined space. The attendant shall not perform any other work activities except that they may also serve as the attending supervisor. The attendant shall only monitor a single confined space, unless entry points to subsequent confined space(s) are immediately adjacent and are under the direct control of the attendant. The attendant has the authority to discontinue work activities at any time.

The supervisor and/or attendant shall immediately notify employees on the worksite and the office of a potential emergency. It is their duty to assess the situation and contact emergency response personnel if applicable.

To facilitate emergency rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a confined space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. The entry supervisor, prior to the initial entry of personnel into a confined space, shall ensure the rescue equipment and retrieval system is functioning properly.

ELECTRICAL SAFETY

Work activities involving electrical hazards shall be conducted safely. Work tasks shall be conducted such that they mitigate or minimize the risk of injury and illness from exposure to electrical hazards.

Employees shall not perform live electrical work or any ancillary electrical work for which they are not qualified. Qualified electrical contractors will be engaged to perform such work.

Extensions Cords - Extension cords pose a risk of serious injury if not used properly. Worn or frayed electric cords or cables shall be removed from work areas and disposed of. Plugs equipped with a grounding prong must have the prong in place. Damaged plugs must be replaced. Working spaces, walkways, and similar locations must be kept clear of cords to eliminate hazards. Extension cords shall not be fastened with staples, hung from nails, or suspended by wire.

Grounding, GFCIs and Assured Grounding - Equipment, tools and cord sets shall be provided and utilized with grounding and GFCI's so as to protect employees from electrical shock and to prevent fire. Note: Portable equipment which is "double insulated" and endorsed by a nationally recognized testing facility need not have a grounding conductor, but is subject to the inspection to ensure that the tool has not been compromised.

Visual inspections - Visual inspection of tools and equipment are required prior to each use and shall include general condition, plugs and caps, the presence of ground prong, electrical cord sets, external defects, and missing parts. Any equipment failing a visual inspection shall be taken out of service and replaced.

Underground risks -

In work areas where the exact location of underground electric power lines is unknown, employees using jackhammers, bars, or other hand tools that may contact a line shall be provided with insulated protective gloves. Gloves must be rated to (or exceed) the voltage for which they may be exposed. The gloves shall be inspected before use and replaced as per the manufacturer's specifications.

Overhead electrical line risks –

While conducting site activities near overhead lines, field personnel need to be aware of the location of the lines so as not to use conductive equipment (e.g., metal equipment to include: drill rigs; hand auger extensions; geoprobe units; excavators, etc.) in close proximity to power lines.

OSHA 29 CFR 1926.550 requires that any vehicle or mechanical equipment (i.e., drill rigs) capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance distance of at least 10 feet is maintained. When calculating clearance distances for a drill rig, consider both the length of the derrick and the length of the rods. Higher voltages require greater clearance distances. Contact the electrical utility company to verify line voltage.

Confined Space or enclosed space work electrical risks -

When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized parts, protective shields, protective barriers, or insulating materials shall be used as necessary to avoid inadvertent contact with these parts. Doors, hinged panels, and the like shall be secured to prevent swinging into an employee and causing the employee to contact exposed energized parts. Employees shall not enter spaces containing exposed energized parts, unless illumination is provided that enables the employees to perform the work safely.

Temporary Wiring risks -

Temporary electrical power and lighting wiring methods that may be of a class less than would be required for a permanent installation. Temporary wiring shall be removed immediately upon completion of work and when the purpose for which the wiring was installed no longer applies.

Flexible cords and cables shall be protected from damage. Sharp corners and projections shall be avoided. Flexible cords and cables may pass through doorways or other pinch points, if protection is provided to avoid damage. Cords and temporary wiring passing through walls shall be properly protected (e.g. sleeved). Extension cord sets used with portable electric tools and appliances shall be of three-wire type and shall be designed for hard or extra-hard usage. Flexible cords used with temporary and portable lights shall be designed for hard or extra-hard usage.

LOCKOUT / TAGOUTS

Work activities associated with energized equipment or processes shall be controlled prior to initiating by verifying a zero energy state.

Lockout/Tagout procedures should be implemented whenever working on equipment or machines where hazardous energy sources are involved. Lockout/Tagout procedures do not apply to equipment or machines that have an electrical plug as the sole hazardous energy source and can reach a zero energy state by simply being unplugged as long as control of the plug can be maintained at all times.

A Lockout (isolation of the energy) can be accomplished by use of an isolating device or a control mechanism. An isolating device is a mechanical device that physically prevents the transmission or release of hazardous energy, including, but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; line valve; slide gate; similar device used to block or isolate energy. An energy control mechanism can be any lock or combination of locks, multi-lock hasps and/or other types of special mechanisms (chains, valve covers, breaker covers, etc.) applied to an energy-isolating device to ensure that it cannot be moved/operated. Supervisors shall train employee to ensure awareness of the prohibition of removing control mechanisms.

Tags (when necessary) shall be durable, standardized in type and have areas to indicate the employee's name and contact information.

Lockout Application

Perform the actions BEFORE commencing other work activities, in the following order:

- 1) Identify known operation devices for the equipment/machine/process, and commit all of them to the 'off' or 'neutral' position
- 2) Identify known energy controlling devices for the equipment/machine/process, commit all of them to the 'off' or 'neutral' position following established machine shutdown procedures, and utilize a lockout device to secure them in the 'off' or 'neutral' position

- Note 1: tag the lockout mechanism if multiple authorized employees are present or if the work will not be completed within the normal work shift. In such cases, mark the tag with your name and contact information.
 - Note 2: If the proper lockout procedures or a hazardous energy source is unknown, authorized employees shall not conduct further work activities and shall immediately contact their supervisor for assistance/instructions on proceeding.
- 3) Identify and neutralize all potential stored energy sources such as gravity, springs, electrical capacitors, hydraulic pressure and compressed gases.
 - 4) Visually inspect the equipment/machine/process and/or use electronic or mechanical means to verify that a zero energy state has been reached
 - 5) Ensure that affected and authorized employees are clear from the equipment/machine/process, then try to activate the equipment/machine/process by initiating identified operation devices to ensure that a zero energy state has been reached. Apply additional lockouts to any energy controlling devices having unprotected energy sources and repeat this procedure point until a zero energy state is obtained. Proceed with the required work activities for the equipment/machine/process when the zero energy state is obtained
 - 6) If a zero energy state cannot be reached, contact your supervisor for instructions

Release From Lockout

Authorized employees shall visually inspect the equipment/machine/ process to ensure that personnel and tools have been cleared and/or removed.

Then, only the authorized employee who placed the lockout mechanism into use can remove it.

FORKLIFTS

Forklifts pose a risk for serious injury if not used properly. Prior to operating a forklift, employees must complete forklift training and be certified. Absent proof of certification obtained elsewhere, the employee must complete an in-house video course and pass a written test.

Forklifts are to be maintained in good condition and must be inspected prior to use. The machine is not to be altered, including the use of fork extensions. Load limits are to be strictly adhered to. Situational awareness is critical to safe operations of the machine. The operator must insure that the ground conditions are stable and can support both the machine and load. Backup alarms must be working. Tampering with a backup alarm is grounds for immediate dismissal. Forklifts are not to be used to transport or lift other company personnel.

ALCOHOL AND DRUGS IN THE WORKPLACE

Drugs and alcohol are prohibited in the workplace. This prohibition also includes any prescription or over-the-counter medications that impair your ability to work safely, such as cough medicine, pain relievers, etc.

The posted Drug in Workplace Notice states –

The unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited on any jobsite or Company property. Furthermore, any employee convicted of a criminal drug statute must notify the Company in writing of such conviction within 5 days.

As a condition of employment, all employees agree to abide by these rules. Violation of this policy will result in the exercise of appropriate disciplinary action.

HEAT ILLNESS PREVENTION PROGRAM

RECOGNIZE HEAT ILLNESS TYPES AND THEIR SYMPTOMS

Field supervisors should understand the typical heat illness types and how to recognize their symptoms. The primary types of heat illnesses that employees are susceptible to when working outdoors in a hot environment are Heat Stroke, Heat Exhaustion, Heat Cramps, Fainting, and Heat Rash.

TAKE PROACTIVE STEPS TO PREVENT HEAT ILLNESS

Training

- Study the different heat illness types and how recognize their symptoms
- Conduct tailgate trainings reviewing environmental and personal risk factors
- Familiarize yourself and your crew with heat illness prevention strategies
- Understand ongoing monitoring and emergency response procedures

Acclimatization

- Understand that it takes 4 to 14 days for the body to adjust to working in hot weather
- Adjust work load, rest breaks, shift timing, etc., during acclimatization period
- Closely monitor new employees who may be more susceptible to heat illness

Providing Water

- Ensure that an adequate supply of water is available at the start to the shift
- Make sure that water containers are located close to the work zone
- Monitor water supply levels on regular intervals and refill prior to running out
- Remind employees to drink frequently and provide them with time to do so

Clothing

- Encourage workers to wear loose fitting, light colored clothing
- Wear wide-brimmed protective headwear where feasible

Breaks

- Provide rest breaks in a shady, comfortable, safe place
- Allow preventative recovery breaks before heat illness symptoms appear

Access to Shade

- Ensure that access to shaded areas is permitted at all times
- Avoid sitting in parked vehicles or in areas that are hot from sitting in the sun
- Provide portable sources of shade, such canopies and umbrellas, for crew use

Monitoring and Emergency Response

- Continuously monitor crew and stay alert to the presence of heat related symptoms
- Encourage coworkers to use a “buddy system” to watch each other
- Have access to a cell phone or other means of emergency communication
- Remind crew of emergency procedures and location of first aid providers

Extra Measures During Heat Waves

- Monitor weather conditions and forecasts
- Be extra vigilant and enforce mandatory use of the “buddy system” to monitor conditions
- Encourage additional water consumption
- Provide additional and/or longer break periods
- Consider altering work scheduling and assignments

FIRE PROTECTION AND PREVENTION

Fire prevention is the key to fire safety. Work should be planned whenever possible to limit or eliminate fuel sources in the work processes and to control heat, sparks, and others sources of ignition.

Superintendents and foremen should survey the work area before beginning any construction activities, taking into account existing environmental conditions and the risks of the planned work. Maintaining a clean and organized work area is essential to limiting the risk of fire. Flammable liquids and combustibles should be stored away from heat sources. Spark barriers and pre-wetting should be employed whenever using tools that create sparks.

Firefighting equipment must be properly maintained, readily available, and placed in a conspicuous location so that it can be quickly deployed when needed. Firefighting equipment may include portable fire extinguishers, shovels, and/or a source of nearby water and a means to convey it. Supervisors and foreman are responsible to train their crews on the proper use of fire extinguishers. This training should be repeated at least annually. Fire extinguisher should be inspected regularly and returned to the shop for servicing annually.

A site specific fire response plan should be discussed with co-workers prior to the start of the work so that they are adequately prepared if a fire should erupt on the jobsite.

HOT WORK

All cutting and welding operations shall be performed in compliance with OSHA standards and all other applicable state, and local regulations and standard safe work practices. Welding is restricted to areas or situations where adequate fire prevention, welder protection and public protection can be assured.

The project supervisor is responsible for the on-site safety assessment and for issuing Hot Work Permits if the work is to be performed outside of an area approved for routine hot work. The permit should be maintained on site.

A "Fire Watch" is an English speaking person specifically assigned to observe the hot work, to warn others of hazards associated with flammable materials, and when capable, to prevent incipient stage fires. A Fire Watch should be present when performing permitted Hot Work. Fire suppression equipment must be maintained nearby at all times. The Fire Watch should be ready to quickly adapt to changing circumstances.

Welders should exercise judgment in applying precautionary measures. They should ensure that the work area is adequately defined and, if applicable, the ground wetted in advance. Only trained and qualified personnel may operate or maintain welding, cutting or brazing equipment.

General Rules - If the object to be cut, burned or brazed cannot be moved and if all fire hazards cannot be removed, then guards shall be used to confine the heat sparks and slag and to protect the immovable fire hazards. If these steps cannot be taken to prevent fire, then the hot work will be stopped until a safer alternative is available to perform the work safely.

All equipment should be inspected prior to beginning work. All hoses, cord and leads and other welding equipment must be maintained in a safe and serviceable condition, with no fraying or exposed copper permitted. They should be deployed in a manner that does not create tripping hazards.

Welders must wear the appropriate PPE including safety glasses and hoods with the proper shaded lens. All parts of the body should be covered to prevent skin burns from ultra-violet rays or molten metal. Necessary precautions must be taken to protect against electrical shocks when working in wet or damp places.

Most of the work we perform takes place outdoors in naturally ventilated environments. While this will often provide adequate ventilation, prior to working with welding and cutting equipment you still must access the work zone to ensure that adequate ventilation is present. Take all necessary precautions to prevent the accumulation of gases when cutting torches are used.

Gas Cylinders- Compressed gas cylinders pose additional risks. The equipment shall be inspected for leaks daily. Unserviceable/non-approved equipment may not be used. They are to be shut-off at the bottle when not in use or unattended for short periods of time. At the end of the shift, or when transported, the bottles are to be shut off and gauges and hoses detached and properly stored and protective caps installed.

EMERGENCY ACTION PLAN

Major disasters must be anticipated and procedures must be developed and mastered if the well-being of our personnel is to be protected and if we are ready to serve our community.

The plan administrators shall be the company's primary community/emergency responder liaison.

GENERAL EMERGENCY PROCEEDURES :

When an accident or injury occurs on a jobsite, it is important to keep calm and assess the situation. Your conduct and actions during the first few minutes of any emergency may not only save your life but the lives of your fellow workers or other members of the public.

If there is an emergency requiring immediate first responder attention, dial 911 to report the incident

Every employee is authorized to make a 911 call without first contacting the office if they believe that it is appropriate. Be sure to contact the office after calling 911 so that management personnel can promptly respond. Incidents that do not require first responder attention should first be reported to the office so that we can assist in determining the proper course of action.

MPE utilizes the services of a professional first aid responder (i.e. On-Site Health and Safety) for all other non-911 incidents. They will promptly dispatch an EMT to provide medical attention.

LOCATION OF MEDICAL CLINICS AND FIRST RESPONDERS:

It is important to know the location of the closest source medical attention **BEFORE** an emergency arises, whether that is the local fire house, hospital, or medical clinic. This is a pre-job task. If a medical facility or first responders are not available within a reasonable distance, a first aid/CPR certified individual shall be available on the jobsite to render assistance whenever work is being performed.

LOCATION OF FIRST AID KITS:

There are first aid kits located in the MPE office and the MPE shop area.

In the field, assigned field vehicles (supervisors and lead person vehicles) are equipped with a first aid kit. It is each employee's responsibility to know the location of the closest first aid kit prior to needing it. Employees should contact the office if for any reason additional first aid kits are needed.

The vehicle's assigned driver is responsible to make sure that the first aid kit remains in the vehicle and are available for use. If items in the first aid kit are utilized, the driver is responsible to immediately restock or replace the kit.

FIRE PROCEDURES ("Keep Calm...Report all fires and smoke")

The person reporting the fire to the fire department should provide them with the following information:

1. Company Name & Address
2. What is burning (machine, paper, etc.)
3. Location of fire (roof, office, etc.)

Employee should attempt to extinguish the fire with the use of non-premises equipment (extinguisher, hoses, etc). A minimum of two persons is required to fight a fire. To ensure employee safety, this is to be done only during the early stages of the fire.

Working away from the involved area, Employees should:

1. Clear the aisles, hallways and other areas for personnel and visitors.
2. Close all doors and windows.
3. Check driveway to see that they are clear for entry of fire fighting equipment. See that gates are unlocked and open.
4. Wait at the front entrance for arrival of fire fighting equipment. Direct the fireman to the fire if necessary.

Re-entry onto the property will not be permitted until it is declared safe to do so by someone with Executive authority or by the local fire/law enforcement officials.

EARTHQUAKE PROCEDURES

In the event of an earthquake the following procedures shall be followed:

1. Assess damage and injuries.
2. Give first aid as needed. Remember, after an earthquake, utilities, police and fire agencies may not be readily available. DO NOT ATTEMPT TO TELEPHONE UNLESS ESSENTIAL.
3. Notify executive management if any are away from the premises.
4. Call the Fire Department only in the case of fire.
5. The nearest hospital for treatment is:
Community Hospital
23625 WR Holman Hwy
Monterey CA (831) 624-5311
6. Have damaged or potentially damaged utilities shut off at the main controls.
7. Personnel should take shelter under a sturdy table or equipment during an earthquake and remain there until all shaking has ceased.
8. Evacuate as necessary. Supervisors shall be responsible for seeing that employees are evacuated to a safe area outside the building and clear of overhead electrical lines, utility posts, block walls, etc., which might fall during aftershocks. Supervisors are cautioned to be alert for fallen high tension lines which may be touching metal objects on the ground.
9. Have all areas of the building inspected for damage before allowing personnel to return to the building(s).
10. Have gas, electrical, water, and fuel systems checked for damage before allowing personnel to return to the building(s).
11. Drinking water should be checked to determine that it is not contaminated. Water contained in toilet tanks can be boiled and used if necessary.

SUBCONTRACTOR SAFETY MANAGEMENT

Subcontractors shall be selected and managed in a manner consistent with MPE's safety objectives, policies, and procedures. The subcontractor's safety requirements and activities should equal to or exceed our own.

A subcontractor is a person or business which has a standard subcontract agreement with MPE and is working as an "independent contractor" to provide some portion of the fieldwork on a project.

The project manager is responsible to determine the acceptability of a subcontractor to work for MPE. Often this determination is supplemented by ongoing familiarity and a working relationship with the entity. One objective factor to be taken into consideration is the subcontractor's Experience Modification Rate (EMR). Prospective subcontractors shall furnish their EMR for the past three years. The average should equal, or be less than ,1.0. If the EMR exceeds 1.0, additional evaluation should be undertaken.

The prospective subcontractor should demonstrate that they have a program that meets industry standards. The program should be industry specific, not generic, and should be responsive to the exposures prevalent in the industry and anticipated on the prospective project. The program should include requirements for employee training and recordkeeping.

Subcontractors shall be advised that they are required to promptly report any on the job injuries or accidents to the project manager.

The project manager's pre-job planning should include a review and understanding of the scope of work to be performed by subcontractors. This would include a review of issues such as the material, tools and equipment to be used, the PPE that would be appropriate, and the applicable safety standards that would apply. This will assist the project manager with on-the-job subcontractor monitoring and management. Ongoing monitoring is a key component of subcontractor management.

RECORDKEEPING

SUPERVISORS AND FOREMEN

Supervisors and Foremen are to maintain an updated copy of the Company's Accident Prevention and Safety Program in their binders. They are responsible to make sure that the binder remains in their assigned vehicle and is available for employee use or reference. They are to promptly forward all safety documents (safety/training forms, etc.) to the office for inclusion in the Company's safety related files.

ADMINISTRATORS / OFFICE

The administrators / office shall maintain the safety related files, including but not limited to the following:

- Master Accident Prevention and Safety Program with changes and updates
- Employee Notices & handouts
- Employee training documents
- Master file of safety subjects
- Incident Investigation Reports
- Crew Safety/Training Meeting Reports

The above is not a complete listing of all Company policies, procedures, or work rules. The Company reserves the right to modify, amend, adopt, and rescind any lawful Company policy or work rule at it deems appropriate. The implementation of any policy shall in no way modify or affect the Company's "At Will" employment practice.

Monterey Peninsula Engineering

Site Specific Safety Plan

*Job Specific Hazards
Safety Program Implementation
Inspection Requirements
Documentation Requirements
Emergency Response
&
Site Security*

Carmel Valley Pump Station

For California American Water

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1. ABBREVIATIONS

- 1.1. CCR: California Code of Regulations
- 1.2. GISO: General Industry Safety Orders
- 1.3. IC: Incident Commander
- 1.4. IDLH: Immediately Dangerous to Life or Health
- 1.5. IIPP: Injury and Illness Prevention Program
- 1.6. JHA: Job Hazard Analysis
- 1.7. LOTO: Lock Out Tag Out
- 1.8. MPE: Monterey Peninsula Engineering
- 1.9. CAW: California American Water Company
- 1.10. DDA: Denise Duffy and Associates
- 1.11. OSHA: Occupational Safety & Health Administration
- 1.12. CPUC: California Public Utility Commission
- 1.13. SPM: Safety Program Manager
- 1.14. CSP: Contractor Safety Program
- 1.15. SSO: Site Safety Officer
- 1.16. SSSP: Site Specific Safety Plan
- 1.17. PPE: Personal Protective Equipment
- 1.18. SDS: Safety Data Sheet
- 1.19.

2. SCOPE OF WORK

- 2.1. This Site-Specific Safety Plan (SSSP) has been developed for California American Water Company for the Carmel Valley Pump Station Project by Monterey Peninsula Engineering (MPE).
 - 2.1.1. MPE Job Number 1924

3. PROGRAM APPROVAL

- 3.1. The policies and procedures outlined in this SSSP are strictly enforced at MPE and are to be adhered to at all times.
- 3.2. This SSSP has been developed by:
 - 3.2.1. Paul Bruno, Safety Program Manager/Principal

- 3.2.2. Joseph Taormina, Project Manager
- 3.3. This SSSP has been reviewed by:
 - 3.3.1. Peter Taormina, Engineering Manager/Principal
 - 3.3.2. Jim Bruno, Operations Manager/ Principal
- 3.4. Any changes to the methods stated herein must be approved by the MPE Site Safety Officer (SSO) listed below before they are put into practice.
 - 3.4.1. SSO: Michael Price, Site Foreman, 831-277-0137

4. PURPOSE

- 4.1. The purpose of this SSSP is to:
 - 4.1.1. Specify safety and health requirements for MPE employees, contractors and visitors at this project,
 - 4.1.2. Comply with California Occupational Safety and Health Administration (OSHA) regulations
- 4.2. Since this SSSP is not an all inclusive policy in regards to health and safety issues, it is imperative that employees understand that all policies listed in the MPE Safety and Health Program shall be adhered to at all times.
- 4.3. Any questions regarding this SSSP should be directed to the SSO or your supervisor.

5. REGULATIONS

- 5.1. This SSSP is in compliance with Cal-OSHA Title 8 of the California Code of Regulations (CCR):
 - 5.1.1. Construction Safety Orders section 1541 Excavations
 - 5.1.2. General Industry Safety Orders (GISO) section 3203 Injury and Illness Prevention Program (IIPP)

6. SITE DESCRIPTION

- 6.1. The project sites are as listed below
 - 6.1.1. Ragsdale Drive between its intersections with Highway 68 to York Road.
- 6.2. The site surroundings are as listed below
 - 6.2.1. Grass, Roadway, Trees/Forest, Wetland/Marsh, Buildings/Homes

7. HAZARDS

- 7.1. The following hazards are or may be present at the site during the project:
 - 7.1.1. Chemical hazards

- 7.1.2. Heat Stress
 - 7.1.3. Fall hazards
 - 7.1.4. Vehicular traffic
 - 7.1.5. Underground utilities
 - 7.1.6. Welding fumes
 - 7.1.7. Fire hazards
 - 7.1.8. Electrical
 - 7.1.9. Excavation
 - 7.1.10. Heavy equipment such as an excavator
- 7.2. The SSO is responsible for ongoing Job Hazard Analysis (JHA) at this site.
- 7.2.1. New hazards or procedures shall be documented on an ongoing basis and communicated to employees, contractors and their supervisors.

8. JOB HAZARD ANALYSIS

- 8.1. The JHA has determined that certain tasks may be hazardous.
- 8.1.1. For each task the hazard and recommended precautions have been listed.
- 8.2. TASK: Soil excavation
- 8.2.1. HAZARD: Coming in contact with underground utility
 - 8.2.1.1. PRECAUTION: Contact USA Alert and use a private locator to identify the location of utilities
 - 8.2.1.2. PRECAUTION: Hand dig within 2 feet of USA Alert markings to locate utility conflicts.
 - 8.2.2. HAZARD: Coming in contact with potentially contaminated soil.
 - 8.2.2.1. PRECAUTION: In the event that contaminated soil or groundwater is encountered, MPE will immediately stop work in the vicinity of the unknown hazardous materials release, notify Monterey County Department of Environmental Health, and retaining a qualified environmental firm to perform sampling and remediation.
- 8.3. TASK: Working in or near the excavation
- 8.3.1. HAZARD: Excavation cave in
 - 8.3.1.1. PRECAUTION: Competent person to inspect excavation daily and after each hazard increasing event
 - 8.3.1.2. PRECAUTION: Shoring, sloping or benching as required by Cal/OSHA
- 8.4. TASK: Using chemicals

- 8.4.1. HAZARD: Exposure to the chemical or its vapors
 - 8.4.1.1. PRECAUTION: Wear proper PPE
 - 8.4.1.2. PRECAUTION: Read the chemical SDS
- 8.5. TASK: Working near heavy equipment.
 - 8.5.1. HAZARD: Getting struck by or run over by heavy equipment
 - 8.5.1.1. PRECAUTION: Personnel are to wear an ANSI approved high visibility vest.
 - 8.5.1.2. PRECAUTION: Work area coned off and vehicular traffic directed away from the work area
 - 8.5.1.3. PRECAUTION: Provide spotter.
- 8.6. Please remember that it is not possible to anticipate, identify, evaluate and control all potential site hazards therefore all employees and contractors are expected to be vigilant at all times for other hazards.

9. RESPONSIBILITIES

- 9.1. All employees, contractors and visitors on this site must comply with the requirements of this SSSP.
 - 9.1.1. Failure to follow the SSSP may result in disciplinary action for employees or termination of contract for contractors.
- 9.2. The SSO has the following responsibilities:
 - 9.2.1. Remains on site during all hazardous operations
 - 9.2.2. Halt site work if unsafe conditions are detected.
 - 9.2.3. Managing the safety and health functions at this site;
 - 9.2.4. Serving as the site's point of contact for safety and health matters;
 - 9.2.5. Ensures that employees and contractors have the proper level of safety training,
 - 9.2.6. Ensures that the proper Personal Protective Equipment (PPE) are worn as needed;
 - 9.2.7. Periodically assesses site conditions for unsafe acts and conditions and ensures that proper corrective action is taken as needed;
 - 9.2.8. Assists in the review of this SSSP;
 - 9.2.9. Maintains safety and health records.
- 9.3. Employees and contractors are responsible for:
 - 9.3.1. Complying with the requirements of this SSSP,
 - 9.3.2. Using the proper PPE,
 - 9.3.3. Reporting unsafe acts and conditions to their supervisor or SSO
 - 9.3.4. Reporting injuries and illnesses to their supervisor or SSO

10. TRAINING

- 10.1. Employees potentially exposed to hazardous chemicals are required to receive training.
 - 10.1.1. Employees shall be informed as to the chemicals that they will be working with at this project and advised as to the location of the SDS.
- 10.2. Personnel working at heights greater than 7.5 feet to the next level are required to have received fall protection training within the last 3 years.
- 10.3. Personnel operating forklifts (including rough terrain) are required to have had forklift safety training within the last 3 years.
- 10.4. Personnel operating scissor lifts are required to have had scissor lift safety training.
- 10.5. Personnel operating aerial lifts are required to have had aerial lift safety training.
- 10.6. Personnel responding to medical emergencies are required to have had first aid/CPR training.
- 10.7. Personnel expected to use fire extinguishers such as a hot work fire watch are required to have fire extinguisher training.
- 10.8. Personnel doing hot work such as welding are required to have had hot work safety training.
- 10.9. Personnel acting as excavation safety competent person are required to have completed an excavation safety competent person class.
- 10.10. Personnel exposed to hazardous energy shall be trained in Lock Out Tag Out (LOTO).
- 10.11. Personnel entering into confined spaces are required to have had confined space safety training.
- 10.12. Training records shall be kept according to the requirements of the MPE IIPP.
- 10.13. The SSO is responsible for ensuring that employees are adequately and currently trained for all tasks they are asked to perform.
 - 10.13.1. Employees who have not been trained to a level required by their job function and responsibility are not permitted to participate in or supervise field activities.

11. TAILGATE

- 11.1. A tailgate safety meeting is to be held by the SSO with all MPE employees and contractors prior to start of project.
- 11.2. Additional tailgate safety meetings will be held at least every 10 working days until the project is complete.

- 11.2.1. Additional briefings should be held prior to the start of work involving new hazards.
- 11.3. The following information will be covered during the tailgate safety meeting:
 - 11.3.1. Site hazards
 - 11.3.2. PPE that are to be worn at the site.
 - 11.3.3. Work practices by which the employee can minimize risks from site hazards.
 - 11.3.4. The emergency procedures to follow in case of an emergency and on-site emergency response capabilities.
 - 11.3.5. Location of emergency equipment
- 11.4. Construction managers shall hold regular tailgate meetings with construction staff on days when work near high-priority utilities will occur to review all safety measures regarding such excavations, including measures identified in the Mitigation Monitoring and Reporting Program and in construction specifications" (MM 4.13-1c: Safeguard Employees from Potential Accidents Related to Underground Utilities)
- 11.5. Each tailgate safety meeting shall be documented by having the attendee sign the safety / training form located in Attachment A.

12. CONTRACTORS & SUBCONTRACTORS

- 12.1. Contractor and sub-contractors will be informed of:
 - 12.1.1. The site emergency response procedures and any potential fire, explosion, health, safety or other hazards that have been identified by MPE
 - 12.1.2. Each contractor/sub-contractor is responsible for compliance with all safety and health protection requirements for its employees.
 - 12.1.3. The MPE SSSP can be used by contractors/sub-contractors at the site if it appropriately addresses their activity and potential safety and health hazards.

13. VISITORS

- 13.1. Visitors and regulatory personnel entering the work areas are expected to be familiar with and adhere to all provisions of this SSSP.
- 13.2. Such personnel will be expected to provide and utilize PPE that is equal to, or exceeds the PPE required by the SSO.
- 13.3. Any visitor failing to adhere to the requirements of the SSSP may be excluded from entering the active work areas.
- 13.4. Visitors are to be escorted at all times if they enter the work area.

14. PERSONAL PROTECTIVE EQUIPMENT

- 14.1. PPE shall be selected and used which will protect employees from the potential hazards they are likely to encounter.
- 14.2. The following PPE at a minimum are required to enter the work zone:
 - 14.2.1. Hard hat
 - 14.2.2. Traffic vest
 - 14.2.3. Closed toed boots
- 14.3. Respiratory protection shall be worn as needed.
 - 14.3.1. Employees wearing respiratory protection shall be trained initially and annually thereafter.
 - 14.3.2. Employees wearing respiratory protection shall be fit tested initially and annually thereafter.
- 14.4. PPE can be upgraded or down-graded by the SSO as site conditions change.
 - 14.4.1. The PPE level shall be increased when additional information on site conditions shows that increased protection is necessary to reduce employee exposures.
 - 14.4.2. The PPE level may be decreased when additional information or site conditions show that decreased protection will not result in hazardous exposures to employees.
- 14.5. PPE expected to be worn by personnel are to be provided by their respective employer.
- 14.6. PPE shall be inspected, used, maintained and stored according to its manufacturer's recommendations.
- 14.7. For more information refer to the MPE written PPE and respiratory protection programs.

15. CHEMICAL HAZARDS

- 15.1. If any chemicals are brought to the site a copy of the chemical's Material Safety Data Sheet (SDS) will be retained by the project foreman.
- 15.2. Personnel bringing hazardous chemicals to the site (other than consumer products) are required to have a hard or soft copy of the SDS or Safety Data Sheet (SDS) for said chemical with them.

16. HEAT ILLNESS PREVENTION

- 16.1. Employees shall have access to potable drinking water.

- 16.2. Employees suffering from heat illness or believing a preventative recovery period is needed shall be provided access to an area with shade that is either open to the air or provided with ventilation or cooling for a period of no less than five minutes.
 - 16.2.1. Such access to shade shall be permitted at all times.
- 16.3. The employer shall implement high-heat procedures when the temperature equals or exceeds 95 degrees Fahrenheit. These procedures shall include the following to the extent practicable:
 - 16.3.1. Ensuring that effective communication by voice, observation, or electronic means is maintained so that employees at the work site can contact a supervisor when necessary.
 - 16.3.2. An electronic device, such as a cell phone or text messaging device, may be used for this purpose only if reception in the area is reliable.
 - 16.3.3. Observing employees for alertness and signs or symptoms of heat illness.
 - 16.3.4. Reminding employees throughout the work shift to drink plenty of water.
 - 16.3.5. Close supervision of a new employee by a supervisor or designee for the first 14 days of the employee's employment by the employer, unless the employee indicates at the time of hire that he or she has been doing similar outdoor work for at least 10 of the past 30 days for 4 or more hours per day.
- 16.4. The on-site foreman is designated as the person to ensure that emergency procedures are invoked when appropriate in case of a heat illness incident.
- 16.5. In the event of an emergency, clear and precise directions to the work site will be provided as needed to emergency responders by the on-site foreman.
- 16.6. For more information refer to the MPE heat illness prevention program.

17. ENGINEERING CONTROLS

- 17.1. To minimize exposure during dusty operations, steps should be taken to wet down the work area.

18. SITE CONTROL

- 18.1. MPE will fence areas of the project as needed to prevent unauthorized access to the work zone,
- 18.2. The site control restrictions are to be updated by the SSO and/or on-site foreman to reflect current site conditions, work operations, hazards and procedures on an as needed basis.

19. EXCAVATION SAFETY

- 19.1. If the excavation is 5 feet or deeper and someone enters it a Cal/OSHA permit will be obtained.
- 19.2. Prior to excavating the SSO or the contractor performing the excavation will notify USA Alert and note the ticket number provided by USA alert on the office's dispatch form.
 - 19.2.1. Individuals with first-hand knowledge of the excavation site and that can be reached by telephone should call the location description into USA Alert.
 - 19.2.1.1. This allows USA Alert, and its members, to discuss the location with a person who has knowledge of the excavation layout and specific location.
 - 19.2.2. Notification must be provided at least 2 working days prior to the commencement of excavation.
 - 19.2.2.1. Mark the area to be excavated with white paint prior to calling USA Alert.
 - 19.2.2.2. Mark the excavation site on paved surfaces with white spray chalk, water base, UV paint or equivalent less permanent type marking; use flags or stakes on unpaved surfaces.
 - 19.2.2.3. The area to be excavated should be marked with the initials of the excavator as well.
 - 19.2.2.4. MPE will provide weekly updates to Cal Am and construction workers regarding planned excavations for the upcoming week and to specify when construction will occur near a high priority utility
 - 19.2.3. The USA Ticket will be active for 28 calendar days from the day it is called in.
 - 19.2.3.1. If your excavation will continue past the 28-day active period, call USA Alert back to extend the ticket before it expires.
 - 19.2.4. To notify USA Alert call 811 or 1-800-227-2600.
- 19.3. Private utility locators will be used in case there is a concern regarding the presence or location of private or public utilities at the proposed excavation site.
 - 19.3.1. Only qualified persons that have completed the required training shall perform subsurface installation locating activities
- 19.4. Prior to starting an excavation, examine the excavation site for physical evidence (manholes, valve covers, water meters, sewer cleanouts, vaults, utility maintenance boxes, pole risers, etc) that would indicate the existence of underground facilities.
- 19.5. Always excavate, as cautiously and prudently as possible.

- 19.6. Excavation shall not commence until a positive response has been received from all known owner/operators of subsurface installations within the boundaries of the proposed project; those responses confirm that the owner/operators have located their installations, and those responses either advise the excavator of those locations or advise the excavator that the owner/operator does not operate a subsurface installation that would be affected by the proposed excavation.
- 19.7. When the excavation is proposed within 10 feet of a high priority subsurface installation, the excavator shall be notified by the facility owner/operator of the existence of the high priority subsurface installation before the legal excavation start date and time and an onsite meeting involving the excavator and the subsurface installation owner/operator's representative shall be scheduled by the excavator and the owner/operator at a mutually agreed on time to determine the action or activities required to verify the location of such installations.
 - 19.7.1. High priority subsurface installations are high pressure natural gas pipelines with normal operating pressures greater than 60 p.s.i.g., petroleum pipelines, pressurized sewage pipelines, conductors or cables that have a potential to ground of 60,000 volts or more, or hazardous materials pipelines that are potentially hazardous to employees, or the public, if damaged.
- 19.8. If drilling will be within 2 feet of a marked utility before you use power equipment, expose the underground utility by hand.
- 19.9. Excavations will be inspected daily by a competent person.
- 19.10. Notify the affected utility of any contact, scrape, dent, nick or damage to their facility.
 - 19.10.1. If the damage results in the escape of any flammable, toxic, or corrosive gas or liquid or endangers life, health or property, the excavator responsible shall immediately notify 911 and the facility owner/operator.
 - 19.10.2. The excavator shall take reasonable measures to protect themselves and those in immediate danger, general public, property, and the environment until the facility owner / operator or emergency responders have arrived and completed their assessment.
 - 19.10.3. An excavator discovering or causing damage to a subsurface installation shall notify the operator of the installation and USA Alert who will transmit the notice to its members in the area of the damage.
 - 19.10.3.1. USA Alert will also provide the excavator with the emergency telephone number for the member whose facility was damaged.

20. MATERIAL HANDLING

- 20.1. Material handling shall be performed using equipment that are suited for the task and reduce the likelihood of an injury.
- 20.2. Personnel operating heavy equipment used for material handling shall be trained on the use of said equipment.
- 20.3. Equipment shall be under control at all times and shall be kept in gear when descending grades.
- 20.4. No vehicle shall be driven at a speed greater than is reasonable and proper, with due regard for weather, traffic, intersections, width and character of the roadway, type of motor vehicle, and any other existing conditions.
- 20.5. Arrangements shall be made to direct exhaust gases away from the operator's breathing zone.
- 20.6. Every vehicle with a haulage capacity of 2.5 cubic yards or more used to haul dirt, rock, concrete, or other construction material shall be equipped with a warning device that operates automatically while the vehicle is backing.
 - 20.6.1. The warning sound shall be of such magnitude that it will normally be audible from a distance of 200 feet and will sound immediately on backing.
 - 20.6.2. In congested areas or areas with high ambient noise which obscures the audible alarm, a signaler, in clear view of the operator, shall direct the backing operation.
- 20.7. All vehicles shall be equipped with a manually operated warning device which can be clearly heard from a distance of 200 feet.
- 20.8. The operator of all vehicles shall not leave the controls of the vehicle while it is moving under its own engine power.
- 20.9. Hauling or earth moving operations shall be controlled in such a manner as to ensure that equipment or vehicle operators know of the presence of spotters, lab technicians, surveyors, or other workers on foot in the areas of their operations.
 - 20.9.1. Vehicles shall not be operated at speeds which will endanger the driver or traffic.
- 20.10. All vehicles in use shall be checked at the beginning of each shift to assure that the following parts, equipment, and accessories are in safe operating condition and free of apparent damage that could cause failure while in use: service brakes, including trailer brake connections; parking system (hand brake); emergency stopping system (brake); tires; horn; steering mechanism; coupling devices; seat belts; operating controls; and safety devices.
 - 20.10.1. All defects affecting safe operation shall be corrected before the vehicle is placed in service.

- 20.10.2. These requirements also apply to equipment such as lights, reflectors, windshield wipers, defrosters, fire extinguishers, etc., where such equipment is necessary.
- 20.11. Whenever the equipment is parked, the parking brake shall be set.
- 20.11.1. Equipment parked on inclines shall have the wheels chocked and the parking brake set or be otherwise prevented from moving by effective mechanical means.
- 20.12. No loading device shall be left unattended until the load or bucket is lowered to the ground, unless proper precautions such as blocking are taken to prevent accidental lowering.
- 20.13. No internal combustion engine fuel tank shall be refilled with a flammable liquid while the engine is running.
- 20.13.1. Fueling shall be done in such a manner that the likelihood of spillage is minimal.
- 20.13.2. If a spill occurs it shall be washed away completely, evaporated, or equivalent action taken to control vapors before restarting the engine.
- 20.13.3. Fuel tank caps shall be replaced before starting the engine.
- 20.13.4. A good metal-to-metal contact shall be kept between fuel supply tank or nozzle of supply hose and the fuel tank.
- 20.13.5. No open lights, welding, or sparking equipment shall be used near internal combustion equipment being fueled or near storage tanks.
- 20.14. No smoking shall be permitted at or near the gasoline storage area or on equipment being fueled. Post a conspicuous sign in each fuel storage and fueling area stating: "NO SMOKING WITHIN 25 FEET."
- 20.15. Class I liquids shall not be dispensed by pressure from drums, barrels, and similar containers. Approved pumps taking suction through the top of the container or approved self-closing faucets shall be used.
- 20.16. No repairs shall be made to equipment while it is being fueled.
- 20.17. Each fuel storage tank or drum shall have the word "Flammable" conspicuously marked thereon and should also have a similarly sized word indicating the contents of the container.
- 20.18. A dry chemical or carbon dioxide fire extinguisher rated 6:BC or larger shall be in a location accessible to the fueling area.
- 20.19. Roll Over Protection Structure (ROPS) and seat belts shall be installed and used on all equipment
- 20.19.1. ROPS shall provide operator protection against the hazard of falling objects.
- 20.20. Each ROPS shall bear a label with the following information:

- 20.20.1. Name and address of manufacturer.
- 20.20.2. Manufacturer's ROPS model number.
- 20.20.3. Make and model of equipment for which the ROPS is designed.
- 20.21. Labels shall be stamped plates or other permanently attached means of identification, and shall not be obscured, obliterated or changed.
- 20.22. Seat belts shall be adequate for the intended service and in good repair.
- 20.23. Each seat belt shall be permanently and legibly marked or labeled with year of manufacture, model or style number and name or trademark of manufacturer or distributor, or of the importer if manufactured outside of the United States.

21. EMERGENCY PROCEDURES

21.1. Key Personnel/Emergency Response Staff

Key Personnel/Emergency Response Staff		
<i>Personnel (Title – Name)</i>	<i>On/Off Site</i>	<i>Cell Phone</i>
Safety Program Manager – Paul Bruno	Off	(831) 277-6110
Operations Manager – Jim Bruno	On/Off	(831) 277-6114
Engineering Manager – Peter Taormina	Off	(831) 277-6112
General Site Superintendent – Gary Haney	On/Off	(831) 277-6136
Project Manager – Etheline Cimatu	On/Off	(831) 277-6121
Site Safety Officer – Mike Price	On	(831) 277-0137
24-Hour Emergency – Gino Castro	Off	(831) 277-6116

21.2. The following emergencies may occur at this site:

- 21.2.1. Medical emergency
- 21.2.2. Chemical emergency
- 21.2.3. Fire or explosion
- 21.2.4. Evacuation

21.3. Report all emergencies to the MPE SSO.

21.4. The following are emergency numbers that may be needed in case of an emergency:

- 21.4.1. FIRE: 911
- 21.4.2. MEDICAL: 911
- 21.4.3. POLICE: 911
- 21.4.4. CAL-OSHA: 510-794-2521 must be notified within 8 hours in case of a serious injury or fatality

21.4.5. Poison Control Center: 800-662-9886

21.4.6. USA Alert: 811 (in case of emergency involving a utility)

21.5. EVACUATION

21.5.1. The SSO is to designate and communicate the location of an assembly area upwind of the work zone.

21.5.2. In case of an evacuation all employees are to evacuate to the designated assembly area for a headcount.

21.6. SPILL CONTAINMENT

21.6.1. In case of a chemical spill or gas leak the SSO shall become the Incident Commander (IC) until outside agencies have arrived on the site.

21.6.2. Evacuate any area where unprotected personnel may become exposed to the hazardous chemical spill or leak.

21.6.3. Prevent re-entry into said area.

21.6.4. Evacuate personnel to the assembly area

21.6.5. Take a head count of all personnel to ensure that every worker is accounted for.

21.6.6. Provide first aid to contaminated or exposed workers.

21.6.7. If it is safe to do so, prevent runoff of hazardous materials into the storm or sewer drains by covering or diking the drain.

21.7. FIRE EMERGENCY

21.7.1. In case of a fire evacuate the immediate area of the fire and prevent reentry into the area.

21.7.2. In case of a minor fire attempt to put out the fire if you have been trained on how to use a fire extinguisher.

21.7.3. In case of a major fire evacuate the site and notify the fire department.

21.7.4. Meet the fire department upon their arrival and direct them to the fire.

21.8. MEDICAL EMERGENCY

21.8.1. In case of bleeding apply direct pressure while exercising universal precautions to protect from coming in contact with the victim's blood and other bodily fluids.

21.8.1.1. Apply a sterile dressing and bandage to control the bleeding.

21.8.1.2. Severe cuts or bleeding that is not stopping will require the patient to be transported to the nearby hospital.

21.8.2. In case of eye or skin exposure to hazardous material decontaminate the worker immediately by washing the exposed area for a period of at least 15 minutes.

- 21.8.3. In case of inhalation of hazardous materials remove the patient from the hazard area:
 - 21.8.3.1. If they stop breathing provide rescue breaths if you have been trained to do so
 - 21.8.3.2. If their pulse stops provide CPR if you have been trained to do so
- 21.8.4. If the medical emergency warrants it, the SSO may request that an ambulance be dispatched to the site. Examples include:
 - 21.8.4.1. Loss of consciousness
 - 21.8.4.2. No breathing, or circulation (pulse) present
 - 21.8.4.3. Broken bone
 - 21.8.4.4. Convulsions
 - 21.8.4.5. Severe head injury (signs of disorientation)
 - 21.8.4.6. Severe bleeding and
 - 21.8.4.7. Severe burns
- 21.9. Send a copy of the SDS for the suspected chemical exposure with patient in case they are transported to a medical facility.
- 21.10. All work related injuries or illnesses shall be recorded, reported and investigated according to the MPE IIPP.
- 21.11. Emergency room: Community Hospital of the Monterey Peninsula
 - 21.11.1. Located at 23625 Holman Highway, Monterey, 831-625-4900.
 - 21.11.2. This medical facility is open 24 hours a day 7 days a week.
 - 21.11.3. See Appendix A for map and directions to hospital from job site.
- 21.12. Medical clinic: Doctors On Duty-Marina
 - 21.12.1. Located at 3130 Del Monte Blvd., Marina, (831) 883-3330.
 - 21.12.2. This medical facility is to be used for minor injuries and illnesses.
 - 21.12.3. Open Monday through Friday 8 am to 6 pm.

22. EMERGENCY EQUIPMENT

- 22.1. The following emergency equipment will be available at the site:
 - 22.1.1. First Aid Kit
 - 22.1.2. Fire Extinguisher
- 22.2. A fire extinguisher, rated not less than 10B, shall be provided within 50 feet of wherever more than 5 gallons of flammable or combustible liquids or 5 pounds of flammable gas are being used on the job site.
- 22.3. A fire extinguisher shall be provided for each 3,000 square feet of the floor area, or fraction thereof.
 - 22.3.1. Where the floor area is less than 3,000 square feet at least one extinguisher shall be provided.

23. ILLUMINATION

- 23.1. Project is to be done during daylight hours and a need for additional illumination is not anticipated.
- 23.2. If illumination is required due to location or time of day necessary arrangements for additional lighting shall be made.

24. SANITATION

- 24.1. Employees exposed to sewage should:
 - 24.1.1. Wash their hands with soap and water before eating or drinking or touching their eyes or lips
 - 24.1.2. Refrain from taking contaminated clothing home unless segregated
- 24.2. A minimum of one separate toilet facility shall be provided for each 20 employees or fraction thereof.
- 24.3. Toilet facilities shall be kept clean, maintained in good working order, designed and maintained in a manner which will assure privacy and provided with an adequate supply of toilet paper.

25. CONFINED SPACE

- 25.1. Confined spaces are not to be entered during this project unless:
 - 25.1.1. A confined space permit is issued by MPE, and
 - 25.1.2. Personnel entering the confined space are properly trained, and
 - 25.1.3. The space has been monitored by a calibrated 4 gas meter, and
 - 25.1.4. An attendant is at the confined space,
 - 25.1.5. Retrieval system has been deployed for spaces that are 4 feet or deeper and
 - 25.1.6. A rescue team on standby is needed only if entrants cannot stay connected to the retrieval system in spaces that are 4 feet or deeper.
- 25.2. If employees or contractors are to enter permit required confined spaces the MPE confined space entry program shall be followed.
- 25.3. Because confined spaces are present at the site the SSO shall advise employees and contractors during the tailgate safety meeting of said hazard.
- 25.4. Continuous air monitoring shall be performed when entering confined spaces using a 4 gas meter that can properly detect the following:
 - 25.4.1. Oxygen (O₂)
 - 25.4.2. Lower Explosive Limit (LEL)
 - 25.4.3. Hydrogen sulfide (H₂S)

- 25.4.4. Carbon Monoxide (CO)
- 25.4.5. If the meter alarms entrants shall be evacuated until hazardous conditions have been eliminated.
- 25.5. Air test shall be recorded every 15 minutes.
- 25.6. The 4 gas meter visual and audible alarms will activate at:
 - 25.6.1. Less than 19.5% or more than 23.5% oxygen
 - 25.6.2. 10% of LEL
 - 25.6.3. 10 parts per million (ppm) of H₂S
 - 25.6.4. 25 ppm carbon monoxide
- 25.7. Equipment used to perform monitoring is to be calibrated according to its manufacturer's recommendation with proof of calibration available.
 - 25.7.1. Monitoring equipment that is out of calibration shall not be used.
- 25.8. Monitoring equipment must be used by personnel that have been trained on the unit.

26. LOCK OUT TAG OUT (LOTO)

- 26.1. Energy sources capable of causing an injury due to inadvertent activation requires Lock Out and Tag Out (LOTO)
 - 26.1.1. Operations requiring LOTO are anticipated during this project.
- 26.2. Prior to servicing or maintaining any machine or equipment where unexpected energizing could occur and cause injury, the following must be done:
 - 26.2.1. The machine or equipment must be isolated and rendered inoperative.
 - 26.2.2. Wherever possible, the energy source must be locked and tagged out in such a manner that the lock holds the energy isolating device in a safe position that cannot be modified by anyone other than the employee servicing the equipment.
 - 26.2.3. Tags must identify the identity of the person applying the tag.
 - 26.2.4. Personnel performing LOTO must have received LOTO training.
 - 26.2.5. Personnel performing LOTO are required to follow the MPE LOTO program, see Appendix D.
 - 26.2.6. LOTO tags must list the name of employee and company name.

27. CODE OF SAFE PRACTICES

- 27.1. Do not smoke, eat, or drink in hazardous areas.
- 27.2. Alert supervisor of unanticipated hazards.
- 27.3. Do not engage in horseplay.

- 27.4. The buddy rule (another person within sight or sound) should be followed during hazardous operations or in hazardous areas.
- 27.5. Monitor self and buddy for:
 - 27.5.1. PPE improper fittings, rips, tears, and/or damage.
 - 27.5.2. Signs of heat stress and other difficulties.
- 27.6. Heavy equipment:
 - 27.6.1. Make sure that the heavy equipment operator is aware of your presence.
 - 27.6.2. Face moving heavy equipment when possible
 - 27.6.3. Stay out of heavy equipment operator blind spot
 - 27.6.4. Wear the seat belt if one is provided on the apparatus.

28. SAFETY INSPECTIONS

- 28.1. A site safety inspection must be performed by the SSO or on-site foreman of the work area on a daily basis.
- 28.2. Emergency equipment such as fire extinguishers and first aid kits shall be inspected monthly and a record of the inspection kept on the unit.
- 28.3. Fire extinguishers shall be serviced at least annually by a person licensed or registered by the State Fire Marshal.
- 28.4. Forklifts (including rough terrain forklifts), backhoes, scissorlifts, aerial lifts and excavators shall be inspected at the start of each shift that the equipment is to be used and a record of the inspection kept on the unit.
- 28.5. Excavations shall be inspected daily and after each hazard increasing incident by a competent person.
- 28.6. Any deficiencies in the effectiveness of the SSSP identified during the safety inspection shall be documented and corrected in a timely manner depending on the risk associated with the hazard.

29. PERMITS

- 29.1. Personnel performing hot work operations such as welding and grinding that generates sparks are required to obtain a MPE Hot work permit.
 - 29.1.1. Post the permit during hot work at a location proximate to the hot work.
- 29.2. Confined space permit is required for entry into confined spaces
- 29.3. Cal/OSHA excavation permit is required if digging 5 feet or deeper and personnel will enter into the excavation

30. DOCUMENTATION AND RECORDKEEPING

- 30.1. The following records are to be kept onsite:

- 30.1.1. The SSSP,
- 30.2. The following records are to be kept in the employee file:
 - 30.2.1. Training records
- 30.3. The SSSP shall be made available to:
 - 30.3.1. Any contractor or subcontractor or their representative who may be exposed to contaminated soil;
 - 30.3.2. Employees and their designated representatives;

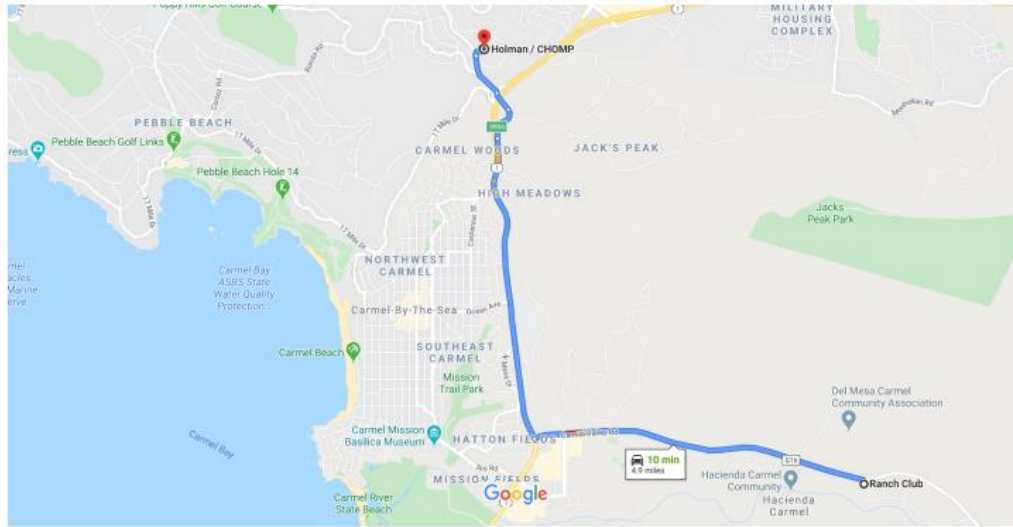
31. PLAN REVIEW & UPDATE

- 31.1. The SSO is to review and update the SSSP as necessary to reflect the current site conditions.
- 31.2. Changes to the SSSP should be documented.

32. ADDITIONAL NOTES

- 32.1. Work within an excavation shall be considered as a non-permit confined space work area when not tapping/tying into an existing sewage piping within the excavation when there is no potential for sewage or sewage gases is present.
- 32.2. However, an excavation is considered as a permit-required confined space entry during any activity when existing sewage piping is removed/tapped/tied into/etc. where sewage or gases may result in hazardous atmosphere may exist.
- 32.3. HA hot work permit will be required when cutting and/or grinding in a confined space area.
- 32.4. Contractor shall use calibrated 4-gas meters when working in a confined space area.
- 32.5. During a permit-required confined space entry, the Contractor shall write down the air sample measurements every 15 minutes.
- 32.6. Contractor shall notify the control room for all emergencies.
- 32.7. The Contractor shall work with CAW employees on any lockout/tagout requirements.
- 32.8. Proof of training for all Cal-OSHA required tasks prior to starting the specific job task shall be submitted to CAW.
- 32.9. Fall protection for excavations shall meet California Code of Regulations Section 1541.

APPENDIX A. MAP AND DIRECTION TO CHOMP



1. Head north on Ranchon San Carlos Rr toward Carmel Valley Rd
Restricted usage road
15 s (131 ft)

Continue on Carmel Valley Rd. Drive from CA-1 N to Del Monte Forest

2. Turn left onto Carmel Valley Rd
8 min (4.8 mi)
2.1 mi
3. Use any lane to turn right onto CA-1 N
2.0 mi
4. Take exit 399A for CA-68 W toward Pacific Grove/Pebble Beach
0.2 mi
5. Continue onto CA-68 W
0.1 mi
6. At the traffic circle, continue straight onto CA-68 E
0.3 mi

Drive to your destination in Monterey

7. Slight right
52 s (0.1 mi)
8. Turn left
266 ft
9. Turn right
148 ft
10. Turn right
98 ft
11. Turn right
Destination will be on the left
16 ft

Holman / CHOMP
Monterey, CA 93940

APPENDIX B. TAILGATE SAFETY MEETING FORM



MONTEREY PENINSULA ENGINEERING

CONTRACTORS & ENGINEERS
P.O. BOX 2317
MONTEREY, CA 93942
(831) 384-4081

Meeting Date: _____

Project Name: _____

Time: _____

Specific location: _____

Tailgate Safety Meeting Form

TOPIC: _____

Emergency Procedures:

Hospital Phone: _____ Hospital Address: _____

Special Hazards: _____

Physical Hazards: _____

Other Topics:

Signing below indicates that I attended a safety meeting presented by Monterey Peninsula Engineering on the above date on the subject indicated. I understand that this is part of an on-going training effort and I was given the opportunity to ask questions to ensure my full understanding of what was addressed. I also understand that if any uncertainty arises in the future, that I am to ask my supervisor or safety manager for assistance. I pledge that I will not violate or allow others to violate safety rules established and that I have not suffered, experienced, or sustained any recent job-related injury or illness.

1. _____ 2. _____

3. _____ 4. _____

5. _____ 6. _____

7. _____ 8. _____

9. _____ 10. _____

11. _____ 12. _____

APPENDIX C. MSDS SHEETS

MSDS C1985

ITEM: 3TB83 - First Aid Kit,Bulk,Red,25 People

DELIVERY: 6296298951

HU NUMBER: UH00954748

MATERIAL SAFETY DATA SHEET (MSDS)

This MSDS should be attached or kept with the respective product with which it is associated.

MSDS/SDS - C1985

Related Grainger Items

RAPID AID

RAPID AID LTD.
4120A SLADEVIEW CRESCENT
UNITS 1 - 4
MISSISSAUGA, ON L5L 5Z3

RAPID AID INSTANT COLD PACK

MSDS REVISION DATE (DD/MM/YYYY): 18/03/2009

MATERIAL SAFETY DATA SHEET

-----SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION-----

PRODUCT IDENTIFIER: RAPID AID INSTANT COLD PACK

PRODUCT USE:
PROVIDES RELIEF FOR BRUISES AND SWELLING, MUSCLE SPASM AND PAIN, HEADACHES
AND MINOR INJURIES.

CHEMICAL FAMILY: INORGANIC AMMONIUM SALT.

SUPPLIER'S NAME AND ADDRESS:
RAPID AID LTD.
4120A SLADEVIEW CRESCENT
UNITS 1 - 4
MISSISSAUGA, ON, L5L 5Z3
CANADA

MANUFACTURER'S NAME AND ADDRESS: REFER TO SUPPLIER

INFORMATION TELEPHONE NO.: (905) 820-4788

24 HR. EMERGENCY TEL #: (905) 820-4788

-----SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS-----

INGREDIENTS	CAS#	% (WEIGHT)		ACGIH TLV	OSHA PEL
		TWA	STEL		
AMMONIUM NITRATE	6484-52-2	40.00	70.00	N/AV	N/AV

	N/AV	N/AV	N/AV	N/AV

-----SECTION 3 - HAZARDS IDENTIFICATION-----

EMERGENCY OVERVIEW:
WHITE, ODORLESS SOLID CHEMICAL SUPPLIED WITH WATER BAG.

THIS PRODUCT MAY BE CONSIDERED A 'MANUFACTURED ARTICLE' OR 'MEDICAL DEVICE'.
HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

CHEMICAL FROM DAMAGED, UN-ACTIVATED COLD PACK MAY HAVE THE FOLLOWING
HAZARDS:
DANGER: STRONG OXIDIZER WHICH WILL PROMOTE COMBUSTION. CONTACT WITH
COMBUSTIBLE MATERIAL MAY CAUSE FIRE.

MAY EXPLODE IN FIRE. THIS PRODUCT REACTS WITH ACIDS EVOLVING CONSIDERABLE
HEAT.

MAY BE HARMFUL IF INHALED OR SWALLOWED.

MAY CAUSE HEADACHE, NAUSEA, DIZZINESS AND OTHER SYMPTOMS OF CENTRAL NERVOUS
SYSTEM DEPRESSION.

CAN CAUSE CYANOSIS. CONTAINS MATERIAL WHICH MAY CAUSE ADVERSE BLOOD SYSTEM
EFFECTS.

CHEMICAL FROM DAMAGED, ACTIVATED COLD PACK MAY HAVE THE FOLLOWING HAZARDS:
ACTIVATION RESULTS IN CHEMICALS MIXING INSIDE THE COLD PACK. THE REACTION
THAT OCCURS IS ENDOTHERMIC, CAUSING THE SOLUTION TO BECOME COLD.

PROLONGED CONTACT MAY CAUSE NUMBNESS. CAUSES LITTLE OR NO IRRITATION.

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS:
EYES, SKIN, DIGESTIVE SYSTEM, RESPIRATORY SYSTEM, BLOOD SYSTEM.

ROUTES OF EXPOSURE:
INHALATION: YES
SKIN ABSORPTION: NO
SKIN & EYES: YES
INGESTION: YES

SIGNS AND SYMPTOMS OF SHORT-TERM (ACUTE) EXPOSURE:

INHALATION: HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

CHEMICAL FROM DAMAGED, UN-ACTIVATED COLD PACK MAY HAVE THE FOLLOWING
HAZARDS: INHALATION OF DUST MAY CAUSE SHORTNESS OF BREATH, TIGHTNESS OF THE
CHEST, A SORE THROAT AND COUGH. IRRITATING OR NOXIOUS GASES MAY BE RELEASED
DURING THERMAL DECOMPOSITION. INHALATION OF HIGH CONCENTRATIONS MAY CAUSE
LOSS OF CONSCIOUSNESS AND CYANOSIS (BLuish DISCOLORATION OF THE SKIN).

SKIN: HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.
CHEMICAL FROM DAMAGED, UN-ACTIVATED COLD PACK MAY HAVE THE FOLLOWING
HAZARDS: MAY CAUSE MILD SKIN IRRITATION.

SKIN CONTACT MAY PROVOKE THE FOLLOWING SYMPTOMS: RED, PUFFY, ITCHING SKIN.

CHEMICAL FROM DAMAGED, ACTIVATED COLD PACK MAY HAVE THE FOLLOWING HAZARDS:
PROLONGED CONTACT MAY CAUSE NUMBNESS. CAUSES LITTLE OR NO IRRITATION.

EYES: HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

CHEMICAL FROM DAMAGED, UN-ACTIVATED COLD PACK MAY HAVE THE FOLLOWING
HAZARDS: DIRECT EYE CONTACT MAY CAUSE SLIGHT REDNESS.

CHEMICAL FROM DAMAGED, ACTIVATED COLD PACK MAY HAVE THE FOLLOWING HAZARDS:
CONTACT WITH EYES MAY CAUSE IRRITATION.

SYMPTOMS INCLUDE:
INFLAMMATION OF EYE TISSUE, CHARACTERIZED BY REDNESS, WATERING, AND/OR
ITCHING.

INGESTION: HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

CHEMICAL FROM DAMAGED COLD PACK MAY HAVE THE FOLLOWING HAZARDS:
MAY CAUSE IRRITATION OF MOUTH, THROAT, AND STOMACH. SYMPTOMS MAY INCLUDE
NAUSEA, VOMITING, DIZZINESS, DROWSINESS AND OTHER SYMPTOMS OF CENTRAL NERVOUS
SYSTEM DEPRESSION. INGESTION OF LARGE QUANTITIES OF NITRATES MAY AFFECT
OXYGEN TRANSPORT IN THE BLOOD AND BLOOD SYSTEM, CAUSING METHEMOGLOBINEMIA.
LARGE DOSES CAN CAUSE SHOCK, CONVULSIONS, COMA AND EVENTUAL DEATH.

EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE:
HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

CHEMICAL FROM DAMAGED COLD PACK MAY HAVE THE FOLLOWING HAZARDS:
CONTAINS MATERIAL WHICH MAY CAUSE ADVERSE BLOOD SYSTEM EFFECTS.

CONDITIONS AGGRAVATED BY OVEREXPOSURE:
PRE-EXISTING SKIN, EYE AND RESPIRATORY DISORDERS.

CARCINOGENIC STATUS: SEE TOXICOLOGICAL INFORMATION, SECTION 11.

ADDITIONAL HEALTH HAZARDS:
NONE KNOWN OR REPORTED BY THE MANUFACTURER. SEE TOXICOLOGICAL INFORMATION,
SECTION 11.

POTENTIAL ENVIRONMENTAL EFFECTS: SEE ECOLOGICAL INFORMATION, SECTION 12.

-----SECTION 4 - FIRST AID MEASURES-----

INHALATION: HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

RECOMMENDED FIRST AID FOR EXPOSURE TO CHEMICAL FROM DAMAGED COLD PACK:
IMMEDIATELY REMOVE PERSON TO FRESH AIR. IF BREATHING HAS STOPPED, GIVE
ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN BY QUALIFIED
MEDICAL PERSONNEL ONLY. GET MEDICAL ATTENTION.

SKIN CONTACT: HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

RECOMMENDED FIRST AID FOR EXPOSURE TO CHEMICAL FROM DAMAGED COLD PACK:
FOR SKIN CONTACT, FLUSH WITH WATER FOR AT LEAST 15 MINUTES, WHILE REMOVING
CONTAMINATED CLOTHING. IF IRRITATION OCCURS OR PERSISTS, SEEK MEDICAL
ATTENTION.

EYE CONTACT: HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

RECOMMENDED FIRST AID FOR EXPOSURE TO CHEMICAL FROM DAMAGED COLD PACK:
IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.
GET MEDICAL ATTENTION.

INGESTION: HARMFUL EFFECTS ARE NOT EXPECTED UNDER NORMAL USAGE.

RECOMMENDED FIRST AID FOR EXPOSURE TO CHEMICAL FROM DAMAGED COLD PACK:
DO NOT INDUCE VOMITING. HAVE VICTIM RINSE MOUTH WITH WATER, THEN GIVE ONE TO
TWO GLASSES OF WATER TO DRINK. NEVER GIVE ANYTHING BY MOUTH TO AN
UNCONSCIOUS PERSON. SEEK IMMEDIATE MEDICAL ATTENTION/ADVICE.

NOTES FOR PHYSICIAN: TREAT SYMPTOMATICALLY.

-----SECTION 5 - FIRE FIGHTING MEASURES-----

FIRE HAZARDS/CONDITIONS OF FLAMMABILITY:
EXPLOSIVE DECOMPOSITION MAY OCCUR UNDER FIRE CONDITIONS. HEAT OF
DECOMPOSITION MAY CAUSE CLOSED CONTAINERS TO BUILD UP PRESSURE AND EXPLODE.

CHEMICAL FROM DAMAGED, UN-ACTIVATED COLD PACK MAY HAVE THE FOLLOWING
HAZARDS: STRONG OXIDIZER WHICH WILL PROMOTE COMBUSTION. CONTACT WITH
COMBUSTIBLE MATERIAL MAY CAUSE FIRE. THIS PRODUCT REACTS WITH ACIDS EVOLVING
CONSIDERABLE HEAT.

FLAMMABILITY CLASSIFICATION (OSHA 29 CFR 1910.1200):
NOT FLAMMABLE UNDER NORMAL CONDITIONS OF HANDLING.

FLASH POINT: N/AP
FLASH POINT METHOD: N/AP

AUTO-IGNITION TEMPERATURE: N/AP

LOWER FLAMMABLE LIMIT (% BY VOL.): N/AP
UPPER FLAMMABLE LIMIT (% BY VOL.): N/AP

OXIDIZING PROPERTIES:

CHEMICAL FROM DAMAGED, UN-ACTIVATED COLD PACK MAY HAVE THE FOLLOWING
HAZARDS: STRONG OXIDIZER WHICH WILL PROMOTE COMBUSTION. WILL ACCELERATE
COMBUSTION AND INCREASE THE RISK OF FIRE AND EXPLOSION IN COMBUSTIBLE OR
FLAMMABLE MATERIALS.

FLAME PROJECTION LENGTH: N/AP
FLASHBACK OBSERVED: N/AP

EXPLOSION DATA:

SENSITIVITY TO MECHANICAL IMPACT / STATIC DISCHARGE:
EXPLOSIVE DECOMPOSITION MAY OCCUR UNDER FIRE CONDITIONS. HEAT OF
DECOMPOSITION MAY CAUSE CLOSED CONTAINERS TO BUILD UP PRESSURE AND EXPLODE.

SUITABLE EXTINGUISHING MEDIA:
USE WATER SPRAY TO FIGHT FIRES. USE CHEMICAL EXTINGUISHING AGENTS WITH

CAUTION. SOME CHEMICAL EXTINGUISHING AGENTS MAY ACCELERATE DECOMPOSITION.

SPECIAL FIRE-FIGHTING PROCEDURES/EQUIPMENT:
FIGHT FIRES FROM A SAFE DISTANCE. EVACUATE PERSONNEL TO SAFE AREAS.
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACE PIECE OPERATED IN POSITIVE PRESSURE MODE.
A FULL-BODY CHEMICAL RESISTANT SUIT SHOULD BE WORN MOVE CONTAINERS FROM FIRE
AREA IF SAFE TO DO SO. WATER SPRAY MAY BE USEFUL IN COOLING EQUIPMENT
EXPOSED TO HEAT AND FLAME.

HAZARDOUS COMBUSTION PRODUCTS: AMMONIA; NITROGEN OXIDES (NO_x).

1. HAZARD RATING:
HEALTH 1
FLAMMABILITY 0
INSTABILITY 3
SPECIAL HAZARDS OX

0 - MINIMAL
1 - SLIGHT
2 - MODERATE
3 - SERIOUS
4 - SEVERE

-----SECTION 6 - ACCIDENTAL RELEASE MEASURES-----

PERSONAL PRECAUTIONS:
ENSURE CLEAN-UP IS CONDUCTED BY TRAINED PERSONNEL ONLY. KEEP ALL OTHER
PERSONNEL UPWIND AND AWAY FROM THE SPILL/RELEASE. WEAR SUITABLE PROTECTIVE
EQUIPMENT. FOR PERSONAL PROTECTION SEE SECTION 8.

ENVIRONMENTAL PRECAUTIONS:
ENSURE SPILLED PRODUCT DOES NOT ENTER DRAINS, SEWERS, WATERWAYS, OR CONFINED
SPACES.

SPILL RESPONSE/CLEANUP:
PICK UP LOOSE ITEMS, AND PLACE IN CONTAINER FOR DISPOSAL.

RECOMMENDED CLEAN-UP PROCEDURE WHEN UN-ACTIVATED COLD PACKS ARE DAMAGED:
VENTILATE AREA OF RELEASE. REMOVE ALL SOURCES OF IGNITION. REMOVE
COMBUSTIBLE MATERIALS. USE ONLY NON-SPARKING TOOLS AND EQUIPMENT IN THE
CLEAN-UP PROCESS. COVER ANY SPILLED MATERIAL WITH NON-COMBUSTIBLE ABSORBENT
MATERIAL, SUCH AS VERMICULITE OR SAND, THEN PLACE ABSORBENT MATERIAL INTO A
CONTAINER FOR LATER DISPOSAL (SEE SECTION 13). USE METHODS THAT DO NOT
GENERATE DUSTS. NOTIFY THE APPROPRIATE AUTHORITIES AS REQUIRED.

RECOMMENDED CLEAN-UP PROCEDURES WHEN ACTIVATED COLD PACKS ARE DAMAGED:
VENTILATE AREA OF RELEASE. REMOVE ALL SOURCES OF IGNITION. CONTAIN AND
ABSORB SPILLED LIQUID WITH NON-COMBUSTIBLE, INERT ABSORBENT MATERIAL
(E.G. SAND), THEN PLACE ABSORBENT MATERIAL INTO A CONTAINER FOR LATER
DISPOSAL (SEE SECTION 13). NOTIFY THE APPROPRIATE AUTHORITIES AS REQUIRED.

PROHIBITED MATERIALS: DO NOT USE COMBUSTIBLE ABSORBENTS, SUCH AS SAWDUST.

SPECIAL SPILL RESPONSE PROCEDURES:
IN CASE OF A TRANSPORTATION ACCIDENT, IN THE UNITED STATES CONTACT CHEMTREC
AT 1-800-424-9300 OR INTERNATIONAL AT 1-703-527-3887. IF A SPILL/RELEASE IN
EXCESS OF THE EPA REPORTABLE QUANTITY IS MADE INTO THE ENVIRONMENT,
IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER IN THE UNITED STATES
(PHONE: 1-800-424-8002).

US CERCLA REPORTABLE QUANTITY (RQ): NONE REPORTED.

-----SECTION 7 - HANDLING AND STORAGE-----

SAFE HANDLING PROCEDURES:
USE IN A WELL-VENTILATED AREA. PROTECT FROM DAMAGE. KEEP AWAY FROM HEAT AND
FLAME. KEEP AWAY FROM COMBUSTIBLE MATERIAL.

RECOMMENDED HANDLING PROCEDURES WHEN UN-ACTIVATED COLD PACK IS DAMAGED:
WEAR SUITABLE PROTECTIVE EQUIPMENT. AVOID BREATHING DUST. AVOID AND CONTROL
OPERATIONS WHICH CREATE HIGH VAPOR OR DUST CONCENTRATIONS. DO NOT INGEST.
AVOID CONTACT WITH SKIN, EYES AND CLOTHING. NEVER RETURN CONTAMINATED
MATERIAL TO ITS ORIGINAL CONTAINER. LABEL CONTAINERS APPROPRIATELY. WASH
THOROUGHLY AFTER HANDLING.

RECOMMENDED HANDLING PROCEDURES WHEN ACTIVATED COLD PACK IS DAMAGED:
WEAR SUITABLE PROTECTIVE EQUIPMENT. AVOID BREATHING VAPOR OR MIST. AVOID
CONTACT WITH SKIN, EYES AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

STORAGE REQUIREMENTS:
STORE IN A COOL, DRY, WELL-VENTILATED AREA. STORE AWAY FROM INCOMPATIBLES
AND OUT OF DIRECT SUNLIGHT. INSPECT PERIODICALLY FOR DAMAGE OR LEAKS. NO
SMOKING IN THE AREA. PROTECT FROM DAMAGE.

INCOMPATIBLE MATERIALS:
ACIDS; REDUCING AGENTS; COMBUSTIBLE MATERIALS; ORGANIC MATERIALS; REACTIVE
METALS; FUEL; HALOGENATED COMPOUNDS; COPPER.

SPECIAL PACKAGING MATERIALS:
ALWAYS KEEP IN CONTAINERS MADE OF THE SAME MATERIALS AS THE SUPPLY
CONTAINER.

-----SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTION-----

VENTILATION AND ENGINEERING MEASURES:
NOT A HAZARD UNDER NORMAL CONDITIONS OF USE.

RECOMMENDED PROTECTIVE MEASURES WHEN COLD PACKS ARE DAMAGED:
USE GENERAL OR LOCAL EXHAUST VENTILATION TO MAINTAIN AIR CONCENTRATIONS
BELOW RECOMMENDED EXPOSURE LIMITS.

RESPIRATORY PROTECTION: NOT REQUIRED UNDER NORMAL CONDITIONS OF HANDLING.

RECOMMENDED PROTECTIVE MEASURES WHEN COLD PACKS ARE DAMAGED:
RESPIRATORY PROTECTION IS REQUIRED IF THE CONCENTRATIONS EXCEED THE TLV.
ADVICE SHOULD BE SOUGHT FROM RESPIRATORY PROTECTION SPECIALISTS.

SKIN PROTECTION: NONE REQUIRED WHEN USED AS INTENDED.

RECOMMENDED PROTECTIVE MEASURES WHEN COLD PACKS ARE DAMAGED:
GLOVES IMPERVIOUS TO THE MATERIAL ARE RECOMMENDED. THE SUITABILITY FOR A
SPECIFIC WORKPLACE SHOULD BE DISCUSSED WITH THE PRODUCERS OF THE PROTECTIVE
GLOVES.

EYE / FACE PROTECTION: NONE REQUIRED WHEN USED AS INTENDED.

RECOMMENDED PROTECTIVE MEASURES WHEN COLD PACKS ARE DAMAGED:
CHEMICAL SPLASH GOGGLES ARE RECOMMENDED.

OTHER PROTECTIVE EQUIPMENT: NONE REQUIRED UNDER NORMAL CONDITIONS.

RECOMMENDED PROTECTIVE MEASURES WHEN COLD PACKS ARE DAMAGED:
AN EYEWASH STATION AND SAFETY SHOWER SHOULD BE MADE AVAILABLE IN THE
IMMEDIATE WORKING AREA. OTHER EQUIPMENT MAY BE REQUIRED DEPENDING ON
WORKPLACE STANDARDS.

GENERAL HYGIENE CONSIDERATIONS:
HANDLE IN ACCORDANCE WITH GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICE.

RECOMMENDED PROTECTIVE MEASURES WHEN COLD PACKS ARE DAMAGED:
AVOID CONTACT WITH SKIN, EYES AND CLOTHING. AVOID BREATHING VAPORS, FUMES OR
DUST. DO NOT EAT, DRINK OR SMOKE WHEN USING THIS PRODUCT. WASH HANDS BEFORE
BREAKS AND IMMEDIATELY AFTER HANDLING THE PRODUCT. WEAR ONLY CLEAN,
UNCONTAMINATED CLOTHES WHEN LEAVING PLACE OF WORK.

PERMISSIBLE EXPOSURE LEVELS:
FOR INDIVIDUAL INGREDIENT EXPOSURE LEVELS, SEE SECTION 2.

-----SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES-----

PHYSICAL STATE: SOLID

APPEARANCE: WHITE, ODORLESS SOLID CHEMICAL SUPPLIED WITH WATER BAG.

ODOR: ODORLESS

ODOR THRESHOLD: N/AV

pH: N/AV

BOILING POINT: 176.7 DEG. C (350 DEG. F) (DECOMPOSITION TEMPERATURE)

SPECIFIC GRAVITY: 1.725

MELTING/FREEZING POINT: N/AP

COEFFICIENT OF WATER/OIL DISTRIBUTION: N/AV

VAPOR PRESSURE (MMHg @ 20 DEG. C / 68 DEG. F): N/AP

SOLUBILITY IN WATER: COMPLETE

VAPOR DENSITY (AIR = 1): N/AP

EVAPORATION RATE (n-BUTYL ACETATE = 1): N/AP

VOLATILE ORGANIC COMPOUNDS (VOC'S): N/AV

VOLATILES (% BY WEIGHT): N/AV

-----SECTION 10 - REACTIVITY AND STABILITY DATA-----

STABILITY AND REACTIVITY:
STABLE UNDER THE RECOMMENDED STORAGE AND HANDLING CONDITIONS PRESCRIBED.
UNSTABLE WITH HEAT OR CONTAMINATION.

CHEMICAL FROM DAMAGED, UN-ACTIVATED COLD PACK MAY HAVE THE FOLLOWING
HAZARDS: STRONG OXIDIZER WHICH WILL PROMOTE COMBUSTION. CONTACT WITH
COMBUSTIBLE MATERIAL MAY CAUSE FIRE.

HAZARDOUS POLYMERIZATION:
NOT EXPECTED UNDER PRESCRIBED STORAGE AND HANDLING CONDITIONS. DECOMPOSITION
MAY OCCUR AT EXTREMELY HIGH TEMPERATURES.

CONDITIONS TO AVOID:
AVOID HEAT AND OPEN FLAME. ENSURE ADEQUATE VENTILATION, ESPECIALLY IN
CONFINED AREAS. AVOID CONTACT WITH INCOMPATIBLE MATERIALS. KEEP OUT OF
DIRECT SUNLIGHT. KEEP AWAY FROM COMBUSTIBLE MATERIAL.

MATERIALS TO AVOID AND INCOMPATIBILITY:
SEE SECTION 7 (HANDLING AND STORAGE) FOR FURTHER DETAILS.

HAZARDOUS DECOMPOSITION PRODUCTS:
NONE KNOWN, REFER TO HAZARDOUS COMBUSTION PRODUCTS IN SECTION 5.

-----SECTION 11 - TOXICOLOGICAL INFORMATION-----

TOXICOLOGICAL DATA:
THERE IS NO AVAILABLE DATA FOR THE PRODUCT ITSELF, ONLY FOR THE INGREDIENTS.
REFER TO SECTION 2 FOR INDIVIDUAL INGREDIENT LD50'S AND LC50'S.

INGREDIENTS	LC50 (4HR)	LD50
INH, RAT	ORAL	DERMAL

AMMONIUM NITRATE	>88,800 MG/M3	2217 MG/KG (RAT)	N/AV
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CARCINOGENIC STATUS:
NO COMPONENTS ARE LISTED AS CARCINOGENS BY ACGIH, IARC, OSHA OR NTP.

REPRODUCTIVE EFFECTS: NOT EXPECTED TO HAVE OTHER REPRODUCTIVE EFFECTS.

TERATOGENICITY: NOT EXPECTED TO BE A TERATOGEN.

MUTAGENICITY: NOT EXPECTED TO BE MUTAGENIC IN HUMANS.

EPIDEMIOLOGY: NO INFORMATION AVAILABLE.

SENSITIZATION TO MATERIAL:
NOT EXPECTED TO BE A SKIN OR RESPIRATORY SENSITIZER.

SYNERGISTIC MATERIALS: N/AV

IRRITANCY: MILD SKIN IRRITANT. MAY CAUSE EYE IRRITATION.

OTHER IMPORTANT HAZARDS: NONE KNOWN OR REPORTED BY THE MANUFACTURER.

-----SECTION 12 - ECOLOGICAL INFORMATION-----

ENVIRONMENTAL EFFECTS:
THE PRODUCT SHOULD NOT BE ALLOWED TO ENTER DRAINS OR WATER COURSES, OR BE DEPOSITED WHERE IT CAN AFFECT GROUND OR SURFACE WATERS.

IMPORTANT ENVIRONMENTAL CHARACTERISTICS:
NO DATA IS AVAILABLE ON THE PRODUCT ITSELF.

ECOTOXICOLOGICAL: NO DATA IS AVAILABLE ON THE PRODUCT ITSELF.

-----SECTION 13 - DISPOSAL CONSIDERATIONS-----

HANDLING FOR DISPOSAL:
HANDLE WASTE ACCORDING TO RECOMMENDATIONS IN SECTION 7. EMPTY CONTAINERS RETAIN RESIDUE (LIQUID AND/OR VAPOR) AND CAN BE DANGEROUS.

METHODS OF DISPOSAL:
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, PROVINCIAL AND LOCAL REGULATIONS. CONTACT YOUR LOCAL, STATE, PROVINCIAL OR FEDERAL ENVIRONMENTAL AGENCY FOR SPECIFIC RULES.

RCRA:
IF THIS PRODUCT, AS SUPPLIED, BECOMES A WASTE IN THE UNITED STATES, IT MAY MEET THE CRITERIA OF A HAZARDOUS WASTE AS DEFINED UNDER RCRA, TITLE 40 CFR 261. IT IS THE RESPONSIBILITY OF THE WASTE GENERATOR TO DETERMINE THE PROPER WASTE IDENTIFICATION AND DISPOSAL METHOD.

-----SECTION 14 - TRANSPORTATION INFORMATION-----

REGULATORY INFORMATION	UN NUMBER	SHIPPING NAME	CLASS GROUP	PACKING GROUP	LABEL
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TDG	UN1942	AMMONIUM NITRATE	5.1	III	CLASS 5.1, OXIDIZING SUBSTANCES
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TDG ADDITIONAL INFORMATION:
WITHIN CANADA ONLY, THIS PRODUCT MAY BE SHIPPED ACCORDING TO THE 500 KG GROSS MASS EXEMPTION. EACH MEANS OF CONTAINMENT MUST BE MARKED WITH EITHER THE DANGEROUS GOODS SAFETY MARKS REQUIRED BY PART 4 OR THE PROPER SHIPPING NAME. THE DANGEROUS GOODS MUST BE ACCOMPANIED BY A PROPER SHIPPING DOCUMENT. REFER TO TDG SECTION 1.16 FOR DETAILED INFORMATION ON THIS EXEMPTION. IF SHIPPING BY GROUND TO DESTINATIONS OUTSIDE CANADA, THE LIMITED QUANTITY EXEMPTION MAY BE USED. UNDER THE TDGR, REFER TO SECTION 1.17 FOR ADDITIONAL EXEMPTION INFORMATION, IF SHIPPING UNDER THIS EXEMPTION.

49 CFR/DOT	UN1942	AMMONIUM NITRATE	LIMITED	III	UN**** QUANTITY
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49 CFR/DOT ADDITIONAL INFORMATION:
AS SUPPLIED, THIS PRODUCT CAN BE SHIPPED AS A LIMITED QUANTITY IN THE UNITED STATES. THE UN NUMBER PLACED WITHIN THE SQUARE-ON-POINT BORDER APPEARING HERE, OR THE PROPER SHIPPING NAME, MUST APPEAR ON THE PACKAGE IN ACCORDANCE WITH 49 CFR PART 172.315.

ICAO/IATA	UN1942	AMMONIUM NITRATE	5.1	III	CLASS 5.1, OXIDIZING SUBSTANCES
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ICAO/IATA ADDITIONAL INFORMATION:
REFER TO ICAO/IATA PACKING INSTRUCTION: Y516, 516 OR 518. REVIEW ALL STATE AND OPERATOR VARIATIONS, PRIOR TO SHIPPING THIS MATERIAL.

-----SECTION 15 - REGULATORY INFORMATION-----

US FEDERAL INFORMATION:

TSCA:
ALL LISTED INGREDIENTS APPEAR ON THE TOXIC SUBSTANCES CONTROL ACT (TSCA) INVENTORY.

OSHA:
THIS MATERIAL IS NOT CLASSIFIED AS HAZARDOUS UNDER OSHA REGULATIONS (29 CFR PART 1910.1200). THIS PRODUCT IS CONSIDERED AN 'ARTICLE' UNDER 29 CFR PART 1910.1200.

CERCLA REPORTABLE QUANTITY (RQ) (40 CFR 117.302): NONE REPORTED.

SARA TITLE III:

SEC. 302, EXTREMELY HAZARDOUS SUBSTANCES, 40 CFR 355:
NO EXTREMELY HAZARDOUS SUBSTANCES ARE PRESENT IN THIS MATERIAL.

SARA TITLE III:

SEC. 311 AND 312, MSDS REQUIREMENTS, 40 CFR 370 HAZARD CLASSES: NONE.

IF OUTER CONTAINERS ARE DAMAGED AND LEAKING:
REACTIVE HAZARD; IMMEDIATE (ACUTE) HEALTH HAZARD; CHRONIC HEALTH HAZARD.

SARA TITLE III:

SEC 313, TOXIC CHEMICALS NOTIFICATION, 40 CFR 372:
THIS MATERIAL IS NOT SUBJECT TO SARA NOTIFICATION REQUIREMENTS, SINCE IT DOES NOT CONTAIN ANY TOXIC CHEMICAL CONSTITUENTS ABOVE DE MINIMUS CONCENTRATIONS.

US STATE RIGHT TO KNOW LAWS:

NEW JERSEY LABELING REQUIREMENTS:
THIS PRODUCT CONTAINS THE FOLLOWING SUBSTANCES REQUIRED TO BE DISCLOSED ON PRODUCT LABELING:
AMMONIUM NITRATE (CAS # 6484-52-2)
NITRATES (CAS # 7732-18-5).

CALIFORNIA PROPOSITION 65:
TO THE BEST OF OUR KNOWLEDGE, THIS PRODUCT DOES NOT CONTAIN ANY CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER OR REPRODUCTIVE HARM.

OTHER U.S. STATE "RIGHT TO KNOW" LISTS:

THE FOLLOWING CHEMICALS ARE SPECIFICALLY LISTED BY INDIVIDUAL STATES:
AMMONIUM NITRATE (MA, PA, RI).

INTERNATIONAL INFORMATION:

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) INFORMATION:
ALL INGREDIENTS LISTED APPEAR ON THE DOMESTIC SUBSTANCES LIST (DSL).

CANADIAN WHMIS CLASSIFICATION:
THIS PRODUCT IS NOT A WHMIS CONTROLLED PRODUCT IN CANADA. THIS PRODUCT MAY BE CONSIDERED A 'MANUFACTURED ARTICLE' OR 'MEDICAL DEVICE'.

FOR INFORMATIONAL PURPOSES, THIS PRODUCT WOULD HAVE THE FOLLOWING WHMIS CLASSIFICATION:
CLASS C (OXIDIZING MATERIAL);
CLASS D2B (MATERIALS CAUSING OTHER TOXIC EFFECTS, TOXIC MATERIAL)

THIS PRODUCT HAS BEEN CLASSIFIED ACCORDING TO THE HAZARD CRITERIA OF THE CPR AND THE MSDS CONTAINS ALL OF THE INFORMATION REQUIRED BY THE CPR.

-----SECTION 16 - OTHER INFORMATION-----

HMIS RATING:
HEALTH 1
FLAMMABILITY 0
REACTIVITY 3

* - CHRONIC HAZARD
0 - MINIMAL
1 - SLIGHT
2 - MODERATE
3 - SERIOUS
4 - SEVERE

LEGEND:

ACGIH: AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS

CAS: CHEMICAL ABSTRACT SERVICES

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980

DOT: DEPARTMENT OF TRANSPORTATION

EPA: ENVIRONMENTAL PROTECTION AGENCY

HMIS: HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

HSDB: HAZARDOUS SUBSTANCES DATA BANK

IARC: INTERNATIONAL AGENCY FOR RESEARCH ON CANCER

INH: INHALATION

LC: LETHAL CONCENTRATION

LD: LETHAL DOSE

MA: MASSACHUSETTS

MSHA: MINE SAFETY AND HEALTH ADMINISTRATION

N/AP: NOT APPLICABLE

N/AV: NOT AVAILABLE

NFPA: NATIONAL FIRE PROTECTION ASSOCIATION

NIOSH: NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH

NTP: NATIONAL TOXICOLOGY PROGRAM

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

PA: PENNSYLVANIA

PEL: PERMISSIBLE EXPOSURE LIMIT

RCRA: RESOURCE CONSERVATION AND RECOVERY ACT

RI: RHODE ISLAND

RTECS: REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES

SARA: SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT

STEL: SHORT TERM EXPOSURE LIMIT

TDG: CANADIAN TRANSPORTATION OF DANGEROUS GOODS ACT & REGULATIONS

TLV: THRESHOLD LIMIT VALUES

TWA: TIME WEIGHTED AVERAGE

TSCA: TOXIC SUBSTANCE CONTROL ACT

WHMIS: WORKPLACE HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

REFERENCES:

1. ACGIH, THRESHOLD LIMIT VALUES AND BIOLOGICAL EXPOSURE INDICES FOR 2008.
2. INTERNATIONAL AGENCY FOR RESEARCH ON CANCER MONOGRAPHS, SEARCHED 2009.
3. CANADIAN CENTRE FOR OCCUPATIONAL HEALTH AND SAFETY, CCINFOWEB DATABASES, 2009 (CHEMPENDIUM AND RTECS).
4. MATERIAL SAFETY DATA SHEET FROM MANUFACTURER.
5. US EPA TITLE III LIST OF LISTS OCTOBER 2006 VERSION.
6. CALIFORNIA PROPOSITION 65 LIST - DECEMBER 19, 2008 VERSION.

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THE COMPLIANCE CENTER INC.
HAZARDOUS MATERIALS REGULATIONS SPECIALISTS

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MSDS PREPARATION DATE (DD/MM/YYYY): 04/06/2008

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REVISION NO.: 2

REVISION INFORMATION:
(M)SDS SECTIONS UPDATED: 2. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL SAFETY DATA SHEET

POLYETHYLENE (LINEAR LOW OR HIGH DENSITY)

NORTHTOWN COMPANY

PRODUCT IDENTIFICATION

Chemical Names and Synonyms: POLYETHYLENE (LINEAR LOW OR HIGH DENSITY)

Use or Description:

COMPONENTS AND EXPOSURE LIMITS

Component	Percent by Weight	Exposure Limit
Ethylene butene copolymer (CAS #25087-34-7) or Ethylene hexene copolymer (CAS #25213-02-9)	Approximately 100	15.0 mg/m ³ OSHA Nuisance Dust

Additives such as antioxidants, stabilizers, processing aids, antiblock and slip agents may be used in the following concentrations: 0 - 1% by weight.

TYPICAL PROPERTIES

Appearance: TRANSLUCENT	Boiling Point: N/A	Solubility in Water: NEGLIGIBLE
pH: N/A	Odor: MILD	Vapor Pressure: N/A
% Volatility by Weight: 0.1 MAX	Specific Gravity: 0.91 - 1.05	Vapor Density: N/A
Evaporation Rate: N/A	Melting Point: F(C) 230 - 275 (110 - 135)	

FIRE AND EXPLOSION HAZARDS

Auto Ignition Temperature: NA	Flash Point: NONE	Flammable Limits in Air: NA
NFPA Hazard: 0-1-0-NA	HMIS Rating: 0-1-0-A	

Extinguishing Media: CARBON DIOXIDE, FOAM, DRY CHEMICAL, AND WATER FOG

Special Fire Fighting Procedures: DO NOT ENTER ENCLOSED SPACE WITHOUT USING SELF-CONTAINED BREATHING APPARATUS

Unusual Fire and Explosion Hazards: Bulk storage of polyethylene pellets may result in the accumulation of ethylene gas with possible explosive potential; concentration of ethylene gas must be kept below the lower limit (LEL) OF 2.7% .

HEALTH HAZARDS

Acute Health Effects:
 EYES: DUST MAY CAUSE IRRITATION OR REDNESS; FUMES FROM MOLTEN PRODUCT MAY CAUSE IRRITATION OR REDNESS
 SKIN: REDNESS
 INHALATION: PRODUCT AS IS SHOULD NOT CAUSE IRRITATION OR DERMATITIS; MOLTEN PRODUCT MAY CAUSE THERMAL BURNS
 INGESTION: INHALATION OF FINES OR FUMES FROM MOLTEN PRODUCT MAY CAUSE IRRITATION TO THE NOSE OR THROAT NOT EXPECTED TO CAUSE ADVERSE REACTION IF INGESTED

Chronic Health Effects: NONE ARE KNOWN	Medical Conditions Aggravated by Exposure: NONE ARE KNOWN	Primary Routes of Entry: INHALATION, INGESTION
--	---	--

Carcinogenicity Status: Occupational Safety and Health Administration: NOT LISTED
 National Toxicity Program: NOT LISTED
 International Agency for Research on Cancer: NOT LISTED

Toxicological Data: NON-TOXIC BASED ON STUDIES OF SIMILAR PRODUCTS AND THEIR COMPONENTS

FIRST AID PROCEDURES

Eyes:	FLUSH WITH PLENTY OF WATER; IF IRRITATION CONTINUES, GET MEDICAL ATTENTION
Skin:	WASH SKIN WITH SOAP AND WATER, FOR THERMAL BURNS, COOL MOLTEN MATERIALS WITH WATER AND GET MEDICAL ATTENTION
Inhalation:	IF OVERCOME BY DUST OR FUMES, REMOVE TO FRESH AIR; IF BREATHING IS DIFFICULT, GIVE OXYGEN AND GET MEDICAL ATTENTION; IF VICTIM HAS STOPPED BREATHING, GIVE ARTIFICIAL RESPIRATION AND GET MEDICAL ATTENTION
Ingestion:	NO FIRST AID MEASURES SHOULD BE NECESSARY

PERSONAL PROTECTION

Respirator:	WEAR DUST MASK IF DUST LEVELS EXCEED 15.0 mg/m ³
Skin:	PROTECTIVE GLOVES AND LONG SLEEVES WHEN HANDLING MOLTEN MATERIAL
Eyes:	SAFETY GLASSES SHOULD BE WORN AT ALL TIMES; SAFETY GOGGLES SHOULD BE WORN WHEN HANDLING MOLTEN MATERIAL
Ventilation:	LOCAL VENTILATION IS RECOMMENDED TO REDUCE DUST AND FUMES WHEN HANDLING MOLTEN MATERIAL

REACTIVITY DATA

Hazardous Thermal Decomposition Products:	INCOMPLETE COMBUSTION MAY PRODUCE CARBON DIOXIDE, CARBON MONOXIDE, ALDEYDES, HYDROCARBONS, FORMALDEHYDE
Stability:	MATERIAL IS STABLE
Incompatible Materials:	THIS MATERIAL IS INCOMPATIBLE WITH STRONG OXIDIZERS
Hazardous Materials:	NONE ARE KNOWN
Hazardous Polymerization:	WILL NOT OCCUR

SPILL LEAK AND DISPOSAL PROCEDURES

Spill and Leak Procedures:	SWEEP OR SHOVEL UP AND HOLD FOR DISPOSAL
Waste Management Procedures:	PRODUCT IS NON-HAZAROUS IN ITS NEAT FORM
Environmental Impact:	THIS MATERIAL IS NOT EXPECTED TO PRESENT ANY ENVIRONMENTAL PROBLEMS

ADDITIONAL PRECAUTIONS

Storage:	STORE IN A VENTILATED AREA AWAY FROM SOURCES OF IGNITION; DO NOT STORE WITH INCOMPATIBLE MATERIALS
Transfer:	STATIC GROUNDING RECOMMENDED PRIOR TO TRANSFER OF PRODUCT

REGULATORY DATA

Occupational Safety and Health Administration:	NUISANCE DUST	CONEG:	NOT REGULATED
Resource Conservation Recovery Act:	NOT REGULATED	Clean Air Act:	NOT REGULATED
Superfund Amendments Reauthorization Act:	NOT REGULATED	Proposition 65:	NOT REGULATED
Department of Transportation:	NOT REGULATED		

Permatex, Inc.
10 Columbus Blvd.
Hartford, CT 06106 USA
Telephone: 1-87-Permatex
(877) 376-2839
Emergency: 800-255-3924
International Emergency: 813-248-0585

Material Safety Data Sheet

1. PRODUCT IDENTIFICATION

Product Name: **2C FORM-A-GASKET #2 SEALANT 11OZ**
Item No: **80011**
Product Type: **Sealant**

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	Weight Percent	ACGIH TLV:	OSHA PEL:
KAOLIN 1332-58-7	50-60	2 mg/m ³ dust TWA	15 mg/m ³ dust; 5 mg/m ³ respir. TWA
VEGETABLE OIL 68187-84-8	15-25	Not Listed	Not Listed
ROSIN 8050-09-7	10-20	sensitizer; reduce exposure to as low as possible	15 mg/m ³ total dust; 5 mg/m ³ respir.
2-PROPANOL 67-63-0	10-20	200 ppm TWA	400 ppm TWA; 980 mg/m ³ TWA
TITANIUM DIOXIDE 13463-67-7	0.1-1.0	10 mg/m ³ TWA ACGIH	15 mg/m ³ TWA (total dust)
SILICA, QUARTZ 14808-60-7	0.1-1.0	0.05 mg/m ³ TWA respirable	0.1 mg/m ³ TWA respirable

3. HAZARDS IDENTIFICATION

Toxicity: May cause eye, skin and respiratory irritation. Oral LD50 greater than 5000 mg/kg.
Primary Routes of Entry: Eye and skin contact, ingestion, inhalation
Signs and Symptoms of Exposure: Excessive accidental exposure may cause headache, dizziness, nausea and mild respiratory irritation. Overexposure may cause eye and skin redness.

Ingredient	Weight Percent	NTP	ACGIH Carcinogens	IARC
KAOLIN 1332-58-7	50-60		A4-Not classifiable as a human carcinogen	
2-PROPANOL 67-63-0	10-20		A4 - Not classifiable as a human carcinogen	Group 3 Monograph 71, 1999; Supp.7, 1987; Monograph 15, 1977
TITANIUM DIOXIDE 13463-67-7	0.1-1.0	male rat-negative, female rat-negative, male mice-negative, female mice-negative	A4	Group 2B; Vol 93,2006; Vol 47,1989
SILICA, QUARTZ 14808-60-7	0.1-1.0		A2 - Suspected Human Carcinogen	Group 1; Monograph 68, 1997 (inhaled)

Medical Conditions Recognized as Being Aggravated by Exposure: Preexisting eye, skin and respiratory disorders may be aggravated by overexposure to this product.

4. FIRST AID MEASURES

Ingestion: Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.
Inhalation: Move to fresh air in case of accidental inhalation of vapours. Oxygen or artificial respiration if needed. Obtain medical attention.
Skin Contact: Wash off with soap and water. If skin irritation persists, call a physician.
Eye Contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

5. FIRE FIGHTING MEASURES

Flash Point (°F/C): Does not apply. Per ASTM D4359 this product is a solid.
Recommended Extinguishing Media: Carbon Dioxide, Dry Chemicals, Foam.

Product Name: 2C FORM-A-GASKET #2 SEALANT
11OZ

Item No: 80011

5. FIRE FIGHTING MEASURES

Special Fire-Fighting Procedures:

Firefighters should wear self-contained breathing apparatus. Water spray may be ineffective on flames but should be used to keep fire-exposed containers cool.

Hazardous Products of Combustion:

Aldehydes, Oxides of carbon, Carboxylic acids

Unusual Fire/Explosion Hazards:

Closed containers may rupture or explode when exposed to extreme heat.

Lower Explosive Limit:

2

Upper Explosive Limit:

12

6. ACCIDENTAL RELEASE MEASURES

Spill Procedures:

Eliminate all sources of ignition. Maintain good ventilation. Take up with an inert absorbent. Store in a closed waste container until disposal. Residues may be cleaned up with isopropyl alcohol.

7. HANDLING AND STORAGE

Storage:

Store away from heat, sparks or open flame. Do not store at temperatures above 120 degrees F.

Handling:

Avoid contact with skin and eyes. Do not inhale vapors. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eyes:

Safety glasses

Skin:

Rubber or plastic gloves.

Ventilation:

General; local exhaust ventilation as necessary to control any air contaminants to within their exposure limits (or to the lowest feasible levels when limits have not been established) during the use of this product.

Respiratory Protection:

An approved respirator (i.e. NIOSH, etc.) should be worn when exposures are expected to exceed the applicable limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Black paste

Odor:

Alcoholic

Boiling Point:

180 degrees F.

pH:

Does not apply

Solubility in Water:

Partial

Specific Gravity:

1.5

VOC Content(Wt.%):

12.7% by weight

Vapor Pressure:

33 mm Hg @ 68 degrees F.

Vapor Density (Air=1):

2.07

Evaporation Rate:

7.7 (ether = 1)

10. STABILITY AND REACTIVITY

Chemical Stability:

Stable at normal conditions

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong oxidizers

Conditions to Avoid:

Keep away from heat, sparks and open flame. - No smoking

Hazardous Products of Combustion:

Aldehydes, Oxides of carbon, Carboxylic acids

11. TOXICOLOGICAL INFORMATION

See Section 3

12. ECOLOGICAL INFORMATION

No data available

13. DISPOSAL CONSIDERATIONS

Recommended Method of Disposal: Disposal should be made in accordance with federal, state and local regulations.

US EPA Waste Number: NH - Not a RCRA Hazardous Waste Material

14. TRANSPORTATION INFORMATION

DOT (49CFR 172)

Domestic Ground Transport

DOT Shipping Name:

Unrestricted

Product Name: 2C FORM-A-GASKET #2 SEALANT
11OZ

Item No: 80011

Hazard Class: None
UN/ID Number: None
Marine Pollutant: None

IATA

Proper Shipping Name: Not regulated
Class or Division: None
UN/NA Number: None

IMDG

Proper Shipping: Unrestricted
Hazard Class: None
UN Number: None

15. REGULATORY INFORMATION

SARA 313 Chemicals: The following component(s) is listed as a SARA Section 313 Toxic Chemical.

NONE

CALIFORNIA PROP 65:

No California Prop 65 chemicals are known to be present at or above the No Significant Risk Level.

TSCA Inventory Status:

Listed on Inventory: YES All components of this product are listed (or exempt) on the EPA TSCA inventory.

16. OTHER INFORMATION

Estimated NFPA Rating: HEALTH 2, FLAMMABILITY 1, REACTIVITY 0

Estimated HMIS Classification: HEALTH 2, FLAMMABILITY 1, PHYSICAL HAZARD 0

NFPA is a registered trademark of the National Fire Protection Assn.

HMIS is a registered trademark of the National Paint and Coatings Assn.

Prepared By: Denise Boyd, Health and Safety Manager
Company: Permatex, Inc. 10 Columbus Blvd. Hartford, CT USA 06106

Revision Date: 12/15/2006

Revision 5

Number:

Material Safety Data Sheet

CA-14

1. Product and company identification

Product name : CA-14
Material uses : Mastic.
Supplier/Manufacturer : Polyguard Products
3801 South Interstate 45
Ennis, TX 75119
Tel: 714-897-0700
Responsible name : Atrion Regulatory Services, Inc.
In case of emergency : CHEMTREC, U.S. : +1-800-424-9300 International: +1-703-527-3887

2. Hazards identification

Physical state : Liquid. [Viscous.]
Odor : Aromatic.
OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview : WARNING!
FLAMMABLE LIQUID AND VAPOR. HARMFUL IF INHALED. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid exposure during pregnancy. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation : Harmful by inhalation. Irritating to respiratory system.
Ingestion : Harmful if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage.
Skin : Irritating to skin. May cause dermatitis.
Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : Contains material that can cause target organ damage.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.
Target organs : Contains material which causes damage to the following organs: kidneys, liver, gastrointestinal tract, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

Over-exposure signs/symptoms

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
Ingestion : Adverse symptoms may include the following:
nausea or vomiting

Hazards identification

- Skin** : Adverse symptoms may include the following:
irritation
redness
- Eyes** : Adverse symptoms may include the following:
pain or irritation
watering
redness
- Medical conditions aggravated by over-exposure** : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3. Composition/information on ingredients

United States

Name	CAS number	%
Toluene	108-88-3	30 - 60
Pitch, petroleum, arom.	68187-58-6	10 - 30
Distillates (petroleum), solvent-dewaxed heavy paraffinic	64742-65-0	5 - 10
Methanol	67-56-1	1 - 5

Canada

Name	CAS number	%
Toluene	108-88-3	30 - 60
Pitch, petroleum, arom.	68187-58-6	10 - 30
Distillates (petroleum), solvent-dewaxed heavy paraffinic	64742-65-0	5 - 10
Methanol	67-56-1	1 - 5

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4. First aid measures

- Eye contact** : Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 20 minutes. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 20 minutes. Get medical attention immediately.
- Inhalation** : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
- Ingestion** : Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
- Notes to physician** : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Fire-fighting measures

- Flammability of the product** : Flammable liquid. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.
- Extinguishing media**
- Suitable** : Use dry chemical, CO₂, water spray (fog) or foam.
- Not suitable** : Do not use water jet.
- Special exposure hazards** : Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

- Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares; smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
- Methods for cleaning up** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

- Handling** : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Storage** : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Exposure controls/personal protection

United States

Product name

Toluene

Exposure limits
NIOSH REL (United States, 12/2001).
STEL: 560 mg/m³ 15 minute(s).

STEL: 150 ppm 15 minute(s).

TWA: 375 mg/m³ 10 hour(s).

TWA: 100 ppm 10 hour(s).

OSHA PEL Z2 (United States, 11/2006).

AMP: 500 ppm 10 minute(s).

CEIL: 300 ppm

TWA: 200 ppm 8 hour(s).

ACGIH TLV (United States, 1/2008).

TWA: 20 ppm 8 hour(s).

Distillates (petroleum), solvent-dewaxed heavy paraffinic

NIOSH REL (United States, 12/2001).
STEL: 10 mg/m³ 15 minute(s). Form: MistTWA: 5 mg/m³ 10 hour(s). Form: Mist

Methanol

ACGIH TLV (United States, 1/2008). Absorbed through skin.
STEL: 328 mg/m³ 15 minute(s).

STEL: 250 ppm 15 minute(s).

TWA: 262 mg/m³ 8 hour(s).

TWA: 200 ppm 8 hour(s).

NIOSH REL (United States, 12/2001). Absorbed through skin.
STEL: 325 mg/m³ 15 minute(s).

STEL: 250 ppm 15 minute(s).

TWA: 260 mg/m³ 10 hour(s).

TWA: 200 ppm 10 hour(s).

OSHA PEL (United States, 11/2006).
TWA: 260 mg/m³ 8 hour(s).

TWA: 200 ppm 8 hour(s).

Canada

Product name

Toluene

Exposure limits
CA Alberta Provincial (Canada, 10/2006). Absorbed through skin.

8 hrs OEL: 50 ppm 8 hour(s).

8 hrs OEL: 188 mg/m³ 8 hour(s).
CA British Columbia Provincial (Canada, 7/2007).

TWA: 20 ppm 8 hour(s).

CA Ontario Provincial (Canada, 3/2007).

TWAEV: 50 ppm 8 hour(s).

CA Quebec Provincial (Canada, 12/2006). Absorbed through skin.

TWAEV: 50 ppm 8 hour(s).

TWAEV: 188 mg/m³ 8 hour(s).

Distillates (petroleum), solvent-dewaxed heavy paraffinic

CA Alberta Provincial (Canada, 10/2006).
8 hrs OEL: 5 mg/m³ 8 hour(s). Form: Mist15 min OEL: 10 mg/m³ 15 minute(s). Form: Mist
CA Ontario Provincial (Canada, 3/2007).
TWAEV: 5 mg/m³ 8 hour(s). Form: mistSTEV: 10 mg/m³ 15 minute(s). Form: mist
CA Quebec Provincial (Canada, 12/2006).
TWAEV: 5 mg/m³ 8 hour(s). Form: mistSTEV: 10 mg/m³ 15 minute(s). Form: mist

Methanol

CA Alberta Provincial (Canada, 10/2006). Absorbed through skin.
8 hrs OEL: 262 mg/m³ 8 hour(s).

8 hrs OEL: 200 ppm 8 hour(s).

15 min OEL: 250 ppm 15 minute(s).

15 min OEL: 328 mg/m³ 15 minute(s).

Exposure controls/personal protection

CA British Columbia Provincial (Canada, 7/2007). Absorbed through skin.

TWA: 200 ppm 8 hour(s).

STEL: 250 ppm 15 minute(s).

CA Ontario Provincial (Canada, 3/2007). Absorbed through skin.

TWAEV: 200 ppm 8 hour(s).

TWAEV: 260 mg/m³ 8 hour(s).

STEV: 250 ppm 15 minute(s).

STEV: 325 mg/m³ 15 minute(s).

CA Quebec Provincial (Canada, 12/2006). Absorbed through skin.

TWAEV: 200 ppm 8 hour(s).

TWAEV: 262 mg/m³ 8 hour(s).

STEV: 250 ppm 15 minute(s).

STEV: 328 mg/m³ 15 minute(s).

Consult local authorities for acceptable exposure limits.

- | | |
|--|---|
| Recommended monitoring procedures | : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. |
| Engineering measures | : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment. |
| Hygiene measures | : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location. |
| Personal protection | |
| Eyes | : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. |
| Skin | : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. |
| Respiratory | : Use a properly fitted, air-purifying or supplied air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. |
| Hands | : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. |
| Environmental exposure controls | : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels. |

Physical and chemical properties

Physical state	: Liquid. [Viscous.]
Flash point	: Closed cup: 7.22°C (45°F) [Setaflash.]
Flammable limits	: Lower: 1% Upper: 8%
Color	: Black.
Odor	: Aromatic.
Boiling/condensation point	: 100 to 121°C (212 to 249.8°F)
Specific gravity	: 1.1
Vapor pressure	: 5.1 kPa (38 mm Hg)
Vapor density	: 3.2 [Air = 1]
Volatility	: 31% (w/w)
Evaporation rate	: 2.7 (Butyl acetate. = 1)
VOC	: 330 (g/l).
Solubility	: Very slightly soluble in the following materials: cold water and hot water.

10. Stability and reactivity

Stability	: The product is stable.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas. Do not swallow.
Materials to avoid	: Reactive or incompatible with the following materials: oxidizing materials and acids.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Conditions of reactivity	: Highly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge. Flammable in the presence of the following materials or conditions: heat.

11. Toxicological information

Acute toxicity

Product/ingredient name	Species	Dose	Result	Exposure
Toluene	Rabbit	14100 uL/kg	LD50 Dermal	-
	Rat	636 mg/kg	LD50 Oral	-
	Rat	6900 mg/kg	LD50 Unreported	-
Methanol	Rabbit	15800 mg/kg	LD50 Dermal	-
	Rat	5600 mg/kg	LD50 Oral	-
	Rat	64000 ppm	LC50 Inhalation Vapor	4 hours
Distillates (petroleum), solvent-dewaxed heavy paraffinic	Rabbit	>5 g/kg	LD50 Dermal	-
	Rat	>5 g/kg	LD50 Oral	-

Inhalation	: Harmful by inhalation. Irritating to respiratory system.
Ingestion	: Harmful if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage.
Skin	: Irritating to skin. May cause dermatitis.
Eyes	: Irritating to eyes.

1 . Toxicological information

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Toluene	A4	3	-	-	-	-
Methanol	-	-	-	None.	-	-

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Product/ingredient name	Test	Species	Exposure	Result
Toluene	-	Daphnia	48 hours	Acute EC50 6000 ug/L
	-	Fish	96 hours	Acute LC50 13 to 15 mg/L
	-	Crustaceans	48 hours	Acute LC50 15500 ug/L
	-	Fish	96 hours	Acute LC50 7.3 ul/L
Methanol	-	Daphnia	48 hours	Acute LC50 3289 to 4395 mg/L
	-	Fish	96 hours	Acute LC50 19 to 20 ml/L
	-	Crustaceans	48 hours	Acute LC50 2500000 ug/L

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

AERG : 127

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN1139	COATING SOLUTION	3	II		-
TDG Classification	UN1139	COATING SOLUTION	3	II		-
IMDG Class	UN1139	COATING SOLUTION	3	II		Emergency schedules (EmS) F-E, S-D
IATA-DGR Class	UN1139	COATING SOLUTION	3	II		-

PG* : Packing group

5. Regulatory information

United States

HCS Classification : Flammable liquid
Toxic material
Irritating material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Toluene; Methanol
SARA 311/312 MSDS distribution - chemical inventory - hazard identification
Toluene: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard;
Methanol: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: Toluene; Benzo[j]fluoranthene; 5-Methylchrysene;
Benzo[a]pyrene; Benz[a]anthracene; Chrysene
Clean Water Act (CWA) 311: Toluene
Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements	Toluene	108-88-3	30 - 60
	Methanol	67-56-1	1 - 5
Supplier notification	Toluene	108-88-3	30 - 60
	Methanol	67-56-1	1 - 5

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations : **Connecticut Carcinogen Reporting**: None of the components are listed.
Connecticut Hazardous Material Survey: None of the components are listed.
Florida substances: None of the components are listed.
Illinois Chemical Safety Act: None of the components are listed.
Illinois Toxic Substances Disclosure to Employee Act: None of the components are listed.
Louisiana Reporting: None of the components are listed.
Louisiana Spill: None of the components are listed.
Massachusetts Spill: None of the components are listed.
Massachusetts Substances: The following components are listed: Toluene; Methanol
Michigan Critical Material: None of the components are listed.
Minnesota Hazardous Substances: None of the components are listed.
New Jersey Hazardous Substances: The following components are listed: Toluene; Methanol
New Jersey Spill: None of the components are listed.
New Jersey Toxic Catastrophe Prevention Act: None of the components are listed.
New York Acutely Hazardous Substances: The following components are listed: Toluene; Methanol
New York Toxic Chemical Release Reporting: None of the components are listed.
Pennsylvania RTK Hazardous Substances: The following components are listed: Toluene; Methanol
Rhode Island Hazardous Substances: None of the components are listed.

California Prop. 65 : **WARNING**: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

15. Regulatory information

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Toluene	No.	Yes.	No.	7000 µg/day (ingestion) 13000 µg/day (inhalation)
5-Methylchrysene	Yes.	No.	0.0084 µg/day (ingestion)	No.
Benzo[j]fluoranthene	Yes.	No.	0.11 µg/day (ingestion)	No.
Benzo[a]pyrene	Yes.	No.	Yes.	No.
Benz[a]anthracene	Yes.	No.	0.033 µg/day (ingestion)	No.
Chrysene	Yes.	No.	0.35 µg/day (ingestion)	No.
Silica crystalline, quartz	Yes.	No.	No.	No.

Canada

WHMIS (Canada)

- : Class B-2: Flammable liquid
- Class D-1B: Material causing immediate and serious toxic effects (Toxic).
- Class D-2A: Material causing other toxic effects (Very toxic).
- Class D-2B: Material causing other toxic effects (Toxic).



Canadian lists

- : **CEPA Toxic substances:** None of the components are listed.
- Canadian ARET:** None of the components are listed.
- Canadian NPRI:** The following components are listed: Toluene; Methanol
- Alberta Designated Substances:** None of the components are listed.
- Ontario Designated Substances:** None of the components are listed.
- Quebec Designated Substances:** None of the components are listed.

Canada inventory

- : All components are listed or exempted.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

International lists

- : This product, (and its ingredients) is (are) listed on national inventories, or is (are) exempted from being listed, in Australia (AICS), in Europe (EINECS/ELINCS), in Korea (TCCL), in Japan (METI), in the Philippines (RA6969).

16. Other information

Label requirements

- : FLAMMABLE LIQUID AND VAPOR. HARMFUL IF INHALED. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

Hazardous Material Information System (U.S.A.)

:

Health	*	3
Fire hazard		3
Physical Hazard		0
Personal protection		

HAZARD RATINGS

4- Extreme
3- Serious
2- Moderate
1- Slight
0- Minimal

See section 8 for more detailed information on personal protection.

6. Other information

The customer is responsible for determining the PPE code for this material.

National Fire Protection :
Association (U.S.A.)



References : ANSI Z400.1, MSDS Standard, 2004. - Manufacturer's Material Safety Data Sheet. - 29CFR Part1910.1200 OSHA MSDS Requirements. - 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG. - Canada Gazette Part II, Vol. 122, No. 2. Registration SOR/88-64, 31 December 1987. Hazardous Products Act "Ingredient Disclosure List" - Canadian Transport of Dangerous Goods, Regulations and Schedules, Clear Language version 2005.

Date of issue : 11/15/2008
Version : 1

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Material Safety Data Sheet

CHEMTREC Transportation
Emergency Phone: 800-424-9300

Pittsburgh Poison Control
Center
Health Emergency No.: 412-681-6669

•NOTE: The CHEMTREC Transportation
•Emergency Phone is to be used only in the
•event of chemical emergencies involving a
•spill, leak, fire, exposure or accident involving
•chemicals

Section 1 - Chemical Product / Company Information

Product Name: BITUMASTIC 50

Revision Date: 08/08/2005

Identification Number: PLMSDS 0025S5NL

Supercedes : 08/08/2005

Product Use/Class: Coal Tar - FOR INDUSTRIAL USE ONLY

Preparer: Regulatory, Department

Manufacturer:

Section 2 - Composition / Information On Ingredients

Chemical Name	CAS Number	Weight % Less Than	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA-CEIL
COAL TAR FIBER	65996-93-2	20.0	0.2 MGM3	N/E	0.2 MGM3	NE
PITCH						
INDENE	95-13-6	20.0	10 PPM	N/E	45 MGM3	N/E
TALC	014807-96-6	15.0	N/E	N/E	N/E	N/E
CLAY	TRADE SECRET	10.0	NE	NE	NE	NE
COAL TAR DISTILLATE	65996-79-4	10.0	100PPM	N/E	NE	NE
COAL TAR CREOSOTE	8001-58-9	5.0	0.2 MG/M3	N/E	N/E	N/E
TOLUENE	108-88-3	5.0	50 PPM	N/E	150 PPM	NE
BENZENE	71-43-2	2.0	0.5 PPM	2.5 PPM	1 PPM	N/E
NAPHTHALENE	91-20-3	2.0	10 PPM	15 PPM	50 MGM3	N/E
META-XYLENE	000108-38-3	2.0	434 Mg/M3	651 Mg/M3	434 Mg/M3	N/E
ETHYL BENZENE	100-41-4	0.6	100 PPM	125 PPM	435 MGM3	N/E

Section 3 - Hazards Identification

Emergency Overview: FLAMMABLE liquid and vapor. Contains COAL TAR which can cause cancer. Contains BENZENE which can cause cancer. Contains INDENE which can cause cancer. Contains NAPHTHALENE which can cause cancer. Risk of Cancer depends on duration and level of exposure.

Effects Of Overexposure - Eye Contact: May cause eye irritation.

Effects Of Overexposure - Skin Contact: Direct skin contact may cause irritation. May cause allergic skin reaction.

Effects Of Overexposure - Inhalation: Harmful if inhaled, may affect the brain or nervous system, causing dizziness, headache, or nausea. May cause nose and throat irritation.

Effects Of Overexposure - Ingestion: Harmful if swallowed.

Effects Of Overexposure - Chronic Hazards: Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage.

Primary Route(s) Of Entry: Skin Contact, Skin Absorption, Inhalation, Ingestion, Eye Contact

Medical Conditions Prone to Aggravation by Exposure: If you have a condition that could be aggravated by exposure to dust or organic vapors, see a physician prior to use.

Section 4 - First Aid Measures

First Aid - Eye Contact: If material gets into eyes, flush with water immediately for 15 minutes. Consult a physician.

First Aid - Skin Contact: In case of contact, immediately flush skin with plenty of water while removing contaminated clothing and shoes. Launder clothing before reuse. If rash or irritation develops, consult a physician.

First Aid - Inhalation: If inhaled, remove to fresh air. Administer oxygen if necessary. Consult a physician if symptoms persist or exposure was severe.

First Aid - Ingestion: If swallowed do not induce vomiting. Seek immediate medical attention.

Section 5 - Fire Fighting Measures

Flash Point, F: 80F (26C)
(Setaflash)

Lower Explosive Limit, %: 0.8
Upper Explosive Limit, %: 7.1

Extinguishing Media: Carbon Dioxide, Dry Chemical, Foam, Water Fog

Unusual Fire And Explosion Hazards: Flammable Liquid. Vapors are heavier than air and will accumulate. Vapors will form explosive concentrations with air. Vapors travel long distances and will flashback. Use mechanical ventilation when necessary to keep percent vapor below the "Lower Explosion Level" (LEL). Eliminate all ignition sources. Keep away from sparks, open flames and heat sources. All electric equipment and installations should be made and grounded in accordance with the National Electrical Code. In areas where explosion hazards exist, workers should be required to use non-ferrous tools and to wear conductive and non-sparking shoes.

Special Firefighting Procedures: Flammable. Cool fire-exposed containers using water spray.

Section 6 - Accidental Release Measures

Steps To Be Taken If Material Is Released Or Spilled: Eliminate all ignition sources. Handling equipment must be grounded to prevent sparking. Evacuate the area of unprotected personnel. Wear appropriate personal protection clothing and equipment. Follow exposure controls/personal protection guidelines in Section 8. Contain and soak up residual with an absorbent (clay or sand). Take up absorbant material and seal tightly for proper disposal. Dispose of in accordance with local, state and federal regulations. Refer to Section 15 for SARA Title III and CERCLA information.

Section 7 - Handling And Storage

Handling: Do not get in eyes, on skin, or on clothing. Keep container tightly closed when not in use. Wear personal protection equipment. Do not breathe vapors. Wash thoroughly after handling. If pouring or transferring materials, ground all containers and tools. Do not weld, heat, cut or drill on full or empty containers. Use only in accordance with Carboline application instructions, container label and Product Data Sheet. Avoid breathing

vapors or spray mist.

Storage: Keep away from heat, sparks, open flames and oxidizing agents. Keep containers closed. Store in a cool, dry place with adequate ventilation.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use explosion-proof ventilation when required to keep below health exposure guidelines and Lower Explosion Limit (LEL).

Respiratory Protection: Use only with ventilation to keep levels below exposure guidelines listed in Section 2. User should test and monitor exposure levels to ensure all personnel are below guidelines. If not sure, or not able to monitor, use MSHA/NIOSH approved supplied air respirator. Follow all current OSHA requirements for respirator use.

Skin Protection: Recommend impervious gloves and clothing to avoid skin contact. If material penetrates to skin, change gloves and clothing. The use of protective creams may be beneficial to certain individuals. Protective creams should be applied before exposure.

Eye Protection: Recommend safety glasses with side shields or chemical goggles to avoid eye contact.

Other protective equipment: Eye wash and safety showers should be readily available.

Hygienic Practices: Wash with soap and water before eating, drinking, smoking, applying cosmetics, or using toilet facilities. Use of a hand cleaner is recommended. Launder contaminated clothing before reuse. Leather shoes can absorb and allow hazardous materials to pass through. Check shoes carefully after soaking before reuse.

Section 9 - Physical And Chemical Properties

Boiling Range:	176 F (80 C) - 424 F (218 C)	Vapor Density:	Heavier than Air
Odor:	Tar Odor	Odor Threshold:	N/D
Appearance:	Viscous, Black Liquid	Evaporation Rate:	Slower Than Ether
Solubility in H2O:	N/D		
Freeze Point:	N/D	Specific Gravity:	1.33
Vapor Pressure:	N/D	PH:	N/D
Physical State:	Liquid		

(See section 16 for abbreviation legend)

Section 10 - Stability And Reactivity

Conditions To Avoid: Heat, sparks and open flames.

Incompatibility: Keep away from strong oxidizing agents, heat and open flames.

Hazardous Decomposition Products: Carbon monoxide, nitrogen oxides, and unidentified organic compounds. Consider all smoke and fumes from burning material as very hazardous. Welding, cutting or abrasive grinding can create smoke and fumes. Do not breathe any fumes or smoke from these operations.

Hazardous Polymerization: Will not occur under normal conditions.

Stability: This product is stable under normal storage conditions.

Section 11 - Toxicological Information

Product LD50: N/D

Product LC50: N/D

Chemical Name	CAS Number	LD50	LC50
COAL TAR FIBER PITCH	65996-93-2	NOT AVAILABLE	NOT AVAILABLE
INDENE	95-13-6	NOT AVAILABLE	NOT AVAILABLE
TALC	014807-96-6	NOT AVAILABLE	NOT AVAILABLE
CLAY	TRADE SECRET	NOT AVAILABLE	NOT AVAILABLE
COAL TAR DISTILLATE	65996-79-4	NOT AVAILABLE	NOT AVAILABLE
COAL TAR CREOSOTE	8001-58-9	NOT AVAILABLE	NOT AVAILABLE
TOLUENE	108-88-3	5.0 G/KG RAT ORAL, 14G/KG RABBIT DERMAL	8000 PPM/4HRS, RAT, INHALATION
BENZENE	71-43-2	NOT AVAILABLE	NOT AVAILABLE
NAPHTHALENE	91-20-3	NOT AVAILABLE	NOT AVAILABLE
META-XYLENE	000108-38-3	NOT AVAILABLE	NOT AVAILABLE
ETHYL BENZENE	100-41-4	3500 MG/KG RAT, ORAL	NOT AVAILABLE

Section 12 - Ecological Information

Ecological Information: No data

Section 13 - Disposal Information

Disposal Information: Dispose of in accordance with State, Local, and Federal Environmental regulations. Responsibility for proper waste disposal is with the owner of the waste.

Section 14 - Transportation Information

DOT Proper Shipping Name:	Paint	Packing Group:	III
DOT Technical Name:	N/A	Hazard Subclass:	N/A
DOT Hazard Class:	3	Resp. Guide	128
		Page:	
DOT UN/NA Number:	UN 1263		

Section 15 - Regulatory Information

CERCLA - SARA HAZARD CATEGORY

This product has been reviewed according to the EPA Hazard Categories promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD, CHRONIC HEALTH HAZARD, FIRE HAZARD

SARA SECTION 313

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

Chemical Name	CAS Number
TOLUENE	108-88-3
BENZENE	71-43-2
META-XYLENE	000108-38-3
ETHYL BENZENE	100-41-4

TOXIC SUBSTANCES CONTROL ACT

All components of this product are listed on the TSCA inventory.

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

<u>Chemical Name</u>	<u>CAS Number</u>
NAPHTHALENE	91-20-3
PARA-XYLENE	000106-42-3

U.S. STATE REGULATIONS AS FOLLOWS:

NEW JERSEY RIGHT-TO-KNOW

The following materials are non-hazardous, but are among the top five components in this product.

<u>Chemical Name</u>	<u>CAS Number</u>
HYDROCARBON RESIN	NOT ESTABLISHED

PENNSYLVANIA RIGHT-TO-KNOW

The following non-hazardous ingredients are present in the product at greater than 3%.

<u>Chemical Name</u>	<u>CAS Number</u>
HYDROCARBON RESIN	NOT ESTABLISHED

CALIFORNIA PROPOSITION 65

Warning: The following ingredients present in the product are known to the state of California to cause Cancer:

<u>Chemical Name</u>	<u>CAS Number</u>
COAL TAR CREOSOTE	8001-58-9
BENZENE	71-43-2
NAPHTHALENE	91-20-3
ETHYL BENZENE	100-41-4

Warning: The following ingredients present in the product are known to the state of California to cause birth defects, or other reproductive hazards:

<u>Chemical Name</u>	<u>CAS Number</u>
TOLUENE	108-88-3
BENZENE	71-43-2

INTERNATIONAL REGULATIONS AS FOLLOWS:

CANADIAN WHMIS

This MSDS has been prepared in compliance with Controlled Product Regulations except for the use of the 16 headings.

CANADIAN WHMIS CLASS: B2 D2A D2B

Section 16 - Other Information

HMIS Ratings

Health: 3

Flammability: 3

Reactivity: 0

Personal Protection: X

VOLATILE ORGANIC COMPOUNDS, GR/LTR MIXED (UNTHINNED): 360

REASON FOR REVISION: Changed to 16 Section Format.

Legend: N.A. - Not Applicable, N.E. - Not Established, N.D. - Not Determined

The information contained herein is, to the best of our knowledge and belief accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by use of this material. It is the responsibility of the user to comply with all applicable federal, state, and local laws and regulations



SAFETY DATA SHEET

Date Revised: MAY 2010
Supersedes: AUGUST 2007

Christy's® HD-50

Information on this form is furnished solely for the purpose of compliance with the U.S. Occupational Safety and Health Act, the Canadian Hazardous Products Act and Controlled Products Regulations and shall not be used for any other purpose. T Christy Enterprises urges the customers receiving this Safety Data Sheet to study it carefully to become aware of the hazards, if any, of the product involved. In the interest of safety, you should notify your employees, agents and contractors of the information on this sheet.

SECTION I - PRODUCT AND COMPANY INFORMATION

PRODUCT NAME: HD-50 BITUMINOUS COAL TAR COATING

SYNONYMS:

PRODUCT USE: Corrosion protection

SUPPLIER and MANUFACTURER: T Christy Enterprises, Inc
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-800-258-4583 (North America)
Tel. 1-714-507-3300 (International)

EMERGENCY: Transportation/Medical issues: Tel. 800.535.5053 INFOTRAK

SECTION II - HAZARDOUS INGREDIENTS, EXPOSURE LIMITS, TRANSPORT & WHMIS DATA

None of the ingredients below are listed as carcinogens by IARC, NTP, OSHA or ACGIH	CAS#	APPROX % BY WEIGHT	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL	EXPOSURE LIMIT PPM: MG/M3
100 Solvent		5-10%	50 PPM				
Tuluol	108-88-3	10-15%	50 PPM				
*Coal Tar Pitch (Refined)	65996-93-02	20-30%			0.2 mg/m3		
HAZARDOUS INGRED.							
**Coal Tar Pitch	65996-9302	100					OSHA-TWA*
Benz(a) anthracene	56-66-3	1.04					None Establishe
Benzo (b) fluoranthene	205-99-2	0.79					None Establishe
Benzo (k) fluoranthene	207-08-9	0.52					None Establishe
Benzo (j) fluoranthene	205-82-3	0.56					None Establishe
Dibenzo (a,h) anthracene	53-70-3	0.16					None Establishe
Indeno (1,2,3-cd) pyrene	193-39-5	0.50					None Establishe
Phenanthrene	85-01-8	4.00					None Establishe
Benzo(a) phenanthrene	218-01-9	1.04					None Establishe
Benzo(a) pyrene	50-32-8	0.96					None Establishe
Benzo(g,h,i) perylene	191-24-2	0.55					None Establishe
Dibenzo (a,i) pyrene	191-30-0	0.30					None Establishe

* For coal tar pitch volatiles, OSHA-PEL is 0.2 mg/m3 averaged over an 8-hour work shift, benzene soluble fraction of total particulate including dust, fumes, and mists.

** At 100% coal tar pitch contains the above list of hazardous ingredients.

Proposition 65: This product contains chemicals known to the state of California to cause cancer.

Title III Section 313 Supplier Notification: This product contains toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40CFR372. This information must be included in all MSDS's that are copied and distributed for this material.

DOT, IATA, IMO/IMDG SHIPPING INFORMATION

Proper Shipping Name: Paint
Hazard Class: 3
Identification Number: UN 1263 Paint, Flammable
Packing Group: II
Label Required: Flammable liquid
DOT Reportable Quantities: Benzo (a) pyrene - 1 LB.
Benzo (b) fluoranthene - 1 LB.

SPECIAL HAZARD DESIGNATIONS

	NFPA	HAZARD RATING
HEALTH:	2	0 - MINIMAL
FLAMMABILITY:	3	1 - SLIGHT
REACTIVITY:	0	2 - MODERATE
PROTECTIVE		3 - SERIOUS
EQUIPMENT:		4 - SEVERE

B = Eye, Hand/Skin Protection (Normal use or application & spill clean-up activities)

H = Eye, Hand/Skin and Respiratory Protection plus Impermeable Apron (When risk of immersion and/or splashing is present)

WHMIS CLASSIFICATION: CONTROLLED PRODUCT

SECTION III - PHYSICAL DATA

APPEARANCE Black viscous material	ODOR Petroleum distillates	FREEZING POINT
SPECIFIC GRAVITY @ 73°F ± 3.6° (23°C ± 2°)	WEIGHT PER GALLON 11.0#	
VAPOR DENSITY (Air = 1) Heavier than air	EVAPORATION RATE (BUAC = 1) Slower than ether	
COEFFICIENT OF WATER/OIL DISTRIBUTION	PH INFORMATION	VOC STATEMENT

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 41°F (TOC)	AUTO IGNITION TEMP.	LEL 1.2	UEL N/A
FIRE EXTINGUISHING MEDIA CO2, Dry chemical foam			
SPECIAL FIRE FIGHTING PROCEDURES Wear full firefighting protective clothing, including self-contained breathing apparatus. Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure buildup and possible auto ignition or explosion.			
UNUSUAL FIRE AND EXPLOSION HAZARDS Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Closed containers may explode when exposed to extreme heat. Water may be used to cool unruptured containers to prevent pressure buildup.			

SECTION V - REACTIVITY DATA			
STABILITY	UNSTABLE STABLE		CONDITIONS TO AVOID Keep away from heat, sparks, open flame and other sources of ignition.
		X	
INCOMPATIBILITY (MATERIALS TO AVOID) Strong oxidants like liquid chlorine and concentrated oxygen.			
HAZARDOUS DECOMPOSITION PRODUCTS Toxic fumes may be emitted when burned; may produce carbon monoxide, carbon dioxide in the case of incomplete combustion.			
HAZARDOUS POLYMERIZATION	MAY OCCUR WILL NOT OCCUR	X	CONDITIONS TO AVOID High temperatures
SECTION VI - HEALTH HAZARD DATA & TOXICOLOGICAL PROPERTIES			
PRIMARY ROUTES OF ENTRY: ☒ Inhalation ☒ Skin Contact ☐ Eye Contact ☒ Ingestion			
TOXIC EXPOSURE VALUES EFFECT OF OVEREXPOSURE ACUTE: Inhalation Overexposure to vapor may result in respiratory tract irritation. Repeated and/or prolonged contact to high concentrations of vapor may result in respiratory difficulties, central nervous system (CNS) effects and possible cardiovascular collapse. Skin Contact Contact with skin can result in severe irritation which, when accentuated by sunlight, may result in a photo toxic skin reaction. Repeated and/or prolonged contact may cause more serious skin disorders including cancer. Contact with heated material may cause thermal burns. Eye Contact Overexposure may result in irritation and /or corneal changes. Direct eye contact may cause irritation. Contact with heated material may cause thermal burns.			
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE Respiratory allergies, chronic diseases of the skin, nose, throat and lungs, central nervous system, liver, kidney and / or blood.			
SECTION VII - PREVENTIVE MEASURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Stop leak if no risk involved. Stay upwind. Remove all sources of ignition (flame, hot surfaces and electrical, static or frictional sparks). Handling equipment must be grounded to prevent sparking. Avoid breathing vapors. Ventilate area. Solidified Spills Shovel into dry containers and cover. Large Spills Evacuate the hazard area of unprotected personnel. Wear appropriate respirator and protective clothing. Shut off source of leak only if safe to do so. Dike spill for later disposal. Contain runoff from fire control and dilution water. This product is a mixture of hazardous substances. When this product is spilled or leaked, the CERCLA reportable quantity is 11 gallons/ 104 pounds. Remove with vacuum trucks or pump to storage/salvage vessels. Soak up residue with absorbent such as clay, sand or other suitable material. Place in non-leaking containers for proper disposal. Small Spills Contain and remove with inert absorbent material and non-sparking tools. Place in non-leaking containers and seal tightly for proper disposal. Avoid contact.			
WASTE DISPOSAL METHOD If disposing in a state other than California, dispose of as an industrial waste in accordance with local, state and federal regulations. Place in tightly sealed properly labeled containers. This product contains coal tar constituents which have been determined by IARC to be a carcinogen. According to California hazardous waste regulations, substances posing a hazard to human health because of carcinogenicity are hazardous wastes. Dispose of as a hazardous waste in the state of California.			
RESPIRATORY PROTECTION (Specify type) Use approved chemical/mechanical filters designed to remove a combination of particulates and organic vapor in open and restricted ventilation areas. Use approved airline-type respirators or hoods in confined areas.			
VENTILATION Sufficient ventilation in pattern and volume should be provided to keep the air contaminant concentration below applicable exposure limits. Heavy solvent vapors should be removed from the lower levels of work area, and all ignition sources (non-explosion proof equipment) should be eliminated if flammable/air mixtures will be encountered. All application areas should be ventilated in accordance with OSHA regulation 29 CFR Part 1910.94. Use ventilation to remove airborne decomposition products formed during welding or flame-cutting of surfaces coated with this product. Caution: Solvent vapors are heavier than air and collect in lower levels of the work area.			
PROTECTIVE GLOVES Use neoprene or rubber gloves to prevent skin contact.			
OTHER PROTECTIVE EQUIPMENT AND HYGIENIC PRACTICES Use disposable or impervious clothing if work clothing contamination is likely. Remove and wash contaminated clothing. Use protective cream if skin contact is likely.			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Do not store or use near heat, sparks or open flame. Refer to OSHA 29CFR 1910.106 "Flammable and Combustible Liquids" for specific storage requirements. Store only in well-ventilated areas. Do not puncture, drag or slide container. Keep container closed when not in use.			
OTHER PRECAUTIONS Avoid breathing sanding dust. Can cause allergic respiratory reaction. Can cause allergic skin reaction. Prevent prolonged or repeated breathing of vapor or spray mists. Do not weld or flame-cut an empty drum or container. Do not handle until the manufacturer's safety precautions have been read and understood.			
SECTION VIII - FIRST AID MEASURES			
EMERGENCY AND FIRST AID PROCEDURES Inhalation Move person to fresh air. Restore breathing if stopped. If breathing is difficult, give oxygen. Treat symptomatically. Get prompt medical attention. Eye Contact Flush eyes with plenty of water for 15 minutes while holding eyelids open. CALL DOCTOR IMMEDIATELY. Skin Contact Wash affected skin areas with soap and water. Remove contaminated clothing. Get medical attention if irritation persists. Ingestion If swallowed, drink one or two glasses of water to dilute. DO NOT INDUCE VOMITING. Call physician or poison control immediately for further instructions. Never give anything by mouth to an unconscious person. <u>NOTE TO PHYSICIAN</u> If more than 2.0 mil per kg has been ingested and vomiting has not occurred, emesis should be induced with supervision. Keep victim's head below hips to prevent aspiration. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before emesis, gastric lavage using cuffed endotracheal tube should be considered.			
SECTION IX - SDS PREPARATION INFORMATION			
Prepared by: Environmental Health & Safety	Telephone number: (714) 507-3300	e-mail address <EHSinfo@tchristy.com	
The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.			



SAFETY DATA SHEET

Date Revised: MAY 2010

Supersedes: JULY 2005

Christy's® PTFE TAPE

Information on this form is furnished solely for the purpose of compliance with the U.S. Occupational Safety and Health Act, the Canadian Hazardous Products Act and Controlled Products Regulations and shall not be used for any other purpose. T Christy Enterprises urges the customers receiving this Safety Data Sheet to study it carefully to become aware of the hazards, if any, of the product involved. In the interest of safety, you should notify your employees, agents and contractors of the information on this sheet.

SECTION I - PRODUCT AND COMPANY INFORMATION

PRODUCT NAME: Polytetrafluoroethylene (PTFE)

SYNONYMS:

PRODUCT USE: Teflon Tape

SUPPLIER and MANUFACTURER:

T Christy Enterprises, Inc
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-800-258-4583 (North America)
Tel. 1-714-507-3300 (International)

EMERGENCY: Transportation/Medical issues: Tel. 800.535.5053 INFOTRAK

SECTION II - HAZARDOUS INGREDIENTS, EXPOSURE LIMITS, TRANSPORT & WHMIS DATA

None of the ingredients below are listed as carcinogens by IARC, NTP, OSHA or ACGIH

CAS#	APPROX % BY WEIGHT	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
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Polytetrafluoroethylene (PTFE)	9002-84-0	100%			
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NOTE: PTFE tape, as such, is not a hazardous material. It is a processed solid polymer.

All of the constituents of T Christy adhesive products are either listed on the TSCA inventory of chemical substances maintained by the US EPA and the Canadian Domestic Substance List or are exempt there from.

DOT, IATA, IMO/MDG SHIPPING INFORMATION

Proper Shipping Name:
Hazard Class:
Identification Number:
Packing Group:
Label Required:

TDG INFORMATION

TDG CLASS:
SHIPPING NAME:
UN NUMBER:

WHMIS CLASSIFICATION: CONTROLLED PRODUCT

SPECIAL HAZARD DESIGNATIONS

	HMIS	NFPA	HAZARD RATING
HEALTH:			0 - MINIMAL
FLAMMABILITY:			1 - SLIGHT
REACTIVITY:			2 - MODERATE
PROTECTIVE EQUIPMENT:			3 - SERIOUS
			4 - SEVERE

B = Eye, Hand/Skin Protection (Normal use or application & spill clean-up activities)

H = Eye, Hand/Skin and Respiratory Protection plus Impermeable Apron (When risk of immersion and/or splashing is present)

SECTION III - PHYSICAL DATA

APPEARANCE White	ODOR	BOILING POINT (°F/°C) N/A	FREEZING POINT
SPECIFIC GRAVITY @ 73°F ± 3.6° (23°C ± 2°) 2.1 - 2.2	VAPOR PRESSURE (mm Hg.) N/A	MELTING POINT > 341°C (642°F)	
VAPOR DENSITY (Air = 1) N/A	REACTIVITY IN WATER NONE	SOLUBILITY IN WATER Insoluble	
COEFFICIENT OF WATER/OIL DISTRIBUTION	PH INFORMATION	VOC STATEMENT	

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT N/A	AUTO IGNITION TEMP.	FLAMMABLE LIMITS (PERCENT BY VOLUME)	LEL N/A	UEL N/A
FIRE EXTINGUISHING MEDIA Use media suitable for surrounding fire.				
SPECIAL FIRE FIGHTING PROCEDURES Self contained breathing apparatus with full face piece and protective clothing if involved with other materials.				
UNUSUAL FIRE AND EXPLOSION HAZARDS Product will emit toxic fumes at high temperatures: Above 800°F (Tetrafluoroethylene), above 825°F (Hexafluoropropylene), above 930°F (Carbonyl Fluoride), above 885°F (Perfluoroisobutylene)				

SECTION V - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	Heating above 750°F for prolonged periods.
INCOMPATIBILITY (MATERIALS TO AVOID)			
HAZARDOUS DECOMPOSITION PRODUCTS			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	
SECTION VI - HEALTH HAZARD DATA & TOXICOLOGICAL PROPERTIES			
PRIMARY ROUTES OF ENTRY: X Inhalation Skin Contact Eye Contact Ingestion			
TOXIC EXPOSURE VALUES: <i>Refer to table in Section II for Lethal Dose and Lethal Concentration exposure values</i>			
EFFECT OF OVEREXPOSURE			
ACUTE:			
Inhalation:		Flu like transient sickness	
Inhalation:		No toxic effect from dusts	
Skin Contact:			
Skin Absorption:		Probably non-irritating and non-absorbing	
Eye Contact:		Mechanical irritation	
Ingestion:		PTFE has been shown to be inert when ingested by rats	
CHRONIC:		Could be fatal	
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory inflammation			
REPRODUCTIVE EFFECTS	TERATOGENICITY	MUTAGENICITY	EMBRYOTOXICITY
N. AP.	N. AP.	N. AP.	N. AP.
SENSITIZATION TO PRODUCT		SYNERGISTIC PRODUCTS	
N. AP.		N. AV.	
SECTION VII - PREVENTIVE MEASURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED			
Sweep up to prevent slippage on tape.			
WASTE DISPOSAL METHOD			
Follow local, State and Federal regulations. Consult disposal expert.			
RESPIRATORY PROTECTION (Specify type)			
VENTILATION			
PROTECTIVE GLOVES		EYE PROTECTION	
N/A		N/A	
OTHER PROTECTIVE EQUIPMENT AND HYGIENIC PRACTICES			
N/A			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING			
OTHER PRECAUTIONS No Smoking While Handling Material			
SECTION VIII - FIRST AID MEASURES			
EMERGENCY AND FIRST AID PROCEDURES			
Inhalation:		Move to fresh air. Refer to physician.	
Eye Contact:			
Skin Contact:			
Ingestion:			
SECTION IX - SDS PREPARATION INFORMATION			
Prepared by:		Telephone number:	e-mail address
Environmental Health & Safety		(714) 507-3300	<EHSinfo@tchristy.com
The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.			

MATERIAL SAFETY DATA SHEET

03702
03 00

DATE OF PREPARATION
Apr 3, 2010

SECTION 1 — PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NUMBER

03702

PRODUCT NAME

KRYLON® Industrial QUIK-MARK™ Solvent-Based Inverted Marking Paint (Fluorescent), Orange

MANUFACTURER'S NAME

THE SHERWIN-WILLIAMS COMPANY
KRYLON PRODUCTS GROUP
Cleveland, OH 44115

Telephone Numbers and Websites

Product Information	(800) 247-3266 www.kpg-industrial.com
Regulatory Information	(216) 566-2902 www.paintdocs.com
Medical Emergency	(216) 566-2917
Transportation Emergency*	(800) 424-9300

**for Chemical Emergency ONLY (spill, leak, fire, exposure, or accident)*

SECTION 2 — COMPOSITION/INFORMATION ON INGREDIENTS

% by Weight	CAS Number	Ingredient	Units	Vapor Pressure
14	74-98-6	Propane		
		ACGIH TLV	2500 PPM	760 mm
		OSHA PEL	1000 PPM	
6	106-97-8	Butane		
		ACGIH TLV	800 PPM	760 mm
		OSHA PEL	800 PPM	
8	110-54-3	Hexane		
		ACGIH TLV	50 PPM	127 mm
		OSHA PEL	50 PPM	
4	107-83-5	2-Methylpentane		
		ACGIH TLV	Not Available	211 mm
		OSHA PEL	Not Available	
1	96-14-0	3-Methylpentane		
		ACGIH TLV	500 PPM	211 mm
		OSHA PEL	Not Available	
1	79-29-8	2,3-Dimethylbutane		
		ACGIH TLV	Not Available	230 mm
		OSHA PEL	Not Available	
9	142-82-5	Heptane		
		ACGIH TLV	400 PPM	50 mm
		ACGIH TLV	500 PPM STEL	
		OSHA PEL	400 PPM	
		OSHA PEL	500 PPM STEL	
7	64742-89-8	V. M. & P. Naphtha		
		ACGIH TLV	300 PPM	12 mm
		OSHA PEL	300 PPM	
		OSHA PEL	400 PPM STEL	
0.4	100-41-4	Ethylbenzene		
		ACGIH TLV	100 PPM	7.1 mm
		ACGIH TLV	125 PPM STEL	
		OSHA PEL	100 PPM	
		OSHA PEL	125 PPM STEL	
2	1330-20-7	Xylene		
		ACGIH TLV	100 PPM	5.9 mm
		ACGIH TLV	150 PPM STEL	
		OSHA PEL	100 PPM	
		OSHA PEL	150 PPM STEL	
27	471-34-1	Calcium Carbonate		
		ACGIH TLV	10 mg/m3 as Dust	
		OSHA PEL	10 mg/m3 Total Dust	
		OSHA PEL	5 mg/m3 Respirable Fraction	

SECTION 3 — HAZARDS IDENTIFICATION

ROUTES OF EXPOSURE

INHALATION of vapor or spray mist.

EYE or SKIN contact with the product, vapor or spray mist.

EFFECTS OF OVEREXPOSURE

EYES: Irritation.

SKIN: Prolonged or repeated exposure may cause irritation.

INHALATION: Irritation of the upper respiratory system.

May cause nervous system depression. Extreme overexposure may result in unconsciousness and possibly death.

Prolonged overexposure to hazardous ingredients in Section 2 may cause adverse chronic effects to the following organs or systems:

- the liver
- the urinary system
- the reproductive system

SIGNS AND SYMPTOMS OF OVEREXPOSURE

Headache, dizziness, nausea, and loss of coordination are indications of excessive exposure to vapors or spray mists.

Redness and itching or burning sensation may indicate eye or excessive skin exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

None generally recognized.

CANCER INFORMATION

For complete discussion of toxicology data refer to Section 11.

HMIS Codes

Health	2*
Flammability	3
Reactivity	0

SECTION 4 — FIRST AID MEASURES

EYES: Flush eyes with large amounts of water for 15 minutes. Get medical attention.
SKIN: Wash affected area thoroughly with soap and water.
 Remove contaminated clothing and launder before re-use.
INHALATION: If affected, remove from exposure. Restore breathing. Keep warm and quiet.
INGESTION: Do not induce vomiting. Get medical attention immediately.

SECTION 5 — FIRE FIGHTING MEASURES

FLASH POINT	LEL	UEL	EXTINGUISHING MEDIA
Propellant < 0 °F	0.9	9.5	Carbon Dioxide, Dry Chemical, Foam

UNUSUAL FIRE AND EXPLOSION HAZARDS

Containers may explode when exposed to extreme heat.
 Application to hot surfaces requires special precautions.
 During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.

SPECIAL FIRE FIGHTING PROCEDURES

Full protective equipment including self-contained breathing apparatus should be used.
 Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.

SECTION 6 — ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

- Remove all sources of ignition. Ventilate the area.
- Remove with inert absorbent.

SECTION 7 — HANDLING AND STORAGE

STORAGE CATEGORY

Not Available

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Keep away from heat, sparks, and open flame. Vapors will accumulate readily and may ignite explosively.
 During use and until all vapors are gone: Keep area ventilated - Do not smoke - Extinguish all flames, pilot lights, and heaters - Turn off stoves, electric tools and appliances, and any other sources of ignition.
 Consult NFPA Code. Use approved Bonding and Grounding procedures.
 Contents under pressure. Do not puncture, incinerate, or expose to temperature above 120F. Heat from sunlight, radiators, stoves, hot water, and other heat sources could cause container to burst. Do not take internally. Keep out of the reach of children.

SECTION 8 — EXPOSURE CONTROLS/PERSONAL PROTECTION

PRECAUTIONS TO BE TAKEN IN USE

Use only with adequate ventilation.
 Avoid contact with skin and eyes. Avoid breathing vapor and spray mist.
 Wash hands after using.

This coating may contain materials classified as nuisance particulates (listed "as Dust" in Section 2) which may be present at hazardous levels only during sanding or abrading of the dried film. If no specific dusts are listed in Section 2, the applicable limits for nuisance dusts are ACGIH TLV 10 mg/m3 (total dust), 3 mg/m3 (respirable fraction), OSHA PEL 15 mg/m3 (total dust), 5 mg/m3 (respirable fraction).

VENTILATION

Local exhaust preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits. Refer to OSHA Standards 1910.94, 1910.107, 1910.108.

RESPIRATORY PROTECTION

If personal exposure cannot be controlled below applicable limits by ventilation, wear a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2.
 When sanding or abrading the dried film, wear a dust/mist respirator approved by NIOSH/MSHA for dust which may be generated from this product, underlying paint, or the abrasive.

PROTECTIVE GLOVES

None required for normal application of aerosol products where minimal skin contact is expected. For long or repeated contact, wear chemical resistant gloves.

EYE PROTECTION

Wear safety spectacles with unperforated sideshields.

OTHER PRECAUTIONS

Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT WEIGHT	7.37 lb/gal	883 g/l
SPECIFIC GRAVITY	0.89	
BOILING POINT	<0 - 325 °F	<-18 - 162 °C
MELTING POINT	Not Available	
VOLATILE VOLUME	78%	
EVAPORATION RATE	Faster than ether	
VAPOR DENSITY	Heavier than air	
SOLUBILITY IN WATER	N.A.	
pH	7.0	
VOLATILE ORGANIC COMPOUNDS (VOC Theoretical - As Packaged)		
Volatile Weight 56.25%		Less Water and Federally Exempt Solvents

SECTION 10 — STABILITY AND REACTIVITY**STABILITY — Stable****CONDITIONS TO AVOID**

None known.

INCOMPATIBILITY

None known.

HAZARDOUS DECOMPOSITION PRODUCTS

By fire: Carbon Dioxide, Carbon Monoxide

HAZARDOUS POLYMERIZATION

Will not occur

SECTION 11 — TOXICOLOGICAL INFORMATION**CHRONIC HEALTH HAZARDS**

Prolonged and repeated exposure to Hexane may cause damage to nerve tissue of the arms and legs (peripheral neuropathy), resulting in muscular weakness and loss of sensation. This effect may be increased by the presence of Methyl Ethyl Ketone.

Reports have associated repeated and prolonged overexposure to solvents with permanent brain and nervous system damage.

Ethylbenzene is classified by IARC as possibly carcinogenic to humans (2B) based on inadequate evidence in humans and sufficient evidence in laboratory animals. Lifetime inhalation exposure of rats and mice to high ethylbenzene concentrations resulted in increases in certain types of cancer, including kidney tumors in rats and lung and liver tumors in mice. These effects were not observed in animals exposed to lower concentrations. There is no evidence that ethylbenzene causes cancer in humans.

TOXICOLOGY DATA

CAS No.	Ingredient Name			
74-98-6	Propane	LC50 RAT LD50 RAT	4HR	Not Available Not Available
106-97-8	Butane	LC50 RAT LD50 RAT	4HR	Not Available Not Available
110-54-3	Hexane	LC50 RAT LD50 RAT	4HR	Not Available 28700 mg/kg
107-83-5	2-Methylpentane	LC50 RAT LD50 RAT	4HR	Not Available Not Available
96-14-0	3-Methylpentane	LC50 RAT LD50 RAT	4HR	Not Available Not Available
79-29-8	2,3-Dimethylbutane	LC50 RAT LD50 RAT	4HR	Not Available Not Available
142-82-5	Heptane	LC50 RAT LD50 RAT	4HR	Not Available Not Available
64742-89-8	V. M. & P. Naphtha	LC50 RAT LD50 RAT	4HR	Not Available Not Available
100-41-4	Ethylbenzene	LC50 RAT LD50 RAT	4HR	Not Available 3500 mg/kg
1330-20-7	Xylene	LC50 RAT LD50 RAT	4HR	5000 ppm 4300 mg/kg
471-34-1	Calcium Carbonate	LC50 RAT LD50 RAT	4HR	Not Available Not Available

SECTION 12 — ECOLOGICAL INFORMATION**ECOTOXICOLOGICAL INFORMATION**

No data available.

SECTION 13 — DISPOSAL CONSIDERATIONS**WASTE DISPOSAL METHOD**

Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261.

Waste must be tested for ignitability to determine the applicable EPA hazardous waste numbers.

Do not incinerate. Depressurize container. Dispose of in accordance with Federal, State/Provincial, and Local regulations regarding pollution.

SECTION 14 — TRANSPORT INFORMATION**US Ground (DOT)**

May be classed as Consumer Commodity, ORM-D

UN1950, AEROSOLS, 2.1, LIMITED QUANTITY, (ERG#126)

Canada (TDG)

May be classed as Consumer Commodity, ORM-D

UN1950, AEROSOLS, CLASS 2.1, LIMITED QUANTITY, (ERG#126)

IMO

May be shipped as Limited Quantity

UN1950, AEROSOLS, CLASS 2.1, LIMITED QUANTITY, EmS F-D, S-U, ADR (D)

SECTION 15 — REGULATORY INFORMATION**SARA 313 (40 CFR 372.65C) SUPPLIER NOTIFICATION**

CAS No.	CHEMICAL/COMPOUND	% by WT	% Element
110-54-3	Hexane	8	
100-41-4	Ethylbenzene	0.3	
1330-20-7	Xylene	2	

CALIFORNIA PROPOSITION 65

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

TSCA CERTIFICATION

All chemicals in this product are listed, or are exempt from listing, on the TSCA Inventory.

SECTION 16 — OTHER INFORMATION

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.



SAFETY DATA SHEET

Date Revised: JAN 2010

Supersedes: JULY 2005

Chlorine

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SECTION I - PRODUCT AND COMPANY INFORMATION

PRODUCT NAME: DRY CHLORINE TABLETS

PRODUCT USE: For disinfection and oxidation

SUPPLIER and MANUFACTURER: T Christy Enterprises, Inc
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-800-258-4583 (North America)
Tel. 1-714-507-3300 (International)

EMERGENCY: Transportation/Medical issues: Tel. 800.535.5053 INFOTRAK

SECTION II - HAZARDOUS INGREDIENTS, EXPOSURE LIMITS, TRANSPORT & WHMIS DATA

None of the ingredients below are listed as carcinogens by IARC, NTP, OSHA or ACGIH		CAS#	APPROX % BY WEIGHT	ACGIH TLV	ACGIH STEL	OSHA PEL (TWA)	OSHA STEL
Calcium hypochlorite		7778-54-3	60-80%				
Sodium chloride		7647-14-5	10-20%				
Calcium chlorate		10137-74-3	0-5%				
Calcium chloride		10043-52-4	0-5%				
Calcium hydroxide		1305-62-0	0-6%	5mg			
Calcium carbonate		471-34-1	0-5%	10mg		15mg (Total dust) 5mg (Respirable fraction)	
Water			4-10%				

All of the constituents of TChristy adhesive products are either listed on the TSCA inventory of chemical substances maintained by the US EPA and the Canadian Domestic Substance List or are exempt therefrom.

DOT, IATA, IMO/MDG SHIPPING INFORMATION

Proper Shipping Name: Calcium hypochlorite
Hazard Class: 5.1
Identification Number: UN1748
Packing Group: II
Label Required: Oxidizer

TDG INFORMATION

TDG CLASS: N/A
SHIPPING NAME:
UN NUMBER:

WHMIS CLASSIFICATION: CONTROLLED PRODUCT

SPECIAL HAZARD DESIGNATIONS

	HMIS	NFPA	HAZARD RATING
HEALTH:	3	3	0 - MINIMAL
FLAMMABILITY:	0	0	1 - SLIGHT
REACTIVITY:	1	1	2 - MODERATE
PROTECTIVE			3 - SERIOUS
EQUIPMENT:	B	B	4 - SEVERE

B = Eye, Hand/Skin Protection (Normal use or application & spill clean-up activities)

H = Eye, Hand/Skin and Respiratory Protection plus Impermeable Apron (When risk of immersion and/or splashing is present)

SECTION III - PHYSICAL DATA

APPEARANCE White tablet	ODOR Chlorine-like	BULK DENSITY 1.9 G/CC ph @25°C: 10.4 - 10.8 (1% soln)
SPECIFIC GRAVITY (H ₂ O = 1) N/A	DECOMPOSITION TEMPERATURE Onset-approx 170 -180C° (338-356°F)	PERCENT VOLATILE BY VOLUME(%) None
VAPOR DENSITY (Air = 1) N/A	EVAPORATION RATE (BUAC = 1) N/A	SOLUBILITY IN WATER Approximately 18% @ 25°C
COEFFICIENT OF WATER/OIL DISTRIBUTION N/A	PH INFORMATION N/A	VOC STATEMENT

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT N/A	AUTO IGNITION TEMP.	FLAMMABLE LIMITS (PERCENT BY VOLUME)	LEL N/A	UEL N/A
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FIRE EXTINGUISHING MEDIA
Water only

SPECIAL FIRE FIGHTING PROCEDURES

Use water to cool containers exposed to fire. Do not use dry extinguishers containing substances by spill or otherwise ammonium compounds. This product is chemically reactive with many substances. Any contamination of the product with other substances by spill or otherwise may result in a chemical reaction and fire. This product is a strong oxidizer which is capable of intensifying a fire once started.

UNUSUAL FIRE AND EXPLOSION HAZARDS

None known.

SECTION V - REACTIVITY DATA			
STABILITY	UNSTABLE STABLE		CONDITIONS TO AVOID Store at temperature > 125°F (52°C)
		X	
INCOMPATIBILITY This product is chemically reactive with many substances, including, other pool treatment products, acids, organics, nitrogen-containing compounds, dry powder fire extinguishers, oxidizers, corrosive, flammable or combustible materials.			
HAZARDOUS DECOMPOSITION PRODUCTS Chlorine gas			
HAZARDOUS POLYMERIZATION	MAY OCCUR WILL NOT OCCUR		CONDITIONS TO AVOID Prevent entrance of humidity and moisture into container. Always close the lid.
		X	
SECTION VI - HEALTH HAZARD DATA & TOXICOLOGICAL PROPERTIES			
PRIMARY ROUTES OF ENTRY: <u> X </u> Inhalation <u> X </u> Skin Contact <u> X </u> Eye Contact <u> X </u> Ingestion			
TOXIC EXPOSURE VALUES EFFECT OF OVEREXPOSURE ACUTE: <u>Inhalation:</u> May be fatal if swallowed. Avoid breathing dust or fumes. Causes skin, eye, digestive tract and respiratory tract burns. May be irritating to the nose, mouth, throat and lungs. In confined areas, high levels of dust can result in chlorine vapor which may result in burns to the respiratory tract, production lung edema, shortness of breath, wheezing, choking, chest pains, impairment of lung function and lung damage. <u>Skin Contact:</u> Dermal exposure can cause severe irritation and / or burns characterized by redness, swelling and scab formation <u>Skin Absorption:</u> <u>Eye Contact:</u> Severe irritation and / or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage. <u>Ingestion:</u> Irritation and / or burns can occur to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding and / or tissue ulceration. Ingestion may be fatal.			
CHRONIC: MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Asthma, respiratory and cardiovascular disease.			
Reproductive Effects N. AP.	Teratogenicity N. AP.	Mutagenicity N. AP.	
SECTION VII - PREVENTIVE MEASURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Monitor all exit water for available chlorine and pH. Advise local authorities of any contaminated water release. For a land spill separate all spilled product from packaging, debris and other material. Using a clean broom or shovel, place all spilled product into plastic bags, and place those bags into a clean, dry disposable container properly marked and labelled. Do not seal containers tightly. Place all damaged packaging material in a disposal container of water to assure decontamination before disposal. Vapors may be suppressed by the use of a water fog. All water utilized to assist in fume suppression, decontamination or fire suppression may be contaminated and must be contained before disposal and/or treatment.			
WASTE DISPOSAL METHOD If this product becomes a waste, it meets the criteria of a hazardous waste as defined under 40 CFR 261 and would have the following EPA hazardous waste number: D001. If this product becomes a hazardous waste, it will be a hazardous waste that is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly. Must be disposed of in accordance with local, state, and federal regulations in a permitted hazardous waste treatment storage and disposal facility. Care must be taken to prevent environmental contamination from the use of this material.			
RESPIRATORY PROTECTION (Specify type) Wear a NIOSH approved respirator if dusts are created.			
VENTILATION Use local exhaust ventilation to minimize dust and chlorine level where industrial use occurs. Otherwise, ensure good general ventilation.			
PROTECTIVE GLOVES Neoprene		EYE PROTECTION Splashproof chemical goggles.	
OTHER PROTECTIVE EQUIPMENT AND HYGIENIC PRACTICES Where industrial use occurs, chemical goggles or full impermeable suit may be required.			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Keep product tightly sealed in original containers. Store in cool, dry, well-ventilated area. Store away from combustible or flammable products. Keep product packaging clean and free of all contamination, including other pool treatment products, acids, corrosive liquids, organic materials and oxidizers.			
OTHER PRECAUTIONS Do not store at temperatures above 52°C (125°F). Storage above this temperature may result in rapid decomposition, evolution of chlorine gas and heat sufficient to ignite combustible products.			
SECTION VIII - FIRST AID MEASURES			
EMERGENCY AND FIRST AID PROCEDURES <u>Inhalation:</u> Remove to fresh air and if breathing stopped, give artificial respiration. If breathing is difficult, give oxygen. CALL DOCTOR. <u>Eye Contact:</u> Flush eyes with plenty of water for 15 minutes lifting the upper and lower eyelids. CALL DOCTOR. <u>Skin Contact:</u> Immediately remove contaminated clothing and shoes. Immediately flush with water for at least 15 minutes. CALL DOCTOR <u>Ingestion:</u> Immediately drink large quantities of water. DO NOT INDUCE VOMITING. Do not give anything by mouth if person is unconscious or if having convulsions. CALL DOCTOR IMMEDIATELY.			
SECTION IX - SDS PREPARATION INFORMATION			
Prepared by: Environmental Health & Safety	Telephone number: (714) 507-3300	e-mail address <EHSinfo@tchristy.com	
The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.			



PRODUCT INFORMATION & SPECIFICATIONS

PRO-WIPES™ Hand Cleaning Towels

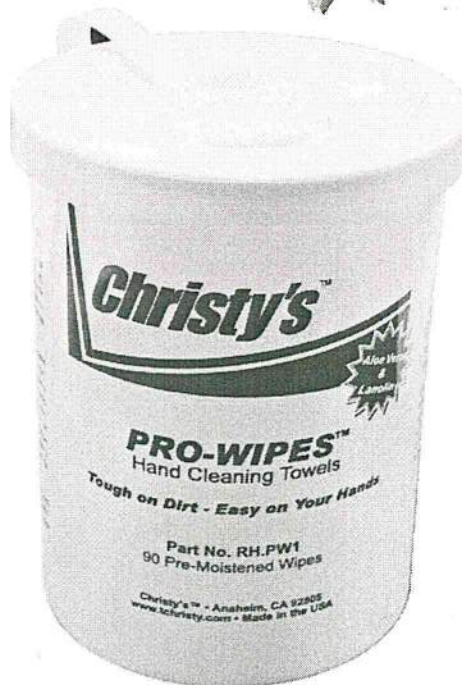
Now contains 90 towels per tub. Ideal when water isn't available. Pro-Wipes™ remove grease, paint, grime, oil, ink and more. Dirt sticks to Pro-Wipes™ not your hands. Pro-Wipes™ clean and treat working hands with aloe & lanolin leaving a pleasant citrus scent.

NEW FORMULATION: Deionized Water, D'Limonene, Surfactants, Glycerin, Mineral Oil, Aloe Vera, Lanolin.

- Pre-moistened towels; no need to rinse or dry
- Ideal when water isn't available
- Single towel dispensing & tear-off
- Large 10" x 12" sheet: 90 sheets per tub
- Aloe & lanolin leave hands clean but not sticky
- Removes grease, paint, oil, ink, grime & more
- Environmentally friendly

APPLICATIONS

- Irrigation / Ag
- Waterworks
- Plumbing
- Construction
- Electrical
- Welding
- Tools / Equipment



RH.PW1

Description	Part No.	Case Qty.
Christy's™ Hand Cleaning Towels	RH.PW1	6



SAFETY DATA SHEET

Date Revised: JULY 2010
Supersedes: AUGUST 2007

Christy's® ULTRA SEAL

Information on this form is furnished solely for the purpose of compliance with the U.S. Occupational Safety and Health Act, the Canadian Hazardous Products Act and Controlled Products Regulations and shall not be used for any other purpose. T Christy Enterprises urges the customers receiving this Safety Data Sheet to study it carefully to become aware of the hazards, if any, of the product involved. In the interest of safety, you should notify your employees, agents and contractors of the information on this sheet.

SECTION I - PRODUCT AND COMPANY INFORMATION

PRODUCT NAME: Ultra Seal
PRODUCT USE: Thread Sealing Compound with PTFE
SUPPLIER and MANUFACTURER: T Christy Enterprises, Inc.
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-800-258-4583 (North America)
Tel. 1-714-507-3300 (International)
SYNONYMS:
EMERGENCY: Transportation/Medical issues: Tel. 800.535.5053 INFOTRAK

SECTION II - HAZARDOUS INGREDIENTS, EXPOSURE LIMITS, TRANSPORT & WHMIS DATA

None of the ingredients below are listed as carcinogens by IARC, NTP, OSHA or ACGIH	CAS#	APPROX % BY WEIGHT	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
Isopropanol	67-63-0	8-13%	400 ppm		400 ppm	
Butyl Cellulosolve	111-76-2	20-25%	25 ppm		50 ppm	

All of the constituents of T Christy adhesive products are either listed on the TSCA inventory of chemical substances maintained by the US EPA and the Canadian Domestic Substance List or are exempt there from.

DOT, IATA, IMO/MDG SHIPPING INFORMATION

Proper Shipping Name: Thread sealing compound with PTFE
Hazard Class:
Identification Number:
Packing Group:
Label Required:

TDG INFORMATION

TDG CLASS:
SHIPPING NAME:
UN NUMBER:

WHMIS CLASSIFICATION: CONTROLLED PRODUCT

SPECIAL HAZARD DESIGNATIONS

	HMIS	NFPA	HAZARD RATING
HEALTH:		2	0 - MINIMAL
FLAMMABILITY:		0	1 - SLIGHT
REACTIVITY:		0	2 - MODERATE
PROTECTIVE EQUIPMENT:			3 - SERIOUS
			4 - SEVERE

B = Eye, Hand/Skin Protection (Normal use or application & spill clean-up activities)

H = Eye, Hand/Skin and Respiratory Protection plus Impermeable Apron (When risk of immersion and/or splashing is present)

SECTION III - PHYSICAL DATA

APPEARANCE White paste	ODOR Mild	BOILING POINT (°F/°C) 180°F	FREEZING POINT
SPECIFIC GRAVITY @ H20 =1 1.41	VAPOR PRESSURE (mm Hg.) 0.88	MELTING POINT N/A	
VAPOR DENSITY (Air = 1) >1	EVAPORATION RATE (BUTYL ACETATE = 1) 0.6	SOLUBILITY IN WATER Slight	
COEFFICIENT OF WATER/OIL DISTRIBUTION	PH INFORMATION	VOC STATEMENT 345.6 G/L	

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 82°F (28°C) ASTM METHOD D93-80	FLAMMABLE LIMITS 921°F (494°C) IGNITION TEMPERATURE (PERCENT BY VOLUME)	LEL 1.10%	UEL 10.60%
FIRE EXTINGUISHING MEDIA Carbon Dioxide or dry chemical or water			

SPECIAL FIRE FIGHTING PROCEDURES
None

UNUSUAL FIRE AND EXPLOSION HAZARDS

Contact with strong oxidizers may cause fires or explosions. Carbon monoxide may be released.

SECTION V - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	N/A
INCOMPATIBILITY (MATERIALS TO AVOID) Liquid oxygen systems, liquid sodium, gaseous fluorine, strong oxidizers.			
HAZARDOUS DECOMPOSITION PRODUCTS N/A			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	N/A
SECTION VI - HEALTH HAZARD DATA & TOXICOLOGICAL PROPERTIES			
PRIMARY ROUTES OF ENTRY: X Inhalation x Skin Contact Eye Contact x Ingestion			
TOXIC EXPOSURE VALUES: Refer to table in Section II for Lethal Dose and Lethal Concentration exposure values			
EFFECT OF OVEREXPOSURE			
ACUTE:			
<u>Inhalation:</u>		Possible dizziness if used in confined area	
<u>Skin Contact:</u>		May cause mild irritation to sensitive skin	
<u>Skin Absorption:</u>			
<u>Eye Contact:</u>			
<u>Ingestion:</u>			
CHRONIC:			
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory inflammation None known			
REPRODUCTIVE EFFECTS	TERATOGENICITY	MUTAGENICITY	EMBRYOTOXICITY
N. AP.	N. AP.	N. AP.	N. AP.
SENSITIZATION TO PRODUCT		SYNERGISTIC PRODUCTS	
N. AP.		N. AV.	
SECTION VII - PREVENTIVE MEASURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Normal good housekeeping procedures			
WASTE DISPOSAL METHOD Disposal to be done in accordance with local, state and federal regulations			
RESPIRATORY PROTECTION (Specify type) Avoid breathing of fumes. If used in a confined area, a respirator may be necessary.			
VENTILATION Local exhaust: Normal ventilation is adequate.			
PROTECTIVE GLOVES May be necessary for sensitive skin.		EYE PROTECTION Keep out of eyes. Wear protective goggles where necessary.	
OTHER PROTECTIVE EQUIPMENT AND HYGIENIC PRACTICES Wash with soap and water after use.			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Store away from heat or open flame. Close container after use.			
OTHER PRECAUTIONS Wear protective gloves to prevent possible skin absorption and dermatitis. Keep out of reach of children.			
SECTION VIII - FIRST AID MEASURES			
EMERGENCY AND FIRST AID PROCEDURES			
<u>Inhalation:</u>		Move to well ventilated area.	
<u>Eye Contact:</u>		Flush eyes with water	
<u>Skin Contact:</u>		Wash exposed area with soap and water. Wash clothing before reuse.	
<u>Ingestion:</u>		Call a doctor	
SECTION IX - SDS PREPARATION INFORMATION			
Prepared by: Environmental Health & Safety		Telephone number: (714) 507-3300	e-mail address <EHSinfo@tchristy.com>
The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.			



SAFETY DATA SHEET

Date Revised: JAN 2010

Supersedes: DEC 2009

Christy's® Pipewrap Tape

Information on this form is furnished solely for the purpose of compliance with the U.S. Occupational Safety and Health Act, the Canadian Hazardous Products Act and Controlled Products Regulations and shall not be used for any other purpose. T Christy Enterprises urges the customers receiving this Safety Data Sheet to study it carefully to become aware of the hazards, if any, of the product involved. In the interest of safety, you should notify your employees, agents and contractors of the information on this sheet.

SECTION I - PRODUCT AND COMPANY INFORMATION

PRODUCT NAME: Christy's® Pipewrap Tape **SYNONYMS:**

PRODUCT USE: Polyvinyl Chloride Tapes (PVC tapes)

SUPPLIER and MANUFACTURER: T Christy Enterprises, Inc
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-800-258-4583 (North America)
Tel. 1-714-507-3300 (International)

EMERGENCY: Transportation/Medical issues: Tel. 800.535.5053 INFOTRAK

SECTION II - HAZARDOUS INGREDIENTS, EXPOSURE LIMITS, TRANSPORT & WHMIS DATA

None of the ingredients below are listed as carcinogens by IARC, NTP, OSHA or ACGIH		APPROX %	ACGIH	ACGIH	OSHA	OSHA
CAS#	BY WEIGHT	TLV	STEL	PEL	STEL	
Rubber Adhesive			10 -15			
PVC Resin	9002-86-2	45-60				
Plasticizers	117-81-7	25-35				
Lead Stabilizer		2-3				
Pigments		0-5				
Antimony Oxide	1309-64-4	0-7				
CaCO ₃	471-34-1	0-20				
Toulene	108-88-3	0-1				
Vinyl Chloride (monomer)	75-01-4	<10 ppm				

All of the constituents of TChristy adhesive products are either listed on the TSCA inventory of chemical substances maintained by the US EPA and the Canadian Domestic Substance List or are exempt therefrom.

DOT, IATA, IMO/IMDG SHIPPING INFORMATION

Proper Shipping Name: N/A
Hazard Class: N/A
Identification Number: N/A
Packing Group: N/A
Label Required: N/A

TDG INFORMATION

TDG CLASS: N/A
SHIPPING NAME:
UN NUMBER:

WHMIS CLASSIFICATION: CONTROLLED PRODUCT

SPECIAL HAZARD DESIGNATIONS

HMIS	NFPA	HAZARD RATING
HEALTH:		0 - MINIMAL
FLAMMABILITY:		1 - SLIGHT
REACTIVITY:		2 - MODERATE
PROTECTIVE		3 - SERIOUS
EQUIPMENT:		4 - SEVERE

B = Eye, Hand/Skin Protection (Normal use or application & spill clean-up activities)

H = Eye, Hand/Skin and Respiratory Protection plus Impermeable Apron (When risk of immersion and/or splashing is present)

SECTION III - PHYSICAL DATA

APPEARANCE Solid	ODOR Slight PVC material odor	BOILING POINT (°F/°C) N/A	FREEZING POINT N/A
SPECIFIC GRAVITY (H₂O = 1) 1.25 - 1.45	DECOMPOSITION TEMPERATURE 260°C / 500°F	SOFTENING POINT > 100°C	
VAPOR DENSITY (Air = 1) N/A	EVAPORATION RATE (BUAC = 1)	SOLUBILITY IN WATER N/A	
COEFFICIENT OF WATER/OIL DISTRIBUTION N/A	PH INFORMATION N/A	VOC STATEMENT	

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 320 - 390°C (ASTM D-192)	AUTO IGNITION TEMP.	FLAMMABLE LIMITS (PERCENT BY VOLUME)	LEL N/A	UEL N/A
FIRE EXTINGUISHING MEDIA Water, dry chemical foam. CO ₂				
SPECIAL FIRE FIGHTING PROCEDURES Close or confined quarters require self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.				
UNUSUAL FIRE AND EXPLOSION HAZARDS Any vinyl can be forced to burn by continuous application of intense heat.				

SECTION V - REACTIVITY DATA

STABILITY	UNSTABLE	CONDITIONS TO AVOID
	STABLE	X

INCOMPATIBILITY

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION	MAY OCCUR	CONDITIONS TO AVOID
	WILL NOT OCCUR	X

SECTION VI - HEALTH HAZARD DATA & TOXICOLOGICAL PROPERTIES

PRIMARY ROUTES

OF ENTRY: _____ Inhalation _____ Skin Contact _____ Eye Contact _____ Ingestion

TOXIC EXPOSURE VALUES

EFFECT OF OVEREXPOSURE

ACUTE:

Inhalation:Skin Contact:Skin Absorption:Eye Contact:Ingestion:

CHRONIC:

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

REPRODUCTIVE EFFECTS	TERATOGENICITY	MUTAGENICITY	EMBRYOTOXICITY	SENSITIZATION TO PRODUCT	SYNERGISTIC PRODUCTS
N. AP.	N. AP.	N. AP.	N. AP.	N. AP.	N. AV.

SECTION VII - PREVENTIVE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

N/A

WASTE DISPOSAL METHOD

Follow local, State and Federal regulations. Consult disposal expert. Can be disposed of by incineration. Excessive quantities should not be permitted to enter drains. Empty containers should be air dried before disposing. CA Hazardous Waste Code: 214.

RESPIRATORY PROTECTION (Specify type)

Use in well ventilated area.

VENTILATION

Use only with adequate ventilation. Provide sufficient ventilation in volume and pattern to keep contaminants below applicable exposure limits set forth in Section II.

PROTECTIVE GLOVES

Not needed.

EYE PROTECTION

Splashproof chemical goggles, face shield, safety glasses with brow guards and side shields, etc. as appropriate for exposure.

OTHER PROTECTIVE EQUIPMENT AND HYGIENIC PRACTICES

Not needed

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Store in cool and dry shade between 40°F - 90°F (5°C - 38°C). Keep away from heat, sparks, open flame and other sources of ignition. Avoid prolonged breathing. Use with adequate ventilation. Avoid contact with eyes, skin and clothing.

OTHER PRECAUTIONS

SECTION VIII - FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES

Inhalation:Eye Contact:Skin Contact:Ingestion:**SECTION IX - SDS PREPARATION INFORMATION**

Prepared by:

Environmental Health & Safety

Telephone number:

(714) 507-3300

e-mail address

<EHSinfo@tchristy.com

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.



SAFETY DATA SHEET

Date Revised: JAN 2010

Supersedes: DEC 2009

Christy's® Pipewrap Tape

Information on this form is furnished solely for the purpose of compliance with the U.S. Occupational Safety and Health Act, the Canadian Hazardous Products Act and Controlled Products Regulations and shall not be used for any other purpose. T Christy Enterprises urges the customers receiving this Safety Data Sheet to study it carefully to become aware of the hazards, if any, of the product involved. In the interest of safety, you should notify your employees, agents and contractors of the information on this sheet.

SECTION I - PRODUCT AND COMPANY INFORMATION

PRODUCT NAME: Christy's® Pipewrap Tape
PRODUCT USE: Polyvinyl Chloride Tapes (PVC tapes)
SYNONYMS:
SUPPLIER and MANUFACTURER: T Christy Enterprises, Inc.
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-800-258-4583 (North America)
Tel. 1-714-507-3300 (International)
EMERGENCY: Transportation/Medical Issues: Tel. 800.535.5053 INFOTRAK

SECTION II - HAZARDOUS INGREDIENTS, EXPOSURE LIMITS, TRANSPORT & WHMIS DATA

None of the ingredients below are listed as carcinogens by IARC, NTP, OSHA or ACGIH	CAS#	APPROX % BY WEIGHT	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
Rubber Adhesive			10 -15			
PVC Resin	9002-86-2	45-60				
Plasticizers	117-81-7	25-35				
Lead Stabilizer		2-3				
Pigments		0-5				
Antimony Oxide	1309-64-4	0-7				
CaCO ₃	471-34-1	0-20				
Toulene	108-88-3	0-1				
Vinyl Chloride (monomer)	75-01-4	<10 ppm				

All of the constituents of TChristy adhesive products are either listed on the TSCA inventory of chemical substances maintained by the US EPA and the Canadian Domestic Substance List or are exempt therefrom.

DOT, IATA, IMO/MDG SHIPPING INFORMATION		SPECIAL HAZARD DESIGNATIONS		
Proper Shipping Name:	N/A	HMIS	NFPA	HAZARD RATING
Hazard Class:	N/A	HEALTH:		0 - MINIMAL
Identification Number:	N/A	FLAMMABILITY:		1 - SLIGHT
Packing Group:	N/A	REACTIVITY:		2 - MODERATE
Label Required:	N/A	PROTECTIVE		3 - SERIOUS
TDG INFORMATION		EQUIPMENT:		4 - SEVERE
TDG CLASS:	N/A	B = Eye, Hand/Skin Protection (Normal use or application & spill clean-up activities)		
SHIPPING NAME:		H = Eye, Hand/Skin and Respiratory Protection plus Impermeable Apron (When risk of immersion and/or splashing is present)		
UN NUMBER:				
WHMIS CLASSIFICATION: CONTROLLED PRODUCT				

SECTION III - PHYSICAL DATA

APPEARANCE Solid	ODOR Slight PVC material odor	BOILING POINT (*F/C) N/A	FREEZING POINT N/A
SPECIFIC GRAVITY (H₂O = 1) 1.25 - 1.45	DECOMPOSITION TEMPERATURE 260°C / 500°F	SOFTENING POINT > 100°C	
VAPOR DENSITY (Air = 1) N/A	EVAPORATION RATE (BUAC = 1)	SOLUBILITY IN WATER N/A	
COEFFICIENT OF WATER/OIL DISTRIBUTION N/A	PH INFORMATION N/A	VOC STATEMENT	

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 320 - 390°C (ASTM D-192)	AUTO IGNITION TEMP.	FLAMMABLE LIMITS (PERCENT BY VOLUME)	LEL N/A	UEL N/A
FIRE EXTINGUISHING MEDIA Water, dry chemical foam. CO2				
SPECIAL FIRE FIGHTING PROCEDURES Close or confined quarters require self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.				
UNUSUAL FIRE AND EXPLOSION HAZARDS Any vinyl can be forced to burn by continuous application of intense heat.				

SECTION V - REACTIVITY DATA			
STABILITY	☐ UNSTABLE ☒ STABLE	X	CONDITIONS TO AVOID
INCOMPATIBILITY			
HAZARDOUS DECOMPOSITION PRODUCTS			
HAZARDOUS POLYMERIZATION	☐ MAY OCCUR ☒ WILL NOT OCCUR	X	CONDITIONS TO AVOID
SECTION VI - HEALTH HAZARD DATA & TOXICOLOGICAL PROPERTIES			
PRIMARY ROUTES OF ENTRY: ☐ Inhalation ☐ Skin Contact ☐ Eye Contact ☐ Ingestion			
TOXIC EXPOSURE VALUES EFFECT OF OVEREXPOSURE ACUTE: <u>Inhalation:</u> <u>Skin Contact:</u> <u>Skin Absorption:</u> <u>Eye Contact:</u> <u>Ingestion:</u> CHRONIC:			
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:			
REPRODUCTIVE EFFECTS	TERATOGENICITY	MUTAGENICITY	EMBRYOTOXICITY SENSITIZATION TO PRODUCT SYNERGISTIC PRODUCTS
N. AP.	N. AP.	N. AP.	N. AP. N. AP. N. AV.
SECTION VII - PREVENTIVE MEASURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED			
N/A			
WASTE DISPOSAL METHOD Follow local, State and Federal regulations. Consult disposal expert. Can be disposed of by incineration. Excessive quantities should not be permitted to enter drains. Empty containers should be air dried before disposing. CA Hazardous Waste Code: 214.			
RESPIRATORY PROTECTION (Specify type) Use in well ventilated area.			
VENTILATION Use only with adequate ventilation. Provide sufficient ventilation in volume and pattern to keep contaminants below applicable exposure limits set forth in Section II.			
PROTECTIVE GLOVES Not needed.		EYE PROTECTION Splashproof chemical goggles, face shield, safety glasses with brow guards and side shields, etc. as appropriate for exposure.	
OTHER PROTECTIVE EQUIPMENT AND HYGIENIC PRACTICES Not needed			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Store in cool and dry shade between 40°F - 90°F (5°C - 38°C). Keep away from heat, sparks, open flame and other sources of ignition. Avoid prolonged breathing. Use with adequate ventilation. Avoid contact with eyes, skin and clothing.			
OTHER PRECAUTIONS			
SECTION VIII - FIRST AID MEASURES			
EMERGENCY AND FIRST AID PROCEDURES			
<u>Inhalation:</u> <u>Eye Contact:</u> <u>Skin Contact:</u> <u>Ingestion:</u>			
SECTION IX - SDS PREPARATION INFORMATION			
Prepared by:	Telephone number:	e-mail address	
Environmental Health & Safety	(714) 507-3300	<EHSinfo@tchristy.com	
The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.			



SAFETY DATA SHEET

Christy's® Purple Primer Low VOC Primer for PVC/CPVC Plastic Pipe
Christy's® Clear Primer Low VOC Primer for PVC/CPVC Plastic Pipe

Date Revised: AUG 2011
Supersedes: JUNE 2011

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Christy's® Purple Primer
Christy's® Clear Primer

SYNONYMS:

PRODUCT USE: Low VOC Primer for PVC Plastic Pipe / CPVC Pipe

MANUFACTURER: T Christy Enterprises, Inc
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-714-507-3300 (North America)

SUPPLIER:
Tel. 1-714-507-3300 (International)

EMERGENCY: Transportation and Medical issues: Tel. 800.535.5053 INFOTRAK

SECTION 2 - HAZARDS IDENTIFICATION

GHS CLASSIFICATION:

Health	Environmental	Physical
Acute Toxicity: Category 4 Skin Corrosion: Category 3 Skin Sensitization: YES Eye: Category 2B	Acute Toxicity: Category III Chronic Toxicity: Category IV	Flammable Liquid/Aerosol/Gas: Category 1

GHS LABEL:



WHMIS CLASSIFICATION: CONTROLLED PRODUCT
CLASS B, DIVISION 2 CLASS D, DIVISION 2B

Hazard Statements

Highly flammable liquid and vapor May cause allergic skin reaction

Precautionary Statements (See Section 15 for all advisory and required precautions)

Do not breath vapor Keep container closed Use in well-ventilated area

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

	CAS#	EINECS #	REACH Pre-registration Number	CONCENTRATION % by Weight
Tetrahydrofuran (THF)	109-99-9	203-726-8	05-2116297729-22-0000	30-60
Methyl Ethyl Ketone (MEK)*	78-93-3	201-159-0	05-2116297728-24-0000	5-20
Cyclohexanone	108-94-1	203-631-1	05-2116297718-25-0000	5-15
Acetone	67-64-1	200-662-2	05-2116297713-35-0000	20-40

All of the constituents of this adhesive product are listed on the TSCA inventory of chemical substances maintained by the US EPA, or are exempt from that listing.

*This chemical is subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (40CFR372).

SECTION 4 - FIRST AID MEASURES

Contact with eyes: Flush eyes immediately with plenty of water for 15 minutes and seek medical advice immediately.
Skin contact: Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water. If irritation develops, seek medical advice.
Inhalation: Remove to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. Seek medical advice.
Ingestion: Rinse mouth with water. Give 1 or 2 glasses of water or milk to dilute. Do not induce vomiting. Seek medical advice immediately.

SECTION 5 - FIREFIGHTING MEASURES

Suitable Extinguishing Media: Dry chemical powder, carbon dioxide gas, foam, Halon, water fog.
Unsuitable Extinguishing Media: Water spray or stream.
Exposure Hazards: Carbon monoxide, carbon dioxide, hydrogen chloride and smoke
Combustion Products: Carbon monoxide, carbon dioxide, hydrogen chloride and smoke
Protection for Firefighters: Self-contained breathing apparatus or full-face positive pressure airline masks.

HMIS	NFPA	
Health 2	2	0-Minimal
Flammability 3	3	1-Slight
Reactivity 1	1	2-Moderate
		3-Serious
		4-Severe

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep away from heat, sparks and open flame.
Provide sufficient ventilation, use explosion-proof exhaust ventilation equipment or wear suitable respiratory protective equipment.
Prevent contact with skin or eyes (see section 8).
Environmental Precautions: Prevent product or liquids contaminated with product from entering sewers, drains, soil or open water course.
Methods for Cleaning up: Clean up with sand or other inert absorbent material. Transfer to a closable vessel (Metal or polyethylene [PE])
Materials not to be used for clean up: Liquid(s)

SECTION 7 - HANDLING AND STORAGE

Handling: Avoid breathing of vapor, avoid contact with eyes, skin and clothing.
Keep away from ignition sources, use only electrically grounded handling equipment and ensure adequate ventilation/fume exhaust hoods.
Do not eat, drink or smoke while handling.
Storage: Store in ventilated room or shade below 27°C (80°F) and away from direct sunlight.
Keep away from ignition sources and incompatible materials: caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates.
Follow all precautionary information on container label, product bulletins and solvent cementing literature.

SECTION 8 - PRECAUTIONS TO CONTROL EXPOSURE / PERSONAL PROTECTION

EXPOSURE LIMITS:	Component	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL:	
	Tetrahydrofuran (THF) #, ##	50 ppm skin	100 ppm	200 ppm	250 ppm	# Mfg. Recommended Allowable Exposure Limit (AEL): 25 ppm
	Methyl Ethyl Ketone (MEK)	200 ppm	300 ppm	200 ppm	300 ppm	## Mfg. Recommended STEL: 75 ppm
	Cyclohexanone	20 ppm skin		50 ppm		
	Acetone	500 ppm	750 ppm	750 ppm	1000 ppm	

Engineering Controls: If ventilated cabinet, enclosure or fume hood is necessary, average airflow should be at least 100 FPM (50.8 cm/sec).

Monitoring: Maintain breathing zone airborne concentrations below exposure limits.

Personal Protective Equipment (PPE):

Eye Protection: Avoid contact with eyes, wear splash proof chemical goggles, face shield, safety glasses (spectacles) with brow guards and side shields, etc. as may be appropriate for the exposure.

Skin Protection: Prevent contact with the skin as much as possible. Polyethylene or PVA coated rubber gloves should be used for frequent immersion.
Use of latex/nitrile surgical gloves or solvent-resistant barrier cream should provide adequate protection when normal adhesive application practices and procedures are used for making structural bonds.

Respiratory Protection: Prevent inhalation of the solvents. Use in a well-ventilated room. Open doors and/or windows to ensure airflow and air changes. Use local exhaust ventilation to remove airborne contaminants from employee breathing zone and to keep contaminants below levels listed above.
With normal use, the Exposure Limit Value will not usually be reached. When limits approached, use respiratory protection equipment.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear / Purple - thin liquid	Odor Threshold:	0.1 ppm (Cyclohexanone)
Odor:	Ethereal, similar to Acetone	Boiling Range:	57°C (133°F) to 67°C (151°F)
P.H.	Not Applicable	Evaporation Rate:	6-11 (BUAC = 1)
Melting/Freezing Point:	95°C (-139°F) Based on first boiling component: Acetone	Flammability:	Category I
Boiling Point:	57°C (133°F) Based on first boiling component: Acetone	Flammability Limits:	LEL: 2%
Flash Point:	-14°C (-6.8°F) T.C.C. based on THF	UEL: 11.8%	
Specific Gravity	@23°C ± 2° (73°F ± 3.6°) Typically 0.842 ± 0.01	Vapor Pressure:	190 mm Hg @ 20°C (68°F): Acetone
Solubility:	Completely soluble in water.	Vapor Density:	2.0 (Air = 1)
Partition Coefficient n-octanol/water:	Not Available	Other Data: Viscosity:	Water-thin
Auto-ignition Temperature:	321°C (609.8°F): THF		
Decomposition Temperature:	Not Applicable		
VOC Content:	When applied as directed, per SCAQMD Rule 1168, Test Method 316A, VOC content is: 550 g/l.		

SECTION 10 - STABILITY AND REACTIVITY

Stability:	Stable
Hazardous decomposition products:	None in normal use. When forced to burn, this product gives off carbon monoxide (CO), carbon dioxide (CO ₂), hydrogen chloride (HCl) and smoke.
Conditions to avoid:	Keep away from heat, sparks, open flame and other ignition sources.
Incompatible Materials:	Caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates.

SECTION 11 - TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:	Inhalation, Eye and Skin Contact
Acute symptoms and effects:	
Inhalation:	Severe overexposure may result in nausea, dizziness, headache. Can cause drowsiness, irritation of eyes and nasal passages.
Eye Contact:	Vapors slightly uncomfortable. Overexposure may result in severe eye injury with corneal or conjunctival inflammation on contact with the liquid.
Skin Contact:	Liquid contact may remove natural skin oils resulting in skin irritation. Dermatitis may occur with prolonged contact.
Ingestion:	May cause nausea, vomiting, diarrhea and mental sluggishness.
Chronic (long-term) effects:	None known to humans
Toxicity:	LD ₅₀ LC ₅₀
Tetrahydrofuran (THF)	Oral: 2880 mg/kg (rat) Inhalation 3 hrs. 21,000 PPM (rat)
Methyl Ethyl Ketone (MEK)	Oral: 3.98 g/kg (rat), Dermal: 8-10 mg/kg (rabbit) Inhalation 4 hrs. 4,000 PPM (rat)
Cyclohexanone	Oral: 1900 mg/kg (rat), Dermal: 1.0 g/kg (rabbit) Inhalation LCLO, 4-hrs, 2,000 PPM (rat)
Acetone	Oral: 9.75 g/kg (rat), Dermal: 20 g/kg (rabbit) Inhalation LCLO, 4 hrs, 16,000 PPM (rat)

Reproductive Effects	Teratogenicity	Mutagenicity	Embryotoxicity	Sensitization to Product	Synergistic Products
Not Applicable	Not Applicable	Poss.	Not Applicable	Not Applicable	Not Available

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity:	Category IV
Mobility:	In normal use, emission of volatile organic compounds (VOC's) to the air takes place. Typically at a rate of <250 Grams/Litre.
	Minimal other adverse effects include possible ground water contamination from release to soil, sewers, drains or water course.
Degradability:	Biodegradable
BioAccumulation:	Minimal to none.

SECTION 13 - WASTE DISPOSAL CONSIDERATIONS

Follow local and national regulations. Consult disposal expert. Can be disposed of by controlled incineration. May be reacted with component "B" and disposed of as trash. Excessive quantities should not be permitted to enter drains, sewers or water courses. Empty containers should be air dried before disposing.

SECTION 14 - TRANSPORT INFORMATION

DOT, IATA, ADR, IMO/MDG SHIPPING INFORMATION			
Proper Shipping Name:	Flammable Liquid, n.o.s. (Acetone, Methyl Ethyl Ketone)		DOT EXCEPTION: Case quantities of cement in containers of less than one liter may be shipped as LIMITED QUANTITY or CONSUMER COMMODITY, ORM-D
Hazard Class:	3		
Secondary Risk	None		
Identification Number:	UN 1993		
Packing Group:	II		
Label Required:	Flammable Liquid		
TDG INFORMATION			
	TDG CLASS:		FLAMMABLE LIQUID 3
	SHIPPING NAME:		FLAMMABLE LIQUID, n.o.s. (Acetone)
	UN NUMBER:		1993, PG II
Marine Pollutant:	NO		

SECTION 15 - REGULATORY INFORMATION

Precautionary Label Information:	Highly Flammable, Irritant	Ingredient Listings:	USA TSCA, Europe EINECS, Canada DSL, Australia AICS, Korea ECL/TCCL, Japan MITI (ENCS)
Symbols:	F, Xi		
Risk Phrases:	R-11 Highly Flammable R-20 Harmful by inhalation R-21 Harmful in contact with skin. R-22 Harmful if swallowed.		R-36/37/38 Irritating to eyes, respiratory system and skin. R-41 Risk of serious damage to the eyes. R-43 May cause sensitization by skin contact.
Safety Phrases:	S-2 Keep out of reach of children. S-7 Keep container tightly closed when not in use. S-9 Keep container in a well-ventilated place. S-15/16 Keep away from heat and sources of ignition. No smoking. S-23 Do not breathe vapor.		S-24/25 Avoid contact with skin and eyes. S-29 Do not empty into drains. S-37 Wear suitable gloves. S-45 If seeking medical advice show physician label or SDS. S-46 Use only in well ventilated areas.

SECTION 16 - OTHER INFORMATION

Specification Information:		
Department issuing data sheet:	Environmental Health and Safety	All ingredients are compliant with the requirements of the European Directive on RoHS (Restriction of Hazardous Substances).
e-mail address:	<EHSinfo@tchristy.com>	
Training necessary:	Yes, training in practices and procedures contained in product literature.	
Reissue date / reason for reissue:	August 2011 / Updated information	
Intended Use of Product:	Adhesive welding primer for cementing PVC and CPVC plastic pipe and fittings	

This product is intended for use by skilled individuals at their own risk. The information contained herein is based on data considered accurate based on current state of knowledge and experience. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.



SAFETY DATA SHEET

Christy's® Red Hot Blue Glue® PVC Plastic Pipe Cement
Christy's® Red Hot Blue Glue® Low VOC PVC Plastic Pipe Cement
Christy's® Red Hot Clear Glue® Low VOC PVC Plastic Pipe Cement
Christy's® CLEAR Heavy Low VOC PVC Plastic Pipe Cement

Date Revised: AUG 2011
Supersedes: DEC 2010

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Christy's® Red Hot Blue Glue®
Christy's® Red Hot Blue Glue® Low VOC
Christy's® Red Hot Clear®
Christy's® Clear Heavy Bodied Low VOC

SYNONYMS:

PRODUCT USE: Solvent Cement for PVC Plastic Pipe

MANUFACTURER: T Christy Enterprises, Inc
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-714-507-3300 (North America)

SUPPLIER:

Tel. 1-714-507-3300 (International)

EMERGENCY: Transportation/Medical issues: Tel. 800.535.5053 INFOTRAK

SECTION 2 - HAZARDS IDENTIFICATION

GHS CLASSIFICATION:

Health	Environmental	Physical
Acute Toxicity: Category 4	Acute Toxicity: Category III	Flammable Liquid/Aerosol/Gas: Category 1
Skin Corrosion: Category 3	Chronic Toxicity: Category IV	
Skin Sensitization: YES		
Eye: Category 2B		

GHS LABEL:



WHMIS CLASSIFICATION: CONTROLLED PRODUCT
CLASS B, DIVISION 2 CLASS D, DIVISION 2B

Hazard Statements

Highly flammable liquid and vapor May cause allergic skin reaction or rash. Do not breathe vapor Keep container closed Use in well-ventilated area

Precautionary Statements (See Section 15 for all advisory and required precautions)

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

	CAS#	EINECS #	REACH Pre-registration Number	CONCENTRATION % by Weight
Polyvinyl Chloride Resin (PVC)	NON/HAZ			
Tetrahydrofuran (THF)**	109-99-9	203-726-8	05-2116297729-22-0000	45-65
Methyl Ethyl Ketone (MEK)*	78-93-3	201-159-0	05-2116297728-24-0000	5-20
Cyclohexanone	108-94-1	203-631-1	05-2116297718-25-0000	10-30
Acetone	67-64-1	200-662-2	05-2116297713-35-0000	0-20

All of the constituents of this adhesive product are listed on the TSCA inventory of chemical substances maintained by the US EPA, or are exempt from that listing.

*This chemical is subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (40CFR372).

SECTION 4 - FIRST AID MEASURES

Contact with eyes: Flush eyes immediately with plenty of water for 15 minutes and seek medical advice immediately.
Skin contact: Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water. If irritation develops, seek medical advice.
Inhalation: Remove to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. Seek medical advice.
Ingestion: Rinse mouth with water. Give 1 or 2 glasses of water or milk to dilute. Do not induce vomiting. Seek medical advice immediately.

SECTION 5 - FIREFIGHTING MEASURES

Suitable Extinguishing Media:	Dry chemical powder, carbon dioxide gas, foam, Halon, water fog.	HMIS	NFPA	0-Minimal
Unsuitable Extinguishing Media:	Water spray or stream.	Health	2	1-Slight
Exposure Hazards:	Carbon monoxide, carbon dioxide, hydrogen chloride and smoke	Flammability	3	2-Moderate
Combustion Products:	Carbon monoxide, carbon dioxide, hydrogen chloride and smoke	Reactivity	1	3-Serious
Protection for Firefighters:	Self-contained breathing apparatus or full-face positive pressure airline masks.			4-Severe

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep away from heat, sparks and open flame.
Provide sufficient ventilation, use explosion-proof exhaust ventilation equipment or wear suitable respiratory protective equipment.
Prevent contact with skin or eyes (see section 8).
Environmental Precautions: Prevent product or liquids contaminated with product from entering sewers, drains, soil or open water course.
Methods for Cleaning up: Clean up with sand or other inert absorbent material. Transfer to a closable vessel (Metal or polyethylene [PE])
Materials not to be used for clean up: Liquid(s)

SECTION 7 - HANDLING AND STORAGE

Handling: Avoid breathing of vapor, avoid contact with eyes, skin and clothing.
Keep away from ignition sources, use only electrically grounded handling equipment and ensure adequate ventilation/fume exhaust hoods.
Do not eat, drink or smoke while handling.
Storage: Store in ventilated room or shade below 27°C (80°F) and away from direct sunlight.
Keep away from ignition sources and incompatible materials: caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates.
Follow all precautionary information on container label, product bulletins and solvent cementing literature.

SECTION 8 - PRECAUTIONS TO CONTROL EXPOSURE / PERSONAL PROTECTION

EXPOSURE LIMITS:	Component	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL:	
	Tetrahydrofuran (THF)	50 ppm skin	100 ppm	200 ppm	250 ppm	# Mfg. Recommended Allowable Exposure Limit (AEL): 25 ppm
	Methyl Ethyl Ketone (MEK)	200 ppm	300 ppm	200 ppm	300 ppm	## Mfg. Recommended STEL: 75 ppm
	Cyclohexanone	20 ppm skin		50 ppm		

Engineering Controls: If ventilated cabinet, enclosure or fume hood is necessary, average airflow should be at least 100 FPM (50.8 cm/sec).

Monitoring: Maintain breathing zone airborne concentrations below exposure limits.

Personal Protective Equipment (PPE):

Eye Protection: Avoid contact with eyes, wear splash proof chemical goggles, face shield, safety glasses (spectacles) with brow guards and side shields, etc. as may be appropriate for the exposure.

Skin Protection: Prevent contact with the skin as much as possible. Polyethylene or PVA coated rubber gloves should be used for frequent immersion. Use of latex/nitrile surgical gloves or solvent-resistant barrier cream should provide adequate protection when normal adhesive application practices and procedures are used for making structural bonds.

Respiratory Protection: Prevent inhalation of the solvents. Use in a well-ventilated room. Open doors and/or windows to ensure airflow and air changes. Use local exhaust ventilation to remove airborne contaminants from employee breathing zone and to keep contaminants below levels listed above. With normal use, the Exposure Limit Value will not usually be reached. When limits approached, use respiratory protection equipment.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES - Christy's® Red Hot Blue Glue®

Appearance:	Blue, medium syrupy liquid		
Odor:	Ethereal	Odor Threshold:	0.1 ppm (Cyclohexanone)
P.H.	Not Applicable		
Melting/Freezing Point:	-108.5°C (-163°F) Based on first boiling component: THF	Boiling Range:	67°C (151°F)
Boiling Point:	67°C (151°F) Based on first boiling component: Tetrahydrofuran (THF)	Evaporation Rate:	> 1.0 (BUAC = 1)
Flash Point:	-14°C (7°F) T.C.C. based on THF	Flammability:	Category I
Specific Gravity	@23°C ± 2° (73°F ± 3.6°) Typical 0.990 ± 0.04	Flammability Limits:	LEL: 2%
Solubility:	Solvent portion completely soluble in water. Resin portion separates out.		UEL: 11.8%
Partition Coefficient n-octanol/water:	Not Available	Vapor Pressure:	143 mm Hg @ 20°C (68°F): THF
Auto-ignition Temperature:	321°C (609.8°F): THF	Vapor Density:	2.49 (Air = 1)
Decomposition Temperature:	Not Applicable	Other Data: Viscosity:	Medium bodied
VOC Content :	When applied as directed, per SCAQMD Rule 1168, Test Method 316A, VOC content is: ≤ 600 g/l.		

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES - Christy's® Red Hot Blue Glue® Low VOC

Appearance:	Blue, medium syrupy liquid		
Odor:	Ethereal	Odor Threshold:	0.1 ppm (Cyclohexanone)
P.H.	Not Applicable		
Melting/Freezing Point:	-95°C (-139°F) Based on first boiling component: Acetone	Boiling Range:	57°C (133°F) to 67°C (151°F)
Boiling Point:	57°C (133°F) Based on first boiling component: Acetone	Evaporation Rate:	> 1.0 (BUAC = 1)
Flash Point:	-14°C (-6.8°F) T.C.C. based on THF	Flammability:	Category I
Specific Gravity	@23°C ± 2° (73°F ± 3.6°) Typical 0.990 ± 0.04	Flammability Limits:	LEL: 2%
Solubility:	Solvent portion completely soluble in water. Resin portion separates out.		UEL: 11.8%
Partition Coefficient n-octanol/water:	Not Available	Vapor Pressure:	190 mm Hg @ 20°C (68°F): Acetone
Auto-ignition Temperature:	321°C (609.8°F): THF	Vapor Density:	2.49 (Air = 1)
Decomposition Temperature:	Not Applicable	Other Data: Viscosity:	Medium bodied
VOC Content :	When applied as directed, per SCAQMD Rule 1168, Test Method 316A, VOC content is: 510 g/l.		

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES - Christy's® Red Hot Clear®

Appearance:	Clear transparent, medium syrupy liquid		
Odor:	Ethereal	Odor Threshold:	0.1 ppm (Cyclohexanone)
P.H.	Not Applicable		
Melting/Freezing Point:	-95°C (-139°F) Based on first boiling component: Acetone	Boiling Range:	57°C (133°F) to 67°C (151°F)
Boiling Point:	57°C (133°F) Based on first boiling component: Acetone	Evaporation Rate:	> 1.0 (BUAC = 1)
Flash Point:	-14°C (-6.8°F) T.C.C. based on THF	Flammability:	Category I
Specific Gravity	@23°C ± 2° (73°F ± 3.6°) Typical 0.990 ± 0.04	Flammability Limits:	LEL: 2%
Solubility:	Solvent portion completely soluble in water. Resin portion separates out.		UEL: 11.8%
Partition Coefficient n-octanol/water:	Not Available	Vapor Pressure:	190 mm Hg @ 20°C (68°F): Acetone
Auto-ignition Temperature:	321°C (609.8°F): THF	Vapor Density:	2.49 (Air = 1)
Decomposition Temperature:	Not Applicable	Other Data: Viscosity:	Medium bodied
VOC Content :	When applied as directed, per SCAQMD Rule 1168, Test Method 316A, VOC content is: 510 g/l.		

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES - Christy's® Clear Heavy Bodied Low VOC

Appearance:	Clear, thick syrupy liquid		
Odor:	Ethereal	Odor Threshold:	0.1 ppm (Cyclohexanone)
P.H.	Not Applicable		
Melting/Freezing Point:	-108.5°C (-163°F) Based on first boiling component: THF	Boiling Range:	67°C (151°F)
Boiling Point:	67°C (151°F) Based on first boiling component: Tetrahydrofuran (THF)	Evaporation Rate:	> 1.0 (BUAC = 1)
Flash Point:	-14°C (7°F) T.C.C. based on THF	Flammability:	Category I
Specific Gravity	@23°C ± 2° (73°F ± 3.6°) Typical 0.990 ± 0.04	Flammability Limits:	LEL: 2%
Solubility:	Solvent portion completely soluble in water. Resin portion separates out.		UEL: 11.8%
Partition Coefficient n-octanol/water:	Not Available	Vapour Pressure:	143 mm Hg @ 20°C (68°F): THF
Auto-ignition Temperature:	321°C (609.8°F): THF	Vapour Density:	2.49 (Air = 1)
Decomposition Temperature:	Not Applicable	Other Data: Viscosity:	Heavy bodied
VOC Content :	When applied as directed, per SCAQMD Rule 1168, Test Method 316A, VOC content is: ≤ 600 g/l.		

SECTION 10 - STABILITY AND REACTIVITY

Stability:	Stable
Hazardous decomposition products:	None in normal use. When forced to burn, this product gives off carbon monoxide (CO), carbon dioxide (CO ₂), hydrogen chloride (HCl) and smoke.
Conditions to avoid:	Keep away from heat, sparks, open flame and other ignition sources.
Incompatible Materials:	Caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates.

SECTION 11 - TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:	Inhalation, Eye and Skin Contact
Acute symptoms and effects:	
Inhalation:	Severe overexposure may result in nausea, dizziness, headache. Can cause drowsiness, irritation of eyes and nasal passages.
Eye Contact:	Vapors slightly uncomfortable. Overexposure may result in severe eye injury with corneal or conjunctival inflammation on contact with the liquid.
Skin Contact:	Liquid contact may remove natural skin oils resulting in skin irritation. Dermatitis may occur with prolonged contact.
Ingestion:	May cause nausea, vomiting, diarrhea and mental sluggishness.
Chronic (long-term) effects:	None known to humans
Toxicity:	LD ₅₀ LC ₅₀
Tetrahydrofuran (THF)	Oral: 2880 mg/kg (rat) Inhalation 3 hrs. 21,000 PPM (rat)
Methyl Ethyl Ketone (MEK)	Oral: 3.98 g/kg (rat), Dermal: 8-10 mg/kg (rabbit) Inhalation 4 hrs. 4,000 PPM (rat)
Cyclohexanone	Oral: 1900 mg/kg (rat), Dermal: 1.0 g/kg (rabbit) Inhalation LCLO, 4 hrs, 2,000 PPM (rat)

Reproductive Effects	Teratogenicity	Mutagenicity	Embryotoxicity	Sensitization to Product	Synergistic Products
Not Applicable	Not Applicable	Poss.	Not Applicable	Not Applicable	Not Available

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity:	Category IV
Mobility:	In normal use, emission of volatile organic compounds (VOC's) to the air takes place. Typically at a rate of ≤ 600 Grams/Litre.
Degradability:	Biodegradable
BioAccumulation:	Minimal to none.

SECTION 13 - WASTE DISPOSAL CONSIDERATIONS

Follow local and national regulations. Consult disposal expert. Can be disposed of by controlled incineration. May be reacted with component "B" and disposed of as trash. Excessive quantities should not be permitted to enter drains, sewers or water courses. Empty containers should be air dried before disposing.

SECTION 14 - TRANSPORT INFORMATION**DOT, IATA, ADR, IMO/MDG SHIPPING INFORMATION**

Proper Shipping Name:	Adhesives	DOT EXCEPTION: Case quantities of cement in containers of less than one liter may be shipped as LIMITED QUANTITY or CONSUMER COMMODITY, ORM-D
Hazard Class:	3	
Secondary Risk:	None	
Identification Number:	UN 1133	
Packing Group:	II	
Label Required:	Flammable Liquid	
Marine Pollutant:	NO	

TDG INFORMATION

TDG CLASS:	FLAMMABLE LIQUID 3
SHIPPING NAME:	ADHESIVES (TETRAHYDROFURAN)
UN NUMBER:	1133, PG II

SECTION 15 - REGULATORY INFORMATION

Precautionary Label Information: Highly Flammable, Irritant

Symbols: F, Xi

Risk Phrases:

- R-11 Highly Flammable
- R-20 Harmful by inhalation
- R-21 Harmful in contact with skin.
- R-22 Harmful if swallowed.

Safety Phrases:

- S-2 Keep out of reach of children.
- S-7 Keep container tightly closed when not in use.
- S-9 Keep container in a well-ventilated place.
- S-15/16 Keep away from heat and sources of ignition. No smoking.
- S-23 Do not breathe vapor.

Ingredient Listings: USA TSCA, Europe EINECS, Canada DSL, Australia AICS, Korea ECL/TCCL, Japan MITI (ENCS)

R-36/37/38 Irritating to eyes, respiratory system and skin.

R-41 Risk of serious damage to the eyes.

R-43 May cause sensitization by skin contact.

S-24/25 Avoid contact with skin and eyes.

S-29 Do not empty into drains.

S-37 Wear suitable gloves.

S-45 If seeking medical advice show physician label or SDS.

S-46 Use only in well ventilated areas.

SECTION 16 - OTHER INFORMATION**Specification Information:**

Department issuing data sheet: Environmental Health & Safety

e-mail address: <EHSinfo@tchristy.com>

All ingredients are compliant with the requirements of the European Directive on RoHS (Restriction of Hazardous Substances).

Training necessary: Yes, training in practices and procedures contained in product literature.

Reissue date / reason for reissue: August 2011 / Updated information

Intended Use of Product: Adhesive for bonding/cementing PVC plastic pipe and fittings

This product is intended for use by skilled individuals at their own risk. The information contained herein is based on data considered accurate based on current state of knowledge and experience. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.



SAFETY DATA SHEET

Date Revised: JAN 2010

Supersedes: JULY 2005

Christy's® PRO-LUBE™

Information on this form is furnished solely for the purpose of compliance with the U.S. Occupational Safety and Health Act, the Canadian Hazardous Products Act and Controlled Products Regulations and shall not be used for any other purpose. T Christy Enterprises urges the customers receiving this Safety Data Sheet to study it carefully to become aware of the hazards, if any, of the product involved. In the interest of safety, you should notify your employees, agents and contractors of the information on this sheet.

SECTION I - PRODUCT AND COMPANY INFORMATION

PRODUCT NAME: Christy's® Pro-Lube™

SYNONYMS:

PRODUCT USE: PIPE JOINT LUBRICANT

SUPPLIER and MANUFACTURER: T Christy Enterprises, Inc.
655 East Ball Road, Anaheim, CA 92805-5910
Tel. 1-800-258-4583 (North America)
Tel. 1-714-507-3300 (International)

EMERGENCY: Transportation/Medical issues: Tel. 800.535.5053 INFOTRAK

SECTION II - HAZARDOUS INGREDIENTS, EXPOSURE LIMITS, TRANSPORT & WHMIS DATA

None of the ingredients below are listed as carcinogens by IARC, NTP, OSHA or ACGIH.		CAS#	APPROX % BY WEIGHT	ACGIH TLV	ACGIH STEL	OSHA PEL	OSHA STEL
Polassum soap of distilled natural fatty acids		143-18-0	60-70%				
Water		7732-18-5	20-30%	333mg/kg		TD1a	
Polyglycols		25322-68-3	1-5%	50g/kg		LD50	

DOT, IATA, IMO/MDG SHIPPING INFORMATION

Proper Shipping Name: Pipe joint compound
Hazard Class: Non-hazardous
Identification Number: N/A
Packing Group: N/A
Label Required: N/A

TDG INFORMATION

TDG CLASS: N/A
SHIPPING NAME: Pipe joint compound
UN NUMBER:

WHMIS CLASSIFICATION:

SPECIAL HAZARD DESIGNATIONS

	HMS	NFPA	HAZARD RATING
HEALTH	1	1	0 - MINIMAL
FLAMMABILITY:	1	1	1 - SLIGHT
REACTIVITY:	1	1	2 - MODERATE
PROTECTIVE			3 - SERIOUS
EQUIPMENT:			4 - SEVERE

B = Eye, Hand/Skin Protection (Normal use or application & spill clean-up activities)

H = Eye, Hand/Skin and Respiratory Protection plus Impermeable Apron (When risk of immersion and/or splashing is present)

SECTION III - PHYSICAL DATA

APPEARANCE Soft brown gel	ODOR Soapy	BOILING POINT (°F/°C) Initial 100°C	FREEZING POINT N/A
SPECIFIC GRAVITY (H ₂ O = 1) Typical 0.9-1.0	V.O.C. 39 G/L	PERCENT VOLATILE BY VOLUME (%) Approx 25%	
VAPOR DENSITY (Air = 1) N/A	EVAPORATION RATE (BUAC = 1) N/A	SOLUBILITY IN WATER Dispersible - PH 10% Dispersion 9.4 - 9.9	
COEFFICIENT OF WATER/OIL DISTRIBUTION N/A	PH INFORMATION N/A	VOC STATEMENT	

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT >200°C	AUTO IGNITION TEMP.	FLAMMABLE LIMITS (PERCENT BY VOLUME)	LEL N/A	UEL N/A
-----------------------	---------------------	---	------------	------------

FIRE EXTINGUISHING MEDIA

Foam, alcohol foam, CO₂, dry chemical, water fog

SPECIAL FIRE FIGHTING PROCEDURES

Evacuate enclosed areas, stay upwind. Close or confined quarters require self-contained breathing apparatus, positive pressure hose masks or airline masks. Use water spray to cool containers, to flush spills from source of ignition and to disperse vapors.

UNUSUAL FIRE AND EXPLOSION HAZARDS

None

SECTION V - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	Keep away from heat, sparks, open flame and other sources of ignition.
INCOMPATIBILITY None			
HAZARDOUS DECOMPOSITION PRODUCTS			
None			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	Keep away from heat, sparks, open flame and other sources of ignition.
SECTION VI - HEALTH HAZARD DATA & TOXICOLOGICAL PROPERTIES			
PRIMARY ROUTES OF ENTRY: X Inhalation X Skin Contact X Eye Contact X Ingestion			
TOXIC EXPOSURE VALUES			
EFFECT OF OVEREXPOSURE			
ACUTE:			
Inhalation:	Severe overexposure may result in nausea, dizziness, headache. Can cause irritation of eyes and nasal passages.		
Skin Contact:	Skin irritant. Dermatitis may occur with prolonged contact. Slight defatting on long contact.		
Skin Absorption:	Prolonged or widespread exposure may result in the absorption of harmful amounts of material.		
Eye Contact:	Irritant		
Ingestion:	Moderately toxic. May cause nausea, vomiting, diarrhea. CALL A DOCTOR IMMEDIATELY		
CHRONIC:			
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:			
Dermatitis			
REPRODUCTIVE EFFECTS	TERATOGENICITY	MUTAGENICITY	EMBRYOTOXICITY
N. AP.	N. AP.	N. AP.	N. AP.
SENSITIZATION TO PRODUCT		SYNERGISTIC PRODUCTS	
N. AP.		N. AV.	
SECTION VII - PREVENTIVE MEASURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED			
Eliminate all ignition sources. Avoid breathing of vapors. Keep liquid out of eyes. Contain liquid with sand or earth. Place leaking container in well-ventilated area. Scoop up bulk, and absorb remainder in absorbent clay, wash slippery residue. Launder contaminated clothing.			
WASTE DISPOSAL METHOD			
Follow local, State and Federal regulations. Consult disposal expert. Excessive quantities should not be permitted to enter drains. Empty containers should be air dried before disposing. Hazardous Waste Code: 214			
RESPIRATORY PROTECTION (Specify type)			
Use in well ventilated area			
VENTILATION			
General ventilation or local exhaust is recommended to maintain vapor-concentrations below recommended exposure limits.			
PROTECTIVE GLOVES		EYE PROTECTION	
PVA coated.		Splash proof chemical goggles recommended	
OTHER PROTECTIVE EQUIPMENT AND HYGIENIC PRACTICES			
Impervious apron and a source of running water to flush or wash the eyes and skin in case of contact.			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING			
Store in a cool, well-ventilated area. Keep away from heat, sparks, and flame. Keep container tightly closed. Keep away from foodstuff, do not eat, drink or smoke while using. Avoid vapors. Use adequate ventilation. Train employees on all special handling procedures before they work with this product.			
OTHER PRECAUTIONS			
Follow all precautionary information given on container label, product bulletins and our solvent cementing literature. All handling equipment should be electrically grounded.			
SECTION VIII - FIRST AID MEASURES			
EMERGENCY AND FIRST AID PROCEDURES			
Inhalation:	Remove to well ventilated area. CALL A DOCTOR.		
Eye Contact:	Flush eyes with plenty of water for 15 minutes and CALL A DOCTOR		
Skin Contact:	Remove contaminated clothing and shoes. Wash skin with plenty of soap and water for at least 15 minutes. If irritation develops, CALL A DOCTOR.		
Ingestion:	Give 1 or 2 glasses of water or milk. This material produces a strong emetic action. CALL A DOCTOR OR POISON CONTROL CENTER.		
SECTION IX - SDS PREPARATION INFORMATION			
Prepared by:	Telephone number:	e-mail address	
Environmental Health & Safety	(714) 507-3300	<EHSinfo@tchristy.com	
The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.			

LOCTITE CORPORATION

04/08/01

ROCKY HILL, CONNECTICUT 06067
EMERGENCY PHONE: (860) 571-5100

MATERIAL SAFETY DATA SHEET

Page 01 of 05

Loctite(R) Gasket Sealant 2 Non-Hardening Pliable
30515

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Loctite(R) Gasket Sealant 2 Non-Hardening Pliable
Item No.: 30515
Product Type: Sealant

2. COMPOSITION, INFORMATION ON INGREDIENTS

Ingredients	CAS No.	%
Clay	1332-58-7	50-55
Rosin	8050-09-7	15-20
Vegetable oil	68187-84-8	15-20
ISOPROPYL ALCOHOL	67-63-0	10-15
Soybean derivative	8002-43-5	1-3

Ingredients which have exposure limits

Exposure Limits (TWA) Ingredients	ACGIH (TLV)	OSHA (PEL)	OTHER
Clay	2 mg/m3 dust	10 mg/m3 dust 5 mg/m3 respir.	None
ISOPROPYL ALCOHOL	400 ppm TWA 983 mg/m3	400 ppm TWA 980 mg/m3	400 ppm TWA DuPont AEL

Exposure Limits (STEL) Ingredients	ACGIH (TLV)	OSHA (PEL)
ISOPROPYL ALCOHOL	500 ppm 1230 mg/m3	500 ppm 1225 mg/m3

3. HAZARDS IDENTIFICATION

Toxicity: Eye irritant.
Oral LD50 greater than 5000 mg/kg (estimated)
Primary Routes of Entry: Inhalation, ingestion, contact.
Signs and Symptoms
of Exposure: Vapor above TLV is irritating to eyes, nose and
throat and can cause headache, dizziness, nausea.
Existing Conditions
Aggravated by Exposure: Skin, eye, and respiratory disorders.

Ingredients	Literature Referenced Target Organ and Other Health Effects	Carcinogen NTP IARC OSHA
Clay	NUI	NO NO NO
Rosin	ALG IRR RES	NO NO NO

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04/08/01

EMERGENCY PHONE: (860) 571-5100

MATERIAL SAFETY DATA SHEET

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Product Name: Loctite(R) Gasket Sealant 2 Non-Hardening Pliable
Item No.: 30515

3. HAZARDS IDENTIFICATION

(continued)

Vegetable oil	No Data	NO	NO	NO
ISOPROPYL ALCOHOL	ALG BLO CNS IRR KID	NO	N/A	NO
Soybean derivative	NTO	NO	NO	NO

Abbreviations

N/A Not Applicable	ALG Allergen
BLO Blood	CNS Central nervous system
IRR Irritant	KID Kidney
NTO No Target Organs	NUI Nuisance dust
RES Respiratory	

4. FIRST AID MEASURES

Ingestion: Do not induce vomiting. Keep individual calm. Obtain medical attention.

Inhalation: Remove to fresh air. If symptoms persist, obtain medical attention.

Skin Contact: Wash with soap and water.

Eye Contact: Flush at least 15 minutes with water. Obtain medical attention.

5. FIRE FIGHTING MEASURES

Flash Point: Does not apply
Per ASTM D 4359 this product is a solid.

Recommended Extinguishing Agents: Carbon dioxide, foam, dry chemical

Special Firefighting Procedures: Not available

Hazardous Products formed by Fire or Thermal Decomp: Aliphatic aldehydes, carboxylic acids, oxides of carbon.

Unusual Fire or Explosion Hazards: None

Explosive Limits:
(% by volume in air) Lower 2%
(% by volume in air) Upper 12%

6. ACCIDENTAL RELEASE MEASURES

Steps to be taken in case of spill or leak: Remove sources of ignition. Maintain adequate ventilation. Scrape up as much as possible and store in a closed container until disposal.

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04/08/01

MATERIAL SAFETY DATA SHEET

Page 03 of 05

Product Name: Loctite(R) Gasket Sealant 2 Non-Hardening Pliable
Item No.: 30515

6. ACCIDENTAL RELEASE MEASURES

(continued)

Residues may be cleaned with isopropyl alcohol.

7. HANDLING AND STORAGE

Safe Storage: Store away from heat and flame.
(Contact Loctite Customer Service 1-800-243-4874 for shelf life information)
Handling: Avoid prolonged breathing of vapors. Keep away from eyes. Avoid prolonged skin contact.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Eyes: Safety glasses or goggles.
Skin: Rubber or plastic gloves.
Ventilation: Must be adequate to avoid exceeding TLV.
Respiratory: Not available

See Section 2 for Exposure Limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Black Paste
Odor: Alcoholic
Boiling Point: 180°F
pH: Does not apply
Solubility in Water: Partial
Specific Gravity: 1.5 at 77°F
Volatile Organic Compound (EPA Method 24) 14.2%; 213 grams per liter
Vapor Pressure: 33 mm at 68°F
Vapor Density: 2.07
Evaporation Rate (Ether = 1) 7.7

10. STABILITY AND REACTIVITY

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibility: Strong oxidizers.
Conditions to Avoid: Not available
Hazardous Decomposition Products (non-thermal): None

11. TOXICOLOGICAL INFORMATION

See Section 3.

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EMERGENCY PHONE: (860) 571-5100

MATERIAL SAFETY DATA SHEET

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Product Name: Loctite(R) Gasket Sealant 2 Non-Hardening Pliable
Item No.: 30515

12. ECOLOGICAL INFORMATION

No data available

13. DISPOSAL CONSIDERATIONS

Recommended methods of disposal: Incinerate following EPA and local regulations.
EPA Hazardous Waste Number NH - Not a RCRA Hazardous Waste Material

14. TRANSPORTATION INFORMATION

DOT (49 CFR 172)

Domestic Ground Transport

Proper Shipping Name: Unrestricted
Hazard Class or Division: Unrestricted
Identification Number: None
Marine Pollutant: None

IATA

Proper Shipping Name: Unrestricted
Class or Division: Unrestricted
UN or ID Number: None

15. REGULATORY INFORMATION

CA Proposition 65: No California Proposition 65 chemicals are known to be present.

16. OTHER INFORMATION

Estimated NFPA(R) Code:

Health Hazard: 2
Fire Hazard: 2
Reactivity Hazard: 0
Specific Hazard: Does not apply

Estimated HMIS(R) Code:

Health Hazard: 2
Flammability Hazard: 2
Reactivity Hazards: 0
Personal Protection: See Section 8.

NFPA is a registered trademark of the National Fire Protection Assn.
HMIS is a registered trademark of the National Paint and Coatings Assn.

Prepared By: Stephen Repetto
Title: Research Chemist, Environmental Health & Safety
Company: Loctite Corp., 1001 Tr Br Cr, Rocky Hill CT 06067

LOCTITE CORPORATION

04/08/01

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EMERGENCY PHONE: (860) 571-5100

MATERIAL SAFETY DATA SHEET

Page 05 of 05

Product Name: Loctite(R) Gasket Sealant 2 Non-Hardening Pliable
Item No.: 30515

16. OTHER INFORMATION

(continued)

(24hr.) Phone: (860) 571-5100
Revision Date: January 27, 1999

Revision: 0036

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APPENDIX C. INCIDENT INVESTIGATION REPORT FORM



MONTEREY PENINSULA ENGINEERING

CONTRACTORS & ENGINEERS
P.O. BOX 2317
MONTEREY, CA 93942
(831) 384-4081

Incident investigation form

Incident details				
Name of person involved in the incident:			Date of incident:	
Location of incident:				
Incident investigation team:				
What task was being performed at the time of the incident?				
What happened? (e.g. 'employee tripped over box' or 'forklift hit wall')				
What factors contributed to the incident?				
Environment:		Equipment/materials:		
☐ Noise	☐ Layout / design	☐ Wrong equipment for the job	☐ Equipment failure	
☐ Lighting	☐ Dust / fume	☐ Inadequate maintenance	☐ Material / equipment too heavy / awkward	
☐ Vibration	☐ Slip / trip hazard	☐ Inadequate guarding	☐ Inadequate training provided	
☐ Damaged / unstable floor	☐ Other	☐ Other		
Work systems:		People:		
☐ Hazard not identified	☐ No / inadequate risk assessment conducted	☐ Procedure not followed / no procedure exists	☐ Drugs / alcohol	
☐ No / inadequate safe work procedure	☐ No / inadequate controls implemented	☐ Fatigue	☐ Time / production pressures	
☐ Hazard not reported	☐ Inadequate training / supervision	☐ Change of routine	☐ Distraction / personal issues / stress	
☐ Other		☐ Lack of communication	☐ Other	
Corrective actions:				
Contributing factor (from above list)	What are we going to do to fix the problem?	Who	When	Completion date
Issue fixed?				
Name	Signature		Date	
Person involved in incident:				
Manager:				

Incident investigation process guide

1. Establish the facts of the incident, including:
 - What happened?
 - When and where did it happen?
 - What task was being done?
 - Who was involved?
 - Were there any witnesses?
2. Gather all necessary background information, for example:
 - maintenance records
 - safe work procedures
 - instructions manuals
 - training records.
3. Consider all the potential contributing factors:
 - Environment: *Did environmental conditions (e.g. light, noise, floor surfaces) contribute to the incident?*
 - Equipment /materials: *Did anything about the equipment, materials, tools etc (e.g. equipment failures, missing guards) contribute to the incident?*
 - Work systems: *Was there something about the system that contributed (e.g. hazard not identified, known hazard not addressed)?*
 - People: *Was there something the workers, supervisors or contractors did that contributed to the incident (e.g. poor communication, being tired or rushing to finish on time)?*
4. Determine the primary cause/s of the incident, that is, those which if they hadn't occurred then the incident wouldn't have occurred. Ask yourself *"Would the incident have happened if....?"*
5. Identify the root cause / system failures that underlie the primary cause/s and contributing factors.

One simple technique for identifying the root cause is the 'Five Whys'. This technique involves asking yourself 'Why did this happen?' and continuing to ask 'Why' for each response until you reach a conclusion that does not generate another 'why' and the underlying cause becomes apparent.
6. The final and most important step in any investigation is to take action to fix all the factors that contributed to the incident, starting with the primary cause/s and working through each of the contributing and underlying causes.

Appendix C-6

Soil and Groundwater Management Plan



MONTEREY PENINSULA ENGINEERING

CONTRACTORS & ENGINEERS
P.O. BOX 2317
MONTEREY, CA 93942
(831) 384-4081

SUBMITTAL TRANSMITTAL

Date: 3/17/2020

Title: Soil and Groundwater Management Plan

Submittal No: 01062.01 Revision No: 0

MPE Job #:	1923	Owner:	California American Water
Project Name:	Carmel Valley Pump Station	Owner's Rep:	Lawrence Tam (AECOM)
Contractor:	Monterey Peninsula Engineering	MPE PM:	Etheline Cimatu, EIT

☐ For your information ☒ For your review and comment

Item no.	Section No.	Drawing No.	Description	Type	Source	Review Action	Reviewer Initials
001	01062		Soil and Groundwater Management Plan	Plan	MPE		

NET = No Exceptions Taken; MCN = Make Corrections Noted; A&R = Amend and Resubmit; R = Rejected; RA = Receipt Acknowledged

Contractor:

- ☒ We have verified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related work, as specified (no exceptions).
- ☐ We have verified that the material or equipment contained in this submittal meets all the requirements specified except the attached deviations.

- A. Construction/installation shall proceed only when action code is **NET** or **MCN**
- B. Action coded **A&R** and **R** shall be resubmitted
- C. Review is for conformance with the contract documents and,
- D. Does not relieve the contractor from responsibility for all requirements of the Contract documents.

No.	Deviation

Certified by: Monterey Peninsula Engineering March 17, 2020
Contractor Date



SOIL AND GROUNDWATER MANAGEMENT PLAN

Carmel Valley Pump Station

March 2020

Prepared for:

California American Water

511 Forest Lodge Road, Ste 100, Pacific Grove CA 93950

Prepared by:

Monterey Peninsula Engineering

192 Healy Ave, Marina, CA 93933

Carmel Valley Pump Station
Soil and Groundwater Management Plan

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CASQA Best Management Practices Construction Dewatering Operations.....	8
Geotechnical Investigation by Pacific Crest Engineering Inc.	9

1. INTRODUCTION

Soil and Groundwater Management Plan (SGMP) has been prepared for California American Water for use during construction of the Carmel Valley Pump Station project. The site is located on the southwest corner of Carmel Valley Road and Rancho San Carlos Road in Monterey County, California (Figure 1: Site Location Map). The SGMP provides guidelines for management of soil and groundwater impacted by hazardous substances and/or petroleum hydrocarbons that may be encountered or generated during excavation for the project. Management encompasses identification and evaluation of impacted soil and groundwater, handling (including health and safety guidelines), and onsite reuse or offsite disposal.

2. PURPOSE

The purpose of this SGMP is to provide guidelines for the general contractor and their authorized designees for management of soil and groundwater that is or appears to be impacted by hazardous substances and/or petroleum hydrocarbons that may be encountered or generated during construction activities.

3. BACKGROUND INFORMATION

Construction activities includes but not limited to the installation of a 28' by 26' pump station building containing pumps, and electrical equipment at the existing San Carlos Well Site located at 26530 Rancho San Carlos Rd, Carmel, CA, 93923.

For a summary of previous geotechnical investigation, see attached report supplied by Pacific Crest, September 2015.

4. PROJECT CONTACTS

The following table lists potential contacts, their affiliation, and their responsibility with respect to activities associated with this SGMP.

Name	Role	Contact Number/s	Email
Etheline Cimatú	Project Manager	(831) 277-6118	joe@mpe2000.com
Jim Bruno	General Superintendent	(831) 277-6114	jim@mpe2000.com
Gino Castro	Dispatcher	(831) 277-6116	gino@mpe2000.com
Mike Price	Foreman	(831) 277-6135	michaelpriempe@gmail.com

5. NOTIFICATION PROCEDURES

The following table provides notification procedures for situations or occurrences that may develop during site development activities. Onsite personnel that observe the situations or occurrences indicated below will notify the primary contact(s) who in-turn will notify secondary contacts as deemed appropriate. Contact names and phone numbers are indicated above.

Situation or Occurrence		Primary Contact		Secondary Contact(s)
48 hours Prior to Excavation Work	→	Underground Service Alert	→	USA Subscribers (e.g., utilities)
Situation Immediately Dangerous to Life and Health	→	911 Site Safety Officer Project Foreman Owner	→	Owner
Injury or Illness	→	911 Site Safety Officer Project Foreman	→	Owner
Accident Resulting in Property Damage	→	Site Safety Officer Project Foreman	→	Owner
“Chemical” Odor Detected	→	Site Safety Officer Project Foreman	→	911 Owner
“Contaminated” Soil Observed	→	Site Safety Officer Project Foreman	→	Owner
Water Generated	→	Project Foreman	→	Owner
Unanticipated Subsurface Facilities (tanks, piping, etc)	→	Project Foreman	→	Owner
“When in Doubt”	→	Site Safety Officer Project Foreman	→	Owner

6. RESPONSIBILITY OF IMPLEMENTATION

This plan was prepared by Monterey Peninsula Engineering for California American Water. MPE will oversee implementation of this plan, and it will be the responsibility of MPE to make its workers aware of the requirements of the SGMP. In addition, MPE shall provide a copy of this plan to third-party contractors working at the site who may encounter subsurface materials during execution of their work.

The Soil and Groundwater Management Plan was developed based on an understanding of current conditions as characterized by observations made during potholing and analytical data for one pothole soil sample collected from several potholes to be performed. It may be necessary to modify this plan for any of several reasons, including but not limited to the following:

- Change in the understanding of environmental conditions
- Intrusive activity that is not addressed by the SGMP
- New chemical toxicity information
- New legal requirements

MPE will be responsible for modifying this SGMP when substantial changes occur to the assumptions or conditions documented herein.

MPE and all its subcontractors will follow all procedures outlined in this plan when handling and transporting soil and ground water over the course of this project. MPE will follow, in addition to procedures outlined in this plan, all local and general regulations pertaining to the proper handling of soil and ground water.

7. SOIL MANAGEMENT

Management of Non-Impacted Soil

In the absence of obvious discoloration, chemical odors, or other indicators of apparent contamination, excavated soil should be suitable for onsite reuse within geotechnical guidelines. Excess soil, if any, shall be temporarily stockpiled onsite, then characterized for offsite fill or disposal.

Excavated pavement (e.g., asphalt and concrete) and other construction materials or debris shall be transported offsite to an appropriate local recycling facility or disposed of offsite as general construction debris at a licensed landfill facility according to applicable disposal requirements.

Management of Impacted Soil

Onsite personnel should immediately notify the Site Safety Officer (SSO) if apparently contaminated soil is encountered (based on observed soil discoloration, detection of chemical odor, etc.) during excavation.

If impacted soil is identified and ultimately required to be excavated, it shall be temporarily stockpiled on and covered with 6-mil polyethylene sheeting to prohibit wind dispersal and contact with underlying non-impacted soil. Stockpiled impacted soil shall be sampled and tested according to the procedures indicated in the section *Soil Sampling Procedures*.

Soil Sampling Procedures

Soil samples will be collected from stockpiles of visibly impacted soil. Soil samples will be collected and handled in accordance with industry-standard procedures. The following summarizes soil sampling activities and procedures:

- Stockpile sampling will include collection of one discrete soil sample for each approximately 25 cubic yards of stockpiled soil. Each group of four discrete samples will be composited into one four-part composite sample representative of approximately 100 cubic yards of soil. Discrete

composite subsamples will be obtained by a backhoe, hand-auger, or drive-sampler. Stockpile soil samples will be obtained at different locations and depths in the stockpile to obtain material representative of the stockpile.

- Sample labels indicating the sample identification number, the date/time of collection, and the sampler's initials will be affixed to the sample containers. Sample locations will be recorded on a field site plan and log sheet.
- Sample containers will be transported to the laboratory for analysis following standard chain-of-custody procedures.

Soil Transport

Following completion of the excavation and backfill, based on the estimated volume of impacted soil, an appropriate number of stockpile soil samples will be submitted to a laboratory for analysis. A waste profile for impacted soil will be submitted to the appropriate disposal facility for approval. Soil characterization information for non-impacted soils will be submitted to the receiving entity for approval.

Soil that requires offsite disposal will be transported to the offsite disposal facility using non-hazardous or hazardous waste manifests, as appropriate based on stockpile characterization analytical data.

Manifests and other records maintained by the trucking contractor will include the date and time of transport, approximate truckload volume, trucking company and driver information. Manifests will not be required for transport of non-impacted soil.

Trucks used to transport impacted soil offsite shall be equipped with cover tarps to minimize soil loss during transport. Soil shall be covered at all times except during loading and unloading activities. During loading activities, soil shall be sprayed liberally with water to minimize the generation of dust.

8. GROUNDWATER MANAGEMENT

If groundwater is encountered on the job in small quantities, containment and testing of the water will be done in a towable water tank or water truck. The water will either be disposed of as sewage at the Monterey Regional Waste Management District (14201 Del Monte Blvd, Marina, CA 93933) or at an approved discharged site.

Alternatively, we may containerize large quantities of extracted groundwater into a Baker tank and then sample and profile the accumulated water for offsite disposal as sewage at MRWMD site or at an approved discharge site. (Attached CASQA BMP Fact Sheet – Dewatering)

9. APPENDICES

Site Layout

Project Overview

The Work to be done under this Contract is shown on the drawings and specified in Contract Documents. The project will include a pump station building containing the pumps, and electrical equipment at the existing San Carlos Well Site located at 26530 Rancho San Carlos Rd, Carmel, CA, 93923. The pump station building will be built using CMU split face block construction and a wood truss roof system. The pump station will be approximately 28 feet wide by 26 feet long.

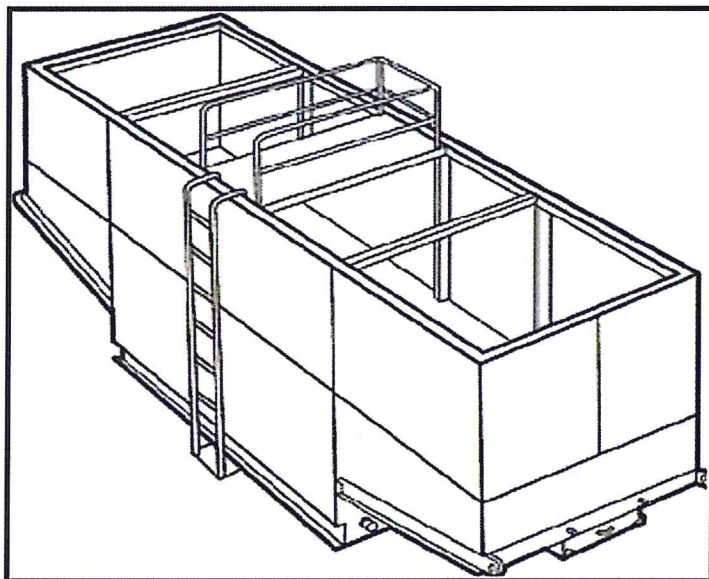
Below is a list of the major features of the pump station building:

- Three vertical turbine pumps.
- Pump piping and valves.
- Security - intrusion alarms at exterior doors.
- PLC and SCADA controls

Other site improvements will include:

- Site grading and drainage.
- 10 foot wide gravel access road from San Carlos Ranch Road to the pump station building.
- Gravel utility yard.
- Transmission piping, fitting, and valving to and from the pump station building and the existing 30-inch transmission main in Carmel Valley Road.
- Bio retention swales

CASQA Best Management Practices Construction Dewatering Operations



Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location to proceed with construction work or to provide vector control.

The General Permit incorporates Numeric Action Levels (NAL) for turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Discharges from dewatering operations can contain high levels of fine sediment that, if not properly treated, could lead to exceedances of the General Permit requirements or Basin Plan standards.

The dewatering operations described in this fact sheet are not Active Treatment Systems (ATS) and do not include the use of chemical coagulations, chemical flocculation or electrocoagulation.

Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area to facilitate construction.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

- SE-5: Fiber Roll
- SE-6: Gravel Bag Berm

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precipitation (stormwater) from depressed areas at a construction site.

Stormwater mixed with non-stormwater should be managed as non-stormwater.

Limitations

- Dewatering operations will require, and should comply with applicable local and project-specific permits and regulations. In some areas, all dewatering activities, regardless of the discharge volume, require a dewatering permit.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this fact sheet primarily address sediment. Other secondary pollutant removal benefits are discussed where applicable.
- The controls detailed in this fact sheet only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Avoid dewatering discharges where possible by using the water for dust control.

Implementation

- A Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP).
- Regional Water Quality Control Board (RWQCB) Regions may require notification and approval prior to any discharge of water from construction sites.
- The destination of discharge from dewatering activities will typically determine the type of permit required for the discharge. For example, when discharging to a water of the U.S., a dewatering permit may be required through the site's governing RWQCB. When discharging to a sanitary sewer or Municipal Separate Storm Sewer System (MS4), a permit may need to be obtained from the owner of the sanitary sewer or MS4 in addition to obtaining an RWQCB dewatering permit. Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges should not cause erosion at the discharge point. Appropriate BMPs should be implemented to maintain compliance with all applicable permits.
- Maintain dewatering records in accordance with all local and project-specific permits and regulations.

Sediment Treatment

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The sediment particle size and permit or receiving water limitations on sediment or turbidity are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. Use of other enhanced treatment methods (i.e., introduction of chemicals or electric current to enhance flocculation and removal of sediment) must comply with: 1) for storm drain or surface water discharges, the requirements for Active Treatment Systems (see SE-11); or 2) for sanitary sewer discharges, the requirements of applicable sanitary sewer discharge permits.

Sediment Basin (see also SE-2)

Description:

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3) and have a designed outlet structure.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, silt, some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Temporary sediment basins should be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outlet, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap (See also SE-3)

Description:

- A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2) and do not have a designed outlet (but do have a spillway or overflow).

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

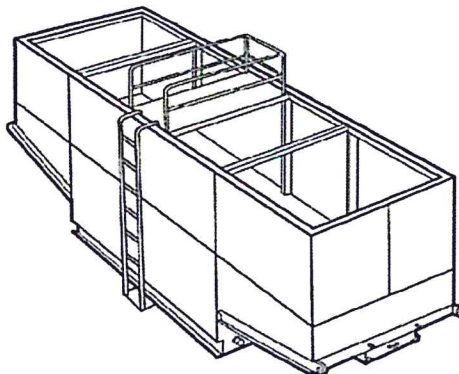
Implementation:

- Excavation and construction of related facilities is required.
- Trap inlets should be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Weir Tanks



Description:

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.
- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by a licensed waste disposal company.

Dewatering Tanks



Description:

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

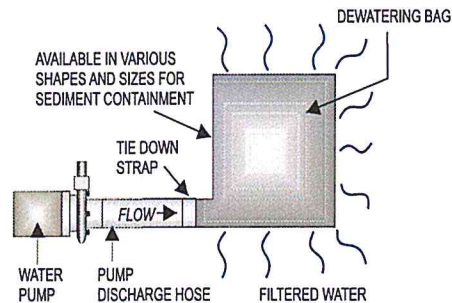
Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by licensed waste disposal company.

Gravity Bag Filter



Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, silt, and fines). Some metals are removed with the sediment.

Implementation:

- Water is pumped into one side of the bag and seeps through the top, bottom, and sides of the bag.
- Place filter bag on pavement or a gravel bed or paved surface. Avoid placing a dewatering bag on unprotected bare soil. If placing the bag on bare soil is unavoidable, a secondary barrier should be used, such as a rock filter bed placed beneath and beyond the edges of the bag to, prevent erosion and capture sediments that escape the bag.
- Perimeter control around the downstream end of the bag should be implemented. Secondary sediment controls are important especially in the initial stages of discharge, which tend to allow fines to pass through the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier (as applicable) is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- Caution should be taken when removing and disposing of the bag, to prevent the release of captured sediment
- Properly dispose of the bag offsite. If sediment is removed from the bag prior to disposal (bags can potentially be reused depending upon their condition), dispose of sediment in accordance with the general maintenance procedures described at the end of this BMP Fact Sheet.

Sand Media Particulate Filter



Description:

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Venders generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Pressurized Bag Filter



Description:

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

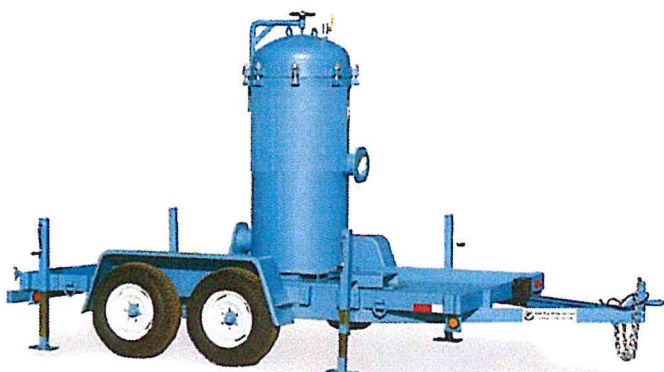
Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Cartridge Filter



Description:

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Costs

- Sediment control costs vary considerably depending on the dewatering and sediment treatment system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from \$360 per month for a 1,000 gallon tank to \$2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

Inspection and Maintenance

- Inspect and verify that dewatering BMPs are in place and functioning prior to the commencement of activities requiring dewatering.
- Inspect dewatering BMPs daily while dewatering activities are being conducted.

- Inspect all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Sample dewatering discharges as required by the General Permit.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants should be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Geotechnical Investigation by Pacific Crest Engineering Inc.

GEOTECHNICAL INVESTIGATION
FOR
RANCHO SAN CARLOS PUMP STATION
RANCHO SAN CARLOS ROAD
MONTEREY COUNTY, CALIFORNIA
APN 015-251-030

FOR
CREEGAN + D'ANGELO INFRASTRUCTURE ENGINEERS
MONTEREY, CALIFORNIA

BY
PACIFIC CREST ENGINEERING INC.
CONSULTING GEOTECHNICAL ENGINEERS
1559-M252-B51
SEPTEMBER 2015
www.4pacific-crest.com

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September 9, 2015

Project No. 1559-M252-B51

Mr. Robert Jones
Creegan + D'Angelo Infrastructure Engineers
2420 Martin Road, Suite 380
Fairfield, CA 94534

Subject: **Geotechnical Investigation – Design Phase**
Rancho San Carlos Pump Station
Rancho San Carlos Road
Monterey County, California
APN 015-251-030

Dear Mr. Jones,

In accordance with your authorization, we have performed a design phase geotechnical investigation for the proposed pump station facility located adjacent to the southwest corner of Carmel Valley Road and Rancho San Carlos Road in Monterey County, California.

The accompanying report presents our conclusions and recommendations as well as the results of the geotechnical investigation on which they are based. If you have any questions concerning the data, conclusions or recommendations presented in this report, please call our office.

Very truly yours,

PACIFIC CREST ENGINEERING INC.



Elizabeth M. Mitchell, GE
President/Principal Geotechnical Engineer
GE 2718
Expires 12/31/18

Copies: 3 to Client

GEOTECHNICAL INVESTIGATION

PURPOSE AND SCOPE

This report describes the geotechnical investigation and presents results, including recommendations, for the proposed pump station facility located on the southwest corner of Carmel Valley Road and Rancho San Carlos Road in Monterey County, California. Our scope of services for this project has consisted of:

1. Discussions with our clients Mr. Robert Jones and Mr. Leon Gomez of Creegan and D'Angelo Infrastructure Engineers and Mr. Douglas Fraser of California American Water.
2. Review of the pertinent published material concerning the site, including geologic and topographic maps, and other available literature.
3. The drilling and logging of 3 test borings.
4. Laboratory analysis of retrieved soil samples.
5. Engineering analysis of the field and laboratory results.
6. Preparation of this report documenting our investigation and presenting geotechnical recommendations for the design and construction of the project.

LOCATION AND DESCRIPTION

The property is located on the southwest corner of Carmel Valley Road and Rancho San Carlos Road in Monterey County, California. Please refer to Figure No. 1, Regional Site Map, in Appendix A for the general vicinity of the project site. Furthermore, the site is located at the following coordinates:

Latitude = 36.538925 degrees
Longitude = -121.872228 degrees

The majority of the subject parcel is relatively flat with the southwestern edge gently sloping towards the Carmel River. The site is currently occupied by some above ground piping and valving along the southeastern edge of the property. An existing gravel access road is situated along the southeastern side of the property. The southwestern half of the parcel is forested with moderate sized trees and shrubs.

Based upon discussions with Mr. Robert Jones, it is our understanding the proposed development will consist of the construction of a new 1200 ft² pump station facility in the northeast quadrant of the parcel. Also proposed are driveway and utility improvements in the vicinity of the new pump station.

It is our understanding that the project area may be located within the flood zone for the Carmel River and the finish floor elevation of the proposed pump station may need to be raised.

We have not yet been provided with a preliminary plan set for the new development, and assume that the proposed pump station facility will be single story, of wood frame and masonry construction, combined with concrete slab-on-grade floors. Structural loading conditions are not known at this time, but are expected to be typical of this type of construction.

FIELD INVESTIGATION

Soil Borings

Three 6-inch to 8-inch diameter test borings were drilled at the site on July 29, 2015 and August 24, 2015. The location of the test borings is shown on Figure No. 2, Site Map Showing Test Borings, in Appendix A. The drilling method used was hydraulically operated continuous flight augers. An engineer from Pacific Crest Engineering Inc. was present during the drilling operations to log the soil encountered and to choose soil sampling type and locations.

Relatively undisturbed soil samples were obtained at various depths by driving a split spoon sampler 18 inches into the ground. This was achieved by dropping a 140 pound down hole safety hammer through a vertical height of 30 inches. The number of blows needed to drive the sampler for each 6 inch portion is recorded and the total number of blows needed to drive the last 12 inches is reported as the Standard Penetration Test (SPT) value. The outside diameter of the samplers used in this investigation was either 3 inches, or 2 inches, and is noted respectively as "L", or "T" on the boring logs.

All standard penetration test data has been normalized to a 2 inch O.D. sampler so as to reflect a SPT "N" value. The normalization method used was derived from the second edition of the Foundation Engineering Handbook (H.Y. Fang, 1991). The method utilizes a Sampler Hammer Ratio which is noted as either R_s for non-cohesive soils, or R_c for cohesive soils. This ratio is dependent on the weight of the hammer, height of hammer drop, outside diameter of sampler, and inside diameter of sample. Using the Sampler Hammer Ratio, the correlation can be made from the samplers used in the field to the standard SPT "N" Value. Based on this method, the average correction factor is 0.52 for non-cohesive soils, and 0.65 for cohesive soils.

The soils encountered in the borings were continuously logged in the field and visually described in accordance with the Unified Soil Classification System (ASTM D2488-Modified). The soil classification was verified and or modified upon completion of laboratory testing in accordance with ASTM D2487.

Appendix A contains the Site Map Showing Test Borings, an explanation of the boring log terminology, and the Log of Test Borings presenting the soil profile explored in each boring, the sample locations, and the SPT "N" values for each sample. Stratification lines on the boring logs are approximate as the actual transition between soil types may be gradual.

LABORATORY INVESTIGATION

The laboratory testing program was developed to help in evaluating the engineering properties of the materials encountered on the site. Laboratory tests performed include:

- a. Moisture Density relationships in accordance with ASTM test D2937.
- b. Gradation tests in accordance with ASTM test D1140.
- c. Direct Shear tests in accordance with ASTM test D3080.
- d. Expansion Index testing in accordance with ASTM test D4829.
- e. R" Value tests in accordance with California Test 301.
- f. Corrosivity Testing in accordance with Cal 643 (minimum resistivity), Cal 422-mod (Chlorides), Cal 417-mod (Sulfates) and California 643 (pH).

The results of the laboratory tests are presented on the boring logs opposite the sample tested in Appendix A.

SOIL CONDITIONS

Regional Geologic Maps

The surficial geology in the area of the project site is mapped as Older Flood Plain Deposits (Clark, Dupre', and Rosenberg, 1997). These deposits are described as unconsolidated relatively fine-grained heterogeneous deposits of sand and silt. Generally includes relatively thin layers of clay. The native soils encountered during our field investigation are consistent with this description.

Soil Borings

Borings 1 through 3 were drilled in the relatively flat area in the northeastern quadrant of the property where the proposed development will be located. The stratigraphy in all three test borings was generally consistent.

The soils observed across the site from the surface to 51½ below existing grade generally consisted of fine to coarse grained sand to silty sand with a thin layer of silty sand to sandy silt at the surface. Groundwater was encountered at between 18 and 18½ feet in all of our borings. The underlying sandy soils are generally poorly graded, damp to wet beneath the groundwater table and considered non-expansive. The upper 3 to 10 feet is loose and is considered moderately compressible and prone to settlement under new loads. Below this depth the sand is medium dense to dense with depth.

REGIONAL SEISMIC SETTING

The seismic setting of the site is one in which it is reasonable to assume that the site will experience significant seismic shaking during the lifetime of the project.

Based upon our review of the Geologic Map of Monterey County, California (Clark, Dupre', and Rosenberg, 1997), and the Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada (CDMG, 1998), active or potentially active faults which may significantly affect the site include those listed in the Table No. 1, below.

TABLE No. 1, Faults in the Monterey County Area

Fault Name	Distance (miles)	Distance (km.)	Direction	Slip Rate* (mm/yr)	M _w Max.*
Monterey Bay – Tularcitos	2.2	3.5	Northeast	0.5	7.1
San Gregorio	6.8	11	Southwest	5	7.3
Rinconada	11.2	18	Northeast	1	7.3
San Andreas – 1906 Segment	28.0	45	Northeast	24	7.9

*Source: CDMG, February, 1998

SEISMIC HAZARDS

A detailed investigation of seismic hazards is beyond our scope of services for this project. In general however, seismic hazards which may affect project sites in the Carmel area of Monterey County include ground shaking, ground surface fault rupture, liquefaction and lateral spreading, and seismically induced slope instabilities. Geotechnical aspects of these issues are discussed below:

Ground Shaking

Ground shaking will be felt on the site during seismic events. Structures founded on thick soft soil deposits are more likely to experience more destructive shaking, with higher amplitude and lower frequency, than structures founded on bedrock. Generally, shaking will be more intense closer to earthquake epicenters. Thick soft soil deposits large distances from earthquake epicenters, however, may result in seismic accelerations significantly greater than expected in bedrock. Structures built in accordance with the latest edition of the California Building Code have an increased potential for experiencing relatively minor damage which should be repairable. The seismic design of the project should be based on the 2013 California Building Code (CBC) as it has incorporated the most recent seismic design parameters.

TABLE No. 2, 2013 CBC Seismic Design Parameters

Design Parameter	Specific to Site ASCE 7-10	Reference ¹
Site Class	D – Stiff Soil	Table 20.3-1 ASCE 7-10
Mapped Spectral Acceleration for Short Periods ²	$S_s = 1.508 \text{ g}$	Fig. 22-1 ASCE 7-10
Mapped Spectral Acceleration for 1-second Period	$S_1 = 0.559 \text{ g}$	Fig. 22-2 ASCE 7-10
Short Period Site Coefficient	$F_a = 1.0$	Table 1613.3.3(1)
1-Second Period Site Coefficient	$F_v = 1.5$	Table 1613.3.3(2)
MCE Spectral Response Acceleration for Short Period	$S_{MS} = 1.508 \text{ g}$	Equation 16-37 CBC
MCE Spectral Response Acceleration for 1-Second Period	$S_{M1} = 0.838 \text{ g}$	Equation 16-38 CBC
5% Damped Spectral Response Acceleration for Short Period	$S_{DS} = 1.005 \text{ g}$	Equation 16-39 CBC
5% Damped Spectral Response Acceleration for 1-Second Period	$S_{D1} = 0.559 \text{ g}$	Equation 16-40 CBC
Seismic Design Category ³	D	Section 1613.3.5

¹ Design values may also have been obtained by using the USGS seismic design maps application available on the USGS website at <http://earthquake.usgs.gov/designmaps/us/application.php>

² Per Section 12.8.1.3 of ASCE 7-10 the S_s value can be reduced to 1.5 for the purposes of calculating C_s for regular structures five stories or less in height and having a period T of 0.5 seconds or less.

³ Seismic Design Category assumes the structure **is not** a Risk Category IV as defined by Table 1604.5 of the 2013 CBC. Pacific Crest Engineering Inc. should be contacted for revised Table 2 seismic design parameters if the structure is within Risk Category IV.

The recommendations of this report are intended to reduce the potential for structural damage to an acceptable risk level, however strong seismic shaking could result in architectural damage and the need for post-earthquake repairs. It should be assumed that exterior improvements such as pavements, slabs, sidewalks or patios will need to be repaired or replaced following strong seismic shaking. An increased depth of subgrade compaction below exterior improvements will assist in minimizing the damage to these elements.

Ground Surface Fault Rupture

Ground surface fault rupture occurs along the surficial trace(s) of active faults during significant seismic events. Pacific Crest Engineering Inc. has not performed a specific investigation for the presence of active faults on the project site. Since the nearest known active or potentially active fault is mapped approximately 2.2 miles (approximately 3.5 km) from the site (Clark, Dupre', and Rosenberg, 1997 and CDMG, 1998), the potential for ground surface fault rupture to occur at the site should be considered low.

Liquefaction

Liquefaction tends to occur in loose, saturated fine grained sands, coarse silts or clays with a low plasticity. In order for liquefaction to occur there must be the proper soil type, soil saturation, and cyclic accelerations of sufficient magnitude to progressively increase the water pressures within the soil mass.

Non-cohesive soil shear strength is developed by the point to point contact of the soil grains. As the water pressures increase in the void spaces surrounding the soil grains, the soil particles become supported more by the water than the point to point contact. When the water pressures increase sufficiently, the soil grains begin to lose contact with each other resulting in the loss of shear strength and continuous deformation of the soil until the soil appears to "liquefy".

Based upon our review of the regional geologic and liquefaction maps (Rosenberg, 2001), the site is located in an area classified as having a high potential for liquefaction and our field investigation has confirmed the presence of potentially liquefiable soils underlying the project site. The subject soils consist of loose to medium dense, relatively cohesionless sand to silty sand which was observed to the extent of our borings at 51½ feet below existing grade. Groundwater was encountered at approximately 18 to 18½ feet during our field investigation.

The potential for liquefaction was evaluated quantitatively for this project, based upon the data obtained from our exploratory borings. Our analysis utilized the software program LiquefyPro Version 5, which is based upon the most recent recommendations of the NCEER Workshop and SP117 Implementation. The program calculates a factor of safety against liquefaction and also estimates seismically induced settlement due to both liquefaction and dynamic compaction of loose, dry sands above the design water table.

For our analysis we assumed a peak ground acceleration (PGA) of 0.59g and a ground water elevation of 15 feet below existing grade. The soil profile in Boring No. 2 was used in our analysis. The results of our analysis indicate the portion of the sand stratum between approximately 18 and 40 feet below existing grade possess a safety factor below 1.0 and is therefore considered liquefiable. It is in this stratum that the potential for liquefaction and settlement issues are the greatest.

Estimated settlements due to seismically induced liquefaction of the relatively cohesionless sands were also calculated using LiquefyPro, based upon the work of Ishihara and Yoshimine and Seed. Based on our analysis, the estimated total seismically-induced settlement is on the order of 4 inches and the estimated differential settlement across the least dimension of the structure equates to 2 inches.

The determination that the site has liquefiable soils would generally trigger a special Site Class F designation, per Chapter 20 of ASCE7-10. However, Site Coefficients F_a and F_v are determined by Tables 1613.3.3(1) and 1613.3.3(2) of the 2013 CBC. Note b for Site Class F refers to Section 11.4.7 of ASCE 7-10. This section states *“The site-specific ground motion procedures set forth in Chapter 21 are permitted to be used to determine ground motions for any structure. A site response analysis shall be performed in accordance with Section 21.1 for structures on Site Class F sites, unless the exception to Section 20.3.1 is applicable.”* Section 20.3.1.1 of ASCE 7-10 states the following under “Exception”: *“For structures having fundamental periods of vibration equal to or less than 0.5 s, site-response analysis is not required to determine spectral accelerations for liquefiable soils. Rather, a site class is permitted to be determined in accordance with Section 20.3 and the corresponding values of F_a and F_v determined from tables 11.4-1 and 11.4-2.”* These are the same tables as Tables 1613.3.3(1) and 1613.3.3(2) from the 2013 CBC.

Based on the above discussion, it is our opinion that a Site Class F designation is not appropriate for the project site. **This is based on the assumption that the building period is less than 0.5 seconds, which must be verified by the Project Structural Engineer. If this assumption is incorrect, significant additional geotechnical and geology studies may be required for this site. Based on the procedures outlined in Chapter 20 of ASCE 7-10 and Section 1613.3.5 of**

the 2013 CBC, we have determined the appropriate Site Class is D with a Seismic Design Category of D.

Please note: The Site Class designation does not eliminate the potential for settlement and structural damage due to liquefaction of the subsurface soils. This must be considered in the project design, and is described in more detail within the “Discussions, Conclusions and Recommendations” section of this report.

The recommendations of this report are intended to reduce the potential for structural damage to an acceptable risk level, however strong seismic shaking could result in architectural damage and the need for post-earthquake repairs. It should be assumed that exterior improvements around the building such as pavements, slabs, sidewalks or patios may need to be repaired or replaced following strong seismic shaking.

Liquefaction Induced Lateral Spreading

Liquefaction induced lateral spreading occurs when a liquefied soil mass fails toward an open slope face, or fails on an inclined topographic slope. Our analysis indicates that the site is underlain by potentially liquefiable soils, however, based on the relatively flat to gently sloping terrain, it is our opinion that the potential for lateral spreading to occur at the site should be considered low.

Landsliding

Landsliding is a hazard which may affect the slopes in the vicinity of this property. A rigorous numerical analysis of the stability of the slopes on and surrounding the project site was beyond our scope of services on this project. However, given the relatively flat to gently sloping topography surrounding the project site in conjunction with the natural grade of the slopes in the vicinity, we do not anticipate the potential for slope instability to occur and adversely affect the subject project.

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

GENERAL

1. The results of our investigation indicate that the proposed pump station facility is feasible from a geotechnical engineering standpoint, provided our recommendations are included in the design and construction of the project.
2. Grading and foundation plans should be reviewed by Pacific Crest Engineering Inc. during their preparation and prior to contract bidding.
3. Pacific Crest Engineering Inc. should be notified at least four (4) working days prior to any site clearing and grading operations on the property in order to observe the stripping and disposal of unsuitable materials, and to coordinate this work with the grading contractor. During this period, a pre-construction conference should be held on the site, with at least you or your representative, the grading contractor, a County representative and one of our engineers present. At this meeting, the project specifications and the testing and inspection responsibilities will be outlined and discussed.
4. Field observation and testing must be provided by a representative of Pacific Crest Engineering Inc., to enable them to form an opinion as to the degree of conformance of the exposed site conditions to those foreseen in this report, the adequacy of the site preparation, the acceptability of fill materials, and the extent to which the earthwork construction and the degree of compaction comply with the specification requirements. **Any work related to grading or foundation excavation that is performed without the full knowledge and direct observation of Pacific Crest Engineering Inc., the Geotechnical Engineer of Record, will render the recommendations of this report invalid, unless the Client hires a new Geotechnical Engineer who agrees to take over complete responsibility for this report's findings, conclusions and recommendations.** The new Geotechnical Engineer must agree to prepare a Transfer of Responsibility letter. This may require additional test borings and laboratory analysis if the new Geotechnical Engineer does not completely agree with our prior findings, conclusions and recommendations.

PRIMARY GEOTECHNICAL CONSIDERATIONS

5. Based upon the results of our investigation, primary geotechnical considerations for the project include the loose compressible near-surface soils, potentially liquefiable soils beneath the proposed structure, strong seismic shaking and surface drainage.
6. During our field investigation we encountered loose sandy soils in the upper 3 to 10 feet across the site which is considered to be moderately compressible. To mitigate the potential for adverse settlement to occur beneath the proposed structure, we recommend subexcavation and recompaction of the near-surface soils within the building area. Refer to the Site Preparation section of this report for details.

7. Based on our engineering analysis, the subject site is underlain by potentially liquefiable soils. In order to mitigate the potential for adverse effects on the proposed development due to liquefaction, it is our opinion that the pump station facility should be founded on a rigid mat slab foundation system designed to move as a unit and resist differential settlement.

8. The project site is located within a seismically active area and strong seismic shaking is expected to occur within the design lifetime of the project. Improvements should be designed and constructed in accordance with the most current CBC and the recommendations of this report to minimize reaction to seismic shaking. Structures built in accordance with the latest edition of the California Building Code have an increased potential for experiencing relatively minor damage, which should be repairable, however strong seismic shaking could result in architectural damage and the need for post-earthquake repairs.

9. In order to reduce erosion and stormwater from migrating beneath the proposed structure, it is imperative that surface runoff be adequately controlled. We recommend collecting surface drainage into a closed conduit system that directs runoff away from the structure. Discharging runoff onto splash blocks adjacent to foundations is not recommended for this project.

SITE PREPARATION

10. The initial preparation of the site will consist of the removal of trees as required and any debris. Tree removal should include the entire stump and root ball. Septic tanks and leaching lines, if found, must be completely removed. The extent of this soil removal will be designated by a representative of Pacific Crest Engineering Inc. in the field. This material must be removed from the site.

11. Any voids created by removal of tree and root balls, septic tanks, and leach lines must be backfilled with properly compacted native or imported soils that are free of organic and other deleterious materials or with approved imported fill.

12. As discussed above any wells encountered shall be capped in accordance with the requirements and approval of the County Health Department. The strength of the cap shall be equal to the adjacent soil and shall not be located within 5 feet of a structural footing.

13. Surface vegetation, tree roots and organically contaminated topsoil should then be removed ("stripped") from the area to be graded. In addition, any remaining debris or large rocks must also be removed (this includes asphalt or rocks greater than 2 inches in greatest dimension). This material may be stockpiled for future landscaping.

14. It is anticipated that the depth of stripping may be 2 to 4 inches, however the required depth of stripping must be based upon visual observations of a representative of Pacific Crest Engineering Inc., in the field. The depth of stripping will vary upon the type and density of vegetation across the project site and with the time of year. Areas with dense vegetation or groves of trees may require an increased depth of stripping.

- c. granular in nature, well graded, and contain sufficient binder to allow utility trenches to stand open,
- d. free of rocks in excess of 2 inches in size.

In addition to the above requirements, import fill should have a Plasticity Index between 4 and 12, and a minimum Resistance "R" Value of 30, and be non-expansive.

21. All native and import fill should be placed in maximum 8 inch lifts, before compaction, at a water content which is within 1 to 3 percent of the laboratory optimum value.

22. We recommend field density testing be performed in maximum 2 foot elevation differences. In general terms, we would recommend at least one compaction test per 200 linear feet of utility trench or retaining wall backfill, and at least one compaction test per 2,000 square feet of building or structure area. This is a subjective value and may be changed by the Geotechnical Engineer based on a review of the final project layout and exposed field conditions.

23. Samples of any proposed imported fill should be submitted to Pacific Crest Engineering Inc. for appropriate testing and approval not less than ten (10) working days before the anticipated jobsite delivery. This includes proposed import trench sand, drain rock and aggregate base materials. Imported fill material delivered to the project site without prior submittal of samples for appropriate testing and approval must be removed from the project site.

CUT AND FILL SLOPES

24. Grading is anticipated to be minor, no cut and fill slopes are currently planned for this project. Should your plans change, please contact our office for additional recommendations.

EROSION CONTROL

25. The surface soils are classified as having a high potential for erosion. Therefore, the finished ground surface should be planted with ground cover and continually maintained to minimize surface erosion. For specific and detailed recommendations regarding erosion control on and surrounding the project site, you should consult your civil engineer or an erosion control specialist.

FOUNDATIONS – RIGID MAT SLAB

26. At the time we prepared this report, foundation and grading plans had not been completed and the structure location and foundation details had not been finalized. We request an opportunity to review these items during the design stages to determine if supplemental recommendations will be required.

27. An appropriate foundation system to support the proposed structure will consist of a reinforced concrete rigid mat slab foundation system designed to withstand differential settlement and allow the structure to move as a single unit. The loading should be kept as even as possible in all areas of the structure.

15. Although not anticipated, it is possible that there are areas of man-made fill on the project site that our field investigation did not detect. Areas of man-made fill, if encountered on the project site will need to be completely excavated to undisturbed native material. The excavation process should be observed and the extent designated by a representative of Pacific Crest Engineering Inc., in the field. Any voids created by fill removal must be backfilled with properly compacted approved native soils that are free of organic and other deleterious materials, or with approved imported fill.

16. Following the stripping and backfilling of voids, the exposed soils in the building pad area should be removed to a minimum depth of 36 inches below existing grade, or 18 inches below bottom of all foundation elements, whichever is deeper. Exposed soils beneath exterior slabs and pavements should be subexcavated to a minimum depth of 12 inches below subgrade. The base of the excavation should be scarified 8 inches, and the soil moisture conditioned and compacted. The moisture conditioning procedure will depend upon the time of year that the work is done, but it should result in the soils being 1 to 3 percent over optimum moisture content at the time of compaction.

17. Following subexcavation of the native soils, the site should then be brought to design grades with native or imported non-expansive engineered fill placed in maximum 8 inch lifts (before compaction). **This should result in a minimum of 18 inches of engineered fill beneath all foundation elements and mat slabs, and 12 inches beneath exterior slabs and pavements.** Recomacted sections should extend at least 5 feet horizontally beyond all thickened edges, slabs and pavement areas.

Note: If this work is done during or soon after the rainy season, the on-site soils and other materials may be too wet in their existing condition to be used as engineered fill. These materials may require a diligent and active drying and/or mixing operation to reduce the moisture content to the levels required to obtain adequate compaction as an engineered fill. If the on-site soils or other materials are too dry, water may need to be added. In some cases the time and effort to dry the on-site soil may be considered excessive, and the import of aggregate base may be required.

18. All soil on the project should be compacted to a minimum of 90% of its maximum dry density. The upper 8 inches of the soil subgrade in the pavement areas, and all aggregate subbase and aggregate base should be compacted to a minimum of 95% of its maximum dry density.

19. The maximum dry density will be obtained from a laboratory compaction curve run in accordance with ASTM Procedure #D1557. This test will also establish the optimum moisture content of the material. Field density testing will be performed in accordance with ASTM Test #D6938 (nuclear method).

20. Native or imported soil used as engineered fill on this project should meet the following requirements:

- a. free of organics, debris, and other deleterious materials,
- b. free of "recycled" materials such as asphaltic concrete, concrete, brick, etc.,

28. Based on our liquefaction analysis, the foundation system should be designed to accommodate a total seismically-induced settlement of 4 inches and a differential settlement of 2 inches across the least dimension of the structure.
29. The rigid mat slab should be designed for an allowable bearing capacity of 1,500 psf, (dead plus live load) and may be increased by one-third for wind or seismic loads.
30. The coefficient of vertical subgrade reaction used in design should be 100 kcf (kips per cubic foot).
31. The mat may be assumed to have a lateral sliding resistance 0.35.
32. The embedded portion of the mat may be assumed to have a lateral bearing pressure resistance value of 300 psf/ft of depth. Neglect lateral pressure in the upper 12 inches.
33. The structural mat should have thickened edge beams which extend at least 12 inches below lowest adjacent grade, not including sand or gravel sections.
34. Slab thickness, reinforcement, and doweling should be determined by the project structural engineer in accordance with applicable CBC or ACI Standards.
35. The structural mat should be underlain by a minimum 6 inch thick capillary break of $\frac{3}{4}$ inch clean crushed rock (no fines). It is recommended that neither Class II baserock nor sand be employed as the capillary break material.
36. Where floor coverings are anticipated or vapor transmission may be a problem, a vapor retarder/membrane should be placed between the capillary break layer and the floor slab in order to reduce the potential for moisture condensation under floor coverings. We recommend a high quality vapor retarder at least 10 mil thick and puncture resistant (Stego Wrap or equivalent). The vapor retarder must meet the minimum specifications for ASTM E-1745, Standard Specification For Water Vapor Retarder. Please note that low density polyethylene film (such as Visqueen) may meet minimum current standards for permeability but not puncture resistance. Laps and seams should be overlapped at least six inches and properly sealed to provide a continuous layer beneath the entire slab that is free of holes, tears or gaps. Joints and penetrations should also be properly sealed.
37. Floor coverings should be installed on concrete slabs that have been constructed according to the guidelines outlined in ACI 302.2R and the recommendations of the flooring material manufacturer.
38. Currently, ACI 302-1R recommends that concrete slabs to receive moisture sensitive floor coverings be placed directly upon the vapor retarder, with **no sand cushion**. ACI states that vapor retarders are not effective in preventing residual moisture within the concrete slab from migrating to the surface. Including a low water-to-cement ratio (less than 0.50) and/or admixtures into the mix design are generally necessary to minimize water content, reduce soluble alkali content, and provide workability to the concrete. As noted in CIP 29 (*Concrete in Practice by the National Ready Mixed Concrete Association*), placing concrete directly on the vapor

retarder can also create potential problems. If environmental conditions do not permit rapid drying of bleed water from the slab surface then the excess bleeding can delay finishing operations (refer to CIP 13, 19 and 20). Most of these problems can be alleviated by using a concrete with a low water content, moderate cement factor, and well-graded aggregate with the largest possible size. **With the increased occurrence of moisture related floor covering failures, minor cracking of floors placed on a vapor retarder and other problems discussed here are considered a more acceptable risk than failure of floor coverings, and these potential risks should be clearly understood by the Client and Project Owner.**

39. If a sand layer is chosen as a cushion for slabs without floor coverings, it should consist of a clean sand. Clean sand is defined as 100 percent passing the #4 sieve, and less than 5 percent passing the #200 sieve.

40. Requirements for pre-wetting of the subgrade soils prior to the pouring of the slabs will depend on the specific soils and seasonal moisture conditions and will be determined by a representative of Pacific Crest Engineering Inc. at the time of construction. It is important that the subgrade soils be properly moisture conditioned at the time the concrete is poured. Subgrade moisture contents should not be allowed to exceed our moisture recommendations for effective compaction, and should be maintained until the slab is poured.

Please Note: Recommendations given above for the reduction of moisture transmission through the slab are general in nature and present good construction practice. Moisture protection measures for concrete slabs-on-grade should meet applicable ACI and ASTM standards. Pacific Crest Engineering Inc. are not waterproofing experts. For a more complete and specific discussion of moisture protection within the structure, a qualified waterproofing expert should be consulted to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. The waterproofing consultant should provide recommendations for mitigation of potential adverse impacts of moisture vapor transmission on various components of the structure as deemed appropriate.

41. Utility connections entering the building should be designed with flexible connections to accommodate anticipated total settlements.

RETAINING WALLS

42. No retaining walls are currently planned for this project. Should your plans change, please contact our office for additional recommendations.

UTILITY TRENCHES

43. Utility trenches that are parallel to the sides of the building should be placed so that they do not extend below a line sloping down and away at a 2:1 (horizontal to vertical) slope from the bottom outside edge of all footings and grade beams.

44. Utility pipes should be designed and constructed so that the top of pipe is a minimum of 24 inches below the finish subgrade elevation of any road or pavement areas. Any pipes within the

top 24 inches of finish subgrade should be concrete encased, per design by the Project Civil Engineer.

45. For the purpose of this section of the report, backfill is defined as material placed in a trench starting one foot above the pipe, and bedding is all material placed in a trench below the backfill.

46. Unless concrete bedding is required around utility pipes, free-draining clean sand should be used as bedding. Sand bedding should be compacted to at least 95 percent relative compaction.

47. Approved imported clean sand or native soil should be used as utility trench backfill. Backfill in trenches located under and adjacent to structural fill, foundations, concrete slabs and pavements should be placed in horizontal layers no more than 8 inches thick. This includes areas such as sidewalks, patios, and other hardscape areas. Each layer of trench backfill should be water conditioned and compacted to at least 95 percent relative compaction. Clean sand is defined as 100 percent passing the #4 sieve, and less than 5 percent passing the #200 sieve.

48. All utility trenches beneath the perimeter of the structure should be backfilled with controlled density fill (such as 2-sack sand\cement slurry) to help minimize potential moisture intrusion below interior floors. The length of the plug should be at least three times the width of the thickened edges at the building perimeter, but not less than 36 inches. A representative from Pacific Crest Engineering Inc. should be contacted to observe the placement of slurry plugs. In addition, all utility pipes which penetrate through the footings, stemwalls or grade beams (below the exterior soil grade) should also be sealed water-tight, as determined by the Project Engineer or Architect.

49. A representative from our firm should be present to observe the bottom of all trench excavations, prior to placement of utility pipes and conduits. In addition, we should observe the condition of the trench prior to placement of sand bedding, and to observe compaction of the sand bedding, in addition to any backfill planned above the bedding zone.

50. Jetting of the trench backfill is not recommended as it may result in an unsatisfactory degree of compaction.

51. Trenches must be shored as required by the local agency and the State of California Division of Industrial Safety construction safety orders.

SURFACE DRAINAGE

52. Following completion of the project we recommend that storm drainage provisions and performance of permanent erosion control measures be closely observed through the first season of significant rainfall, to determine if these systems are performing adequately and, if necessary, resolve any unforeseen issues.

53. Surface water must not be allowed to pond or be trapped adjacent to structures, on the building pad nor in the parking areas.

54. All roof eaves should be guttered, with the outlets from the downspouts provided with adequate capacity to carry the storm water from the structures to reduce the possibility of soil saturation and erosion. The connection should be in a closed conduit which discharges at an approved location away from structures and graded areas. We would recommend a discharge point which is at least 10 feet down slope of any foundation or fill areas.

55. Final grades should be provided with a positive gradient away from all foundations in order to provide for rapid removal of the surface water from the foundations to an adequate discharge point. Soil grades should slope away from foundation areas at least 5 percent for the first 10 feet. Impervious surface areas should slope away from foundations at least 2 percent for the first 10 feet. Concentrations of surface water runoff should be handled by providing necessary structures, such as paved ditches, catch basins, etc.

56. Irrigation activities at the site should be done in a controlled and reasonable manner.

57. The building and surface drainage facilities must not be altered nor any filling or excavation work performed in the area without first consulting Pacific Crest Engineering Inc. Surface drainage improvements developed by the project civil engineer must be maintained by the property owner at all times, as improper drainage provisions can produce undesirable affects.

PAVEMENT DESIGN

58. The soils that comprise the pavement subgrade will in all likelihood consist of the near-surface sandy silt to silty sand material encountered across the site. An "R" Value sample of this material were collected for laboratory testing. Based on the laboratory testing, the near-surface soils obtained a "R" Value of 60 which was used for the design of the pavement sections presented below.

59. For design purposes, the following traffic indices are suggested*

- a. Parking stalls T.I. = 4.5
- b. Traffic aisles T.I. = 5
- c. Truck usage areas T.I. = 5.5

*Pacific Crest Engineering Inc. has not performed a site specific traffic study to determine the actual traffic indices associated with this project. These values are for general design purposes only and the values may need modification. Traffic volume and equivalent axle loads that exceed the assumed TI could be destructive to the pavement, resulting in an accelerated rate of deterioration and the need for increased maintenance.

60. The following table provides a flexible pavement design which is based on the Caltrans Highway Design Manual – Chapter 600 (last updated November 2, 2012). The design thickness layer was determined to the nearest 0.5 inch. To provide for deficient layer thickness that can result from allowable tolerances in the Standard Specifications, a safety factor of 0.20 feet was added to the asphalt concrete and aggregate base thicknesses, as outlined in the design procedure.

The following pavement sections are suggested:

TABLE No.3, Recommended Pavement Sections
(R-Value = 60)

Material	Traffic Index		
	4.5	5	5.5
Asphalt Concrete	2.5 in	3.0 in	3.5 in
Class 2 Aggregate Base (R=78 min)	6 in	6 in	6 in

61. To have the selected pavement sections perform to their greatest efficiency, it is very important that the following items be considered:

- a. Properly scarify and moisture condition the upper 8 inches of the subgrade soil and compact it to a minimum of 95% of its maximum dry density, at a moisture content 1 to 3% over the optimum moisture content for the soil.
- b. Provide sufficient gradient to prevent ponding of water.
- c. Use only quality materials of the type and thickness (minimum) specified. All aggregate base and subbase must meet Caltrans Standard Specifications for Class 2 materials, and be angular in shape. All Class 2 aggregate base should be $\frac{3}{4}$ inch maximum in aggregate size.
- d. Compact the base and subbase uniformly to a minimum of 95% of its maximum dry density.
- e. Use $\frac{1}{2}$ inch maximum, Type "A" medium graded asphaltic concrete. Place the asphaltic concrete only during periods of fair weather when the free air temperature is within prescribed limits by Cal Trans Specifications.
- f. **Porous pavement systems which consist of porous paving blocks, asphaltic concrete or concrete are generally not recommended due to the potential for saturation of the subgrade soils and resulting increased potential for a shorter pavement life. At a minimum, porous pavement systems should include a layer of Mirafi HP370 geotextile fabric placed on the subgrade soil beneath the porous paving section. These pavement systems should only be used with the understanding by the Owner of the increased potential for pavement cracking, rutting, potholes, etc.**
- g. Maintenance should be undertaken on a routine basis.

PLAN REVIEW

62. We respectfully request an opportunity to review the project plans and specifications during preparation and before bidding to ensure that the recommendations of this report have been included and to provide additional recommendations, if needed. These plan review services are also typically required by the reviewing agency. Misinterpretation of our recommendations or omission of our requirements from the project plans and specifications may result in changes to the project design during the construction phase, with the potential for additional costs and delays in order to bring the project into conformance with the requirements outlined within this report. Services performed for review of the project plans and specifications are considered “post-report” services and billed on a “time and materials” fee basis in accordance with our latest Standard Fee Schedule.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. This Geotechnical Investigation was prepared specifically for Creegan + D'Angelo and for the specific project and location described in the body of this report. This report and the recommendations included herein should be utilized for this specific project and location exclusively. This Geotechnical Investigation should not be applied to nor utilized on any other project or project site. Please refer to the ASFE "Important Information about Your Geotechnical Engineering Report" attached with this report.
2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the time, our firm should be notified so that supplemental recommendations can be provided.
3. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are called to the attention of the Architects and Engineers for the project and incorporated into the plans, and that the necessary steps are taken to ensure that the Contractors and Subcontractors carry out such recommendations in the field.
4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural process or the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or partially, by changes outside of our control. This report should therefore be reviewed in light of future planned construction and then current applicable codes. This report should not be considered valid after a period of two (2) years without our review.
5. This report was prepared upon your request for our services in accordance with currently accepted standards of professional geotechnical engineering practice. No warranty as to the contents of this report is intended, and none shall be inferred from the statements or opinions expressed.
6. The scope of our services mutually agreed upon for this project did not include any environmental assessment or study for the presence of hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site.

Important Information about Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time to perform additional study.* Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.



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APPENDIX A

Regional Site Map
Site Map Showing Test Borings
Boring Log Explanation
Log of Test Borings
Direct Shear Test Results
R-Value Test Results
Corrosivity Test Results



0 1000'



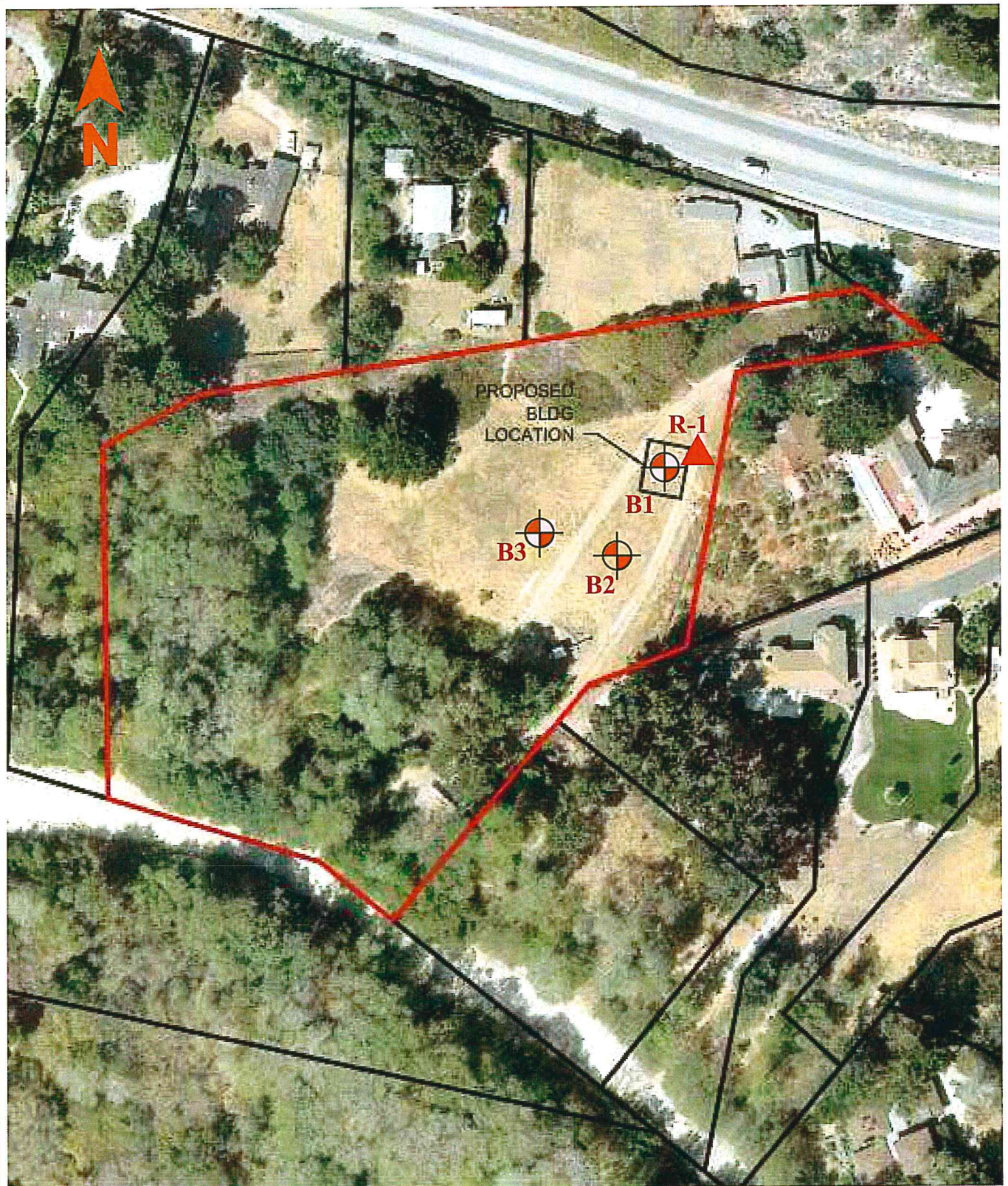
Approximate Scale

Base Map from Google Earth

Pacific Crest Engineering Inc.
444 Airport Blvd., Suite 106
Watsonville, CA 95076

Regional Site Map
Rancho San Carlos Pump Station
Monterey County, California

Figure No. 1
Project No. 1559
Date: 9/9/15



0 100'
SCALE

Approximate Location of Test Boring
Approximate Location of R-Value Sample

Base Map from Polaris Consulting

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Site Map Showing Test Borings
Rancho San Carlos Pump Station
Monterey County, California

Figure No. 2
Project No. 1559
Date: 9/9/15

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488 (Modified)

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN #200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN #4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravels-sand mixtures, little or no fines
		GRAVELS (MORE THAN 12% FINES)	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN #4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS (MORE THAN 12% FINES)	SM	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 35%		ML	Inorganic silts and very fine clayey sand silty sands, with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly, sand, silty or lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS LIQUID LIMIT IS BETWEEN 35% AND 50%		MI	Inorganic silts, clayey silts and silty fine sands of intermediate plasticity
			CI	Inorganic clays, gravelly/sandy clays and silty clays of intermediate plasticity
			OI	Organic clays and silty clays of intermediate plasticity
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Organic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
	HIGHLY ORGANIC SOILS			PT

BORING LOG EXPLANATION

Depth, ft.	Sample No. and Type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	SPT "N" Value	Plasticity Index	Dry Density, p.c.f.	Moisture % of Dry Wt.	MISC. LAB RESULTS
1			 ← Ground water elevation						
2	1-1		← Soil Sample Number ← Soil Sampler Size/Type L = 3" Outside Diameter M = 2.5" Outside Diameter T = 2" Outside Diameter ST = Shelby Tube BAG = Bag Sample						
3									
4									
5									

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	BLOWS/FOOT
VERY SOFT	0-2
SOFT	2-4
FIRM	4-8
STIFF	8-16
VERY STIFF	16-32
HARD	OVER 32

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Boring Log Explanation
Rancho San Carlos Pump Station
Monterey County, California

Figure No. 3
Project No. 1559
Date: 9/9/15

LOGGED BY SSC DATE DRILLED 7/29/15 BORING DIAMETER 6" SS BORING NO. 1

Depth (feet)	Sample No. and Type	Symbol	Soil Description	Unified Soil Classification	SPT "N" Value	Plasticity Index	Dry Density (pcf)	Moisture % of Dry Wt.	Misc. Lab Results
1	1-1	L	Brown Sandy SILT, damp, stiff, non-plastic	ML					$\phi = 24^\circ$ $c = 490$ psf $EI = 6$ 50% passing #200 sieve
2					7		96.1	6.3	
3	1-2	T	Gray brown Silty SAND, damp, medium dense	SM					
4					12			4.1	
5	1-3	L	Light gray brown fine-coarse grained SAND, damp, loose, some rounded gravels to 1/2"	SP					3% passing #200 sieve
6					9			2.3	
7	1-4	T	Light gray brown fine-coarse grained SAND, damp, loose, some rounded gravels to 3/4"		8			3.3	
8									
9									
10	1-5	L	Light gray brown SAND with Gravels, damp-moist, medium dense, rounded gravels to 3/4"						3% passing #200 sieve
11					15		99.0	3.3	
12	1-6	T	Light gray brown SAND with Gravels, damp, medium dense, rounded gravels to 3/4"		17			1.5	
13									
14									
15	1-7	T	some caving soils observed - redrilled to 15'						4% passing #200 sieve
16			Light brown fine-coarse grained SAND, moist, medium dense, some rounded gravels to 1/2"		21			6.1	
17									
18			 Groundwater encountered at 18'						
19			Caving Soils - hole collapsed to 7' when auger was pulled						
20			Boring terminated at 20 feet. Groundwater encountered at 18 feet.						
21									
22									
23									
24									

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Log of Test Borings
 Rancho San Carlos Pump Station
 Monterey County, California

Figure No. 4
 Project No. 1559
 Date: 9/9/15

LOGGED BY ssc DATE DRILLED 8/24/15 BORING DIAMETER 8" HS BORING NO. 2

Depth (feet)	Sample No. and Type	Symbol	Soil Description	Unified Soil Classification	SPT "N" Value	Plasticity Index	Dry Density (pcf)	Moisture % of Dry Wt.	Misc. Lab Results
1			Light brown Sandy SILT, damp, stiff, non-plastic	ML					
2	2-1	L	Light gray brown fine-coarse grained SAND, damp, loose	SP					$\phi = 38^\circ$ $c = 110$ psf 3% passing #200 sieve
3			Light gray brown fine-coarse grained SAND, damp, loose		5		104.0	2.2	
4	2-2	T	Light brown fine-coarse grained SAND, damp, loose, trace gravels to 1/2"		4			1.7	
5									
6	2-3	L	Light brown fine-coarse grained SAND, damp-moist, medium dense, some gravels to 3/4"		10		99.0	2.8	3% passing #200 sieve
7									
8	2-4	T	Light brown fine-coarse grained SAND, damp-moist, loose, some gravels to 3/4"		9			4.6	
9									
10									
11									
12	2-5	L	Gray fine-medium grained SAND with Silt, damp, medium dense,						
13			Dark gray Sandy SILT, moist, stiff, slight plasticity	ML	15		84.5	17.2	50% passing #200 sieve
14				SP					
15									
16	2-6	T	Gray fine-coarse grained SAND, moist, medium dense, trace rounded gravels to 1/2"		24			4.4	4% passing #200 sieve
17									
18			 Groundwater encountered at 18 1/2 feet.						
19									
20	2-7	T	Interbedded Layers:	SM-SP					
21			Gray fine-medium grained SAND with Silt, wet, medium dense / Gray Silty SAND, wet, medium dense		17			28.9	
22									
23				SP					
24									

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Log of Test Borings
 Rancho San Carlos Pump Station
 Monterey County, California

Figure No. 5
 Project No. 1559
 Date: 9/9/15

LOGGED BY SSC DATE DRILLED 8/24/15 BORING DIAMETER 8" HS BORING NO. 2

Depth (feet)	Sample No. and Type	Symbol	Soil Description	Unified Soil Classification	SPT "N" Value	Plasticity Index	Dry Density (pcf)	Moisture % of Dry Wt.	Misc. Lab Results
25	2-8	L	Gray fine-coarse grained SAND, wet, medium dense	SP	22		115.1	15.8	3% passing #200 sieve
26									
27									
28									
29									
30	2-9	T	Gray fine-coarse grained SAND, wet, medium dense, trace shale gravels		20			16.8	
31									
32									
33									
34									
35	2-10	T	Gray fine-coarse grained SAND, wet, medium dense, trace shale gravels		21			16.8	4% passing #200 sieve
36									
37									
38									
39									
40	2-11	L	No Recovery		50/6"				
41									
42									
43									
44									
45	2-12	T	Gray fine-medium grained SAND with Silt, wet, medium dense	SM-SP	29			26.3	
46									
47									
48									

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Log of Test Borings
Rancho San Carlos Pump Station
Monterey County, California

Figure No. 6
Project No. 1559
Date: 9/9/15

LOGGED BY SSC DATE DRILLED 8/24/15 BORING DIAMETER 8" HS BORING NO. 2

Depth (feet)	Sample No. and Type	Symbol	Soil Description	Unified Soil Classification	SPT "N" Value	Plasticity Index	Dry Density (pcf)	Moisture % of Dry Wt.	Misc. Lab Results
49	2-13 T		Gray fine-medium grained SAND with Silt, wet, dense	SM-SP	34			24.7	
50									
51									
52			Boring terminated at 51½ feet. Groundwater encountered at 18½ feet.						
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									

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Log of Test Borings
Rancho San Carlos Pump Station
Monterey County, California

Figure No. 7
Project No. 1559
Date: 9/9/15

LOGGED BY SSC DATE DRILLED 8/24/15 BORING DIAMETER 8" HS BORING NO. 3

Depth (feet)	Sample No. and Type	Symbol	Soil Description	Unified Soil Classification	SPT "N" Value	Plasticity Index	Dry Density (pcf)	Moisture % of Dry Wt.	Misc. Lab Results
			Gray brown Sandy SILT, damp, stiff, non-plastic	ML					
1	3-1 L		Light gray brown Silty SAND, damp, loose	SM	9		90.2	5.3	34% passing #200 sieve
2									
3	3-2 T		Light gray brown fine-coarse grained SAND, damp, medium dense	SP	14			4.4	5% passing #200 sieve
4									
5									
6	3-3 L		Light gray fine-coarse grained SAND, damp, loose, trace gravels to 1/2"		6		100.1	3.3	2% passing #200 sieve
7									
8	3-4 T		Light gray fine-coarse grained SAND, damp, medium dense, trace gravels to 1/2"		11			3.4	
9									
10									
11									
12	3-5 T		Reddish light brown fine-medium grained SAND with Silt, damp-moist, medium dense, trace quartz gravels	SM-SP	18			8.6	11% passing #200 sieve
13									
14									
15	3-6 T			SP	16			2.5	
16			Light gray fine-coarse grained SAND, damp, medium dense, trace quartz gravels						
17									
18	3-7 T		 Groundwater encountered at 18½ feet.		16			16.4	4% passing #200 sieve
19									
20									
21			Light gray fine-coarse grained SAND, wet, medium dense, trace quartz gravels						
22			Boring terminated at 21½ feet. Groundwater encountered at 18½ feet.						
23									
24									

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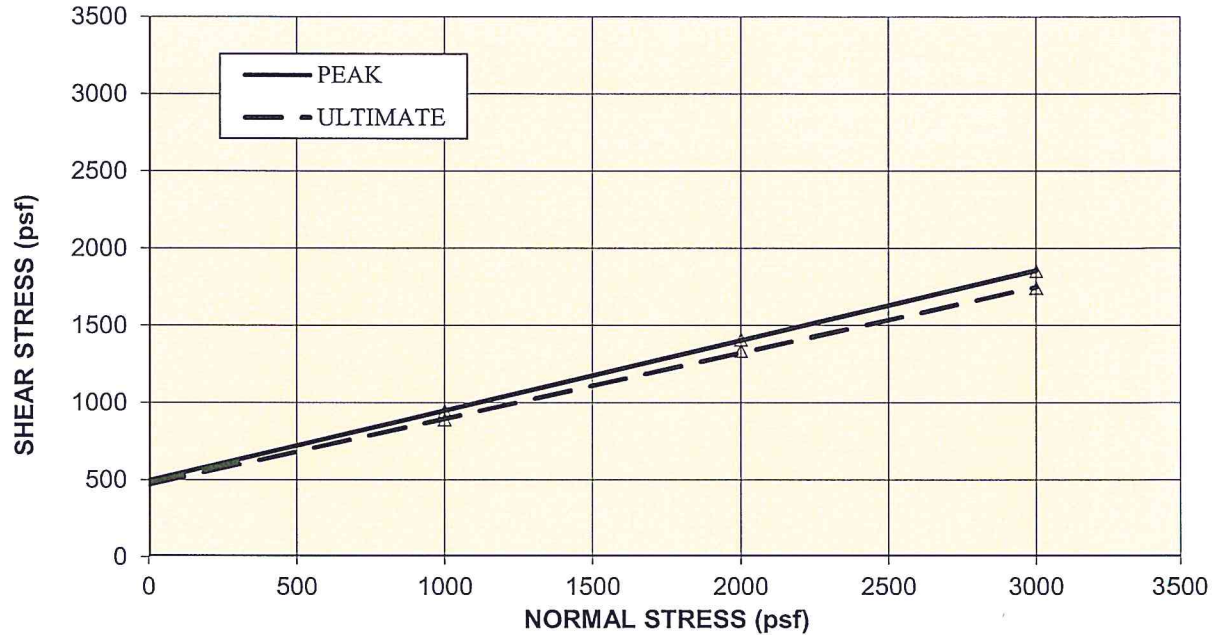
Log of Test Borings
Rancho San Carlos Pump Station
Monterey County, California

Figure No. 8
Project No. 1559
Date: 9/9/15

DIRECT SHEAR TEST - ASTM D3080

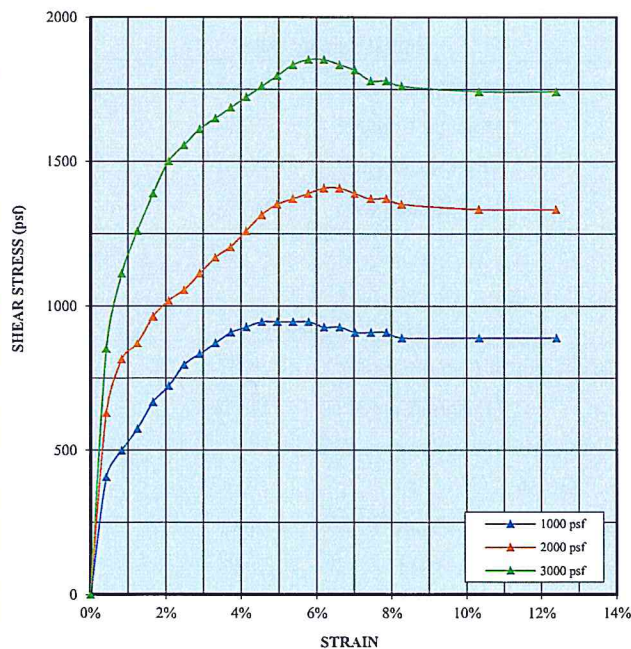
Direct Shear Test for Soils Under Consolidated Drained Conditions

PROJECT NO.	1559	DATE:	8/26/15
PROJECT:	Rancho San Carlos Pump Station	TESTED BY:	SSC



SAMPLE:	1-1-1	USCS:	ML
SAMPLE TYPE:	Undisturbed	Saturated	
SOIL TYPE:	Light Brown Sandy SILT		

	ϕ	C (psf)
PEAK	24	490
ULTIMATE	23	460



Initial Sample Data:

Wet Density (pcf)	102.1
Moisture Content:	6.3%
Dry Density (pcf)	96.1
% Saturation	22.4%

Sample Data At-Test:

Displacement Rate (mm/min):	0.8
Moisture Content:	23.5%

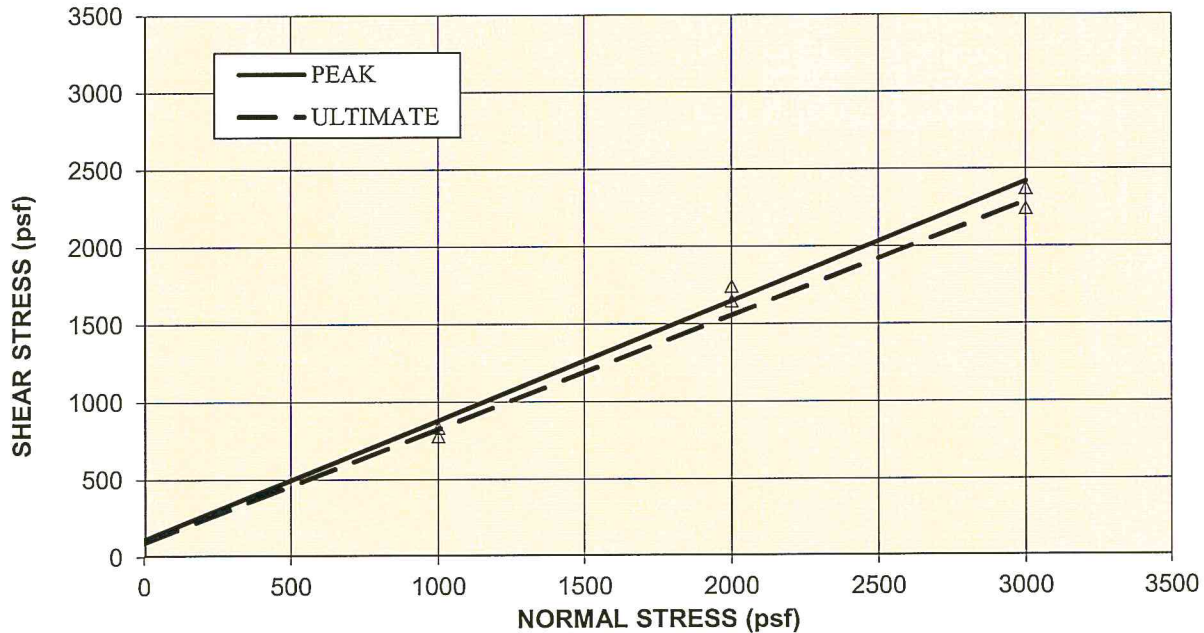
	1	2	3
Normal Stress:	1000	2000	3000
Peak Stress:	945	1409	1853
Ultimate Stress:	890	1334	1742

Figure No. 9

DIRECT SHEAR TEST - ASTM D3080

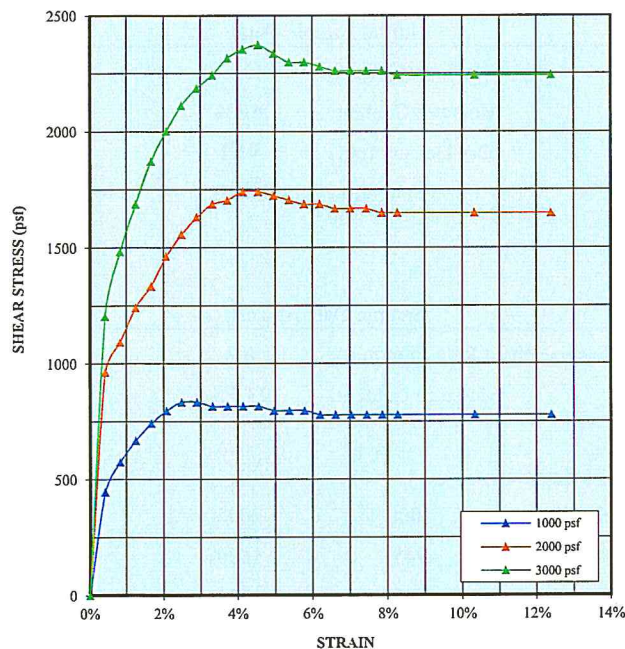
Direct Shear Test for Soils Under Consolidated Drained Conditions

PROJECT NO.	1559	DATE:	8/26/15
PROJECT:	Rancho San Carlos Pump Station	TESTED BY:	SSC



SAMPLE:	2-1-1	USCS:	SP
SAMPLE TYPE:	Undisturbed	Saturated	
SOIL TYPE:	Light Gray Brown SAND		

	ϕ	C (psf)
PEAK	38	110
ULTIMATE	36	90



Initial Sample Data:

Wet Density (pcf)	106.3
Moisture Content:	2.2%
Dry Density (pcf)	104.0
% Saturation	9.7%

Sample Data At-Test:

Displacement Rate (mm/min):	0.8		
Moisture Content:	22.9%		
Sample:	1	2	3
Normal Stress:	1000	2000	3000
Peak Stress:	834	1742	2372
Ultimate Stress:	778	1650	2243

Figure No. 10



R-value Test Report (Caltrans 301)

Job No.: 416-538	Date: 08/13/15				Initial Moisture, R-value by Stabilometer	<u>6.5%</u> 60	
Client: Pacific Crest Engineering	Tested MD						
Project: Rancho San Carlos - 1559	Reduced RU				Expansion Pressure	140	psf
Sample R-1	Checked DC						
Soil Type: Dark Olive Brown Silty SAND							
Specimen Number	A	B	C	D	Remarks:		
Exudation Pressure, psi	164	420	232				
Prepared Weight, grams	1200	1200	1200				
Final Water Added, grams/cc	73	55	64				
Weight of Soil & Mold, grams	3103	3147	3109				
Weight of Mold, grams	2085	2096	2098				
Height After Compaction, in.	2.41	2.49	2.42				
Moisture Content, %	13.0	11.4	12.2				
Dry Density, pcf	113.2	114.7	112.7				
Expansion Pressure, psf	55.9	141.9	107.5				
Stabilometer @ 1000							
Stabilometer @ 2000	62	37	45				
Turns Displacement	5.58	5.2	5				
R-value	39	61	54				

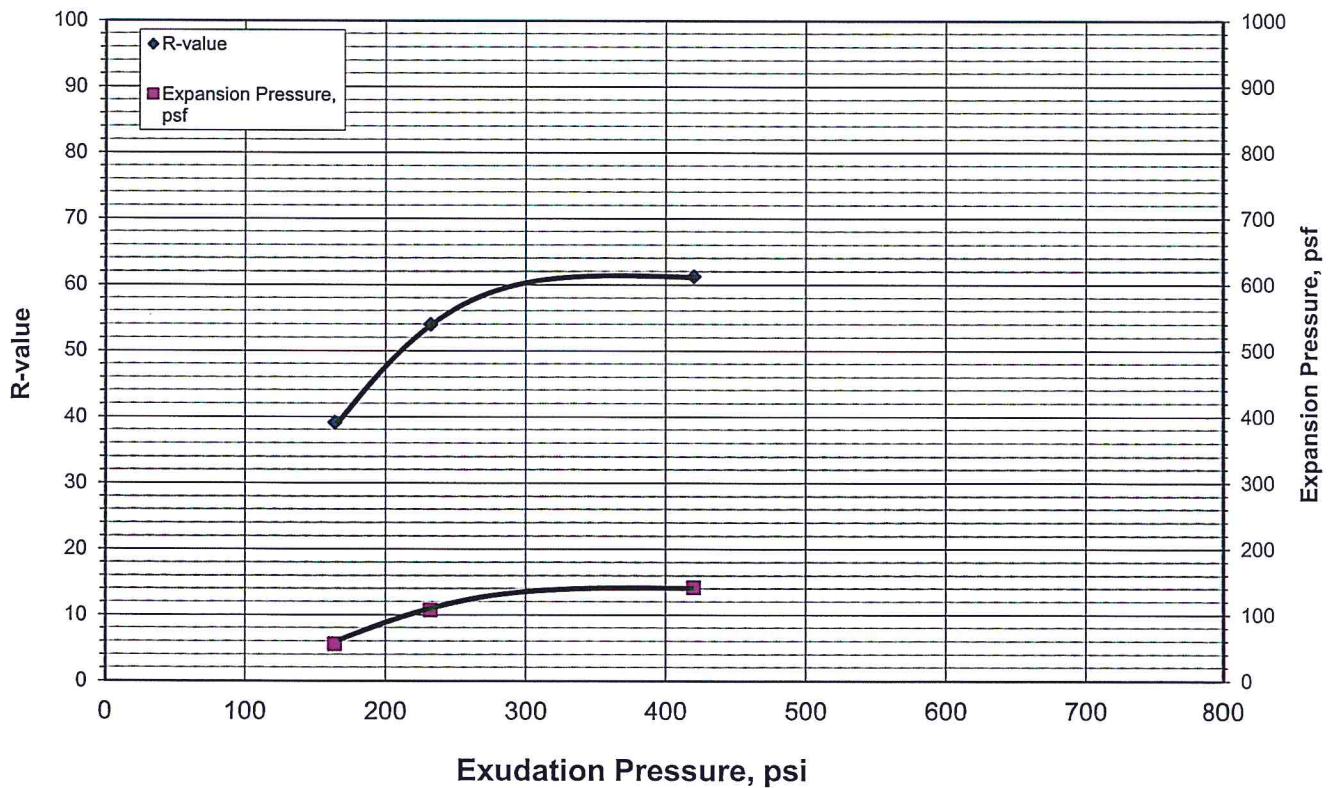


Figure No. 11



Figure No. 12

APPENDIX B

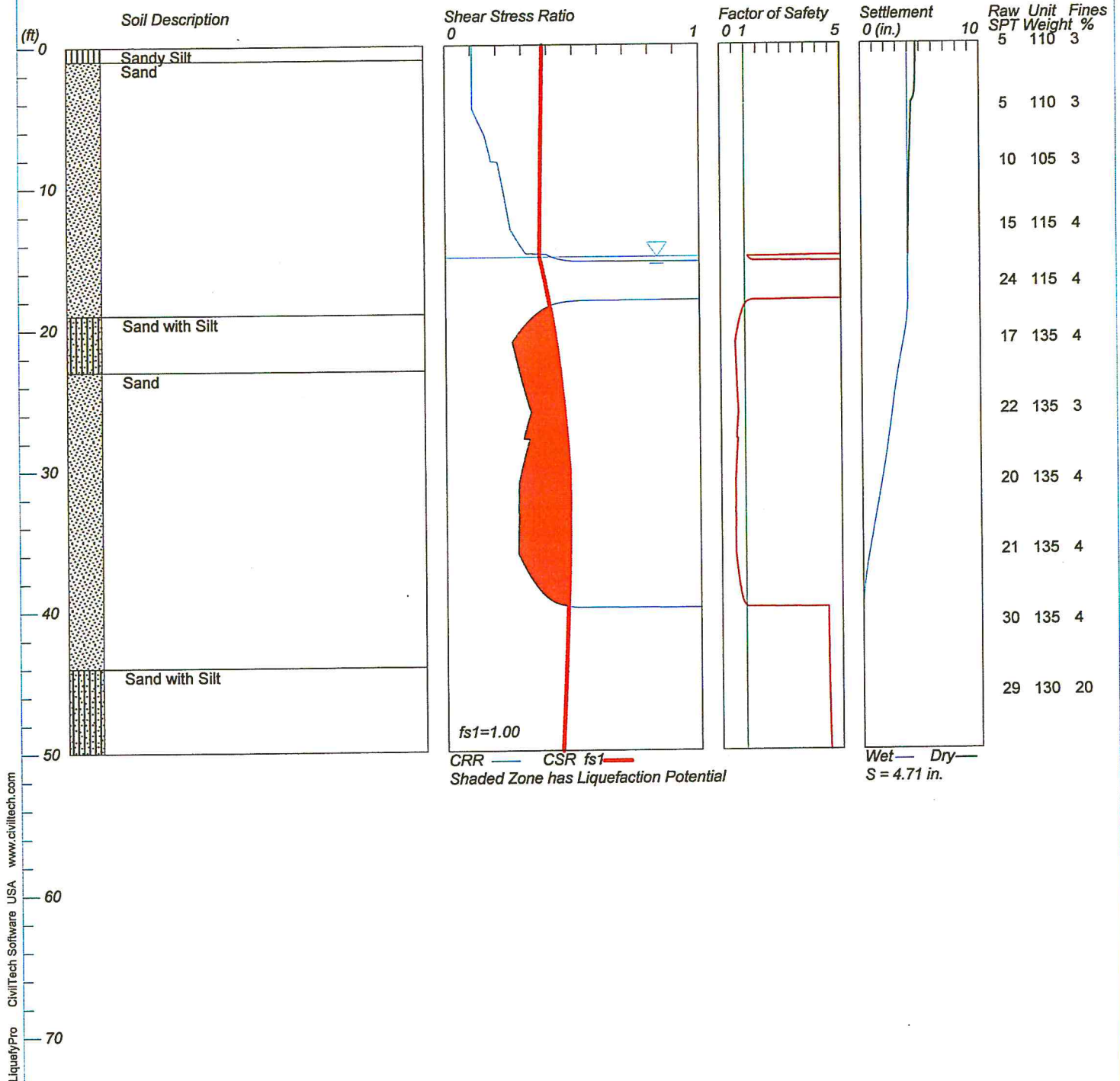
Quantitative Liquefaction Analysis

LIQUEFACTION ANALYSIS

Rancho San Carlos

Hole No.=B2 Water Depth=15 ft

Magnitude=7.3
Acceleration=.59g



LIQUEFACTION ANALYSIS CALCULATION

SHEET

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Input File Name: H:\PF\2015\1559 - Rancho San Carlos Pump Station -
Creegan and DAngelo\Liquefy\B2.liq
Title: Rancho San Carlos
Subtitle: 1559

Surface Elev.=
Hole No.=B2
Depth of Hole= 50.0 ft
Water Table during Earthquake= 15.0 ft
Water Table during In-Situ Testing= 18.0 ft
Max. Acceleration= 0.59 g
Earthquake Magnitude= 7.3

Input Data:

Surface Elev.=
Hole No.=B2
Depth of Hole=50.0 ft
Water Table during Earthquake= 15.0 ft
Water Table during In-Situ Testing= 18.0 ft
Max. Acceleration=0.59 g
Earthquake Magnitude=7.3

Earthquake Magnitude=7.3

2. Settlement Analysis Method: Ishihara / Yoshimine*
3. Fines Correction for Liquefaction: Idriss/Seed (SPT only)
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb=

1.15

8. Sampling Method, Cs= 1
9. User request factor of safety (apply to CSR) , User= 1
Plot one CSR curve (fsl=User)
10. Use Curve Smoothing: Yes*
- * Recommended Options

In-Situ Test Data:

Depth SPT	gamma Fines
ft	pcf %

0.0	5.0	110.0	3.0
4.5	5.0	110.0	3.0
8.5	10.0	105.0	3.0
13.0	15.0	115.0	4.0
17.0	24.0	115.0	4.0
21.0	17.0	135.0	4.0
26.0	22.0	135.0	3.0
31.0	20.0	135.0	4.0
36.0	21.0	135.0	4.0
41.0	30.0	135.0	4.0
46.0	29.0	130.0	20.0
50.0	29.0	130.0	20.0

Output Results:

Settlement of saturated sands=3.97 in.

Settlement of dry sands=0.74 in.

Total settlement of saturated and dry sands=4.71 in.

Differential Settlement=2.355 to 3.109 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
-------------	------	-------	------	---------------	--------------	--------------

0.00	0.11	0.38	5.00	3.97	0.74	4.71
0.05	0.11	0.38	5.00	3.97	0.74	4.71
0.10	0.11	0.38	5.00	3.97	0.74	4.71
0.15	0.11	0.38	5.00	3.97	0.74	4.71
0.20	0.11	0.38	5.00	3.97	0.74	4.71
0.25	0.11	0.38	5.00	3.97	0.74	4.71
0.30	0.11	0.38	5.00	3.97	0.74	4.71
0.35	0.11	0.38	5.00	3.97	0.74	4.71
0.40	0.11	0.38	5.00	3.97	0.74	4.71
0.45	0.11	0.38	5.00	3.97	0.74	4.71
0.50	0.11	0.38	5.00	3.97	0.73	4.71
0.55	0.11	0.38	5.00	3.97	0.73	4.71
0.60	0.11	0.38	5.00	3.97	0.73	4.71
0.65	0.11	0.38	5.00	3.97	0.73	4.71
0.70	0.11	0.38	5.00	3.97	0.73	4.71
0.75	0.11	0.38	5.00	3.97	0.73	4.71
0.80	0.11	0.38	5.00	3.97	0.73	4.70
0.85	0.11	0.38	5.00	3.97	0.73	4.70
0.90	0.11	0.38	5.00	3.97	0.73	4.70
0.95	0.11	0.38	5.00	3.97	0.73	4.70
1.00	0.11	0.38	5.00	3.97	0.73	4.70
1.05	0.11	0.38	5.00	3.97	0.73	4.70
1.10	0.11	0.38	5.00	3.97	0.73	4.70
1.15	0.11	0.38	5.00	3.97	0.73	4.70
1.20	0.11	0.38	5.00	3.97	0.73	4.70
1.25	0.11	0.38	5.00	3.97	0.72	4.70
1.30	0.11	0.38	5.00	3.97	0.72	4.70
1.35	0.11	0.38	5.00	3.97	0.72	4.70
1.40	0.11	0.38	5.00	3.97	0.72	4.70
1.45	0.11	0.38	5.00	3.97	0.72	4.69
1.50	0.11	0.38	5.00	3.97	0.72	4.69

1.55	0.11	0.38	5.00	3.97	0.72	4.69
1.60	0.11	0.38	5.00	3.97	0.72	4.69
1.65	0.11	0.38	5.00	3.97	0.72	4.69
1.70	0.11	0.38	5.00	3.97	0.72	4.69
1.75	0.11	0.38	5.00	3.97	0.72	4.69
1.80	0.11	0.38	5.00	3.97	0.71	4.69
1.85	0.11	0.38	5.00	3.97	0.71	4.69
1.90	0.11	0.38	5.00	3.97	0.71	4.69
1.95	0.11	0.38	5.00	3.97	0.71	4.69
2.00	0.11	0.38	5.00	3.97	0.71	4.68
2.05	0.11	0.38	5.00	3.97	0.71	4.68
2.10	0.11	0.38	5.00	3.97	0.71	4.68
2.15	0.11	0.38	5.00	3.97	0.71	4.68
2.20	0.11	0.38	5.00	3.97	0.71	4.68
2.25	0.11	0.38	5.00	3.97	0.70	4.68
2.30	0.11	0.38	5.00	3.97	0.70	4.68
2.35	0.11	0.38	5.00	3.97	0.70	4.68
2.40	0.11	0.38	5.00	3.97	0.70	4.67
2.45	0.11	0.38	5.00	3.97	0.70	4.67
2.50	0.11	0.38	5.00	3.97	0.70	4.67
2.55	0.11	0.38	5.00	3.97	0.70	4.67
2.60	0.11	0.38	5.00	3.97	0.69	4.67
2.65	0.11	0.38	5.00	3.97	0.69	4.67
2.70	0.11	0.38	5.00	3.97	0.69	4.66
2.75	0.11	0.38	5.00	3.97	0.69	4.66
2.80	0.11	0.38	5.00	3.97	0.69	4.66
2.85	0.11	0.38	5.00	3.97	0.69	4.66
2.90	0.11	0.38	5.00	3.97	0.68	4.66
2.95	0.11	0.38	5.00	3.97	0.68	4.65
3.00	0.11	0.38	5.00	3.97	0.68	4.65
3.05	0.11	0.38	5.00	3.97	0.67	4.65
3.10	0.11	0.38	5.00	3.97	0.67	4.64
3.15	0.11	0.38	5.00	3.97	0.67	4.64
3.20	0.11	0.38	5.00	3.97	0.66	4.64
3.25	0.11	0.38	5.00	3.97	0.66	4.63
3.30	0.11	0.38	5.00	3.97	0.65	4.63
3.35	0.11	0.38	5.00	3.97	0.65	4.62
3.40	0.11	0.38	5.00	3.97	0.64	4.61
3.45	0.11	0.38	5.00	3.97	0.63	4.61
3.50	0.11	0.38	5.00	3.97	0.63	4.60
3.55	0.11	0.38	5.00	3.97	0.62	4.59
3.60	0.11	0.38	5.00	3.97	0.61	4.58
3.65	0.11	0.38	5.00	3.97	0.60	4.57
3.70	0.11	0.38	5.00	3.97	0.59	4.56
3.75	0.11	0.38	5.00	3.97	0.57	4.55
3.80	0.11	0.38	5.00	3.97	0.56	4.53
3.85	0.11	0.38	5.00	3.97	0.54	4.51
3.90	0.11	0.38	5.00	3.97	0.52	4.49
3.95	0.11	0.38	5.00	3.97	0.50	4.47
4.00	0.11	0.38	5.00	3.97	0.47	4.44
4.05	0.11	0.38	5.00	3.97	0.44	4.41
4.10	0.11	0.38	5.00	3.97	0.41	4.38
4.15	0.11	0.38	5.00	3.97	0.38	4.35
4.20	0.11	0.38	5.00	3.97	0.35	4.32

4.25	0.11	0.38	5.00	3.97	0.34	4.32
4.30	0.11	0.38	5.00	3.97	0.34	4.31
4.35	0.11	0.38	5.00	3.97	0.34	4.31
4.40	0.11	0.38	5.00	3.97	0.34	4.31
4.45	0.11	0.38	5.00	3.97	0.33	4.31
4.50	0.11	0.38	5.00	3.97	0.33	4.31
4.55	0.11	0.38	5.00	3.97	0.33	4.30
4.60	0.11	0.38	5.00	3.97	0.33	4.30
4.65	0.11	0.38	5.00	3.97	0.33	4.30
4.70	0.11	0.38	5.00	3.97	0.32	4.30
4.75	0.11	0.38	5.00	3.97	0.32	4.29
4.80	0.11	0.38	5.00	3.97	0.32	4.29
4.85	0.12	0.38	5.00	3.97	0.32	4.29
4.90	0.12	0.38	5.00	3.97	0.31	4.29
4.95	0.12	0.38	5.00	3.97	0.31	4.28
5.00	0.12	0.38	5.00	3.97	0.31	4.28
5.05	0.12	0.38	5.00	3.97	0.31	4.28
5.10	0.12	0.38	5.00	3.97	0.30	4.28
5.15	0.12	0.38	5.00	3.97	0.30	4.28
5.20	0.12	0.38	5.00	3.97	0.30	4.27
5.25	0.13	0.38	5.00	3.97	0.30	4.27
5.30	0.13	0.38	5.00	3.97	0.30	4.27
5.35	0.13	0.38	5.00	3.97	0.29	4.27
5.40	0.13	0.38	5.00	3.97	0.29	4.27
5.45	0.13	0.38	5.00	3.97	0.29	4.26
5.50	0.13	0.38	5.00	3.97	0.29	4.26
5.55	0.13	0.38	5.00	3.97	0.29	4.26
5.60	0.14	0.38	5.00	3.97	0.28	4.26
5.65	0.14	0.38	5.00	3.97	0.28	4.25
5.70	0.14	0.38	5.00	3.97	0.28	4.25
5.75	0.14	0.38	5.00	3.97	0.28	4.25
5.80	0.14	0.38	5.00	3.97	0.28	4.25
5.85	0.14	0.38	5.00	3.97	0.27	4.25
5.90	0.14	0.38	5.00	3.97	0.27	4.24
5.95	0.14	0.38	5.00	3.97	0.27	4.24
6.00	0.15	0.38	5.00	3.97	0.27	4.24
6.05	0.15	0.38	5.00	3.97	0.27	4.24
6.10	0.15	0.38	5.00	3.97	0.26	4.24
6.15	0.15	0.38	5.00	3.97	0.26	4.23
6.20	0.15	0.38	5.00	3.97	0.26	4.23
6.25	0.15	0.38	5.00	3.97	0.26	4.23
6.30	0.15	0.38	5.00	3.97	0.26	4.23
6.35	0.15	0.38	5.00	3.97	0.25	4.23
6.40	0.16	0.38	5.00	3.97	0.25	4.22
6.45	0.16	0.38	5.00	3.97	0.25	4.22
6.50	0.16	0.38	5.00	3.97	0.25	4.22
6.55	0.16	0.38	5.00	3.97	0.25	4.22
6.60	0.16	0.38	5.00	3.97	0.24	4.22
6.65	0.16	0.38	5.00	3.97	0.24	4.22
6.70	0.16	0.38	5.00	3.97	0.24	4.21
6.75	0.16	0.38	5.00	3.97	0.24	4.21
6.80	0.16	0.38	5.00	3.97	0.24	4.21
6.85	0.16	0.38	5.00	3.97	0.23	4.21
6.90	0.16	0.38	5.00	3.97	0.23	4.20

6.95	0.16	0.38	5.00	3.97	0.23	4.20
7.00	0.16	0.38	5.00	3.97	0.23	4.20
7.05	0.16	0.38	5.00	3.97	0.22	4.20
7.10	0.17	0.38	5.00	3.97	0.22	4.20
7.15	0.17	0.38	5.00	3.97	0.22	4.19
7.20	0.17	0.38	5.00	3.97	0.22	4.19
7.25	0.17	0.38	5.00	3.97	0.22	4.19
7.30	0.17	0.38	5.00	3.97	0.21	4.19
7.35	0.17	0.38	5.00	3.97	0.21	4.18
7.40	0.17	0.38	5.00	3.97	0.21	4.18
7.45	0.17	0.38	5.00	3.97	0.21	4.18
7.50	0.17	0.38	5.00	3.97	0.20	4.18
7.55	0.17	0.38	5.00	3.97	0.20	4.18
7.60	0.17	0.38	5.00	3.97	0.20	4.17
7.65	0.17	0.38	5.00	3.97	0.20	4.17
7.70	0.17	0.38	5.00	3.97	0.19	4.17
7.75	0.17	0.38	5.00	3.97	0.19	4.17
7.80	0.17	0.38	5.00	3.97	0.19	4.16
7.85	0.18	0.38	5.00	3.97	0.19	4.16
7.90	0.18	0.38	5.00	3.97	0.18	4.16
7.95	0.18	0.38	5.00	3.97	0.18	4.16
8.00	0.18	0.38	5.00	3.97	0.18	4.15
8.05	0.18	0.38	5.00	3.97	0.18	4.15
8.10	0.18	0.38	5.00	3.97	0.17	4.15
8.15	0.18	0.38	5.00	3.97	0.17	4.14
8.20	0.18	0.38	5.00	3.97	0.17	4.14
8.25	0.20	0.38	5.00	3.97	0.17	4.14
8.30	0.20	0.38	5.00	3.97	0.16	4.14
8.35	0.21	0.38	5.00	3.97	0.16	4.14
8.40	0.21	0.38	5.00	3.97	0.16	4.13
8.45	0.21	0.38	5.00	3.97	0.16	4.13
8.50	0.21	0.38	5.00	3.97	0.16	4.13
8.55	0.21	0.38	5.00	3.97	0.16	4.13
8.60	0.21	0.38	5.00	3.97	0.15	4.13
8.65	0.21	0.38	5.00	3.97	0.15	4.13
8.70	0.21	0.38	5.00	3.97	0.15	4.12
8.75	0.21	0.38	5.00	3.97	0.15	4.12
8.80	0.21	0.38	5.00	3.97	0.15	4.12
8.85	0.21	0.38	5.00	3.97	0.14	4.12
8.90	0.21	0.38	5.00	3.97	0.14	4.12
8.95	0.21	0.38	5.00	3.97	0.14	4.11
9.00	0.21	0.38	5.00	3.97	0.14	4.11
9.05	0.21	0.38	5.00	3.97	0.14	4.11
9.10	0.21	0.38	5.00	3.97	0.14	4.11
9.15	0.21	0.38	5.00	3.97	0.13	4.11
9.20	0.22	0.38	5.00	3.97	0.13	4.10
9.25	0.22	0.38	5.00	3.97	0.13	4.10
9.30	0.22	0.38	5.00	3.97	0.13	4.10
9.35	0.22	0.38	5.00	3.97	0.12	4.10
9.40	0.22	0.38	5.00	3.97	0.12	4.10
9.45	0.22	0.38	5.00	3.97	0.12	4.09
9.50	0.22	0.38	5.00	3.97	0.12	4.09
9.55	0.22	0.37	5.00	3.97	0.12	4.09
9.60	0.22	0.37	5.00	3.97	0.11	4.09

9.65	0.22	0.37	5.00	3.97	0.11	4.09
9.70	0.22	0.37	5.00	3.97	0.11	4.08
9.75	0.22	0.37	5.00	3.97	0.11	4.08
9.80	0.22	0.37	5.00	3.97	0.10	4.08
9.85	0.22	0.37	5.00	3.97	0.10	4.08
9.90	0.22	0.37	5.00	3.97	0.10	4.07
9.95	0.22	0.37	5.00	3.97	0.10	4.07
10.00	0.22	0.37	5.00	3.97	0.10	4.07
10.05	0.22	0.37	5.00	3.97	0.10	4.07
10.10	0.22	0.37	5.00	3.97	0.09	4.07
10.15	0.23	0.37	5.00	3.97	0.09	4.07
10.20	0.23	0.37	5.00	3.97	0.09	4.07
10.25	0.23	0.37	5.00	3.97	0.09	4.07
10.30	0.23	0.37	5.00	3.97	0.09	4.06
10.35	0.23	0.37	5.00	3.97	0.09	4.06
10.40	0.23	0.37	5.00	3.97	0.09	4.06
10.45	0.23	0.37	5.00	3.97	0.09	4.06
10.50	0.23	0.37	5.00	3.97	0.09	4.06
10.55	0.23	0.37	5.00	3.97	0.09	4.06
10.60	0.23	0.37	5.00	3.97	0.09	4.06
10.65	0.23	0.37	5.00	3.97	0.08	4.06
10.70	0.23	0.37	5.00	3.97	0.08	4.06
10.75	0.23	0.37	5.00	3.97	0.08	4.06
10.80	0.23	0.37	5.00	3.97	0.08	4.06
10.85	0.23	0.37	5.00	3.97	0.08	4.05
10.90	0.23	0.37	5.00	3.97	0.08	4.05
10.95	0.23	0.37	5.00	3.97	0.08	4.05
11.00	0.23	0.37	5.00	3.97	0.08	4.05
11.05	0.23	0.37	5.00	3.97	0.08	4.05
11.10	0.24	0.37	5.00	3.97	0.08	4.05
11.15	0.24	0.37	5.00	3.97	0.07	4.05
11.20	0.24	0.37	5.00	3.97	0.07	4.05
11.25	0.24	0.37	5.00	3.97	0.07	4.05
11.30	0.24	0.37	5.00	3.97	0.07	4.05
11.35	0.24	0.37	5.00	3.97	0.07	4.04
11.40	0.24	0.37	5.00	3.97	0.07	4.04
11.45	0.24	0.37	5.00	3.97	0.07	4.04
11.50	0.24	0.37	5.00	3.97	0.07	4.04
11.55	0.24	0.37	5.00	3.97	0.07	4.04
11.60	0.24	0.37	5.00	3.97	0.07	4.04
11.65	0.24	0.37	5.00	3.97	0.06	4.04
11.70	0.24	0.37	5.00	3.97	0.06	4.04
11.75	0.24	0.37	5.00	3.97	0.06	4.04
11.80	0.24	0.37	5.00	3.97	0.06	4.04
11.85	0.24	0.37	5.00	3.97	0.06	4.03
11.90	0.24	0.37	5.00	3.97	0.06	4.03
11.95	0.24	0.37	5.00	3.97	0.06	4.03
12.00	0.24	0.37	5.00	3.97	0.06	4.03
12.05	0.24	0.37	5.00	3.97	0.06	4.03
12.10	0.25	0.37	5.00	3.97	0.06	4.03
12.15	0.25	0.37	5.00	3.97	0.05	4.03
12.20	0.25	0.37	5.00	3.97	0.05	4.03
12.25	0.25	0.37	5.00	3.97	0.05	4.03
12.30	0.25	0.37	5.00	3.97	0.05	4.03

12.35	0.25	0.37	5.00	3.97	0.05	4.02
12.40	0.25	0.37	5.00	3.97	0.05	4.02
12.45	0.25	0.37	5.00	3.97	0.05	4.02
12.50	0.25	0.37	5.00	3.97	0.05	4.02
12.55	0.25	0.37	5.00	3.97	0.05	4.02
12.60	0.25	0.37	5.00	3.97	0.05	4.02
12.65	0.25	0.37	5.00	3.97	0.04	4.02
12.70	0.25	0.37	5.00	3.97	0.04	4.02
12.75	0.25	0.37	5.00	3.97	0.04	4.02
12.80	0.25	0.37	5.00	3.97	0.04	4.01
12.85	0.25	0.37	5.00	3.97	0.04	4.01
12.90	0.25	0.37	5.00	3.97	0.04	4.01
12.95	0.25	0.37	5.00	3.97	0.04	4.01
13.00	0.25	0.37	5.00	3.97	0.04	4.01
13.05	0.26	0.37	5.00	3.97	0.04	4.01
13.10	0.26	0.37	5.00	3.97	0.04	4.01
13.15	0.26	0.37	5.00	3.97	0.03	4.01
13.20	0.26	0.37	5.00	3.97	0.03	4.01
13.25	0.26	0.37	5.00	3.97	0.03	4.01
13.30	0.26	0.37	5.00	3.97	0.03	4.00
13.35	0.27	0.37	5.00	3.97	0.03	4.00
13.40	0.27	0.37	5.00	3.97	0.03	4.00
13.45	0.27	0.37	5.00	3.97	0.03	4.00
13.50	0.27	0.37	5.00	3.97	0.03	4.00
13.55	0.27	0.37	5.00	3.97	0.03	4.00
13.60	0.27	0.37	5.00	3.97	0.02	4.00
13.65	0.28	0.37	5.00	3.97	0.02	4.00
13.70	0.28	0.37	5.00	3.97	0.02	4.00
13.75	0.28	0.37	5.00	3.97	0.02	4.00
13.80	0.28	0.37	5.00	3.97	0.02	3.99
13.85	0.28	0.37	5.00	3.97	0.02	3.99
13.90	0.28	0.37	5.00	3.97	0.02	3.99
13.95	0.29	0.37	5.00	3.97	0.02	3.99
14.00	0.29	0.37	5.00	3.97	0.02	3.99
14.05	0.29	0.37	5.00	3.97	0.02	3.99
14.10	0.29	0.37	5.00	3.97	0.02	3.99
14.15	0.29	0.37	5.00	3.97	0.01	3.99
14.20	0.29	0.37	5.00	3.97	0.01	3.99
14.25	0.30	0.37	5.00	3.97	0.01	3.99
14.30	0.30	0.37	5.00	3.97	0.01	3.98
14.35	0.30	0.37	5.00	3.97	0.01	3.98
14.40	0.30	0.37	5.00	3.97	0.01	3.98
14.45	0.30	0.37	5.00	3.97	0.01	3.98
14.50	0.31	0.37	5.00	3.97	0.01	3.98
14.55	0.31	0.37	5.00	3.97	0.01	3.98
14.60	0.31	0.37	5.00	3.97	0.01	3.98
14.65	0.31	0.37	5.00	3.97	0.01	3.98
14.70	0.31	0.37	5.00	3.97	0.00	3.98
14.75	0.32	0.37	5.00	3.97	0.00	3.98
14.80	0.40	0.37	5.00	3.97	0.00	3.98
14.85	0.40	0.37	5.00	3.97	0.00	3.98
14.90	0.41	0.37	5.00	3.97	0.00	3.97
14.95	0.41	0.37	5.00	3.97	0.00	3.97
15.00	0.42	0.37	1.13	3.97	0.00	3.97

15.05	0.42	0.37	1.15	3.97	0.00	3.97
15.10	0.43	0.37	1.17	3.97	0.00	3.97
15.15	0.44	0.37	1.19	3.97	0.00	3.97
15.20	0.46	0.37	1.22	3.97	0.00	3.97
15.25	0.47	0.37	1.26	3.96	0.00	3.96
15.30	0.50	0.37	1.33	3.96	0.00	3.96
15.35	2.14	0.37	5.00	3.96	0.00	3.96
15.40	2.14	0.38	5.00	3.96	0.00	3.96
15.45	2.14	0.38	5.00	3.96	0.00	3.96
15.50	2.14	0.38	5.00	3.96	0.00	3.96
15.55	2.14	0.38	5.00	3.96	0.00	3.96
15.60	2.14	0.38	5.00	3.96	0.00	3.96
15.65	2.14	0.38	5.00	3.96	0.00	3.96
15.70	2.14	0.38	5.00	3.96	0.00	3.96
15.75	2.14	0.38	5.00	3.96	0.00	3.96
15.80	2.14	0.38	5.00	3.96	0.00	3.96
15.85	2.14	0.38	5.00	3.96	0.00	3.96
15.90	2.14	0.38	5.00	3.96	0.00	3.96
15.95	2.14	0.38	5.00	3.96	0.00	3.96
16.00	2.14	0.38	5.00	3.96	0.00	3.96
16.05	2.14	0.38	5.00	3.96	0.00	3.96
16.10	2.14	0.38	5.00	3.96	0.00	3.96
16.15	2.14	0.38	5.00	3.96	0.00	3.96
16.20	2.14	0.39	5.00	3.96	0.00	3.96
16.25	2.14	0.39	5.00	3.96	0.00	3.96
16.30	2.14	0.39	5.00	3.96	0.00	3.96
16.35	2.14	0.39	5.00	3.96	0.00	3.96
16.40	2.14	0.39	5.00	3.96	0.00	3.96
16.45	2.14	0.39	5.00	3.96	0.00	3.96
16.50	2.14	0.39	5.00	3.96	0.00	3.96
16.55	2.14	0.39	5.00	3.96	0.00	3.96
16.60	2.14	0.39	5.00	3.96	0.00	3.96
16.65	2.14	0.39	5.00	3.96	0.00	3.96
16.70	2.14	0.39	5.00	3.96	0.00	3.96
16.75	2.14	0.39	5.00	3.96	0.00	3.96
16.80	2.14	0.39	5.00	3.96	0.00	3.96
16.85	2.14	0.39	5.00	3.96	0.00	3.96
16.90	2.14	0.39	5.00	3.96	0.00	3.96
16.95	2.14	0.39	5.00	3.96	0.00	3.96
17.00	2.14	0.39	5.00	3.96	0.00	3.96
17.05	2.14	0.40	5.00	3.96	0.00	3.96
17.10	2.14	0.40	5.00	3.96	0.00	3.96
17.15	2.14	0.40	5.00	3.96	0.00	3.96
17.20	2.14	0.40	5.00	3.96	0.00	3.96
17.25	2.14	0.40	5.00	3.96	0.00	3.96
17.30	2.14	0.40	5.00	3.96	0.00	3.96
17.35	2.14	0.40	5.00	3.96	0.00	3.96
17.40	2.14	0.40	5.00	3.96	0.00	3.96
17.45	2.14	0.40	5.00	3.96	0.00	3.96
17.50	2.14	0.40	5.00	3.96	0.00	3.96
17.55	2.14	0.40	5.00	3.96	0.00	3.96
17.60	2.14	0.40	5.00	3.96	0.00	3.96
17.65	2.14	0.40	5.00	3.96	0.00	3.96
17.70	2.14	0.40	5.00	3.96	0.00	3.96

17.75	2.14	0.40	5.00	3.96	0.00	3.96
17.80	2.14	0.40	5.00	3.96	0.00	3.96
17.85	2.14	0.40	5.00	3.96	0.00	3.96
17.90	2.14	0.40	5.00	3.96	0.00	3.96
17.95	2.14	0.40	5.00	3.96	0.00	3.96
18.00	2.14	0.41	5.00	3.96	0.00	3.96
18.05	2.14	0.41	5.00	3.96	0.00	3.96
18.10	0.53	0.41	1.31	3.96	0.00	3.96
18.15	0.49	0.41	1.20	3.96	0.00	3.96
18.20	0.46	0.41	1.13	3.96	0.00	3.96
18.25	0.45	0.41	1.09	3.96	0.00	3.96
18.30	0.43	0.41	1.06	3.95	0.00	3.95
18.35	0.42	0.41	1.03	3.95	0.00	3.95
18.40	0.42	0.41	1.01	3.95	0.00	3.95
18.45	0.41	0.41	0.99*	3.95	0.00	3.95
18.50	0.40	0.41	0.98*	3.94	0.00	3.94
18.55	0.40	0.41	0.96*	3.94	0.00	3.94
18.60	0.39	0.41	0.95*	3.94	0.00	3.94
18.65	0.39	0.41	0.94*	3.93	0.00	3.93
18.70	0.38	0.41	0.92*	3.93	0.00	3.93
18.75	0.38	0.41	0.91*	3.93	0.00	3.93
18.80	0.37	0.41	0.90*	3.92	0.00	3.92
18.85	0.37	0.41	0.89*	3.92	0.00	3.92
18.90	0.36	0.41	0.88*	3.91	0.00	3.91
18.95	0.36	0.41	0.87*	3.91	0.00	3.91
19.00	0.36	0.42	0.86*	3.90	0.00	3.90
19.05	0.35	0.42	0.85*	3.90	0.00	3.90
19.10	0.35	0.42	0.84*	3.89	0.00	3.89
19.15	0.35	0.42	0.83*	3.89	0.00	3.89
19.20	0.34	0.42	0.82*	3.88	0.00	3.88
19.25	0.34	0.42	0.81*	3.88	0.00	3.88
19.30	0.34	0.42	0.81*	3.87	0.00	3.87
19.35	0.33	0.42	0.80*	3.86	0.00	3.86
19.40	0.33	0.42	0.79*	3.86	0.00	3.86
19.45	0.33	0.42	0.78*	3.85	0.00	3.85
19.50	0.33	0.42	0.78*	3.84	0.00	3.84
19.55	0.32	0.42	0.77*	3.84	0.00	3.84
19.60	0.32	0.42	0.76*	3.83	0.00	3.83
19.65	0.32	0.42	0.75*	3.82	0.00	3.82
19.70	0.31	0.42	0.75*	3.82	0.00	3.82
19.75	0.31	0.42	0.74*	3.81	0.00	3.81
19.80	0.31	0.42	0.73*	3.80	0.00	3.80
19.85	0.31	0.42	0.73*	3.79	0.00	3.79
19.90	0.31	0.42	0.72*	3.78	0.00	3.78
19.95	0.30	0.42	0.71*	3.78	0.00	3.78
20.00	0.30	0.42	0.71*	3.77	0.00	3.77
20.05	0.30	0.43	0.70*	3.76	0.00	3.76
20.10	0.30	0.43	0.70*	3.75	0.00	3.75
20.15	0.29	0.43	0.69*	3.74	0.00	3.74
20.20	0.29	0.43	0.68*	3.73	0.00	3.73
20.25	0.29	0.43	0.68*	3.72	0.00	3.72
20.30	0.29	0.43	0.67*	3.71	0.00	3.71
20.35	0.28	0.43	0.67*	3.70	0.00	3.70
20.40	0.28	0.43	0.66*	3.69	0.00	3.69

20.45	0.28	0.43	0.66*	3.68	0.00	3.68
20.50	0.28	0.43	0.65*	3.67	0.00	3.67
20.55	0.28	0.43	0.64*	3.66	0.00	3.66
20.60	0.27	0.43	0.64*	3.65	0.00	3.65
20.65	0.27	0.43	0.63*	3.64	0.00	3.64
20.70	0.27	0.43	0.63*	3.63	0.00	3.63
20.75	0.27	0.43	0.62*	3.62	0.00	3.62
20.80	0.27	0.43	0.62*	3.61	0.00	3.61
20.85	0.27	0.43	0.61*	3.60	0.00	3.60
20.90	0.26	0.43	0.61*	3.58	0.00	3.58
20.95	0.26	0.43	0.60*	3.57	0.00	3.57
21.00	0.26	0.43	0.60*	3.56	0.00	3.56
21.05	0.26	0.43	0.60*	3.55	0.00	3.55
21.10	0.26	0.43	0.60*	3.54	0.00	3.54
21.15	0.26	0.43	0.60*	3.53	0.00	3.53
21.20	0.26	0.43	0.60*	3.51	0.00	3.51
21.25	0.26	0.43	0.60*	3.50	0.00	3.50
21.30	0.26	0.44	0.61*	3.49	0.00	3.49
21.35	0.26	0.44	0.61*	3.48	0.00	3.48
21.40	0.26	0.44	0.61*	3.47	0.00	3.47
21.45	0.27	0.44	0.61*	3.46	0.00	3.46
21.50	0.27	0.44	0.61*	3.45	0.00	3.45
21.55	0.27	0.44	0.61*	3.43	0.00	3.43
21.60	0.27	0.44	0.61*	3.42	0.00	3.42
21.65	0.27	0.44	0.61*	3.41	0.00	3.41
21.70	0.27	0.44	0.61*	3.40	0.00	3.40
21.75	0.27	0.44	0.61*	3.39	0.00	3.39
21.80	0.27	0.44	0.62*	3.38	0.00	3.38
21.85	0.27	0.44	0.62*	3.37	0.00	3.37
21.90	0.27	0.44	0.62*	3.36	0.00	3.36
21.95	0.27	0.44	0.62*	3.34	0.00	3.34
22.00	0.27	0.44	0.62*	3.33	0.00	3.33
22.05	0.27	0.44	0.62*	3.32	0.00	3.32
22.10	0.27	0.44	0.62*	3.31	0.00	3.31
22.15	0.27	0.44	0.62*	3.30	0.00	3.30
22.20	0.28	0.44	0.62*	3.29	0.00	3.29
22.25	0.28	0.44	0.62*	3.28	0.00	3.28
22.30	0.28	0.44	0.63*	3.27	0.00	3.27
22.35	0.28	0.44	0.63*	3.26	0.00	3.26
22.40	0.28	0.44	0.63*	3.25	0.00	3.25
22.45	0.28	0.44	0.63*	3.24	0.00	3.24
22.50	0.28	0.44	0.63*	3.22	0.00	3.22
22.55	0.28	0.44	0.63*	3.21	0.00	3.21
22.60	0.28	0.44	0.63*	3.20	0.00	3.20
22.65	0.28	0.44	0.63*	3.19	0.00	3.19
22.70	0.28	0.45	0.63*	3.18	0.00	3.18
22.75	0.28	0.45	0.63*	3.17	0.00	3.17
22.80	0.28	0.45	0.64*	3.16	0.00	3.16
22.85	0.28	0.45	0.64*	3.15	0.00	3.15
22.90	0.28	0.45	0.64*	3.14	0.00	3.14
22.95	0.29	0.45	0.64*	3.13	0.00	3.13
23.00	0.29	0.45	0.64*	3.12	0.00	3.12
23.05	0.29	0.45	0.64*	3.11	0.00	3.11
23.10	0.29	0.45	0.64*	3.10	0.00	3.10

23.15	0.29	0.45	0.64*	3.09	0.00	3.09
23.20	0.29	0.45	0.64*	3.08	0.00	3.08
23.25	0.29	0.45	0.65*	3.07	0.00	3.07
23.30	0.29	0.45	0.65*	3.06	0.00	3.06
23.35	0.29	0.45	0.65*	3.05	0.00	3.05
23.40	0.29	0.45	0.65*	3.04	0.00	3.04
23.45	0.29	0.45	0.65*	3.03	0.00	3.03
23.50	0.29	0.45	0.65*	3.02	0.00	3.02
23.55	0.29	0.45	0.65*	3.01	0.00	3.01
23.60	0.29	0.45	0.65*	3.00	0.00	3.00
23.65	0.30	0.45	0.65*	2.99	0.00	2.99
23.70	0.30	0.45	0.66*	2.98	0.00	2.98
23.75	0.30	0.45	0.66*	2.97	0.00	2.97
23.80	0.30	0.45	0.66*	2.96	0.00	2.96
23.85	0.30	0.45	0.66*	2.95	0.00	2.95
23.90	0.30	0.45	0.66*	2.94	0.00	2.94
23.95	0.30	0.45	0.66*	2.93	0.00	2.93
24.00	0.30	0.45	0.66*	2.92	0.00	2.92
24.05	0.30	0.45	0.66*	2.92	0.00	2.92
24.10	0.30	0.45	0.67*	2.91	0.00	2.91
24.15	0.30	0.45	0.67*	2.90	0.00	2.90
24.20	0.30	0.45	0.67*	2.89	0.00	2.89
24.25	0.30	0.46	0.67*	2.88	0.00	2.88
24.30	0.31	0.46	0.67*	2.87	0.00	2.87
24.35	0.31	0.46	0.67*	2.86	0.00	2.86
24.40	0.31	0.46	0.67*	2.85	0.00	2.85
24.45	0.31	0.46	0.67*	2.84	0.00	2.84
24.50	0.31	0.46	0.68*	2.83	0.00	2.83
24.55	0.31	0.46	0.68*	2.82	0.00	2.82
24.60	0.31	0.46	0.68*	2.82	0.00	2.82
24.65	0.31	0.46	0.68*	2.81	0.00	2.81
24.70	0.31	0.46	0.68*	2.80	0.00	2.80
24.75	0.31	0.46	0.68*	2.79	0.00	2.79
24.80	0.31	0.46	0.68*	2.78	0.00	2.78
24.85	0.31	0.46	0.68*	2.77	0.00	2.77
24.90	0.31	0.46	0.69*	2.76	0.00	2.76
24.95	0.32	0.46	0.69*	2.76	0.00	2.76
25.00	0.32	0.46	0.69*	2.75	0.00	2.75
25.05	0.32	0.46	0.69*	2.74	0.00	2.74
25.10	0.32	0.46	0.69*	2.73	0.00	2.73
25.15	0.32	0.46	0.69*	2.72	0.00	2.72
25.20	0.32	0.46	0.69*	2.71	0.00	2.71
25.25	0.32	0.46	0.70*	2.71	0.00	2.71
25.30	0.32	0.46	0.70*	2.70	0.00	2.70
25.35	0.32	0.46	0.70*	2.69	0.00	2.69
25.40	0.32	0.46	0.70*	2.68	0.00	2.68
25.45	0.32	0.46	0.70*	2.67	0.00	2.67
25.50	0.32	0.46	0.70*	2.67	0.00	2.67
25.55	0.33	0.46	0.70*	2.66	0.00	2.66
25.60	0.33	0.46	0.70*	2.65	0.00	2.65
25.65	0.33	0.46	0.71*	2.64	0.00	2.64
25.70	0.33	0.46	0.71*	2.63	0.00	2.63
25.75	0.33	0.46	0.71*	2.63	0.00	2.63
25.80	0.33	0.46	0.71*	2.62	0.00	2.62

25.85	0.33	0.46	0.71*	2.61	0.00	2.61
25.90	0.33	0.46	0.71*	2.60	0.00	2.60
25.95	0.33	0.46	0.72*	2.60	0.00	2.60
26.00	0.33	0.46	0.72*	2.59	0.00	2.59
26.05	0.33	0.46	0.71*	2.58	0.00	2.58
26.10	0.33	0.47	0.71*	2.57	0.00	2.57
26.15	0.33	0.47	0.71*	2.56	0.00	2.56
26.20	0.33	0.47	0.71*	2.56	0.00	2.56
26.25	0.33	0.47	0.71*	2.55	0.00	2.55
26.30	0.33	0.47	0.70*	2.54	0.00	2.54
26.35	0.33	0.47	0.70*	2.53	0.00	2.53
26.40	0.33	0.47	0.70*	2.53	0.00	2.53
26.45	0.33	0.47	0.70*	2.52	0.00	2.52
26.50	0.32	0.47	0.69*	2.51	0.00	2.51
26.55	0.32	0.47	0.69*	2.50	0.00	2.50
26.60	0.32	0.47	0.69*	2.49	0.00	2.49
26.65	0.32	0.47	0.69*	2.49	0.00	2.49
26.70	0.32	0.47	0.69*	2.48	0.00	2.48
26.75	0.32	0.47	0.68*	2.47	0.00	2.47
26.80	0.32	0.47	0.68*	2.46	0.00	2.46
26.85	0.32	0.47	0.68*	2.45	0.00	2.45
26.90	0.32	0.47	0.68*	2.44	0.00	2.44
26.95	0.32	0.47	0.68*	2.43	0.00	2.43
27.00	0.32	0.47	0.67*	2.43	0.00	2.43
27.05	0.32	0.47	0.67*	2.42	0.00	2.42
27.10	0.31	0.47	0.67*	2.41	0.00	2.41
27.15	0.31	0.47	0.67*	2.40	0.00	2.40
27.20	0.31	0.47	0.67*	2.39	0.00	2.39
27.25	0.31	0.47	0.66*	2.38	0.00	2.38
27.30	0.31	0.47	0.66*	2.37	0.00	2.37
27.35	0.31	0.47	0.66*	2.36	0.00	2.36
27.40	0.31	0.47	0.66*	2.36	0.00	2.36
27.45	0.31	0.47	0.66*	2.35	0.00	2.35
27.50	0.31	0.47	0.65*	2.34	0.00	2.34
27.55	0.31	0.47	0.65*	2.33	0.00	2.33
27.60	0.31	0.47	0.65*	2.32	0.00	2.32
27.65	0.31	0.47	0.65*	2.31	0.00	2.31
27.70	0.31	0.47	0.65*	2.30	0.00	2.30
27.75	0.30	0.47	0.64*	2.29	0.00	2.29
27.80	0.30	0.47	0.64*	2.28	0.00	2.28
27.85	0.30	0.47	0.64*	2.27	0.00	2.27
27.90	0.33	0.47	0.69*	2.26	0.00	2.26
27.95	0.33	0.47	0.69*	2.26	0.00	2.26
28.00	0.33	0.47	0.69*	2.25	0.00	2.25
28.05	0.32	0.47	0.68*	2.24	0.00	2.24
28.10	0.32	0.47	0.68*	2.23	0.00	2.23
28.15	0.32	0.47	0.68*	2.22	0.00	2.22
28.20	0.32	0.48	0.68*	2.21	0.00	2.21
28.25	0.32	0.48	0.68*	2.21	0.00	2.21
28.30	0.32	0.48	0.67*	2.20	0.00	2.20
28.35	0.32	0.48	0.67*	2.19	0.00	2.19
28.40	0.32	0.48	0.67*	2.18	0.00	2.18
28.45	0.32	0.48	0.67*	2.17	0.00	2.17
28.50	0.32	0.48	0.67*	2.16	0.00	2.16

28.55	0.32	0.48	0.66*	2.15	0.00	2.15
28.60	0.32	0.48	0.66*	2.15	0.00	2.15
28.65	0.32	0.48	0.66*	2.14	0.00	2.14
28.70	0.31	0.48	0.66*	2.13	0.00	2.13
28.75	0.31	0.48	0.66*	2.12	0.00	2.12
28.80	0.31	0.48	0.65*	2.11	0.00	2.11
28.85	0.31	0.48	0.65*	2.10	0.00	2.10
28.90	0.31	0.48	0.65*	2.09	0.00	2.09
28.95	0.31	0.48	0.65*	2.08	0.00	2.08
29.00	0.31	0.48	0.65*	2.07	0.00	2.07
29.05	0.31	0.48	0.65*	2.07	0.00	2.07
29.10	0.31	0.48	0.64*	2.06	0.00	2.06
29.15	0.31	0.48	0.64*	2.05	0.00	2.05
29.20	0.31	0.48	0.64*	2.04	0.00	2.04
29.25	0.31	0.48	0.64*	2.03	0.00	2.03
29.30	0.31	0.48	0.64*	2.02	0.00	2.02
29.35	0.30	0.48	0.64*	2.01	0.00	2.01
29.40	0.30	0.48	0.63*	2.00	0.00	2.00
29.45	0.30	0.48	0.63*	1.99	0.00	1.99
29.50	0.30	0.48	0.63*	1.98	0.00	1.98
29.55	0.30	0.48	0.63*	1.97	0.00	1.97
29.60	0.30	0.48	0.63*	1.96	0.00	1.96
29.65	0.30	0.48	0.62*	1.95	0.00	1.95
29.70	0.30	0.48	0.62*	1.94	0.00	1.94
29.75	0.30	0.48	0.62*	1.93	0.00	1.93
29.80	0.30	0.48	0.62*	1.92	0.00	1.92
29.85	0.30	0.48	0.62*	1.91	0.00	1.91
29.90	0.30	0.48	0.62*	1.90	0.00	1.90
29.95	0.30	0.48	0.61*	1.89	0.00	1.89
30.00	0.30	0.48	0.61*	1.88	0.00	1.88
30.05	0.30	0.48	0.61*	1.87	0.00	1.87
30.10	0.29	0.48	0.61*	1.86	0.00	1.86
30.15	0.29	0.48	0.61*	1.85	0.00	1.85
30.20	0.29	0.48	0.61*	1.84	0.00	1.84
30.25	0.29	0.48	0.61*	1.83	0.00	1.83
30.30	0.29	0.48	0.60*	1.82	0.00	1.82
30.35	0.29	0.48	0.60*	1.81	0.00	1.81
30.40	0.29	0.48	0.60*	1.80	0.00	1.80
30.45	0.29	0.48	0.60*	1.79	0.00	1.79
30.50	0.29	0.48	0.60*	1.78	0.00	1.78
30.55	0.29	0.48	0.60*	1.77	0.00	1.77
30.60	0.29	0.48	0.60*	1.76	0.00	1.76
30.65	0.29	0.48	0.60*	1.75	0.00	1.75
30.70	0.29	0.48	0.59*	1.74	0.00	1.74
30.75	0.29	0.48	0.59*	1.72	0.00	1.72
30.80	0.29	0.48	0.59*	1.71	0.00	1.71
30.85	0.28	0.48	0.59*	1.70	0.00	1.70
30.90	0.28	0.48	0.59*	1.69	0.00	1.69
30.95	0.28	0.48	0.59*	1.68	0.00	1.68
31.00	0.28	0.48	0.59*	1.67	0.00	1.67
31.05	0.28	0.48	0.59*	1.66	0.00	1.66
31.10	0.28	0.48	0.59*	1.65	0.00	1.65
31.15	0.28	0.48	0.59*	1.64	0.00	1.64
31.20	0.28	0.48	0.59*	1.63	0.00	1.63

31.25	0.28	0.48	0.59*	1.62	0.00	1.62
31.30	0.28	0.48	0.59*	1.61	0.00	1.61
31.35	0.28	0.48	0.59*	1.59	0.00	1.59
31.40	0.28	0.48	0.59*	1.58	0.00	1.58
31.45	0.28	0.48	0.59*	1.57	0.00	1.57
31.50	0.28	0.48	0.59*	1.56	0.00	1.56
31.55	0.28	0.48	0.59*	1.55	0.00	1.55
31.60	0.28	0.48	0.59*	1.54	0.00	1.54
31.65	0.28	0.48	0.59*	1.53	0.00	1.53
31.70	0.28	0.48	0.59*	1.52	0.00	1.52
31.75	0.28	0.48	0.59*	1.51	0.00	1.51
31.80	0.28	0.48	0.58*	1.50	0.00	1.50
31.85	0.28	0.48	0.58*	1.49	0.00	1.49
31.90	0.28	0.48	0.58*	1.48	0.00	1.48
31.95	0.28	0.48	0.58*	1.46	0.00	1.46
32.00	0.28	0.48	0.58*	1.45	0.00	1.45
32.05	0.28	0.48	0.58*	1.44	0.00	1.44
32.10	0.28	0.48	0.58*	1.43	0.00	1.43
32.15	0.28	0.48	0.58*	1.42	0.00	1.42
32.20	0.28	0.48	0.58*	1.41	0.00	1.41
32.25	0.28	0.48	0.58*	1.40	0.00	1.40
32.30	0.28	0.48	0.58*	1.39	0.00	1.39
32.35	0.28	0.48	0.58*	1.38	0.00	1.38
32.40	0.28	0.48	0.58*	1.37	0.00	1.37
32.45	0.28	0.48	0.58*	1.36	0.00	1.36
32.50	0.28	0.48	0.58*	1.34	0.00	1.34
32.55	0.28	0.48	0.58*	1.33	0.00	1.33
32.60	0.28	0.48	0.58*	1.32	0.00	1.32
32.65	0.28	0.48	0.58*	1.31	0.00	1.31
32.70	0.28	0.48	0.58*	1.30	0.00	1.30
32.75	0.28	0.48	0.58*	1.29	0.00	1.29
32.80	0.28	0.48	0.58*	1.28	0.00	1.28
32.85	0.28	0.48	0.58*	1.27	0.00	1.27
32.90	0.28	0.48	0.58*	1.26	0.00	1.26
32.95	0.28	0.48	0.58*	1.25	0.00	1.25
33.00	0.28	0.48	0.58*	1.24	0.00	1.24
33.05	0.28	0.48	0.58*	1.22	0.00	1.22
33.10	0.28	0.48	0.58*	1.21	0.00	1.21
33.15	0.28	0.48	0.58*	1.20	0.00	1.20
33.20	0.28	0.48	0.59*	1.19	0.00	1.19
33.25	0.28	0.48	0.59*	1.18	0.00	1.18
33.30	0.28	0.48	0.59*	1.17	0.00	1.17
33.35	0.28	0.48	0.59*	1.16	0.00	1.16
33.40	0.28	0.48	0.59*	1.15	0.00	1.15
33.45	0.28	0.48	0.59*	1.14	0.00	1.14
33.50	0.28	0.48	0.59*	1.13	0.00	1.13
33.55	0.28	0.48	0.59*	1.11	0.00	1.11
33.60	0.28	0.48	0.59*	1.10	0.00	1.10
33.65	0.28	0.48	0.58*	1.09	0.00	1.09
33.70	0.28	0.48	0.58*	1.08	0.00	1.08
33.75	0.28	0.48	0.58*	1.07	0.00	1.07
33.80	0.28	0.48	0.58*	1.06	0.00	1.06
33.85	0.28	0.48	0.58*	1.05	0.00	1.05
33.90	0.28	0.48	0.58*	1.04	0.00	1.04

33.95	0.28	0.48	0.58*	1.03	0.00	1.03
34.00	0.28	0.48	0.58*	1.02	0.00	1.02
34.05	0.28	0.48	0.58*	1.01	0.00	1.01
34.10	0.28	0.48	0.58*	0.99	0.00	0.99
34.15	0.28	0.48	0.58*	0.98	0.00	0.98
34.20	0.28	0.48	0.58*	0.97	0.00	0.97
34.25	0.28	0.48	0.58*	0.96	0.00	0.96
34.30	0.28	0.48	0.58*	0.95	0.00	0.95
34.35	0.28	0.48	0.58*	0.94	0.00	0.94
34.40	0.28	0.48	0.58*	0.93	0.00	0.93
34.45	0.28	0.48	0.58*	0.92	0.00	0.92
34.50	0.28	0.48	0.58*	0.91	0.00	0.91
34.55	0.28	0.48	0.58*	0.90	0.00	0.90
34.60	0.28	0.48	0.58*	0.88	0.00	0.88
34.65	0.28	0.48	0.58*	0.87	0.00	0.87
34.70	0.28	0.48	0.58*	0.86	0.00	0.86
34.75	0.28	0.48	0.58*	0.85	0.00	0.85
34.80	0.28	0.48	0.58*	0.84	0.00	0.84
34.85	0.28	0.48	0.58*	0.83	0.00	0.83
34.90	0.28	0.48	0.58*	0.82	0.00	0.82
34.95	0.28	0.48	0.58*	0.81	0.00	0.81
35.00	0.28	0.48	0.58*	0.80	0.00	0.80
35.05	0.28	0.48	0.58*	0.79	0.00	0.79
35.10	0.28	0.48	0.58*	0.77	0.00	0.77
35.15	0.28	0.48	0.58*	0.76	0.00	0.76
35.20	0.28	0.48	0.58*	0.75	0.00	0.75
35.25	0.28	0.48	0.58*	0.74	0.00	0.74
35.30	0.28	0.48	0.58*	0.73	0.00	0.73
35.35	0.28	0.48	0.58*	0.72	0.00	0.72
35.40	0.28	0.48	0.58*	0.71	0.00	0.71
35.45	0.28	0.48	0.58*	0.70	0.00	0.70
35.50	0.28	0.48	0.58*	0.69	0.00	0.69
35.55	0.28	0.48	0.58*	0.68	0.00	0.68
35.60	0.28	0.48	0.58*	0.67	0.00	0.67
35.65	0.28	0.48	0.58*	0.65	0.00	0.65
35.70	0.28	0.48	0.58*	0.64	0.00	0.64
35.75	0.28	0.48	0.58*	0.63	0.00	0.63
35.80	0.28	0.48	0.58*	0.62	0.00	0.62
35.85	0.28	0.48	0.58*	0.61	0.00	0.61
35.90	0.28	0.48	0.58*	0.60	0.00	0.60
35.95	0.28	0.48	0.58*	0.59	0.00	0.59
36.00	0.28	0.48	0.58*	0.58	0.00	0.58
36.05	0.28	0.48	0.58*	0.57	0.00	0.57
36.10	0.28	0.48	0.58*	0.55	0.00	0.55
36.15	0.28	0.48	0.59*	0.54	0.00	0.54
36.20	0.28	0.48	0.59*	0.53	0.00	0.53
36.25	0.28	0.48	0.59*	0.52	0.00	0.52
36.30	0.29	0.48	0.60*	0.51	0.00	0.51
36.35	0.29	0.48	0.60*	0.50	0.00	0.50
36.40	0.29	0.48	0.60*	0.49	0.00	0.49
36.45	0.29	0.48	0.60*	0.48	0.00	0.48
36.50	0.29	0.48	0.61*	0.47	0.00	0.47
36.55	0.29	0.48	0.61*	0.46	0.00	0.46
36.60	0.29	0.48	0.61*	0.45	0.00	0.45

36.65	0.30	0.48	0.62*	0.44	0.00	0.44
36.70	0.30	0.48	0.62*	0.43	0.00	0.43
36.75	0.30	0.48	0.62*	0.42	0.00	0.42
36.80	0.30	0.48	0.62*	0.41	0.00	0.41
36.85	0.30	0.48	0.63*	0.40	0.00	0.40
36.90	0.30	0.48	0.63*	0.39	0.00	0.39
36.95	0.30	0.48	0.63*	0.38	0.00	0.38
37.00	0.31	0.48	0.64*	0.37	0.00	0.37
37.05	0.31	0.48	0.64*	0.36	0.00	0.36
37.10	0.31	0.48	0.64*	0.35	0.00	0.35
37.15	0.31	0.48	0.65*	0.34	0.00	0.34
37.20	0.31	0.48	0.65*	0.33	0.00	0.33
37.25	0.31	0.48	0.65*	0.32	0.00	0.32
37.30	0.31	0.48	0.66*	0.32	0.00	0.32
37.35	0.32	0.48	0.66*	0.31	0.00	0.31
37.40	0.32	0.48	0.66*	0.30	0.00	0.30
37.45	0.32	0.48	0.67*	0.29	0.00	0.29
37.50	0.32	0.48	0.67*	0.28	0.00	0.28
37.55	0.32	0.48	0.67*	0.27	0.00	0.27
37.60	0.32	0.48	0.68*	0.26	0.00	0.26
37.65	0.33	0.48	0.68*	0.26	0.00	0.26
37.70	0.33	0.48	0.68*	0.25	0.00	0.25
37.75	0.33	0.48	0.69*	0.24	0.00	0.24
37.80	0.33	0.48	0.69*	0.23	0.00	0.23
37.85	0.33	0.48	0.70*	0.22	0.00	0.22
37.90	0.34	0.48	0.70*	0.22	0.00	0.22
37.95	0.34	0.48	0.70*	0.21	0.00	0.21
38.00	0.34	0.48	0.71*	0.20	0.00	0.20
38.05	0.34	0.48	0.71*	0.19	0.00	0.19
38.10	0.34	0.48	0.72*	0.19	0.00	0.19
38.15	0.34	0.48	0.72*	0.18	0.00	0.18
38.20	0.35	0.48	0.72*	0.17	0.00	0.17
38.25	0.35	0.48	0.73*	0.17	0.00	0.17
38.30	0.35	0.48	0.73*	0.16	0.00	0.16
38.35	0.35	0.48	0.74*	0.15	0.00	0.15
38.40	0.35	0.48	0.74*	0.15	0.00	0.15
38.45	0.36	0.48	0.75*	0.14	0.00	0.14
38.50	0.36	0.48	0.75*	0.13	0.00	0.13
38.55	0.36	0.48	0.76*	0.13	0.00	0.13
38.60	0.36	0.48	0.76*	0.12	0.00	0.12
38.65	0.37	0.48	0.76*	0.11	0.00	0.11
38.70	0.37	0.48	0.77*	0.11	0.00	0.11
38.75	0.37	0.48	0.78*	0.10	0.00	0.10
38.80	0.37	0.48	0.78*	0.10	0.00	0.10
38.85	0.38	0.48	0.79*	0.09	0.00	0.09
38.90	0.38	0.48	0.79*	0.08	0.00	0.08
38.95	0.38	0.48	0.80*	0.08	0.00	0.08
39.00	0.38	0.48	0.80*	0.07	0.00	0.07
39.05	0.39	0.48	0.81*	0.07	0.00	0.07
39.10	0.39	0.48	0.82*	0.06	0.00	0.06
39.15	0.39	0.48	0.82*	0.06	0.00	0.06
39.20	0.40	0.48	0.83*	0.05	0.00	0.05
39.25	0.40	0.48	0.84*	0.05	0.00	0.05
39.30	0.40	0.48	0.85*	0.04	0.00	0.04

39.35	0.41	0.48	0.86*	0.04	0.00	0.04
39.40	0.41	0.48	0.87*	0.03	0.00	0.03
39.45	0.42	0.48	0.88*	0.03	0.00	0.03
39.50	0.42	0.48	0.89*	0.03	0.00	0.03
39.55	0.43	0.48	0.90*	0.02	0.00	0.02
39.60	0.44	0.48	0.92*	0.02	0.00	0.02
39.65	0.44	0.48	0.93*	0.01	0.00	0.01
39.70	0.45	0.48	0.95*	0.01	0.00	0.01
39.75	0.47	0.48	0.98*	0.01	0.00	0.01
39.80	0.48	0.48	1.02	0.00	0.00	0.00
39.85	0.51	0.48	1.07	0.00	0.00	0.00
39.90	2.10	0.48	4.42	0.00	0.00	0.00
39.95	2.10	0.48	4.42	0.00	0.00	0.00
40.00	2.10	0.48	4.42	0.00	0.00	0.00
40.05	2.10	0.48	4.42	0.00	0.00	0.00
40.10	2.10	0.48	4.42	0.00	0.00	0.00
40.15	2.10	0.48	4.42	0.00	0.00	0.00
40.20	2.10	0.48	4.42	0.00	0.00	0.00
40.25	2.10	0.47	4.42	0.00	0.00	0.00
40.30	2.10	0.47	4.42	0.00	0.00	0.00
40.35	2.10	0.47	4.42	0.00	0.00	0.00
40.40	2.10	0.47	4.42	0.00	0.00	0.00
40.45	2.10	0.47	4.42	0.00	0.00	0.00
40.50	2.10	0.47	4.42	0.00	0.00	0.00
40.55	2.10	0.47	4.42	0.00	0.00	0.00
40.60	2.10	0.47	4.42	0.00	0.00	0.00
40.65	2.10	0.47	4.42	0.00	0.00	0.00
40.70	2.10	0.47	4.42	0.00	0.00	0.00
40.75	2.10	0.47	4.42	0.00	0.00	0.00
40.80	2.10	0.47	4.42	0.00	0.00	0.00
40.85	2.10	0.47	4.42	0.00	0.00	0.00
40.90	2.10	0.47	4.42	0.00	0.00	0.00
40.95	2.09	0.47	4.42	0.00	0.00	0.00
41.00	2.09	0.47	4.42	0.00	0.00	0.00
41.05	2.09	0.47	4.42	0.00	0.00	0.00
41.10	2.09	0.47	4.42	0.00	0.00	0.00
41.15	2.09	0.47	4.42	0.00	0.00	0.00
41.20	2.09	0.47	4.42	0.00	0.00	0.00
41.25	2.09	0.47	4.42	0.00	0.00	0.00
41.30	2.09	0.47	4.42	0.00	0.00	0.00
41.35	2.09	0.47	4.42	0.00	0.00	0.00
41.40	2.09	0.47	4.42	0.00	0.00	0.00
41.45	2.09	0.47	4.42	0.00	0.00	0.00
41.50	2.09	0.47	4.42	0.00	0.00	0.00
41.55	2.09	0.47	4.42	0.00	0.00	0.00
41.60	2.09	0.47	4.42	0.00	0.00	0.00
41.65	2.09	0.47	4.42	0.00	0.00	0.00
41.70	2.09	0.47	4.43	0.00	0.00	0.00
41.75	2.09	0.47	4.43	0.00	0.00	0.00
41.80	2.09	0.47	4.43	0.00	0.00	0.00
41.85	2.09	0.47	4.43	0.00	0.00	0.00
41.90	2.09	0.47	4.43	0.00	0.00	0.00
41.95	2.09	0.47	4.43	0.00	0.00	0.00
42.00	2.09	0.47	4.43	0.00	0.00	0.00

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44.75	2.07	0.47	4.44	0.00	0.00	0.00
44.80	2.07	0.47	4.44	0.00	0.00	0.00
44.85	2.07	0.47	4.44	0.00	0.00	0.00
44.90	2.07	0.47	4.44	0.00	0.00	0.00
44.95	2.07	0.47	4.44	0.00	0.00	0.00
45.00	2.07	0.46	4.44	0.00	0.00	0.00
45.05	2.07	0.46	4.44	0.00	0.00	0.00
45.10	2.06	0.46	4.44	0.00	0.00	0.00
45.15	2.06	0.46	4.44	0.00	0.00	0.00
45.20	2.06	0.46	4.44	0.00	0.00	0.00
45.25	2.06	0.46	4.44	0.00	0.00	0.00
45.30	2.06	0.46	4.45	0.00	0.00	0.00
45.35	2.06	0.46	4.45	0.00	0.00	0.00
45.40	2.06	0.46	4.45	0.00	0.00	0.00
45.45	2.06	0.46	4.45	0.00	0.00	0.00
45.50	2.06	0.46	4.45	0.00	0.00	0.00
45.55	2.06	0.46	4.45	0.00	0.00	0.00
45.60	2.06	0.46	4.45	0.00	0.00	0.00
45.65	2.06	0.46	4.45	0.00	0.00	0.00
45.70	2.06	0.46	4.45	0.00	0.00	0.00
45.75	2.06	0.46	4.45	0.00	0.00	0.00
45.80	2.06	0.46	4.45	0.00	0.00	0.00
45.85	2.06	0.46	4.45	0.00	0.00	0.00
45.90	2.06	0.46	4.45	0.00	0.00	0.00
45.95	2.06	0.46	4.45	0.00	0.00	0.00
46.00	2.06	0.46	4.45	0.00	0.00	0.00
46.05	2.06	0.46	4.45	0.00	0.00	0.00
46.10	2.06	0.46	4.45	0.00	0.00	0.00
46.15	2.06	0.46	4.45	0.00	0.00	0.00
46.20	2.06	0.46	4.45	0.00	0.00	0.00
46.25	2.06	0.46	4.45	0.00	0.00	0.00
46.30	2.06	0.46	4.45	0.00	0.00	0.00
46.35	2.06	0.46	4.45	0.00	0.00	0.00
46.40	2.06	0.46	4.45	0.00	0.00	0.00
46.45	2.06	0.46	4.46	0.00	0.00	0.00
46.50	2.06	0.46	4.46	0.00	0.00	0.00
46.55	2.05	0.46	4.46	0.00	0.00	0.00
46.60	2.05	0.46	4.46	0.00	0.00	0.00
46.65	2.05	0.46	4.46	0.00	0.00	0.00
46.70	2.05	0.46	4.46	0.00	0.00	0.00
46.75	2.05	0.46	4.46	0.00	0.00	0.00
46.80	2.05	0.46	4.46	0.00	0.00	0.00
46.85	2.05	0.46	4.46	0.00	0.00	0.00
46.90	2.05	0.46	4.46	0.00	0.00	0.00
46.95	2.05	0.46	4.46	0.00	0.00	0.00
47.00	2.05	0.46	4.46	0.00	0.00	0.00
47.05	2.05	0.46	4.46	0.00	0.00	0.00
47.10	2.05	0.46	4.46	0.00	0.00	0.00
47.15	2.05	0.46	4.46	0.00	0.00	0.00
47.20	2.05	0.46	4.46	0.00	0.00	0.00
47.25	2.05	0.46	4.46	0.00	0.00	0.00
47.30	2.05	0.46	4.46	0.00	0.00	0.00
47.35	2.05	0.46	4.46	0.00	0.00	0.00
47.40	2.05	0.46	4.47	0.00	0.00	0.00

47.45	2.05	0.46	4.47	0.00	0.00	0.00
47.50	2.05	0.46	4.47	0.00	0.00	0.00
47.55	2.05	0.46	4.47	0.00	0.00	0.00
47.60	2.05	0.46	4.47	0.00	0.00	0.00
47.65	2.05	0.46	4.47	0.00	0.00	0.00
47.70	2.05	0.46	4.47	0.00	0.00	0.00
47.75	2.05	0.46	4.47	0.00	0.00	0.00
47.80	2.05	0.46	4.47	0.00	0.00	0.00
47.85	2.05	0.46	4.47	0.00	0.00	0.00
47.90	2.05	0.46	4.47	0.00	0.00	0.00
47.95	2.05	0.46	4.47	0.00	0.00	0.00
48.00	2.05	0.46	4.47	0.00	0.00	0.00
48.05	2.04	0.46	4.47	0.00	0.00	0.00
48.10	2.04	0.46	4.47	0.00	0.00	0.00
48.15	2.04	0.46	4.47	0.00	0.00	0.00
48.20	2.04	0.46	4.47	0.00	0.00	0.00
48.25	2.04	0.46	4.47	0.00	0.00	0.00
48.30	2.04	0.46	4.48	0.00	0.00	0.00
48.35	2.04	0.46	4.48	0.00	0.00	0.00
48.40	2.04	0.46	4.48	0.00	0.00	0.00
48.45	2.04	0.46	4.48	0.00	0.00	0.00
48.50	2.04	0.46	4.48	0.00	0.00	0.00
48.55	2.04	0.46	4.48	0.00	0.00	0.00
48.60	2.04	0.46	4.48	0.00	0.00	0.00
48.65	2.04	0.46	4.48	0.00	0.00	0.00
48.70	2.04	0.46	4.48	0.00	0.00	0.00
48.75	2.04	0.46	4.48	0.00	0.00	0.00
48.80	2.04	0.46	4.48	0.00	0.00	0.00
48.85	2.04	0.46	4.48	0.00	0.00	0.00
48.90	2.04	0.45	4.48	0.00	0.00	0.00
48.95	2.04	0.45	4.48	0.00	0.00	0.00
49.00	2.04	0.45	4.48	0.00	0.00	0.00
49.05	2.04	0.45	4.48	0.00	0.00	0.00
49.10	2.04	0.45	4.49	0.00	0.00	0.00
49.15	2.04	0.45	4.49	0.00	0.00	0.00
49.20	2.04	0.45	4.49	0.00	0.00	0.00
49.25	2.04	0.45	4.49	0.00	0.00	0.00
49.30	2.04	0.45	4.49	0.00	0.00	0.00
49.35	2.04	0.45	4.49	0.00	0.00	0.00
49.40	2.04	0.45	4.49	0.00	0.00	0.00
49.45	2.04	0.45	4.49	0.00	0.00	0.00
49.50	2.04	0.45	4.49	0.00	0.00	0.00
49.55	2.03	0.45	4.49	0.00	0.00	0.00
49.60	2.03	0.45	4.49	0.00	0.00	0.00
49.65	2.03	0.45	4.49	0.00	0.00	0.00
49.70	2.03	0.45	4.49	0.00	0.00	0.00
49.75	2.03	0.45	4.49	0.00	0.00	0.00
49.80	2.03	0.45	4.50	0.00	0.00	0.00
49.85	2.03	0.45	4.50	0.00	0.00	0.00
49.90	2.03	0.45	4.50	0.00	0.00	0.00
49.95	2.03	0.45	4.50	0.00	0.00	0.00
50.00	2.03	0.45	4.50	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone

(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units Depth = ft, Stress or Pressure = tsf (atm), Unit Weight
= pcf, Settlement = in.

CRRm	Cyclic resistance ratio from soils
CSRfs	Cyclic stress ratio induced by a given earthquake
(with user request factor of safety)	
F.S.	Factor of Safety against liquefaction, $F.S. = CRRm / CSRfs$
S_sat	Settlement from saturated sands
S_dry	Settlement from dry sands
S_all	Total settlement from saturated and dry sands
NoLiq	No-Liquefy Soils

Appendix C-7

Construction Equipment and Vehicle Efficiency Plan



CONSTRUCTION EQUIPMENT AND VEHICLE EFFICIENCY PLAN

Carmel Valley Pump Station

NOVEMBER 2019

Prepared for:

California American Water

511 Forest Lodge Road, Ste 100, Pacific Grove CA 93950

Prepared by:

Monterey Peninsula Engineering

192 Healy Ave, Marina, CA 93933

Construction Equipment Efficiency Plan

The following engineering controls will be implemented to minimize airborne pollution generated by site operations.

- Only California Air Resources Board (CARB) certified construction equipment will be used onsite
- All equipment will be properly maintained and tuned according to manufactures specifications
- California American Water (Cal Am) and its agents will regularly audit construction. Should vehicle issues be observed, Cal Am and its agents will notify the foreman that the vehicle performance indicates a need for maintenance. If the issue is not resolved, Cal Am and its agents may request a substitute vehicle be used in the construction process
- As possible, trucks used for hauling materials from the site will use low-sulfur diesel fuels
- Low sulfur diesel fuel will be burned in all construction equipment, in accordance with the proposed CARB regulation to reduce public exposure to diesel particulate matter and other air contaminants
- Vehicles utilized on this job will not be allowed to idle unnecessarily
- MPE shall ensure that line power is used instead of diesel generators when line power is available
- MPE will utilize the most efficient haul routes to ensure that all materials and debris hauling is conducted in a fuel-efficient manner
- All state idling restrictions will be consistently complied with.
- In addition, the idling policy shall extend the 5-minute idling limit to cover all on road vehicles (regardless of gross vehicular weight rating) and shall further require that for all diesel powered off-road engines, the idling limit is reduced to 2 minutes, while maintaining the exceptions specified in Title 13 CCR Section 2449(d)(3). Clear signage of these requirements shall be provided for construction workers at all access points to construction areas."
- Worker carpooling options will be provided by the MPE
- Per Mitigation Measure 4.10-1a, all diesel equipment (owned and rented) are 4 years old or less and meet the most efficient Tier 4 standards.



Certificate of Reported Compliance Truck and Bus Regulation

Issued to:

SUNSET PACIFIC CONSTRUCTION

Motor Carrier: CA-CA0033832

This certificate confirms that the fleet owner has attested under penalty of perjury that the statements and information they provided to the Air Resources Board (ARB) are true, accurate, and complete regarding all relevant vehicles in the fleet required to show compliance. ARB hereby finds that the fleet listed above has reported compliance with title 13, California Code of Regulations, section 2025 of the Truck and Bus Regulation. If ARB subsequently finds that the statements and information that have been provided are not true, accurate, and complete, this certificate shall be effectively revoked and the fleet subject to noncompliance penalties.

This certificate is valid until December 31, 2019

Printed on 2019-04-02

Truck and Bus Fleet Identification
33904

Jack Kitowski
Jack Kitowski
Division Chief, Mobile Source Control Division
California Air Resources Board

To verify the authenticity of this certificate, visit
www.arb.ca.gov/msprog/online/tblookup.php

March 1, 2019

CERTIFICATE OF REPORTED COMPLIANCE OFF-ROAD DIESEL VEHICLE REGULATION

is issued to

MONTEREY PENINSULA ENGINEERING

This certificate indicates that the fleet listed above has reported off-road diesel vehicles to the California Air Resources Board and has certified they are in compliance with title 13 CCR, section 2449. All applicable vehicles owned by the individual, company, or agency must be reported and labeled, as specified in Section 2449, with all possible completeness, else this certificate is null and void. **Certificate expires 2/28/2020**

Off-road Diesel Fleet Identification

1107

Jack Kitowski
Chief, Mobile Source Control Division
California Air Resources Board

To verify the authenticity of this certificate, enter this number at http://www.arb.ca.gov/doors/compliance_cert1.html

Appendix C-8
Fugitive Dust Control Plan



FUGITIVE DUST CONTROL PLAN

Carmel Valley Pump Station

NOVEMBER 2019

Prepared for:

California American Water

511 Forest Lodge Road, Ste 100, Pacific Grove CA 93950

Prepared by:

Monterey Peninsula Engineering

192 Healy Ave, Marina, CA 93933

It is anticipated that dust may be generated when haul trucks are traveling through the site, when they are being loaded, and during demolition and painting activities. Disturbance activities will be conducted in such a manner as to minimize fugitive dust emissions.

Based on previous projects, the liberal use of water to abate dust has proven to be the most effective measure.

- A. The following measures will be implemented to control dust.
 - a. Prior to start of work, a two thousand-gallon portable water buffalo will be brought to the site to moisten material generated during demo and loading.
 - b. Water shall be applied to sufficiently reduce the potential for dust emissions but shall not be applied to the point that saturation, ponding or runoff occurs.
 - c. In addition to wetting the roads, a ten-mile per hour speed limit will be enforced on all trucks within the site.
 - d. The portable water truck will also be used to keep the site roads wet.
 - e. All active construction areas shall be watered at least three times daily.
 - f. Sweep all paved access road, parking areas and staging areas at the construction site daily (with water sweepers).
 - g. To mitigate tracking of soil from the site, a construction entrance will be installed to dislodge debris from the trucks as they exit per the SWPPP plan.
 - h. Finally, the roads will be swept daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
 - i. Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
 - j. Traffic speeds on unpaved roads will be limited to 15 miles per hour.
 - k. Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- B. The following engineering controls will be implemented to minimize airborne pollution generated by site operations.
 - a. Only California Air Resources Board (CARB) certified construction equipment will be used onsite,
 - b. All equipment will be properly maintained and tuned according to manufactures specifications,
 - c. As possible, trucks used for hauling materials from the site will use low-sulfur diesel fuels.
 - d. Low sulfur diesel fuel will be burned in all construction equipment, in accordance with the proposed CARB regulation to reduce public exposure to diesel particulate matter and other air contaminants,
 - e. Vehicles utilized on this job will not be allowed to idle unnecessarily.
 - f. MPE shall ensure that line power is used instead of diesel generators when line power is available
 - g. Water runoff from the site will be controlled by site grading.

- C. Per mitigation measure 4.10-1c Construction Fugitive Dust Control Plan, the following measures will also be followed:
- a. Cover all trucks hauling soil, sand, and other loose materials and require trucks to maintain at least 2 feet of freeboard.
 - b. Enclose, cover, or water daily exposed stockpiles (dirt, sand, etc.).
 - c. Replant vegetation in disturbed areas as quickly as possible.
 - d. Post a publicly visible sign that specifies the telephone number and responsible person to contact regarding dust complaints. This person shall respond to complaints and take corrective action within 48 hours. The phone number of the Monterey Bay Unified Air Pollution Control District (MBUAPCD) shall also be visible to ensure compliance with MBUAPCD rules.

The primary method of monitoring for dust will be by visual observation. All site personnel will be instructed to monitor for dust generation and if sustained visual opacity exceeds limits established by OSHA and SCAQMD, operations will be stopped and control methods evaluated and modified as required before work resumes.

In the event that excessively windy conditions exist at the site to the point where, in the opinion of the engineer, the application of water is unable to control dust emissions, then operations at the site shall be halted until better conditions prevail.

Appendix C-9
Noise Management Plan



NOISE MANAGEMENT PLAN

Carmel Valley Pump Station

January 2020

Prepared for:

California American Water

511 Forest Lodge Road, Ste 100, Pacific Grove CA 93950

Prepared by:

Monterey Peninsula Engineering

192 Healy Ave, Marina, CA 93933

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Contractor details	1
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Noise and Vibration Monitoring	4
Noise and Vibration Control Measures.....	4
Complaint Response	5
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DESCRIPTION OF WORK

The Project will take place by Carmel Valley Road and Rancho San Carlos Road in Carmel Valley. The area is primarily residential and open woodland spaces. Work includes but not limited to the installation of a pump station building containing pumps, and electrical equipment at the existing San Carlos Well Site located at 26530 Rancho San Carlos Rd, Carmel, CA, 93923. The pump station will be approximately 28 feet wide by 26 feet long.

Specific activities include: Mass excavation/backfill, soil compaction, building construction, underground utilities installation, gravel and asphalt paving, street sweeping, material staging/preparation and concrete flatwork.

This project is a part of a global system of work that revolves around the proposed Monterey Peninsula Water Supply Project; This plan is being provided in order to meet mitigation measures:

- 4.12-1a: Neighborhood Notice and Construction Disturbance Coordinator
- 4.12-1b: General Noise Controls or Construction Equipment and Activities
- 4.12-1c: Noise Control Plan for Nighttime Pipeline Construction
- 4.12-3: Vibration Reduction Measures

Conducting work during normal hours will be possible in almost all situations. During shutdowns for major connections, most of the local area will be out of water service for 4-8 hours. Because of this, these major connections will be done at night to limit the impact to the public.

Materials stockpiles as well as staging areas shall be placed in such a manner that minimize noise exposure.

The project is anticipated to commence April 2020 and run through December 2020

CONTRACTOR DETAILS

Information regarding the contractor and relevant contacts.

Name	Role	Contact Number/s	Email
Joe Taormina	Project Manager	8312776118	joe@mpe2000.com
Jim Bruno	General Superintendent	8312776114	jim@mpe2000.com
Gino Castro	Dispatcher	8312776116	gino@mpe2000.com

EQUIPMENT

The construction contractor(s) shall assure that construction equipment with internal combustion engines have sound control devices at least as effective as those provided by the original equipment manufacturer. No equipment shall be permitted to have an unmuffled exhaust. The Contractor will ensure that best available controls techniques including mufflers, intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds for all construction-noise equipment and trucks are used.

Operation of equipment requiring the use of back up beepers shall be minimized near sensitive receptors to the extent feasible during night-time construction work hours between 10 p.m. to 7 a.m. If night-time work requires backwards movement and the use of backup alarms results in the exceedance of noise level thresholds specified herein, Contractor shall implement alternative methods such as the use of “smart” alarms, radar activated backup alarms, or administrative controls such as use of a spotter to direct the backing operation and planning activities to minimize backwards movement. Backup warning alarms shall comply with Cal-OSHA requirements (Title 8, CCR). Alternatively, or in conjunction with the above, obtain approval from Cal/OSHA to use alternative systems with lower noise levels, such as those listed below.

- “Smart” alarms with an audible range of 77 to 97 A-weighted decibels (dBA), which limit the warning signal to 5 dBA over ambient noise levels.
- Radar presence-sensing alarms, which identify objects in the reversing path of a truck.
- “BBS-Tek” broadband backup alarm system, which uses a broadband sound instead of a more noticeable single-frequency sound.
- Strobe lights instead of audible alarms (particularly for night use).

Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler shall be placed on the compressed air exhaust to lower noise levels by up to approximately 10 dBA. External jackets shall be used on impact tools, where feasible, in order to achieve a further reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible. Piles shall be installed using drilled methods wherever feasible. Pile driving using impact or vibratory methods shall be prohibited except for locations and times specifically approved in writing by Owner Representative.

Smaller vibratory rollers shall be used to minimize vibration levels during repaving activities where needed to meet vibration limits.

NOISE AND VIBRATION MONITORING AND MITIGATION REQUIREMENTS

A. Noise Monitoring Requirements:

The Contractors shall schedule tests to confirm construction noise levels and effectiveness of noise control measures prior to commencement of substantial noise-generating activities such as grading, earthmoving, demolition.

Monitoring shall occur at least weekly, and more often if needed, in response to complaints.

- Construction-caused noise shall not exceed the noise thresholds or established time limits established under the County of Monterey (County) Noise Ordinance (Ordinance 5250) without authorization by the Owner. Ordinance 5250 amends portions of the County's noise ordinance to feature the following provisions to be adhered to and verified by the Construction Contractor:
 - No higher than 85 dBA allowed at a distance of 50 feet from the source.
 - Exterior noise at night (10pm to 7am) limited to 45 dBA hourly Leq; and, 65 dBA Lmax as measured at or beyond the property line of the noise source.
- Depending upon the type of work, certain projects will require regular noise monitoring with specified machinery by a competent person e.g. noise meter and acoustic consultant.
- Monitoring records shall be provided to the Owner at least weekly or more often if requested by the Owner if noise complaints occur.

In the event that any monitoring results indicate exceedance of noise or vibration thresholds, the Contractor shall immediately notify the Owner and local municipality of the exceedance

- The Contractor shall identify the source and cause of the exceedance, implement corrective actions, and provide documentation to the Owner and local municipality that subsequent noise and vibration levels are within acceptable limits.
- The Contractor shall not resume operations before correcting conditions that cause excessive noise or vibration, subject to approval by the Owner.
- Contractor shall not be entitled to additional compensation or extension of contract time for suspended operations because of its failure to meet specified noise and vibration criteria

B. Vibration Monitoring Requirements:

Construction practices shall be utilized that do not generate vibration levels at the closest sensitive land uses above 0.1 in/sec PPV. The following measures, at a minimum, shall be employed to ensure this threshold is met:

- Vibration monitoring shall be implemented for general construction activities for all components of the pump station until construction practices meet the required vibration levels (per MM 4.12-3). If vibration levels exceed the limits of this mitigation measure, then construction practices shall be modified to use smaller types of construction equipment, operate the equipment in a manner to reduce vibration, or use alternate construction methods, and monitoring shall continue.

NOISE AND VIBRATION MONITORING

Residential properties are located alongside the footprint of the project. Therefore, vibration monitoring would be required (Per MM 4.12-3).

Daily, noise levels will be observed and recorded by the site foreman and submitted to the job owner and weekly.

- MPE shall use the County provision of 85 dBA at 50 feet from the source as our primary guideline for monitoring.
- Crews will be equipped with noise monitoring equipment to monitor noise levels during any activities with the potential to exceed 85 dBA at 50 feet from the source.
- The Cal Am will be notified within 24 hours of any noise or vibration related complaint.
- The construction disturbance coordinator or Cal Am will respond to any complaints within 24 hours.
- Any complaints will be recorded and submitted to Cal Am and the CPUC weekly, if any complaints are received.

NOISE AND VIBRATION CONTROL MEASURES

A. Anticipated noise control measures:

All measures stated in section 3 pertaining to the selection of specific equipment or operation methods, including:

- No equipment shall be permitted to have an unmuffled exhaust.
- Smaller vibratory rollers shall be used to minimize vibration levels during repaving activities where needed to meet vibration limits.
- Operation of equipment requiring the use of back up beepers shall be minimized near sensitive receptors to the extent feasible during night-time construction work hours between 10 p.m. to 7 a.m. If night-time work requires backwards movement and the use of backup alarms results in the exceedance of noise level thresholds specified herein, Contractor shall implement alternative methods such as the use of “smart” alarms, radar activated backup alarms, or administrative controls such as use of a spotter to direct the backing operation and planning activities to minimize backwards movement. Backup warning alarms shall comply with Cal-OSHA requirements (Title 8, CCR).
- Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools.

COMPLAINT RESPONSE

A. Procedure and Recording of Complaints

Procedure and reporting actions to include:

- Incoming complaints will be directed to:
 - Joseph Taormina, PM
 - Cell: 831-277-6118
 - Email: joe@mpe2000.com
 - Office: 192 Healy Ave., Marina CA
- The contact number for construction disturbance coordinator shall be conspicuously placed on construction site fences
- Complaints can be made by phone, email, or in person.
- Complaint Information will be kept in the noise complaint log and submitted weekly to the job owner if any complaints are recorded.
- If any complaints are received, an investigation will ensue with, noise level measurements taken at the area closest to the complaint and next to any equipment that would be a potential cause of the elevated noise levels.
 - If any equipment is found to be the cause of the elevated noise levels, maintenance will be performed.
 - If any specific residences are more vulnerable to construction noise, special care will be used in these areas to run less equipment concurrently.

B. Community Notification

Information about noise complaints will be included in the owners notification to customers.

“Residents and other sensitive receptors within 300 feet of a daytime construction area and within 900 feet of a nighttime construction area shall be notified of the construction location, nature of activities, and schedule, in writing, at least 14 days prior to the commencement of construction activities.

Notices will be posted along the pump station project boundary and delivered to all residential neighbors within 300 feet of daytime construction and 900 feet of nighttime construction.

APPENDICES

A. Site Layout Plan

Appendix C-10

Construction Waste Reduction and Recycling Plan



CONSTRUCTION WASTE REDUCTION AND RECYCLING PLAN

Carmel Valley Pump Station

NOVEMBER 2019

Prepared for:

California American Water

511 Forest Lodge Road, Ste 100, Pacific Grove CA 93950

Prepared by:

Monterey Peninsula Engineering

192 Healy Ave, Marina, CA 93933

Monterey Peninsula Engineering (MPE) will generate the least amount of construction waste possible in this project. Of the inevitable waste that is generated, as much as is economically feasible will be reused salvaged or recycled. Waste disposal to landfills will be minimized, and all waste will be properly disposed of in a safe, appropriate, and lawful manner in compliance with all applicable regulations of local (Monterey County's Integrated Waste Management Plan), state (California Integrated Waste Management Act of 1989 & California Green Building Standards), and federal agencies having jurisdiction over the disposal of removed materials. Receipts for all disposals, landfill/recycling, will be carefully kept so that upon the project's completion, California American Water can collect the receipts to document that the waste reduction, recycling, and diversion goals have been met.

Source Reduction Methods:

MPE will reduce the amount of construction debris onsite, by reducing the use of nonrecyclable materials, replacing disposable materials and products with reusable materials and products, reducing packaging, and increasing the efficiency of the use of paper, cardboard, glass, metal, and other materials.

MPE will aim to divert 50% of the nonhazardous construction waste from landfill disposal. All trees, stumps, rocks, and associated vegetation and soils will be recycled. We will accomplish this by designating a specific area for the separation of materials for potential reuse salvage, recycling, and return using clearly marked bins or signage for each category of waste.

Waste bins and pile areas will be maintained neat and clean.

The following construction debris will be 100% recycled at the Material

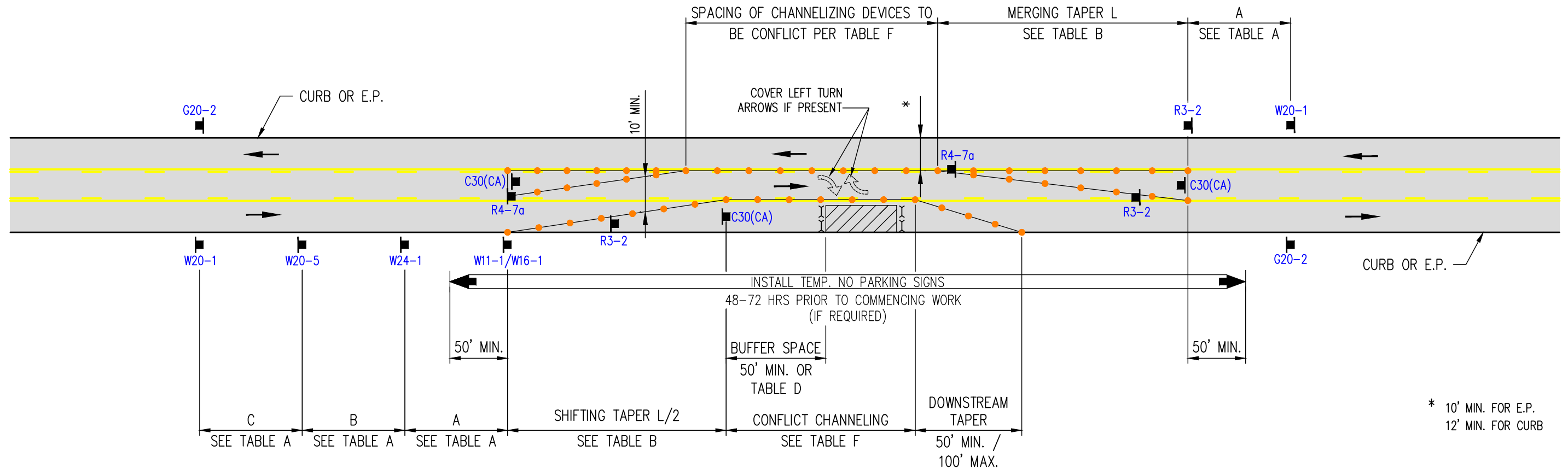
Recovery Facility:

- Asphalt/concrete
- Green waste

The remaining debris, when hauled to the Material Recovery Facility will receive a receipt which guarantees that 50% of the waste was recycled.

Appendix C-11
Traffic Control Plan

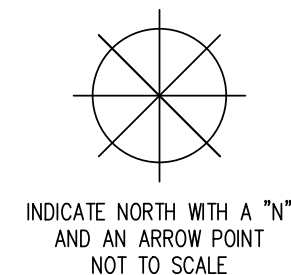
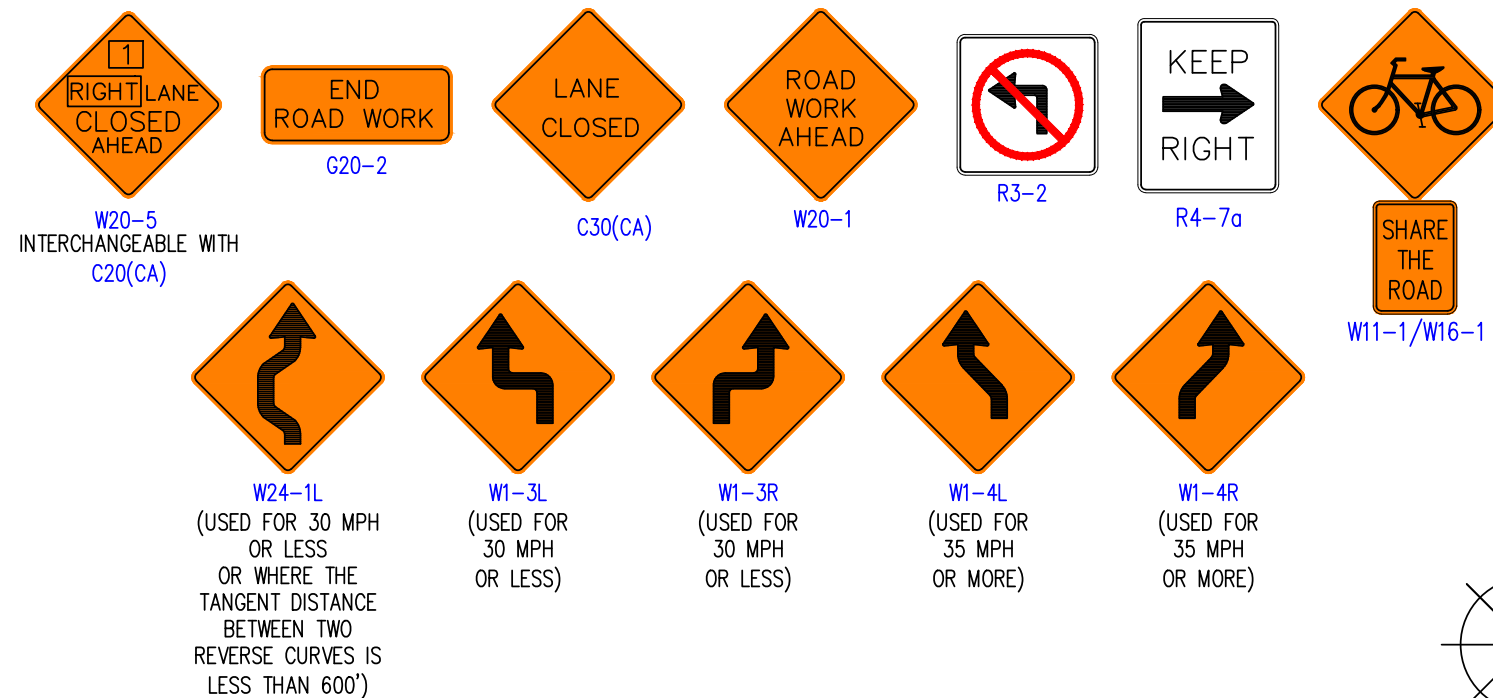
REV. 3/26/2018 CUJTCM-DWG07.DWG



* 10' MIN. FOR E.P.
12' MIN. FOR CURB

LEGEND

- TYPE III BARRICADE W/SIGN
- TYPE III BARRICADE W/O SIGN
- TYPE II BARRICADE W/SIGN
- TYPE II BARRICADE W/O SIGN
- CHANNELIZING DEVICE - SEE TABLE F FOR SPACING
- TRAFFIC CONE WITH CLIP ON SIGN
- SIGN
- SIGNALIZED INTERSECTION
- [FAS] ARROW PANEL (FLASHING ARROW)
- HIGH LEVEL WARNING DEVICE (FLAGTREE) (OPTIONAL)
- FLAGGER
- TANS TOW AWAY NO STOPPING ____ TO ____ (SHOW HOURS)
- TANSAT TOW AWAY NO STOPPING ANY TIME
- WORK ZONE (ACTIVITY AREA) LIMITS
- DIRECTION OF TRAFFIC (NOT PAVEMENT MARKING)
- ROADWAY DESIGNATION



DATES OF TEMPORARY NO PARKING ZONE

WORKSITE TRAFFIC CONTROL PLAN		
SIDE OF ROAD WORK AREA SINGLE LANE CLOSURE - RIGHT LANE USING 2-WAY LEFT TURN LANE		
DATE		SCALE
		NONE
		DRAWING NO. 7

California Temporary Traffic Control Handbook (CATTCH) - QUICK REFERENCE TABLE

Minimum Taper length / Minimum # of Channelizer Devices (Cones, Tubular Markers, etc.)

Maximum Channelizer Spacing (FT.)	MPH	WIDTH OF LANE OFFSET IN FEET (Shift From Normal Lane Width Due To Work Zone)													
		5	6	7	8	9	10	11	12	13	14	15	16	17	18
20	20	33	40	47	53	60	67	73	80	87	93	100	107	113	120
		3	3	4	4	4	5	5	5	6	6	6	7	7	7
25	25	52	63	73	83	94	104	115	125	135	146	156	167	177	188
		4	4	4	5	5	6	6	6	7	7	8	8	9	9
30	30	75	90	105	120	135	150	165	180	195	210	225	240	255	270
		4	4	5	5	6	6	7	7	8	8	9	9	10	10
35	35	102	123	143	163	184	204	225	245	265	286	306	327	347	368
		4	5	6	6	7	7	8	8	9	10	10	11	11	12
40	40	133	160	187	213	240	267	293	320	347	373	400	427	453	480
		5	5	6	7	7	8	9	9	10	11	11	12	13	13
45	45	225	270	315	360	405	450	495	540	585	630	675	720	765	810
		6	7	8	9	10	11	12	13	14	15	16	17	18	19
50	50	250	300	350	400	450	500	550	600	650	700	750	800	850	900
		6	7	8	9	10	11	12	13	14	15	16	17	18	19
55	55	275	330	385	440	495	550	605	660	715	770	825	880	935	990
		6	7	8	9	10	11	12	13	14	15	16	17	18	19
60	60	300	360	420	480	540	600	660	720	780	840	900	960	1020	1080
		6	7	8	9	10	11	12	13	14	15	16	17	18	19
65	65	325	390	455	520	585	650	715	780	845	910	975	1040	1105	1170
		6	7	8	9	10	11	12	13	14	15	16	17	18	19

Minimum # of Channelizing Devices Shown In White
Minimum Taper Length "L" Shown in Grey

Temporary Traffic Control Elements (4 Zones):

1. **Advance Warning Area** - Traffic is informed of what to expect.
2. **Transition Area** - Where traffic is diverted out of it's normal path (See above chart)
3. **Activity Area** is where work takes place - Work Space/Traffic Space/Buffer Space
4. **Termination Area** - Where traffic is returned to normal driving path.

Table A: ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs (ft)		
	A	B	C
Urban - 25 mph or less	100	100	100
Urban - 30 mph to 40 mph	250	250	250
Urban - more than 40 mph	350	350	350
Rural	500	500	500
Expressway/Freeway	1000	1500	2640

TTC Sign Recommendations:

45 mph or greater = 48" Sign
40 mph or less = 36" Sign

Table C: FOR LENGTHS NOT SHOWN ABOVE

$$L = (W \times S^2) / 60 \text{ for 40 mph or less}$$

$$L = W \times S \text{ for 45 mph or more}$$

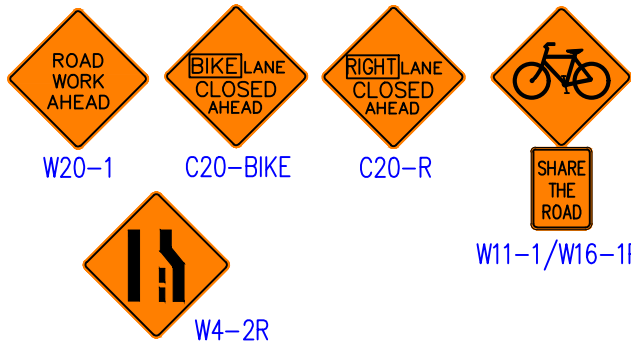
L = Minimum Length of Taper (feet)

W = Width of Offset (feet)

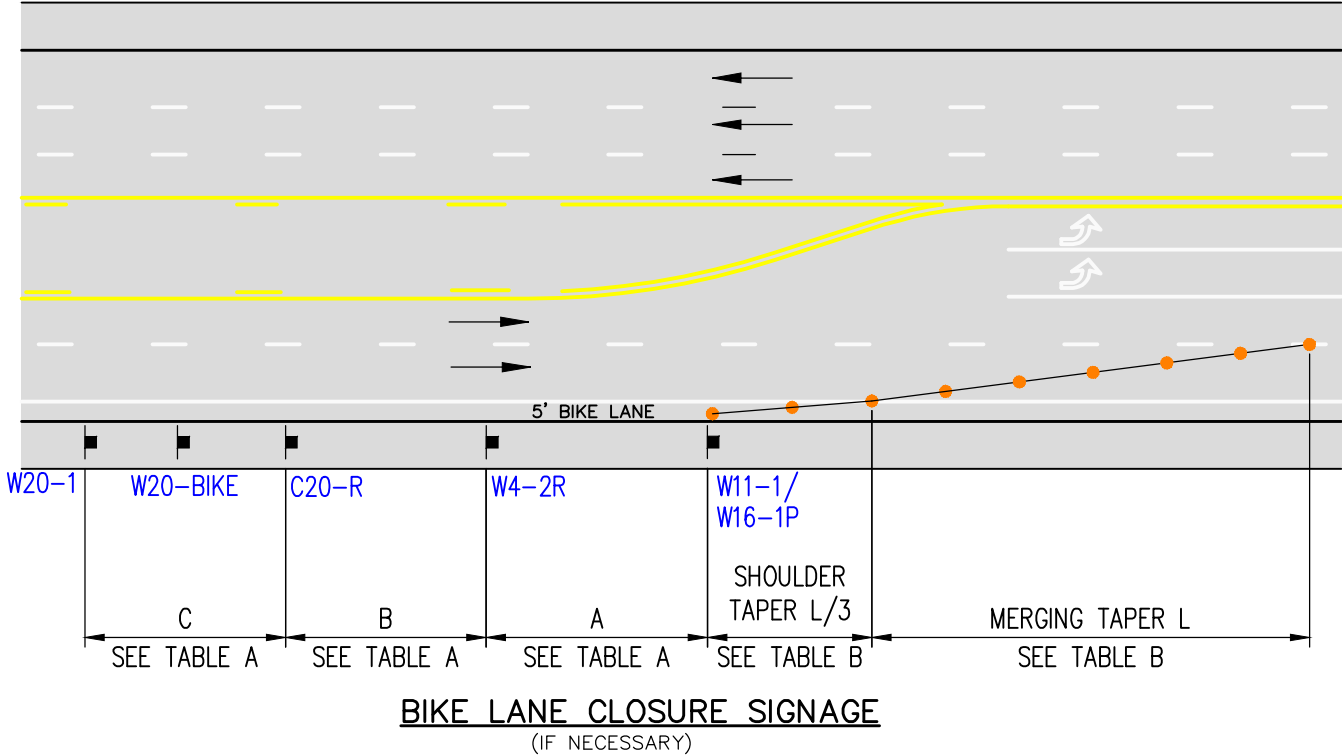
S = Speed Limit (mph)

Table B: Taper Length Criteria for Temporary Traffic Control Zones

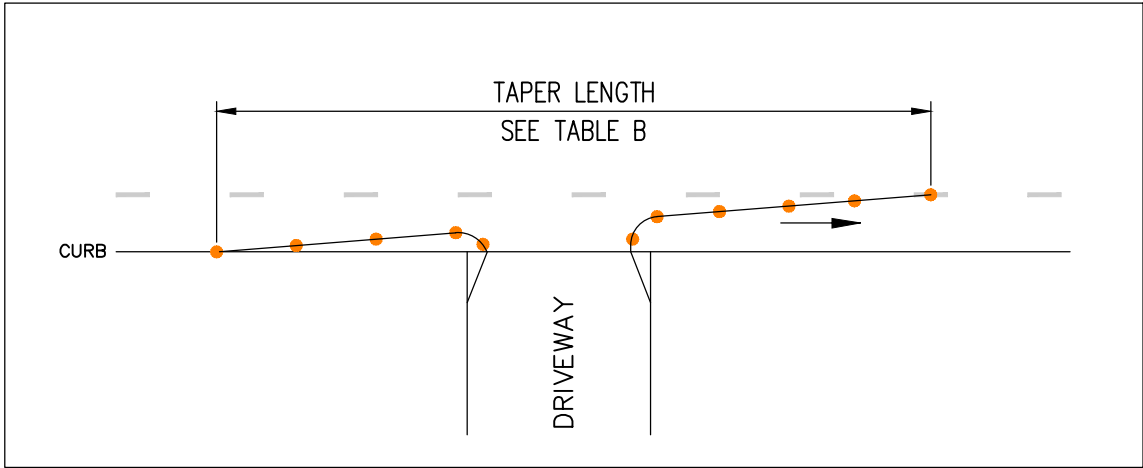
Type of Tapers:	Taper Lengths:
1. Merging Taper	L Minimum
2. Shifting Taper	1/2 L Minimum
3. Shoulder Taper	1/3 L Minimum
4. One-Lane, Two-Way Traffic Taper	50-ft Min/100-ft Max
5. Downstream Taper	50-ft Min/100-ft Max per lane



- CONSTRUCTION NOTES:
1. PLACE BIKE LANE CLOSED AHEAD SIGN (C20-BIKE) HALF THE DISTANCE BETWEEN THE FIRST AND SECOND SIGNS.
 2. BICYCLISTS SHALL NOT BE LED INTO DIRECT CONFLICTS WITH MAINLINE TRAFFIC, WORK SITE VEHICLES, OR EQUIPMENT MOVING THROUGH OR AROUND THE TTC ZONE.



CONSTRUCTION NOTE:
ALL DRIVEWAYS TO REMAIN OPEN
(WHENEVER POSSIBLE) THROUGHOUT
TRAFFIC CONTROL ZONE



SEE TABLE A-F FOR SIGN AND CHANNELIZER DEVICE SPACING AND TAPER LENGTH

SPEED	APPROACH STREET	TAPER LENGTH	SIGN SPACING	CHANNELIZER SPACING

SEE TABLE A-F FOR SIGN AND CHANNELIZER DEVICE SPACING AND TAPER LENGTH

SPEED	APPROACH STREET	TAPER LENGTH	SIGN SPACING	CHANNELIZER SPACING

ABBREVIATIONS:

- MIN = Minimum
LT = Left
RT = Right
LTP = Lane Traffic Panel
TANSAT = Tow Away, No Stopping Anytime
TANS = Tow Away, No Stopping

RECOMMENDED DELINEATOR/CONE
& SIGN PLACEMENT

POSTED SPEED LIMIT	MINIMUM TAPER LENGTH FOR 12-FT LANE			MAXIMUM CHANNELIZER SPACING		MINIMUM SIGN SPACING (ADVANCE OF TAPER & BETWEEN SIGNS)
	MERGING	SHIFTING	SHOULDER	TAPER	TANGENT	
20 MPH	80 FT.	40 FT.	27 FT.	20 FT.	40 FT.	100 FT.
25 MPH	125 FT.	63 FT.	42 FT.	25 FT.	50 FT.	100 FT.
30 MPH	180 FT.	90 FT.	60 FT.	30 FT.	60 FT.	250 FT.
35 MPH	245 FT.	123 FT.	82 FT.	35 FT.	70 FT.	250 FT.
40 MPH	320 FT.	160 FT.	107 FT.	40 FT.	80 FT.	250 FT.
* 45 MPH	540 FT.	270 FT.	180 FT.	45 FT.	90 FT.	350 FT.
* 50 MPH	600 FT.	300 FT.	200 FT.	50 FT.	100 FT.	350 FT.
* 55+MPH	660 FT.	330 FT.	220 FT.	50 FT.	100 FT.	PER TABLE 'A'

NOTES

1. A Flashing Arrow sign shall be used for each lane closed, at merging taper.
- *2. One lane closure sign (C20) shall be used on the approach to a lane closure. Two signs (separated by a distance derived from table A) should be used with speeds of 45 mph or greater. W20-5 signs may be used in place of C20 signs.

NOTE: This chart based on 12-foot wide lanes.
For lane widths greater than 12 feet,
use the following formulae:

Taper formula:
 $L = S \times W$ for speeds of 45 mph or more.
 $L = \frac{WS^2}{60}$ for speeds of 40 mph or less.

Where:
L = Minimum length of taper.
S = Numerical value of posted speed limit prior to work or 85 percentile speed.
W = Width of offset.
i.e.: 50 mph and 19' lane;
 $L = 50 \times 19 = 950$ feet

DATES OF TEMPORARY NO PARKING ZONE

WORKSITE TRAFFIC CONTROL PLAN
STANDARD DETAILS, ABBREVIATIONS
AND REFERENCE CHARTS

DATE	SCALE	NONE
		DRAWING NO. 49

REFERENCE SIGN CHART



REFERENCE SIGN CHART

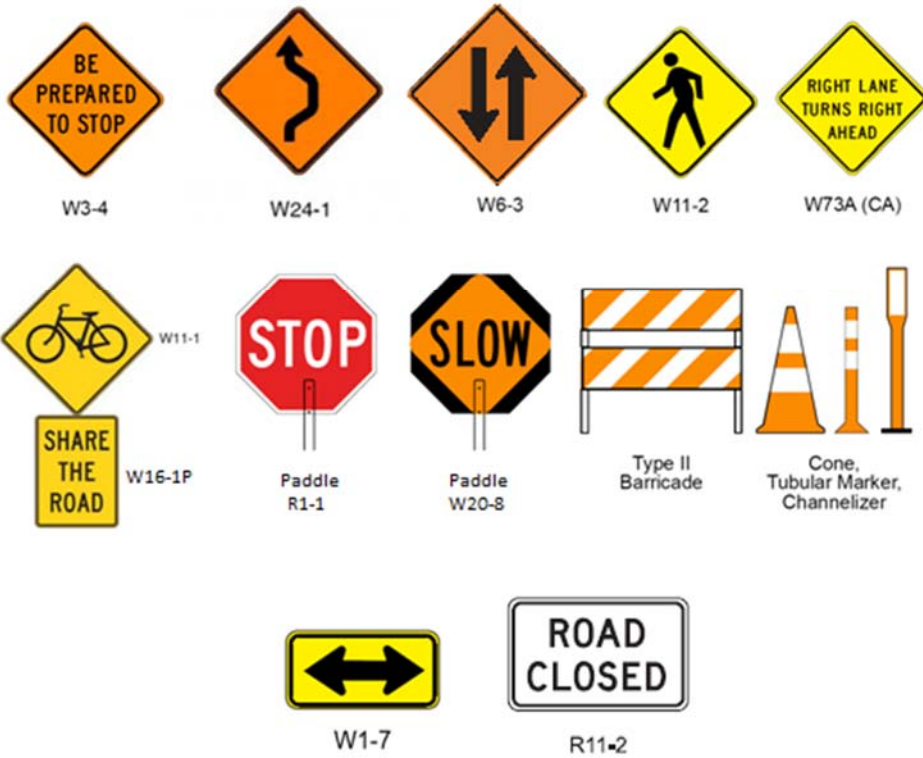
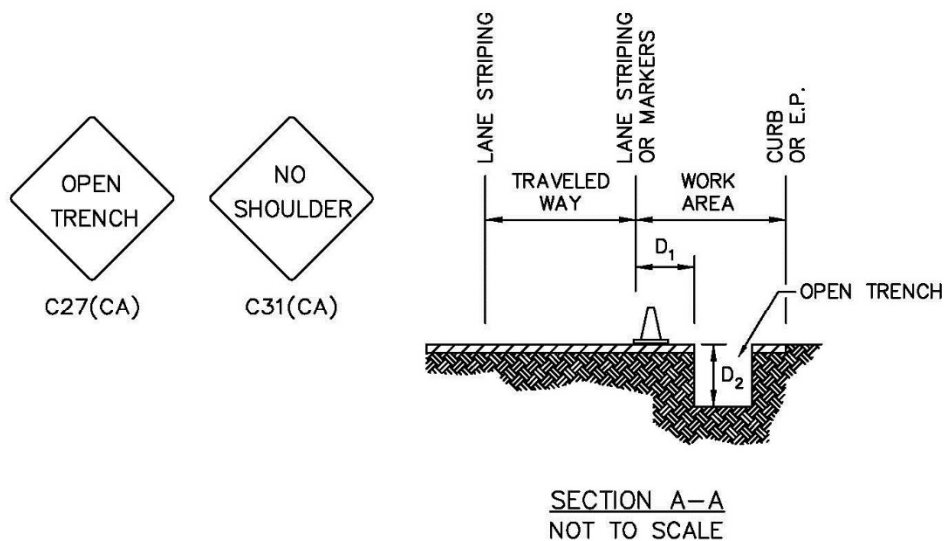
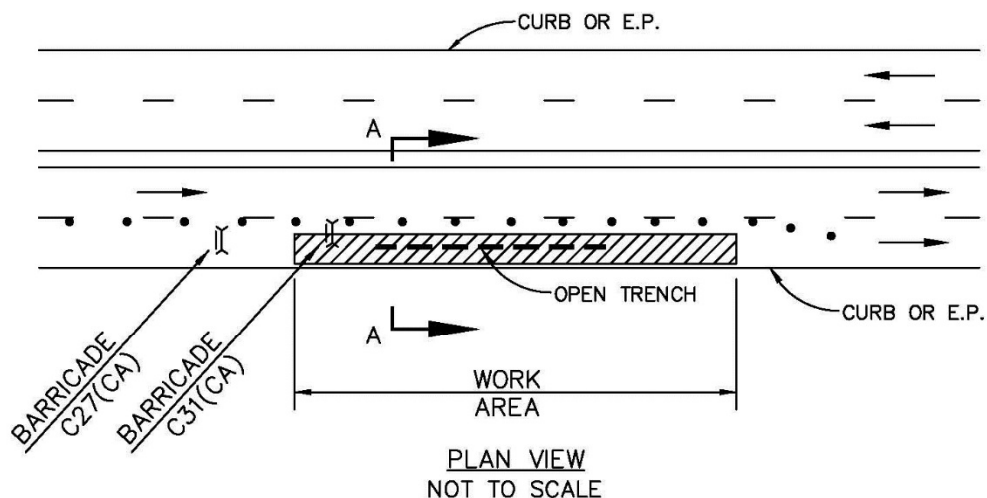


FIGURE A – Use of C27(CA) Open Trench Sign

C27(CA) and NO SHOULDER (C31A(CA)) signs on Type II or Type III barricades alternately set in the trench at intervals not to exceed every 2,000 feet.

FIGURE A
Use of C27 Open Trench Sign



NOTE:

1. C27 AND C31 SIGNS SHALL BE USED WHEN TRENCH D_1 IS 8-FT OR LESS AND D_2 IS GREATER THAN 0.25-FT (3-INCHES) BUT LESS THAN 2.5-FT.
2. D_1 SHALL NOT BE LESS THAN 5-FT.

Table A - Recommended Advance Warning Sign Spacing

Posted Speed	Distance Between Signs **		
	A	B	C
Urban 25 mph or less***	100	100	100
Urban more than 25 mph to 40 mph***	250	250	250
Urban more than 40 mph***	350	350	350
Rural	500	500	500
Expressway/Freeway	1,000	1,500	2,640

** Distances are shown in feet. **The column headings A, B, and C are the dimensions shown on drawings No. 1-48.** The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The third sign is one in a three sign series encountered by a driver/motorist approaching a TTC zone).

*** Posted speed limit, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

Table B - Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length (L)
Merging Taper	at least L
Shifting Taper	at least 0.5L
Shoulder Taper	at least 0.33L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream taper	50 feet min., 100 feet max. per lane

Table C - Formulas for Determining Taper Lengths

Speed Limit	Taper Length (L) Feet
40 mph or less	$L = WS^2/60$
45 mph or more	$L = WS$

Where: L = taper length in feet
W = width of offset feet
S = posted speed limit, or off peak 85th- percentile speed prior to work starting. Or the anticipated operating speed in mph

Table D – Longitudinal Buffer Space or Flagger Station Spacing on Downgrades

Speed (mph)	% Downgrade (Buffer Space)			
	Level Road 0% (ft)	-3% (ft)	-6% (ft)	-9% (ft)
20	115	116	120	126
25	155	158	165	173
30	200	205	215	227
35	250	257	271	287
40	305	315	333	354
45	360	378	400	427
50	425	446	474	507
55	495	520	553	593
60	570	598	638	686
65	645	682	728	785
70	730	771	825	891

**Table E – Taper Length Criteria for Temporary Traffic Control Zones
(for 12 feet Offset Width)**

Speed* S (mph)	Minimum Taper Length ** For Width of Offset 12 ft (W)			
	Merging L (ft)	Shifting L/2 (ft)	Shoulder L/3 (ft)	Down Stream (ft) ***
20	80	40	27	50
25	125	63	42	50
30	180	90	60	50
35	245	123	82	50
40	320	160	107	50
45	540	270	180	50
50	600	300	200	50
55	660	330	220	50
60	720	360	240	50
65	780	390	260	50
70	840	420	280	50

* Posted Speed, off peak 85th percentile speed prior to work starting, or the anticipated operating speed.

** For other offsets use the following merging taper length formula for L:
For speeds of (40 mph) or less ($L=WS^2/60$)
For speeds of (45 mph) or more ($L=WS$)

*** Maximum downstream taper length is 100 feet.

