Stormwater Pollution Prevention Plan

Fulton Fitch Mountain Reconductoring 60 kV Project

LUP Project Risk Type 2 & 3

Application ID#: 494849

Property Address: 605 River Road, Fulton, California

Estimated Construction Project Dates:
Start of Construction May 28, 2018
Completion of Construction June 30, 2019

Qualified SWPPP Practitioner (QSP)

Steve Stetson, CESSWI, QSP# 24740
Ahtna Government Services Corporation; (916) 798-3356

Construction Project Manager:
Matt White, (916) 250-7886

Prepared for

Pacific Gas and Electric Company®

Storm Water Quality Group
3401 Crow Canyon Road, San Ramon, CA
Isabella Johannes - LRP
PG&E Contract Work Supervisor: Marty Bell
PG&E Contract Work Supervisor Phone: (925) 967-8080

Prepared by

Ashley Gaskell, CPESC, QSD #24970
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, California 95691
(916) 372-2000

Date: May 9, 2018

Table of Contents

Appendices

Qualified SWPPP Developer Certification

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: **Fulton Fitch Mountain Reconductor 60 kV Project**

"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."

	5/9/2018
QSD Signature	Date
Ashley Gaskell	**24970**
QSD Name	QSD Certificate Number
CPESC, QSD - AGSC	**(916) 307-9535**
Title and Affiliation	Telephone Number
AGaskell@Ahtna.net	
Email Address	

Amendment Log

Project Name: **Fulton Fitch Mountain Reconductor 60 kV Project**

Amendment No.	Date	Amendment Description

Section 1 SWPPP Requirements

1.1 Introduction

The Fulton Fitch Mountain Reconductor 60 kV Project is located at 605 River Road in Fulton, California. The property is owned by PG&E, and is being constructed on by Pacific Gas and Electric Company (PG&E).

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). In accordance with the General Permit this SWPPP is designed to address the following objectives:

- Control all pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity;
- Identify and control, eliminate, or treat all non-stormwater discharges where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit; and
- 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 Economically Achievable/Best Conventional Pollutant Control Technology (BAT/BCT) standard.

1.2 Permit Registration Documents

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

- Notice of Intent (NOI);
- Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination) Including Individual Method Calculation Documentation if applicable;
- Site Maps;
- Annual Fee;
- Signed Certification Statement;
- SWPPP;

Site Maps are located in Appendix A. A copy of the applicable PRDs, including the NOI, Risk Assessment Documentation, Post Construction Documentation, and Waste Discharge Identification (WDID) Receipt Letter are available in Appendix B.

1.3 SWPPP Availability and Implementation

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 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 SWPPP shall be made available via a request by radio/telephone.

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

1.4 SWPPP Amendments

The SWPPP should be revised when:

- There is an applicable General Permit violation;
- There is a reduction or increase in total disturbed acreage;
- BMPs do not meet the objectives of reducing or eliminating pollutants in stormwater discharges;
- There is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or municipal separate storm sewer system (MS4);
- There is a change in the project duration; or
- Deemed necessary by the QSD or PG&E Water Quality Group.

Each amendment must include the date, a description of the change(s) and the QSD's signature. Amendments shall be recorded in the Amendment Log near the front of the SWPPP and include certifications in Appendix C. The SWPPP text and/or figures shall be revised, replaced, inserted, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by or at the direction of a QSD. The QSP, LRP, Contractor, or appropriate field personnel shall notify the QSD when an amendment or revision is needed.

1.5 Annual Report

Annual Reports for the reporting year beginning July 1st and ending June 30th shall be prepared and certified/submitted no later than September 1st of each year in accordance with information required by the on-line forms.

1.6 Changes to Permit Coverage

The General Permit allows for the reduction or increase of the total acreage covered by the WDID number. When a change occurs, the SWPPP should be modified appropriately and modified PRDs shall be filed electronically within 30 days of the reduction or increase in total disturbed area as a Change of Information (COI) in SMARTS.

1.7 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 and approve the NOT when the conditions of the General Permit have been met.

1.8 Required Non-Compliance Reporting

If a General Permit discharge violation occurs (including un-authorized non-stormwater discharges) or if the project receives a written Notice of Violation (NOV) or order from a regulatory agency, the contractor will immediately notify the QSP, the Environmental Field Specialist (EFS), and the PG&E Stormwater Work Supervisor, who shall notify the Regional Water Board. The contractor will provide a written report to the QSP (Section 6.1), the PG&E Stormwater Work Supervisor, and the EFS within 24 hours. The QSP will then notify the Project Manager and will file a written report to them within 7 days of occurrence, or as specified in the Special Provisions. After hours EFS, call: (800) 874-4043.

PG&E is responsible for submitting any Notices of Non-Compliance to the RWQCB that relate to CGP coverage or discharge violations, including those issued by the CPUC. The Storm Water Work Supervisor will notify the Regional Water Quality Control Board of a Notice of Non-Compliance if necessary. If planned changes in construction activity will result in non-compliance with the CGP, the discharger is required to give advance notice to the RWQCB and local storm water management agency.

The report to PG&E will contain the following items:

- The date, time, location, nature of operation, and type of unauthorized discharge, including the cause or nature of the notice or order;
- The control measures (BMPs) deployed before the discharge event, or prior to receiving the 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; and
- An implementation and maintenance schedule for any affected BMPs.

Section 2 Project Information

2.1 Project and Site Description

2.1.1 Site Description

The Fulton Fitch Mountain Reconductor 60 kV Project comprises approximately 40.23 acres of project area, and is located at 605 River Road in Fulton, California. The site is bounded by the Russian River to the north, River Road to the south, and runs parallel to U.S. Highway 101. The project starting point is located 0.20 miles west of U.S. Highway 101 along River Road in Fulton, California and the termination point is located 0.05 miles south of the Russian River on Bailhache Avenue in Healdsburg, California. The project is located at latitude 38.49755, longitude -122.76071 and is identified on the Site Maps in Appendix A. Access to the project site is provided by traveling from U.S. Highway 101 west on River Road, then turn right at the Fulton Substation gate.

2.1.2 Existing Conditions

As of the initial preparation date of the SWPPP, the project site is located in an existing development consisting of two established substations and mostly wooden and some steel power poles traversing both agricultural and developed lands. The project site has no known historic sources of contamination.

2.1.3 Existing Drainage

The project site topography varies greatly along the project alignment, ranging from flat to steeply sloped and travels through agricultural, developed private land, and public land. The elevation of the project ranges from 105 feet to 135 feet above mean sea level (msl). Surface drainage along the alignment currently flows in multiple directions in to storm drain inlets, roadside swales and tributary creeks and ultimately to the Russian River. Stormwater discharges from the site are not considered direct discharges, as defined by the State Water Board to the Russian River. Existing site topography, drainage patterns, and stormwater conveyance systems are shown in Appendix A.

The project indirectly discharges to the Russian River which is listed for water quality impairments on the most recent 303(d) list for:

- Aluminum
- Indicator Bacteria
- Sedimentation / Siltation
- Specific Conductivity
- Temperature, water

2.1.4 Geology, Groundwater, and Rainfall

The site is underlain by well drained Zamora silty clay loam. The typical profile for this soil type is as follows: (0 to 5 inches – silty clay loam, 5 to 41 inches – clay loam, 41 to 55 inches – sandy clay loam, 55 to 60 inches – gravelly clay). Groundwater is expected to be encountered at approximately 80 inches below ground surface and the annual average precipitation at the project site is 38 to 44 inches. Ponding and flooding is not expected to occur at the project site and the available water capacity of the soil is moderately high.

Based on Isopluvial Maps, the 5-year, 24-hour event for the project is 5.21 inches. This information should be considered during the selection and design of related BMPs.

2.1.5 Project Description

The project consists of two segments, Segment 1 South, LUP Type 2 and Segment 2 North, LUP Type 3. Project activities for Segment 1 South include replacing 3 wood poles with light duty steel poles and reconductoring a 2.0 mile long section of the Fulton-Hopland 60kV Power Line from the Fulton Substation moving northward along the alignment. Project activities for Segment 2 North include replacing 71 wood poles with light duty steel poles and reconductoring a 9.0 mile long section of the Fulton-Hopland 60kV Power Line from the Segment 1 South termination point to the Fitch Mountain Substation near Healdsburg. The project is anticipated to create 11 pull sites, 6 landing zones and 6 laydown/staging yards. Perimeter control for the laydown / staging yards are not required as vegetative buffers exist at the locations The majority of the pole replacements will be completed by helicopter to minimalize soil disturbances and mitigate large equipment access concerns.

2.1.6 Developed Condition

Post construction surface drainage will be directed to the natural flow direction as sheet flow in rural areas and to storm drain inlets within urban areas and will discharge into existing culverts and natural drainage patterns.

Post construction drainage patterns and/or conveyance systems are presented in Appendix A and a summary of drainage information is located in the following table.

Construction Site Estimates

Percent Impervious Before Construction	17.0 %
Runoff Coefficient Before Construction	0.40
Percent Impervious After Construction	17.0 %
Runoff Coefficient After Construction	0.40

Final stabilization will be achieved on the project by meeting the 70% final cover method. Stabilization will be achieved within 90 days of completion of construction activities by June 30, 2019.

2.2 Stormwater Run-On from Offsite Areas

Run-on to the site is generated by point source discharges from up-gradient developed land and undeveloped land. Creeks and streams run through the project site as up-gradient non-point source discharges, such as sheet flow.

The estimated stormwater run-off drainage area contributing to offsite run-on, runoff coefficients, rainfall intensity, and volume calculations are summarized in the table below.

Run-on Summary

A	Runoff Coefficient of Area that Runs onto the Site	0.25	
B	Area Rainfall Intensity	0.695	in./hr.
C	Drainage Area that Runs onto the Site	135	acres
	Site Area Run-on	23.46	ft^3/sec.

Temporary BMPs are required to be implemented to direct offsite run-on away from all disturbed areas through the use of runoff controls or runoff shall collectively be in compliance with effluent limitations in the General Permit. The following BMPs will be implemented to address run-on to the project site:

Run-on BMP	Location	Potential Non-Visible Pollutants
Vegetative Buffer	Throughout the project site.	Sedimentation
Fiber roll	As needed up gradient at new pole locations, laydown areas, pull sites, and landing zones.	Sedimentation
Gravel bags	As needed up gradient at new pole locations, laydown areas, pull sites, and landing zones.	Sedimentation

Off-site drainage areas, associated stormwater conveyance facilities, and/or run-on control BMPs are shown in Appendix A.

2.3 Construction Site Sediment and Receiving Water Risk Determination

A construction site risk assessment has been performed for the project and the resultant risk type is:

Risk Type 2 and Risk Type 3.

Project Type is based on the analytical results of two components: Sediment Risk and Receiving Water Risk. Sediment Risk calculations include analysis of project duration, location, and soil conditions. Receiving Water Risk is based on proximity to impaired receiving waters. Additionally, Linear Underground/Overhead Projects (LUPs) utilize a flow chart to determine either LUP Type 1 status or Receiving Water Risk. Risk Type determination documentation is included in Appendix B and summarized in the table(s) below.

Summary of Sediment Risk – Segment 1 - South

RUSLE Factor	Value	Method for Establishing Value
R	106	US EPA, Construction Rainfall Erosivity Factor Calculator
K	0.37	(SMARTS populated)
LS	0.68	(SMARTS populated)
Total Predicted Sediment Loss (tons/acre)		26.67
Overall Sediment Risk Low: < 15 tons/acre Medium: ≥ 15 and < 75 tons/acre High: ≤ 75 tons/acre		☐ **Low** ☒ **Medium** ☐ **High**

The Segment 1 alignment crosses through the flood plain of a sediment sensitive receiving water but no ground disturbing work will occur in this area.

Summary of Sediment Risk – Segment 2 - North

RUSLE Factor	Value	Method for Establishing Value
R	119	US EPA, Construction Rainfall Erosivity Factor Calculator
K	0.37	(SMARTS populated)
LS	4.39	(Custom Weighted LS)
Total Predicted Sediment Loss (tons/acre)		193.3
Overall Sediment Risk Low: < 15 tons/acre Medium: ≥ 15 and < 75 tons/acre High: ≤ 75 tons/acre		☐ **Low** ☐ **Medium** ☒ **High**

Medium and High Receiving Water Risk is assigned to a project where the disturbed area discharges directly or indirectly to a 303(d)-listed waterbody impaired by sediment, siltation, or turbidity, has a USEPA approved TMDL implementation plan for sediment, siltation, or turbidity OR has designated beneficial uses of Spawn, Cold, and Migratory (Sensitive Receiving Water Body).

Summary of Receiving Water Risk Segment 1 South			
Receiving Water (direct or indirect)	**303(d) Listed for Sediment Related Pollutant**	**TMDL for Sediment Related Pollutant**	**Beneficial Uses of Cold, Spawn, and Migratory**

Russian River	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No
Is the project area or segment located within the flood plain or flood prone area of a Sensitive Receiving Water Body?			☐ Yes ☒ No
Overall Receiving Water Risk			☐ **Low** ☒ **Medium** ☐ **High**

Summary of Receiving Water Risk Segment 2 North			
Receiving Water (direct or indirect)	**303(d) Listed for Sediment Related Pollutant**	**TMDL for Sediment Related Pollutant**	**Beneficial Uses of Cold, Spawn, and Migratory**
Russian River	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No
Is the project area or segment located within the flood plain or flood prone area of a Sensitive Receiving Water Body?			☒ Yes ☐ No
Overall Receiving Water Risk			☐ **Low** ☐ **Medium** ☒ **High**

2.4 Construction Schedule

The site sediment risk shall be determined based on construction taking place between the dates listed on the cover of this SWPPP. Modification or extension of the schedule may affect risk determination and permit requirements and therefore project personnel shall contact the QSD regarding any schedule changes.

2.5 Potential Construction Activity and Pollutant Sources

A list of construction activities and associated materials that are anticipated to be used onsite are included in Appendix D. The 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 BMPs for the project. The location of pollutants and/or associated BMPs are shown on the Site Map(s) in Appendix A.

Sampling requirements for non-visible pollutants are described in Section 7. Additional pollutants and/or more specific products may be onsite. Refer to the Safety Data Sheets (SDS), which shall be retained onsite, likely at the construction trailer.

2.6 Identification of Non-Stormwater Discharges

Non-stormwater discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowance for specified non-stormwater discharges that do not cause erosion or carry other pollutants. Authorized non-stormwater discharges will be managed with the stormwater and non-stormwater BMPs described in Section 3 and/or shown in Appendix A and will be minimized to the extent feasible.

Non-stormwater discharges that may be authorized from this project site include de-chlorinated potable water sources such as

- Irrigation of Vegetative Erosion Control Measures
- Water to Control Dust
- Uncontaminated Groundwater from Dewatering
- Atmospheric Condensate from Refrigeration, Air Conditioners, Compressors, etc.
- Springs
- Foundation or Footing Drainage

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit or authorized under a separate NPDES permit, are prohibited. If an unauthorized non-stormwater discharge situation is observed, the QSP will initiate actions, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed, or treated on-site.

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

- Improper Dumping
- Spills
- Leaks from Tanks, Containers, or Equipment
- Improper Cleaning of Vehicles, Equipment, Impervious Surfaces, etc.
- Improper Use or Application of Construction or Landscape Related Materials
- Inadequate Containment of Potential Pollutants
- Contaminated Water From Dewatering Operations
- Contaminated Water From Run-on

Discharges of construction materials and wastes, such as fuel or paint, resulting from dumping, spills, or direct contact with rainwater or stormwater runoff, are also prohibited.

2.7 Required Site Map Information

The construction project Site Map(s) showing the project location, surface water boundaries, geographic features, construction site perimeter, general topography, and/or other map requirements are located in Appendix A.

Section 3 Best Management Practices

3.1 Schedule for BMP Implementation

BMPs must be implemented, modified, and maintained to reflect the phase of construction and the weather conditions. In order to be effective, some BMPs must be installed before the site is disturbed and others may require multiple applications or installations. The schedule for deployment of BMPs in identified in Section 3.6.

The following BMP and A-ESCP selection tables indicate the BMPs that should be implemented on the construction site; alternate methods may be implemented if effective and approved by the QSP. Fact Sheets/Cut Sheets for BMPs which describe the purpose, application, limitations, implementation, inspection, and maintenance are provided in Appendix H. Additionally, PG&E has Activity Specific Erosion and Sediment Control Plans (A-ESCPs) that provide information for preventing pollution when conducting regular construction and/or maintenance operations. Copies of the applicable A-ESCPs for this project are included in Appendix H. The QSD shall be contacted in the event of a conflict between the SWPPP, the Site Map(s), Fact Sheets or other documents.

3.2 Erosion and Sediment Control

Erosion and sediment controls are required to provide effective reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from the site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking, 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, binding soil particles, and/or strengthening the subsurface.

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

1. Preserve existing vegetation where required and when feasible.
2. Control of area of soil disturbing operations shall be such that the Contractor is able to implement erosion control BMPs quickly and effectively.
3. Provide effective soil cover for inactive areas. Inactive is defined as areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
4. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.
5. Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding, or alternate effective methods.

6. Apply permanent erosion control to remaining disturbed soil areas prior to the completion of construction.
7. Maintain sufficient erosion control materials onsite to allow implementation in conformance with this SWPPP and the General Permit.
8. Limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist.

Erosion Control BMPs

Fact Sheet	BMP Name	Project Specific Notes/Instructions
EC-1	Scheduling	Entire project, at all times, limit soil disturbance activities and pollutant use during precipitation.
EC-2	Preservation of Existing Vegetation	Avoid traveling off designated access routes, unnecessary soil disturbances, and damaging vegetative buffers adjacent to work areas.
EC-3	Hydraulic Mulch	Apply as needed on disturbed areas.
EC-4	Hydroseeding	Apply as needed on disturbed areas.
EC-5	Soil Binders	Apply with any mulch.
EC-6	Straw Mulch	Apply as needed on disturbed areas.
EC-7	Geotextiles and Mats	Use to cover stockpiles when stockpile covers are required.
EC-8	Wood Mulch	Apply as needed on disturbed areas.
EC-15	Soil Preparation and Roughening	Prior to hydroseed application as needed.
EC-16	Non-Vegetative Stabilization	As needed along access roads.
WE-1	Wind Erosion Control	Cover inactive stockpiles and trash receptacles.

3.2.2 Sediment Controls

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

This construction project will implement the following practices to provide effective sediment control during construction:

1. Establish and maintain effective perimeter controls.
2. Stabilize all construction entrances and exits and ensure that construction traffic to and from the project is limited to the entrances and exits.

Slope Percentage	Sheet Flow Length Not to Exceed
0-25%	20 feet

25-50%	15 feet
Over 50%	10 feet

3. 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 lengths in accordance with the table on the right
4. Ensure that all storm drain inlets and perimeter controls, runoff controls, and pollutant controls are maintained and effective.

Sediment Control BMPs

Fact Sheet	BMP Name	Project Specific Notes/Instructions
SE-4	Check Dam	Apply as needed to decrease stormwater runon and runoff velocity.
SE-5	Fiber Rolls	Stockpile protection and up gradient of pole locations prior to soil disturbance.
SE-6	Gravel Bag Berm	Stockpile management, check dams, and berms.
SE-7	Street Sweeping and Vacuuming	All paved surfaces, as often as necessary to remove accumulated sediment from paved surfaces.
SE-10	Storm Drain Inlet Protection	As needed along paved roadways.
TC-1	Stabilized Construction Entrance/Exit	At exit of unpaved access roads and laydown yards, installed prior to soil disturbance and material deliveries.
TC-2	Stabilized Construction Roadway	As needed along unpaved access roads.

3.3 Non-Stormwater Controls and Waste and Materials Management

3.3.1 Non-Stormwater Controls

Non-stormwater discharges into storm drain systems or waterways, which are not authorized, are prohibited. The selection of non-stormwater BMPs is based on the list of construction activities with a potential for non-stormwater discharges identified in Appendix D.

This construction project will implement the following practices to provide effective non-stormwater management during construction:

1. Prevent oil, grease, or fuel to leak into the ground, storm drains, or surface waters. Clean leaks immediately and dispose of leaked materials properly.
2. Place all equipment or vehicles which are to be fueled, maintained, and stored in a designated area, fitted with appropriate BMPs.
3. Clean streets in such a manner as to prevent unauthorized non-storm water discharges.
4. Wash vehicles (if necessary) in such a manner as to prevent non-stormwater discharges.

Non-Stormwater BMPs

Fact Sheet	BMP Name	Project Specific Notes/Instructions
NS-1	Water Conservation Practices	Entire project at all times.
NS-2	Dewatering Operations	Contact QSP or EFS before any dewatering occurs.
NS-4	Temporary Stream Crossing	Limit vehicle access to dry season when possible.
NS-5	Clear Water Diversion	As needed to install temporary stream crossings.
NS-6	Illicit Connection/Discharge	Contact QSP or EFS if illicit connection or discharge occurs.
NS-7	Potable Water/Irrigation	Used for dust control.
NS-8	Vehicle and Equipment Cleaning	Limit cleaning to offsite location.
NS-9	Vehicle and Equipment Fueling	Secondary containment and spill kit required.
NS-10	Vehicle and Equipment Maintenance	Spill kit required.
NS-12	Concrete Curing	Secondary containment required for curing chemical storage. (Minimal or no concrete will be used for the Reconductor work).
NS-13	Concrete Finishing	Secondary containment required for finishing chemical storage. (Minimal or no concrete will be used for the Reconductor work).

3.3.2 Material Management and Waste Management

Material 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.

Waste management consists of implementing procedural and structural BMPs for handling, storing, and ensuring proper disposal of waste to prevent the release of those wastes into stormwater discharges. If applicable to the project site, waste management should be conducted in accordance with the Project's Construction Waste Management Plan.

Material and waste management pollution control BMPs shall be implemented to minimize stormwater contact with construction material, waste, and service areas; and to prevent materials and wastes from being discharged off-site. This construction project will implement the following practices to provide effective waste and materials management during construction:

1. Inventory products.
2. Cover and berm loose stockpiled construction materials that are not actively being used. Contain and securely protect stockpiled waste material from wind and rain at

all times unless actively being used. Contain stockpiled landscape materials such as mulches and topsoil when they are not actively being used.

3. Store chemicals in watertight containers in appropriate secondary containment to prevent any spillage or leakage or in a completely enclosed storage shed.
4. Minimize exposure of construction material to precipitation.
5. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so that there is no discharge into the underlying soil and onto surrounding areas.
6. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surface or into the storm drain system.
7. Ensure the containment of sanitation facilities, clean or replace regularly, and inspect for leaks and spills.
8. Cover waste disposal containers at the end of every business day and during a rain event. Prevent discharges from waste disposal containers.
9. Contain fertilizer and other landscape materials when they are not actively being used.
10. Discontinue the application of any erodible landscape material within 2 days before a forecast rain event or during periods of precipitation.
11. Stack erodible landscape material on pallets and cover or store such materials when not being used or applied.
12. Control the air deposition of site materials and from site operations.

Waste and Material Management BMPs

Fact Sheet	BMP Name	Project Specific Notes/Instructions
WM-1	Material Delivery and Storage	Entire project at all times.
WM-2	Material Use	Entire project at all times.
WM-3	Stockpile Management	All Stockpiles, also see Stockpile A-ESCP.
WM-4	Spill Prevention and Control	Entire project at all times.
WM-5	Solid Waste Management	Entire project at all times.
WM-6	Hazardous Waste Management	Entire project at all times.
WM-7	Contaminated Soil Management	Entire project at all times.
WM-8	Concrete Waste Management	When performing any work that includes concrete based material. (Minimal or no concrete will be used for the Reconductor work).
WM-9	Sanitary-Septic Waste Management	Entire project, at all times, in the staging area.
WM-10	Liquid Waste Management	Entire project at all times.

3.3.3 Spill Response and Implementation

Prevention and control of spills minimizes or eliminates the discharge of hazardous and non-hazardous material and waste to the storm drain system or surface waters. All material storage and handling should be located away from natural water courses and storm drains, and should be stored in areas not susceptible to rain if possible.

Employees, contractors, subcontractors, and any other site personnel shall use Good Housekeeping practices at all times and implement other containment controls as a secondary line of defense. Personnel handling any hazardous materials shall be knowledgeable about such materials and shall take proper steps in notifying the EFS and PG&E Stormwater Work Supervisor immediately if a spill occurs. After hours EFS, call: **(800) 874-4043.**

This construction project will implement the following practices to provide effective spill prevention and management during construction:

1. Equipment and materials for cleanup of spills shall be available on site.
2. Spills and leaks shall be cleaned up immediately and disposed properly.
3. Appropriate spill response personnel are to be assigned and trained.
4. If a spill occurs, document all steps taken and submit a written report to the EFS and the PG&E Stormwater Work Supervisor within 7 days.

3.4 Post Construction Stormwater Management Measures

Post construction BMPs are permanent measures designed to reduce or eliminate pollutant discharges from the site after construction is complete and are installed during construction. LUPs are not subject to post-construction water balance requirements due to the nature of their construction to return project sites to pre-construction conditions, however, permanent BMPs listed in the following table are anticipated to remain after construction is complete.

Seeded areas are expected to be maintained until final stabilization is achieved. The following post construction BMPs have been identified for this site:

BMP Name	Project Specific Notes/Instructions
Permanent Vegetation	Consult with Project Biologist or property owner regarding the seed mix or restoration specifications.
Fiber Rolls	Must be biodegradable, not photodegradable.
Non-Vegetative Stabilization	Gravel will be used at pole installation locations, access roads, laydown areas, and landing zones as needed.

3.5 Activity Specific Erosion and Sediment Control Plans (A-ESCPs)

PG&E has developed Activity Specific Erosion and Sediment Control Plans for activities typical to many PG&E Construction Sites. At a minimum, the Good Housekeeping and Stockpile Management Plans shall be used on every job. The following table indicates the A-ESCPs that are to be implemented on this site.

A-ESCP Name	Project Specific Notes/Instructions
Good Housekeeping	Entire project, every day.
Stockpile Management	Entire project, every day.

Laydown/Staging Area Construction	Entire project, every day.
Pole Replacement	Entire project, every day.
Small Rural Access Road Construction and Maintenance Projects	Entire project, every day.
Small Excavation, Construction, and Potholing	Entire project, every day.
Small Construction at Substations	Entire project, every day.

3.6 BMP Installation Schedule

BMPs shall be installed and maintained during specific phases and timing. A-ESCPs shall also be followed as described. The tables below illustrate the schedule for the installation and maintenance schedule for specific BMPs and A-ESCPs. BMP's shall be installed, maintained, repaired, and/or replaced as necessary during the phase in which they are to be used. Unless BMPs are used for multiple phases or post construction, BMPs shall be removed and properly discarded following the intended phase(s).

Erosion Control BMPs							
BMP No.	**BMP**	**Prior to Land Disturbance**	**Grading and Land Development**	**Streets and Utilities**	**Vertical Construction**	**Landscaping and Site Stabilization**	**Post Construction**
EC-1	Scheduling	✳			✳	✳	
EC-2	Preservation of Existing Vegetation	✳			✳	✳	
EC-3	Hydraulic Mulch					✳	
EC-4	Hydroseeding					✳	
EC-5	Soil Binders					✳	
EC-6	Straw Mulch					✳	
EC-7	Geotextiles & Mats				✳	✳	
EC-8	Wood Mulch					✳	
EC-9	Earth Dikes and Drainage Swales						
EC-10	Velocity Dissipation Devices						
EC-11	Slope Drains						
EC-12	Streambank Stabilization						
EC-14	Compost Blankets						
EC-15	Soil Preparation/Roughening					✳	
EC-16	Non-Vegetation Stabilization					✳	✳

Wind Erosion Control BMPs							
BMP No.	**BMP**	**Prior to Land Disturbance**	**Grading and Land Development**	**Streets and Utilities**	**Vertical Construction**	**Landscaping and Site Stabilization**	**Post Construction**
WE-1	Wind Erosion Control				✳	✳	

Sediment Control BMPs							
BMP No.	BMP	Prior to Land Disturbance	Grading and Land Development	Streets and Utilities	Vertical Construction	Landscaping and Site Stabilization	Post Construction
SE-1	Silt Fence						
SE-2	Sediment Basin						
SE-3	Sediment Trap						
SE-4	Check Dam	*			*	*	
SE-5	Fiber Rolls	*			*	*	*
SE-6	Gravel Bag Berm	*			*	*	
SE-7	Street Sweeping and Vacuuming	*			*	*	
SE-8	Sand Bag Barrier						
SE-9	Straw Bale Barrier						
SE-10	Storm Drain Inlet Protection	*			*	*	
SE-11	Active Treatment Systems						
SE-12	Temporary Silt Dike						
SE-13	Compost Socks and Berms						
SE-14	Biofilter Bags						

Tracking Control BMPs							
BMP No.	BMP	Prior to Land Disturbance	Grading and Land Development	Streets and Utilities	Vertical Construction	Landscaping and Site Stabilization	Post Construction
TC-1	Stabilized Construction Entrance/Exit	*			*	*	
TC-2	Stabilized Construction Roadway	*			*	*	
TC-3	Entrance/Outlet Tire Wash						

Non-Stormwater Management BMPs							
BMP No.	**BMP**	**Prior to Land Disturbance**	**Grading and Land Development**	**Streets and Utilities**	**Vertical Construction**	**Landscaping and Site Stabilization**	**Post Construction**
NS-1	Water Conservation Practices				✳	✳	
NS-2	Dewatering Operations				✳		
NS-3	Paving and Grinding Operations						
NS-4	Temporary Stream Crossing				✳	✳	
NS-5	Clear Water Diversion				✳		
NS-6	Illicit Connection/Discharge				✳	✳	
NS-7	Potable Water/Irrigation				✳	✳	
NS-8	Vehicle and Equipment Cleaning				✳	✳	
NS-9	Vehicle and Equipment Fueling				✳	✳	
NS-10	Vehicle and Equipment Maintenance				✳	✳	
NS-11	Pile Driving Operations						
NS-12	Concrete Curing				✳		
NS-13	Concrete Finishing				✳		
NS-14	Material and Equipment Use Over Water						
NS-15	Demolition Adjacent to Water						
NS-16	Temporary Batch Plants						

Waste Management and Materials Pollution Control BMPs							
BMP No.	**BMP**	**Prior to Land Disturbance**	**Grading and Land Development**	**Streets and Utilities**	**Vertical Construction**	**Landscaping and Site Stabilization**	**Post Construction**
WM-1	Material Delivery and Storage				✳	✳	
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-7	Contaminated Soil Management				✳	✳	
WM-8	Concrete Waste Management				✳	✳	
WM-9	Sanitary/Septic Waste Management				✳	✳	
WM-10	Liquid Waste Management				✳	✳	

A-ESCPs						
A-ESCP	**Prior to Land Disturbance**	**Grading and Land Development**	**Streets and Utilities**	**Vertical Construction**	**Landscaping and Site Stabilization**	**Post Construction**
Good Housekeeping				✳	✳	
Stockpile Management				✳	✳	
Laydown/Staging Area Construction				✳	✳	
Sawcutting, Grinding, and Paving						
Dirt and Gravel Access Road Maintenance – Mountain Regions						
Rural Fencing						
Pole Replacement				✳	✳	
Small Rural Access Road Construction and Maintenance Projects				✳	✳	
Small Construction at Substations					✳	
Small Excavation, Construction, and Potholing				✳	✳	
Pavement Rehabilitation Projects						

Section 4 BMP Inspection and Maintenance

4.1 BMP Inspection and Maintenance

Routine daily unrecorded inspections of BMPs, along with recorded inspections before (if there is a forecast 50% or greater chance of rainfall), during (if any rainfall occurs), and after storm events are required on this project. A storm event is considered to be any event that produces a measurable amount of rainfall. A BMP inspection form must be completed for each recorded inspection and maintained on-site with the SWPPP. A blank inspection checklist can be found in Appendix E. Completed checklists shall be kept in Appendix J or in an accompanying binder.

BMPs shall be maintained regularly to ensure proper and effective functionality. Work to address corrective actions shall begin within 72 hours of identified deficiencies, and be completed as soon as possible. Any associated amendments to the SWPPP shall be prepared by a QSD.

Details for maintenance, inspection, and repair of construction site BMPs are located in the BMP Fact Sheets in Appendix H.

Section 5 Training

All persons responsible for implementing requirements of the 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. To promote stormwater management awareness specific for this project, periodic training of job-site personnel should be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed. The QSP and Contractor can provide stormwater training information at the meetings, and subsequently complete a training log as provided in Appendix E.

PG&E's stormwater training expectations include the following:

- The QSP provide a SWPPP training session to site personnel at the start of the project.
- All site personnel attend a site orientation that includes storm water pollution prevention topics specific to the site.
- Annual onsite classroom or formal training prior to the rainy season for all personnel who are on-site regularly.
- The QSD, QSP, Designated Inspector(s), and Site Manager attend a formal classroom training provided by a governmental agency or professional organization annually.

The QSP may delegate activities to personnel trained to do the task(s) appropriately but shall ensure adequate performance. The QSP is responsible for ensuring that all persons working on construction related activities on-site have SWPPP training. A copy of the training record sign in sheet is filed with the on-site SWPPP immediately after the training. In cases where the initial training does not reach all members of the crew, the QSP must ensure additional training is provided. Additional training may be delegated; however, the initial training must be conducted by the QSP. The QSP is also expected to be available to train and assist those individuals conducting daily inspections. The primary and secondary daily unrecorded inspectors must be trained at the same time to ensure that the secondary contact is able to immediately step in, should the primary contact be unavailable.

Site specific training requirements will include:

- Erosion Control
- Sediment Control
- Non-Storm Water Control
- Waste Management and Material Pollution Control

Retain formal and informal training documentation, including copies of QSD and QSP certificates for designated personnel, in Appendix I.

Section 6 Responsible Parties and Operators

6.1 Responsible Parties

6.1.1 Legally Responsible Person

The Legally Responsible Person (LRP) is the person, company, agency, or other entity that possess a real property interest in the land upon which the construction or land disturbance activities will occur for the regulated site. The LRP's information is listed below.

LRP Name:	Isabella Johannes
Title:	Water Quality Program Manager
Company:	PG&E
Address:	3401 Crow Canyon Rd. San Ramon, CA 94583
Phone:	(925) 519-9672

6.1.2 Qualified SWPPP Practitioner

The QSP is the individual assigned responsibility for non-stormwater and stormwater visual observations, sampling and analysis, and responsibility to ensure compliance with the General Permit, implementation of all elements of the SWPPP, including the preparation of the Annual Report, and elimination of unauthorized discharges. If there are unresolved compliance issues, the QSP must escalate them to the PG&E Contract Work Supervisor. The QSP has primary responsibility and significant authority for General Permit compliance and may delegate activities to appropriately trained personnel for whom he/she ensures adequate performance. The QSP is expected to regularly communicate with their delegated Inspector(s) and all documented inspections performed by a delegate must be reviewed by the QSP. The QSP and Designated Inspector's (if applicable) information is listed below.

QSP Name:	Steven Stetson
Title:	CESSWI, QSP
Company:	Ahtna Government Services Corporation
Address:	3100 Beacon Blvd., West Sacramento, CA 95691
Phone:	(916) 798-3356

Designated Inspector:	
Title:	
Company:	
Address:	

Phone:

6.1.3 Qualified SWPPP Developer

The QSD is the individual who is authorized to develop and revise the SWPPP. The QSD should be contacted regarding questions or concerns with this document. The QSD's information is listed below.

QSD Name: Ashley Gaskell

Title: QSD # 24970

Company: Ahtna Government Services Corporation

Address: 3100 Beacon Blvd, West Sacramento, CA 95691

Phone: (916) 307-9535

6.1.4 Other Significant Responsible Parties

Project Role	**Name**	**Company**	**Phone**
Stormwater Work Supervisor	Marty Bell	PG&E	(925) 967-8080
Project Manager	Matt White	PG&E	(916) 250-7886
Environmental Field Specialist (EFS)	Kevin Risley	PG&E	(707) 331-4213
Land Planner	Dave Thomas	PG&E	(415) 238-0027
Biologist	Abdullah Arakozie	PG&E	(925) 206-9523
Land Agent			
Cultural Resource Specialist			
Responsible for Implementing BMPs			
Environmental Inspector (EI)			
Primary Daily Inspector			
Backup Inspector			
Sampling Agent			

6.2 Contractor and Subcontractors

All contractors, subcontractors, and individuals who will be directed by the QSP shall be listed in Appendix F. Contractor and Subcontractor information shall include telephone numbers, work addresses, areas of responsibility, and emergency contact numbers. The list shall be updated as contractors, subcontractors, and individuals change.

Section 7 Monitoring and Reporting Program

7.1 Purpose

This Monitoring and Reporting Program (M&RP) was developed to address the following objectives:

- Implement the M&RP at the start of construction.
- Implement the M&RP at the appropriate level to protect water quality at all times throughout the life of the project.

Monitoring and reporting frequencies reflect requirements mandated in MM Hydrology-2 of the PG&E Fulton Fitch Mountain Reconductoring Project Final Initial Study/Mitigated Negative Declaration prepared by the State of California Public Utilities Commission.

7.2 Weather and Storm Event Tracking

Visual monitoring and inspection requirements are triggered by any amount of rainfall. A minimum of 48 hours of dry weather will be used to distinguish between separate storm events.

For the purpose of assessing exceptions to the Receiving Water Monitoring Triggers, the General Permit establishes the compliance storm event as the 5-year, 24-hour event.

7.2.1 Weather Tracking

The QSP should consult the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. NOAA forecasts can be obtained at http://www.srh.noaa.gov/. NOAA weather reports are expected to be checked daily, preferably between the hours of 7 and 9am.

Print NOAA weather reports for pre-, during, and post-storm events and attach to the inspection form.

7.2.2 Rain Gauges

The QSP should install a rain gauge on the project site if the closest NOAA weather station is in a location that is uncharacteristic of the project site. Locate the gauge in an open area away from obstructions such as trees, tall grass, or overhangs, around the currently open segment or staging area. Ensure that the top of the gauge is level and the gauge is not in an area where rainwater can indirectly splash from sheds, equipment, trailers, etc. If the rain gauge is vandalized, the event must be documented and corrected as soon as feasible.

If an on-site rain gauge is utilized, the gauge must have the ability to operate remotely and is shown on the Site Maps in Appendix A.

7.3 Safety and Monitoring Exemptions

Safety practices will be in accordance with the Contractor's Health and Safety Plan for the project. A summary of the safety concerns that apply to the project are provided below

- Trip and Fall Hazards
- Active Construction Equipment
- Wet or Muddy Surfaces
- Open Trenches
- Hazardous Material and Waste
- Traffic
- Steep Slopes
- Manhole Lid Removal
- Wild Animals, Domestic Dogs, Snakes, Bees, Ticks, etc.

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.

If monitoring of the site is unsafe because of the dangerous conditions noted above or other dangerous situations that may arise, the QSP or designated inspector shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in Appendix J.

7.4 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. The frequency of visual observations and inspections is identified in the table below.

Summary of Visual Monitoring and Inspections

Type of Inspection	Frequency
Routine Inspections	
Routine Visual Inspection	Daily (unrecorded)
QSP Inspection	Weekly
Storm Event Triggered Inspections	
Prior to a Storm Event	Within 24 hours prior to any event that is forecast at 50% or greater probability of precipitation
During an Extended Storm Event	Once each 24-hour period during extended storm events
Following a Storm Event	Within 24 hours after forecast rain event

7.4.1 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 General Permit and are conducted regardless of time of year or storm events. Regardless of who installs BMPs, the QSP or their delegate is expected to verify and correct installation through routine inspections. When a delegated inspector is assigned, the QSP is expected to conduct at least one inspection per week (every 7 days). This weekly inspection may not be delegated.

BMP inspections are conducted to identify and/or record:

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

A BMP is defined as deficient when it is not doing what it was designed to do or when it is not performing to the manufacturer's specifications.

Daily Visual Inspections along active construction zones are conducted to verify that:

- Appropriate BMPs for stormwater and non-stormwater are being implemented in areas where active construction is occurring;
- 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; and
- Land areas disturbed during construction are returned to pre-construction condition 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 storm event.

A double-sided laminated flashcard has been prepared which includes a checklist and site map (or details of the most commonly used BMPs) and is located in the front of the SWPPP binder to assist with daily inspections.

The QSP may delegate daily unrecorded inspection but remains responsible for identifying the individual, ensuring that they understand how to conduct the inspections and confirming that the inspections are done correctly. The primary and secondary daily unrecorded inspector shall be identified in Section 6. The QSP is responsible for periodically checking in with the delegated daily inspector to ensure that the SWPPP is being appropriately implemented and verify that daily unrecorded inspections are taking place. The periodic checks can be accomplished during weekly site visits and through phone calls.

Non-Stormwater Discharge Observations are conducted to inspect each drainage area for the presence of or indications of prior or current unauthorized and authorized non-stormwater discharges.

- 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 the discharge(s).

Inspections are expected to continue until final stabilization has been achieved.

7.4.2 Storm Event Triggered Observations and Inspections

Prior to Storm Events

Within 1 business day (24 hours) prior to any event that is forecast at 50% or greater probability or precipitation, a stormwater visual monitoring site inspection will include observations of the following:

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

A pre-storm inspection is expected to occur when the NOAA forecast indicates a 50 percent or greater probability of precipitation, regardless of the forecast amount of precipitation.

During Storm Events

During an extended storm event, BMP inspections will be conducted to identify and/or 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, or portions of the site, is not accessible during the storm event, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations, and any project maintenance activities.

A QSP is expected to perform all the weekly inspections during each storm event (e.g., will require two or more QSP visits if there are two or more storm events in a week). *S*WPPP monitoring shall be completed by a Qualified SWPPP Practitioner (QSP) on a weekly basis during the construction period and at least once every 24 hours before, during, and after forecast rain events (any likely precipitation event forecast of 50 percent or greater probability).

After Storm Events

Within 1 business day (24 hours) following any measurable rainfall, a stormwater visual monitoring site inspection is required to observe:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutants sources;
- BMPs to identify if they have been properly designed, implemented, and effective;
- The need for additional BMPs, contact QSD if the SWPPP needs to be revised;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- Discharge of stored or contained rain water.

Photographs

Photographs of the site shall be taken during inspections before, during, and after storm events, and submitted through the SMARTS website once every three storm events.

Photographs from every third storm event shall be attached to the associated Inspection Form during the next site visit.

7.4.3 Visual Monitoring Procedures, Locations, Following-Up, and Reporting

Visual monitoring shall be conducted by the QSP or delegated personnel as identified in Section 6. Stormwater observations and BMP inspections shall be documented on the Inspection Form/Checklist provided in Appendix E. Any photographs used to document observations will be referenced on the inspection report and maintained with the Completed Forms in Appendix J.

Inspections and observations will be conducted at the following locations:

- BMP locations;
- Drainage area(s);
- Discharge location(s);
- Stormwater storage or containment area(s);

If failures or shortcomings are identified during visual monitoring, repairs or design changes to BMPs shall begin within 72 hours of identification and be completed as soon as possible. If a BMP deficiency is observed during a documented inspection, it must be noted on the inspection form and include the inspection date, repair start date, corrective action, individual assigned to the action, and action complete date. This shall occur even if the deficiency is remedied immediately. The QSP is expected to use the inspection form to verify that corrective actions are being implemented. If the QSP identifies that no action has occurred to remedy a deficiency, it must be escalated to the project team and PG&E Contract Work Supervisor. It is the Contractor’s responsibility to initial and date the “date addressed” column provided in the Deficiency/Corrective Action table of the Inspection Form.

7.5 Non-Visible Pollutant Sampling and Analysis

The construction materials, existing contamination, wastes, and/or activities identified in Appendix D and Section 2.6 are potential sources of non-visible pollutants to stormwater discharges from the project. Storage, use, and operation locations are shown on the Site Maps in Appendix A, are described in the other sections of the SWPPP, or can be assumed given the nature of the project.

Sampling for non-visible pollutants will be conducted when the following occur:

- A breach, leakage, malfunction, or spill is observed;
- The leak or spill has not been cleaned up prior to the storm event; and
- There is potential for discharge of non-visible pollutants to a surface water or storm drain system.

Non-visible pollutant samples will typically be collected and delivered to the laboratory by the QSP or delegated inspector. If a different entity, such as a Sampling Agent, is responsible for non-visible pollutant sampling, the Sampling Agent’s contact information shall be included in Section 6 and the QSP or the delegated inspector should contact the Sampling Agent 24 hours prior to a predicted sampling event or a soon as possible to ensure samples are collected in accordance with the sampling schedule.

An adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available on the project site or available by phone call prior to a sampling event. Monitoring supplies and equipment should be stored in a cool temperature environment that should 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 site or readily available by phone call may include, but are not limited, clean powder-free nitrile gloves, sample collection equipment, sample analysis equipment, cooler(s), 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 Appendix E.

7.5.1 Non-Visible Pollutant Sampling Schedule

If necessary, samples for non-visible pollutant(s) and an unaffected background sample shall be collected during the first two hours of discharge from storm events which general runoff. Samples shall be collected during the scheduled site business hours, regardless of the time of year and phase of construction.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during site inspections and have potential to discharge non-visible pollutants to surface waters or a storm drain system:

- 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 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 a breach, malfunction, leakage, or spill is observed and the leak or spill is not cleaned up prior to the storm event.
- A construction activity with the potential to contribute non-visible pollutants was occurring during or within 24 hours prior to the storm event and BMP was observed to be breached, malfunctioning, or improperly implemented.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied.
- Stormwater runoff from an area contaminated by historical usage of the site has been observed to combine with stormwater runoff from the site.

7.5.2 Non-Visible Pollutant Sampling Locations

Non-visible pollutant sampling locations will be determined in the field at the time of sampling. The sample with potential non-visible pollutants shall be taken at the location of the discharge, at the project boundary, or closest accessible point. The background sample should be taken upstream of all site related potential pollution impacts or where run-on enters the site. Non-visible pollutant sampling locations shall be added to the Site Map(s) in Appendix A when/if non-visible pollutant sampling is required.

Non-visible pollutant sampling locations should be identified by the QSP or designated inspector on the pre-storm inspection form prior to a storm event.

7.5.3 Non-Visible Pollutant Sample Collection and Analysis

Non-visible pollutant samples shall be collected, preserved, stored, transported, and analyzed in accordance with the methods provided by the designated laboratory, Surface Water Ambient Monitoring Program (SWAMP) field methods, Standard Methods for the Examination of Water and Wastewater (American Public Health Association), and/or analytical methods for each constituent. Appendix D lists the specific sources and types of potential non-visible pollutants on the project site and water quality indicator constituent(s) for each pollutant.

7.5.4 Non-Visible Pollutant Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results. Runoff/down-gradient results shall be compared with the associated up-gradient/unaffected sample results and any run-on results. Should the runoff/down-gradient 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. The QSD shall be notified regarding any revisions to the BMPs which should be recorded as an amendment to the SWPPP.

Discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R § 117.3 and 302.4 are prohibited. 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 report to the appropriate agencies as required by 40 C.F.R § 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be uploaded to SMARTS as an AdHoc Report, included in the Annual Report, and recorded on the Discharge Reporting Form in Appendix E.

7.6 pH and Turbidity Sampling and Analysis

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 NALs (or the exceedance of a Receiving Water Monitoring Trigger (RWMT)). Samples for pH and turbidity will be collected from all discharge points where storm water is discharged off-site and shall characterize discharges associated with construction activity from the entire project disturbed area.

pH and turbidity samples are typically collected and analyzed by the QSP or delegated inspector who has water quality sampling and field measurement training and experience. If a different entity, such as a Sampling Agent, is responsible for pH and turbidity sampling, the Sampling Agent’s contact information shall be included in Section 6 and the QSP or the delegated inspector should contact the Sampling Agent 24 hours prior to a predicted sampling event or a soon as possible to ensure samples are collected in accordance with the sampling schedule.

An adequate stock of monitoring supplies and equipment for monitoring turbidity and pH will be available prior to sampling events. Monitoring supplies and equipment should 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 may 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 Sampling Log sheets provided in Appendix E.

7.6.1 pH and Turbidity Sampling Schedule

Stormwater runoff samples shall be collected and analyzed for pH and turbidity from each day of any event that produces more than ½" of rainfall that results in a discharge from the site. 48-hours without precipitation separates storm events. A minimum of three samples will be collected per day of discharge from each active segment during a storm event. If there are multiple active segments that are characteristically similar, only one segment needs to be sampled. The QSP or trained sampling personnel shall use their best professional judgment to determine time intervals between samples. Samples should be representative of the total discharge from the project each day of discharge during the event.

When discharged, stored or collected water from any event that produces more than ½" of rainfall shall be tested for turbidity and pH. Stored or collected water may be sampled at the point it is released from the storage or containment area or at the site discharge location.

Run-on samples should be collected whenever the QSP identifies that run-on has the potential to contribute to an exceedance of an NAL (or RWMT).

7.6.2 pH and Turbidity Sampling Locations

Sampling locations are based on the site runoff discharge locations; accessibility for sampling; and personnel safety. Planned pH and turbidity sampling locations are shown on the Site Map(s) in Appendix A and include the locations identified in the table below.

Sampling location(s) on the project site and/or contractor's yard will be field located as work moves along the alignment for the collection of pH and turbidity runoff samples. The table below provides example information for potential sampling locations.

Location Number	Description	Latitude and Longitude	Segment
FF1-ON-1	Runon sample location; to be field located.	Latitude: (xx.xxxxx) Longitude: (-xxx.xxxxx)	1
FF1-OFF-1	Runoff sample location; to be field located	Latitude: (xx.xxxxx) Longitude: (-xxx.xxxxx)	1
FF2-ON-1	Runon sample location; to be field located.	Latitude: (xx.xxxxx) Longitude: (-xxx.xxxxx)	2
FF2-OFF-1	Runoff sample location; to be field located	Latitude: (xx.xxxxx) Longitude: (-xxx.xxxxx)	2

Run-on sampling locations will be identified and noted on the Site Map(s) when run-on has the potential to contribute to an exceedance of an NAL (or RWMT). If an NAL (or RWMT) exceedance occurs, personnel collecting the samples shall collect and analyze samples at the location(s) where run-on occurs. The location should be at the project boundary or other location that is up gradient of the construction activity and potential pollutants. The sample collection location(s) shall be denoted on the Site Map(s) in Appendix A.

7.6.3 pH and Turbidity Sample Collection and Analysis

Samples shall be collected and analyzed for the constituents indicated in the table below.

Parameter	Test Method	Detection Limit
Turbidity	EPA 0180.1 or Field Test with Calibrated Portable Instrument	1 NTU
pH	Field Test with Calibrated Portable Instrument	0.2 pH Units

pH and Turbidity sample collection, field analysis, and equipment calibration shall be performed in accordance with the field instrument manufacturer's specifications and/or instructions and results recorded on the Sampling Log sheet. Field sampling staff should periodically review the field instrument instructions. Maintenance and calibration records shall be maintained and available upon request. Personnel shall collect, maintain, and analyze samples in accordance with SWAMP field methods and/or Standard Methods for the Examination of Water and Wastewater (American Public Health Association).

7.6.4 pH and Turbidity Data Evaluation and Reporting

Numeric Action Levels

This project is subject to NALs for pH and turbidity. Compliance with the NALs for pH and turbidity is based on daily site average. The QSP or designated inspector shall calculate the arithmetic average of the turbidity samples and the logarithmic average of the pH samples to determine if the daily average NALs shown in the table below has been exceeded.

Numeric Action Levels

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

In the event that the pH or turbidity NAL is exceeded the QSP or designated inspector shall immediately investigate the cause of the exceedance and identify corrective actions. The QSP shall notify the EFS and the Water Quality Group within 48 hours of NAL exceedances. Exceedances of NALs shall be electronically reported to the State Water Board through the SMARTS system within 10 days of the conclusion of the storm event for Risk Type 2 exceedances. For Risk Type 3, all pH and turbidity sampling data shall be electronically reported to the State Water Board through the SMARTS system within 5 days of the conclusion of the storm event. If requested by the Regional Water Board, an NAL Exceedance report will be submitted. An NAL Exceedance Report Form is provided in Appendix E to record the required information. The NAL Exceedance Report must contain the following information:

- Analytical method(s), method reporting unit(s), and method detection limit(s) (MDLs) 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.

Receiving Water Monitoring Triggers

Segment 1 - South is not subject to RWMTs because the segment is not Type 3. Segment 2- North is subject to RWMTs for pH and turbidity and compliance is based on the daily average. Weighted daily averages of the pH and turbidity sampling analysis shall be calculated immediately via logarithmic averaging for pH and arithmetic averaging for turbidity to determine if RWMTs in the table below have been exceeded.

Receiving Water Monitoring Triggers

Parameter	Unit	Daily Average
pH	pH Units	Lower RWMT = 6.0 Upper RWMT = 9.0
Turbidity	NTU	RWMT = 500 NTU

All pH and turbidity sampling data shall be electronically reported to the State Water Board through SMARTS within 5 days of the conclusion of each storm event. The QSP shall notify the EFS and the Water Quality Group within 24 hours of RWMT exceedances.

7.7 Receiving Water Sampling and Analysis

Segment 1 - South is not subject to Receiving Water Monitoring. Segment 2 – North is subject to Receiving Water Monitoring and has indirect discharge to the following receiving water:

- Russian River

7.8 Non-Stormwater Sampling and Analysis

This project is not subject to non-stormwater sampling and analysis requirements.

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

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

7.10 Training of Sampling Personnel

All sampling personnel shall be trained to collect, maintain, and ship samples in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPrP) and Standard Methods for the

Examination of Water and Wastewater (American Public Health Association). Training documentation shall be located in Appendix I.

7.11 Sample Collection and Handling

Samples shall be collected, maintained, preserved, and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPrP) and Standard Methods for the Examination of Water and Wastewater (American Public Health Association), analytical constituent specific methods, and/or methods as directed by the laboratory.

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

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever contamination may have occurred;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using 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 eat, drink, or smoke while collecting samples;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The Sampler should collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow path or stream as noted below.

- For small streams and flow paths, simply dip the bottle facing upstream until full.
- For larger streams that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle, facing upstream to avoid any contamination by the sampler.
- For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
- Avoid collection samples from ponded, sluggish, or stagnant water.
- Avoid collecting samples directly downstream from a bridge or other structures that may affect the sample.
- Do not enter manholes or drain inlets; use a pole-sampler.
- Use the capture and transfer method to collect samples in very shallow or sheet flow.

Depending upon the specific analytical test, some containers may contain preservatives. These containers should not be dipped into the stream, but filled indirectly from a collection container.

7.12 Sample Handling

pH measurements must be conducted immediately, do not store pH samples for later measurement. Turbidity measurements may be conducted immediately or in a laboratory. Samples for laboratory analysis should be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Prepare sample container labels;
- Seal containers in re-sealable storage bags;
- Place sample containers into an ice-chilled cooler;
- Document sample information on a Sample Log sheet; and
- Complete the CoC.

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 the time of sample collection through delivery to the laboratory. Ensure sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the 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 laboratory within 48 hours of the sampling (unless required sooner by the laboratory).

This project anticipates sending any required laboratory samples to the location listed below.

Laboratory Name:	Brelje and Race Laboratories
Address:	425 South E Street
City, State, Zip:	Santa Rosa, CA 95404
Telephone Number:	(707) 544-8807
Point of Contact:	Jill Brodt

7.13 Sample Documentation Procedures

Data documented on sample bottle identification labels, field log sheets, and CoCs should be recorded using waterproof ink. Sample documentation shall be considered accountable documents and therefore if an error is made on an accountable document, corrections should be made by lining through the error and entering the correct information. Erroneous information should not be obliterated and corrections should be initialed and dated.

Sample documentation procedures include the following:

- Sample Bottle Identification Labels: Attach an identification label to each sample bottle and uniquely identify each location. 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 on the field log sheets.
- Field Log Sheets: Complete a field log sheet for each sampling event.

- Chain of Custody (CoC): Complete for each sampling event for which samples are collected for laboratory analysis. Sign the CoC when the sample(s) is(are) turned over to the testing laboratory or courier.

7.14 Active Treatment System Monitoring

This project does not require a project specific sampling and analysis plan for an ATS because deployment of an ATS is not anticipated for this project.

7.15 Bioassessment Monitoring

This project is not subject to bioassessment monitoring.

7.16 Watershed Monitoring Option

This project is not participating in a watershed monitoring program.

7.17 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.

7.17.1 Field Logs

The purpose of field logs is to recording sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log includes the date and time of water quality sample collections, sampling personnel, sample 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. An example Sampling Log is included in Appendix E.

7.17.2 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. A clean sampling approach will minimize the chance of field contamination and questionable data results.

7.17.3 Chain of Custody

The CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Analytical laboratories usually provide CoC forms to be completed for sample containers. An example CoC is included in Appendix E.

7.17.4 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. QA/QC samples include field duplicates, equipment blanks, field blanks, and travel blanks.

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, must be collected in the same manner. Duplicate samples shall not influence any evaluations or conclusion. Field Duplicates are required at a frequency of 5 percent (1 of 20) or 1 duplicate minimum per sampling event.

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.

Field Blanks

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ionized water filled 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. Field Blanks are required at a frequency as required by the laboratory for the test method as required.

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. Travel Blanks, at a frequency determined by that laboratory, are required for sampling plans that include VOC laboratory analysis.

7.18 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. Ensure all requested analyses were performed and all samples are accounted for in the reports.
- Check Laboratory reports to make sure hold times were met.
- Check Laboratory report to make sure analysis meets or is lower than reporting levels.
- 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 note data that is an order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location. 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.
- Check the laboratory QA/QC results. Evaluate the reported data to check for contamination, precision, and accuracy. When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provide an explanation of the potential impact to the sample results.

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

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

7.19 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 the 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 field measurements, including precipitation;

- Names of the individual(s) who performed the inspections, sampling, visual observations, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The names of the individual(s) who performed the 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;
- Non-stormwater discharge inspections and visual observations and stormwater discharge visual observation records;
- Visual observation and sample collection exemption records; and
- Records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections; and
- NAL Exceedance Reports, if requested by the Regional Board.

Section 8 References

The following plans, specifications, permits, and/or other documents are included in this SWPPP by reference.

- Project Plans and Specifications: Fulton Fitch Mountain KMZ file dated 03/16/2018, prepared by PG&E.
- Project Plans and Specifications: Fulton Fitch Mountain KMZ file dated 11/29/2017, prepared by PG&E.
- Soil Disturbance Calculations: Order number 74000600 dated 2/6/2017.
- The State Water Resources Control Board, Surface Water Ambient Monitoring Program, Quality Assurance Program Plan, Version 1.0 date September 1, 2008.
- Standard Methods for the Examination of Water and Wastewater, American Public Health Association.
- CASQA 2009, Stormwater BMP Handbook Portal: Construction, November 2009
- California Storm water Best Management Practices Handbook – Construction, November 2009.
- Caltrans Storm Water Quality Handbook, Project Planning and Design Guide, Construction Site Best Management Practices (BMPs) Manual, November 2000.
- California Geological Survey. California Geomorphic Provinces, Note 36. Retrieved: http://www.consrv.ca.gov/CGS/information/publications/cgs_notes/note_36/note_36.pdf
- Caltrans, "Pollutant Testing Guidance Table", November 2002.
- CPUC, Impact Statement (IS) / Mitigated Negative Declaration (MND), July 2017. Retrieved: http://www.cpuc.ca.gov/environment/info/panoramaenv/Fulton-Fitch/Fulton-Fitch.html
- Natural Resource Conservation Service (NRCS), 2016. Fresno County, CA, Western Part, Soil Map and Data, Version 10, 1 October 2015.
- PG&E Good Housekeeping Activity Specific Erosion Sediment Control Plan (A-ESCP), February 2013.
- PG&E Laydown and Staging Area Construction Activity Specific Erosion Sediment Control Plan (A-ESCP), January 2011.

- PG&E Pole Replacement Activity Specific Erosion Sediment Control Plan (A-ESCP), November 2013.
- PG&E Small Excavation, Construction, and Potholing Activity Specific Erosion Sediment Control Plan (A-ESCP), February 2013.
- PG&E Small Construction at Substation Activity Specific Erosion Sediment Control Plan (A-ESCP), November 2013.
- PG&E Small Rural Access Road Construction and Maintenance Projects Activity Specific Erosion Sediment Control Plan (A-ESCP), January 2011.
- PG&E Stockpile Management Activity Specific Erosion Sediment Control Plan (A-ESCP), February 2013.
- State Water Resources Control Board (SWRCB) Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm water Runoff Associated with Construction Activity, 2009, as modified by Order 2010-0014 DWQ (November 16, 2010).
- Wagner, D.L., Jennings, and Strand, R.G., 1958. Geologic Map of the California Santa Cruz Quadrangle, Regional Geologic Map No. 020, California Geologic Survey. Scale 1:250,000

Appendix A

Vicinity Map, Site Maps, and Daily Inspection Flashcard

PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project
Santa Rosa to Healdsburg, CA

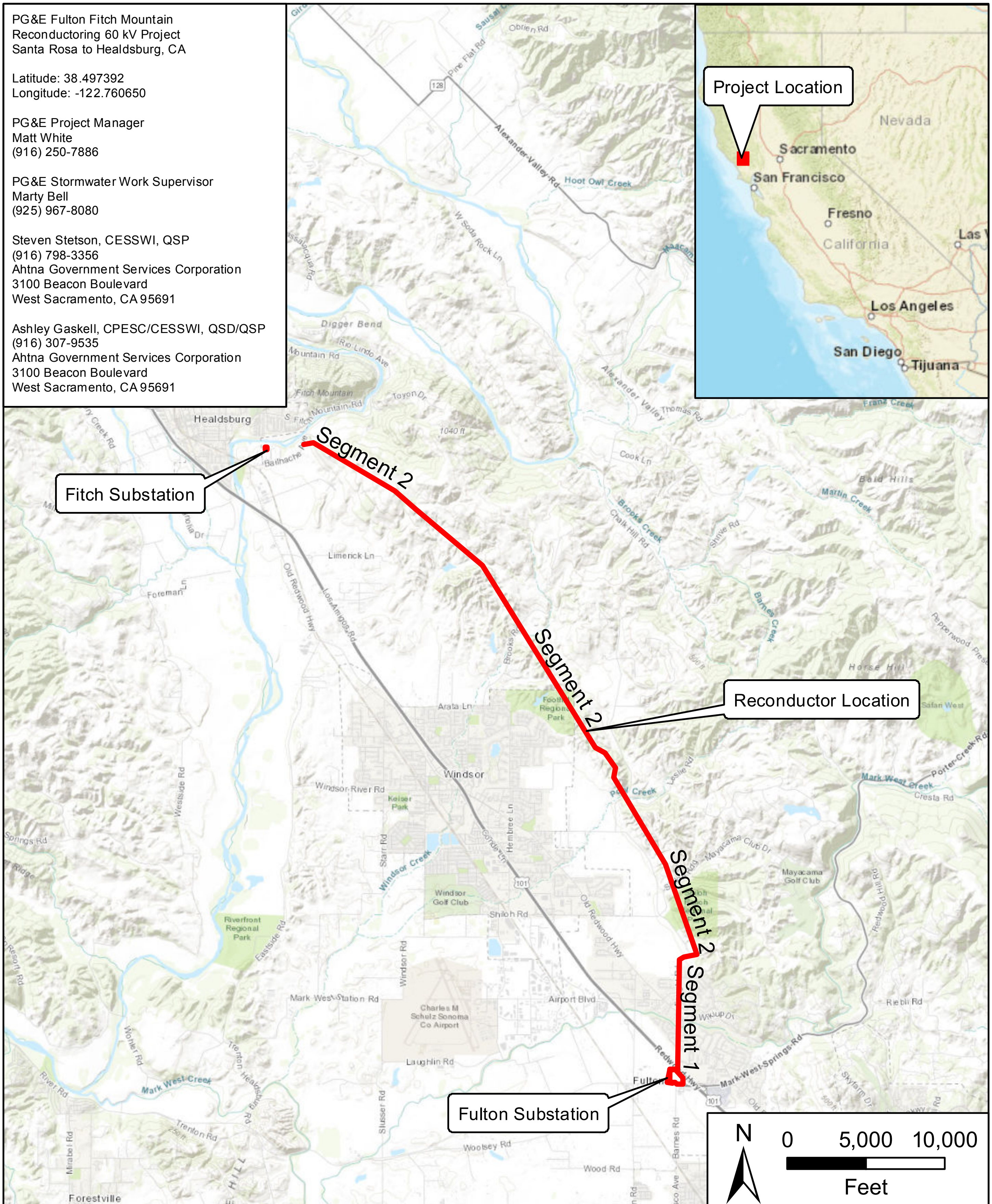
Latitude: 38.497392
Longitude: -122.760650

PG&E Project Manager
Matt White
(916) 250-7886

PG&E Stormwater Work Supervisor
Marty Bell
(925) 967-8080

Steven Stetson, CESSWI, QSP
(916) 798-3356
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Ashley Gaskell, CPESC/CESSWI, QSD/QSP
(916) 307-9535
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691



Order Number:
74000600

LUP Type 2 & 3
JUNE 2018

Project Location Map

PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project
Santa Rosa to Healdsburg, Sonoma County, California
USGS 7.5 min Healdsburg Quadrangle, 1993

Figure
1

Ahtna Government Services Corporation

Source: Digital USGS topo data provided by ESRI. *Project area is for graphical purposes only.

General Water Pollution Control Notes:

1. THESE DRAWINGS ARE INTENDED TO BE USED IN CONJUNCTION WITH THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND SUPPORTING REFERENCE MATERIAL. IN ADDITION, THESE DRAWINGS SHALL REFLECT UPDATES AND MODIFICATIONS AS DETERMINED BY SITE MONITORING ACTIVITIES.

2. THE INFORMATION ON THESE DRAWINGS ARE ACCURATE FOR WATER POLLUTION CONTROL PURPOSES ONLY.

3. PUBLIC ACCESS TO THE WORK SITE SHALL BE RESTRICTED.

4. ALL CONTRACTORS AND SUBCONTRACTORS WILL IMPLEMENT A POLICY OF "ZERO EXPOSURE" OF NON-VISIBLE POLLUTANTS TO STORM WATER RUN-ON OR RUNOFF.

5. WORK VEHICLES SHALL BE RESTRICTED TO WORK AREAS OR ACCESS ROUTES ONLY.

6. STOCKPILES, CONSTRUCTION MATERIALS AND WASTE MATERIALS SHALL BE PROTECTED FROM CONTACT WITH STORM WATER. STOCKPILES SHALL BE COVERED WHEN INACTIVE AND PRIOR TO RAIN EVENTS. REFER TO PG&E's STOCKPILE MANAGEMENT A-ESCP FOR ADDITIONAL DETAILS.

7. CONSTRUCTION WASTE AND HAZARDOUS WASTE SHALL BE CONTAINED IN APPROPRIATE WASTE RECEPTACLES AND DISPOSED OF ON A REGULAR SCHEDULE. WASTE RECEPTACLES SHALL BE COVERED AT THE END OF EACH WORK DAY AND DURING RAIN EVENTS.

8. GENERALLY, THE SITE SHALL BE KEPT FREE FROM LITTER AND DEBRIS. REFER TO PG&E's GOOD HOUSE-KEEPING A-ESCP FOR ADDITIONAL DETAILS.

9. ADDITIONAL MEASURES NOT SHOWN ON THESE DRAWINGS MAY BE REQUIRED TO PREVENT OFF-SITE DISCHARGE OF POLLUTANTS.

10. DRAWINGS SHALL BE UPDATED AND MAINTAINED IN THE ON-SITE SWPPP AND ELECTRONIC FILES.

11. ACTUAL SITE CONDITIONS, SCHEDULING OF OPERATIONS, METHODS OF OPERATION AND WEATHER IMPACT THE EFFECTIVENESS OF THIS SWPPP. THE PERSONNEL RESPONSIBLE FOR DAILY ACTIVITIES ON SITE SHALL READ THE SWPPP AND THE GENERAL PERMIT FOR CONSTRUCTION ACTIVITY (CAS000002).

This Entire Project Is Subject to Type 2 & 3 Requirements

Storm Water Pollution Control Construction Notes:

1 PRESERVE EXISTING VEGETATION IN AREAS NOT SUBJECT TO PROJECT RELATED DISTURBANCES. (EC-2)

2 FIBER ROLL SHALL BE PLACED ON THE UPGRADIENT AND DOWNGRADIENT MARGINS OF WORK AREAS AND ALONG POTENTIAL RUNON AND RUNOFF LOCATIONS AS NECESSARY, IT SHALL BE SECURED WITH STAKES OR GRAVEL BAGS.

3 AN EFFECTIVE COMBINATION OF DUST CONTROL, STREET SWEEPING AND TRACKING CONTROLS SHALL BE IMPLEMENTED TO REDUCE FUGITIVE DUST AND TRACKOUT BASED ON DAILY VISUAL INSPECTIONS.

4 STAGING AREAS (MATERIALS AND EQUIPMENT STORAGE, SANITARY FACILITIES, WASTE CONTAINERS, AND ADMINISTRATION FACILITIES). ALL FLUIDS STORAGE CONTAINERS SHALL HAVE APPROPRIATE SECONDARY CONTAINMENT FACILITIES. ADDITIONAL BMP MATERIALS SHALL BE STOCKPILED FOR IMPLEMENTATION AS NECESSARY. SPILL KITS AND DRIP PANS SHALL BE AVAILABLE AT ALL TIMES.

5 STOCKPILE MANAGEMENT. FIBER ROLLS WILL BE PLACED AT THE BASE OF STOCKPILES AND STOCK-PILES SHALL BE COVERED WITH TARPS OR EROSION CONTROL BLANKETS (ANCHORED IN PLACE) WHEN INACTIVE, BEFORE AND DURING RAIN EVENTS.

6 CONCRETE WORK SHALL BE SCHEDULED TO AVOID ANTICIPATED PRECIPITATION. WASHOUT SHALL OCCUR WITHIN DESGINATED CONCRETE WASHOUT FACILITIES OR WITHIN SELF-CONTAINED CONCRETE TRUCK. GRADING AND CONCRETE ACTIVITIES SHALL BE SCHEDULED TO AVOID ANTICIPATED RAIN EVENTS.

7 RUMBLE RACKS OR AGGREGATE ENTRANCES SHALL BE INSTALLED AT STAGING AREAS TO REDUCE TRACKING ONTO PAVED ROADS.

8 DRAIN INLET (DI) PROTECTION. GRAVEL BAG BERMS, GEOTEXTILE INSERTS, OR FIBER ROLL SHALL BE INSTALLED AROUND/INSIDE THE DI DURING ACTIVE CONSTRUCTION.

CASQA BMPs Reference:

Erosion Control BMPs
EC-1, Scheduling
EC-2, Preservation of Existing Vegetation
EC-3, Hydraulic Mulch
EC-4, Hydroseeding
EC-5, Soil Binders
EC-6, Straw Mulches
EC-7, Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
EC-8, Wood Mulch
EC-15, Soil Preparation/Rougening
EC-16, Non-Vegetative Stabilization

Sediment Control BMPs
SE-4, Check Dam
SE-5, Fiber Rolls
SE-6, Gravel Bag Berm
SE-7, Street Sweeping and Vacuuming
SE-10, Drain Inlet Protection

Wind Erosion Control BMPs
WE-1, Wind Erosion Control

Tracking Control BMPs
TC-1, Stabilized Construction Entrance/ Exit
TC-2, Stabilized Construction Roadway

Restoration Notes:

A GRAVEL BASE ROCK WILL BE UTILIZED TO STABILIZE AREAS OF SOIL DISTURBANCE WITHIN THE SUBSTATION.

B NON-VEGETATED AREAS SHALL BE RETURNED TO PRE-CONSTRUCTION GRADE AND COMPACTION LEVELS FOLLOWING THE COMPLETION OF CONSTRUCTION. NON-VEGETATIVE MEASURES SUCH AS GRAVEL MAY BE UTILIZED WHERE NEEDED AND APPROPRIATE.

C VEGETATED AREAS SHALL BE RETURNED TO PRE-CONSTRUCTION CONDITIONS. A NATIVE SEED MIX SHALL BE USED WHEN RESTORING AREAS OF GRASSLAND, OAK WOODLAND AND WETLAND, OR AS DEEMED NECESSARY. CONSULT PG&E BIOLOGIST FOR SEED MIX.

D POLE REPLACEMENT LOCATIONS SHALL BE COMPACTED AND STABILIZED WITH GRAVEL, NATIVE SEED MIX, OR EQUIVALENT. CONSULT PG&E BIOLOGIST FOR SEED MIX, IF NEEDED.

E NATIVE SEED MIX WILL BE USED UNLESS IN CONFLICT WITH RESTORATION SPECIFIED BY PROPERTY OWNER. CONSULT PG&E BIOLOGIST FOR SEED MIX, IF NEEDED.

CASQA BMPs Reference Continued:

Non-Stormwater BMPs
NS-1, Water Conservation Practices
NS-2, Dewatering Operations
NS-4, Temporary Stream Crossing
NS-5, Clear Water Diversion
NS-6, Illicit Connection/Discharge
NS-7, Potable Water/Irrigation
NS-8, NS-9, NS-10, Vehicle and Equipment Cleaning, Fueling and Maintenance
NS-12, Concrete Curing
NS-13, Concrete Finishing

Waste Management and Materials Pollution Control BMP
WM-1, WM-2, Material Delivery, Storage and Use
WM-3, Stockpile Management
WM-4, Spill Prevention and Control
WM-5, Solid Waste Management
WM-6, Hazardous Waste Management
WM-7, Contaminated Soil Management
WM-8, Concrete Waste Management
WM-9, Sanitary/Septic Waste Management
WM-10, Liquid Waste Management
A-ESCP, Good Housekeeping
A-ESCP, Stockpile Management
A-ESCP, Laydown/Staging Area Construction
A-ESCP, Pole Replacement
A-ESCP, Small Rural Access Road Construction and Maintenance Projects
A-ESCP, Small Construction at Substations
A-ESCP, Small Excavation, Construction, and Potholing

Legend:

Pole
Water Crossing
Drail Inlet
Sanitary Facilities
Waste Receptacle
Pull Site
Pole Removal
Pole Reframing
Top Replacement
TSP Replacement
LDSP Replacement
Helicopter Landing Zone
Delineation Fencing
Fiber Roll
Access Road
Water Feature
Flow Direction
Staging Area
Substation
Regional Park
Stockpile Area

PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project
Santa Rosa to Healdsburg, CA

Latitude: 38.497407
Longitude: -122.760519

PG&E Project Manager
Matt White
(916) 250-7886

PG&E Stormwater Work Supervisor
Marty Bell
(925) 967-8080

Steve Stetson, CESSWI, QSP
(916) 798-3356
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Ashley Gaskell, CPESC/CESSWI, QSD/QSP
(916) 307-9535
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Figure **SW-1**

Water Pollution Control Drawing
PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project
Santa Rosa to Healdsburg,
Sonoma County, California

Figure References:
PG&E Project Drawings.
Aerial Photo provided by ESRI streaming mapserver.

LUP Type 2 & 3
JUNE 2018

Order Number:
74000600

Ahtna Government Services Corporation

Sampling locations associated with the reconductor work will be field located.

Temporary roads are anticipated to be constructed and will be composed of erosion control blankets covered by gravel. All areas of disutrbance will be returned to pre-construction conditions or better. Temporary access roads will be field-located during the 2018-2019 rainy season.

All details identified within this figure (SW-2) are included within Segment 1 South.

The Following Construction Notes Apply to All Work Areas: 1 2 3

The Following Restoration Notes Apply to All Work Areas: B C D E

PG&E Fulton Fitch Mountain Reconductoring 60 kV Project
Santa Rosa to Healdsburg, CA

Latitude: 38.497407
Longitude: -122.760519

PG&E Project Manager
Matt White
(916) 250-7886

PG&E Stormwater Work Supervisor
Marty Bell
(925) 967-8080

Steven Stetson, CESSWI, QSP
(916) 798-3356
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Ashley Gaskell, CPESC/CESSWI, QSD/QSP
(916) 307-9535
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Figure SW-2

Water Pollution Control Drawing

PG&E Fulton Fitch Mountain Reconductoring 60 kV Project Segment 1 South

Santa Rosa to Healdsburg, Sonoma County, California

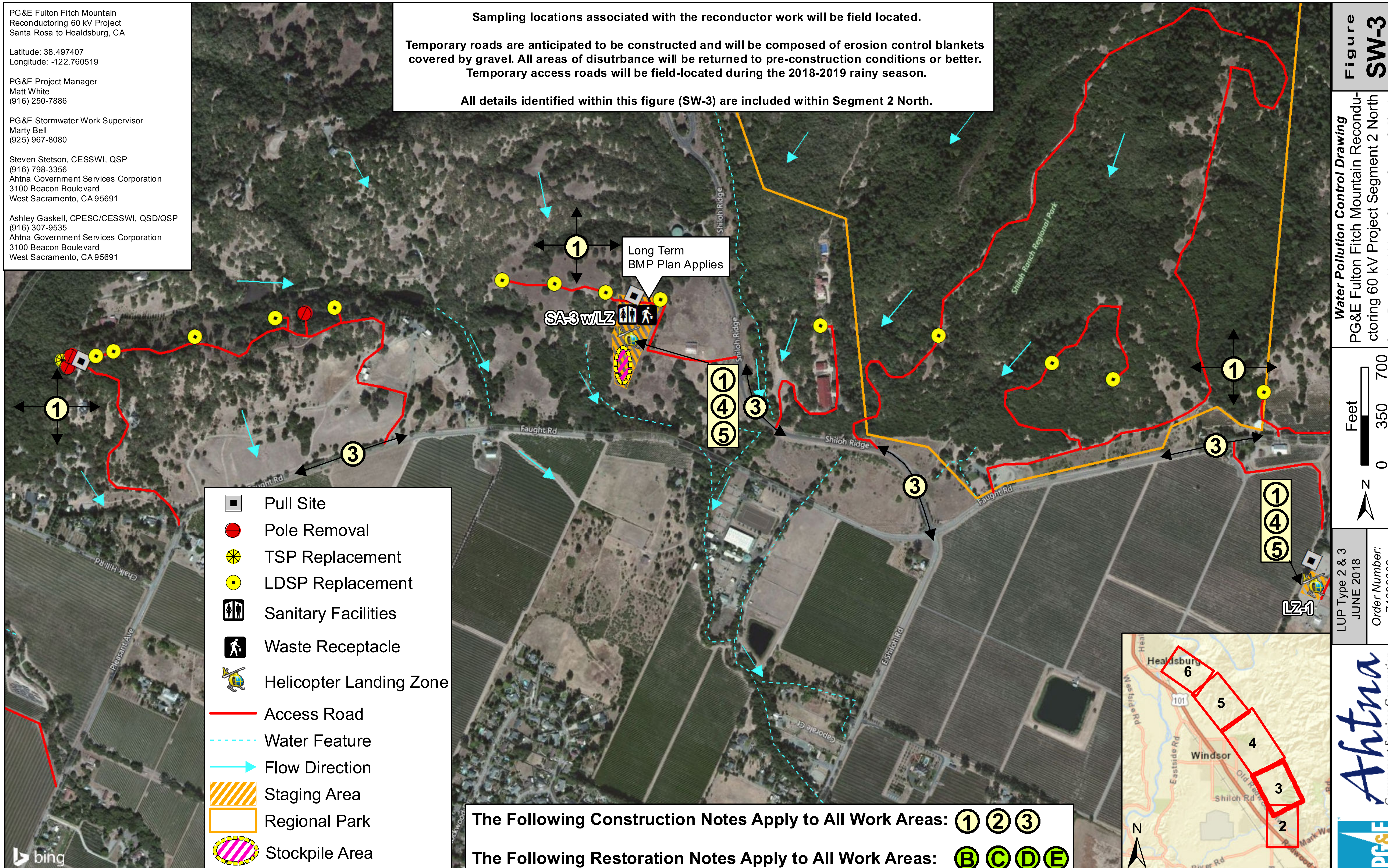
LUP Type 2 & 3
JUNE 2018

Order Number: 74000600

Ahtna Government Services Corporation

PG&E

Source: Digital aerial photo data provided by ESRI streaming mapserver. *This map and it's elements are for graphical purposes only.


PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project
Santa Rosa to Healdsburg, CA
Latitude: 38.497407
Longitude: -122.760519
PG&E Project Manager
Matt White
(916) 250-7886
PG&E Stormwater Work Supervisor
Marty Bell
(925) 967-8080
Steven Stetson, CESSWI, QSP
(916) 798-3356
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691
Ashley Gaskell, CPESC/CESSWI, QSD/QSP
(916) 307-9535
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691
Sampling locations associated with the reconductor work will be field located.
Temporary roads are anticipated to be constructed and will be composed of erosion control blankets covered by gravel. All areas of disutrbance will be returned to pre-construction conditions or better. Temporary access roads will be field-located during the 2018-2019 rainy season.
All details identified within this figure (SW-3) are included within Segment 2 North.
Long Term BMP Plan Applies
SA-3 w/LZ
LZ-1
Faught Rd
Shiloh Ridge
Shiloh Ranch Regional Park
Chalk Hill Rd
Pleasant Ave
E Shiloh Rd
Pull Site
Pole Removal
TSP Replacement
LDSP Replacement
Sanitary Facilities
Waste Receptacle
Helicopter Landing Zone
Access Road
Water Feature
Flow Direction
Staging Area
Regional Park
Stockpile Area
The Following Construction Notes Apply to All Work Areas: 1 2 3
The Following Restoration Notes Apply to All Work Areas: B C D E
Healdsburg
Windsor
Shiloh Rd
6
5
4
3
2
Figure SW-3
Water Pollution Control Drawing
PG&E Fulton Fitch Mountain Reconductoring 60 kV Project Segment 2 North
Santa Rosa to Healdsburg, Sonoma County, California
Feet
0 350 700
N
LUP Type 2 & 3
JUNE 2018
Order Number: 74000600
Ahtna Government Services Corporation
PG&E
Source: Digital aerial photo data provided by ESRI streaming mapserver. *This map and it's elements are for graphical purposes only.

PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project
Santa Rosa to Healdsburg, CA

Latitude: 38.497407
Longitude: -122.760519

PG&E Project Manager
Matt White
(916) 250-7886

PG&E Stormwater Work Supervisor
Marty Bell
(925) 967-8080

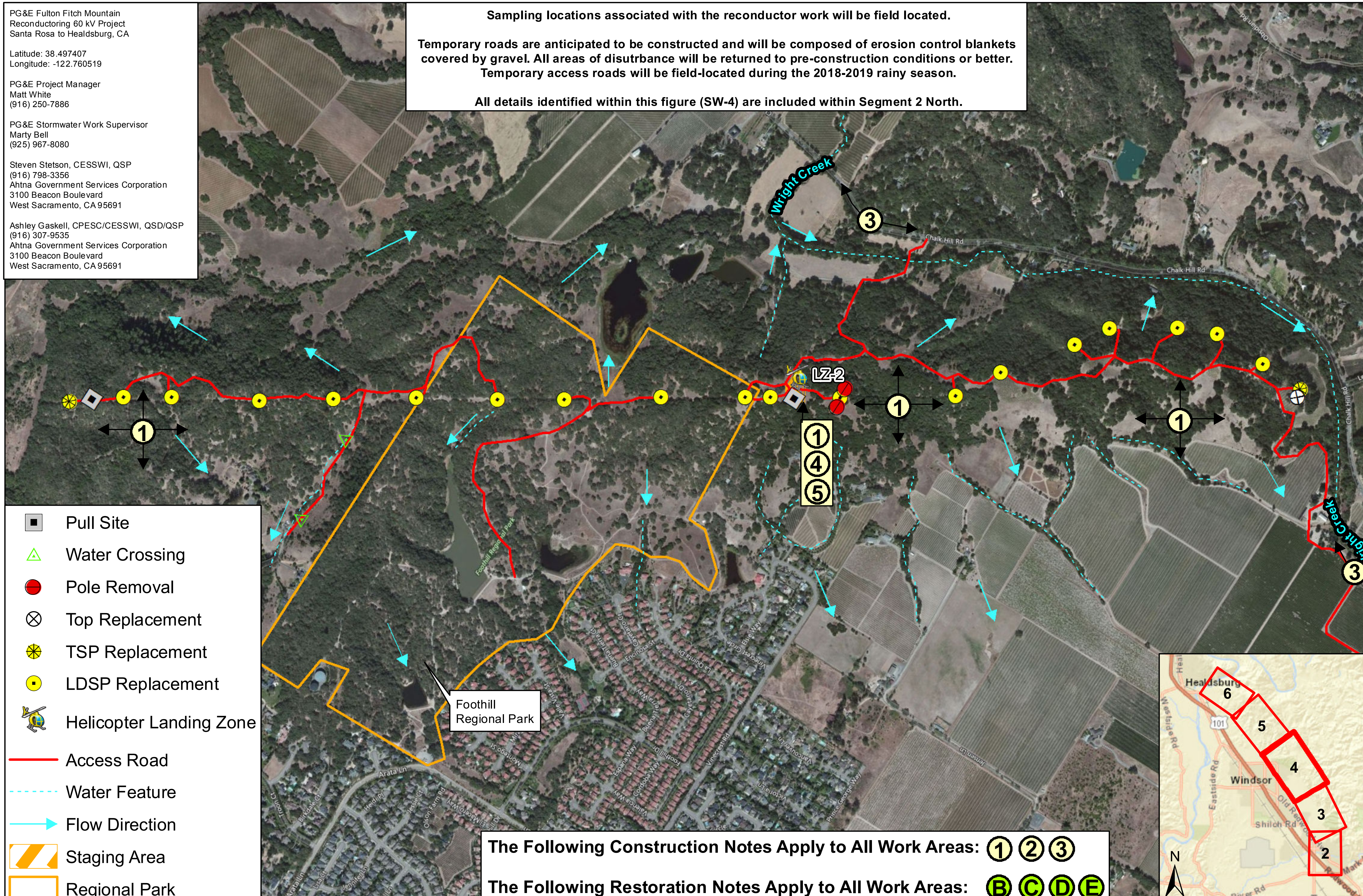
Steven Stetson, CESSWI, QSP
(916) 798-3356
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Ashley Gaskell, CPESC/CESSWI, QSD/QSP
(916) 307-9535
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Sampling locations associated with the reconductor work will be field located.

Temporary roads are anticipated to be constructed and will be composed of erosion control blankets covered by gravel. All areas of disutrbance will be returned to pre-construction conditions or better. Temporary access roads will be field-located during the 2018-2019 rainy season.

All details identified within this figure (SW-4) are included within Segment 2 North.



Pull Site
Water Crossing
Pole Removal
Top Replacement
TSP Replacement
LDSP Replacement
Helicopter Landing Zone
Access Road
Water Feature
Flow Direction
Staging Area
Regional Park

The Following Construction Notes Apply to All Work Areas: 1 2 3

The Following Restoration Notes Apply to All Work Areas: B C D E

Figure **SW-4**

Water Pollution Control Drawing
PG&E Fulton Fitch Mountain Reconductoring 60 kV Project Segment 2 North
Santa Rosa to Healdsburg, Sonoma County, California

Feet
0 350 700

LUP Type 2 & 3
JUNE 2018

Order Number:
74000600

Ahtna Government Services Corporation

PG&E

Source: Digital aerial photo data provided by ESRI streaming mapserver. *This map and it's elements are for graphical purposes only.

PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project
Santa Rosa to Healdsburg, CA

Latitude: 38.497407
Longitude: -122.760519

PG&E Project Manager
Matt White
(916) 250-7886

PG&E Stormwater Work Supervisor
Marty Bell
(925) 967-8080

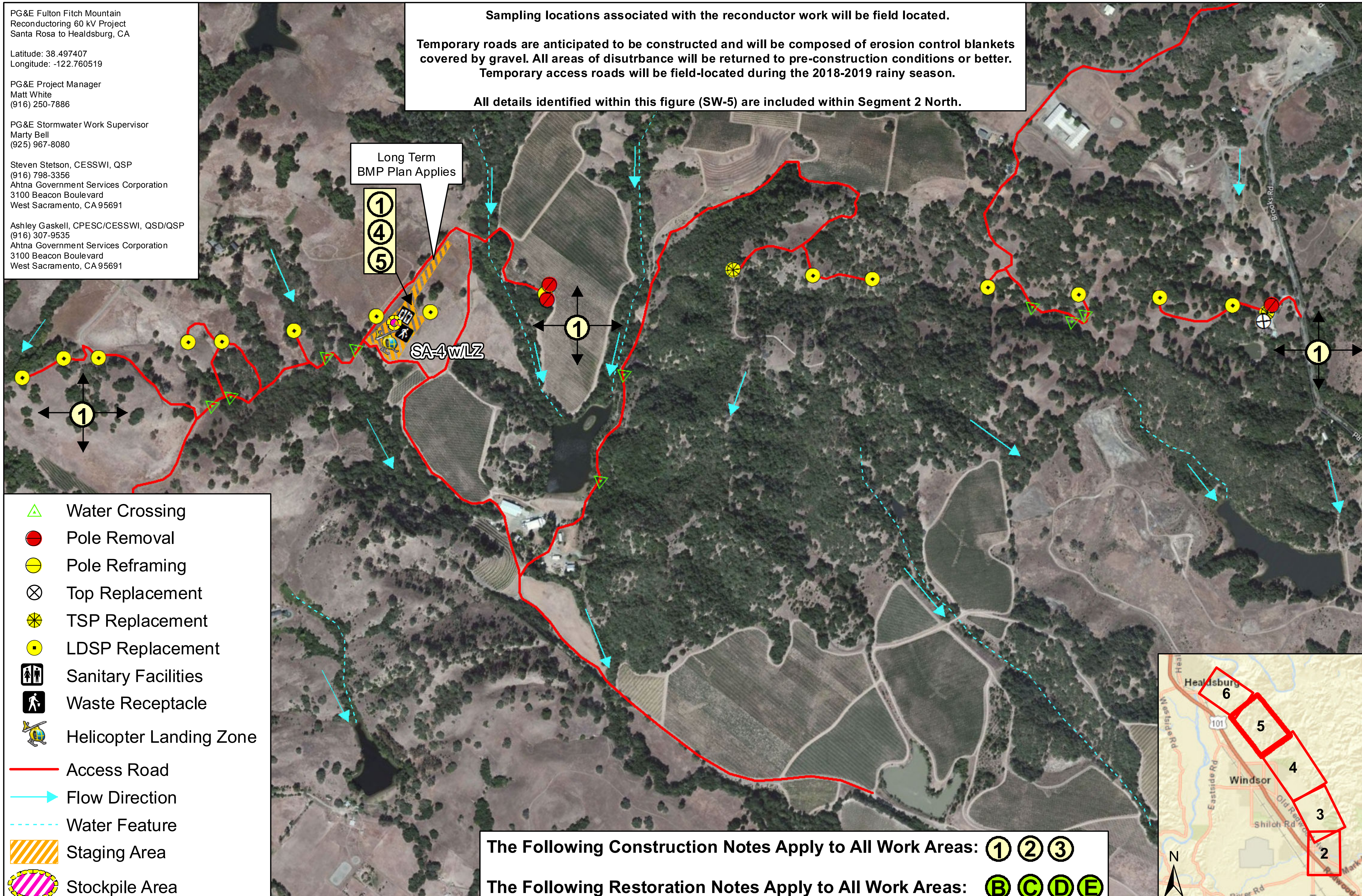
Steven Stetson, CESSWI, QSP
(916) 798-3356
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Ashley Gaskell, CPESC/CESSWI, QSD/QSP
(916) 307-9535
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Sampling locations associated with the reconductor work will be field located.

Temporary roads are anticipated to be constructed and will be composed of erosion control blankets covered by gravel. All areas of disutrbance will be returned to pre-construction conditions or better. Temporary access roads will be field-located during the 2018-2019 rainy season.

All details identified within this figure (SW-5) are included within Segment 2 North.



Water Crossing
Pole Removal
Pole Reframing
Top Replacement
TSP Replacement
LDSP Replacement
Sanitary Facilities
Waste Receptacle
Helicopter Landing Zone
Access Road
Flow Direction
Water Feature
Staging Area
Stockpile Area

The Following Construction Notes Apply to All Work Areas: 1 2 3

The Following Restoration Notes Apply to All Work Areas: B C D E

Figure **SW-5**

Water Pollution Control Drawing
PG&E Fulton Fitch Mountain Reconductoring 60 kV Project Segment 2 North
Santa Rosa to Healdsburg, Sonoma County, California

LUP Type 2 & 3
JUNE 2018

Order Number:
74000600

Ahtna Government Services Corporation

PG&E

Source: Digital aerial photo data provided by ESRI streaming mapserver. "This map and it's elements are for graphical purposes only.

PG&E Fulton Fitch Mountain Reconductoring 60 kV Project
Santa Rosa to Healdsburg, CA

Latitude: 38.497407
Longitude: -122.760519

PG&E Project Manager
Matt White
(916) 250-7886

PG&E Stormwater Work Supervisor
Marty Bell
(925) 967-8080

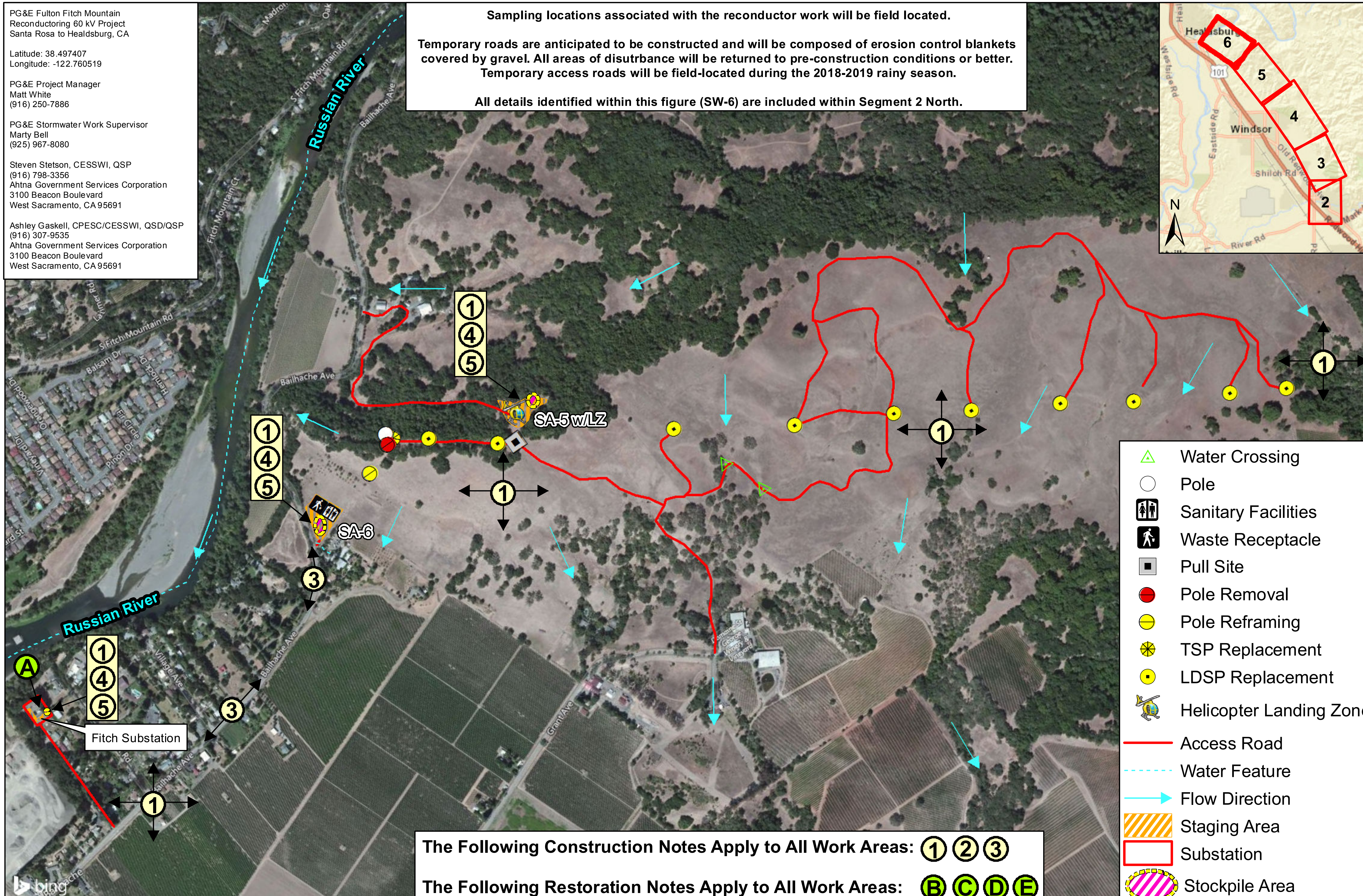
Steven Stetson, CESSWI, QSP
(916) 798-3356
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Ashley Gaskell, CPESC/CESSWI, QSD/QSP
(916) 307-9535
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Sampling locations associated with the reconductor work will be field located.

Temporary roads are anticipated to be constructed and will be composed of erosion control blankets covered by gravel. All areas of disutrbance will be returned to pre-construction conditions or better. Temporary access roads will be field-located during the 2018-2019 rainy season.

All details identified within this figure (SW-6) are included within Segment 2 North.



The Following Construction Notes Apply to All Work Areas: 1 2 3

The Following Restoration Notes Apply to All Work Areas: B C D E

Figure **SW-6**

Water Pollution Control Drawing
PG&E Fulton Fitch Mountain Reconductoring 60 kV Project Segment 2 North
Santa Rosa to Healdsburg, Sonoma County, California

LUP Type 2 & 3
JUNE 2018

Order Number:
74000600

Ahtna Government Services Corporation

Source: Digital aerial photo data provided by ESRI streaming mapserver. *This map and it's elements are for graphical purposes only.

PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project
Santa Rosa to Healdsburg, CA

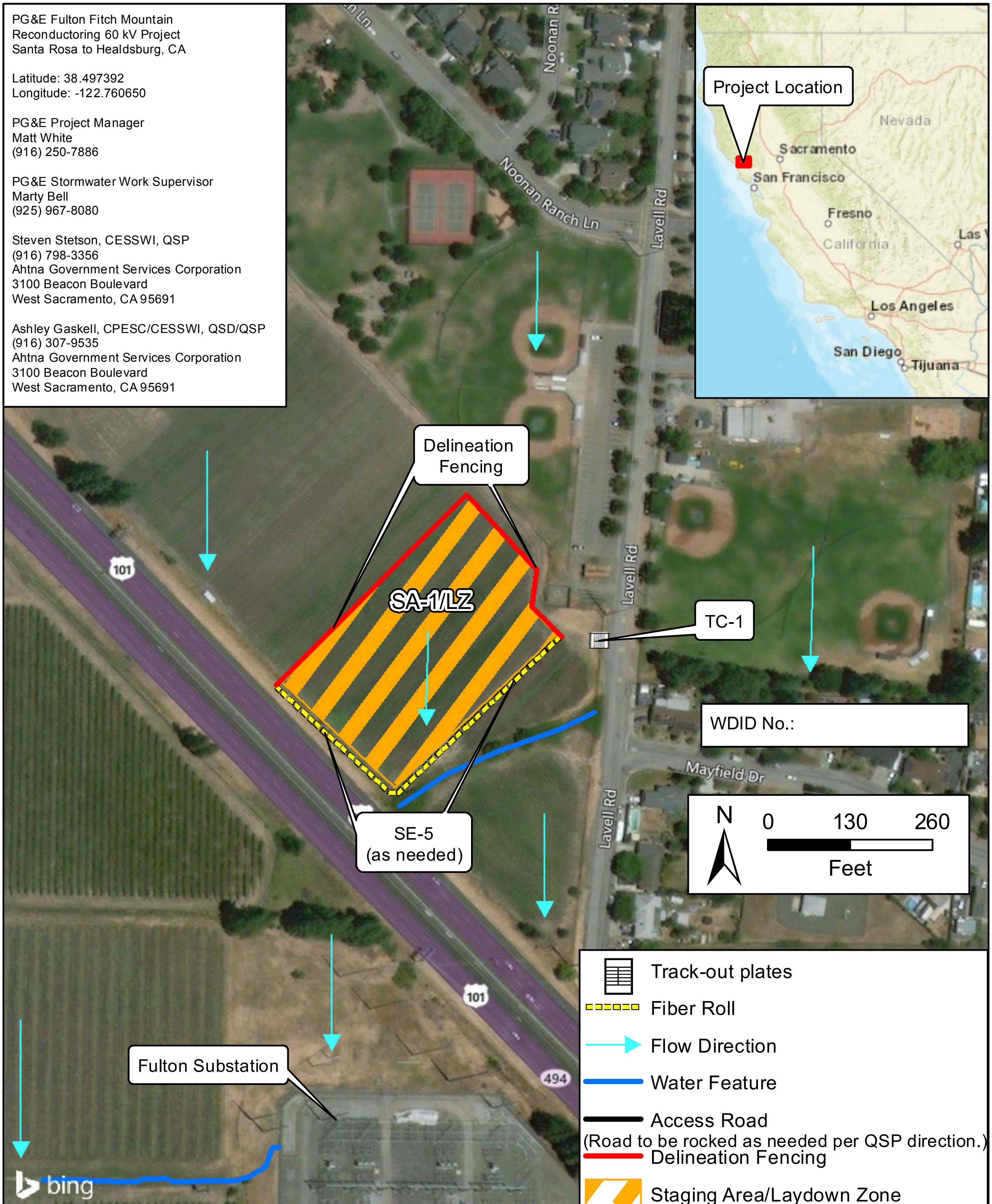
Latitude: 38.497392
Longitude: -122.760650

PG&E Project Manager
Matt White
(916) 250-7886

PG&E Stormwater Work Supervisor
Marty Bell
(925) 967-8080

Steven Stetson, CESSWI, QSP
(916) 798-3356
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691

Ashley Gaskell, CPESC/CESSWI, QSD/QSP
(916) 307-9535
Ahtna Government Services Corporation
3100 Beacon Boulevard
West Sacramento, CA 95691



PG&E | Ahtna Government Services Corporation

Order Number: 74000600

LUP Type 2 & 3
JUNE 2018

Typical Long Term Staging Area BMPs

PG&E Fulton Fitch Mountain
Reconductoring 60 kV Project

Santa Rosa to Healdsburg, Sonoma County, California

Figure
A

Source: Digital USGS topo data provided by ESRI. *Project area is for graphical purposes only.

Best Management Practice Typical

Tracking Control: TC-1, Stabilized Construction Entrance

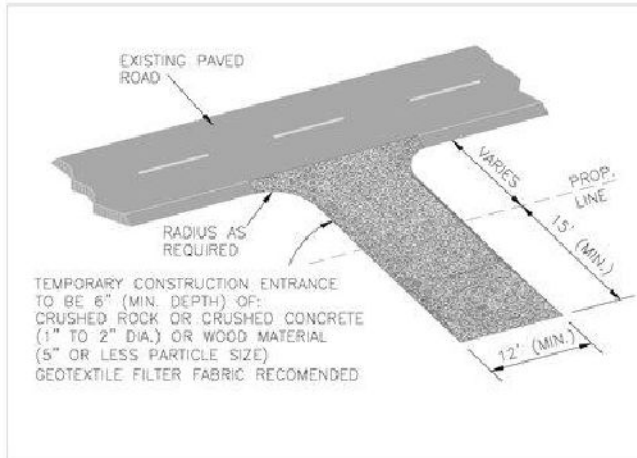
Categories:
EC Erosion Control (Secondary)
SE Sediment Control (Secondary)
TC Tracking Control (Primary)

A stabilized construction entrance reduces or eliminates the tracking of sediment onto public 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. They should be used anywhere traffic will be entering or leaving the construction site.

Graphic 2.1
Suitable Application Examples:
- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.

Installation:
- Construct on level ground where possible.
- Construct length of 50' or maximum site will allow and 10' minimum width to accomodate traffic.
- Rumble racks constructed of steel panels with ridges will help removed additional sediment.
- Limit points of entrance/exit to site.
- Limit vehicle speed to control dust.
- Properly grade entrance/exit to prevent runoff from leaving construction site.
- Route runoff through a sediment trapping device before discharge.

Inspection and Maintenance:
- Inspect and verify performance meets 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.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.



Sediment Control: SE-7, Street Sweeping and Vacuuming

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. It prevents sediment from the project site from entering storm drains or receiving waters.

Graphic 2.2
Implementation:
- Control the number of points where vehicles can leave the site to focus sweeping and vacuuming efforts.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swepts or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments as they spread dirt rather than remove it.
- If not mixed with debris or trash, consider inforporating the removed sediment back into the project.

Inspection and Maintenance:
- Inspect in accordance with General Permit Requirements for the associated project type and risk level at a minimum weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect points of ingress and egress daily.
- Remove tracked or spilled sediment outside of construction limits daily if required by your jurisdiction.
- Do not sweep unknown substances or potentially hazardous objects.
- Adjust brooms frequently to maximize efficiency.
- Properly dispose of sweeper wastes at an approved dumpsite.

Categories:
SE Sediment Control (Secondary)
TC Tracking Control (Primary)

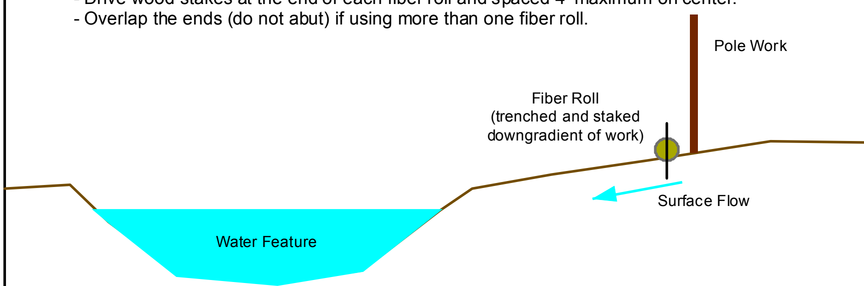
Best Management Practice Typical
Sediment Control: SE-5, Fiber Roll

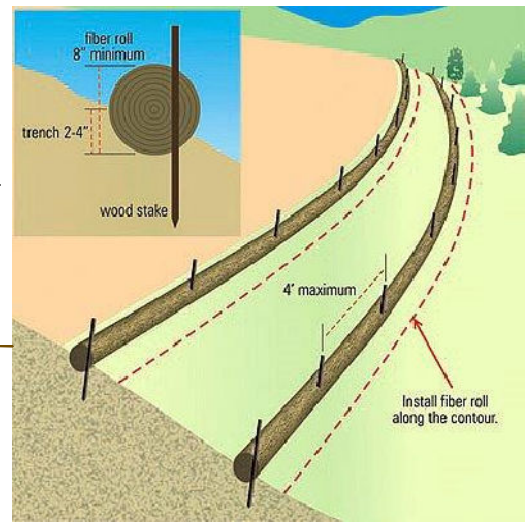
Categories:
SE Sediment Control (Primary)
EC Erosion Control (Secondary)

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped with burlap or similar.
When placed at the toe or on the face of slopes along contours they act to intercept runoff and reduce its flow velocity. Runoff is released as sheet flow and sediment is removed in the process.

Graphic 1.1
Suitable Application Examples:
- Along the toe, top, face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
-Downgradient of pole install or removal work
- At the end of a downward slope where it transitions to a steeper slope
- Along the perimeter of a project
- Down-slope of exposed soil areas

Installation Tips:
- Prepare the slope before installation.
- Install perpendicular to water movement and parallel to slope contour.
- Turn the ends of the fiber roll up slope to precent runoff from going around the roll.
- Stake fiber rolls into a trench (1/4 to 1/3 as deep as the thickness of the roll and equally as wide).
- Drive wood stakes at the end of each fiber roll and spaced 4' maximum on center.
- Overlap the ends (do not abut) if using more than one fiber roll.





Graphic 1.2
Suitable Application Examples:
- Around temporary stockpiles

Installation Tips:
- Place fiber rolls around the base of active stockpiles.
- Secure in place with wood stakes or sand or gravel bags.

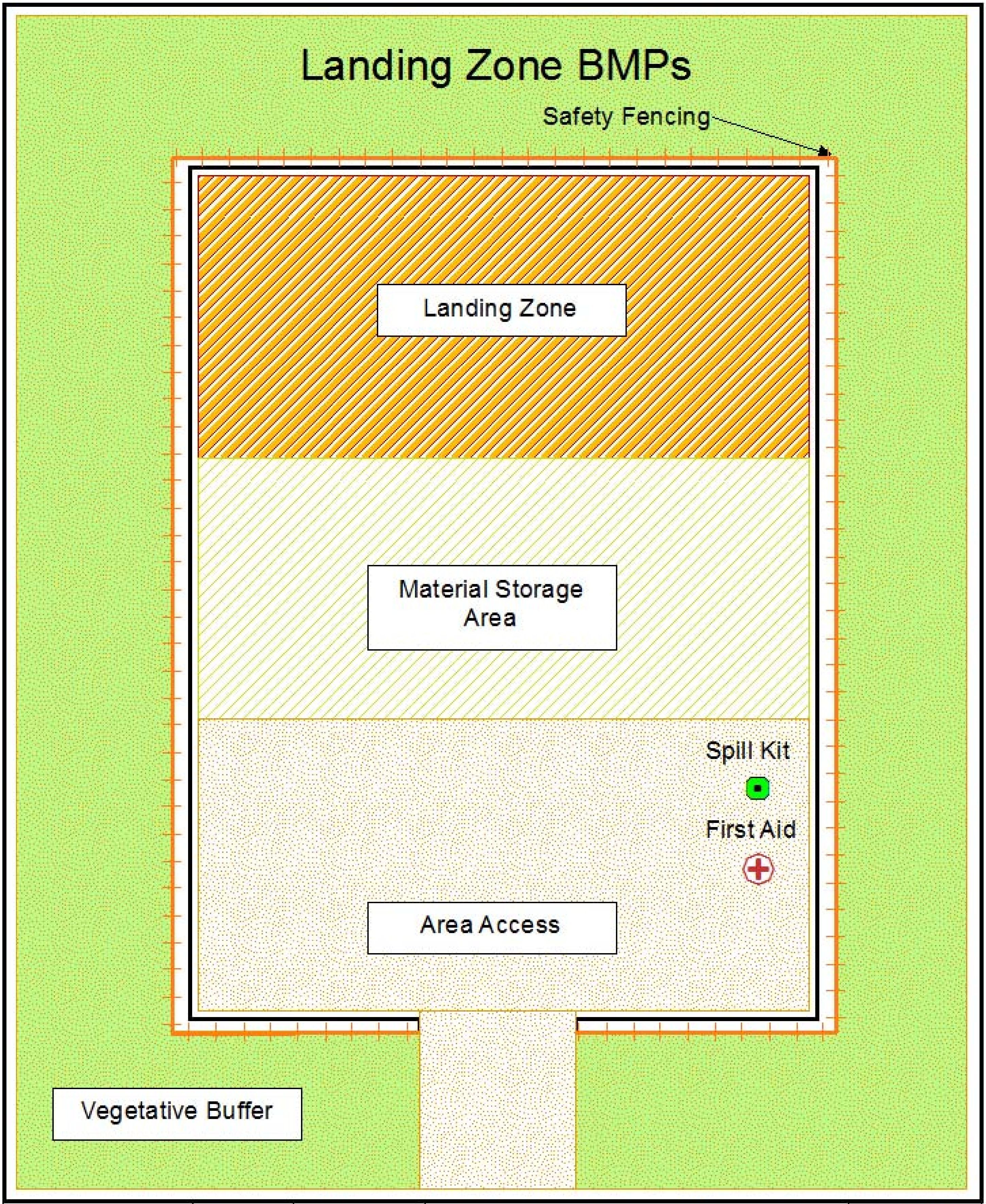
Inspection and Maintenance:
- Inspect and replace and split, torn, unraveling or slumping fiber rolls.
- Periodically remove any sediment that accumulates to one-third the designated sediment storage depth.
- Inspect in accordance with General Permit Requirements for the associated project type and risk level at a minimum weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
-Repair any rills or gullies promptly.

PG&E Ahtna Government Services Corporation

Order Number:
74000600
LUP Type 2 & 3
JUNE 2018

BMP Typical
PG&E Fulton Fitch Mountain
Reconductoring 60kV Project

Figure
C



Ahtna Government Services Corporation

PG&E

Project No.: 7400600

LUP Type 2 & 3

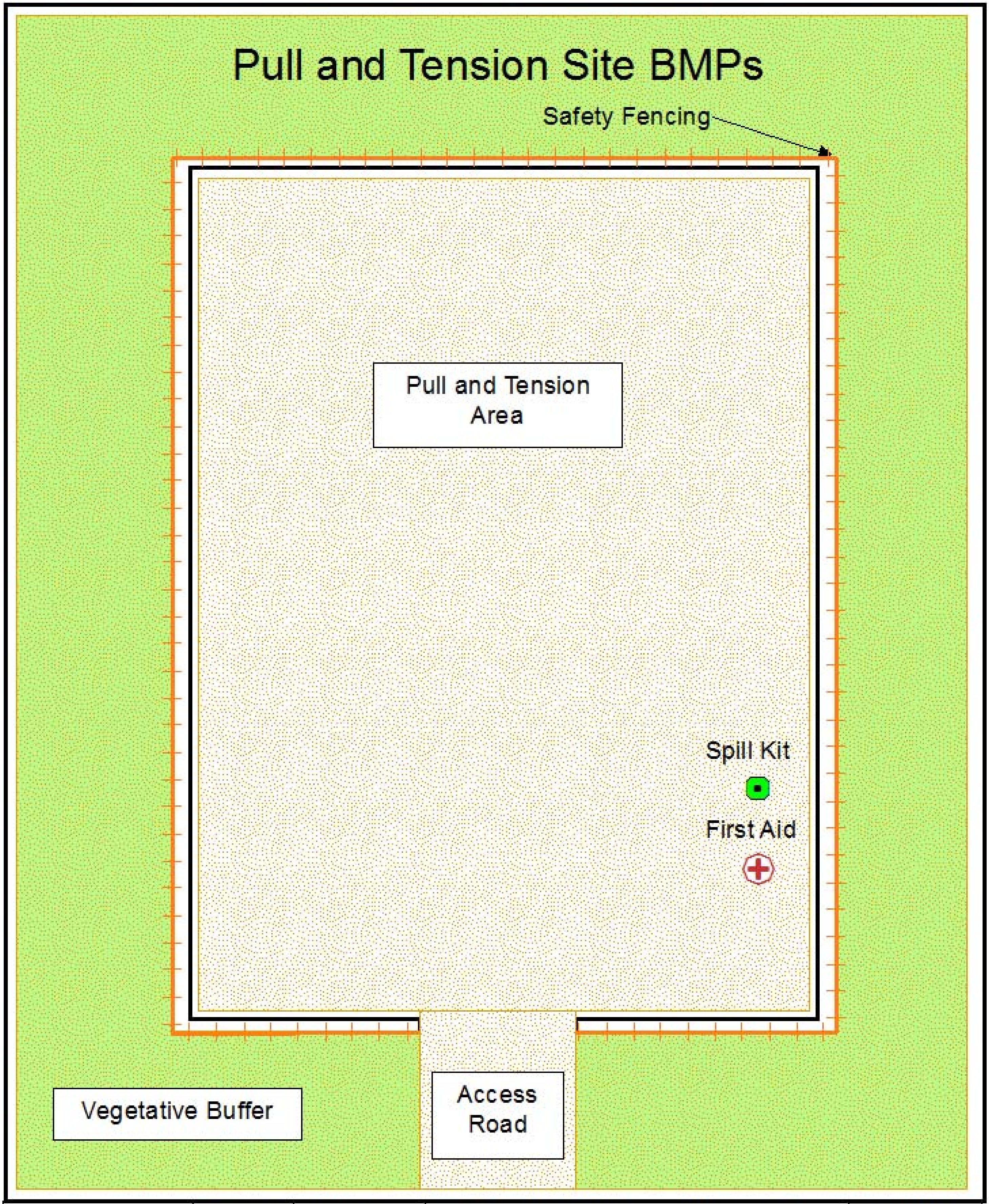
May 2018

Typical BMP Installation Map

Fulton Fitch Mountain Reconductoring 60kV Project
Sonoma County, CA.

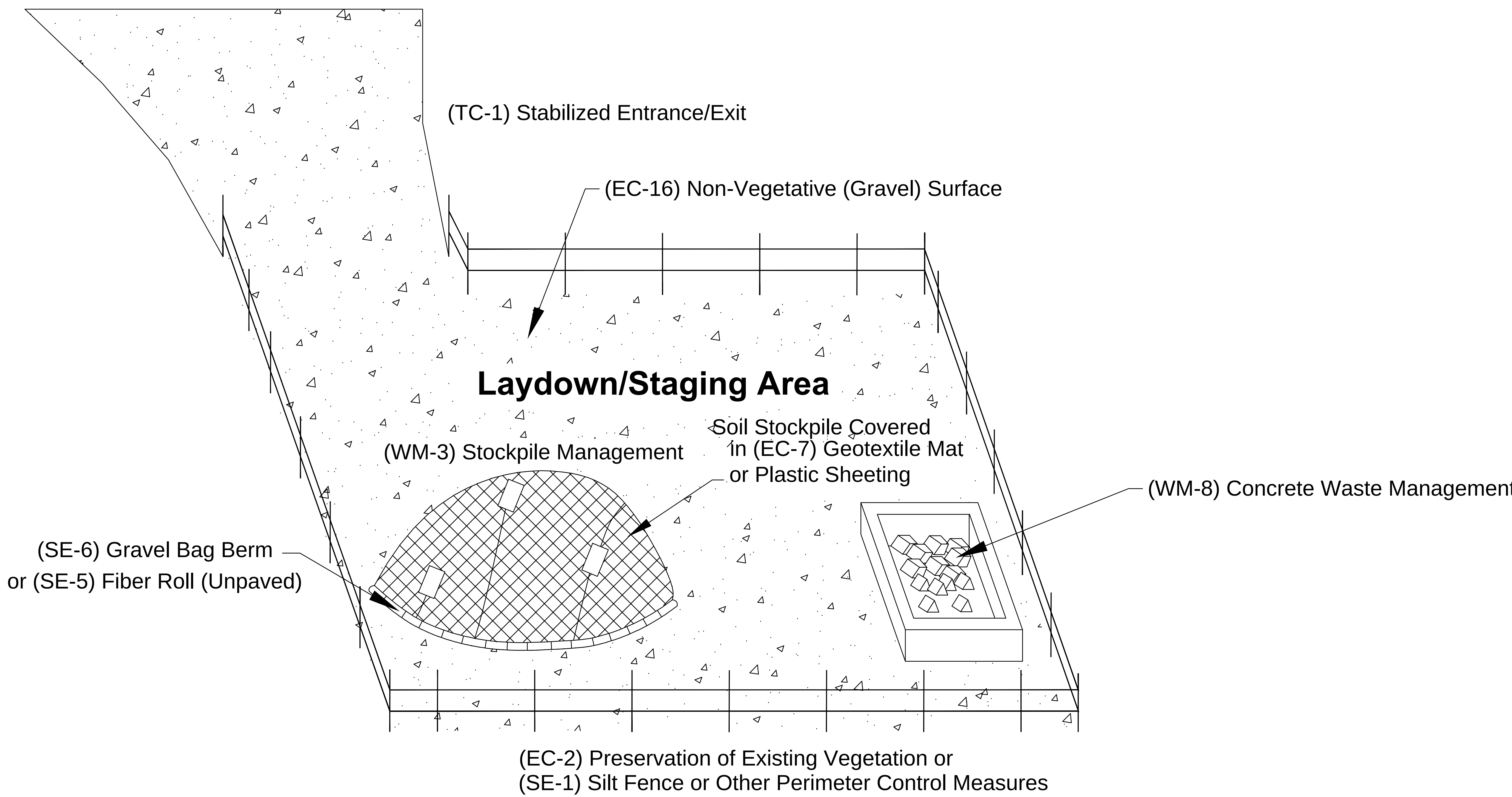
Figure D

Source: ESRI



Ahtna Government Services Corporation	Project No.: 7400600	LUP Type 2 & 3 May 2018	***Typical BMP Installation Map*** Fulton Fitch Mountain Reconductoring 60kV Project Sonoma County, CA.	Figure E

Source: ESRI



ETIC ENGINEERING

A-ESCP LAYDOWN/STAGING AREA TYPICAL BMP USE MAP
PACIFIC GAS AND ELECTRIC COMPANY

FIGURE: 1

PG&E - LUP TYPE 2 & 3 BMP VISUAL INSPECTION CHECK LIST

Circle All That Apply:

LUP Type 1 & 2	Daily Site BMP	Pre-Storm Event Baseline	Daily Storm BMP	Post Storm
Visual Inspection	X	X	X	X
Photographic Records [1]		X	X	X

[1] Photo-documentation transmitted to QSD (AGaskell@Ahtna.net)

Good Housekeeping for Construction Materials	Y	N	N/A
1. Inventory of products up to date.			
2. Stockpiled construction materials not actively in use are covered and bermed.			
3. All chemicals are stored in water tight containers with appropriate secondary containment.			
4. Construction materials are minimally exposed to precipitation.			
5. BMPs preventing the off-site tracking of materials are implemented and effective.			

Good Housekeeping for Waste Management	Y	N	N/A
1. Portable toilets are contained to prevent discharge of waste.			
2. Sanitation facilities are clean with no apparent leaks or spills.			
3. BMPs are in place to cover waste disposal containers at the end of the day and during rain events.			
4. Discharges from waste disposal containers are prevented from entering storm drain inlets or receiving waters.			
5. Stockpiled waste material is securely protected from wind and rain if not actively in use.			
6. Procedures are in place to address hazardous and non-hazardous spills.			
7. Appropriate spill response personnel are assigned and trained.			
8. Equipment and materials for spill clean-up are available onsite.			
9. Washout areas are contained appropriately to prevent discharge or infiltration to soil.			

Good Housekeeping for Vehicle Storage & Maintenance	Y	N	N/A
1. Measures are in place to prevent oil and fuel from leaking into ground, storm drain inlets, or surface waters.			
2. All equipment or vehicles are fueled, maintained, and stored in designated areas with appropriate BMPs.			
3. Vehicle and equipment leaks are cleaned immediately and disposed of properly.			

Good Housekeeping for Landscape Materials	Y	N	N/A
1. Stockpiled materials such as mulches and topsoil are contained and covered when not in use.			
2. Erodible landscape materials have not been applied 2 days prior to a forecasted rain event.			
3. Erodible landscape materials are applied at quantities and rates with manufacturer recommendations.			
4. Bagged erodible landscape materials are stored on pallets and covered.			

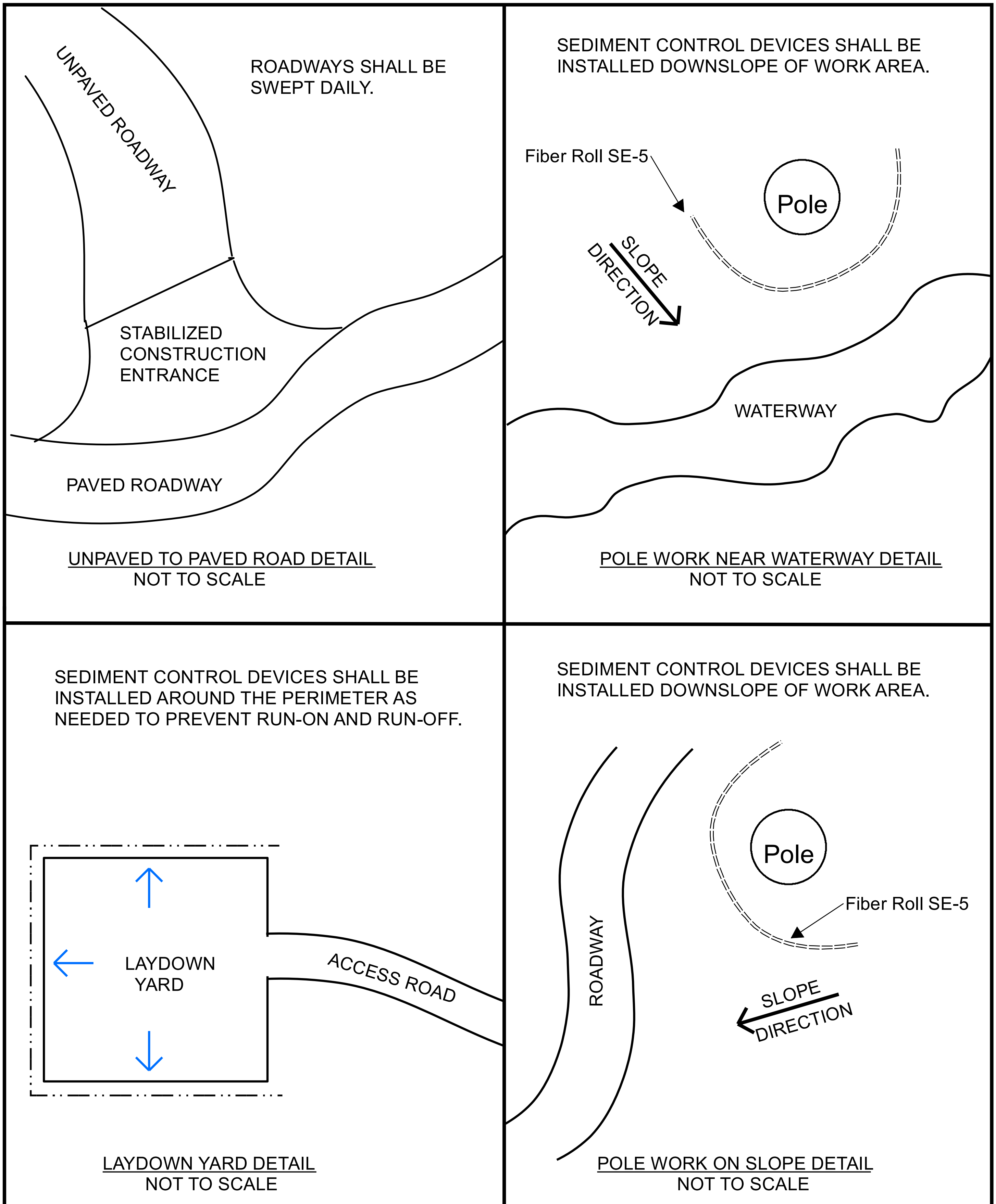
Non-Stormwater Management	Y	N	N/A
1. Non-Stormwater discharges are properly controlled.			
2. Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems.			
3. Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			

SWPPP	Y	N	N/A
1. The project SWPPP and BMP plans are up to date, available on-site and properly implemented.			

Erosion Controls	Y	N	N/A
1. Wind erosion controls are effectively implemented.			
2. Effective soil cover is provided for disturbed areas that are inactive as well as finished slopes, open space, utility backfill and completed areas.			
3. Measures are implemented on-site to control the air deposition of site materials and from site operations.			
4. The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			

Sediment Controls	Y	N	N/A
1. Perimeter controls are established and effective at controlling erosion and sediment discharges from the site.			
2. Entrances and exits are stabilized to control erosion and sediment discharges from the site.			
3. Sediment basins are properly maintained.			

Run-On and Run-Off Controls	Y	N	N/A
1. Run-on to the site is effectively managed and directed away from all disturbed areas.			



Ahtna
Government Services Corporation

PG&E

Project No.:
7400600

LUP Type 2 & 3

May 2018

Typical BMP Installation Map

Fulton Fitch Mountain Reconductoring 60kV Project
Sonoma County, CA.

Figure
1

Source: ESRI

Appendix B

Applicable Permit Registration Documents (PRDs)

NOI
WDID Receipt Letter
Risk Determination
Soil Disturbance Spreadsheet

Water Boards Storm Water Multiple Application & Report Tracking System

Help

Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Owner Information

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

Property Owner Information Populate Contact Info: Select

Owner Name:	Pacific Gas and Electric Company * ?	**Contact First Name:**	Isabella *
Street Address:	3401 Crow Canyon Road * ?	**Contact Last Name:**	Johannes *
Address Line 2:	?	**Title:**	Water Quality Manager
City/State/Zip::	San Ramon CA 94583 * ?	**Phone:**	925-519-9672 * **Ext:** **(999-999-9999)**
Type:	Private Business ? * ?	**E-mail:**	iXJ4@pge.com * **(abc@xyz.com)**
Federal Tax ID:	94-0742640 ?		

Save & Exit | Save & Continue

Fields marked with * are mandatory fields.

Water Boards Storm Water Multiple Application & Report Tracking System

Help Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Developer Information

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

Developer Information Same as Owner Info Clear Developer Information

Developer Name:	Pacific Gas and Electric Company *	**Contact First Name:**	Marty *
Street Address:	2730 Gateway Oaks Drive *	**Contact Last Name:**	Bell *
Address Line 2:		**Title:**	Stormwater Work Supervisor
City/State/Zip::	Sacramento CA 95833 *	**Phone:**	925-967-8080 * **Ext:** **(999-999-9999)**
		E-mail:	MHBJ@pge.com * **(abc@xyz.com)**

Save & Exit Save & Continue

Fields marked with * are mandatory fields.

Water Boards Storm Water Multiple Application & Report Tracking System

Help

Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Site Information

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

Site Information Same as Owner Info | Same As Developer Info | Clear Info | **If different, enter below**

Site Name:	Fulton Fitch Mountain Reconductor 60 kV Project *	**Contact First Name:**	Matt *
Street Address:	605 River Road *	**Contact Last Name:**	White *
Address Line 2:		**Title:**	Project Manager
Latitude:	38.49755 ***Longitude:** -122.76071 *Lookup Map **(Decimal degrees only, minimum 5 significant digits Ex: 99.99999)**	**Phone:**	916-250-7886 ***Ext:** **(999-999-9999)**
City:	Fulton *	**Emergency Phone:**	**Ext:** **(999-999-9999)**
County:	Sonoma *	**E-mail:**	mdwr@pge.com ***(abc@xyz.com)**
Regional Board:	Region 1 - North Coast *		
State/Zip:	**CA** 95439 *	**Total Site Size:**	30.5 * ⦿ **Acres** ○ **Sqft**

Additional Information (Construction Specific)

Total Area to be Disturbed:	30.5 **Acres** *	**Percent of Total Disturbed:**	100 **%**
Imperviousness Before Construction:	17 **%** *	**Imperviousness After Construction:**	17 **%** *
Tract Number(s):			
Mile Post Marker:			
Is the construction site part of larger common plan of development?	○ **Yes** ⦿ **No** *		
Name of plan or development:			
Construction Commencement Date:	05/28/2018 ***(mm/dd/yyyy)**		
Complete Grading Date:	**(mm/dd/yyyy)**	**Complete Project Date:**	06/30/2019 ***(mm/dd/yyyy)**

Type of Construction

○ Construction

☐ **Residential** ☐ **Commercial** ☐ **Industrial** ☐ **Reconstruction** ☐ **Transportation** ☐ **Utility:**

☐ **Other:** *

⊙ Linear Utility Project

☐ **Above Ground** ☐ **Below Ground** ☐ **Gas Line** ☐ **Water/Sewer Line** ☐ **Communication Line** ☐ **Cable Line** ☑ **Electrical**

☐ **Other:** *

Save & Exit | Save & Continue

Fields marked with * are mandatory fields.

Water Boards Storm Water Multiple Application & Report Tracking System

Help Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Segment Information

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

Segment Information

Segment Name	Start Date	End Date	Begin Point Latitude	Begin Point Longitude	End Point Latitude	End Point Longitude	Delete
Segment 1 - South *	05/28/2018 *	06/30/2019 *	38.497556 *	-122.760715	38.518826 *	-122.757005 *	Delete
Segment 2 - North *	05/28/2018 *	06/30/2019 *	38.518826 *	-122.757005	38.606638 *	-122.852842 *	Delete
*	*	*	*		*	*	

Save Segment

Save & Exit | Save & Continue

Fields marked with * are mandatory fields.

Water Boards Storm Water Multiple Application & Report Tracking System

Help

Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Risk

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

Segment Name	Start Date	End Date	Mid Point Latitude	Mid Point Longitude	LUP Type	Risk Factor Value
Segment 1 - South	05/28/2018	06/30/2019	38.50806	-122.75889	Type2	Y
Segment 2 - North	05/28/2018	06/30/2019	38.56278	-122.805	Type3	Y

Save & Exit | Save & Continue

Fields marked with * are mandatory fields.

Water Boards Storm Water Multiple Application & Report Tracking System

Help | Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Risk

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

SEGMENT NAME: Segment 1 - South

Will >/= 70% of the construction activity occur on paved surfaces/Will < 30% of the soil disturbance occur on unpaved surfaces?	No
Will the construction activity occur on unpaved improved roads, including their shoulders or land immediately adjacent to them?	Yes
Will areas disturbed be returned to preconstruction conditions or equivalent condition* at the end of the day?	No

SEDIMENT RISK FACTOR WORKSHEET
Instructions: Enter R,K and LS factor values. System will calculate watershed erosion estimates and site sediment risk factor
A. Sediment Risk

A) R Factor Value: (What's this?)	106 * Erosivity Calculator
B) K Factor Value (weighted average, by area, for all site soils) (What's this?) ***If not using the SWRCB map(Populate K Factor) upload your analysis on the Attachment Tab prior to submitting to the SWRCB.	0.37 * Populate K Factor
C) LS Factor (weighted average, by area, for all slopes) (What's this?) ***If not using the SWRCB map(Populate LS Factor) upload your analysis on the Attachment Tab prior to submitting to the SWRCB.	0.68 * Populate LS Factor
Watershed Erosion Estimate (=R*K*LS) in tons/acre	26.67
Site Sediment Risk Factor Low Sediment Risk: < 15 tons/acre Medium Sediment Risk: >/= 15 and <75 tons/acre High Sediment Risk: >/= 75 tons/acre	Medium

RECEIVING WATER (RW) RISK FACTOR WORKSHEET

Is the project area or project section area located within a Sediment Sensitive Watershed*?	Populate Receiving Water Risk Yes
Is the project area or section located within the flood plain or flood prone area (riparian zone) of a Sensitive Receiving Water Body*?	No

Statewide Map of High Receiving Water Risk Watersheds

Medium

C. Combined Risk Level Matrix

		Sediment Risk		
		Low	Medium	High
Receiving	Low	Type1	Type1	Type2
Water	Medium	Type1	Type2	Type3
Risk	High	Type2	Type3	Type3

Segment Sediment Risk: Medium

Segment Receiving Water Risk: Medium

Segment Combined Risk: Type2

Save Segment Risk *Save Segment Risk before clicking on Save & Continue/Save & Exit button

Save & Exit Save & Continue

Fields marked with * are mandatory fields.

Water Boards Storm Water Multiple Application & Report Tracking System

Help Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Risk

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

SEGMENT NAME: Segment 2 - North

Will >/= 70% of the construction activity occur on paved surfaces/Will < 30% of the soil disturbance occur on unpaved surfaces?	No
Will the construction activity occur on unpaved improved roads, including their shoulders or land immediately adjacent to them?	Yes
Will areas disturbed be returned to preconstruction conditions or equivalent condition* at the end of the day?	No

SEDIMENT RISK FACTOR WORKSHEET **Instructions: Enter R,K and LS factor values. System will calculate watershed erosion estimates and site sediment risk factor** **A. Sediment Risk**	
A) R Factor Value: (What's this?)	119 * Erosivity Calculator
B) K Factor Value (weighted average, by area, for all site soils) (What's this?) ***If not using the SWRCB map(Populate K Factor) upload your analysis on the Attachment Tab prior to submitting to the SWRCB.	0.37 * Populate K Factor
C) LS Factor (weighted average, by area, for all slopes) (What's this?) ***If not using the SWRCB map(Populate LS Factor) upload your analysis on the Attachment Tab prior to submitting to the SWRCB.	4.39 * Populate LS Factor
Watershed Erosion Estimate (=R*K*LS) in tons/acre	193.29
Site Sediment Risk Factor Low Sediment Risk: < 15 tons/acre Medium Sediment Risk: >/= 15 and <75 tons/acre High Sediment Risk: >/= 75 tons/acre	High

RECEIVING WATER (RW) RISK FACTOR WORKSHEET

Is the project area or project section area located within a Sediment Sensitive Watershed*?	Populate Receiving Water Risk Yes
Is the project area or section located within the flood plain or flood prone area (riparian zone) of a Sensitive Receiving Water Body*?	Yes Statewide Map of High Receiving Water Risk Watersheds

High

C. Combined Risk Level Matrix

		Sediment Risk		
		Low	**Medium**	**High**
Receiving	**Low**	Type1	Type1	Type2
Water	**Medium**	Type1	Type2	Type3
Risk	**High**	Type2	Type3	Type3

Segment Sediment Risk: High

Segment Receiving Water Risk: High

Segment Combined Risk: Type3

Save Segment Risk *Save Segment Risk before clicking on Save & Continue/Save & Exit button

Save & Exit | Save & Continue

Fields marked with * are mandatory fields.

Water Boards Storm Water Multiple Application & Report Tracking System

Help

Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Additional Site Information

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

Regulatory Status

If applicable, has the local agency reviewed/approved a required erosion/sediment control plan?	○ Yes ○ No ⦿ N/A
Does the erosion/sediment control plan address construction activities such as infrastructure and structures?	○ Yes ○ No ⦿ N/A
Name of Local Agency:	Sonoma County Water Agency
Phone:	707-526-5370 **(999-999-9999)**
Is this project or any part thereof, subject to conditions imposed under a CWA Section 404 Water Quality Certification?	○ Yes ⦿ No
If yes, provide details:	

Receiving Water Information

Name of receiving water: (river, lake, creek, stream, bay, ocean)	Russian River
Does the storm water runoff from the construction site discharge to (check all that apply):	☑ **Indirectly to waters of the US** ☐ **Storm drain system - Enter owner's name:** ☐ **Directly to waters of the US (e.g, river, lake, creek, stream, bay, ocean, etc)**

Qualified SWPPP Developer (QSD)

First Name:	Ashley *
Last Name:	Gaskell * Lookup QSD
QSD Certification No:	24970 *

Save & Exit | Save & Continue

Fields marked with * are mandatory fields.

Water Boards Storm Water Multiple Application & Report Tracking System

Help Logout

You are logged-in as: **ARCADIS STORM WATER**
If this account does not belong to you, please log out.

Navigate To:

Billing Information

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 494849	**Owner:**	Pacific Gas and Electric Company	**Certified Date:**	05/01/2018
Status:	Not Submitted		3401 Crow Canyon Road San Ramon CA 94583	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fulton Fitch Mountain Reconductor 60 kV Project	**NOT Effective Date:**	
Permit Type:	Construction - NOI		605 River Road Fulton CA 95439	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Segments Info | Risk | Addl. Site Info | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

Billing Information Same as Owner | Same as Developer | Clear Billing Info **If different, enter below. Bill Month: Bill Hold:**

Billing Name:	Pacific Gas and Electric Company *	**Contact First Name:**	Stormwater *
Street Address:	3401 Crow Canyon Road *	**Contact Last Name:**	Program Manager *
Address Line 2:		**Title:**	
City/State/Zip:	San Ramon CA 94583 *	**Phone:**	925-415-6304 ***Ext:** **(999-999-9999)**
E-mail:	stormwater@pge.com * **(abc@xyz.com)**		

Save & Exit | Save & Continue

Fields marked with * are mandatory fields.

SWRCB Tax ID: 68-0281986
The following are the Invoices and Payments associated with this NOI.

Invoices:

The Fee Statement for this application (NOI) filing is available after the application is submitted. Questions regarding the NOI application fee, please call the Stormwater Unit at (916) 341-5536 or email at stormwater@waterboards.ca.gov

Invoice No	Invoice Date	Fiscal Year	Invoice Amount	Original Invoice Amount	Invoice Status	Status Date	Prepare Form-X

Pacific Gas and Electric Company®

Risk Determination

General Information			
Project/Site Name:	Fulton Fitch Mountain Reconductor 60 kV	Segment Name:	Segment 1 - South
Assessment Date:	April 25, 2018	Completed By:	Ashley Gaskell
Construction Start Date:	05/28/2018	End Date:	06/30/2019

Segment 1 - Sediment Risk

R-Factor:	106
K-Factor:	0.37
LS-Factor:	0.68
RxKxLS:	26.67
Sediment Risk:	**Medium**

Start Date:	05/28/2018
End Date:	06/30/2019
Latitude:	38.50806
Longitude:	-122.75889

RxKxLS	
<15	Low
15-75	Medium
>75	High

Segment 1 - Receiving Water Risk

Receiving Water Risk:	**Medium***

Project is not in a Sediment Sensitive Watershed.	Low
In a Sediment Sensitive Watershed but not in the flood plain or flood prone area.	Medium
In the flood plain or flood prone area of a Sediment Sensitive Watershed.	High

Segment 1 - Combined Risk

Project Type:	**2**

	Low	Med	High
Low	1	1	2
Med	1	2	3
High	2	3	3

*** The Segment 1 alignment crosses through the flood plain of a sediment sensitive receiving water but no ground disturbing work will occur in this area.**

Segment 2 - Sediment Risk

R-Factor:	119
K-Factor:	0.37
LS-Factor:	4.39
RxKxLS:	193.3
Sediment Risk:	**High**

Start Date:	05/28/2018
End Date:	06/30/2019
Latitude:	38.56278
Longitude:	-122.80472

RxKxLS	
<15	Low
15-75	Medium
>75	High

Segment 2 - Receiving Water Risk

Receiving Water Risk:	**High**

Project is not in a Sediment Sensitive Watershed.	Low
In a Sediment Sensitive Watershed but not in the flood plain or flood prone area.	Medium
In the flood plain or flood prone area of a Sediment Sensitive Watershed.	High

Segment 2 - Combined Risk

Project Type:	**3**

	Low	Med	High
Low	1	1	2
Med	1	2	3
High	2	3	3

Sediment Risk Calculation

R-Factor Documentation

Segment 1 South

Facility Information

Start Date: 5/28/2018
End Date: 6/30/2019
Latitude: 38.50806
Longitude: -122.75889

Erosivity Index Calculator Results

An erosivity index value of **106** has been determined for the construction period of **5/28/2018** - **06/30/2019**.

A rainfall erosivity factor of 5.0 or greater has been calculated for your site and period of construction. **You do NOT qualify for a waiver from NPDES permitting requirements.**

Segment 2 North

Facility Information

Start Date: 5/28/2018
End Date: 6/30/2019
Latitude: 38.56278
Longitude: -122.80472

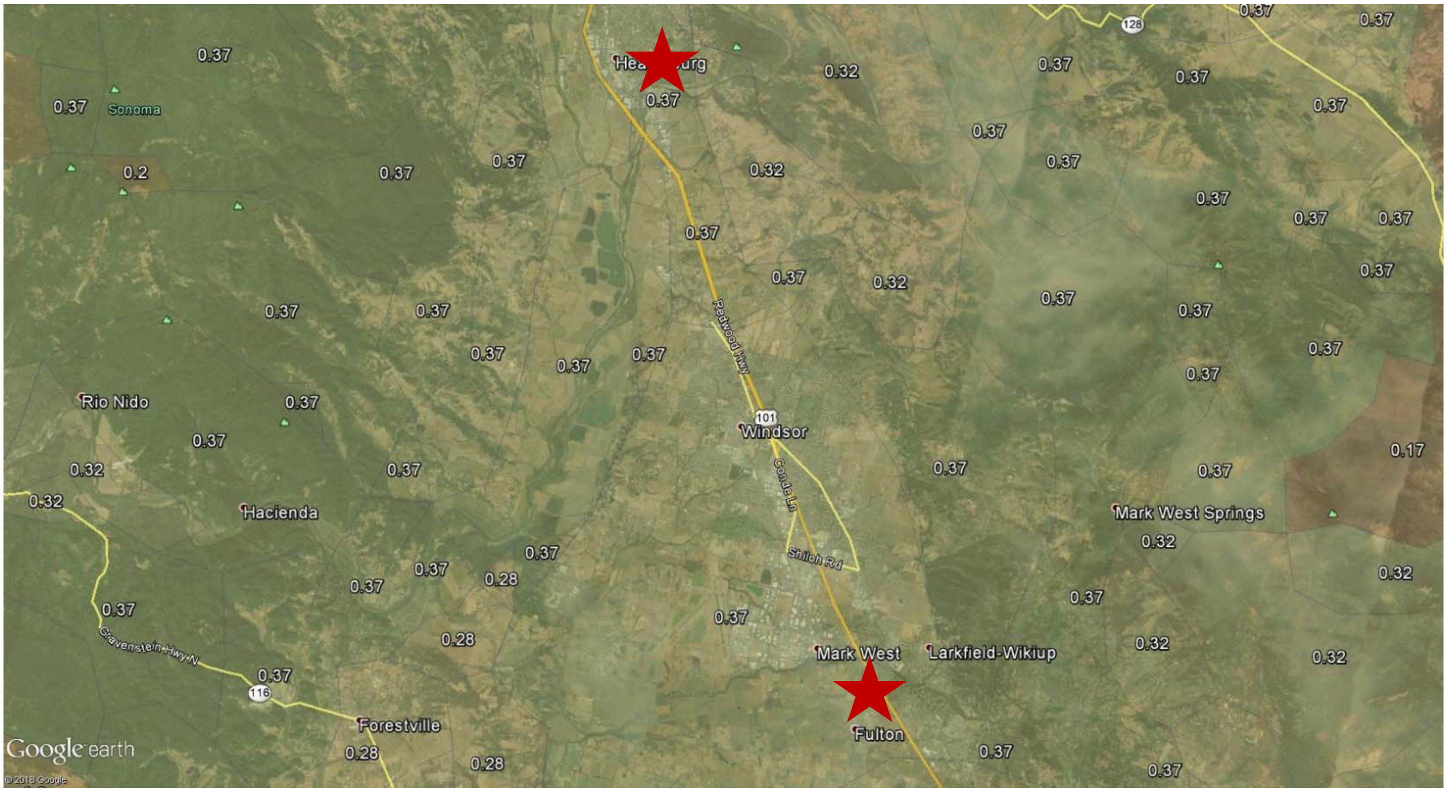
Erosivity Index Calculator Results

An erosivity index value of **119** has been determined for the construction period of **5/28/2018** - **06/30/2019**.

A rainfall erosivity factor of 5.0 or greater has been calculated for your site and period of construction. **You do NOT qualify for a waiver from NPDES permitting requirements.**

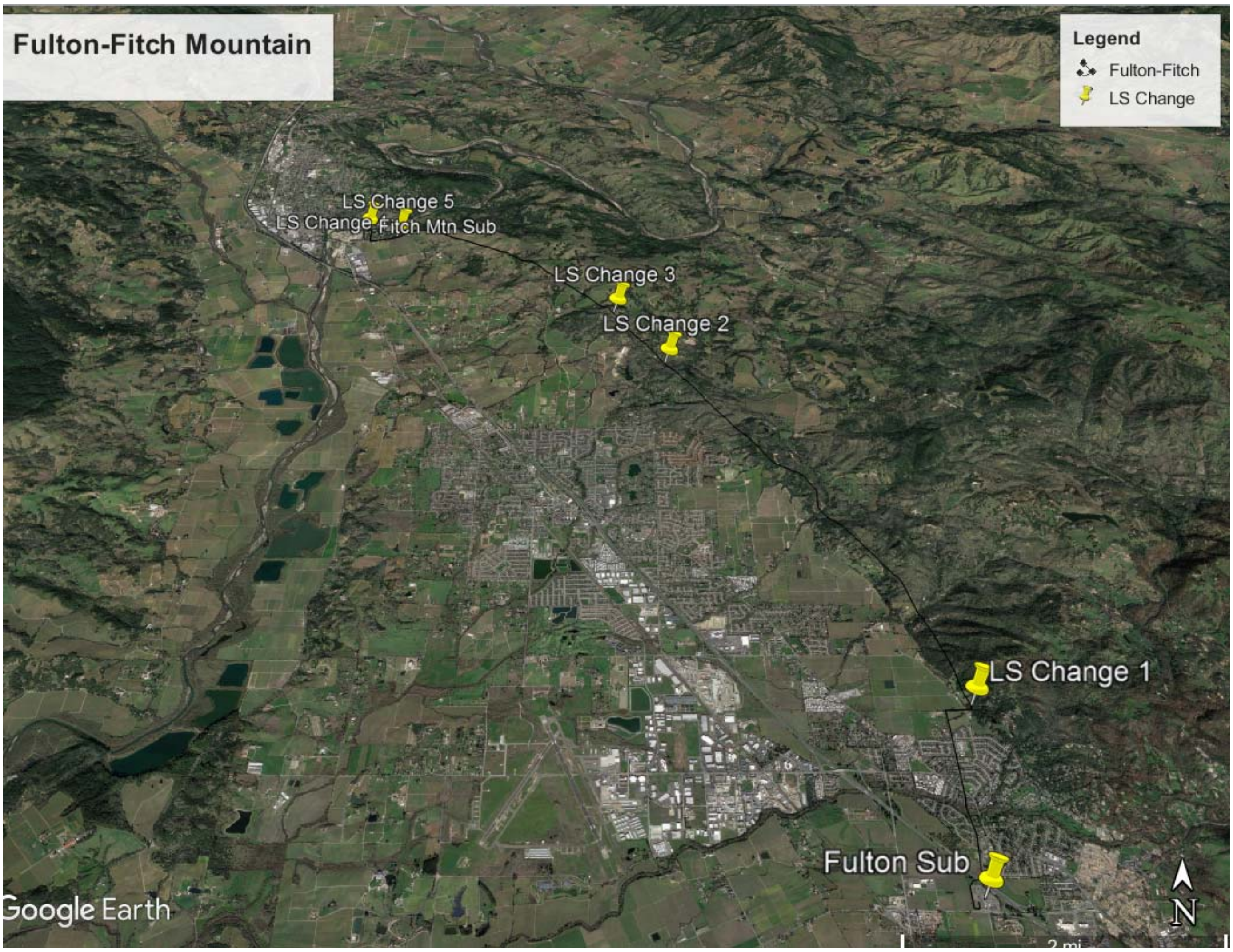
K-Factor Documentation

Source: SWRCB GIS files via Google Earth overlay; dated September 2011



LS-Factor Documentation

Source: SWRCB GIS files via Google Earth overlay; dated September 2011



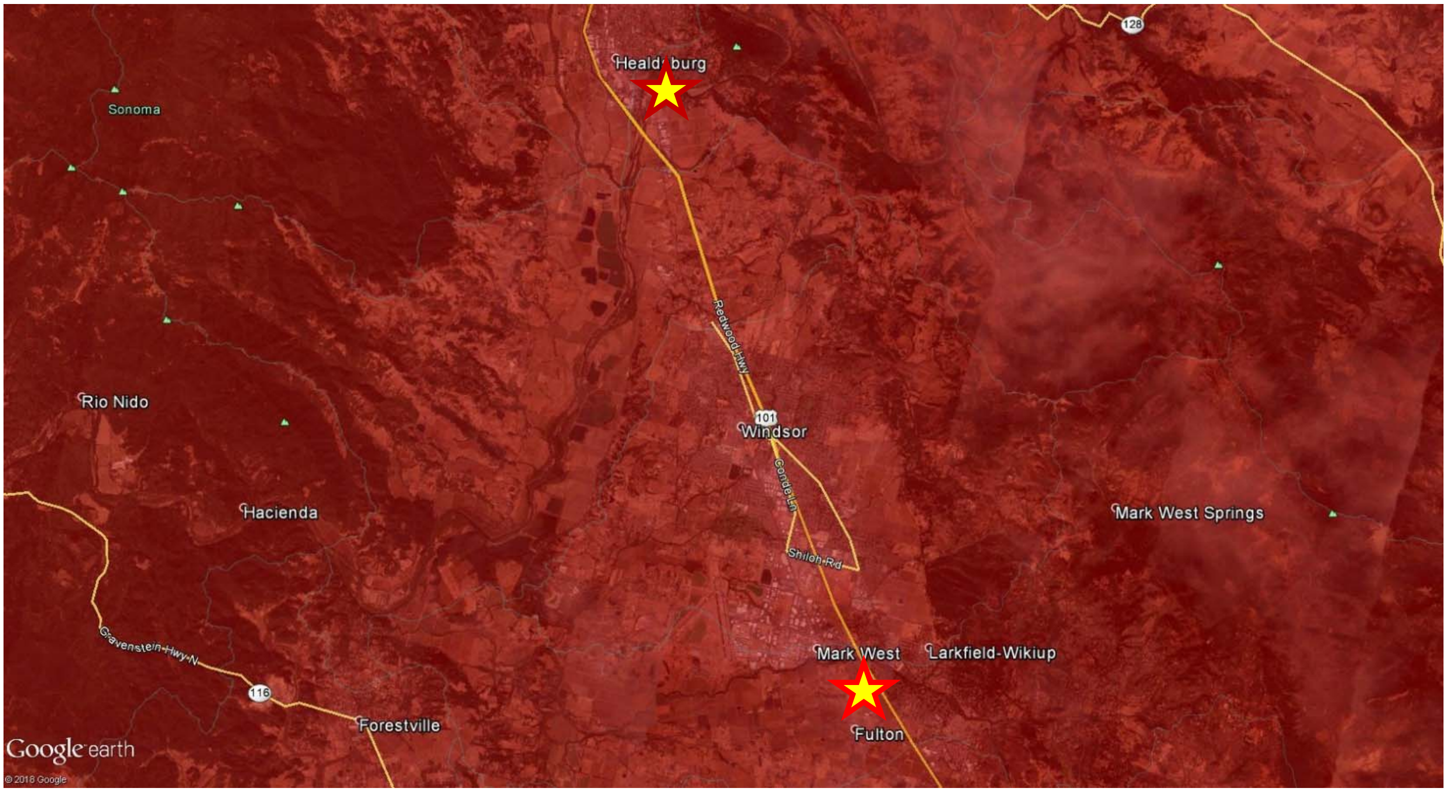
LS-Factor Documentation

Fulton-Fitch Mountain Weighted LS						
	Segment 1	**Segment 2**				
	Section 1	**Section 2**	**Section 3**	**Section 4**	**Section 5**	**Section 6**
	Fulton to LS 1	LS 1 to LS 2	LS 2 to LS 3	LS 3 to LS 4	LS 4 to LS 5	LS 5 to Fitch Mtn.
R-Value	106	119	119	119	119	119
K-Value	0.37	0.37	0.32	0.32	0.37	0.37
LS Value - Section	**0.68**	**4.51**	**3.6**	**4.86**	**1.21**	**2.11**
R*K*LS	26.67	198.58	137.09	185.07	53.28	92.90
Sed Risk	Med	High	High	High	Med	High
RW Risk	Med	Med	Med	Med	Med	Med
LUP Type - Section	2	3	3	3	2	3
Acreage %	100	55.77	8.81	29.56	0.10	5.76
Weighted LS-Value	0.68	2.52	0.31	1.44	0.00	0.12
LS Value - Segment	0.68	4.39				
Risk Type - Segment	2	3				

Receiving Water Risk Documentation

Source: SWRCB GIS files via Google Earth overlay; dated February 2012

Sediment Sensitive Receiving Water Map



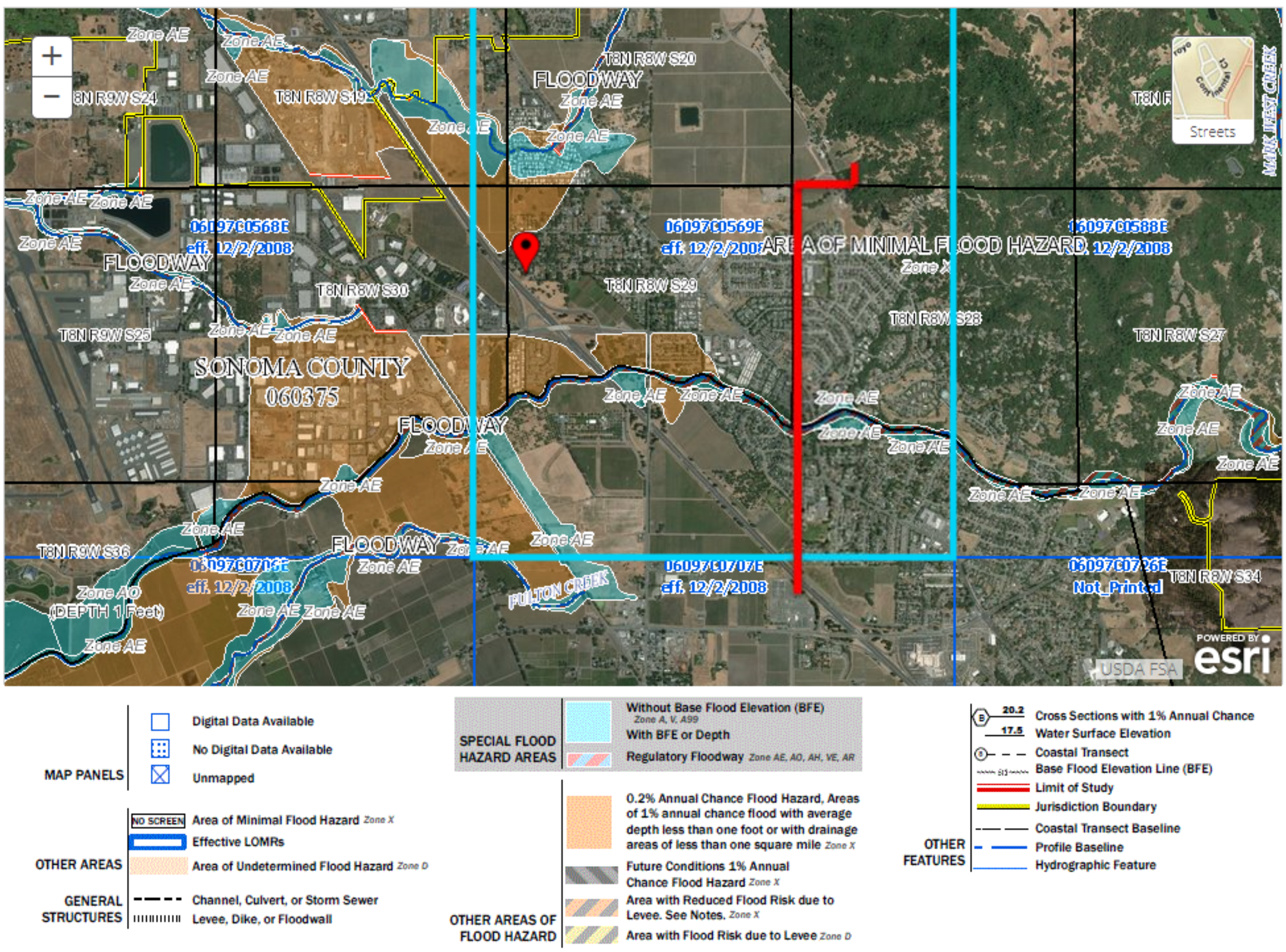
Source: FEMA Firm Map Title

Flood Plain or Flood Prone Area Map

Fulton Substation (Segment 1)

605 River Rd., Fulton, CA

You can choose a new flood map or move the location pin by selecting a different location on the locator map below or by entering a new location in the search field above. NOTE: Please be sure to enable popups for this site.



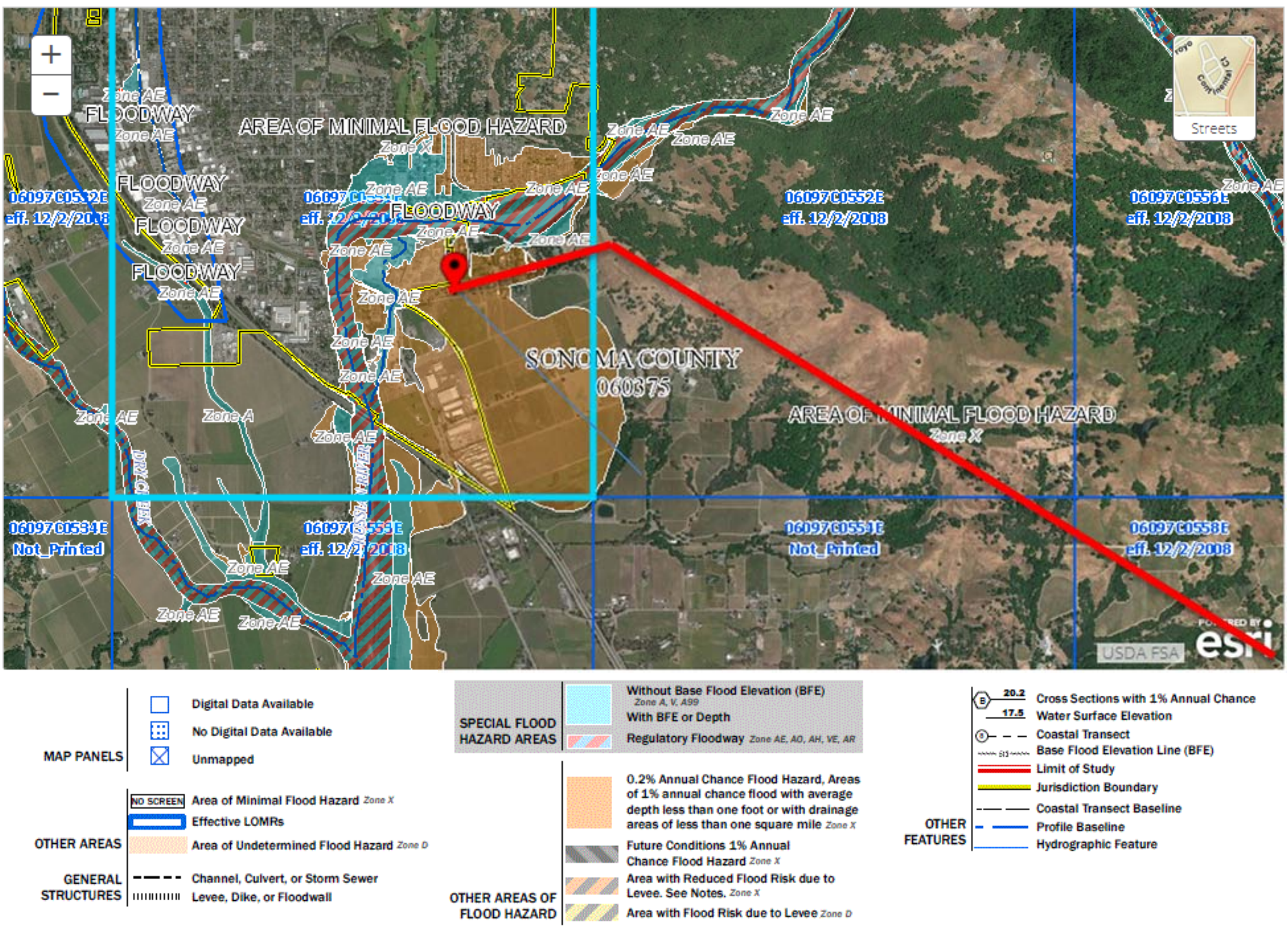
Source: FEMA Firm Map Title

Flood Plain or Flood Prone Area Map

Fitch Mountain Substation (Segment 2)

195 Bailhache Ave., Healdsburg, CA

You can choose a new flood map or move the location pin by selecting a different location on the locator map below or by entering a new location in the search field above. NOTE: Please be sure to enable popups for this site.



Project Name: Fulton Fitch Mountain Reconductoring 60kv **Order #:** 74000600

Calculating Soil Disturbance Areas of Construction Projects

The State Water Resources Control Board requires permitting under the New State General Storm Water Construction Permit for construction activities, where soil disturbance is one acre or greater. To determine whether a construction project or activity disturbs an acre or more of soil, the surface area (square feet) for the following activities* must be determined. Items numbered below refer to activities occurring on **unpaved** surfaces unless otherwise specified. **If the sum of these activities equals or exceeds 39,200 square feet or 0.9 acre, then permit coverage and a Storm Water Pollution Prevention Plan (SWPPP) must be obtained before commencement of the construction activity per PG&E Stormwater Group Expectations Document Requirements.** (Cells into which data should be entered are shaded green.)

ACTIVITIES - type in description of activity and put dimensions in green area			Width	Length	AREA IN FT2
1. Gas Transmission Surface areas of trenches and laterals (includes trenches within paved areas)					
					0
					0
					0
2. Gas Transmission Unpaved areas adjacent to trench (consider permanent easement plus temporary construction easement)					
					0
					0
					0
					0
3. Gas Transmission Ancillary facilities, such as jack/bore pits, HDD areas, poles, tension/pull sites, pads, and access vaults that are outside of the areas calculated in 1 or 2 above.					
					0
					0
					0
4. Gas Distribution Trenching Calculations	Enter the number of gas distribution locations or length of pipe here ▼				
	Linear Feet/Length of Pipe on Pavement				0
	Linear Feet/Length of Pipe on Shoulder				0
	Linear Feet/Length of Pipe off the Shoulder				0
	Number of Services Trenched				0
	Number of Tie-ins				0
5. Gas Distribution Bore Calculations	Enter the number of gas distribution locations or length of pipe here ▼				
	Length of HDD Bore				
	Number of Services HDD				0
	Number of Tie-ins				
	Number of Bore/Bell Holes	0			0
	Number of HDD Burp/Entry Holes	0			0
	Number of Pot Holes/Utility Crossing	0			0
6. Regulator Station Footprint Dimentions					0
7. Area of the base of stockpiles on unpaved surfaces not included in 1-6 above.					
					0
					0
					0
					0
8. Borrow areas not included in 1-6 above.					
					0
					0
					0
					0
9. Area of equipment and material storage, staging, and preparation areas (laydown) not on paved surfaces and outside of 1-6 above.					
					0
					0
					0
					0
10. Vehicle parking if unpaved outside of 1-6 above					

Project Name: Fulton Fitch Mountain Reconductoring 60kv **Order #:** **74000600**

Calculating Soil Disturbance Areas of Construction Projects

The State Water Resources Control Board requires permitting under the New State General Storm Water Construction Permit for construction activities, where soil disturbance is one acre or greater. To determine whether a construction project or activity disturbs an acre or more of soil, the surface area (square feet) for the following activities* must be determined. Items numbered below refer to activities occurring on **unpaved** surfaces unless otherwise specified. **If the sum of these activities equals or exceeds 39,200 square feet or 0.9 acre, then permit coverage and a Storm Water Pollution Prevention Plan (SWPPP) must be obtained before commencement of the construction activity per PG&E Stormwater Group Expectations Document Requirements.** (Cells into which data should be entered are shaded green.)

ACTIVITIES - type in description of activity and put dimensions in green area			Width	Length	AREA IN FT2
					0
					0
					0
					0
	Enter the number of poles or towers here ▼				
	Tubular Steel Poles - 40 ft x 40 ft	74			118400
	Wood Poles - 10 ft x 10 ft				0
11. Poles/ towers footprints of work areas	Towers - 50 ft x 50 ft				0
12. Improved helicopter landing sites (e.g., graded and/or rocked) and sites where helicopter refueling will occur. (Vegetated areas used for touchdowns in the dry season should not be included if soil disturbance and refueling will not occur there.)					
2 stand alone landing zones			600	600	360000
4 landing zones are locaded in existing laydown / staging areas.					0
					0
					0
13. New road construction, upgrades to existing roads that would change composition (e.g., unpaved to paved), or change dimension of road (e.g., widening). Overland access where no roads are present, such as across grasslands would be included especially if use is during wet season. The exclusion of this activity can be evaluated by the Storm Water Team for dry season, limited drive-in and drive-out use as long as the activity does not cause soil disturbance (this needs to be confirmed with the Storm Water Team before excluding from the calculation).					
Access Roads			10	39137	391370
					0
					0
					0
14. Areas of paved surfaces constructed for the project other than roads included avove.					
					0
					0
					0
					0
15. Other:					
11 pull sites total			600	600	360000
6 laydown /staging yards			400	250	100000
					0
					0
				Total Surface Area in Acres	**30.527**

Appendix C

Amendment Certifications

Pacific Gas and Electric Company®

Amendment Certification

General Information	
Project/Site Name:	**Fulton Fitch Mountain Reconductor 60 kV**
Project Location:	
Amendment Number:	

QSD Certification of the SWPPP Amendment
By signing below, the QSD certifies the following statement, "I certify under penalty of law that this amendment 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." Additionally, the QSD certifies that, "I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD Signature	Date
QSD Name	QSD Certification Number
Title and Affiliation	Telephone Number
Address	Email Address

Appendix D

Construction Activities, Materials Used and Associated Pollutants

Activities, Materials, and Pollutants

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Cleaning Products	Acids	No	**pH** Acidity Anions (acetic acid, phosphoric acid, sulfuric acid, nitric acid, hydrogen chloride)	pH Meter Acidity Test Kit	EPA 150.1 (pH) SM 2310B (Acidity) EPA 300.0 (Anion)
	Bleaches	No	**Residual Chlorine**	Chlorine	SM 4500-CL G (Res. Chlorine)
	Detergents	Yes - Foam	Visually Observable - No Testing Required		
	TSP	No	**Phosphate**	Phosphate	EPA 365.3 (Phosphate)
	Solvents	No	**VOC**	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)
Contaminated Soil [5]	Aerially Deposited Lead[3]	No	**Lead**	None	EPA 200.8 (Metal)
	Petroleum	Yes – Rainbow Surface Sheen and Odor	Visually Observable - No Testing Required		
	Mining or Industrial Waste, etc.	No	**Contaminant Specific**	Contaminant Specific – Check with laboratory	Contaminant Specific – Check with laboratory
Portland Concrete Cement & Masonry Products	Portland Cement (PCC)	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Masonry products	No	**pH**	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
			Alkalinity		SM 2320 (Alkalinity)
	Sealant (Methyl Methacrylate - MMA)	No	**Methyl Methacrylate**	None	EPA 625 (SVOC)
			Cobalt		EPA 200.8 (Metal)

			Zinc		
	Incinerator Bottom Ash Bottom Ash Steel Slag Foundry Sand Fly Ash Municipal Solid Waste	No	**Aluminum** **Calcium** **Vanadium** **Zinc**	Calcium Test	EPA 200.8 (Metal) EPA 200.7 (Calcium)
	Mortar	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Concrete Rinse Water	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Non-Pigmented Curing Compounds	No	Acidity	pH Meter Alkalinity or Acidity Test Kit	SM 2310B (Acidity)
			Alkalinity		SM 2320 (Alkalinity)
			pH		EPA 150.1 (pH)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
Adhesives	Adhesives	No	COD	None	EPA 410.4 (COD)
			Phenols	Phenol	EPA 420.1 (Phenol)
			SVOC	None	EPA 625 (SVOC)

Landscaping and Other Products	Aluminum Sulfate	No	Aluminum	TDS Meter Sulfate	EPA 200.8 (Metal)
			TDS		EPA 160.1 (TDS)
			Sulfate		EPA 300.0 (Sulfate)
	Sulfur-Elemental	No	**Sulfate**	Sulfate	EPA 300.0 (Sulfate)

	Fertilizers-Inorganic [4]	No	**Nitrate**	Nitrate	EPA 300.0 (Nitrate)
			Phosphate	Phosphate	EPA 365.3 (Phosphate)
			Organic Nitrogen	None	EPA 351.3 (TKN)
			Potassium	None	EPA 200.8 (Metal)
	Fertilizers-Organic	No	TOC	Nitrate	EPA 415.1 (TOC)
			Nitrate		EPA 300.0 (Nitrate)
			Organic Nitrogen		EPA 351.3 (TKN)
			COD		EPA 410.4 (COD)
	Natural Earth (Sand, Gravel, and Topsoil)	Yes - Cloudiness and turbidity	Visually Observable - No Testing Required		
	Herbicide	No	**Herbicide**	None	Check lab for specific herbicide or pesticide
	Pesticide		**Pesticide**		
	Lime		Alkalinity	pH Meter Alkalinity or Acidity Test Kit	SM 2320 (Alkalinity)
			pH		EPA 150.1 (pH)
Portable Toilet Waste Products	Portable Toilet Waste	Yes	Visually Observable - No Testing Required		

Painting Products	Paint	Yes	Visually Observable - No Testing Required		
	Paint Strippers	No	**VOC**	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)
	Resins	No	**COD**	None	EPA 410.4 (COD)
			SVOC		EPA 625 (SVOC)
	Sealants	No	**COD**	None	EPA 410.4 (COD)
	Solvents	No	**COD**	None	EPA 410.4 (COD)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
	Lacquers, Varnish, Enamels, and Turpentine	No	**COD**	None	EPA 410.4 (COD)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
	Thinners	No	VOC	None	EPA 601/602 or EPA 624 (VOC)
			COD		EPA 410.4 (COD)
			Chloride		EPA 300.0 (Chloride)
			TDS		EPA 160.1 (TDS)
			Cations (Sodium, Magnesium, Calcium)		EPA 200.7 (Cations)

Vehicle	Antifreeze and Other Vehicle Fluids	Yes - Colored Liquid	Visually Observable - No Testing Required		
	Batteries	No	Sulfuric Acid	None	EPA 300.0 (Sulfate)
			Lead	None	EPA 200.8 (Metal)
			pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
	Fuels, Oils, Lubricants	Yes - Rainbow Surface Sheen and Odor	Visually Observable - No Testing Required		
Treated Wood Products	Ammoniacal-Copper-Zinc-Arsenate (ACZA) Copper-Chromium-Arsenic (CCA) Ammoniacal-Copper-Arsenate (ACA) Copper Naphthenate	No	Arsenic	Total Chromium	EPA 200.8 (Metal)
			Total Chromium		
			Copper		
			Zinc		
	Creosote	Yes - Rainbow Surface or Brown Suspension	Visually Observable - No Testing Required		

Soil Amendment/Stabilization Products	Polymer/Copolymer [6, 7]	No	**Organic Nitrogen**	None	EPA 351.3 (TKN)
			BOD	None	EPA 405.1 (BOD)
			COD	None	EPA 410.4 (COD)
			DOC	None	EPA 415.1 (DOC)
			Nitrate	Nitrate	EPA 300.0 (Nitrate)
			Sulfate	Sulfate	EPA 300.0 (Sulfate)
			Nickel	None	EPA 200.8 (Metal)
	Straw/Mulch	Yes - Solids	Visually Observable - No Testing Required		
	Lignin Sulfonate	No	Alkalinity	Alkalinity	SM 2320 (Alkalinity)
			TDS	TDS Meter	EPA 160.1 (TDS)
	Psyllium	No	COD	None	EPA 410.4 (COD)
			TOC		EPA 415.1 (TOC)
	Guar/Plant Gums	No	COD	None	EPA 410.4 (COD)
			TOC		EPA 415.1 (TOC)
			Nickel		EPA 200.8 (Metal)
	Gypsum	No	pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
			Calcium	Calcium	EPA 200.7 (Calcium)
			Sulfate	Sulfate	EPA 300.0 (Sulfate)
			Aluminum	None	EPA 200.8 (Metal)
			Barium		
			Manganese		
			Vanadium		

Notes:

1. If specific pollutant is known, analyze only for that specific pollutant. See Material SDS to verify.
2. For each construction material, test for one of the pollutant indicators. Bolded pollutant indicates lowest analysis cost or best indicator. However, the composition of the specific construction material, if known, is the first criterion for selecting which analysis to use.
3. See www.hach.com, www.lamotte.com, www.ysi.com and www.chemetrics.com for some of the test kits.
4. If the type of inorganic fertilizer is unknown, analyze for all pollutant indicators listed.
5. Only if special handling requirements are required in the Caltrans Standard Special Provisions for aerially deposited lead (ADL)
6. If used with a dye or fiber matrix, it is considered visually observable and no testing is required.
7. Based upon research conducted by Caltrans, the following copolymers/polymers do not discharge pollutants and water quality sampling and analysis is not required: Super Tak™, M-Binder™, Fish Stik™, Pro40dc™, Fisch-Bond™, and Soil Master WR™.

Acronyms:

- BOD – Biochemical Oxygen Demand
- COD – Chemical Oxygen Demand
- DOC – Dissolved Organic Carbon
- EPA – Environmental Protection Agency
- HACH – Worldwide company that provides advanced analytical systems and technical support for water quality testing.
- SM – Standard Method
- SVOC – Semi-Volatile Organic Compounds
- TDS – Total Dissolved Solids
- TKN – Total Kjeldahl Nitrogen
- TOC – Total Organic Carbon
- TSP – Tri-Sodium Phosphate
- VOC - Volatile Organic Compounds

References:

- Construction Storm Water Sampling and Analysis Guidance Document, California Stormwater Quality Task Force, October 2001.
- Environmental Impact of Construction and Repair Materials on Surface and Ground Waters, Report 448, National Cooperative Highway Research Program, 2001
- Soil Stabilization for Temporary Slopes, Environmental Programs, California Department of Transportation, October 1, 1999.
- Statewide Storm Water Management Plan, Division of Environmental Analysis, California Department of Transportation, April 2002.
- Statewide Storm Water Quality Practice Guidelines, Environmental Program, California Department of Transportation, August 2000.
- Soil Stabilization for Temporary Slopes and District 7 Erosion Control Pilot Study, June 2000.
- Stormwater Monitoring Protocols, Guidance Manual, California Department of Transportation, May 2000.

Appendix E

Example Forms

Inspection Form and BMP Checklist
Sampling Log
Exceedance and Discharge Reporting Form
Chain of Custody Form
Training Form

Stormwater Inspection Form

Inspection Information							
Project Name/Location: *Fulton Fitch Mountain Reconductor 60 kV*						WDID #:	
Inspection Date:			Inspection Time:		Project Type: ☐ Traditional ☐ LUP Risk Type/Level: ☐ 1 ☐ 2 ☐ 3		
Inspection Type:	Weekly ☐	Before Predicted Rain ☐	During Rain Event ☐	After Qualifying Rain Event ☐	Contained Stormwater Release ☐	Quarterly Non-Stormwater & Date of Last ☐	

BMPs			
Are BMPs for current activities implemented as shown or described in the SWPPP?	☐ Yes	☐ No	☐ N/A
Are BMPs effective for current activities?	☐ Yes	☐ No	☐ N/A
Are there corrective actions? The Contractor/Client is responsible for completing the "Date Addressed" & "Initials" columns of the Corrective Actions below when complete.	☐ Yes	☐ No	☐ N/A

Deficiencies/Corrective Actions

Action #	Deficiency/Corrective Action	Date Addressed	Initials

Notes/Comments/Concerns

Pacific Gas and Electric Company®

Stormwater Inspection Form

Site Information		
Construction Phase(s)/Stage(s):	Recently Completed and Current Activities:	Approximate Area of Site Exposed:
☐ Grading & Land Disturbance ☐ Streets & Utilities ☐ Vertical Construction ☐ Final Stabilization & Landscaping ☐ Inactive		*Acres*

SWPPP Onsite? ☐ Yes ☐ No ☐ N/A	Rain Gauge Onsite? ☐ Yes ☐ No ☐ N/A

Weather and Observations					
Estimated Storm Begin:	Estimated Storm Length:	End of Last Precipitation:	Rain Gauge Reading:	Predicted Chance of Rain:	
				Today	Future NOAA Forecast
Date: Time:	☐ Days ☐ Hours	Date: Time:	☐ Today ☐ Final Total	%	% Date:

Were any discharges observed? (describe below)	☐ Yes (if yes, →) ☐ No	☐ Authorized ☐ Un-Authorized	☐ Stormwater ☐ Non-Stormwater	☐ Dewatering ☐ Non-Visible Pollutant

Discharge Observations: (location, description, source, samples, etc.)	

Odors:	☐ Yes	☐ No	☐ N/A	Sheen:	☐ Yes	☐ No	☐ N/A
Floating Material:	☐ Yes	☐ No	☐ N/A	Discolorations:	☐ Yes	☐ No	☐ N/A
Suspended Material:	☐ Yes	☐ No	☐ N/A	Turbidity:	☐ Yes	☐ No	☐ N/A

On-Site Observations: (location, description, source, samples, etc.)	

Photos Taken: ☐ Yes ☐ No	LUPs Only: ☐ 1st Storm ☐ 2nd Storm ☐ 3rd Storm

Inspector Information	
Inspector Name:	Inspector Title:
Signature:	Report Date:

Pacific Gas and Electric Company®

Stormwater Inspection Form

BMP Checklist				
Housekeeping – Construction Materials	Implemented? **Yes**	**No**	**N/A**	Action #
Is there an inventory of 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.)	☐	☐	☐	
Are loose stockpiled construction materials that are not actively being used covered or bermed? (i.e. Soil, Spoils, Aggregate, Fly-ash, Stucco, Hydrated Lime, etc.)	☐	☐	☐	
Are chemicals stored in watertight containers with appropriate secondary containment to prevent any spillage or leakage or in a completely enclosed storage shed?	☐	☐	☐	
Is exposure of construction materials to precipitation minimized? (This does not include materials and equipment that are designed to be outdoors.)	☐	☐	☐	
Are BMPs to prevent the off-site tracking of loose construction and landscape materials implemented?	☐	☐	☐	
Housekeeping – Waste Management	Implemented? **Yes**	**No**	**N/A**	Action #
Is the disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system prevented?	☐	☐	☐	
Are sanitation facilities (e.g., portable toilets) contained to prevent discharges of pollutants to the storm drain system or receiving water?	☐	☐	☐	
Are sanitation facilities cleaned, replaced, and/or inspected regularly for leaks and spills?	☐	☐	☐	
Are waste disposal containers covered at the end of every business day and during rain events?	☐	☐	☐	
Are discharges from waste disposal containers to the storm drain system or receiving water prevented?	☐	☐	☐	
Is stockpiled waste material contained and securely protected from wind and rain at all times unless actively being used?	☐	☐	☐	
Are procedures that effectively address hazardous and nonhazardous spills implemented?	☐	☐	☐	
Are equipment and materials for the cleanup of spills available on site and are spills or leaks cleaned up immediately and are they disposed of properly?	☐	☐	☐	
Are concrete washout and other washout areas that may contain additional pollutants contained such that there is no discharge into the underlying soil and onto the surrounding areas?	☐	☐	☐	
Housekeeping – Landscape Materials	Implemented? **Yes**	**No**	**N/A**	Action #
Are stockpiled materials such as mulches and topsoil contained when not actively being used?	☐	☐	☐	
Are fertilizers and other landscape materials contained when they are not actively being used?	☐	☐	☐	
Is the application of any erodible landscape material discontinued within 2 days before a forecasted rain event or during periods of precipitation?	☐	☐	☐	
Is erodible landscape material applied at quantities and application rates according to manufacturers recommendations of based on written specification by knowledgeable and experienced field personnel?	☐	☐	☐	
Is erodible landscape material stacked on pallets and covered or stored when not being used or applied?	☐	☐	☐	

Pacific Gas and Electric Company®

Stormwater Inspection Form

Housekeeping – Vehicle Storage and Maintenance	Implemented? Yes	No	N/A	Action #
Is oil, grease, or fuel prevented from leaking in to the ground, storm drains or surface waters?	☐	☐	☐	
Is all equipment or vehicles, which are to be fueled, maintained and stored placed in a designated area fitted with appropriate BMPs (Traditional Projects)?	☐	☐	☐	
Are leaks cleaned immediately and leaked materials disposed properly?	☐	☐	☐	
Housekeeping – Air Deposition	Implemented? **Yes**	**No**	**N/A**	*Action #*
Is the air deposition of site materials and from site operations controlled? (Particulates include, but are not limited to; sediment, nutrients, trash, metals, bacteria, oil and grease, and organics.)	☐	☐	☐	
Non-Storm Water Management	Implemented? **Yes**	**No**	**N/A**	Action #
Are measures to control all non-storm water discharges during construction implemented?	☐	☐	☐	
Are vehicles washed in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems?	☐	☐	☐	
Are streets cleaned in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems?	☐	☐	☐	
Sediment Controls	Implemented? **Yes**	**No**	**N/A**	Action #
Are effective perimeter controls established and maintained?	☐	☐	☐	
Are all construction entrances and exits stabilized to sufficiently control erosion and sediment discharges from the site?	☐	☐	☐	
Are appropriate erosion control BMPs (runoff control and soil stabilization) implemented in conjunction with sediment control BMPs for areas under active construction? (Risk Level 2/3 Only)	☐	☐	☐	
Is construction activity to and from the project limited to entrances and exits that employ effective controls to prevent the off-site tracking of sediment. (Risk Level 2/3 Only)	☐	☐	☐	
Are all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire wash-off locations) maintained and protected from activities that reduce their effectiveness? (Risk Level 2/3 Only)	☐	☐	☐	
Are all immediate access roads inspected on a daily basis? 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).	☐	☐	☐	
Are linear sediment controls applied along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths in accordance with the information below? (Risk Level 2/3 Only)	☐	☐	☐	

Slope Percentage	Sheet flow length not to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

Pacific Gas and Electric Company®

Stormwater Inspection Form

Erosion Control	Implemented? **Yes**	**No**	**N/A**	Action #
Is effective wind erosion control implemented?	☐	☐	☐	
Is effective soil cover for inactive areas and all finished slopes, open space, utility backfills, and completed lots provided?	☐	☐	☐	
Is the use of plastic material limited 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.)	☐	☐	☐	
Run-on and Runoff Controls	Implemented? **Yes**	**No**	**N/A**	Action #
Is all run-on, all runoff within the site and all runoff that discharges off the site effectively managed? (Run-on from off-site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in the CGP.	☐	☐	☐	

Inspection Log

General Information	
Project/Site Name:	Fulton Fitch Mountain Reconductor 60 kV
Project Location:	

Inspection Information			
Date	**Time**	**Inspector Name**	**Notes**
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		
	☐ am ☐ pm		

*An Inspection Log is only required on LUP Type 2 and 3 projects.

Ahtna
Government Services Corporation

PG&E - BMP Visual Inspection Checklist
PG&E Fulton Fitch Mountain Reconductor 60kV Project

Inspection Type (check all that apply):

LUP Type 1	Daily Site BMP	Pre-Storm Event	During-Storm Event	Post-Storm Event
Visual Inspection				
Photo Record*				

*Photo documentation shall be submitted to the QSP at: SStetson@Ahtna.net 916-798-3356

Good Housekeeping for Construction Materials	Y	N	N/A
1. Inventory of Products up-to-date			
2. Stockpiled construction materials not actively in use are covered and bermed			
3. All chemicals are stored in water-tight containers with appropriate secondary containment			
4. Construction materials are minimally exposed to precipitation			
5. BMPs preventing the off-site tracking of materials are implemented and effective			

Good Housepeeking for Waste Management	Y	N	N/A
1. Portable toilets are contained to prevent discharge of waste			
2. Sanitation facilities are clean with no apparent spills or leaks			
3. BMPs are in place to cover waste disposal containers at the end of the day and during rain events			
4. Discharges from waste disposal containers are prevented from entering storm drain inlets or receiving waters			
5. Stockpiled waste material is securely protected from wind and rain if not actively in use			
6. Procedures are in place to address hazardous and non-hazardous spills			
7. Appropriate spill response personnel are assigned and trained			
8. Equipment and materials for spill clean-up are available onsite			
9. Washout areas are contained appropriately to prevent discharge or infiltration into the soil			

Good Housekeeping for Vehicle Storage and Maintenance	Y	N	N/A
1. Measures are in place to prevent oil and fuel from leaking into the ground, storm drain inlets, and/or surface waters			
2. All equipment or vehicles are fueled, maintained, and stored in designated areas with appropriate BMPs			
3. Vehicle and equipment leaks are cleaned immediately and disposed of properly			

Good Housekeeping for Landscape Materials	Y	N	N/A
1. Stockpiled materials such as mulches and topsoil are contained and covered when not in use			
2. Erodible landscape materials have not been applied 2 days prior to a forecasted rain event			
3. Erodible landscape materials are applied at quantities and rates with manufacturer recommendations			
4. Bagged erodible landscape materials are stored on pallets and covered			

Non-Stormwater Management	Y	N	N/A
1. Non-stormwater discharges are properly controlled			
2. Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
3. Streets are cleaned in a manner to prevent non-stromwater discharges to surface waters or drainage systems			

SWPPP	Y	N	N/A
1. The Project SWPPP and BMP plans are up-to-date, available on-site, and properly implemented			

Erosion Controls	Y	N	N/A
1. Wind erosion controls are effectively implemented			
2. Effective soil cover is provided for disturbed areas that are inactive as well as finished slopes, open space, utility backfill, and completed areas			
3. Measures are implemented on-site to control the air deposition of site materials and from site operations			
4. The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists			

Sediment Controls	Y	N	N/A
1. Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
2. Entrances ans exits are stabilized to control erosion and sediment discharges from the site			
3. Sediment basins are properly maintained			

Run-on and Run-off Controls	Y	N	N/A
1. Run-on to the site is effectively managed and directed away from all disturbed areas			

Pacific Gas and Electric Company®

Sampling Log

General Information			
Project/Site Name:	Fulton Fitch Mountain Reconductor 60 kV		
Date:		Event Start Time:	
Sampler:		Rainfall Amount:	
Sampling Event Type:	☐ Storm Water	☐ Non-storm water	☐ Non-visible pollutant

Field Meter Calibration			
pH Meter ID:		Turbidity Meter ID:	
Calibration Date/Time:		Calibration Date/Time:	

Field pH and Turbidity Measurements

Were field duplicates taken? ☐Yes ☐ No

Discharge Location	% Total Daily Flow	pH	Turbidity	Time
Sum % Flow (Must = 100)	**0**			

Calculated Averages	
pH:	**#NUM!**
Turbidity:	**0.00**

Additional Sampling Notes

(weather, color, odor, BMPs, other samples etc.)

Estimated Event End:	

Pacific Gas and Electric Company®

Discharge Reporting Form

General Information			
Project/Site Name:	**Fulton Fitch Mountain Reconductor 60 kV**		
Date:		Event Start Time:	
Inspector:		Event Rainfall Amount:	
Sampling Event Type:	☐ Unauthorized Discharge	☐ Non-Visible Pollutant Discharge	☐ Other

Sample Results

Describe any sampling results, including daily average and specific locations with high values.
Record analytical methods, method reporting units, method detection limits, and time of sampling.

Cause

Describe visual observations, the BMPs, and the situation leading to the exceedance or discharge.

Solution

Describe corrective actions taken or planned to be taken to remedy the situation.

Report By (Name/Title): **Signature:**

Chain of Custody

Pacific Gas and Electric Company®

Report To:
Name:
Address:
Phone #:
Project Name: Fulton Fitch Mountain Reconductor 60 kV
Sampled By:

Destination Laboratory

Date	Time	Sample ID	Container		Preservative	Analysis Requested						Turn Around Days	Special Instructions
			No.	Type									

Suspected Constituents:

Relinquished by (sign)	Print Name/Company	Date	Time	Received by (sign)	Print Name/Company

Method of Shipment:	Hand Delivery □ Fed-Ex □ US Mail □ Other _______________ □

Pacific Gas and Electric Company®

Training Log

Note: Training will be reported in the Annual Report. This form is provided to record training information. Copies of completed forms and training certifications should be included in Appendix I.

General Information			
Project/Site Name:	Fulton Fitch Mountain Reconductor 60 kV		
Project Location:			
Specific Training Objective:			
Location:		Date:	
Instructor:		Telephone:	
Course Length:	☐ hours ☐ minutes		

Training Topic(s)	
☐ Erosion Control	☐ Sediment Control
☐ Wind Erosion Control	☐ Tracking Control
☐ Non-stormwater management	☐ Waste Management and Materials Pollution Control
☐ Storm Water Sampling	☐ Other:

Attendees

Attach additional forms if necessary

Name & Title	Company	Phone

Training Log

Attendees Attach additional forms if necessary		
Name & Title	**Company**	**Phone**

COMMENTS:

NAL Exceedance Report

Construction Site & Run-on Evaluation

Pacific Gas and Electric Company

Project Name:	Fulton Fitch Mountain Reconductor 60 kV		
Project City:		Report Date:	
Preparer Name:		WDID Number:	
Sampler Name(s):			

Current BMPs

[Insert an narrative description of all of the BMPs that were in place associated with the discharge sample(s) with the NAL Exceedance(s)]

Probable Cause

[Insert a narrative description of the opinion of probable cause of the NAL Exceedance including source areas and BMP deficiencies. If run-on to the project may have contributed to the NAL exceedance, also include details, run-on sampling location(s), and analytical results of the run-on.]

Proposed Corrective Actions

[Insert a narrative description of the implemented and proposed corrective action(s) to eliminate or limit future NAL Exceedances]

Attachment A – Ad Hoc Report

[Print and attach the Ad Hoc Report that was generated in SMARTS for the NAL Exceedance]

Appendix F

Contractors and Subcontractors

Pacific Gas and Electric Company®

Contractors and Subcontractors

Company Name	Contact Name	Work Address	Telephone Number	Emergency Contact Number	Area of Responsibility
Ahtna	Ashley Gaskell	3100 Beacon Blvd, W. Sacramento, CA 95691	916-307-9535	916-372-2000	SWPPP
Ahtna	Steven Stetson	3100 Beacon Blvd, W. Sacramento, CA 95691	916-798-3356	916-372-2000	SWPPP

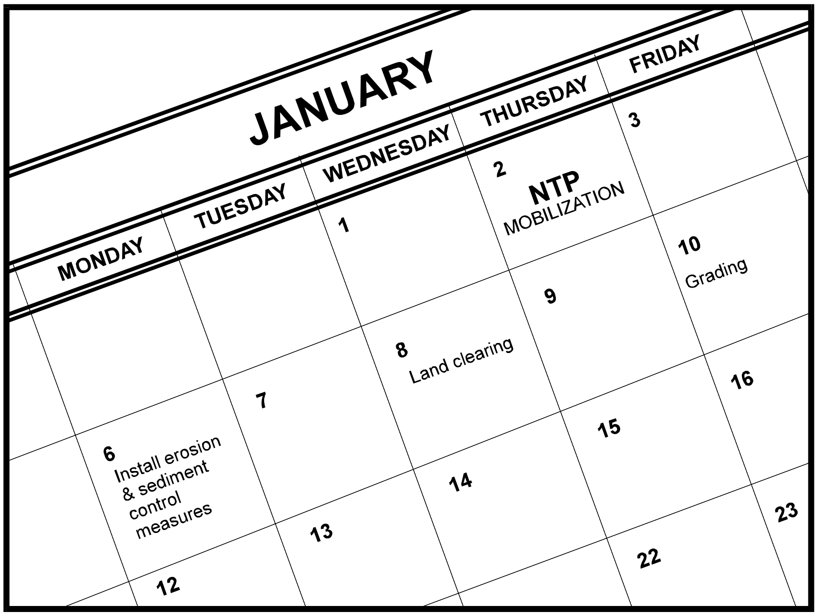
Appendix G

Construction General Permit

Electronic copy of CGP is included in the SWPPP binder

Appendix H

BMP Fact Sheets and A-ESCPs



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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 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.

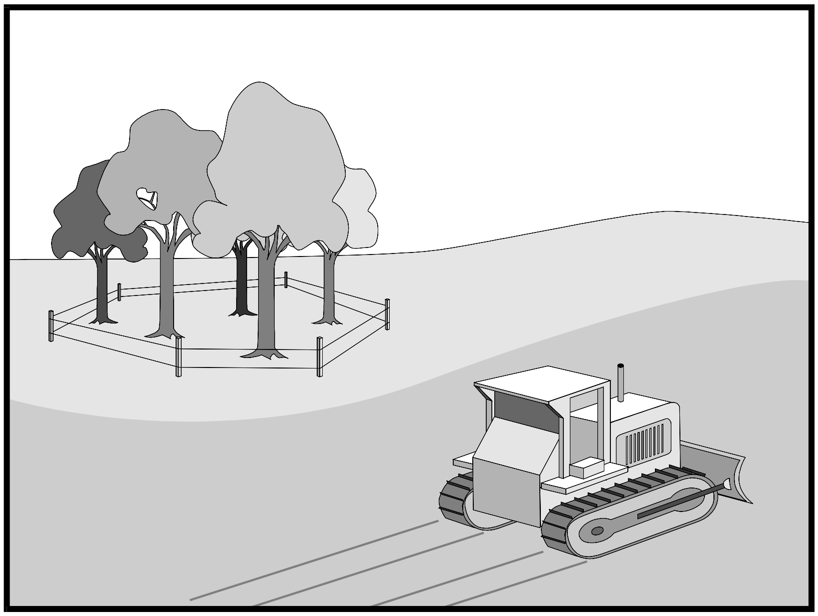
Inspection and Maintenance

- 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.



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

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.

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.

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.

- 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.

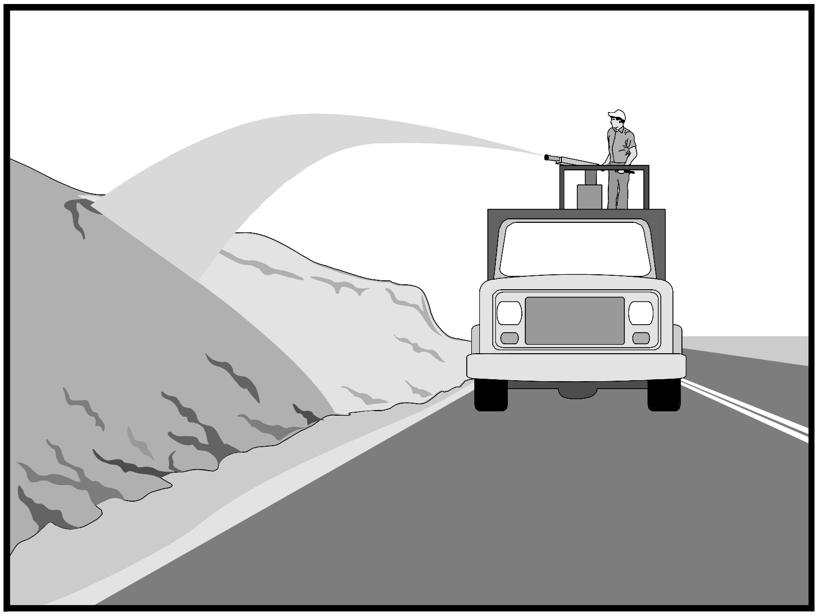
References

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.



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-4 Hydroseeding

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

Description and Purpose

Hydraulic Mulch consists of various types of fibrous materials mixed with water and sprayed onto the soil surface in slurry form to provide a layer of temporary protection from wind and water erosion.

Suitable Applications

Hydraulic mulch as a temporary, stand alone, erosion control BMP is suitable for disturbed areas that require temporary protection from wind and water erosion until permanent soil stabilization activities commence. Examples include:

- Rough-graded areas that will remain inactive for longer than permit-required thresholds (e.g., 14 days) or otherwise require stabilization to minimize erosion or prevent sediment discharges.
- Soil stockpiles.
- Slopes with exposed soil between existing vegetation such as trees or shrubs.
- Slopes planted with live, container-grown vegetation or plugs.
- Slopes burned by wildfire.

Hydraulic mulch can also be applied to augment other erosion control BMPs such as:

- In conjunction with straw mulch (see EC-6 Straw Mulch) where the rate of hydraulic mulch is reduced to 100-500 lbs per acre and the slurry is applied over the straw as a tackifying agent to hold the straw in place.

- Supplemental application of soil amendments, such as fertilizer, lime, gypsum, soil bio-stimulants or compost.

Limitations

In general, hydraulic mulch is not limited by slope length, gradient or soil type. However, the following limitations typically apply:

- Most hydraulic mulch applications, particularly bonded fiber matrices (BFMs), require at least 24 hours to dry before rainfall occurs.

- Temporary applications (i.e., without a vegetative component) may require a second application in order to remain effective for an entire rainy season.

- Treatment areas must be accessible to hydraulic mulching equipment.

- Availability of water sources in remote areas for mixing and application.

- As a stand-alone temporary BMP, hydraulic mulches may need to be re-applied to maintain their erosion control effectiveness, typically after 6-12 months depending on the type of mulch used.

- Availability of hydraulic mulching equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- Cellulose fiber mulches alone may not perform well on steep slopes or in course soils.

Implementation

- Where feasible, it is preferable to prepare soil surfaces prior to application by roughening embankments and fill areas with a crimping or punching type roller or by track walking.

- The majority of hydraulic mulch applications do not necessarily require surface/soil preparation (See EC-15 Soil Preparation) although in almost every case where re-vegetation is included as part of the practice, soil preparation can be beneficial. One of the advantages of hydraulic mulch over other erosion control methods is that it can be applied in areas where soil preparation is precluded by site conditions, such as steep slopes, rocky soils, or inaccessibility.

- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

- Hydraulic mulching is generally performed utilizing specialized machines that have a large water-holding/mixing tank and some form of mechanical agitation or other recirculation method to keep water, mulch and soil amendments in suspension. The mixed hydraulic slurry can be applied from a tower sprayer on top of the machine or by extending a hose to areas remote from the machine.

- Where possible apply hydraulic mulch from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage and failure of the BMP.
- Hydraulic mulch can also include a vegetative component, such as seed, rhizomes, or stolons (see EC-4 Hydraulic Seed).
- Typical hydraulic mulch application rates range from 2,000 pounds per acre for standard mulches (SMs) to 3,500 pounds per acre for BFMs. However, the required amount of hydraulic mulch to provide adequate coverage of exposed topsoil may appear to exceed the standard rates when the roughness of the soil surface is changed due to soil preparation methods (see EC-15 Soil Preparation) or by slope gradient.
- Other factors such as existing soil moisture and soil texture can have a profound effect on the amount of hydraulic mulch required (i.e. application rate) applied to achieve an erosion-resistant covering.
- Avoid use of mulch without a tackifier component, especially on slopes.
- Mulches used in the hydraulic mulch slurry can include:
  - Cellulose fiber
  - Thermally-processed wood fibers
  - Cotton
  - Synthetics
  - Compost (see EC-14, Compost Blanket)
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Categories of Hydraulic Mulches

Standard Hydraulic Mulch (SM)

Standard hydraulic mulches are generally applied at a rate of 2,000 pounds per acre and are manufactured containing around 5% tackifier (i.e. soil binder), usually a plant-derived guar or psyllium type. Most standard mulches are green in color derived from food-color based dyes.

Hydraulic Matrices (HM) and Stabilized Fiber Matrices (SFM)

Hydraulic matrices and stabilized fiber matrices are slurries which contain increased levels of tackifiers/soil binders; usually 10% or more by weight. HMs and SFMs have improved performance compared to a standard hydraulic mulch (SM) because of the additional percentage of tackifier and because of their higher application rates, typically 2,500 – 4,000 pounds per acre. Hydraulic matrices can include a mixture of fibers, for example, a 50/50 blend of paper and wood fiber. In the case of an SFM, the tackifier/soil binder is specified as a polyacrylamide (PAM).

Bonded Fiber Matrix (BFM)

Bonded fiber matrices (BFMs) are hydraulically-applied systems of fibers, adhesives (typically guar based) and chemical cross-links. Upon drying, the slurry forms an erosion-resistant blanket that prevents soil erosion and promotes vegetation establishment. The cross-linked adhesive in the BFM should be biodegradable and should not dissolve or disperse upon re-wetting. BFMs are typically applied at rates from 3,000 to 4,000 lbs/acre based on the manufacturer's recommendation. BFMs should not be applied immediately before, during or immediately after rainfall or if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Mechanically-Bonded Fiber Matrices (MBFM)

Mechanically-bonded fiber matrices (MBFMs) are hydraulically applied systems similar to BFM that use crimped synthetic fibers and PAM and are typically applied to a slope at a higher application rate than a standard BFM.

Hydraulic Compost Matrix (HCM)

Hydraulic compost matrix (HCM) is a field-derived practice whereby finely graded or sifted compost is introduced into the hydraulic mulch slurry. A guar-type tackifier can be added for steeper slope applications as well as any specified seed mixtures. A HCM can help to accelerate seed germination and growth. HCMs are particularly useful as an in-fill for three-dimensional re-vegetation geocomposites, such as turf reinforcement mats (TRM) (see EC-7 Geotextiles and Mats).

Costs

Average installed costs for hydraulic mulch categories are is provided in Table 1, below.

Table 1
HYDRAULIC MULCH BMPs
INSTALLED COSTS

BMP	Installed Cost/Acre
Standard Hydraulic Mulching (SM)	$1,700 - $3,600 per acre
Hydraulic Matrices (HM) and Stabilized Fiber Matrices	
Guar-based	$2,000 - $4,000 per acre
PAM-based	$2,500 - $5,610 per acre
Bonded Fiber Matrix (BFM)	$3,900 - $6,900 per acre
Mechanically Bonded Fiber Matrix (MBFM)	$4,500 - $6,000 per acre
Hydraulic Compost Matrix (HCM)	$3,000 - $3,500 per acre

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.

- 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.
- Compare the number of bags or weight of applied mulch to the area treated to determine actual application rates and compliance with specifications.

References

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

Controlling Erosion of Construction Sites, Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

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

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

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

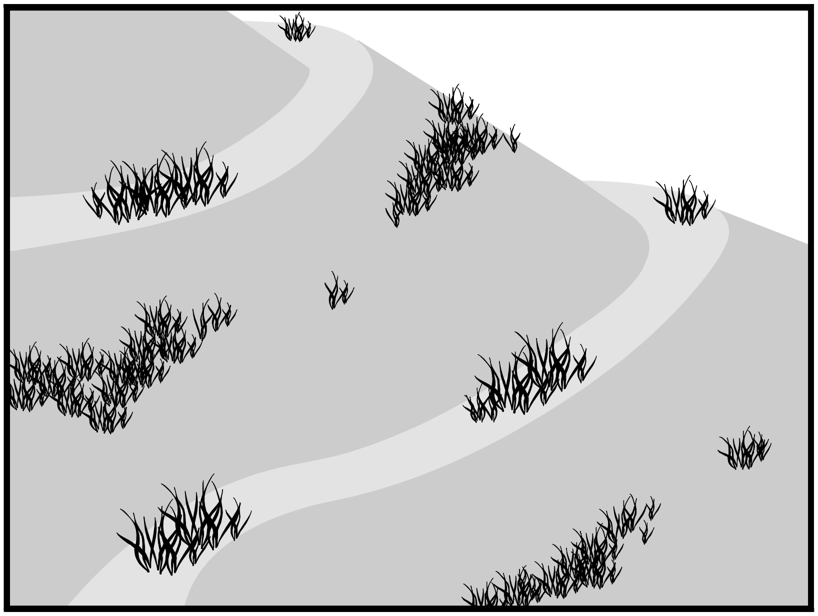
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

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.

Hydroseeding EC-4



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

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.

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).

Implementation

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

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

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of 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: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

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.

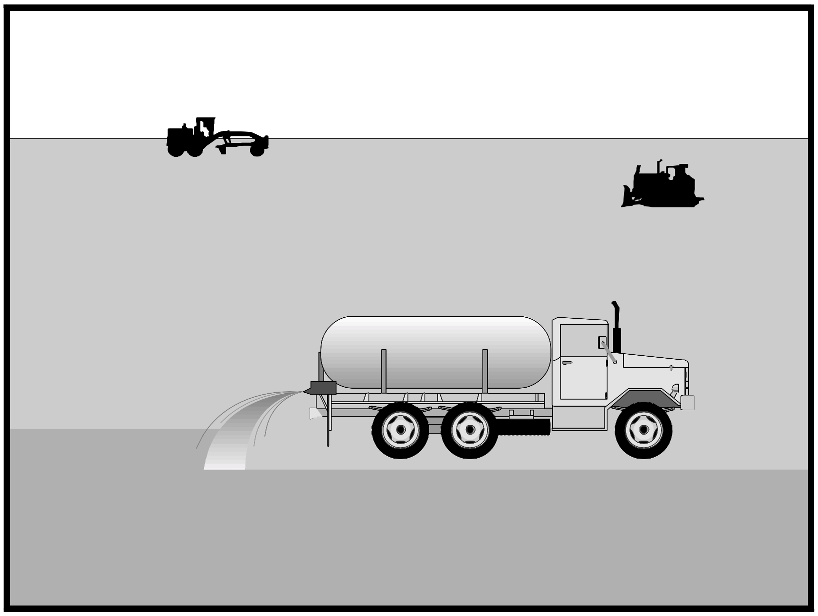
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

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.



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

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

Soil binding consists of application and maintenance of a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils on construction sites.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring temporary protection. Because soil binders, when used as a stand-alone practice, can often be incorporated into the soil, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are commonly used in the following areas:

- Rough graded soils that will be inactive for a short period of time
- Soil stockpiles
- Temporary haul roads prior to placement of crushed rock
- Compacted soil road base
- Construction staging, materials storage, and layout areas

Limitations

- Soil binders are temporary in nature and may need reapplication.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.

- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.

- Plant-material-based soil binders do not generally hold up to pedestrian or vehicular traffic across treated areas as well as polymeric emulsion blends or cementitious-based binders.

- Soil binders may not sufficiently penetrate compacted soils.

- Some soil binders are soil texture specific in terms of their effectiveness. For example, polyacrylamides (PAMs) work very well on silt and clayey soils but their performance decreases dramatically in sandy soils.

- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.

- Soil binders may not cure if low temperatures occur within 24 hours of application.

- The water quality impacts of some chemical soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup.

Implementation

General Considerations

- Soil binders should conform to local municipality specifications and requirements.

- Site soil types will dictate appropriate soil binders to be used.

- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater when cured. Obtain a Material Safety Data Sheet (MSDS) from the manufacturer to ensure non-toxicity.

- Stormwater runoff from PAM treated soils should pass through one of the following sediment control BMP prior to discharging to surface waters.

  - When the total drainage area is greater than or equal to 5 acres, PAM treated areas should drain to a sediment basin.

  - Areas less than 5 acres should drain to sediment control BMPs, such as a sediment trap, or a series of check dams. The total number of check dams used should be maximized to achieve the greatest amount of settlement of sediment prior to discharging from the site. Each check dam should be spaced evenly in the drainage channel through which stormwater flows are discharged off site.

- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.

- 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.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this Fact Sheet. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application is related to the functional longevity of the binder, which can be affected by subgrade conditions, surface type, climate, and maintenance schedule.
- Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material-Based (Short Lived, <6 months) Binders

<u>Guar:</u> Guar is a non-toxic, biodegradable, natural galactomannan-based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

Application Rates for Guar Soil Stabilizer

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

<u>Psyllium:</u> Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together, but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

<u>Starch:</u> Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material-Based (Long Lived, 6-12 months) Binders

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound typically requires 12 to 24 hours drying time. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with the manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:1 to 1:1	10.0 – 20.0

Poly-Acrylamide (PAM) and Copolymer of Acrylamide**:** Linear copolymer polyacrylamide for use as a soil binder is packaged as a dry flowable solid, as a liquid. Refer to the manufacturer's recommendation for dilution and application rates as they vary based on liquid or dry form, site conditions and climate.

- Limitations specific to PAM are as follows:

- Do not use PAM on a slope that flows into a water body without passing through a sediment trap or sediment basin.

- The specific PAM copolymer formulation must be anionic. Cationic PAM should not be used in any application because of known aquatic toxicity problems. Only the highest drinking water grade PAM, certified for compliance with ANSI/NSF Standard 60 for drinking water treatment, should be used for soil applications.

- PAM designated for erosion and sediment control should be “water soluble” or “linear” or “non-cross linked”.

- PAM should not be used as a stand-alone BMP to protect against water-based erosion. When combined with mulch, its effectiveness increases dramatically.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

Cementitious-Based Binders

Gypsum: This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer’s written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.

- Prior to application, roughen embankment and fill areas.

- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.

- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.

- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.

- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.

- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd² or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd².

Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate installed costs:

Soil Binder	Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Plant-Material-Based (Short Lived) Binders	$700-$900	$770-$990
Plant-Material-Based (Long Lived) Binders	$1,200-$1,500	$1,320-$1,650
Polymeric Emulsion Blend Binders	$700 -$1,500	$770-$1,650
Cementitious-Based Binders	$800-$1,200	$880-$1,350

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.
2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

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.
- Reapply the selected soil binder as needed to maintain effectiveness.

Table 1 Properties of Soil Binders for Erosion Control

Evaluation Criteria	Binder Type			
	Plant Material Based (Short Lived)	**Plant Material Based (Long Lived)**	**Polymeric Emulsion Blends**	**Cementitious-Based Binders**
Relative Cost	Low	Moderate to High	Low to High	Low to Moderate
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies (1)	Varies (1)	Varies (1)	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

References

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

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

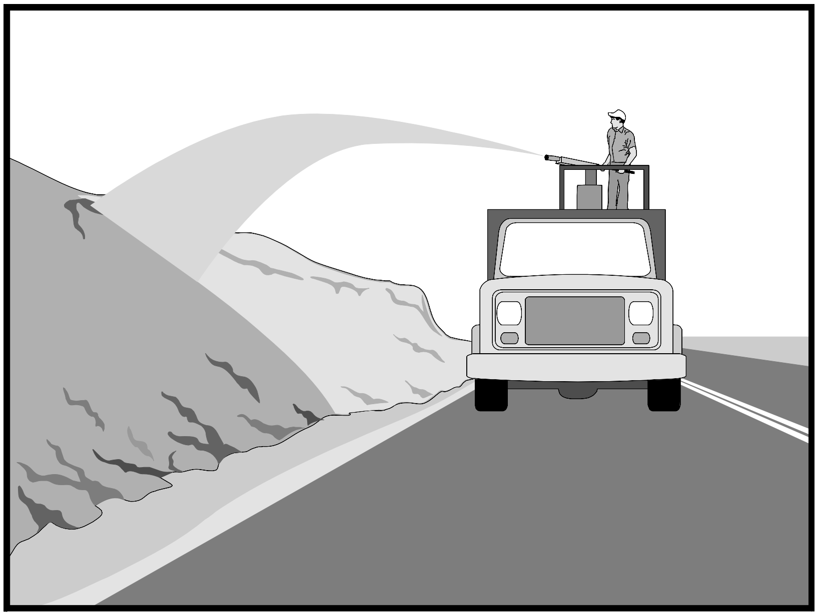
Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

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.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Straw Mulch EC-6



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

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper, or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Suitable Applications

Straw mulch is suitable for disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch can be specified for the following applications:

- As a stand-alone BMP on disturbed areas until soils can be prepared for permanent vegetation. The longevity of straw mulch is typically less than six months.
- Applied in combination with temporary seeding strategies
- Applied in combination with permanent seeding strategies to enhance plant establishment and final soil stabilization
- Applied around containerized plantings to control erosion until the plants become established to provide permanent stabilization

Limitations

- Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- There is a potential for introduction of weed seed and unwanted plant material if weed-free agricultural straw is not specified.
- Straw mulch applied by hand is more time intensive and potentially costly.
- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- “Punching” of straw does not work in sandy soils, necessitating the use of tackifiers.
- Potential fugitive dust control issues associated with straw applications can occur. Application of a stabilizing emulsion or a water stream at the same time straw is being blown can reduce this problem.
- Use of plastic netting should be avoided in areas where wildlife may be entrapped and may be prohibited for projects in certain areas with sensitive wildlife species, especially reptiles and amphibians.

Implementation

- Straw should be derived from weed-free wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw should be used.
- Use tackifier to anchor straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking can be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier should not be applied during or immediately before rainfall.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Application Procedures

- When using a tackifier to anchor the straw mulch, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- Apply straw at a rate of between 3,000 and 4,000 lb/acre, either by machine or by hand distribution and provide 100% ground cover. A lighter application is used for flat surfaces and a heavier application is used for slopes.
- Evenly distribute straw mulch on the soil surface.
- Anchoring straw mulch to the soil surface by "punching" it into the soil mechanically (incorporating) can be used in lieu of a tackifier.

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.

  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier should be selected based on longevity and ability to hold the fibers in place. A tackifier is typically applied at a rate of 125 lb/acre. In windy conditions, the rates are typically 180 lb/acre.

  - On very small areas, a spade or shovel can be used to punch in straw mulch.

  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coulter, known commercially as a "crimper."

Costs

Average annual cost for installation and maintenance is included in the table below. Application by hand is more time intensive and potentially more costly.

BMP	Unit Cost per Acre
Straw mulch, crimped or punched	$2,458-$5,375
Straw mulch with tackifier	$1,823-$4,802

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

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.

- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives. Straw mulch as a stand-alone BMP is temporary and is not suited for long-term erosion control.

- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.

- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

References

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

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

Controlling Erosion of Construction Sites, Agricultural Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

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

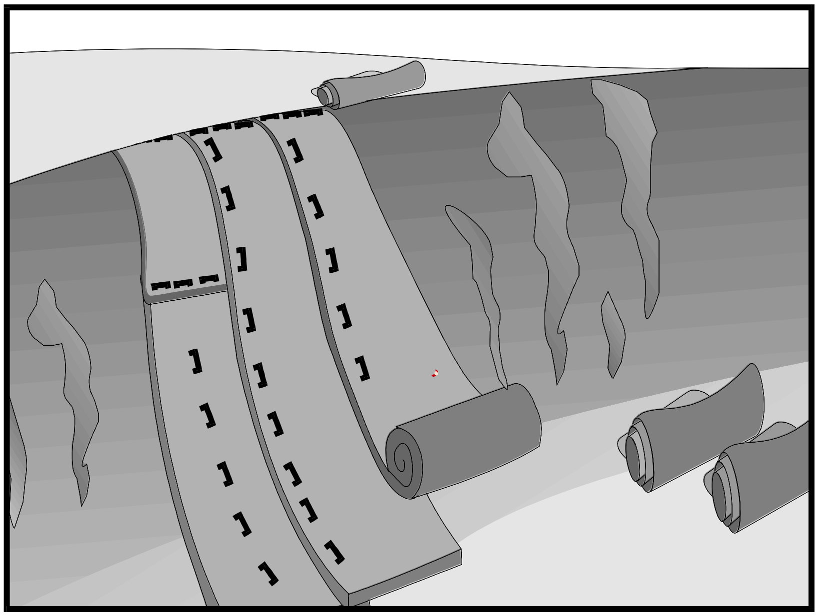
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Soil Erosion by Water, Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

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

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.



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

Description and Purpose

Mattings, 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. Mattings 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

- 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/yd^2, ±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/yd^2. 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/yd^2. 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/yd^2. 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 ¼ 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/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2. 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 ½-3/4 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.

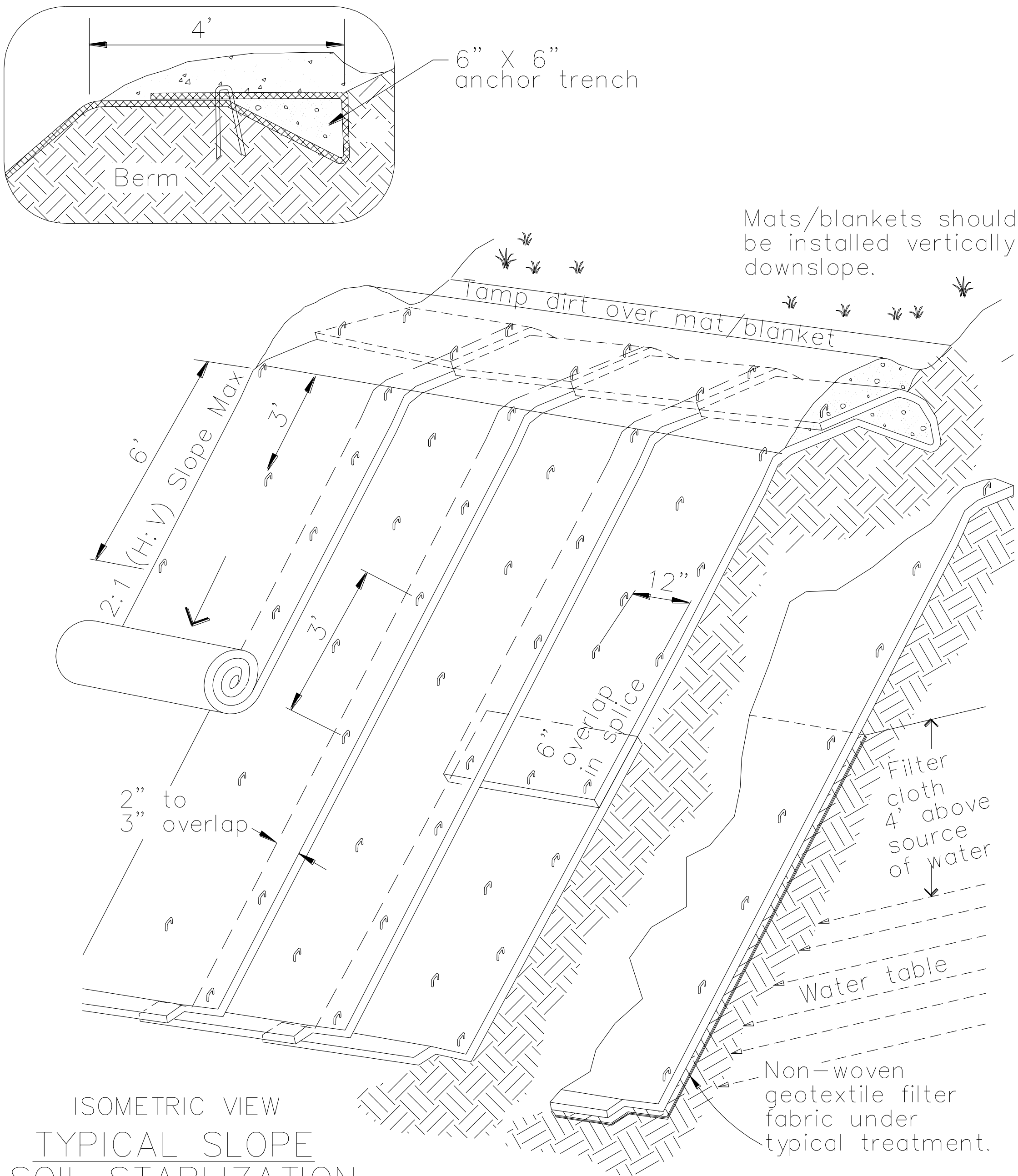
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

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.

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.



ISOMETRIC VIEW

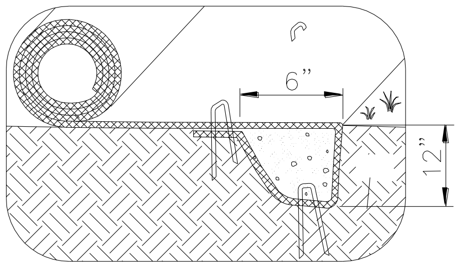
TYPICAL SLOPE
SOIL STABLIZATION
NTS

WET SLOPE LINING
NTS

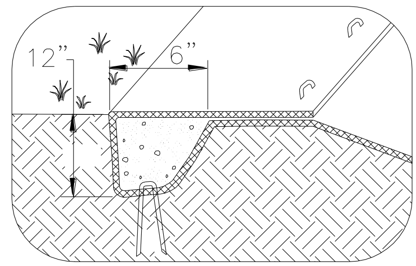
NOTES:

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

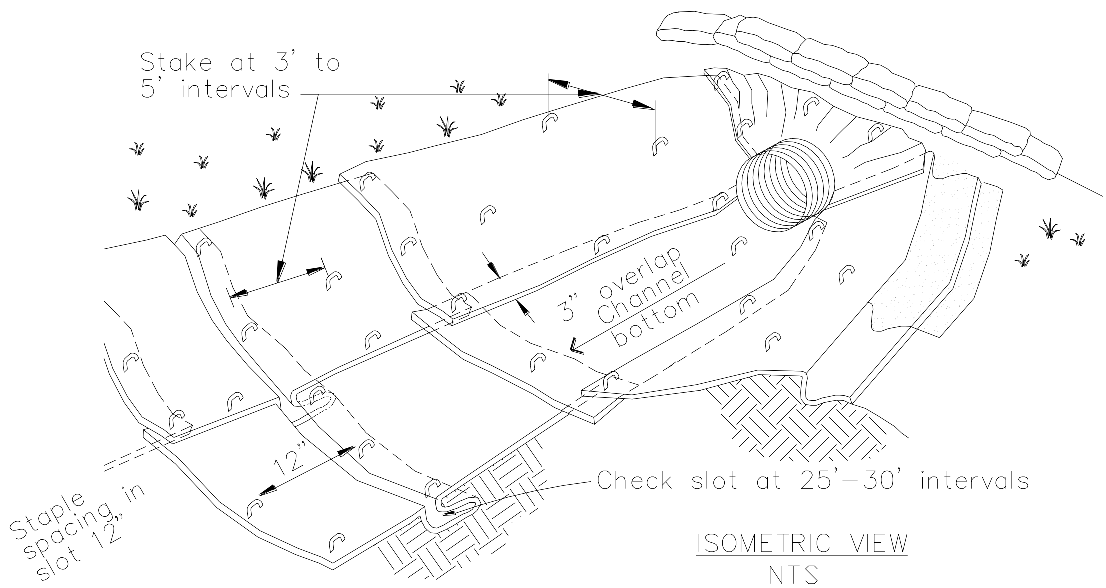
TYPICAL INSTALLATION DETAIL



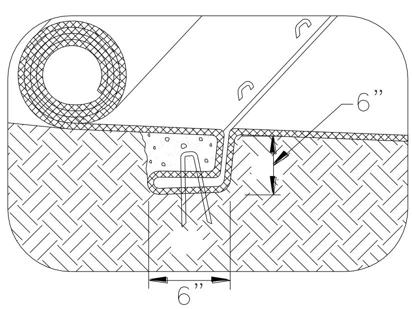
INITIAL CHANNEL ANCHOR TRENCH
NTS



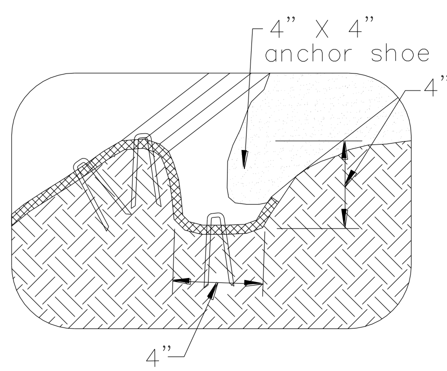
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
NTS



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

Wood mulching consists of applying a mixture of shredded wood mulch, bark or compost to disturbed soils. The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Suitable Applications

Wood mulching is suitable for disturbed soil areas requiring temporary protection until permanent stabilization is established.

Limitations

- Not suitable for use on slopes steeper than 3:1 (H:V). Best suited to flat areas or gentle slopes or 5:1 (H:V) or flatter.
- Wood mulch and compost may introduce unwanted species.
- Not suitable for areas exposed to concentrated flows.
- May need to be removed prior to further earthwork.

Implementation

Mulch Selection

There are many types of mulches. Selection of the appropriate type of mulch should be based on the type of application, site conditions, and compatibility with planned or future uses.

Application Procedures

Prior to application, after existing vegetation has been

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

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

removed, roughen embankment and fill areas by rolling with a device such as a punching type roller or by track walking. The construction application procedures for mulches vary significantly depending upon the type of mulching method specified. Two methods are highlighted here:

- Green Material: This type of mulch is produced by the recycling of vegetation trimmings such as grass, shredded shrubs, and trees. Methods of application are generally by hand although pneumatic methods are available.
  - Green material can be used as a temporary ground cover with or without seeding.
  - The green material should be evenly distributed on site to a depth of not more than 2 in.
- Shredded Wood: Suitable for ground cover in ornamental or revegetated plantings.
  - Shredded wood/bark is conditionally suitable. See note under limitations.
  - Distribute by hand or use pneumatic methods.
  - Evenly distribute the mulch across the soil surface to a depth of 2 to 3 in.
- Avoid mulch placement onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average annual cost for installation and maintenance (3-4 months useful life) is around $4,000 per acre, but cost can increase if the source is not close to the project site.

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.
- 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.
- Regardless of the mulching technique selected, the key consideration in inspection and maintenance is that the mulch needs to last long enough to achieve erosion control objectives. If the mulch is applied as a stand alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation.
- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.
- Reapply mulch when bare earth becomes visible.

References

Controlling Erosion of Construction Sites Agriculture Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

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

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

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

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, U.S. EPA, April 1990.

Soil Erosion by Water Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

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

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

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-7 Geotextiles and Mats

Description and Purpose

Soil Preparation/Roughening involves assessment and preparation of surface soils for BMP installation. This can include soil testing (for seed base, soil characteristics, or nutrients), as well as roughening surface soils by mechanical methods (including sheepsfoot rolling, track walking, scarifying, stair stepping, and imprinting) to prepare soil for additional BMPs, or to break up sheet flow. Soil Preparation can also involve tilling topsoil to prepare a seed bed and/or incorporation of soil amendments, to enhance vegetative establishment.

Suitable Applications

Soil preparation: Soil preparation is essential to proper vegetative establishment. In particular, soil preparation (i.e. tilling, raking, and amendment) is suitable for use in combination with any soil stabilization method, including RECPs or sod. Soil preparation should not be confused with roughening.

Roughening: Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces. Soil preparation is most effective when used in combination with erosion controls. Soil Roughening is suitable for use as a complementary process for controlling erosion on a site. Roughening is not intended to be used as a stand-alone BMP, and should be used with perimeter controls, additional erosion control measures, grade breaks, and vegetative establishment for maximum effectiveness. Roughening is intended to only affect surface soils and should not compromise slope stability or overall compaction. Suitable applications for soil roughening include:

- Along any disturbed slopes, including temporary stockpiles, sediment basins, or compacted soil diversion berms and swales.

- Roughening should be used in combination with hydraulically applied stabilization methods, compost blanket, or straw mulch; but should not be used in combination with RECPs or sod because roughening is intended to leave terraces on the slope.

Limitations

- Preparation and roughening must take place prior to installing other erosion controls (such as hydraulically applied stabilizers) or sediment controls (such as fiber rolls) on the faces of slopes.

- In such cases where slope preparation is minimal, erosion control/revegetation BMPs that do not require extensive soil preparation - such as hydraulic mulching and seeding applications - should be employed.

- Consideration should be given to the type of erosion control BMP that follows surface preparation, as some BMPs are not designed to be installed over various types of tillage/roughening, i.e., RECPs (erosion control blankets) should not be used with soil roughening due to a “bridging” effect, which suspends the blanket above the seed bed.

- Surface roughness has an effect on the amount of mulch material that needs to be applied, which shows up as a general increase in mulch material due to an increase in surface area (Topographic Index -see EC-3 Hydraulic Mulching).

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

General

A roughened surface can significantly reduce erosion. Based on tests done at the San Diego State Erosion Research Laboratory, various roughening techniques on slopes can result in a 12 - 76% reduction in the erosion rate versus smooth slopes.

Materials

Minimal materials are required unless amendments and/or seed are added to the soil. The majority of soil roughening/preparation can be done with equipment that is on hand at a normal construction site, such as bull dozers and compaction equipment.

Installation Guidelines

Soil Preparation

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Based upon soil testing conducted, apply additional soil amendments (e.g. fertilizers, additional seed) to the soil to help with germination. Follow EC-4, Hydroseeding, when selecting and applying seed and fertilizers.

Cut Slope Roughening:

- Stair-step grade or groove the cut slopes that are steeper than 3:1.
- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet (0.6 m) high in soft materials or more than 3 feet (0.9 m) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening:

- Place on fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches (0.2 m), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches (0.1-0.2 m) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Do not blade or scrape the final slope face.

Roughening for Slopes to be Mowed:

- Slopes which require mowing activities should not be steeper than 3:1.
- Roughen these areas to shallow grooves by track walking, scarifying, sheepsfoot rolling, or imprinting.
- Make grooves close together (less than 10 inches), and not less than 1 inch deep, and perpendicular to the direction of runoff (i.e., parallel to the slope contours).
- Excessive roughness is undesirable where mowing is planned.

Roughening With Tracked Machinery:

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.
- Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth.

Costs
Costs are based on the additional labor of tracking or preparation of the slope plus the cost of any required soil amendment materials.

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.
- Check the seeded slopes for signs of erosion such as rills and gullies. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.
- Inspect BMPs weekly during normal operations, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

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

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

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TR	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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

Decomposed Granite (DG) is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

Degradable Mulches of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

Geotextiles and Mats can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured from degradable or synthetic materials and are designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

Gravel Mulch is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

Rock Slope Protection consists of utilizing large rock or rip-rap (4"- 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

Soil Binders can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

Decomposed Granite (DG) and Gravel Mulch are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

Degradable Mulches can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

Geotextiles and Mats can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

Rock Slope Protection can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

Soil Binders can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

Limitations

General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

Decomposed Granite

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

Gravel Mulch

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

Rock Slope Protection

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

Implementation

General

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base.
- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2” depth.
- Should completely cover all exposed surfaces.

Rock Slope Protection

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

Costs

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$10 - \$15/yd^2 in flat areas and \$11 - \$23/yd^2 on side slopes.

Inspection and Maintenance

General

- 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.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

Decomposed Granite and Gravel Mulch Stabilization

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.

- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

References

Arid Zone Forestry: A Guide for Field Technicians. Food and Agriculture Organization of the United Nations, 1989.

Design of Roadside Channels with Flexible Linings, Hydraulic Engineering Circular Number 15, Third Edition, Federal Highway Administration, 2007.

Design Standards for Urban Infrastructure - Soft Landscape Design, Department of Territory and Municipal Services - Australian Capital Territory http://www.tams.act.gov.au/work/standards_and_procedures/design_standards_for_urban_infrastructure

Erosion and Sediment Control Handbook: A Guide for Protection of State Waters through the use of Best Management Practices during Land Disturbing Activities, Tennessee Department of Environment and Conservation, 2002.

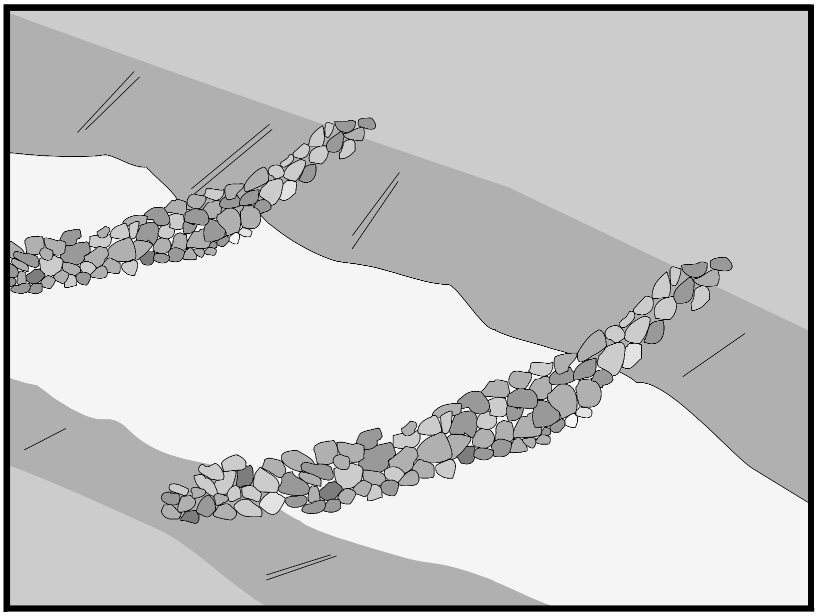
Gravel Mulch, Landscape Architecture Non-Standard Specification 10-2, California Department of Transportation (Caltrans), http://www.dot.ca.gov/hq/LandArch/roadside/detail-gm.htm

Maine Erosion and Sediment Control BMPs, DEPLW0588, Maine Department of Environmental Protection: Bureau of Land and Water Quality, 2003.

National Menu of Best Management Practices, US Environmental Protection Agency, 2006.

Standard Specification 72-2: Rock Slope Protection. California Department of Transportation, 2006.

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



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-14 Biofilter Bags

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.

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

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 or 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

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

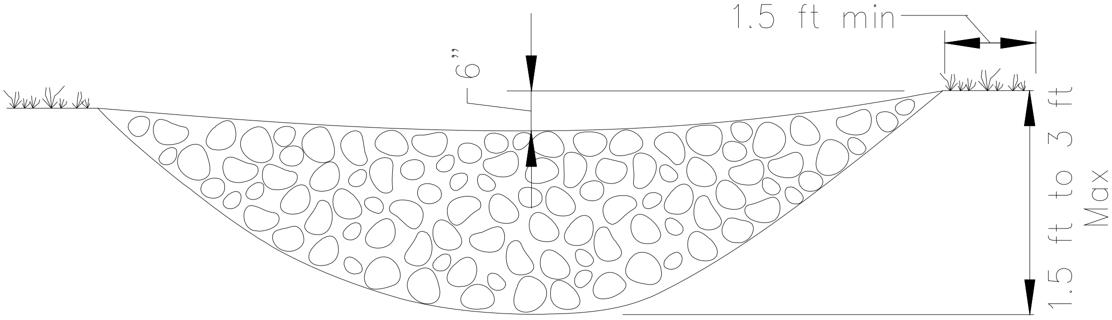
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

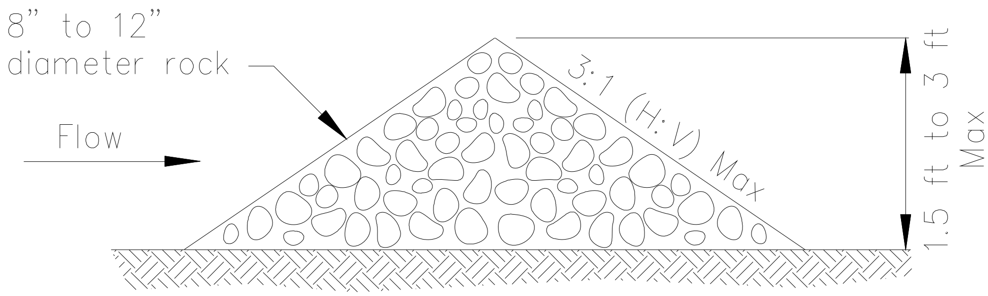
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

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

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: http://anrcatalog.ucdavis.edu/pdf/8125.pdf

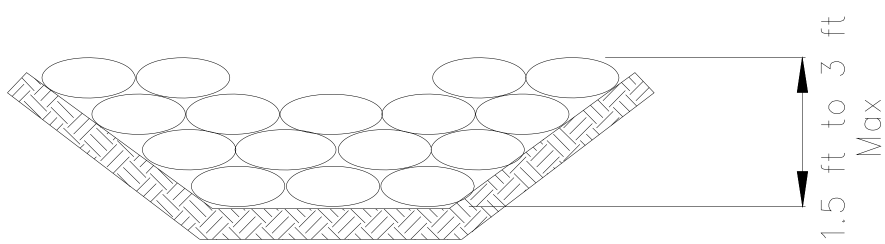


ELEVATION

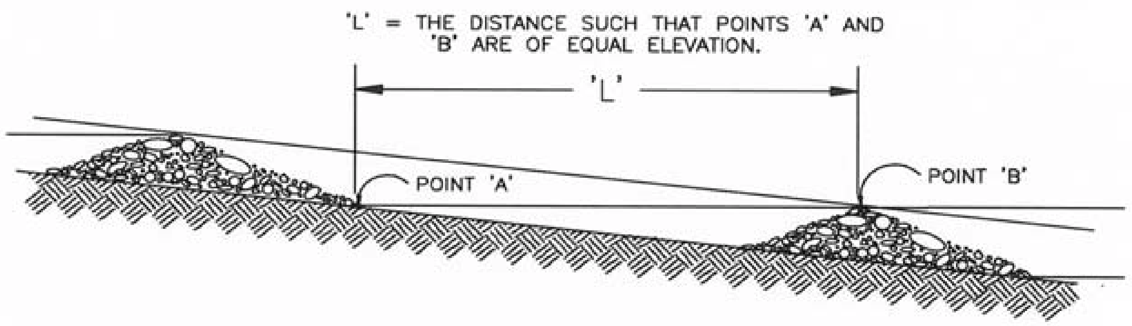


TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE

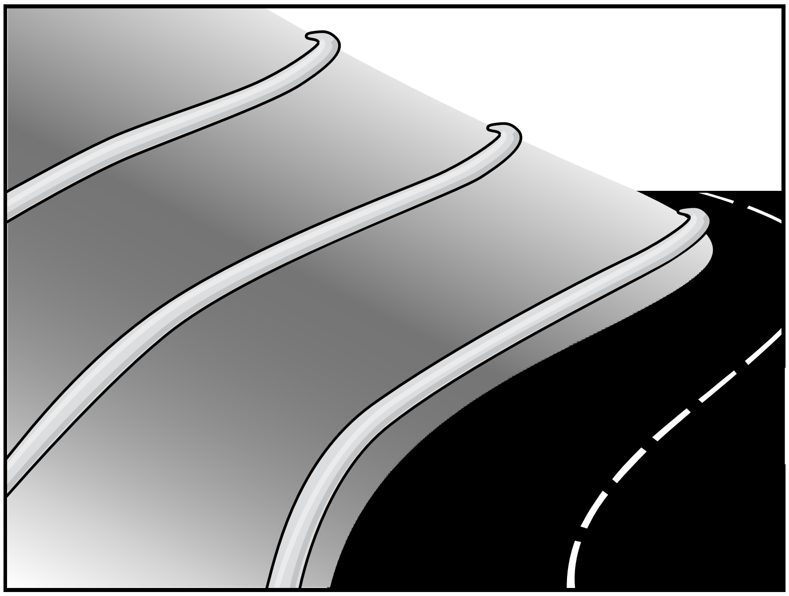


GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE



SPACING BETWEEN CHECK DAMS

Fiber Rolls SE-5



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.

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-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

- 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 ¼ to 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 biodegradeable 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.

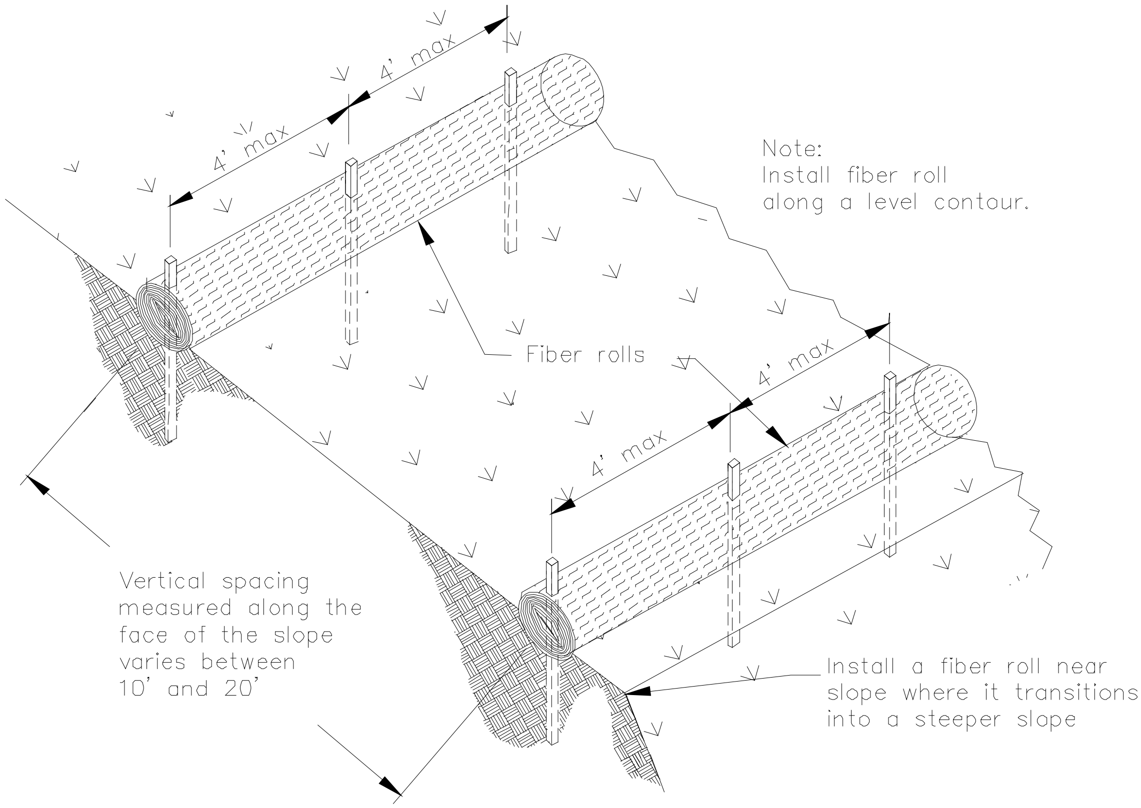
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

- Repair any rills or gullies promptly.

References

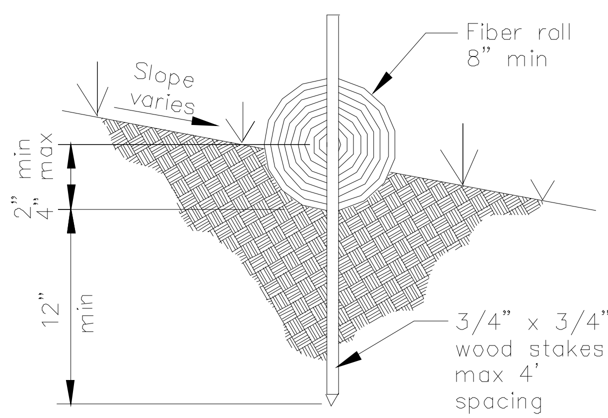
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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



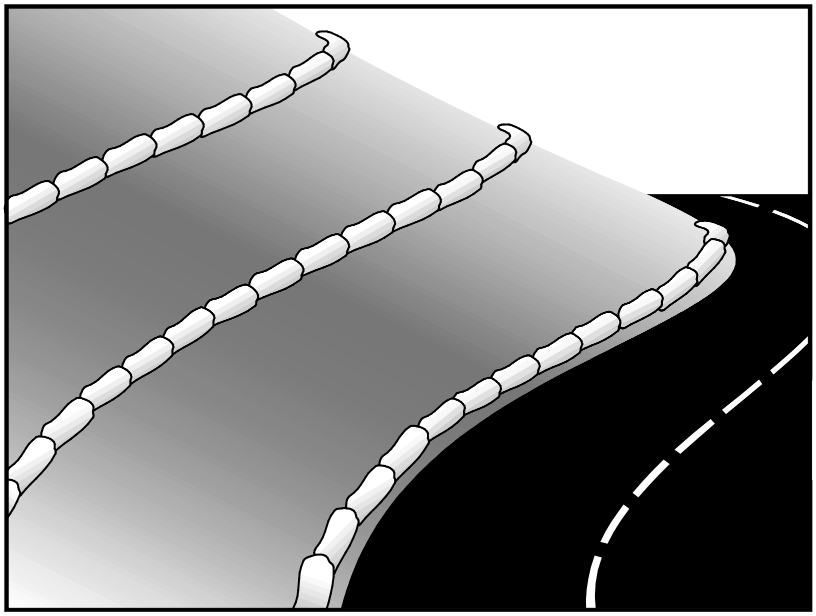
TYPICAL FIBER ROLL INSTALLATION

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

- 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/yd^2, Mullen burst strength exceeding 300 lb/in^2 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.

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

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.

- 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 yd^3 hopper) to \$88/hour (9 yd^3 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.

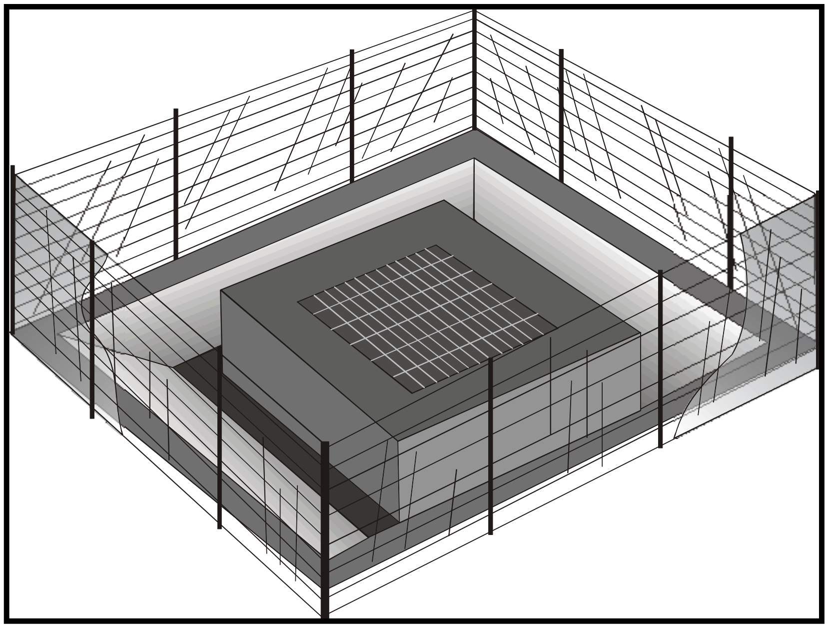
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

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.

Storm Drain Inlet Protection SE-10



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

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 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.

- Six 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.

- 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 yd^3/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.

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.

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.

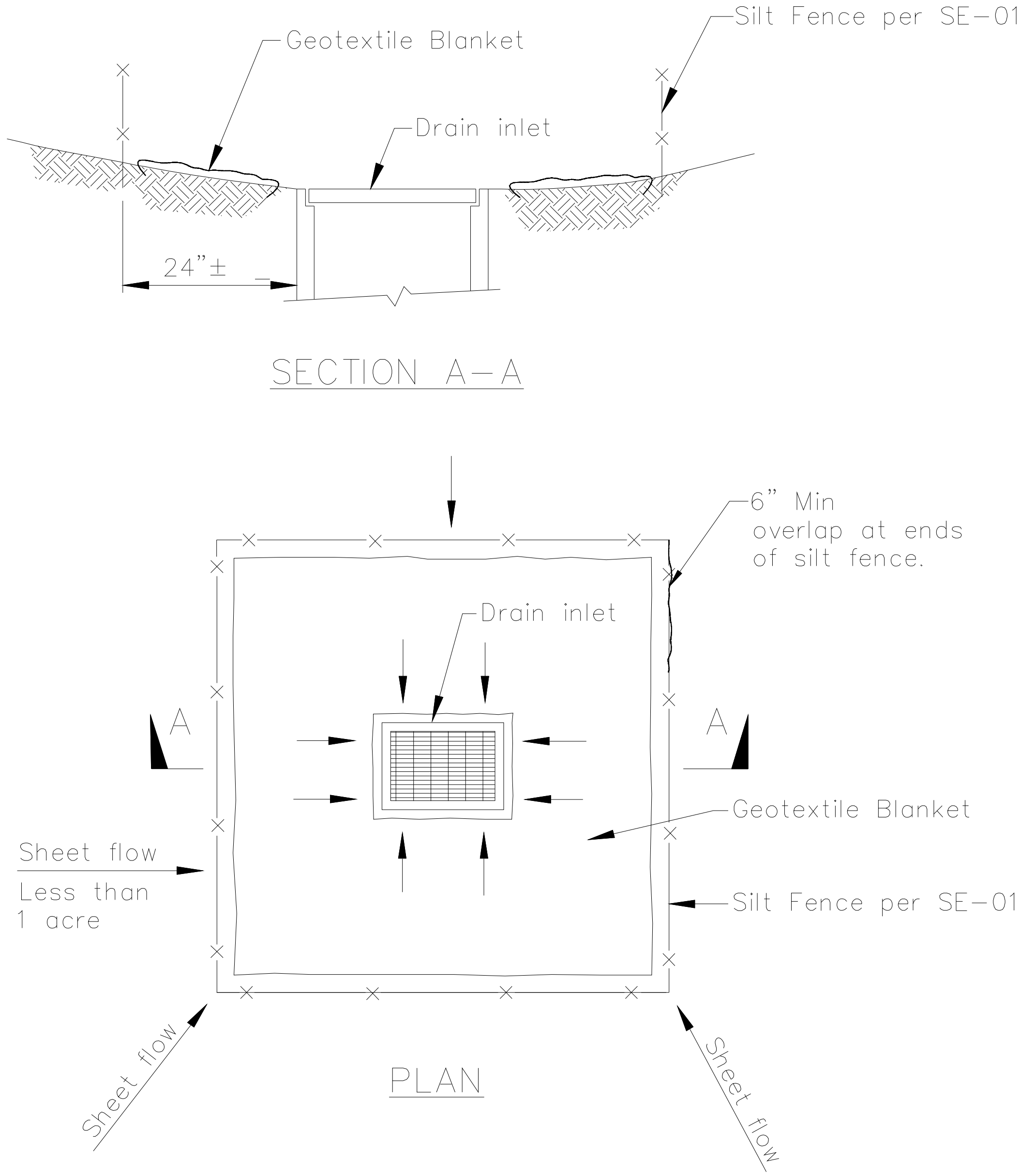
- Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

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

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

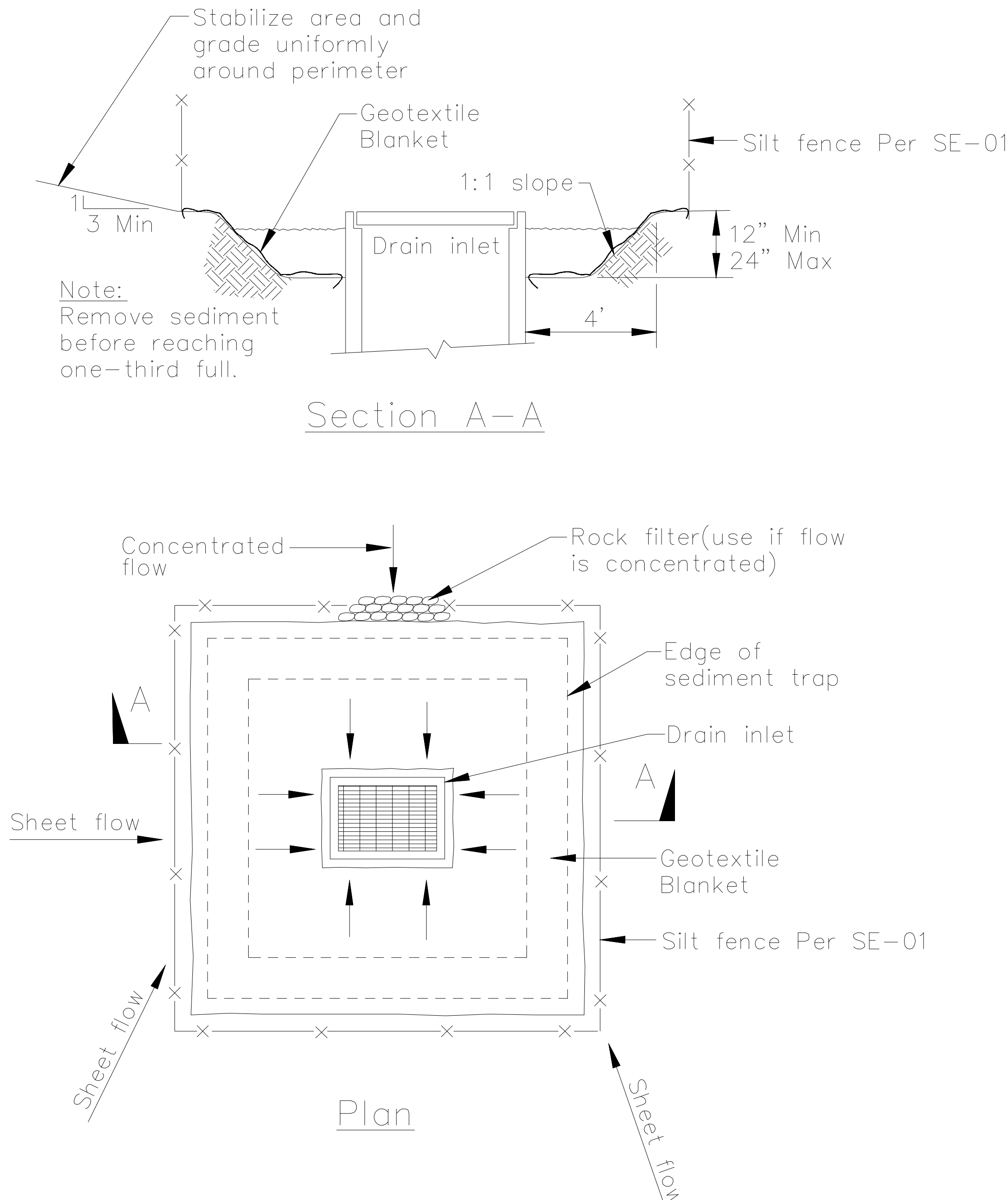
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



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.

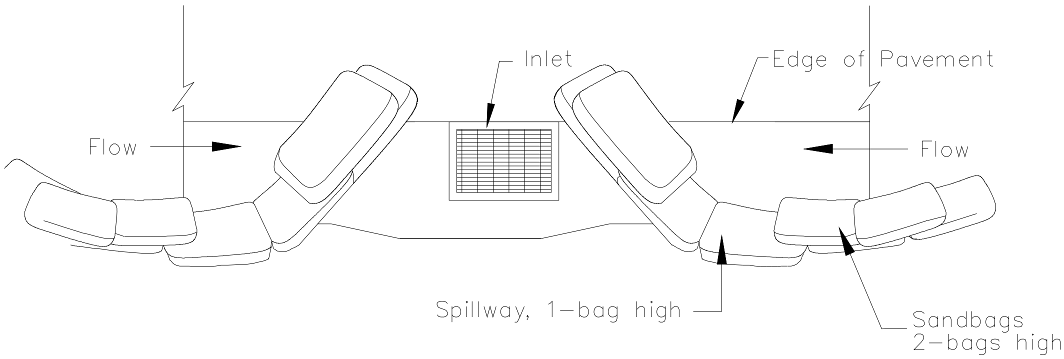


DI PROTECTION TYPE 2

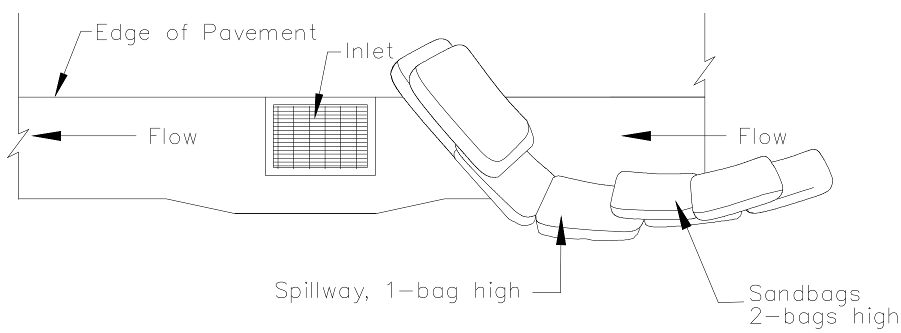
NOT TO SCALE

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



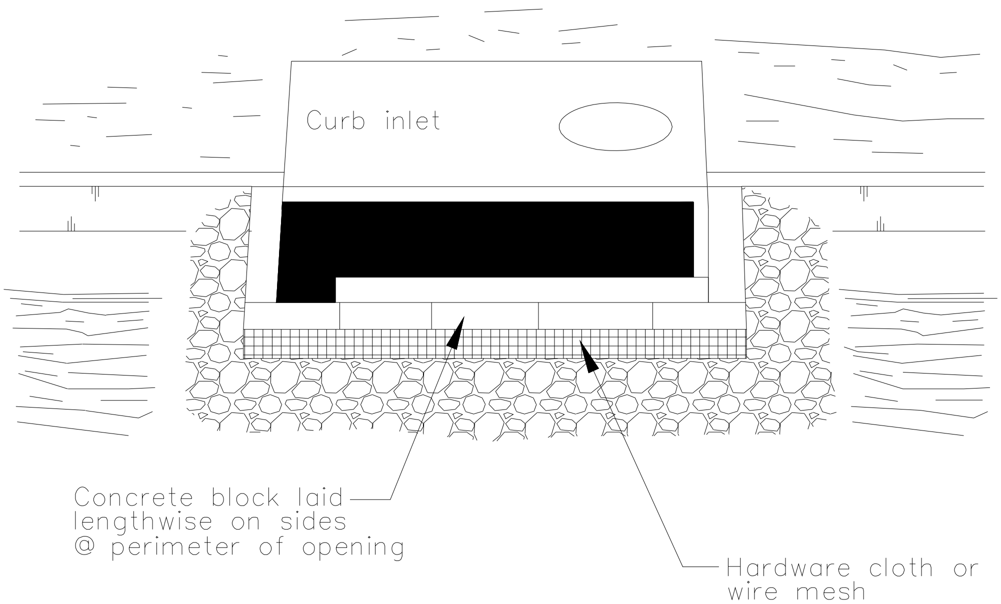
TYPICAL PROTECTION FOR INLET ON GRADE

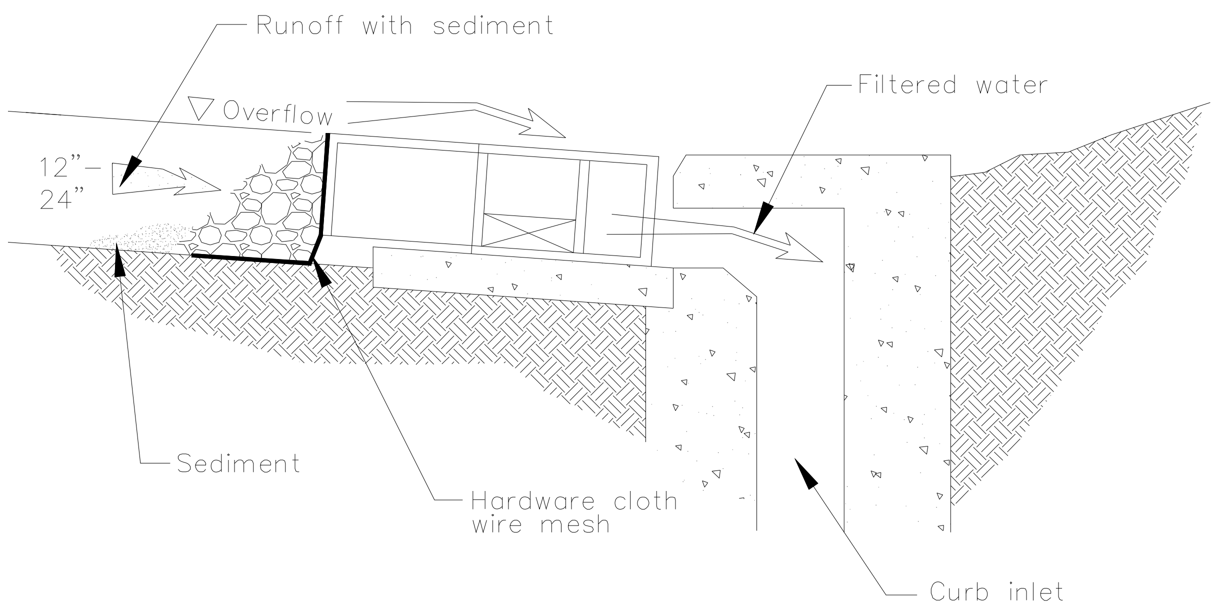
NOTES:

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.

DI PROTECTION TYPE 3

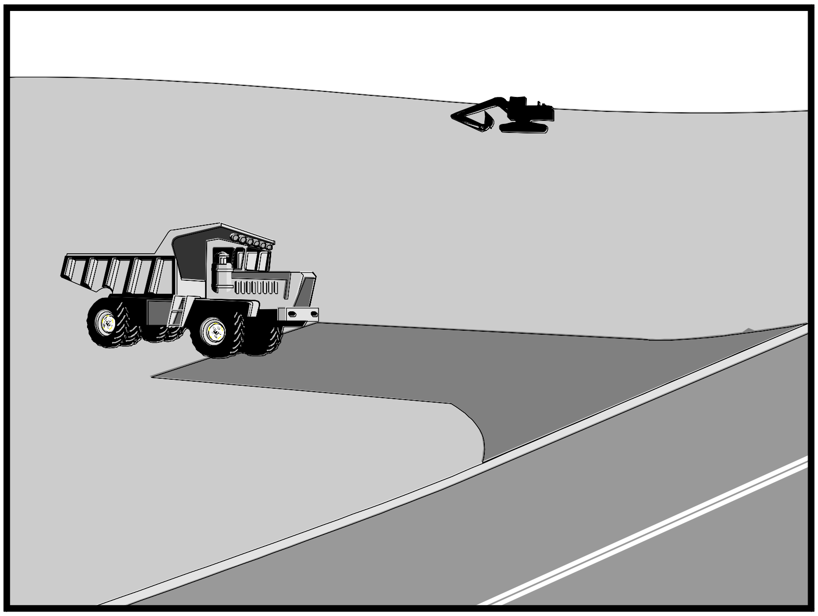
NOT TO SCALE





DI PROTECTION – TYPE 4
NOT TO SCALE

Stabilized Construction Entrance/Exit TC-1



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

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.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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.

- 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.

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.

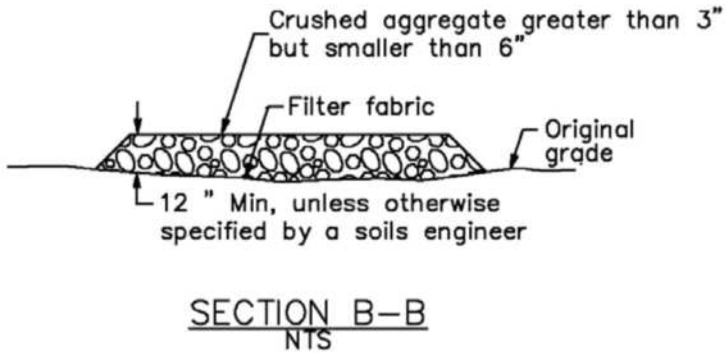
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

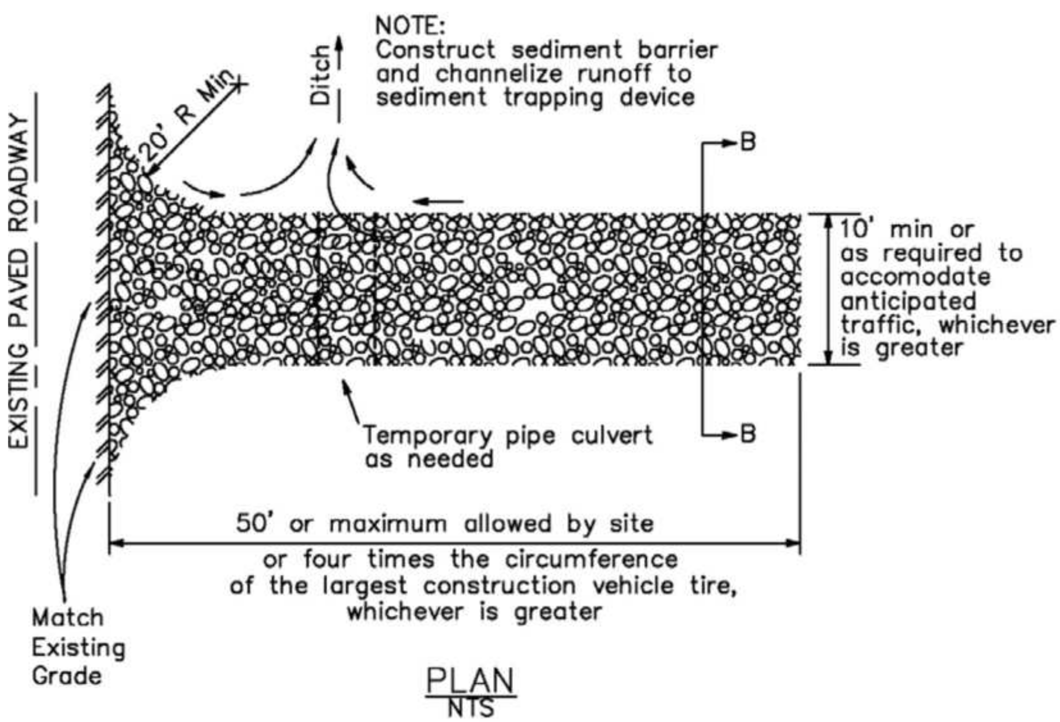
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

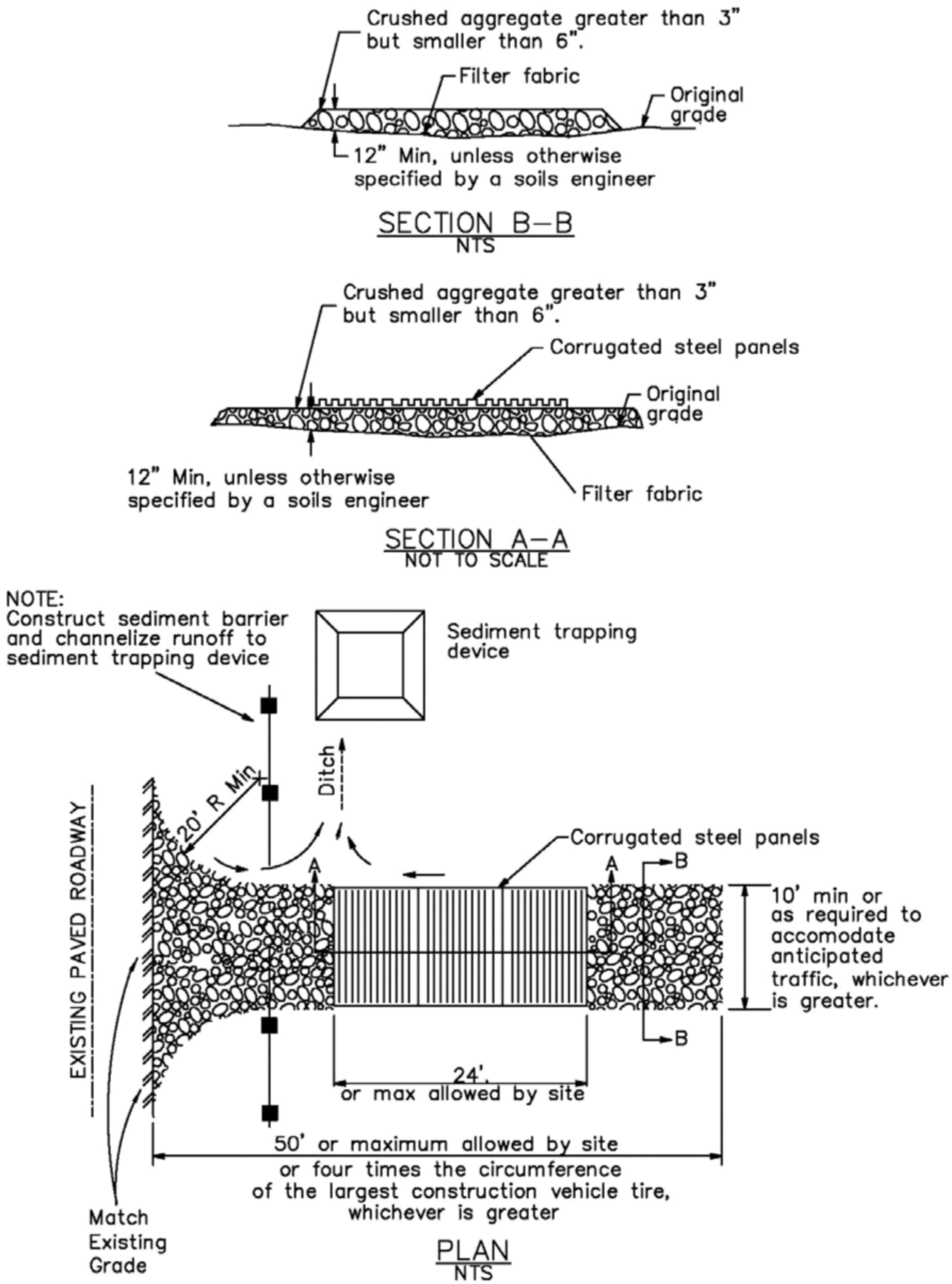
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

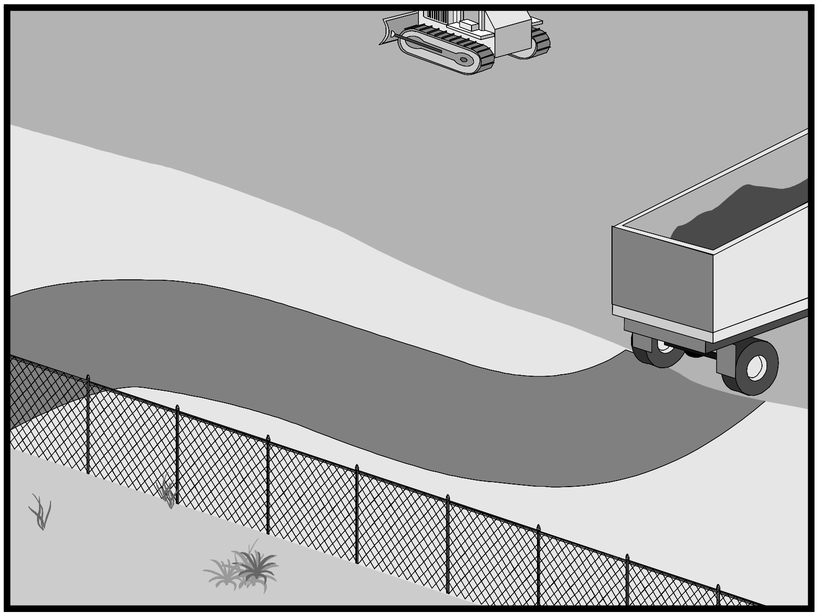
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.


Crushed aggregate greater than 3" but smaller than 6"
Filter fabric
Original grade
12 " Min, unless otherwise specified by a soils engineer
SECTION B-B
NTS


NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device
Ditch
20' R Min
EXISTING PAVED ROADWAY
B
B
10' min or as required to accomodate anticipated traffic, whichever is greater
Temporary pipe culvert as needed
50' or maximum allowed by site or four times the circumference of the largest construction vehicle tire, whichever is greater
Match Existing Grade
PLAN
NTS


Crushed aggregate greater than 3" but smaller than 6".
Filter fabric
Original grade
12" Min, unless otherwise specified by a soils engineer
SECTION B–B
NTS
Crushed aggregate greater than 3" but smaller than 6".
Corrugated steel panels
Original grade
12" Min, unless otherwise specified by a soils engineer
Filter fabric
SECTION A–A
NOT TO SCALE
NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device
Sediment trapping device
Ditch
20' R Min
EXISTING PAVED ROADWAY
Corrugated steel panels
A
A
B
B
10' min or as required to accomodate anticipated traffic, whichever is greater.
24'.
or max allowed by site
50' or maximum allowed by site or four times the circumference of the largest construction vehicle tire, whichever is greater
Match Existing Grade
PLAN
NTS

Stabilized Construction Roadway TC-2



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

Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

Limitations

- The roadway must be removed or paved when construction is complete.
- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.

- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

Implementation

General

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

Installation/Application Criteria

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.

- Coordinate materials with those used for stabilized construction entrance/exit points.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

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.

- Keep all temporary roadway ditches clear.

- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.

- Periodically apply additional aggregate on gravel roads.

- Active dirt construction roads are commonly watered three or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

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.

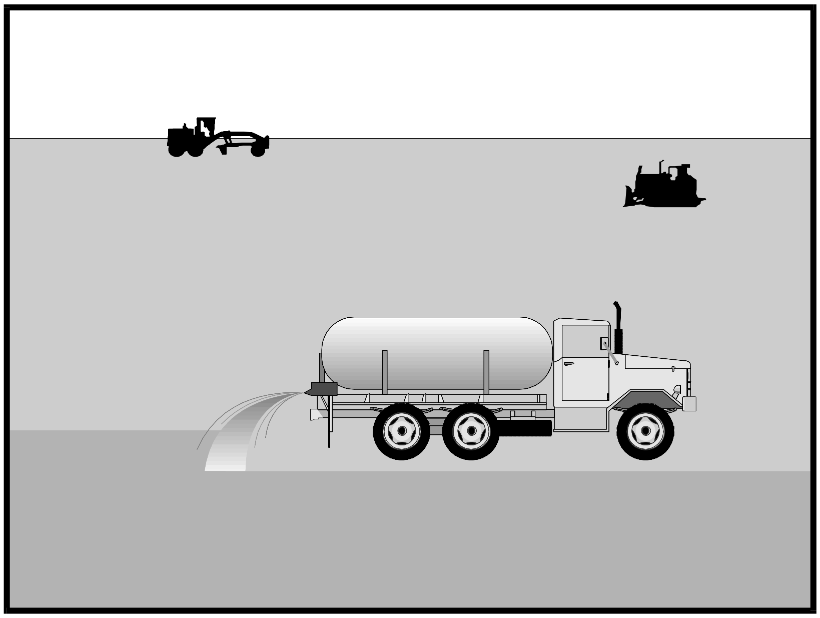
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

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.

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

Wind Erosion Control WE-1



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

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:

- 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, montimorillonite) 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

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

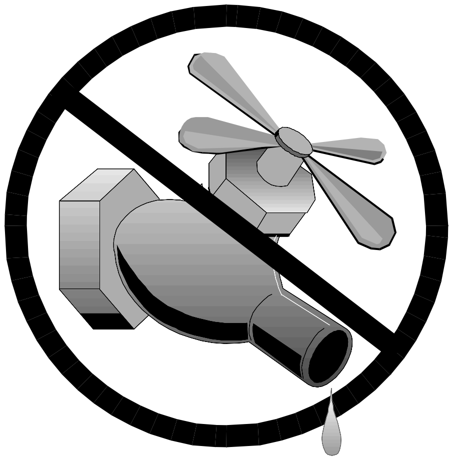
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

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

Water Conservation Practices NS-1



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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

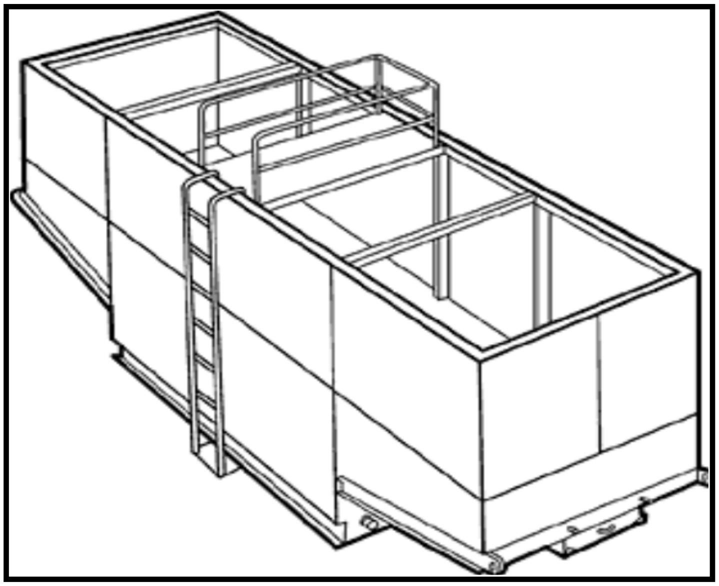
The cost is small to none compared to the benefits of conserving water.

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 occuring.
- 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.



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

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 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.

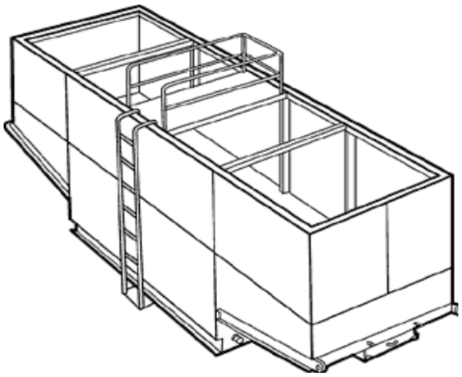
Implementation:

- 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.

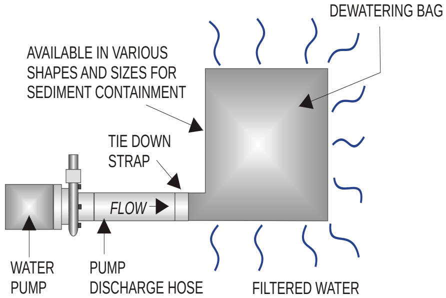
Implementation:

- 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.

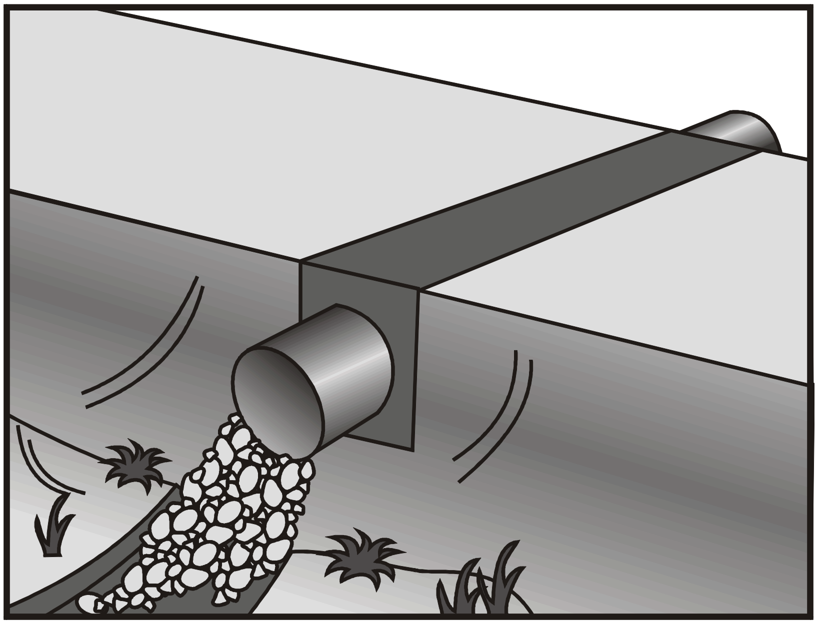
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

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.

Temporary Stream Crossing NS-4



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

Description and Purpose

A temporary stream crossing is a temporary culvert, ford or bridge placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings are not intended to maintain traffic for the public. The temporary access will eliminate erosion and downstream sedimentation caused by vehicles.

Suitable Applications

Temporary stream crossings should be installed at all designated crossings of perennial and intermittent streams on the construction site, as well as for dry channels that may be significantly eroded by construction traffic.

Temporary streams crossings are installed at sites:

- Where appropriate permits have been secured (404 Permits, and 401 Certifications)
- Where construction equipment or vehicles need to frequently cross a waterway
- When alternate access routes impose significant constraints
- When crossing perennial streams or waterways causes significant erosion
- Where construction activities will not last longer than one year
- Where appropriate permits have been obtained for the

stream crossing

Limitations

The following limitations may apply:

- Installation and removal will usually disturb the waterway.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Installation may require dewatering or temporary diversion of the stream. See NS-2, Dewatering Operations and NS-5, Clear Water Diversion.
- Installation may cause a constriction in the waterway, which can obstruct flood flow and cause flow backups or washouts. If improperly designed, flow backups can increase the pollutant load through washouts and scouring.
- Use of natural or other gravel in the stream for construction of Cellular Confinement System (CCS) ford crossing will be contingent upon approval by fisheries agencies.
- Ford crossings may degrade water quality due to contact with vehicles and equipment.
- May be expensive for a temporary improvement.
- Requires other BMPs to minimize soil disturbance during installation and removal.
- Fords should only be used in dry weather.

Implementation

General

The purpose of this BMP is to provide a safe, erosion-free access across a stream for construction equipment. Minimum standards and specifications for the design, construction, maintenance, and removal of the structure should be established by an engineer registered in California. Temporary stream crossings may be necessary to prevent construction equipment from causing erosion of the stream and tracking sediment and other pollutants into the stream.

Temporary stream crossings are used as access points to construction sites when other detour routes may be too long or burdensome for the construction equipment. Often heavy construction equipment must cross streams or creeks, and detour routes may impose too many constraints such as being too narrow or poor soil strength for the equipment loadings. Additionally, the contractor may find a temporary stream crossing more economical for light–duty vehicles to use for frequent crossings, and may have less environmental impact than construction of a temporary access road.

Location of the temporary stream crossing should address:

- Site selection where erosion potential is low.

- Areas where the side slopes from site runoff will not spill into the side slopes of the crossing.

The following types of temporary stream crossings should be considered:

- **Culverts** – A temporary culvert is effective in controlling erosion but will cause erosion during installation and removal. A temporary culvert can be easily constructed and allows for heavy equipment loads.

- **Fords** - Appropriate during the dry season in arid areas. Used on dry washes and ephemeral streams, and low-flow perennial streams. CCS, a type of ford crossing, is also appropriate for use in streams that would benefit from an influx of gravels. A temporary ford provides little sediment and erosion control and is ineffective in controlling erosion in the stream channel. A temporary ford is the least expensive stream crossing and allows for maximum load limits. It also offers very low maintenance. Fords are more appropriate during the dry ice season and in arid areas of California.

- **Bridges** - Appropriate for streams with high flow velocities, steep gradients and where temporary restrictions in the channel are not allowed.

Design

During the long summer construction season in much of California, rainfall is infrequent and many streams are dry. Under these conditions, a temporary ford may be sufficient. A ford is not appropriate if construction will continue through the winter rainy season, if summer thunderstorms are likely, or if the stream flows during most of the year. Temporary culverts and bridges should then be considered and, if used, should be sized to pass a significant design storm (i.e., at least a 10-year storm). The temporary stream crossing should be protected against erosion, both to prevent excessive sedimentation in the stream and to prevent washout of the crossing.

Design and installation requires knowledge of stream flows and soil strength. Designs should be prepared under direction of, and approved by, a registered civil engineer and for bridges, a registered structural engineer. Both hydraulic and construction loading requirements should be considered with the following:

- Comply with any special requirements for culvert and bridge crossings, particularly if the temporary stream crossing will remain through the rainy season.

- Provide stability in the crossing and adjacent areas to withstand the design flow. The design flow and safety factor should be selected based on careful evaluation of the risks due to over topping, flow backups, or washout.

- Install sediment traps immediately downstream of crossings to capture sediments. See SE-3, Sediment Trap.

- Avoid oil or other potentially hazardous materials for surface treatment.

- Culverts are relatively easy to construct and able to support heavy equipment loads.

- Fords are the least expensive of the crossings, with maximum load limits.

- CCS crossing structures consist of clean, washed gravel and cellular confinement system blocks. CCS are appropriate for streams that would benefit from an influx of gravel; for example, salmonid streams, streams or rivers below reservoirs, and urban, channelized streams. Many urban stream systems are gravel-deprived due to human influences, such as dams, gravel mines, and concrete channels.

- CCS allow designers to use either angular or naturally occurring rounded gravel, because the cells provide the necessary structure and stability. In fact, natural gravel is optimal for this technique, because of the habitat improvement it will provide after removal of the CCS.

- A gravel depth of 6 to 12 in. for a CCS structure is sufficient to support most construction equipment.

- An advantage of a CCS crossing structure is that relatively little rock or gravel is needed, because the CCS provides the stability.

- Bridges are generally more expensive to design and construct, but provide the least disturbance of the streambed and constriction of the waterway flows.

Construction and Use

- Stabilize construction roadways, adjacent work area, and stream bottom against erosion.

- Construct during dry periods to minimize stream disturbance and reduce costs.

- Construct at or near the natural elevation of the streambed to prevent potential flooding upstream of the crossing.

- Install temporary erosion control BMPs in accordance with erosion control BMP fact sheets to minimize erosion of embankment into flow lines.

- Any temporary artificial obstruction placed within flowing water should only be built from material, such as clean gravel or sandbags, that will not introduce sediment or silt into the watercourse.

- Temporary water body crossings and encroachments should be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments should be clean, rounded river cobble.

- Vehicles and equipment should not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed.

- The exterior of vehicles and equipment that will encroach on the water body within the project should be maintained free of grease, oil, fuel, and residues.

- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate soil stabilization measures.
- Riparian vegetation, when removed pursuant to the provisions of the work, should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble must be removed upon completion of project activities.
- Conceptual temporary stream crossings are shown in the attached figures.

Costs

Caltrans Construction Cost index for temporary bridge crossings is $45-$95/ft^2.

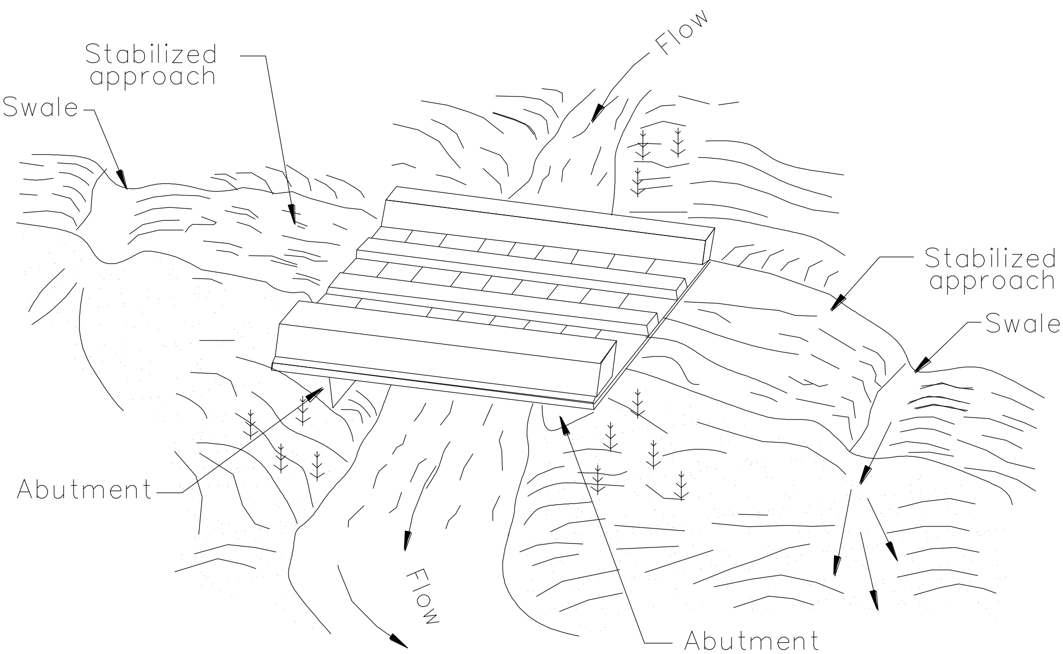
Inspection and Maintenance

- 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.
- Check for blockage in the channel, sediment buildup or trapped debris in culverts, blockage behind fords or under bridges.
- Check for erosion of abutments, channel scour, riprap displacement, or piping in the soil.
- Check for structural weakening of the temporary crossings, such as cracks, and undermining of foundations and abutments.
- Remove sediment that collects behind fords, in culverts, and under bridges periodically.
- Replace lost or displaced aggregate from inlets and outlets of culverts and cellular confinement systems.
- Remove temporary crossing promptly when it is no longer needed.

References

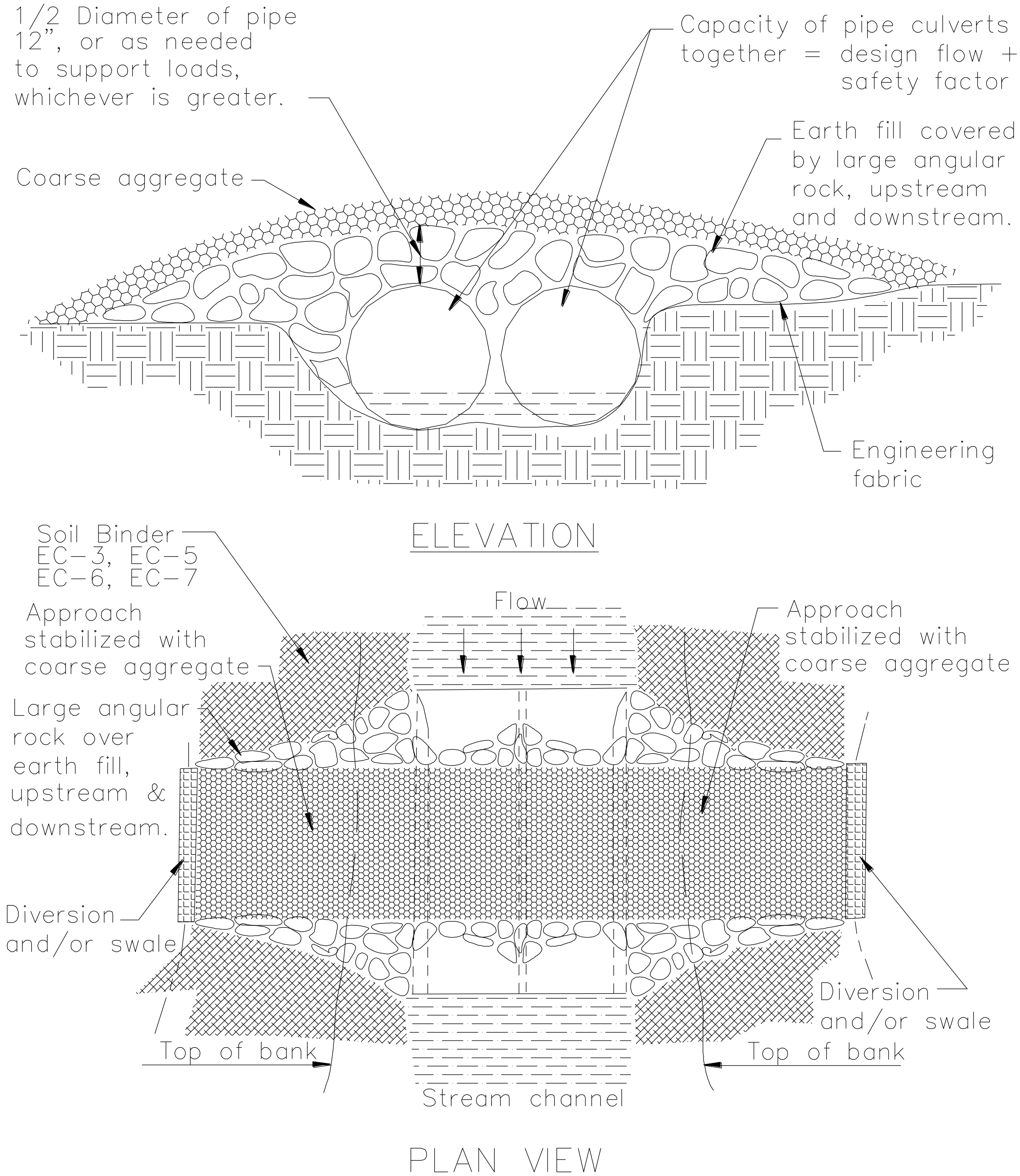
California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October 2000.

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

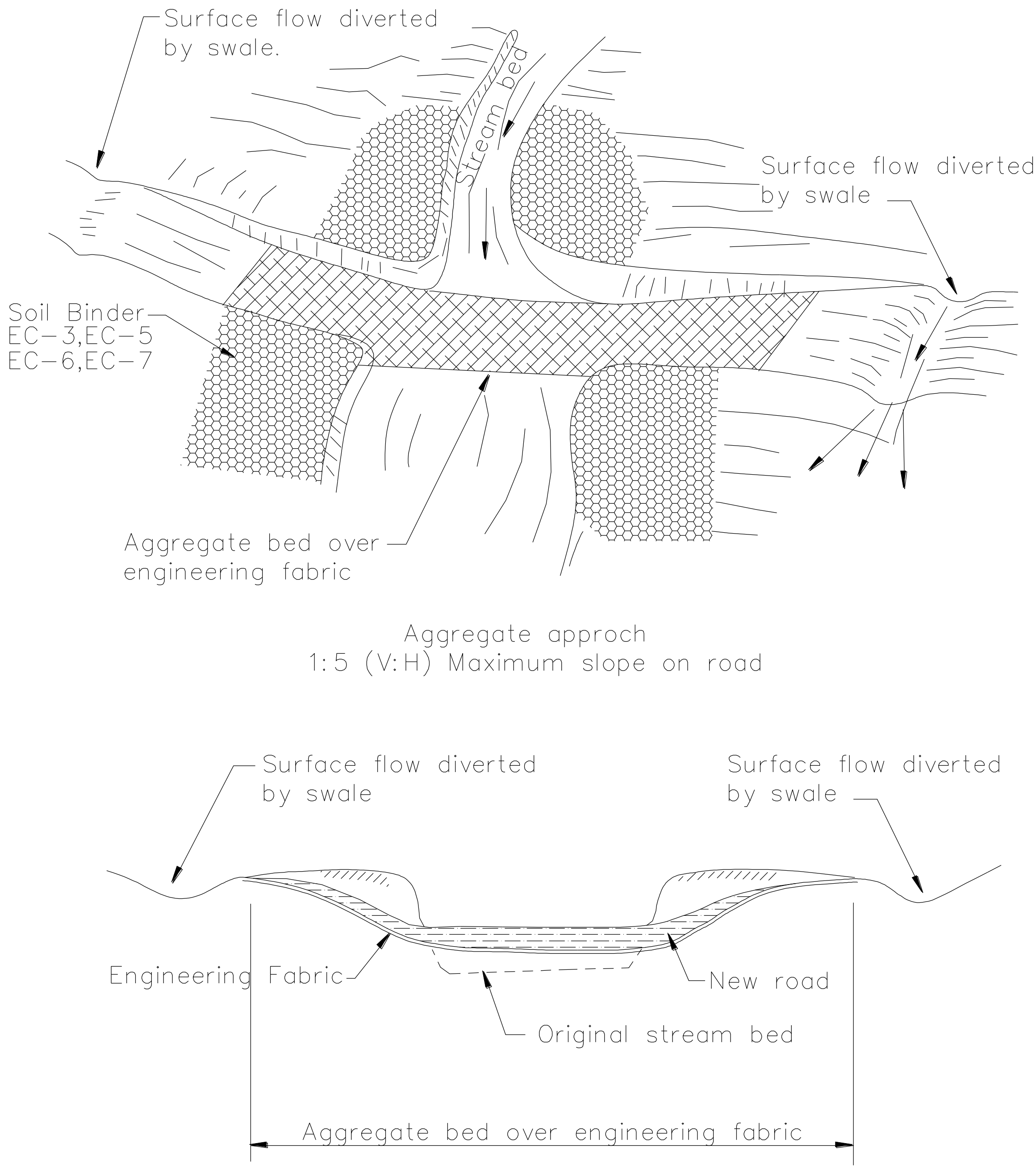


NOTE:
Surface flow of road diverted by swale and/or dike.

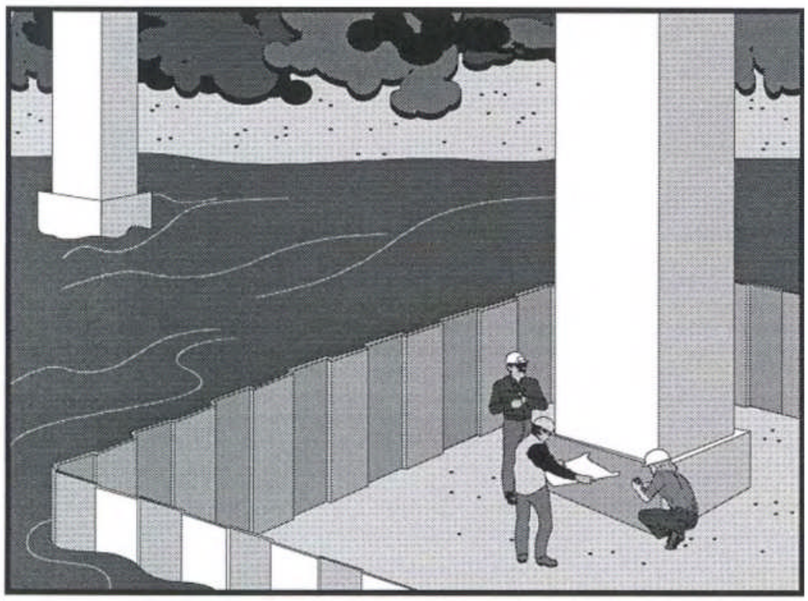
TYPICAL BRIDGE CROSSING
NOT TO SCALE



TYPICAL CULVERT CROSSING
NOT TO SCALE



TYPICAL FORD CROSSING
NOT TO SCALE



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

Description and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used in a waterway to enclose a construction area and reduce sediment pollution from construction work occurring in or adjacent to water. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

Suitable Applications

A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a flowing stream or water body.

- Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.

- Pumped diversions are suitable for intermittent and low flow streams.

- Excavation of a temporary bypass channel, or passing the flow through a heavy pipe (called a "flume") with a trench excavated under it, is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.

- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmonid spawning streams.

Limitations

- Diversion and encroachment activities will usually disturb the waterway during installation and removal of diversion structures.

- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.

- Diversion and encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.

- Diversion or isolation activities are not appropriate in channels where there is insufficient stream flow to support aquatic species in the area dewatered as a result of the diversion.

- Diversion or isolation activities are inappropriate in deep water unless designed or reviewed by an engineer registered in California.

- Diversion or isolation activities should not completely dam stream flow.

- Dewatering and removal may require additional sediment control or water treatment. See NS-2, Dewatering Operations.

- Not appropriate if installation, maintenance, and removal of the structures will disturb sensitive aquatic species of concern.

Implementation

General

- Implement guidelines presented in NS-17, Streambank Stabilization to minimize impacts to streambanks.

- Where working areas encroach on flowing streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.

- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.

- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the fuel tanks, gearboxes, and axles of the equipment unless lubricants and fuels are sealed such that inundation by water will not result in discharges of fuels, oils, greases, or hydraulic fluids.

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe should not enter the water body except as necessary to cross the stream to access the work site.

- Stationary equipment such as motors and pumps located within or adjacent to a water body, should be positioned over drip pans.

- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water should, at all times, be allowed to pass downstream to maintain aquatic life.

- Equipment should not be parked below the high water mark unless allowed by a permit.

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate erosion control measures.

- Riparian vegetation approved for trimming as part of the project should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble should be removed upon completion of project activities.

- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.

- Where possible, avoid or minimize diversion and encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Scheduling should also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.

- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.

Temporary Diversions and Encroachments

- Construct diversion channels in accordance with EC-9, Earth Dikes and Drainage Swales.

- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with EC-7, Geotextiles and Mats, or use rock slope protection.

- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment and slope protection, or other temporary soil stabilization methods.

- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also EC-10, Velocity Dissipation Devices.

Temporary Dry Construction Areas

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment-settling device, such as a portable tank or settling basin, before returning water to the water body. See also NS-2, Dewatering Operations.

- Any substance used to assemble or maintain diversion structures, such as form oil, should be non-toxic and non-hazardous.

- Any material used to minimize seepage underneath diversion structures, such as grout, should be non-toxic, non-hazardous, and as close to a neutral pH as possible.

Comparison of Diversion and Isolation Techniques:

- Gravel bags are relatively inexpensive, but installation and removal can be labor intensive. It is also difficult to dewater the isolated area. Sandbags should not be used for this technique in rivers or streams, as sand should never be put into or adjacent to a stream, even if encapsulated in geotextile.

- Gravel Bag Berms (SE-6) used in conjunction with an impermeable membrane are cost effective, and can be dewatered relatively easily. If spawning gravel is used, the impermeable membrane can be removed from the stream, and the gravel can be spread out and left as salmonid spawning habitat if approved in the permit. Only clean, washed gravel should be used for both the gravel bag and gravel berm techniques.

- Cofferdams are relatively expensive, but frequently allow full dewatering. Also, many options now available are relatively easy to install.

- Sheet pile enclosures are a much more expensive solution, but do allow full dewatering. This technique is not well suited to small streams, but can be effective on large rivers or lakes, and where staging and heavy equipment access areas are available.

- K-rails are an isolation method that does not allow full dewatering, but can be used in small to large watercourses, and in fast-water situations.

- A relatively inexpensive isolation method is filter fabric isolation. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place. This method should be used in relatively calm water, and can be used in smaller streams. Note that this is not a dewatering method, but rather a sediment isolation method.

- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They can also be used for in-stream construction, when dewatering an area is not required.

- When used in watercourses or streams, cofferdams must be used in accordance with permit requirements.

- Manufactured diversion structures should be installed following manufacturer's specifications.

- Filter fabric and turbidity curtain isolation installation methods can be found in the specific technique descriptions that follow.

Filter Fabric Isolation Technique

Definition and Purpose

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel bags, and steel t-posts.

Appropriate Applications

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.
- Filter fabric isolation is relatively inexpensive. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place.
- If spawning gravel is used, all other components of the isolation can be removed from the stream, and the gravel may be spread out and left as salmonid spawning habitat if approved in the permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.
- This method should be used in relatively calm water, and can be used in smaller streams. This is not a dewatering method, but rather a sediment isolation method.
- Water levels inside and outside the fabric curtain must be about the same, as differential heads will cause the curtain to collapse.

Limitations

- Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.
- Filter fabrics are not appropriate for projects where dewatering is necessary.
- Filter fabrics are not appropriate to completely dam stream flow.

Design and Installation

- For the filter fabric isolation method, a non-woven or heavy-duty fabric is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.
- Anchor filter fabric with gravel bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream, where it can provide aquatic habitat benefits. If a sandbag splits open in a watercourse, the sand could cause a decrease in water quality, and could bury sensitive aquatic habitat.
- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 18 ft for ease of handling (otherwise, it gets too heavy to move).

- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the silt fence fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.

- Pull the fabric up, and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the silt fence to the post with three diagonal nylon ties.

- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.

Inspection and Maintenance

- Immediately repair any gaps, holes or scour.

- Remove and properly dispose of sediment buildup.

- Remove BMP upon completion of construction activity. Recycle or reuse if applicable.

- Revegetate areas disturbed by BMP removal if needed.

Turbidity Curtain Isolation Technique

Definition and Purpose

A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

Appropriate Applications

Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the sediment particles will fall out of suspension.

Limitations

- Turbidity curtains should not be used in flowing water; they are best suited for use in ponds, lakes, and very slow-moving rivers.

- Turbidity curtains should not be placed across the width of a channel.

- Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the resuspension of particles and by accidental dumping by the removal equipment.

Design and Installation

- Turbidity curtains should be oriented parallel to the direction of flow.

- The curtain should extend the entire depth of the watercourse in calm-water situations.

- In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom should be held down by a load line incorporated into the curtain fabric. The fabric should be a brightly colored impervious mesh.
- The curtain should be held in place by anchors placed at least every 100 ft.
- First, place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink.
- Consideration must be given to the probable outcome of the removal procedure. It must be determined if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.
- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

Maintenance and Inspection:

- The curtain should be inspected for holes or other problems, and any repairs needed should be made promptly.
- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.
- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water.

K-rail River Isolation

Definition and Purpose

This temporary sediment control or stream isolation method uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

Barriers are placed end-to-end in a pre-designed configuration and gravel-filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

- This technique is also useful at the toe of embankments, and cut or fill slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Design and Installation

- To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rails to sit. Washed gravel should always be used.
- Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two. There should be sufficient gravel bags between the bottom K-rails such that the top rail is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.
- Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

Inspection and Maintenance:

- The barrier should be inspected and any leaks, holes, or other problems should be addressed immediately.
- Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

Stream Diversions

The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

Advantages of a Pumped Diversion

- Downstream sediment transport can be nearly eliminated.
- Dewatering of the work area is possible.
- Pipes can be moved around to allow construction operations.
- The dams can serve as temporary access to the site.
- Increased flows can be managed by adding more pumping capacity.

Disadvantages of a Pumped Diversion

- Flow volume is limited by pump capacity.
- A pumped diversion requires 24 hour monitoring of pumps.
- Sudden rain could overtop dams.
- Erosion at the outlet.

- Minor in-stream disturbance is required to install and remove dams.

Advantages of Excavated Channels and Flumes

- Excavated channels isolate work from water flow and allow dewatering.
- Excavated channels can handle larger flows than pumps.

Disadvantages of Excavated Channels and Flumes

- Bypass channel or flume must be sized to handle flows, including possible floods.
- Channels must be protected from erosion.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

Design and Installation

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Pump capacity must be sufficient for design flow.
- A standby pump is required in case a primary pump fails.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheet pile, sandbags, continuous berms, inflatable water bladders, etc., would be acceptable.

When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached and the excavated channel is stable, breach the upstream end and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.

Inspection and Maintenance

- Pumped diversions require 24 hour monitoring of pumps.
- Inspect embankments and diversion channels for damage to the linings, accumulating debris, sediment buildup, and adequacy of the slope protection. Remove debris and repair linings and slope protection as required. Remove holes, gaps, or scour.
- Upon completion of work, the diversion or isolation structure should be removed and flow should be redirected through the new culvert or back into the original stream channel. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Costs

Costs of clear water diversion vary considerably and can be very high.

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.

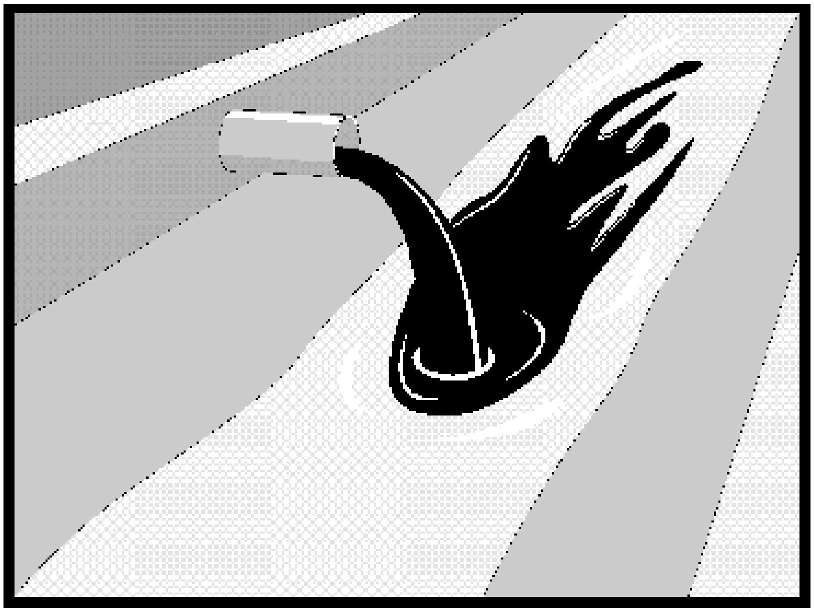
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Refer to BMP-specific inspection and maintenance requirements.

References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October, 2000.

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



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

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.

- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.

- Inspect site regularly during project execution for evidence of illicit connections, illegal dumping or discharges.

- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General –** unlabeled and unidentifiable material should be treated as hazardous.

- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.

- **Liquids** - signs of illegal liquid dumping or discharge can include:

  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season

- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:

  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects

- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:

  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

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 the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

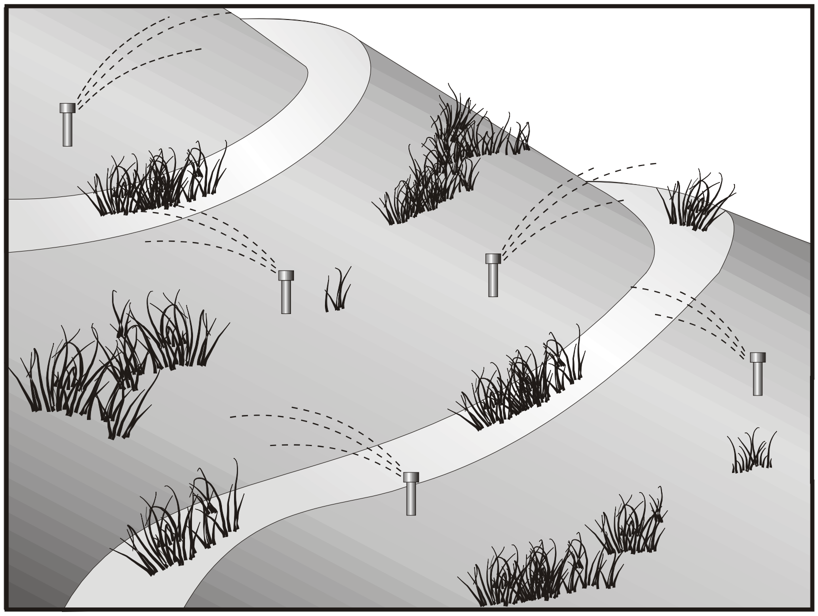
References

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.

Potable Water / Irrigation NS-7



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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.

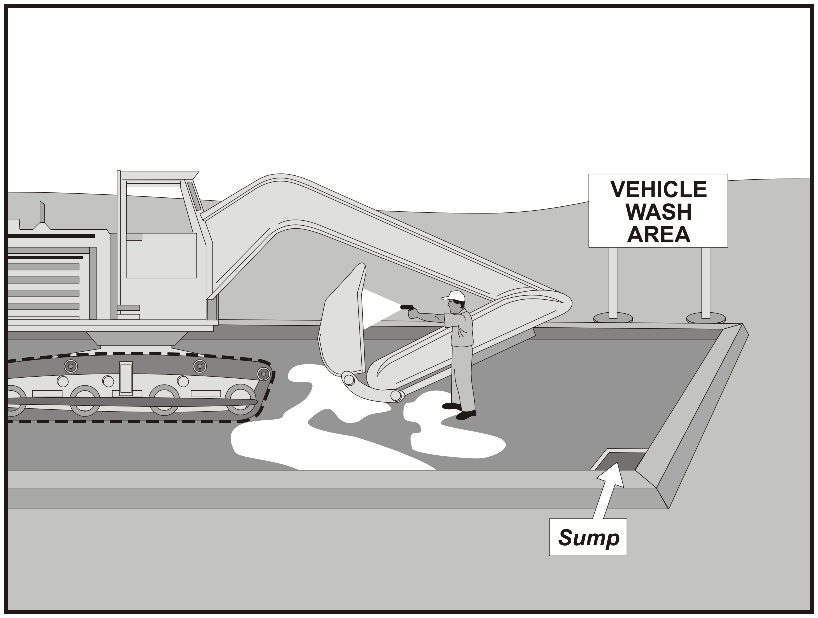
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

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.



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

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

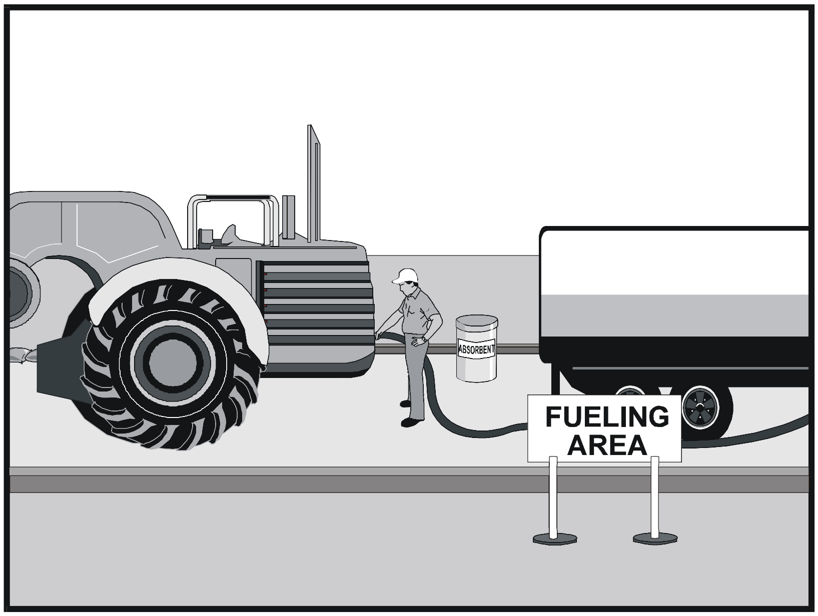
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at 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.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

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

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.

- Discourage "topping-off" of fuel tanks.

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

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.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

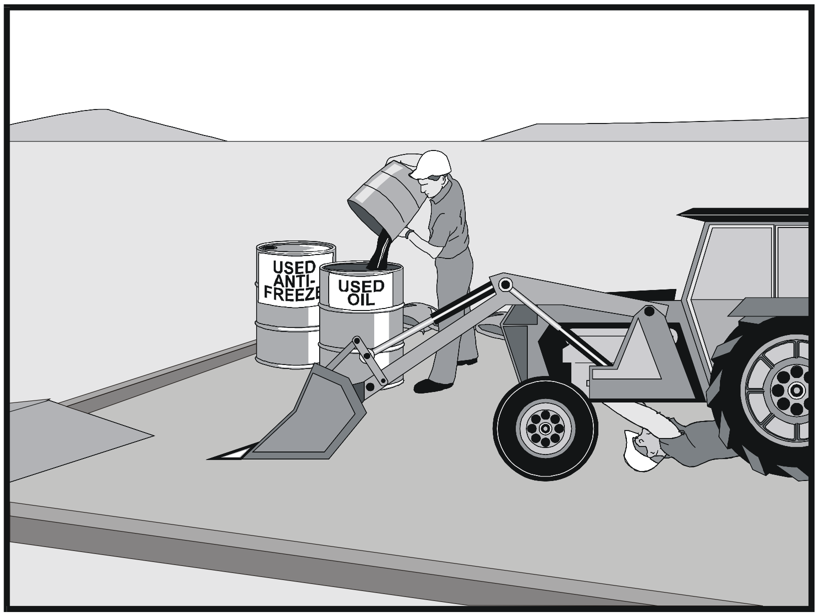
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

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.

Vehicle & Equipment Maintenance NS-10



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.

- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.

- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

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.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

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.

- Keep ample supplies of spill cleanup materials onsite.

- Maintain waste fluid containers in leak proof condition.

- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.

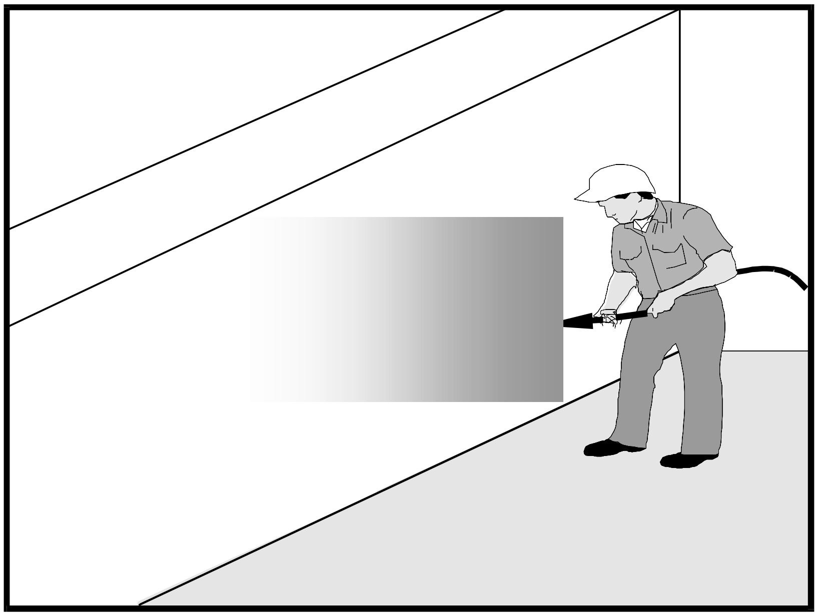
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

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.

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



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

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.

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

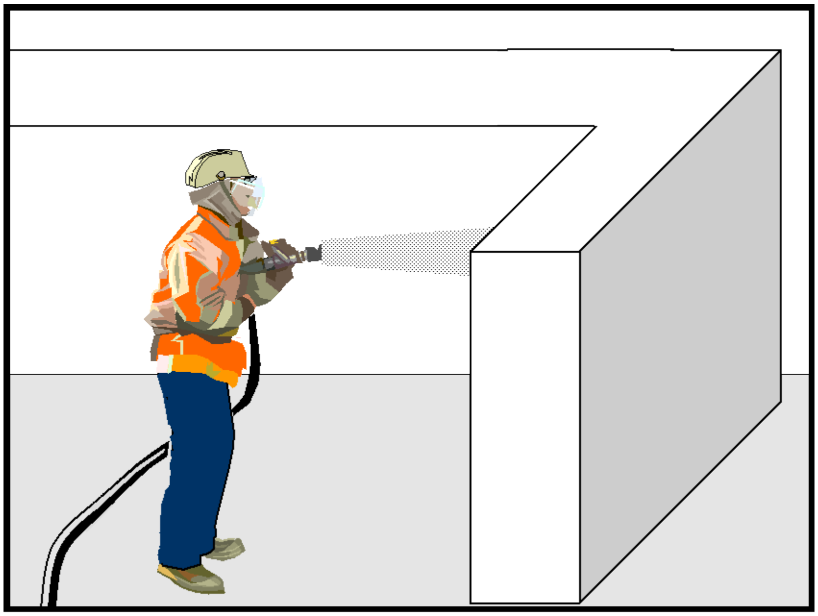
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

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.

Concrete Finishing NS-13



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

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.

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.

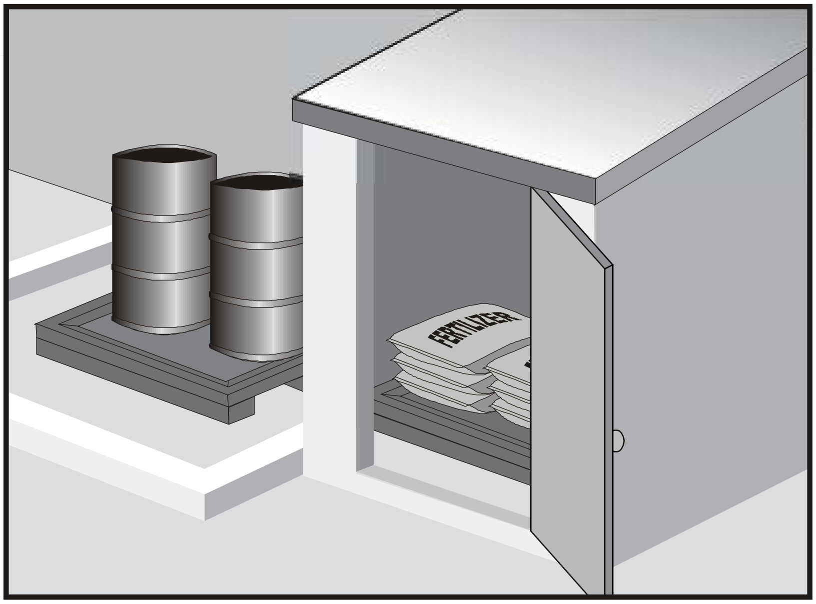
References

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.

Material Delivery and Storage WM-1



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

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

- 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.

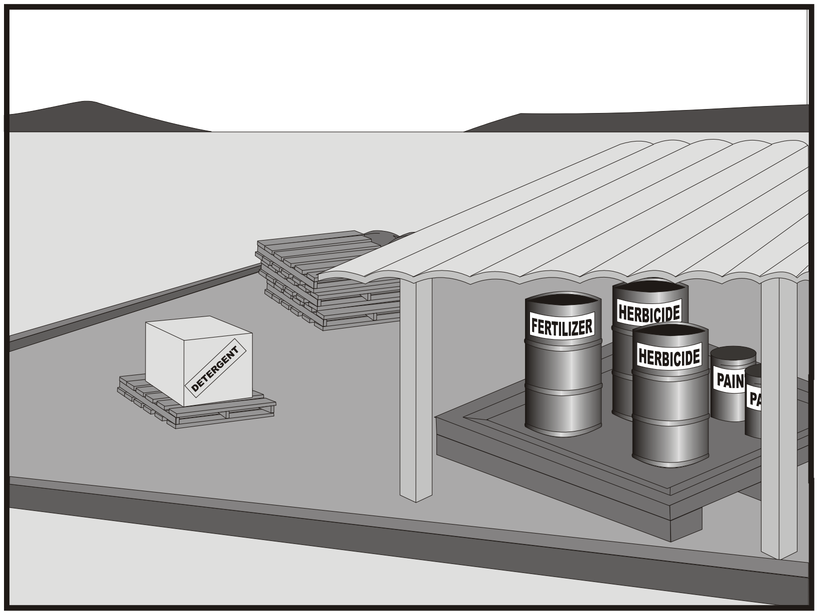
References

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.

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.



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

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

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

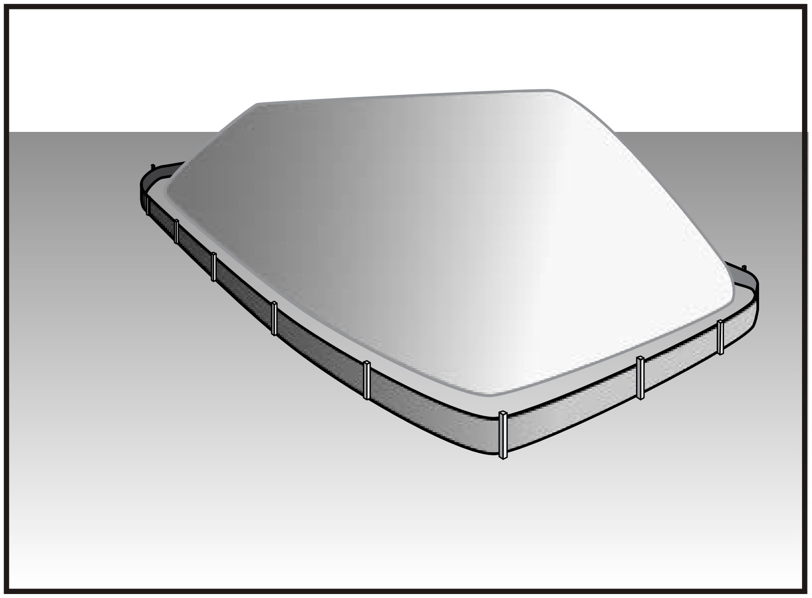
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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.



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

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:

- 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 runon 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).

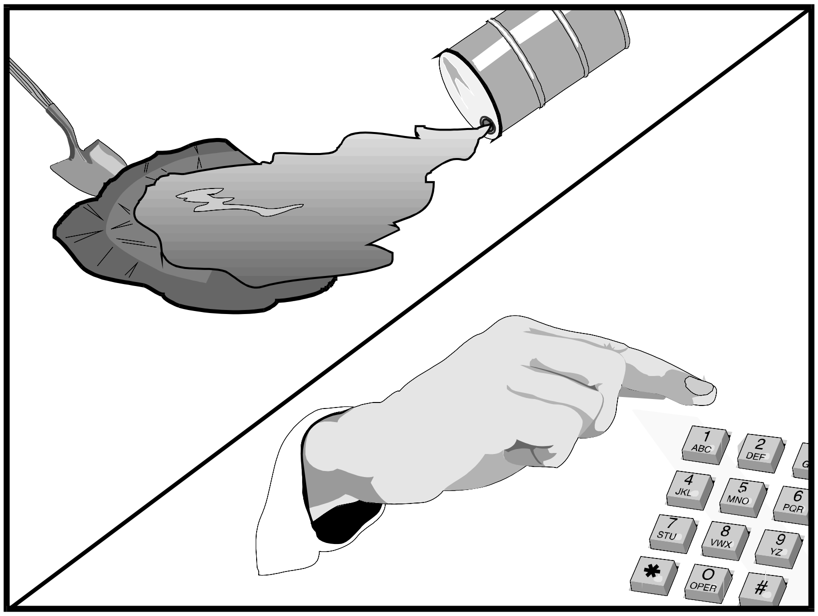
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

- 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.

Spill Prevention and Control WM-4



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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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 runon 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 runon 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 runon 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.

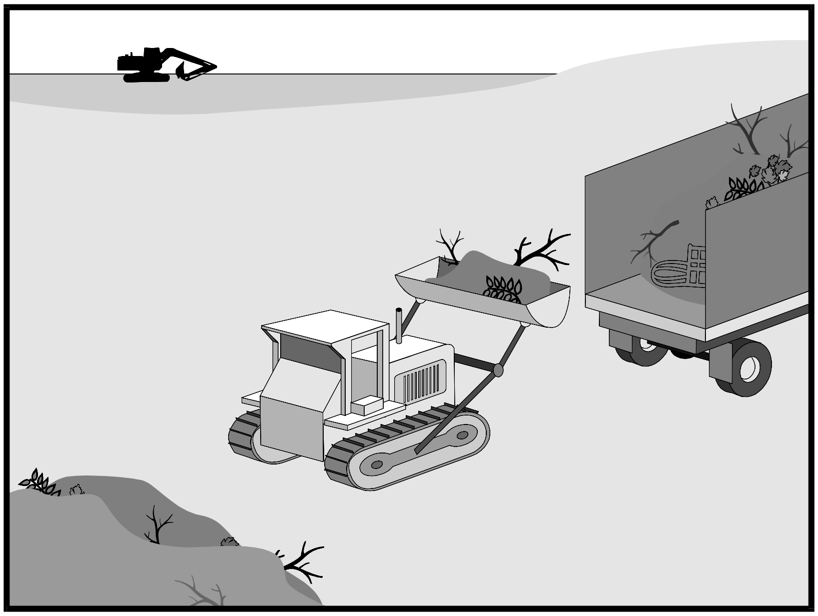
References

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.

Solid Waste Management WM-5



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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

CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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 runon 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.

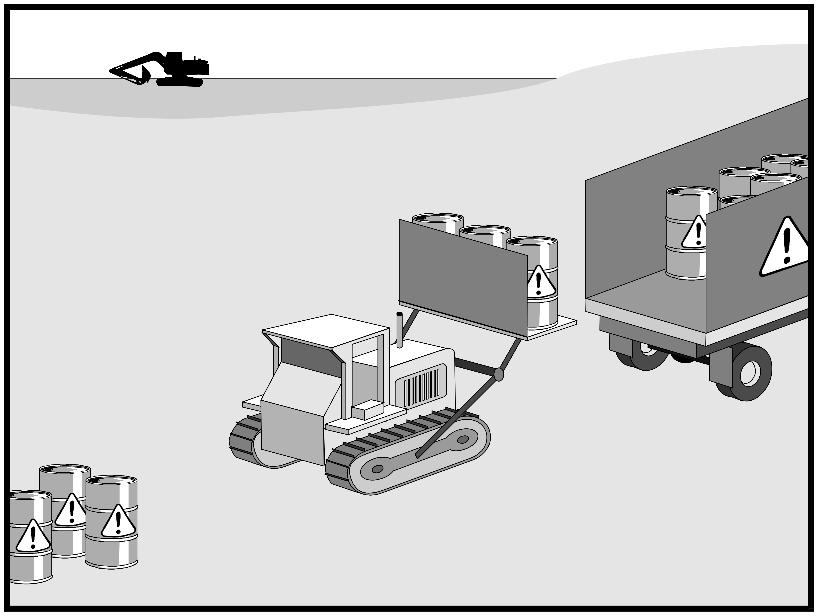
- Arrange for regular waste collection.

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.



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

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers 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 tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. 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.

- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.

- Unless watertight, containers of dry waste should be stored on pallets.

- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.

- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. “Paint out” brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

- The following actions should be taken with respect to temporary contaminant:

  - Ensure that adequate hazardous waste storage volume is available.

  - Ensure that hazardous waste collection containers are conveniently located.

  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

  - Minimize production or generation of hazardous materials and hazardous waste on the job site.

  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.

  - Segregate potentially hazardous waste from non-hazardous construction site debris.

  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.

- Place hazardous waste containers in secondary containment.

- Do not allow potentially hazardous waste materials to accumulate on the ground.

- Do not mix wastes.

- Use all of the product before disposing of the container.

- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- 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.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

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
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept 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.

- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

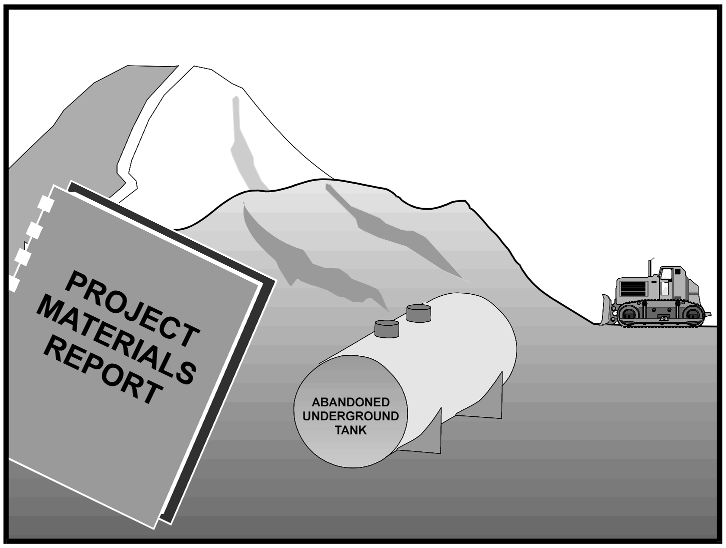
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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.

Contaminated Soil Management WM-7



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.

- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.

- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.

- The contractor may further identify contaminated soils by investigating:

  - Past site uses and activities

  - Detected or undetected spills and leaks

  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements

  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.

  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.

- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.

- Excavation, transportation, and placement operations should result in no visible dust.

- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.

- Test suspected soils at an approved certified laboratory.

- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.

- Avoid temporary stockpiling of contaminated soils or hazardous material.

- Take the following precautions if temporary stockpiling is necessary:

  - Cover the stockpile with plastic sheeting or tarps.

  - Install a berm around the stockpile to prevent runoff from leaving the area.

  - Do not stockpile in or near storm drains or watercourses.

- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.

- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.

- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.

- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.

- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.

- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.

- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):

  - United States Department of Transportation (USDOT)

  - United States Environmental Protection Agency (USEPA)

  - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil 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.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

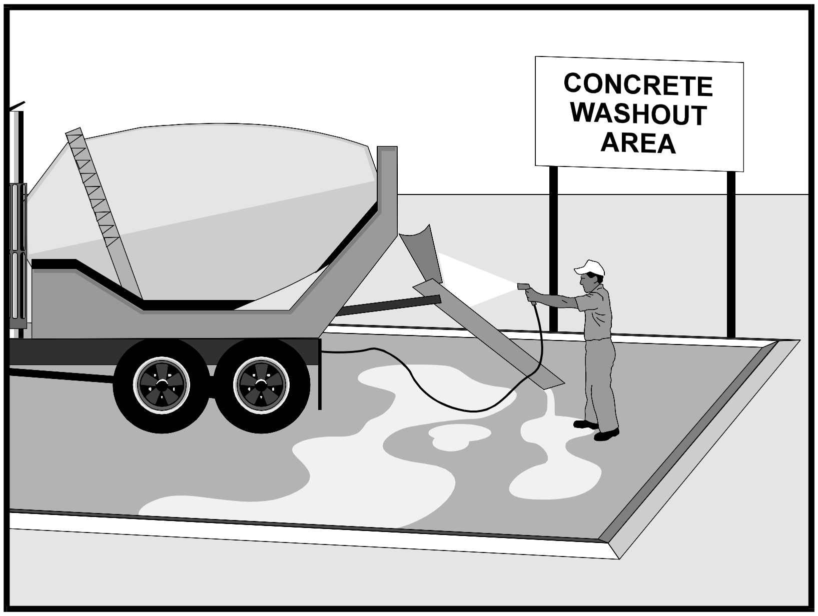
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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.

Concrete Waste Management WM-8



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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.

- 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-0ff 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.

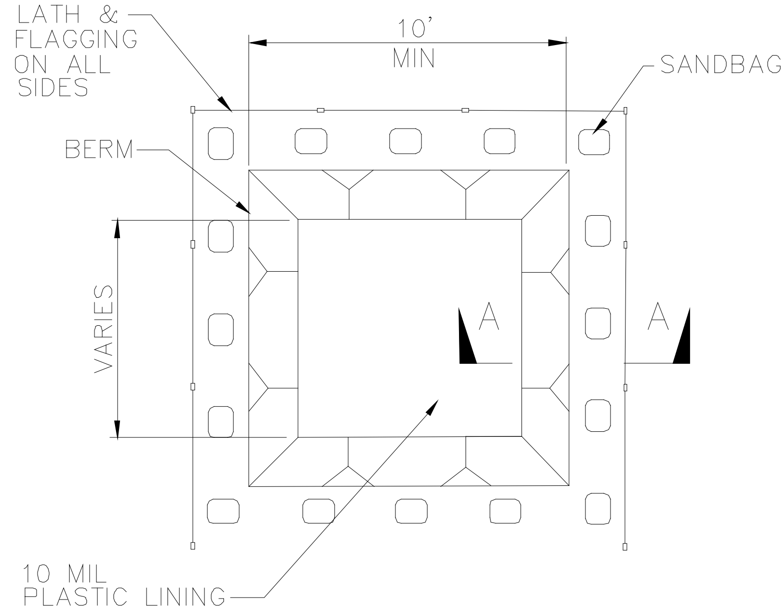
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

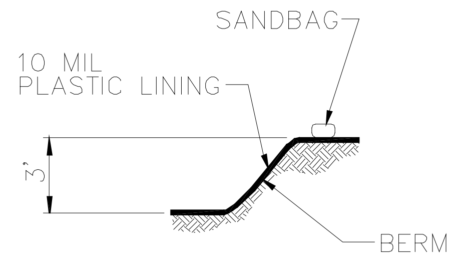
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

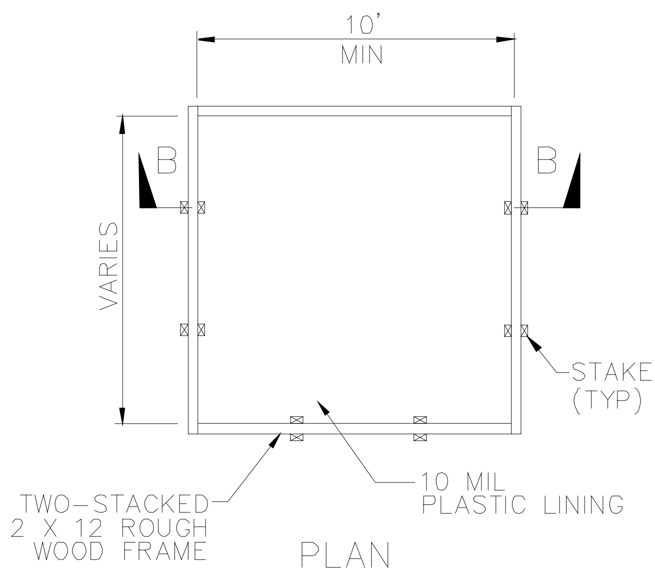
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



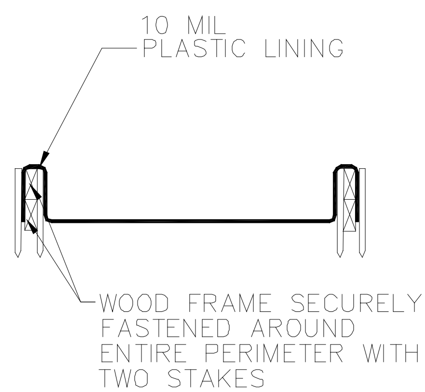
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



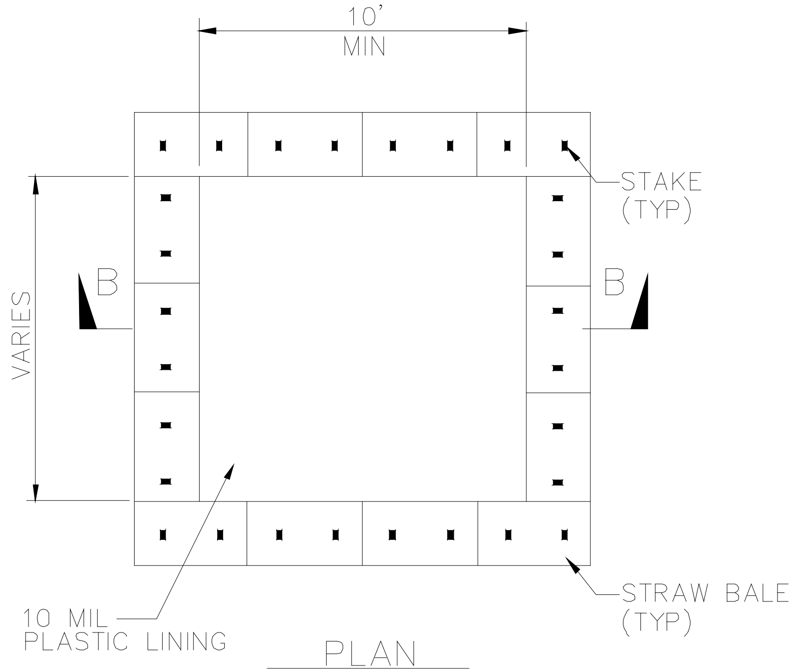
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



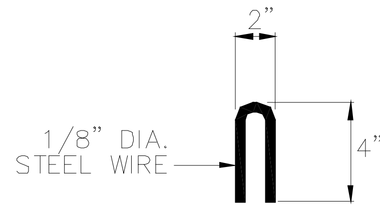
SECTION B–B
NOT TO SCALE

NOTES

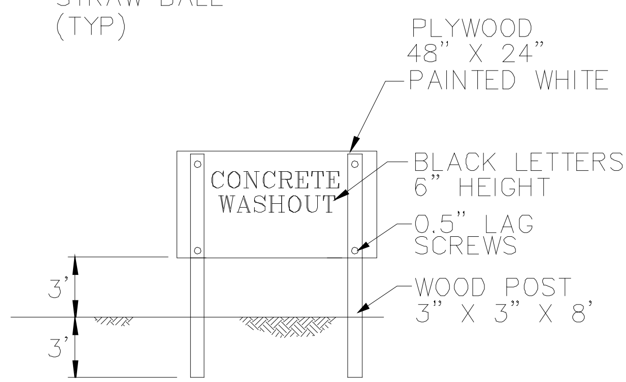
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



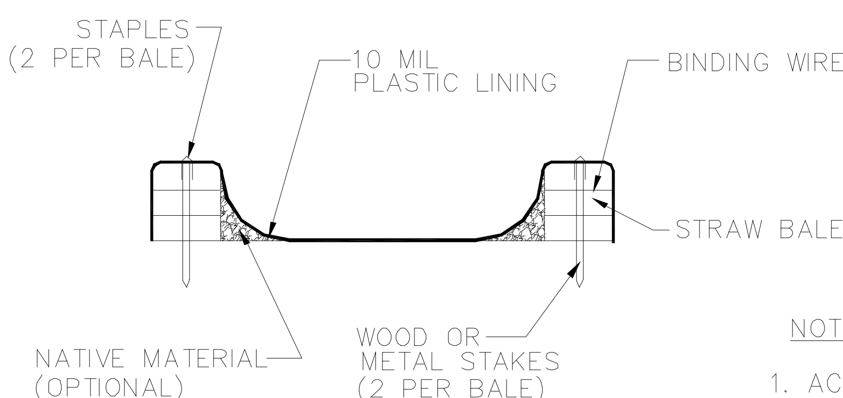
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



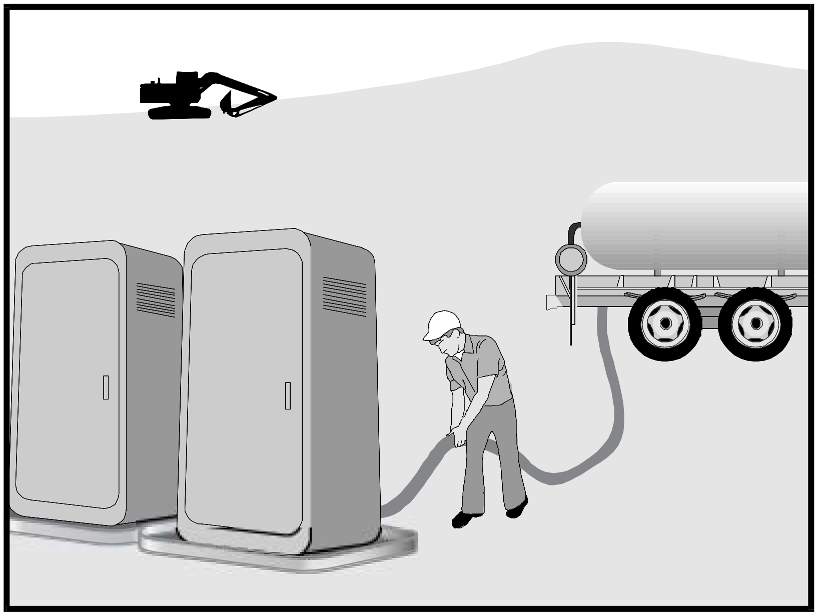
CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)



SECTION B-B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



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

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.

- 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.

Inspection and Maintenance

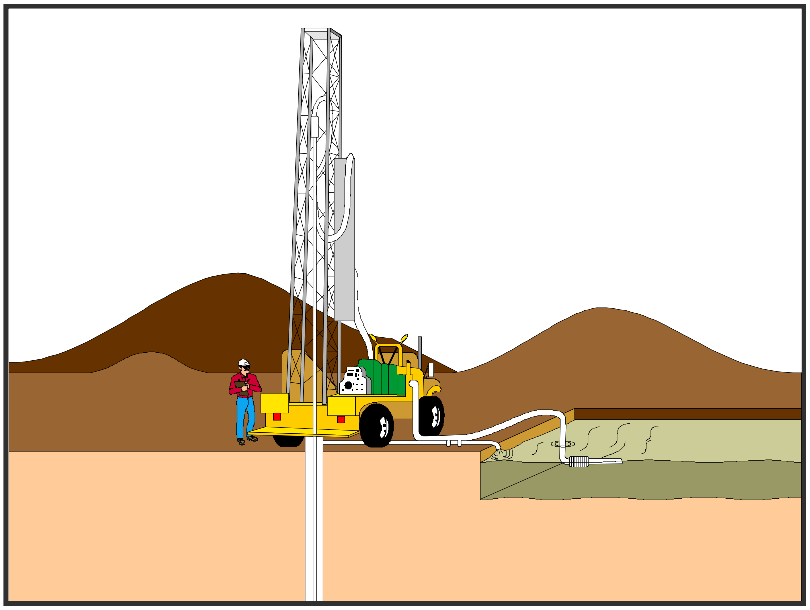
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange 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.

Liquid Waste Management WM-10



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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.

Good Housekeeping

Activity Specific Erosion and Sediment Control Plan
(A-ESCP)

If Cumulative Soil Disturbance Changes,
Contact the Environmental Field Specialists (EFS)
For Re-Evaluation of Storm Water Protection Needs

Prepared by

PG&E Water Quality Group

February 2013

TABLE OF CONTENTS

Attachments

1.0 WHAT IS COVERED UNDER THIS A-ESCP?

1.1 Good Housekeeping

This A-ESCP sets forth minimum Best Management Practices (BMPs) for Good Housekeeping[1] at all PG&E construction projects (which includes all permitted, non-permitted, and maintenance projects). If specific environmental concerns are encountered, or if the procedures contained within this A-ESCP prove ineffective, contact your local Environmental Field Specialist (EFS).

1.2 Typical Good Housekeeping BMPs

Minimum BMPs for Housekeeping on all PG&E projects include the following:

- Product and Materials Inventory (See Section 2.1)
- Stockpile Management (See Stockpile Management A-ESCP)
- Liquid Pollutant Storage (See Section 2.2)
- Construction Material Storage (See Section 2.3)
- Tracking Controls (See Section 2.4)
- Concrete and Other Rinse and Wash Waters (See Section 2.5)
- Sanitation Facilities (See Section 2.6)
- Waste Disposal Containers (See Section 2.7)
- Hazardous and Non-Hazardous Spills (See Section 2.8)
- Spill Kits and Clean Up Materials (See Section 2.9)
- Vehicle and Equipment Storage and Maintenance (See Section 2.10)
- Airborne Pollution Control (See Section 2.11)

1.3 Site Conditions Covered in this A-ESCP

This document is applicable to all PG&E projects, and must be used as a reference for specific Good Housekeeping Practices.

1.4 Scheduling Good Housekeeping BMP Installation

Planning for storm water pollution prevention is required for all PG&E construction projects throughout the year. Good Housekeeping BMPs must be implemented on all projects, regardless of time of year.

---

[1] Landscape Materials have additional requirements. If the construction project includes such materials, contact the Stormwater Group

2.0 BEST MANAGEMENT PRACTICES

The purpose of this A-ESCP is to specify appropriate Good Housekeeping BMPs for all construction projects that are exempt from coverage under the CGP. It is recommended that construction activities are scheduled to minimize soil disturbing activities during rain events.

The BMPs for the project should be installed in areas similar to those shown on the Typical BMP Use Detail, Attachment A.

Detailed cut-sheets on each BMP are provided in Attachment B.

Good Housekeeping BMPs should be followed to protect storm water runoff from construction associated chemicals and/or pollutants and to maintain a clean construction site.

2.1 Product and Materials Inventory

Description:
Consider this BMP if there are products or end products are produced, used, or expected to be used on site that are not designed to be outdoors.

Requirements:
- Conduct an inventory of the products and materials and consider delivery, storage, spill prevention, and cleanup requirements for those products.
- 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.
- Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.
- 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.
- Ensure retention of sampling, visual observation, and inspection records.
- Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:
- WM-1 – Materials Delivery and Storage
- WM-2 – Material Use

Materials properly contained

Materials needing covered storage

2.2 Liquid Pollutant Storage

Description:
Consider this BMP if there are any of the following on the construction site:
- Petroleum products such as oils, fuels, grease, cold mix asphalt, and tar
- Glues, adhesives, and solvents
- Cleaning products
- Herbicides, pesticides, and fertilizers
- Paints, stains, and curing compounds
- Vehicle and equipment fluids such as anti-freeze, exhaust fluid, washer fluid, or battery acid
- Soil binders or amendments
- Sewage or line flushing/sanitizing agents
- Other hazardous or toxic substances

Requirements:
- Minimize the amount of hazardous materials stored at the construction site.
- Store hazardous liquids, wastes, and all chemicals in watertight containers with appropriate secondary containment to prevent any spillage or leakage, or in a completely enclosed storage shed.
- Cover all temporary containment facilities prior to forecast rain, at the end of each day, and during non-work days.
- Do not mix waste or hazardous materials. Doing so may complicate or inhibit disposal and recycling options and can result in dangerous chemical reactions.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:
- NS-9 – Vehicle and Equipment Fueling
- WM-1 – Material Delivery and Storage
- WM-2 – Material Use
- WM-4 – Spill Prevention and Control
- WM-6 – Hazardous Materials/Waste Management
- WM-10 – Liquid Waste Management

Properly contained in secondary containment

Improperly placed and stored on the ground

2.3 Construction Material Storage

Description:
Consider this BMP if any of the following are expected to be on the construction site:

- Asphalt
- Cement
- Dry mix concrete
- Fertilizer, Herbicides, or Pesticides
- Grease
- Soil amendments
- Any other construction materials not designed to be exposed to weather or rain.

Requirements:

- 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.).

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- Stockpile Management A-ESCP
- WM-1 – Material Delivery and Storage
- WM-2 – Material Use
- WM-3 – Stockpile Management
- WM-4 – Spill Prevention and Control
- WM-6 – Hazardous Materials/Waste Management
- WM-7 – Contaminated Soil Management

Properly wrapped in plastic, on pallet, and on plastic

Improperly Placed and stored on the ground

2.4 Tracking Controls

Description:
Consider this BMP if the following occurs on the construction site:

- Vehicle or equipment traffic to or from a construction, laydown, borrow, disposal, or staging area has the potential to contaminate the vehicle's tires with mud or sediment.
- Connections of non-stabilized access roads or any of the above connect to a paved roadway.
- Internal traffic areas, within a construction site, may lead to sediment laden discharge into storm drain systems or surface waters.

Requirements:

- Use 3" to 6" rock as much as 12" thick in the Construction Entrance to dislodge sediment and contain the sediment within the void areas of the rock.
- Limit traffic to using the entrance at all times. Block all other potential access locations.
- Slope entrance away from the adjoining roadway or provide drainage to prevent stormwater from conveying trapped sediments to the roadway.
- Build entrance with adequate length (50' min), width, (20') and turning radii (25').
- Inspect adjacent roadways daily and sweep or vacuum (SE-7) as needed.
- Include a sediment trap where water runs off of the entrance.
- Maintain the entrance by replacing or freshening rock as needed.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- SE-7 – Street Sweeping and Vacuuming
- SE-10 – Storm Drain Inlet Protection
- TC-1 – Stabilized Construction Entrance
- TC-2 – Stabilized Construction Roadway
- TC-3 – Tire Wash

Effective large angular material

Small ineffective material

2.5 Concrete and Other Rinse and Wash Waters

Description:
Consider this BMP if rinsing or washing any of the following is required on the construction site:
- Concrete, stucco, plaster, mortar, grout, tile, or gunite delivery, placement, finishing, pumping, or transporting equipment.
- Paint containers, sprayers, brushes, rollers, mixers, pumps, or cleaning supplies.
- Drywall materials, tools, texture guns and pumps, hoses, and waste.
- Tile mastic, grout, cuttings, or cleaning tools and equipment.
- Construction equipment, vehicles, tools, and materials.
- Cutting, grinding, coring, drilling, or re-finishing of any construction materials using water as a lubricant or coolant.
- Any other materials or equipment that may need to be washed or rinsed.

Requirements:
- Do not allow rinse or wash water to come into contact with the ground or paved surfaces.
- Rinse and wash water shall not be conveyed or dumped into any drain, inlet, or surface water.
- All concrete washout materials, including the water, cement, sand, and gravel shall be disposed of at a proper facility.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:
- NS-3 – Paving and Grinding Operations
- WM-4 – Spill Prevention and Control
- WM-6 – Hazardous Materials/Waste Management
- WM-8 – Concrete Waste Management
- WM-10 – Liquid Waste Management

Commercially available washout

Poorly located, installed, and maintained

2.6 Sanitation Facilities

Description:
Consider this BMP if the following are located at the construction site:

- Portable toilets
- Sanitary waste storage
- Hand wash stations

Requirements:

- Locate away from drainages and inlets (50’ if possible).
- Provide a tray to contain spills and minor leaks.
- Service and maintain facilities regularly to avoid overuse and overfilling.
- Protect from tipping, especially in high wind areas.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- WM-4 – Spill Prevention and Control
- WM-6 – Hazardous Materials/Waste Management
- WM-9 – Sanitary/Septic Waste Management
- WM-10 – Liquid Waste Management

Properly placed on tray and tied down

Poor location and protection

2.7 Waste Disposal Containers

Description:
Consider this BMP if the following present at the construction site:

- Construction debris
- Garbage
- Contaminated soil
- Demolition waste
- Concrete, stucco, mortar, drywall, or any other waste

Requirements:

- Cover waste disposal containers at the end of every day and prior to the onset of precipitation.
- Prevent discharges from waste disposal containers to the storm drain system or surface waters.
- Contain and securely protect stockpiled waste materials form wind and rain at all times unless actively being used.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- WM-5 – Solid Waste Management
- WM-6 – Hazardous Materials/Waste Management
- WM-7 – Contaminated Soil Management
- WM-8 – Concrete Waste Management

Large properly covered dumpster

Overused and improperly covered even during rain

2.8 Hazardous and Non-Hazardous Spills

Description:
Consider this BMP if the following occur on the construction site:

- Any breach, malfunction, leakage, or spill of a potential pollutant.

Requirements:

- Keep spill cleanup kits on-site and with fueling and maintenance vehicles at all times.
- If safe to do so, stop the spill, and begin cleanup immediately.
- Clean the contaminated area and any soil or materials contaminated by the spill.
- Notify the EFS and project foreman.
- If rain is forecast, cover the spill and contaminated areas prior to the onset of precipitation.
- Clean the spill with absorbents. Do not wash the spill with water.
- Store and dispose of cleanup materials, contaminated materials, and recovered spilled material in accordance with federal, state, can local requirements.

To determine if the spill is reportable, contact the EFS. After hours or if the local EFS are unavailable, call the following 800 number: **800-874-4043.**

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- NS-3 – Paving and Grinding Operations
- NS-9 – Vehicle and Equipment Fueling
- WM-1 – Material Delivery and Storage
- WM-2 – Material Use
- WM-4 – Spill Prevention and Control
- WM-6 – Hazardous Materials/Waste Management
- WM-8 – Concrete Waste Management
- WM-9 – Sanitary/Septic Waste Management
- WM-10 – Liquid Waste Management

Large, hazardous spill

Contaminated soil properly prepared for disposal

2.9 Spill Kits and Clean-up Materials

Description:
Consider this BMP if the following are located or performed at the construction site:
- Any construction activity
- Any stored equipment or liquids
- Any equipment or vehicle maintenance, repair, or fueling

Requirements:
- Equipment and materials for cleanup of spills shall be available on site and spills and leaks shall be cleaned up immediately and disposed of properly.
- All personnel must be trained to know where Spill Kits are kept.
- Have Spill Kit within reach during activities with potential to release pollutants, such as vehicle and equipment fueling and maintenance.
- All fueling and maintenance vehicles are required to have Spill Kits on board.
- Spill Kits should have a combination of All Absorbent (typically gray) pads and booms to absorb and retain oils, coolants, solvents and water and Oil Only (typically white) booms and pads to absorb only oil along with dry absorbent (kitty litter), gloves, and disposal bags.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:
- NS-3 – Paving and Grinding Operations
- NS-9 – Vehicle and Equipment Fueling
- WM-1 – Material Delivery and Storage
- WM-2 – Material Use
- WM-4 – Spill Prevention and Control
- WM-6 – Hazardous Materials/Waste Management
- WM-8 – Concrete Waste Management
- WM-9 – Sanitary/Septic Waste Management
- WM-10 – Liquid Waste Management

Typical Spill Kit contents

Hydraulic hose leak and absorbent deployment

2.10 Vehicle and Equipment Storage and Maintenance

Description:
Consider this BMP if there are any of the following on the construction site:

- Any vehicles or equipment being stored, fueled, or maintained.

Requirements:

- Allow only properly maintained vehicles and equipment onto the site.
- Place all equipment and vehicles, which are to be fueled, maintained, or stored in a designated area fitted with appropriate BMPs.
- Clean leaks immediately and properly dispose of leaked material or contaminated soil.
- A Spill Kit should be on each site and on every fueling or maintenance truck, and be easily accessible during fueling or maintenance activities.
- All site personnel should know where the Spill Kit is located.
- Designate one area for fueling and maintenance activities and inspect regularly for spills.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- WM-4 – Spill Prevention and Control
- WM-6 – Hazardous Materials/Waste Management
- WM-10 – Liquid Waste Management
- NS-9 – Vehicle and Equipment Fueling

Generator on secondary containment

Hydraulic tank leaking onto ground

2.11 Airborne Pollution Control

Description:
Consider this BMP if the following occurs on the construction site:

- Any construction activity with the ability to create any airborne pollution, including:
  - Sediment
  - Nutrients
  - Trash
  - Metals
  - Bacteria
  - Oil and grease
  - Organics

Requirements:

- Control all sources of potential airborne pollutants.
- Provide a water truck on-site during any time there is potential for dust (including winter).
- Cover or wet all stockpiles with potential for wind erosion.
- Respond quickly if dust or airborne pollutants are observed.
- Properly contain trash.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- EC-2 – Preservation of Existing Vegetation
- EC-7 – Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
- EC-16 – Non-Vegetative Stabilization
- NS-3 – Paving and Grinding Operations
- SE-7 – Street Sweeping and Vacuuming
- WM-3 – Stockpile Management
- WM-5 – Solid Waste Management

Water truck filling station

Uncontrolled dust

2.12 Where to Obtain BMP Materials

BMP products in Table 1 can be obtained through PG&E materials warehouses using project order numbers and established materials codes. Should the materials be unavailable from PG&E warehouses, BMP materials and products may be obtained from sources shown below, but may be obtained elsewhere depending on location and urgency of need.

TABLE 1
BMP PRODUCTS INFORMATION

Category	Product Name	Units
Certified Weed-Free Straw Mulch (EC-6)	Weed-Free Straw	Bales
Geotextiles and Mats (EC-7) Geotextile Fabric	Mirafi 600	Rolls: 12.5' x 360' 17.5' x 238'
Geotextiles and Mats (EC-7) Jute Mat	Eco-Jute	Rolls: 4' x 225'
Geotextiles and Mats (EC-7) Plastic Sheeting	Visqueen	Rolls: 20 or 40'x 100'; 10ml thick
Silt Fence (SE-1)	Caltrans Grade Silt Fence	100 feet with 36-inch wood posts at 6 foot spacing
Fiber Roll (SE-5)	Sediment Log Type II	25 foot rolls x 6 or 9" diameter
Gravel Bags (SE-6)	Roc Soc	mono filament
Inlet Protection (SE-10) Gravel Bag	Same as SE-6	
Inlet Protection (SE-10)	Same as SE-5	

Example suppliers include Reed & Graham, White Cap, and Curlex. Other options may include feed stores, retail building supply stores, or hardware stores.

3.0 BMP INSPECTION AND MAINTENANCE

BMP installation, inspection and maintenance will be performed by the PG&E construction crew. BMPs should be inspected daily during construction activities. In the event that BMPs appear to require maintenance or are not functioning as expected, the BMP will be maintained, repaired, or replaced to correct the deficiency.

4.0 WHOM TO CALL

If the project receives a written notice or order from any regulatory agency, immediately contact your local EFS for further direction.

Contact the local EFS if any of the following conditions occur:

- Visually cloudy/muddy water is observed leaving the work or staging area
- Discharge or spill of hazardous substance

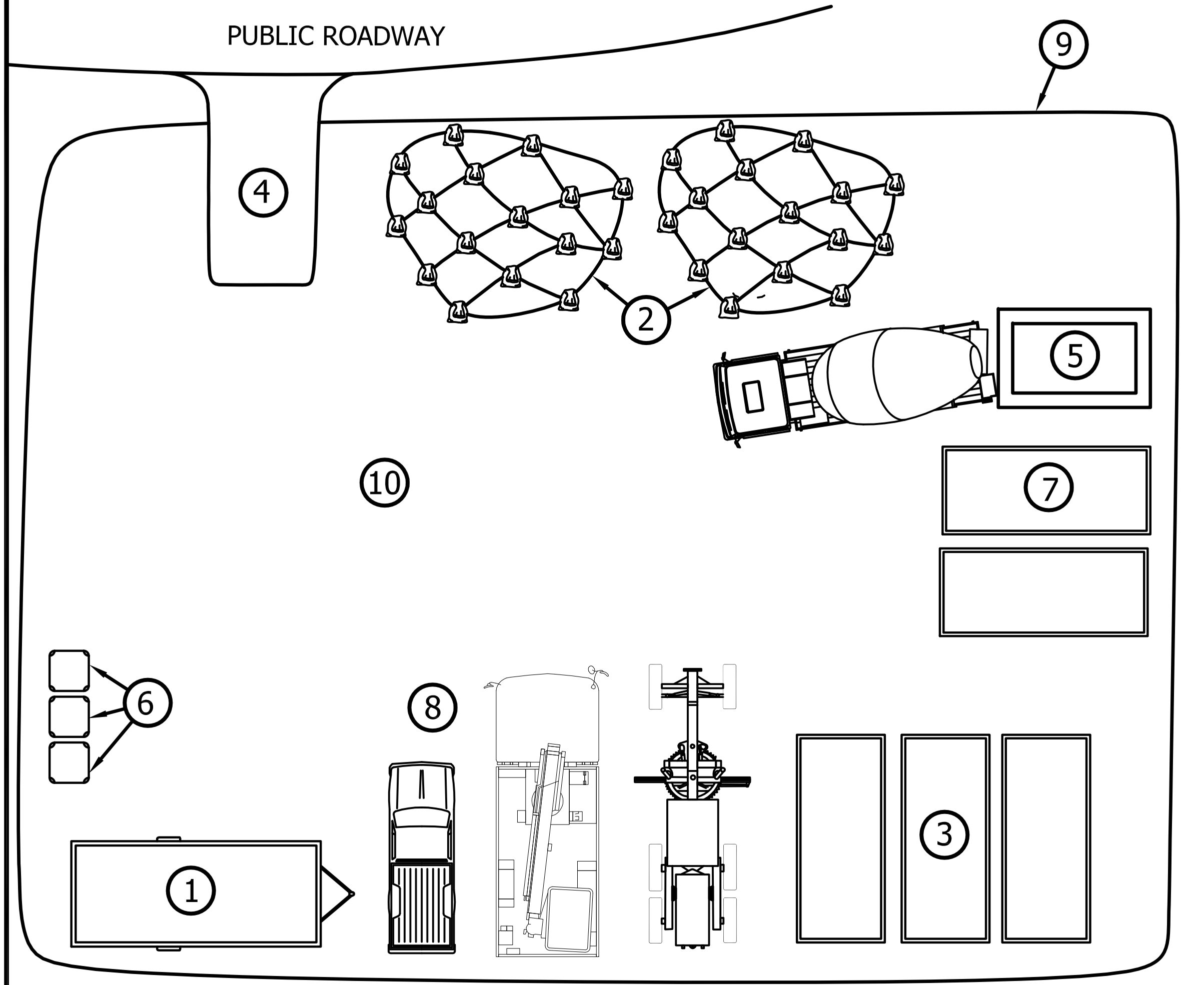
After hours or if the local EFS are unavailable, call the following 800 number:
800-874-4043.

5.0 POST-CONSTRUCTION

Upon completion of construction within the project area:

- Remove all temporary, non-biodegradable BMPs.
- Remove all construction equipment from the site.
- Clear all staging areas of any debris, construction materials, and contaminants.
- Return all drainage ways to their pre-construction line and grade.
- Cover disturbed soil areas with a combination of temporary and permanent vegetative stabilization.

Attachment A Typical BMP Installation Map



1. CONSTRUCTION TRAILER:
KEEP PRODUCT INVENTORY, SPILL KIT, MSDS SHEETS, SWPPP OR ESCP AND INSPECTION REPORTS, AND EMERGENCY CONTACT PHONE NUMBERS. REFER TO SECTIONS 2.1, 2.8, AND 2.9

2. COVERED STOCKPILES:
REFER TO STOCKPILE MANAGEMENT A-ESCP.

3. CONSTRUCTION STORAGE CONTAINERS:
KEEP LIQUID POLLUTANTS AND MATERIALS NOT MEANT FOR OUTSIDE STORAGE. ALTERNATIVES INCLUDE STORING SUCH MATERIALS ON SECONDARY CONTAINMENT WITH WEATHERPROOF COVER. REFER TO SECTIONS 2.2 AND 2.3.

4. STABILIZED CONSTRUCTION ENTRANCE
REFER TO SECTION 2.4.

5. WASHOUT
CONCRETE, PAINT OR OTHER RINSE WATERS. REFER TO SECTION 2.5.

6. SANITATION FACILITIES
REFER TO SECTION 2.6.

7. WASTE DISPOSAL CONTAINERS
REFER TO SECTION 2.7.
8. VEHICLE STORAGE AND MAINTENANCE
REFER TO SECTION 2.10.

9. PERIMETER CONTROL
SILT FENCE (SE-1), FIBER ROLL (SE-5), GRAVEL BAG BERM (SE-6) OR OTHER FUNCTIONING ALTERNATIVE.

10. AIR POLLUTION CONTROL/STABILIZED ROADWAY
CONTROL ALL AIRBORNE POLLUTANTS AT ALL TIMES AND MAINTAIN GRAVEL SURFACE TO SUPPORT CONSTRUCTION TRAFFIC WITHOUT TRACKING OR SEDIMENT LADEN DISCHARGE. REFER TO SECTION 2.11.

NOT TO SCALE

Planning-Engineering-Surveying-SWPPP
BT Consulting Incorporated
phone: (530) 672-2316 www.gobtc.net
P.O. Box 304 Shingle Springs, CA 95682

TYPICAL BMP USE DETAIL

A-ESCP - GOOD HOUSEKEEPING

GH-01

Attachment B PG&E Best Management Practice (BMP) Cut-sheets

The following BMP Fact Sheets are included in the Plan by reference only and can be found in Appendix C of the Field Manual. A full version of the Field Manual that includes the cut-sheets is located on SharePoint.

EC-2	Preservation of Existing Vegetation
EC-6	Straw Mulch
EC-7	Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
EC-16	Non-Vegetative Stabilization
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-7	Street Sweeping and Vacuuming
SE-10	Storm Drain Inlet Protection
NS-3	Paving and Grinding Operations
NS-9	Vehicle and Equipment Fueling
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
TC-3	Tire Wash
WM-1	Material Delivery and Storage
WM-2	Material Use
WM-3	Stockpile Management
WM-4	Spill Prevention and Control
WM-5	Solid Waste Management
WM-6	Hazardous Materials and Waste Management
WM-7	Contaminated Soil Management
WM-8	Concrete Waste Management
WM-9	Sanitary/Septic Waste Management
WM-10	Liquid Waste Management

Attachment C Requirement Summary Table

Good Housekeeping

Best Management Practices to Reduce Environmental Impacts

Good Housekeeping practices apply to all PG&E projects throughout the year. Employees and Contractors shall follow good housekeeping Best Management Practices (BMPs) to protect storm water runoff from construction associated chemicals and/or pollutants and to maintain a clean construction site. Additional detail is provided in the Good Housekeeping Activity Specific Erosion and Sediment Control Plan (A-ESCP).

No.	Good Housekeeping Requirement	A-ESCP Section
1	Inventory products and materials and consider delivery, storage, spill prevention, and cleanup requirements.	2.1
2	Use effective BMPs to reduce or prevent pollutants in all water discharges.	2.1
3	Minimize the amount of hazardous materials at the site and store hazardous liquids, wastes, and all chemicals in watertight containers with appropriate secondary containment to prevent any spillage or leakage, or store in a completely enclosed storage shed.	2.2
4	Cover liquid pollutant containment BMPs prior to rain, at the end of each day, and during non-work days.	2.2
5	Do not mix wastes and/or hazardous materials.	2.2
6	Minimize exposure of materials that have potential to emit pollutants to precipitation.	2.3
7	Install, monitor, and maintain a stabilized entrance/exit, ensure that traffic uses the stabilized entrance/exit and monitor adjacent roadways for tracking.	2.4
8	Do not allow rinse or wash water (concrete rinse, paint wash, etc.) to contact the ground and/or paved surfaces nor allow rinse or wash water to be directed or dumped into any drain inlet or surface water and properly dispose of all rinse and/or wash water.	2.5
9	Properly locate, secure, and maintain sanitation facilities which includes providing a spill/leak tray.	2.6
10	Cover waste disposal containers at the end of each day and prior to and during precipitation.	2.7, 2.10
11	Monitor, maintain, and prevent discharges from waste disposal containers to the storm drain system or surface waters.	2.7
12	Contain and protect stockpiled waste materials.	2.7, 2.10
13	Keep spill cleanup kits on-site, with fueling and maintenance vehicles, and accessible at all times and train all personnel with regard to the location, use, and contents of the spill kit(s). If safe, stop and clean spills (with absorbents) immediately, notify the Environmental Field Specialist (EFS), dispose of materials properly, and cover the spill or contaminated area prior to precipitation.	2.8, 2.9, 2.10
14	Properly maintain vehicles, clean leaks immediately, and dispose of materials properly. Fuel and maintain vehicles and equipment in a proper, designated area and monitor the area regularly.	2.10
15	Control dust and other airborne pollutants and respond quickly to airborne pollutant observation. Provide a water truck if there is potential for dust and cover or wet stockpiles that have potential for wind erosion.	2.11
16	Monitor BMPs daily during construction activity and repair, replace, and/or maintain BMPs to correct any deficiencies.	3.0
17	Upon completion, remove temporary, non-biodegradable BMPs and equipment from the site. Clear debris, construction materials, and contaminants and return drainage ways to their pre-construction line and grade, and cover disturbed soil areas with a combination of temporary and permanent vegetative stabilization measures.	5.0

Stockpile Management

Activity Specific Erosion and Sediment Control Plan
(A-ESCP)

For questions or concerns, please contact your assigned PG&E Environmental Field Specialist (EFS)

Prepared by:
PG&E Construction Stormwater Group

March 2017

TABLE OF CONTENTS

Attachments

References

Referenced BMP Fact Sheets

EC-3	Temporary Hydraulic Mulch
EC-5	Soil Binders
EC-6	Straw Mulch
EC-7	Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
EC-9	Earth Dikes and Drainage Swales
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
WE-1	Wind Erosion Control
WM-3	Stockpile Management
WM-5	Solid Waste Management
WM-7	Contaminated Soil Management
WM-8	Concrete Waste Management

1.0 WHAT IS STOCKPILE MANAGEMENT?

1.1 Introduction

Stockpile management includes Best Management Practices (BMPs) to minimize erosion and sediment transport originating from stockpiles.

All PG&E Project Teams, Crews, and Subcontractors are **required** to be familiar with the information contained within this A-ESCP

Stockpiles may include, but are not limited to, the following materials: soil, aggregate base, construction debris, demolition debris, any metal debris, or a combination thereof.

GOAL: Prevent rainfall from contacting stockpile materials and transporting sediment and other pollutants offsite or to surface waters.

Sediment in stormwater is pollution!

1.2 Requirements for All Stockpiles

- Have BMP materials on site **before** rain events!
- Stockpile protection must take place year-round
- Perimeter controls must be installed around stockpiles (may include earthen berms, straw wattles, or silt fence)
- Cover soil stockpiles with soil binders (such as Gorillasnot) or plastic sheeting
- Locate stockpile away from drainage systems such as swales and drainage inlets

1.3 Planning for Work Involving Stockpiles

- If using soil binders, ensure binders and a water source are present on site at all times during the project including a water truck or water buffalo used to spray the stockpiles.
- If using plastic sheeting, ensure plastic sheeting and associated tie down materials are available on site at all times.

1.4 Definitions

High Risk Stockpiles Specific types of stockpiles that require additional protection because they contain any of the following materials: contaminated soil (TPH, PCBs, etc.), Portland cement, concrete rubble, fly ash, stucco, hydrated lime, and cut back or cold mix asphalt. Specific management for these and similar materials are located in Section 2.2.

Active Stockpiles Active stockpiles are defined as scheduled to be used or accessed within 14 days.

Inactive Stockpiles If a pile is not scheduled to be used within 14 days, it immediately becomes inactive and must be stabilized.

Soil Binders Soil binders are glue-like products sprayed onto soil stockpiles and is the preferred method to stabilize stockpiles. Soil binders may be combined with hydromulch per the manufacturer's specifications. Many soil binders require a minimum curing time to be fully effective and typically need at least 24 hours to cure prior to a rain event. Do not use soil binders within 100' of any surface water source, including diches and storm drain inlets without contacting your assigned EFS.

Plastic Sheeting Plastic sheeting is a rolled product held down using ropes or other means to cover stockpiles. Plastic sheeting should be avoided when possible as it is hard to manage, increases runoff, breaks down quickly in sunlight, and can become airborne during high winds causing damage to power lines and other substation equipment.

2.0 STOCKPILE MANAGEMENT PROCEDURES

The following procedures are intended to address activities related to most stockpile management situations. Although your project may not include all such activities, the project shall follow the procedures contained within this section that apply to your project.

2.1 Active and Inactive Stockpiles

Requirements:

- Inactive stockpiles must be stabilized **at all times.**
- All active stockpiles must be stabilized prior to and during a rain event

Protect From Rain

- Stockpiles must be stabilized to protect from rainfall (splash) erosion, and surface flow erosion.
- Stabilization materials include:
  - Soil Binders (EC-5), or combined with Temporary Hydraulic Mulch (EC-3) if necessary
  - Plastic Covers (EC-7)
  - Erosion Control Blankets (EC-7)

Stockpile Perimeter Controls

- All stockpiles should be protected with perimeter controls such as:
  - Silt Fences (SE-1)
  - Fiber Rolls (SE-5), commonly called Straw Wattle
  - Gravel Bag Berms (SE-6)
  - Earth Dikes and Drainage Swales (EC-9)
- Provide a minimum 50' separation from concentrated flows of stormwater, drainage courses, and storm drain inlets. If space is limited to less than 50', provide additional diversion or protection adjacent to the concentrated flow.

Protect From Wind

- In windy areas for stockpiles susceptible to wind erosion, stockpiles should be securely and temporarily stabilized at the end of every day, and kept wet during working hours to minimize wind erosion. **Do not apply so much water that runoff occurs.**
- Consider if plastic sheeting may come into contact with electrical equipment if it dislodges from the stockpile, and use alternatives if necessary.

Example Photos

Figure 1. Cover pulled back for access during use

Figure 2. Soil binder and mulch application prior to rain

Figure 3. Stockpile stabilized with soil binder and temporary hydraulic mulch

Figure 4. Stockpile stabilized with erosion control blanket

2.2 High Risk Stockpiles

Description:

High risk stockpiles may include visible and non-visible pollutants including, but not limited to:

- Concrete (pH and metals) and asphalt (petroleum) rubble
- Contaminated soil (TPH, PCBs, etc.)
- Cold mix asphalt, aka “cut-back” (petroleum based contaminates)
- Hazardous construction materials
  - Construction waste such as retired transformers
  - New construction materials waiting for installation such as liming agents or gypsum
- Treated wood waste (TWW)
- Soil amendments
  - Fly ash or Hydrated lime
- Fertilizers (ammonium nitrate, urea, anhydrous ammonia, etc.)

Requirements:

High risk stockpiles require additional considerations, some of which include:

- Placing stockpiles in areas that will not have any run-on. If such a location is unavailable, protect from run-on using a diversion ditch or gravel bag berm;
- Containing any possible run-off from the pile by creating a berm or basin to collect stormwater runoff downslope of the stockpile;
- Containing any runoff from piles likely to include non-visible pollutants prior to leaving the project site. If run-off cannot be contained, contact the EFS and collect samples of the runoff for laboratory analysis;
- Bagging and placing contaminated materials on pallets to be stored under cover until they can be moved to a legal collection facility, if possible; and
- Place stockpile on an impervious surface such as pavement, trench plate, or plastic sheeting.

<u>Example Photos</u>

Figure 5. Contaminated stockpile under cover

Figure 6. Concrete rubble stockpile in need of cover

2.3 Where to Obtain BMP Materials

BMP products should be obtained through PG&E materials warehouses using project order numbers and established materials codes. Should the materials be unavailable from PG&E warehouses, BMP materials and products shown below can be obtained from sources shown, but may be obtained elsewhere depending on location and urgency of need.

TABLE 1
BMP PRODUCTS INFORMATION

Category	Product Name	Units
Hydraulic Mulch (EC-3)	Flexterra FGM	Bales
Soil Binders (EC-5)	Soiltac, Gorillasnot	5 gallon buckets
Straw Mulch (EC-6)	Certified Weed-Free Straw	Bales
Geotextiles and Mats (EC-7) Geotextile Fabric	Mirafi 600	Rolls: 12.5' x 360' 17.5' x 238'
Geotextiles and Mats (EC-7) Jute Mat	Eco-Jute	Rolls: 4' x 225'
Geotextiles and Mats (EC-7) Plastic Sheeting	Visqueen	Rolls: 20 or 40'x 100'; 10ml thick
Silt Fence (SE-1)	Caltrans Grade Silt Fence	100 feet with 36-inch wood posts at 6 foot spacing
Fiber Roll (SE-5)	Curlex Sediment Log Type II	25 foot rolls x 6" or 9" diameter
Gravel Bags (SE-6)	Roc Soc or Monofilament Bags	Each
3/8" Nylon Rope	3/8" Nylon Rope	100' or 500'

Example suppliers include Reed & Graham, White Cap, and Curlex. Other options may include feed stores, retail building supply stores, or hardware stores. If you are still having trouble contact your project EFS for assistance.

3.0 INSPECTION AND MAINTENANCE REQUIREMENTS

- It is required that at a minimum, active stockpiles be inspected weekly, prior to forecast rain events, daily during extended rain events, and after the conclusion of rain events.
- During certain conditions it may be necessary to inspect stockpiles covered with plastic sheeting or rolled product more frequently (for example, high winds or extreme heat).

- Repair, re-apply, and/or replace linear sediment barriers, stabilization, and/or covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the perimeter control height.
- Contaminated soil stockpiles or stockpiles with the potential to discharge visible and/or non-visible pollutants offsite should be inspected for signs of potential contaminate or pollutant discharge.
  - Should a discharge be observed that is likely to contain pollutants, notify the EFS for sampling requirements.
- If spilled or leaking hazardous materials contact soil stockpiles, implement appropriate spill control equipment and procedures to completely clean up the pollutant to prohibit additional soil contamination or pollutant discharge from the site. If the extent of the impact of the pollutant is unknown, contact your EFS as soil testing may be necessary.

4.0 TROUBLESHOOTING

Contact your local EFS if any of the following conditions occur:

- Visually cloudy/muddy water is observed leaving the work area;
- Observed sheen, discoloration, foam, odor, or other pollutant indicator;
- Hazardous substance(s) is/are discharged or spilled; or
- There is potential for a non-visible or any other pollutant discharge.

After hours, call: **(800) 874-4043.**

If the project receives a written notice or order from any regulatory agency, immediately contact your local EFS for further direction.

Troubleshooting Guide	
Field Condition – Stockpile Management	**Common Solutions Are:**
Soil stockpile erodes	Cover stockpile with plastic sheeting or spray with a soil stabilizer. Protect with a temporary perimeter sediment barrier around the stockpile
Stockpile is in flow line	Remove stockpile from drainage path or protect with a berm, dike, or temporary diversion device
Storm water run-on impacts the stockpile	Protect the stockpile by using temporary perimeter sediment barriers such as berms, dikes, silt fencing, or sandbags
Wind causes erosion and or blowing dust	Cover stockpile or spray with a soil stabilizer. Use a water application to suppress dust
Field Condition – Soil Binders	**Common Solutions Are:**
Slope was improperly dressed before application	Roughen embankment and fill areas by rolling with a crimping or punching type roller or track walking where rolling is impractical. Pre-wet the areas of application.

Troubleshooting Guide	
Coverage is inadequate	Follow recommended application rates. Count the number of bags of the product to ensure the correct amount of material is implemented. Reapply to the areas
Sprayed areas degrade or become ineffective	Follow recommended application rates. Consider other or additional BMPs. Reapply binder as necessary
Sprayed slope has spot failures	Repair slopes and re-spray damaged areas
Portions of the sprayed area have been disturbed	Keep workers and equipment off sprayed areas. Repair and re-spray areas that have been damaged
Binder fails to penetrate soil	Roughen soil and pre-wet to manufacturer's recommendations. Reapply to areas where necessary
Soil binder is washed off slope	Allow at least 24 hours for the materials to dry before a rain event. Follow manufacturer's recommendations. Reapply as necessary
Excessive water flows across stabilized surface.	Use other BMPs to limit flow onto stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows
Field Condition – Erosion control blankets	**Common Solutions Are:**
Improper anchoring	Dig trench along the top and bury the blankets. Use staples to anchor according to manufacturer's recommendations
Undercutting due to inadequate preparation	Prepare the soil surface. Remove rocks, clods and other obstructions. Fill in rills in uneven areas to promote good contact between mat and soil
Excessive water flow across stabilized surface	Use other BMPs to limit flow onto stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows
Field Condition – Straw wattle	**Common Solutions Are:**
Runoff flows under the fiber roll or daylight shows under fiber roll	Trench-in rolls to a depth of 4 in and stake. Place compacted soil along the uphill side of the fiber roll
Runoff flows between fiber rolls	Ensure that fiber rolls are butted tightly together and staked
There is excessive sediment accumulation	Remove accumulated sediment. Apply soil stabilization measures to contributing areas
Field Condition – Wind Erosion	**Common Solutions Are:**
Excessive dust leaves the site	Increase frequency of water application. Consider using a palliative or binder on inactive areas
Watering for dust control causes erosion	Reduce water pressure on the water truck. Check watering equipment to ensure that it has a positive shutoff. Water less frequently
Sprayed areas are ineffective at limiting dust	Re-spray areas and ensure that the application rate is proper

5.0 POST-CONSTRUCTION

Upon completion of construction within the project area:

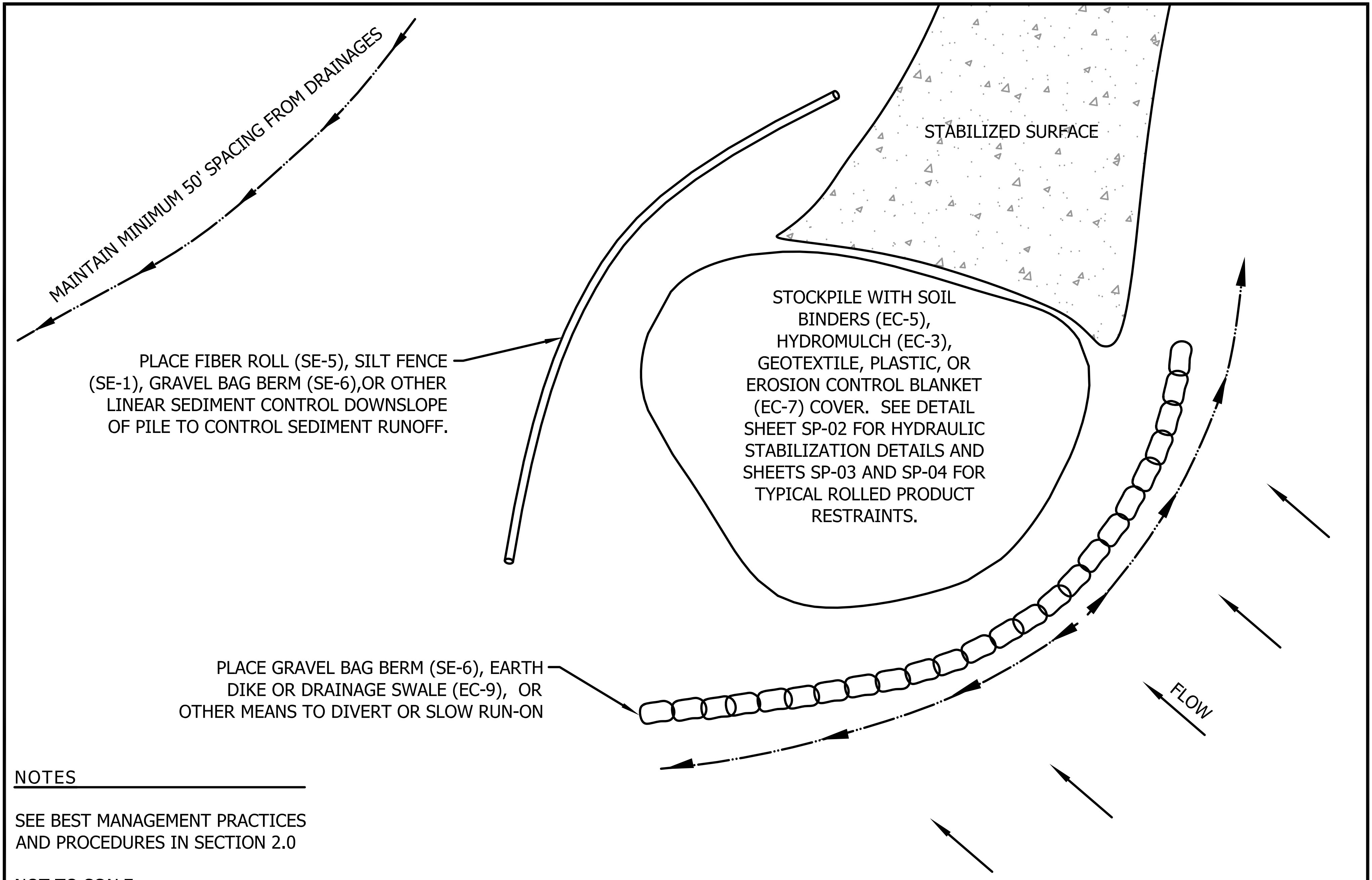
- Remove all temporary, non-biodegradable BMPs;
- Remove all construction equipment from the site;
- Clear all staging areas of any debris, construction materials, and contaminants;
- Return all drainage ways affected by any stockpiles or stockpile to their pre-construction line and grade; and
- Cover disturbed soil areas with temporary and/or permanent stabilization.

Attachment A Activity Specific Installation Details

The following installation details are included to illustrate installation techniques. It is noted that specific installation of any facility must consider the restrictions of the installation site, and that modifications to the following may be required given local conditions.

The following details are included in this Plan

SP-01 Typical Stockpile Placement
SP-02 Hydraulic Stabilization
SP-03 Typical Plastic or Fabric Cover Restraints



NOTES

SEE BEST MANAGEMENT PRACTICES AND PROCEDURES IN SECTION 2.0

NOT TO SCALE

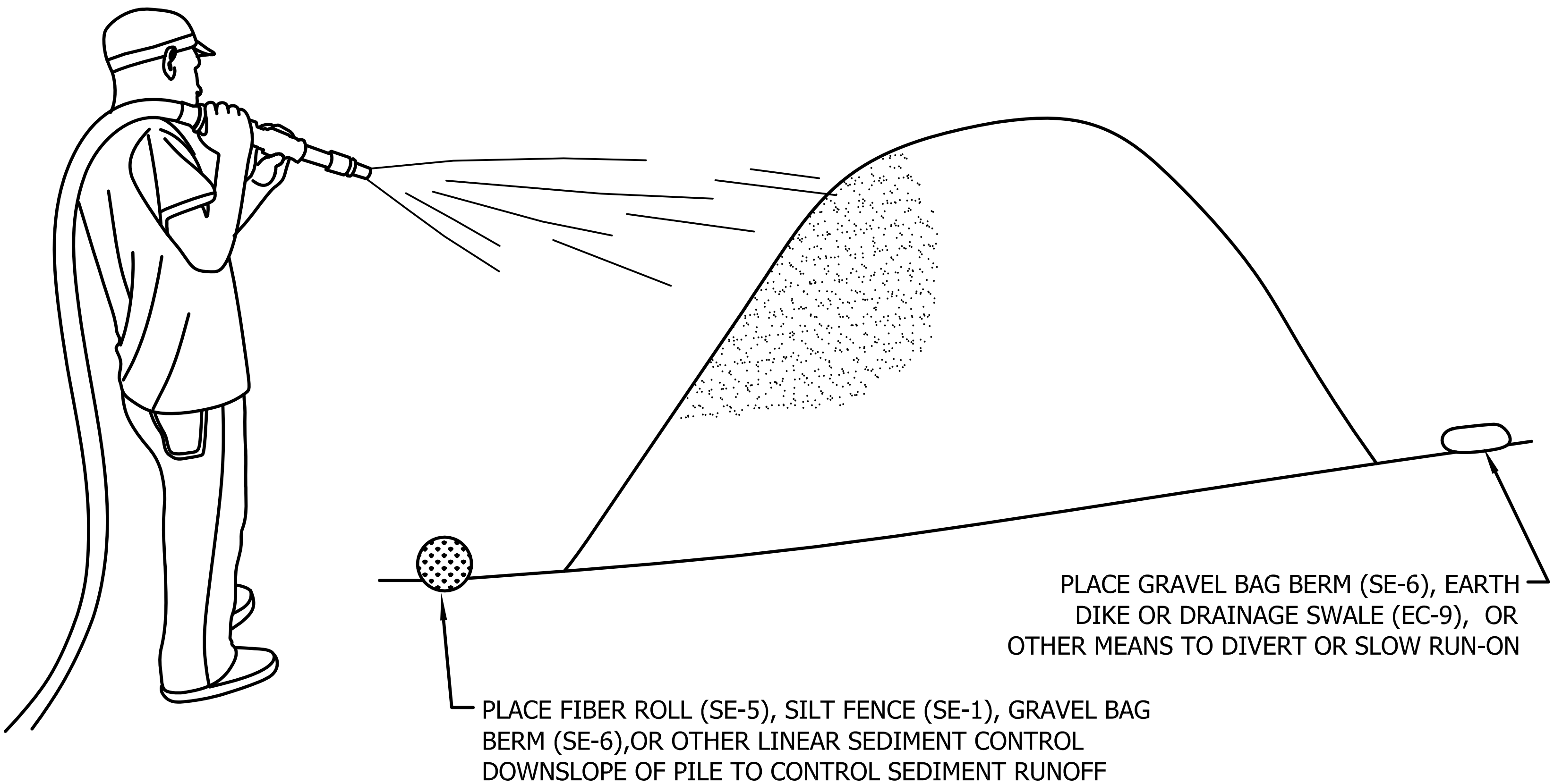
Pacific Gas and Electric Company

TYPICAL STOCKPILE PLACEMENT

A-ESCP - STOCKPILE MANAGEMENT

SP-01

PRODUCT	DURATION	APPLICATION RATE	DILUTION RATE	NOTES
SOILTAC	6 MONTHS	1 GAL / 220 S.F.	9 PARTS WATER TO 1 PART PRODUCT	APPLY IN 2 PASSES
FLEXTERRA FGM	6 MONTHS	1 BALE / 800 S.F.	1 BALE TO 125 GAL WATER	SPECIAL EQUIPMENT / VENDOR REQUIRED



NOTES

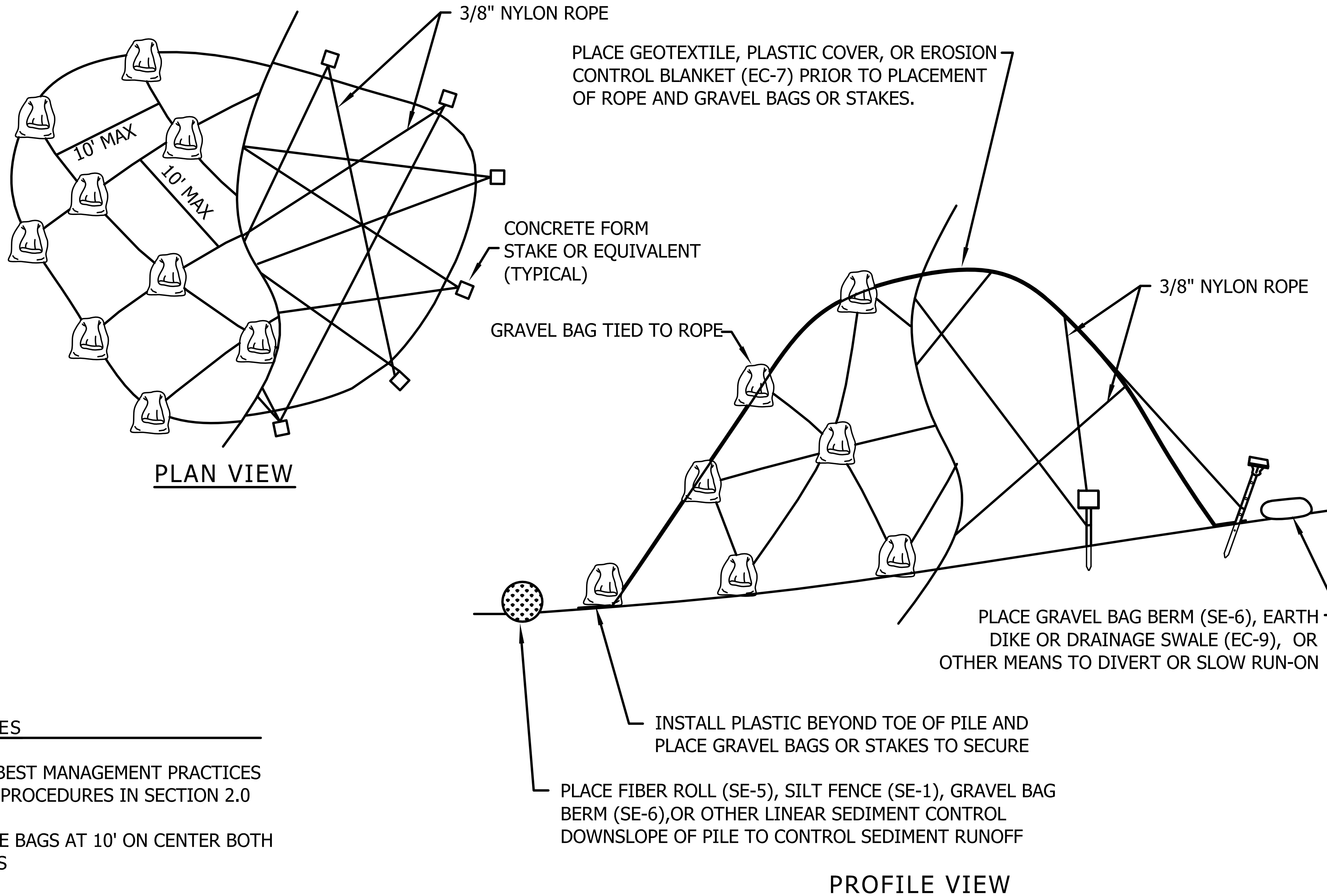
1. SEE BEST MANAGEMENT PRACTICES AND PROCEDURES IN SECTION 2.0.
2. SPRAY FROM MULTIPLE DIRECTIONS TO AVOID SHADOWING.
3. FOLLOW MANUFACTURERS MIXING AND APPLICATION GUIDES.
4. ENSURE THE PRODUCT IS APPLIED WITH ADEQUATE TIME TO CURE.
5. IF SOIL BINDERS ARE USED IN ON-SITE WATER TRUCKS OR TRAILERS, MAKE SURE TO CLEAN ALL BINDER RESIDUE FROM EQUIPMENT AFTER SPRAYING.

Pacific Gas and Electric Company

HYDRAULIC STABILIZATION

SOIL BINDER OR HYDROMULCH
A-ESCP - STOCKPILE MANAGEMENT

SP-02



NOTES

SEE BEST MANAGEMENT PRACTICES AND PROCEDURES IN SECTION 2.0

PLACE BAGS AT 10' ON CENTER BOTH WAYS

NOT TO SCALE

Pacific Gas and Electric Company

PLASTIC OR FABRIC COVER

GRAVEL BAG OR CONCRETE FOR STAKES AND ROPE
A-ESCP - STOCKPILE MANAGEMENT

SP-03

Laydown/Staging Area Construction

Activity Specific Erosion and Sediment Control Plan
(A-ESCP)

If Cumulative Soil Disturbance Changes,
Contact PG&E Environmental Operations - Environmental Field Specialists (EFS)
For Re-Evaluation of Storm Water Protection Needs

Prepared by

PG&E Storm Water Program Group

January 2011

TABLE OF CONTENTS

Attachments

1.0 WHAT IS COVERED UNDER THIS A-ESCP?

1.1 Laydown/Staging Area Construction

This Activity Specific Erosion and Sediment Control Plan (A-ESCP) is applicable to routine laydown/staging area construction activities that are not near sensitive habitat, surface waters or wetlands, or located along steep slopes. If you encounter one of those conditions, contact your local Environmental Field Specialist (EFS). This A-ESCP sets forth minimum Best Management Practices (BMPs) for laydown/staging area construction.

1.2 Project Activities

Typical activities performed might include the following:

- Trim vegetation as needed to clear work area
- Mobilize equipment and materials
- Blade to establish level base
- Install perimeter fencing
- Install gravel at entrance/exit and/or laydown surface
- Demobilize

1.3 Site Conditions Not Covered in this A-ESCP

This is a small project that should not include nearby site conditions such as:

- Nearby water bodies
- Wetlands/vernal pools
- Environmentally sensitive areas or protectable vegetation
- Steep slopes

Should any of these conditions be visible or become apparent in the near vicinity during mobilization activity, contact your local EFS for further direction.

1.4 Scheduling BMP Installation

Planning for storm water pollution prevention is required for all PG&E construction and maintenance projects throughout the year. However during the dryer summer months between June and September, for short duration projects (projects less than one week in duration), erosion and sediment control BMPs may not have to be implemented unless there is a possibility of precipitation. Storm water pollution prevention planning must be done prior to starting the project and erosion and sediment control BMPs must be on hand in the event there is a sudden rain event, but only need to be deployed if precipitation occurs. Good housekeeping and tracking control BMPs must be implemented for all projects, regardless of time of year.

For longer duration projects, and all small construction projects from October to May, BMPs shall be installed prior to the soil disturbing activities, maintained during soil disturbing activities and removed at the conclusion of soil disturbing activities.

2.0 BEST MANAGEMENT PRACTICES

The purpose of this A-ESCP is to specify appropriate stormwater BMPs for laydown/staging area construction. It is recommended that construction activities are scheduled to minimize soil disturbing activities during rain events.

The BMPs for the project should be installed in areas similar to those shown on the Typical BMP Installation Map; Attachment A.

Detailed cut-sheets on each BMP are provided in Attachment B.

In addition to the activity specific erosion and sediment control BMPs recommended in this A-ESCP, good housekeeping BMPs should be followed to minimize contamination of stormwater runoff with construction associated chemicals and to maintain a clean construction site (refer to the Good Housekeeping A-ESCP).

2.1 Where to Obtain BMP Materials

BMP products in Table 1 can be obtained through PG&E materials warehouses using project order numbers and established materials codes.

TABLE 1
BMP PRODUCTS INFORMATION

Category	Supplier	Product Name	Units
Certified Weed-Free Straw Mulch (EC-6)	Reed & Graham	Weed-Free Straw	Bales
Geotextiles and Mats (EC-7) Geotextile Fabric	Reed & Graham	Mirafi 600	Rolls: 12.5' x 360' 17.5' x 238'
Geotextiles and Mats (EC-7) Jute Mat	Reed & Graham	Eco-Jute	Rolls: 4' x 225'
Geotextiles and Mats (EC-7) Plastic Sheeting	Reed & Graham	Visqueen	Rolls: 20 or 40'x 100'; 10ml thick
Silt Fence (SE-1)	Reed & Graham	Caltrans Grade Silt Fence	100 feet with 36-inch wood posts at 6 foot spacing
Fiber Roll (SE-5)	Curlex	Sediment Log Type II	25 foot rolls x 6 or 9" diameter
Gravel Bags (SE-6)	Reed & Graham	Roc Soc	mono filament
Inlet Protection (SE-10) Gravel Bag	Reed & Graham	Same as SE-6	
Inlet Protection (SE-10)	Curlex	Same as SE-5	

2.2 Erosion Control

Erosion control practices consist of source control measures designed to prevent soil particles from becoming dislodged and transported in storm water runoff.

Soil-disturbing activities will be addressed as follows:

TABLE 2

BMP Number	BMP Name
EC-2	Preservation of Existing Vegetation
EC-7	Geotextiles and Mats
EC-16	Non-Vegetative Stabilization

For BMP installation procedures refer to the cut-sheets in Attachment B.

EC-2 Preservation of Existing Vegetation

Vegetation is one of the most effective erosion controls. Protecting existing vegetative cover on the site is a cost-effective, beneficial erosion control measure. For small construction projects, preservation of existing vegetation is most easily accomplished by limiting the work area and disturbed soil areas to the extent practicable. Details for implementation of this BMP are in the cut-sheets found in Attachment B. Key points are:

- Install fencing, barriers, or other markings to delineate vegetated areas to be preserved
- Suitable areas include but are not limited to: slopes, areas on site where no construction activity is planned, and areas near watercourses
- Locate staging and laydown areas outside of the drip line of existing trees
- Remove any fencing, barriers, or markings after the project is completed

Preserve vegetation between construction areas and sensitive areas whenever possible.

Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities.

EC-7 Geotextiles and Mats

Geotextiles and mats come in many different types. This plan covers the use of three types:

- Geotextile fabrics – for shielding soil from flowing water
- Plastic sheeting – for covering stockpiles from rain impacts
- Jute mats – for shielding soil from rain impacts on steep slopes and embankments

Geotextile Fabrics – Geotextile fabrics are used to protect soil from flowing water. Fabric is laid over the soil in areas where the flowing water is concentrated and moving fast enough to cause erosion. Details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Can be used on slopes or in channels
- Must prepare the site to ensure complete contact of the fabric with the soil
- Should be installed vertically down-slope and overlapped
- Must be properly anchored using anchor trenches and pins/nails
- Can be left in place at the end of the project if it is covered by rock or gravel, otherwise it should be removed

Plastic Sheeting – Generally, plastic sheeting should be used only as a covering for stockpiles or for very small graded areas for short periods of time (e.g., to protect against an imminent storm). Details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Plastic sheeting should have a minimum thickness of 6 mils
- Secure with gravel bags or other weights placed no more than 10 ft apart
- Inspect frequently because plastic degrades quickly and is easily damaged by wind
- Keep secure so fragments will not be blown into electrical equipment
- Must be removed at the end of the project

Plastic sheeting over stockpiles properly and improperly secured.

Jute Mats – Jute is used mostly to protect slopes and embankments. It is made of natural fiber and can be left in place at the completion of the project to maintain protection of slopes until vegetation is reestablished. Jute is less effective than geotextiles and is usually used in conjunction with vegetation. The details of installation are the same as geotextile fabrics.

Jute mat used to protect soil on slope and embankment.

<u>EC-16 Non-Vegetative Stabilization (Gravel)</u>

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas where vegetative options are not feasible due to proposed use, soil/climate conditions, time constraints, or other factors. There are many methods of non-vegetative stabilization. This section covers gravel mulch. Also see previous discussion of geotextiles and mats, above.

Gravel mulch is a non-degradable erosion control product, as opposed to degradable straw and wood mulch, composed of washed and screened coarse to very coarse gravel. Details of installation and practices are provided on the cut-sheets in Attachment B. Key points are:

- Gravel should be sized based on slope, rainfall, and upgradient run-on conditions. Inadequately sized gravel mulch may wash away with runoff
- Should be installed at a minimum 2” depth
- If permanent, a weed control fabric should be placed prior to installation

Gravel stabilization being installed.

2.1 Sediment Controls

Sediment controls filter storm water and trap soil particles before they move offsite. Table 3 has a selection of BMPs used to filter storm water.

TABLE 3

BMP Number	BMP Name
SE-1	Silt Fence
SE-6	Gravel Bag Berm
TC-1/2	Stabilized Construction Entrance/Exit/Roadway
WM-3	Stockpile Management
WM-8	Concrete Waste Management

For BMP installation procedures refer to the cut-sheets in Attachment B.

SE-1 Silt Fence

Silt fence is one of the most commonly used BMPs. It traps sediment by intercepting and detaining small amounts of sediment laden sheet flow runoff from disturbed areas to promote sedimentation behind the fence. It can be used in the following applications:

- Along the perimeter of a staging/laydown area
- Below the toe or down-slope of exposed erodible slopes
- Along drainage ways and channels to prevent sediment from entering these areas
- Around stockpiles

Details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Used principally in areas where sheet flow occurs
- Install along a level contour, perpendicular to slope, so water does not flow along fence causing a concentrated flow
- Provide room for runoff to pond behind fence
- Bury bottom of fencing material to prevent water from running underneath
- Overlap ends of fence so flow is not concentrated in gaps between adjacent sections
- Stakes should be on the down-slope side of the fence
- Turn the ends of the fence uphill to prevent storm water from flowing around fence

Silt fence reinforced with gravel bags.

SE-6 Gravel Bag Berm

Gravel bags are a good option for use in concentrated flow areas because their weight will keep them in place. Gravel bags can be formed into berms or check dams in channels. They may be suitable for:

- Diverting water running onto or off of the project site
- Slowing water on disturbed slopes
- Below the toe of slopes
- As sediment traps in channels
- Around temporary stockpiles including those on paved areas

The details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Installation can be labor intensive
- Degraded gravel bags may rupture when removed, spilling contents
- Easily damaged by construction equipment
- Must be removed at end of project

Gravel bags used to slow sheet flow run-on into the lined swale, and as check dams to slow flow within the swale.

2.2 Tracking Controls

Tracking of mud and dirt onto public roads must always be controlled at construction sites. Access roads, parking lots, and other onsite vehicle transportation routes should be stabilized after they are graded if they will be used during or after periods of rain. The tracking control measures are:

TABLE 4

BMP Number	BMP Name
TC-1/2	Tracking Control

For BMP installation procedures refer to the cut-sheets in Attachment B.

<u>TC-1/TC-2 Tracking Control</u>

Tracking of mud and dirt onto public roads must always be controlled at construction sites. Access roads, parking lots, and other onsite vehicle transportation routes should be stabilized after they are graded if they will be used during or after periods of rain.

Tracking controls consist of preventing or reducing the tracking of sediment off-site by vehicles leaving the construction area. Tracking control BMPs include TC-1 Stabilized Construction Entrance/Exit and TC-2 Stabilized Construction Roadway. Details of tracking control BMPs are in the cut-sheets found in Attachment B.

Tracking control is important for any construction project large or small. Track-out of mud, rock, or dirt onto paved streets is visible to the public and any city or county staff will identify this as a storm water violation. Pictured below is an example of a construction entrance/exit that is well maintained in which no muddy wheel tracks are visible on the pavement.

Clean and well maintained construction entrance/exit.

Depending on the size of your project, tracking control can be accomplished in various ways. If you are working on a very small, short duration project, tracking control can be as simple as sweeping during and at the end of the day. Sites that have a construction entrance/exit that transitions from dirt to pavement may require more attention. Pictured here is an example of a construction entrance before and after stabilization.

Construction entrance/exit before and after installation.

Larger sites may require the use of temporary construction roadways. Temporary roads should follow the contours of the natural terrain to the maximum extent possible. Roadways should be graded to prevent runoff from leaving the construction site. Drainage should flow across the roadway width to one or both sides of the roadway, where a trench may be dug and stabilized to direct concentrated flow or a gravel bag berm may be installed along the perimeter of the road.

Make the tracking control fit the size of the project.

2.3 Good Housekeeping BMPs

Good housekeeping covers general practices that keep a construction site clean and neat. It also designates specific areas where such things as refueling can be done safely so that any incidental spills will not end up in storm water runoff from the site. The good housekeeping practices covered in this plan are:

TABLE 5

BMP Number	BMP Name
WM-3	Stockpile Management
WM-8	Concrete Waste Management

WM-3 Stockpile Management

Stockpile management procedures are designed to reduce or eliminate air and storm water pollution from soil, paving and construction materials stockpiles. Details for implementing stockpile management practices are on the cut-sheets provided in Attachment B. Stockpile management requirements include:

- Protection of stockpiles must be implemented during the entire year, not just during the rainy season
- All stockpiles should be covered prior to the onset of rain and in windy conditions
- Protect the perimeter of stockpiles from storm water run-on
- Inspect frequently because plastic degrades quickly and is easily damaged by wind
- Keep secure so fragments will not be blown into electrical equipment

Proper securing of plastic sheeting.

WM-8 Concrete Waste Management

Concrete waste can alter the chemical properties of stormwater; therefore it's important to manage concrete washout and cutting operations to minimize contact with site run-on and runoff. Where offsite washout of concrete wastes is not possible, designated on-site washouts should be provided. Details for implementing WM-8 Concrete Waste Management are provided on the cut-sheets found in Attachment B. Key points are:

- Contain wash out of concrete wastes to evaporate and properly dispose of solids
- Washout areas should be lined to protect the ground and constructed with sufficient volume to contain wastes, washout, and rainwater
- Do not allow excess concrete to be dumped onsite, except in designated areas
- Must have adequate volume so rain events do not overfill containment

Two alternatives for containing concrete washout water.


Adequate volume and maintenance are essential to prevent a release of high pH water from temporary concrete washout containments.

3.0 BMP INSPECTION AND MAINTENANCE

BMP installation, inspection and maintenance will be performed by the PG&E construction crew. BMPs should be inspected daily during construction activities. In the event that BMPs appear to require maintenance or are not functioning as expected, the BMP will be repaired or replaced to correct the deficiency.

4.0 WHOM TO CALL

If the project receives a written notice or order from any regulatory agency, contact your local EFS for further direction immediately.

Contact the local EFS if any of the following conditions occur:

- Visually cloudy/muddy water is observed leaving the work area
- Discharge or spill of hazardous substance

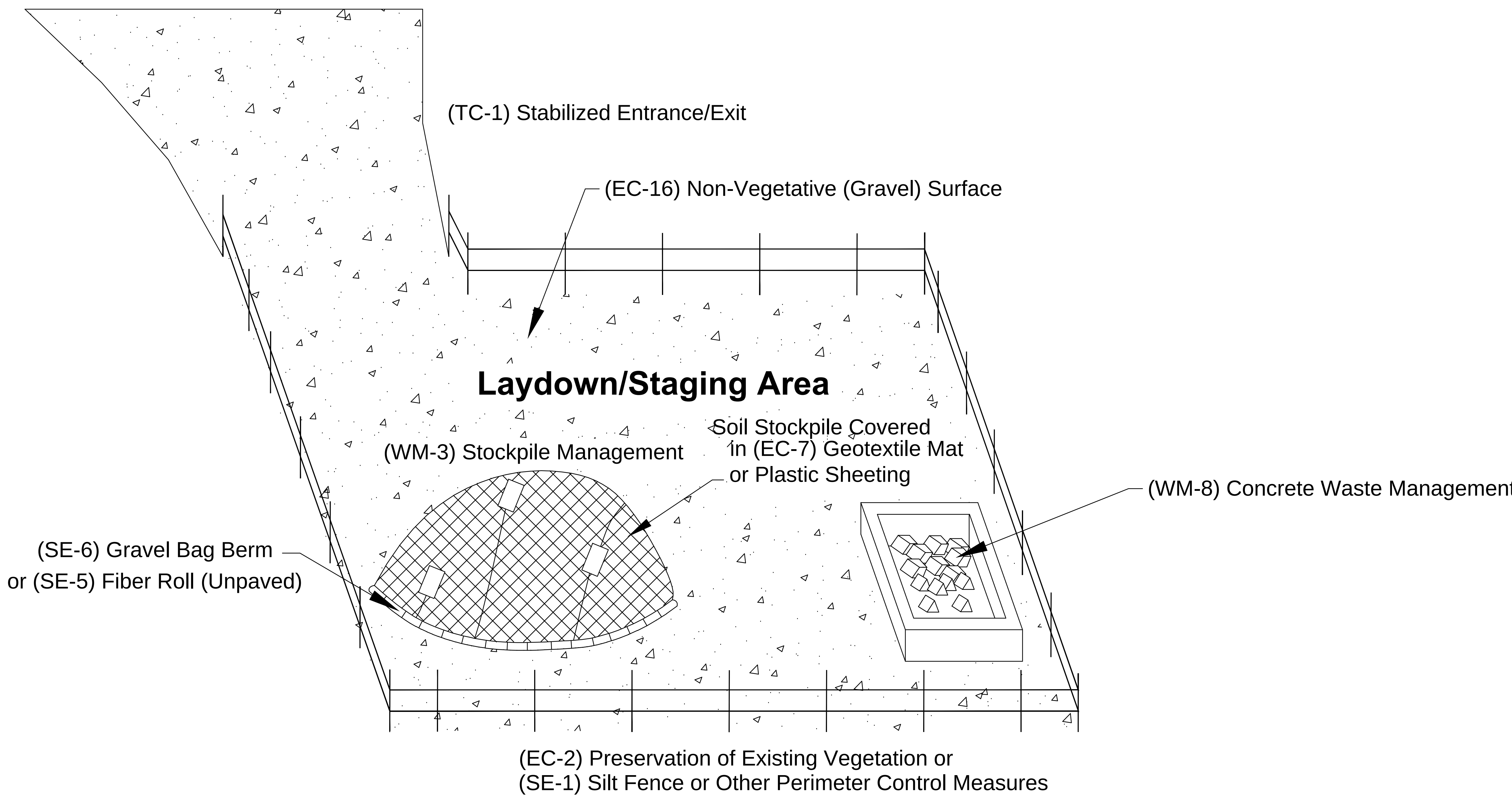
After hours or if the local EFS are unavailable, call the following 800 number:
800-874-4043.

Contact your local EFS if any release of fuels or waste occurs.

5.0 POST-CONSTRUCTION

Upon completion of construction within the project area, all temporary, non-biodegradable BMPs will be removed. All construction equipment will be demobilized and removed from the site.

Attachment A Typical BMP Installation Map



ETIC ENGINEERING

A-ESCP LAYDOWN/STAGING AREA TYPICAL BMP USE MAP
PACIFIC GAS AND ELECTRIC COMPANY

FIGURE:
1

Attachment B PG&E Best Management Practice (BMP) Cut-sheets

Cut-sheets for BMPs described in this A-ESCP are included in this attachment, as follows:

EC-2 Preservation of Existing Vegetation
EC-7 Geotextiles and Mats
EC-16 Non-Vegetative Stabilization
SE-1 Silt Fence
SE-6 Gravel Bag Berm
TC-1 Stabilized Construction Entrance/Exit
TC-2 Stabilized Construction Roadway
WM-3 Stockpile Management
WM-8 Concrete Waste Management

When

This BMP is applicable to projects when:

- There are areas onsite where no construction activity is planned or will occur later
- Areas to be preserved are in the immediate vicinity of the construction site. Mark as appropriate before clearing and grubbing or other soil disturbance activities begin
- Areas with vegetation that can be preserved to protect against soil erosion, such as on steep slopes, watercourses, and building sites in wooded areas
- Areas designated as Environmentally Sensitive Areas (ESAs), or where federal, state, or local government regulations require preservation, such as wetlands, vernal pools, marshes, etc. These areas are typically flagged by a qualified biologist

How

Use the following measures as applicable:

- Preserve existing vegetation whenever possible
- If necessary, contact the project Environmental Representative for clarification regarding areas to be preserved
- Whenever possible, minimize disturbed areas by locating temporary roadways to avoid stands of trees and shrubs, and follow existing contours to reduce cutting and filling
- Locate construction materials, equipment storage, and parking areas outside the drip line of any tree to be retained
- Consider the impact of grade changes to existing vegetation and the root zone
- Remove any markings, barriers, or fencing after project is completed

Maintenance and Inspection

To preserve vegetation, maintain the clearly marked limits of disturbance during construction.

- Routinely inspect barriers during construction
- Repair or replace barriers as needed during construction

Mark vegetated area to be preserved

This slope should have been protected and will now be susceptible to erosion.

Ensure that vegetation protection barriers are adequate in length and delineation.

When

Use the following methods when disturbed soils may be particularly difficult to stabilize or access, including the following situations:

- Steep slopes, generally steeper than 1:3 (V:H)
- Slopes where the erosion hazard is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop adequate protective cover
- Channels with high flows
- Channels intended to be vegetated
- Slopes adjacent to water bodies of Environmentally Sensitive Areas (ESAs)
- Blankets and mats are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (because staples and netting can catch in mowers)

Plastic results in 100 percent runoff; their use is limited to:

  - Covering stockpiles
  - Covering small graded areas for short periods, such as through an imminent storm event, until an alternative protection measure is implemented

How

Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil:

- Grade and shape the area of installation
- Remove all rocks, clods, vegetation, or other obstructions, so that the installed blankets or mats have complete, direct contact with the soil
- Prepare seedbed by loosening topsoil
- 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 before blanket installation, re-seed all check slots and other areas disturbed during installation. Where soil filling is specified, seed the matting and the entire disturbed area after installation and before filling the mat with soil
- Use u-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes to anchor mats and blankets to the ground surface
- Drive wire staples and metal stakes flush to the soil surface
- All anchors should be 6 inches to 18 inches long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils
- For installation on slopes, consult the manufacturer’s recommendations. Generally:
  - Begin at the top of the slope and anchor the blanket in a 6 inch deep by 6 inch wide trench. Backfill trench and tamp earth firmly

  - o Unroll the blanket down slope in the direction of water flow
  - o Overlap the edges of adjacent parallel rolls 2 inches to 3 inches and staple every 3 feet
  - o When blankets must be spliced, place blankets end-over-end (shingle style) with 6-inch overlap. Staple through overlapped area, approximately 12 inches apart
  - o Lay blankets loosely and maintain direct contact with the soil. Do not stretch
  - o Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Place staples down the center and stagger with the staples placed along the edges

- Remove and dispose of blankets and mats before applying permanent soil stabilization measures

Maintenance and Inspection

- Routinely inspect areas treated with temporary soil stabilization before and after significant forecasted storm events. Immediately repair any failures. Maintain areas treated with temporary soil stabilization to provide adequate erosion control. Re-apply or replace temporary soil stabilization on exposed soils when greater than 10 percent of the previously treated area becomes exposed or exhibits visible erosion
- If washout or breakage occurs, reevaluate the original materials installation. Repair damage to the slope or channel. If appropriate, re-install the material or implement a revised BMP

Several types of Erosion Control Blankets.

Remove all rocks, clods, vegetation, or other obstructions to install the blankets or mats.

Installed blankets or mats need to have direct contact with the soil in order to be effective.

Be sure to use enough staples to adequately secure the blankets or mats.

When

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths
- Temporary heliport pads
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish
- Areas where vegetation will not grow adequately within the construction time frame

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

- **Decomposed Granite** is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface. This material is most often used for roadways and walkways
- **Degradable Mulches** of various types can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips, or hydraulic mulch
- **Geotextiles and Mats** can be used for temporary non-vegetative stabilization; an example includes items such as jute netting. These BMPs are typically manufactured from degradable or synthetic materials and are designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted
- **Gravel Mulch** is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel

See also EC-6 Straw Mulch, EC-7 Geotextiles and Mats, and EC-8 Wood Mulching.

How

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls, and sediment controls
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased

Jute Netting

- Used where project construction activities have exposed soils through the removal of existing vegetation and other permanent stabilization techniques such as revegetation, gravel or paving will not be implemented

- Used for additional stabilization in areas where it is expected that the native vegetation will re-establish itself over time
- Remove large clods of dirt and stones and do not over compact the soil
- If being used in conjunction with seeding (revegetation), seed mix and fertilizer (if used) should be applied before installing the jute netting
- On slopes:
    - Apply jute netting by unrolling it down the slope and terminate at level area
    - Secure jute at top by laying at least 6 inches of material below grade at least 6 inches deep
    - Fold 6 inches of netting under itself and secure with staples or stakes
- Secure with staples every 18 to 24 inches. The steeper the slope the closer the staples should be placed to each other
- Overlap all seams at least 2 to 6 inches

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base
- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall)
- If permanent, a weed control fabric should be placed prior to installation
- Should be installed at minimum 2 inch depth
- Should completely cover all exposed surfaces
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems

Rock Slope Protection

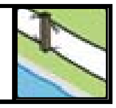
- When using rock slope protection, rock size and installation method should be specified by an engineer

Maintenance and Inspection

- For temporary and permanent installations, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization
- All damage should be repaired immediately
- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary to control run-on to stabilized areas

Place filter fabric down before installing gravel or decomposed granite for stabilization.

Compact gravel or decomposed granite for additional stability.



When

Silt fences are temporary linear sediment barriers of permeable fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff. Silt fences allow sediment to settle from runoff before water leaves the construction site.

Silt fences are placed:

- Below the toe of exposed and erodible slopes
- Down slope of exposed soil areas
- Around temporary stockpiles
- Along streams and channels
- Along the perimeter of a project

How

Construct silt fences with a setback of at least 3 feet from the toe of a slope in areas suitable for temporary ponding or deposition of sediment. Where a 3-foot setback is not practicable, construct as far from the toe of the slope as practicable.

- Generally, use silt fences in conjunction with erosion controls up slope to provide effective control, particularly for slopes adjacent to water bodies or Environmentally Sensitive Areas
- Construct the length of each reach (length of fence) so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; each reach should not exceed 500 feet. The last 6 feet of the reach should be turned up slope
- The maximum length of slope draining to the silt fence should be 200 feet or fewer
- Excavate a trench for the bottom of the silt fence that is not wider or deeper than necessary
- Key in, or bury the bottom of silt fence fabric at least 12 inches deep in trench and tamp into place. If it is not feasible to trench along the slope contour, use sand bags or backfilling to key in the bottom of the fabric
- Install fence post at least 12 inches below grade on down slope side of trench
- Silt fences should not be considered for installation below slopes steeper than 1:1 (horizontal:vertical) or that contain a high number of rocks or loose dirt clods

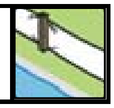
Maintenance and Inspection

- Repair or replace split, torn, slumping, undercut, or weathered fabric
- Inspect silt fences before and after each storm event and routinely throughout the rainy season
- Remove accumulated sediment when it reaches 1/3 of the barrier height. Incorporate removed sediment into the project at appropriate locations or dispose of at a PG&E-approved site

- Remove and dispose of silt fences that are damaged and become unsuitable for the intended purpose and replace with new silt fence barriers
- Remove silt fence when the upgradient area is stabilized. Fill and compact post-holes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground

Silt fence installed at the toe of an erodible slope for perimeter control.

Silt fence needs to be properly keyed in 12 inches below the ground surface.



When

A gravel bag berm consists of a single row of gravel bags that are installed end-to-end to form a barrier across a slope to intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide some sediment removal. Gravel bags can also be used where flows are moderately concentrated, such as ditches, swales, and storm drain inlets (Storm Drain Inlet Protection to divert and/or detain flows). Gravel bag berms are appropriate for perimeter site control or along streams, channels, storm drain inlets, or around stockpiles to intercept sediment laden storm water and non-storm water runoff.

- Where it is desirable to filter sediment in runoff. Note that gravel bag berms are generally more permeable than sand bags. Sand bag barriers should be used where it is desirable to block and pond flows (e.g., for containment of non-storm water flows)
- Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- On a project-by-project basis to maximize effectiveness
- With other BMPs to maximize sediment containment

How

When used as a linear control for sediment removal:

  - Install along a level contour
  - Space rows 8 to 20 feet apart
  - Turn ends of gravel bag row up slope to prevent flow around the ends
  - Use in conjunction with temporary soil stabilization controls up slope to provide effective control

- When used for concentrated flows:
  - Stack gravel bags to required height. When the height requires 3 rows or more, use a pyramid approach
  - Overlap upper rows of gravel bags with overlap joints in lower rows
- Construct gravel bag barriers with a setback of at least 3 feet from the toe of a slope. Where a 3-foot setback is not practicable, construct as far from the toe of the slope as practicable

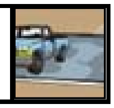
Maintenance and Inspection

- Inspect gravel bag berms before and after each storm event and routinely throughout the rainy season
- Reshape or replace gravel bags as needed
- Repair washouts or other damages as needed
- Inspect gravel bag berms for sediment accumulation and remove sediments when accumulation reaches 1/3 of the berm height. Incorporate removed sediment into the project at appropriate locations or dispose of it at a PG&E-approved site
- Remove gravel bag berms when no longer needed. Remove

sediment accumulation, and clean, re-grade, and stabilize the area. Incorporate removed sediment into the project at appropriate locations or dispose of it at a PG&E-approved site

Gravel bag berm used for perimeter control.

Gravel bag check dams installed to slow the water down and encourage sediments to drop out.



When

Tracking controls reduce offsite tracking of sediment and other pollutants by providing a stabilized entrance at defined construction site entrances and exits and/or providing methods to clean up sediment or other materials to prevent them from entering a storm drain by sweeping or vacuuming.

- Stabilize entrances on a project-by-project basis in addition to other BMPs
- Implement sweeping or vacuuming when sediment is tracked from the project site onto public or private paved roads, typically at points of site exit
- Use stabilized entrances and/or sweeping at construction sites:
    - Where dirt or mud is tracked onto public roads adjacent to water bodies
    - Where poor soils are encountered, such as soils containing clay
    - Where dust is a problem during dry weather conditions

How

<u>Stabilized Construction Entrances</u>

- Limit the points of entrance/exit to the construction site by designating combination or single-purpose entrances and exits. Require all employees, subcontractors, and others to use them. Limit speed of vehicles to control dust
- 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 the heaviest vehicles and equipment that will use it
- Select construction access stabilization (aggregate, asphaltic concrete, and concrete) based on longevity, required performance, and site conditions
- Use of constructed or constructed/manufactured steel plates with ribs for entrance/exit access is permitted
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 inches deep, or place aggregate to a depth recommended by a geotechnical engineer. Use crushed aggregate of more than 3 inches but fewer than 6 inches
- If possible, construct aggregate area with a minimum length of 50 feet and width of 30 feet

<u>Street Sweeping and Vacuuming</u>

- Routinely inspect potential sediment tracking locations, at least daily
- Sweep or vacuum visible sediment tracking as needed
- Manual sweeping is appropriate for small projects. For larger

projects, use sweeping methods that collect removed sediment and material

- If not mixed with debris or trash, incorporate the removed sediment into the project or dispose of it at a PG&E-approved disposal site

Maintenance and Inspection

Stabilized Construction Entrance

- Inspect routinely for damage and assess effectiveness. Repair if access is clogged with sediment
- Sweep where tracking has occurred on roadways, on the same day. Do not use water to wash sediment off the streets. If water must be used, it should be captured to prevent sediment-laden water from running off the site
- Keep all temporary roadway ditches clear

Street Sweeping and Vacuuming

- Inspect inlet and outlet access points routinely and sweep tracked sediment as needed
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous
- After sweeping, properly dispose of sweeper wastes

Depending on the project area soil types, these metal plates may be sufficient enough to prevent track out onto paved roads.

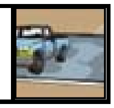
Regularly clean the plates to prevent buildup of sediments, mud, or construction debris from being tracked onto the paved road.

Manufactured metal plates knock dirt off vehicles before exiting a site.

One way to prevent bypassing would be to install a barrier such as safety cones or K-rails.

For rocked construction entrances/exits, use crushed aggregate of more than 3 inches but fewer than 6 inches.

Traditional rocked construction entrance/exit.



When

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

How

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surface. During wet weather, they often become muddy and can generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather.

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5 percent.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15 percent. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of the crowned section or one side in the case of the super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (see SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered:

- Road should follow topographic contours to reduce erosion of the roadway

- The roadway slope should not exceed 15 percent
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust
- Properly grade roadway to prevent runoff from leaving the construction site
- Design stabilized access to support heaviest vehicles and equipment that will use it
- Stabilized roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete grindings for stabilized construction roadway is not allowed
- Coordinate materials with those used for stabilized construction entrance/exit points
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 inch depth

Maintenance and Inspection

- 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, impact weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation
- Keep all temporary roadway ditches clear
- When no longer required, removed stabilized construction roadway and re-grade and repair slopes
- Periodically apply additional aggregate on gravel roads
- Active dirt construction roads are commonly watered three or more times per day during the dry season

Install filter fabric, place stabilization materials and compact.

In areas where run-on onto the road may be an issue install BMPs such as fiber rolls or silt fence to protect the road.

Stabilized construction road.

When

Use this BMP when projects require stockpiled soil and paving materials. The stockpile management practices differ based on forecasted weather or terrain.

- Protection of stockpiles must be implemented whenever there is a potential for transport of materials by a water source (forecast precipitation, windy conditions, or any non-storm water runoff)

How

Use one or more of the following options to manage stockpiles and prevent stockpile erosion and sediment discharges for storm water and non-storm water runoff/run-on:

- o Return stockpile to the excavation if precipitation is forecast
- o Protect stockpiles from storm water run-on with temporary perimeter sediment barriers such as berms, silt fences, fiber rolls, covers, sand/gravel bags, or straw bale barriers, as appropriate
- o Remove or temporarily store stockpiles in a protected location offsite

- **Stockpiles should be covered, stabilized, or protected with a perimeter sediment barrier before the onset of precipitation**
- Secure plastic coverings tightly. Ensure no plastic is blown into electrical equipment
- Keep stockpiles organized and surrounding areas clean
- Protect storm drain inlets, watercourses, and water bodies from stockpiles, as appropriate
- Implement dust control practices as appropriate on all stockpiled material

Maintenance and Inspection

Repair and/or replace covers and perimeter containment structures as needed. Plastic sheeting requires frequent inspection for sun and wind damage.

This stockpile should have perimeter control around it. Such as, fiber rolls, a gravel bag berm, or silt fencing.

Stockpile covered with plastic and secured with large rocks. Where more than one sheet of covering is required, overlap sheets and secure at seam.

This stockpile should be covered even though it has perimeter control.

Silt fence as stockpile perimeter control.

When

Use for projects where concrete, mortar, cement, and stucco are used or where slurry or concrete wastes are generated by construction activities, including:

- Sawcutting
- Coring/drilling
- Grinding, re-finishing, or patching
- Encasing conduit in concrete
- Tower footings

For managing concrete curing compounds, see the BMPs on Material Use (WM-2) and Hazardous Waste Management (WM-6). For managing paving, grinding, and sawcutting operations, see NS-3 Paving and Grinding Operations.

How

Install storm drain protection at any down gradient inlets that the activity might impact. See SE-10 Storm Drain Inlet Protection.

- Avoid mixing excess amounts of concrete
- **Do not wash residue or particulate matter into a storm drain inlet or watercourse**
- The following options should be used for concrete truck chute and/or pump and hose washout:
  - If available, arrange to use an existing concrete washout station. Upon entering the site, concrete truck drivers should be instructed about onsite practices
  - **Concrete Washouts:** Washout stations can be plastic lined temporary bermed areas designed with sufficient volume to completely contain all liquid and waste concrete materials plus enough capacity for rainwater. The designated area must be located away from storm drain inlets or watercourses
  - **Bucket Washout:** Manually rinse the chute into a wheelbarrow, plastic bucket, or pail, and then empty the bucket into the concrete truck barrel or on top of the placed concrete
- Locate washout at least 50 feet from storm drains, open ditches, or water bodies if possible
- Stockpile concrete demolition waste in accordance with WM-3 Stockpile Management

Maintenance and Inspection

- Responsible personnel should ensure that all concrete truck drivers are instructed about project practices when the trucks arrive onsite
- Clean designated washout areas as needed, or minimally when the washout is 75 percent full, to maintain sufficient capacity throughout the project duration
- Clean any designated onsite washout areas and remove all debris upon project completion. Dispose of concrete waste according to WM-5 Solid Waste Management

- Inspect routinely, when applicable activities are underway, to ensure that concrete washout does not overflow

Portable self contained concrete washouts are easy to maintain.

Cover during rain events.

Service the washout when approximately 75% full.

Self contained concrete washout.

Construct a concrete washout by placing a support structure (such as hay bales) to form a basin and line with a thick (minimum 6 mil) plastic.

Service the washout when approximately 75% full.

Make sure the washout doesn't become a waste bin for other construction debris.

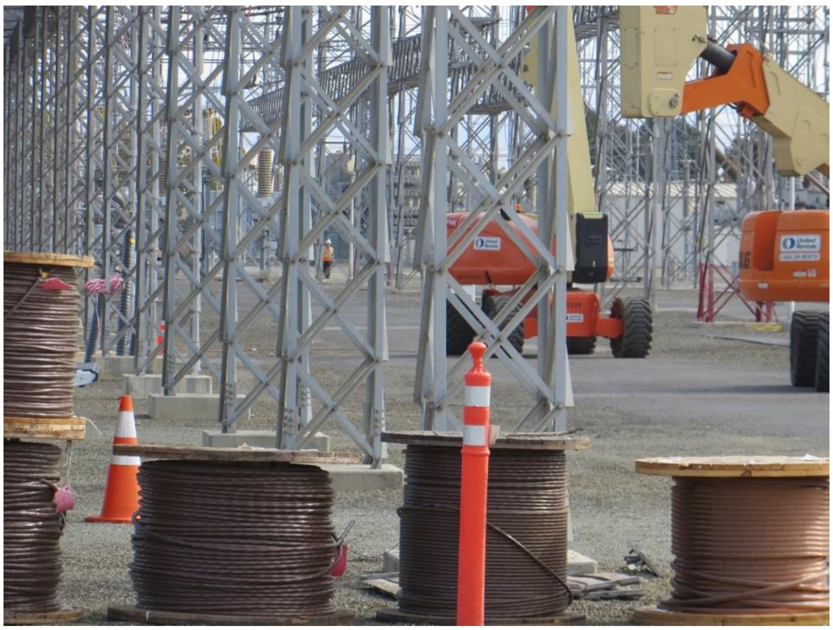
Inspect concrete washout regularly for holes and integrity of the hay bales or support features.

Replace plastic after each servicing and replace hay bales as needed.

Lined concrete washout.

Small Construction at Substations

Activity Specific Erosion and Sediment Control Plan
(A-ESCP)



If Cumulative Soil Disturbance Changes,
Contact the Environmental Field Specialists (EFS)
For Re-Evaluation of Storm Water Protection Needs

Prepared by

PG&E Water Quality Group

November 2013

TABLE OF CONTENTS

Attachments

Attachment A	**Activity Specific Installation Detail**
SS-01	Typical BMP Use Detail
Attachment B	**Activity Specific Erosion & Sediment Control Plans (A-ESCPs)**
GH	Good Housekeeping
SM	Stockpile Management
SP	Sawcutting, Grinding, and Paving
PR	Pole Replacement
SC	Small Excavation, Construction, and Potholing
Attachment C	**PG&E Best Management Practice (BMP) Cut-sheets**
EC-3	Hydraulic Mulch
EC-4	Hydroseed
EC-7	Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
EC-16	Non-Vegetative Stabilization
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-10	Storm Drain Inlet Protection
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
WM-2	Material Use
Attachment D	**Requirement Summary Table**

1.0 WHAT IS COVERED UNDER THIS A-ESCP?

1.1 Small Construction at Substations

Construction, demolition, clearing, grading, excavation, and other land disturbance activities associated with small construction projects at substations have the potential to release sediment and other pollutants, potentially causing negative impacts to the environment.

This Activity Specific Erosion and Sediment Control Plan (A-ESCP) sets forth minimum Best Management Practices (BMPs) for Pacific Gas and Electric Company (PG&E) small substation construction projects. Construction projects include all permitted, non-permitted, and maintenance operations/projects.

If specific environmental concerns are encountered, or if the procedures contained within this A-ESCP prove ineffective, contact your local Environmental Field Specialist (EFS).

1.2 Typical A-ESCPs Related to Small Substation Construction Projects

In many cases, small substation construction activities involve procedures, requirements, or prohibition of practices covered under existing A-ESCPs which include:

- Good Housekeeping
- Stockpile Management
- Sawcutting, Grinding, and Paving
- Pole Replacement
- Small Excavation, Construction, and Potholing

1.3 Site Conditions Covered in this A-ESCP

This A-ESCP is applicable to any small construction projects at existing substations that disturb less than 0.9 acres, including all access roadways, staging areas that include the disturbance of soil, excavations, trenches, trench spoils, stockpiles, and any other land disturbance. Small substation construction activities considered under this A-ESCP are limited to work within existing substations, with existing access roadways.

This document is intended to apply to all PG&E Small Construction Projects at Substations as well as any related activities being completed as a result of a larger project, and must be used as a reference for specific BMPs.

1.4 Scheduling for Small Construction at Substation BMP Installation

Planning for storm water pollution prevention is required for all PG&E construction projects throughout the year. The applicable BMPs described in this A-ESCP shall be implemented on all projects, regardless of the time of year and weather forecast.

2.0 BEST MANAGEMENT PRACTICES

The purpose of this A-ESCP is to specify appropriate BMPs for all Small Construction Projects at Substations. 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.

All PG&E Projects, Crews, and Subcontractors are required to be familiar with and follow, at a minimum, housekeeping and stockpile management standards as detailed in the Good Housekeeping A-ESCP and Stockpile Management A-ESCP prior to starting work. Should site personnel be unfamiliar with the aforementioned requirements, PG&E expects that personnel obtain a copy of the A-ESCPs which are available on SharePoint. Good Housekeeping and Stockpile Management A-ESCP requirements may apply to all activities within this Plan, and therefore are not mentioned in each subsection.

Construction activities should be scheduled to minimize soil disturbing activities during rain events, if possible.

The BMPs for the project should be installed in areas similar to those shown on the Typical BMP Use Detail, Attachment A.

Existing A-ESCPs related to this activity are referenced in Attachment B and can be found in the Field Manual. A full version of the Field Manual is located on SharePoint.

PG&E has detailed Cut-Sheets for specific BMPs which include: when to use the BMP, how to use and install the BMP, and maintenance and inspection guidance for the BMP. BMP Cut-Sheets associated with Small Excavation, Construction, and Potholing are referenced in Attachment C and can be found in the Field Manual which is located on SharePoint.

The following activity specific procedures are intended to address activities related to any small excavation, construction, or potholing activity. Although your project may not include all such activities, the project shall follow the procedures contained within this Section that relate to your project.

2.1 Site Preparation

Description:
Consider site preparation BMPs if any of the following activities are expected to occur on the project:

- Soil disturbance.
- Sawcutting or grinding (See Sawcutting, Grinding, and Paving A-ESCP).
- Work upstream of an environmentally sensitive area.
- Equipment or materials storage, staging or use (See Good Housekeeping A-ESCP).

Requirements:

- Observe the site and access routes for locations where pollutants, including sediment, may be discharged and protect existing vegetation to the extent possible (EC-2).
- Install a Stabilized Construction Entrance (TC-1) if tracking to an adjacent roadway is possible.
- Install appropriate perimeter control BMPs, typically Fiber Roll (SE-5) or Silt Fence (SE-1) downslope of any location where activities may lead to any pollutant discharge.
- Protect any environmentally sensitive areas, especially those with running or standing surface water (streams, rivers, ponds, marshes, creeks, lakes, wetlands etc.) with appropriate perimeter control BMPs, typically Fiber Roll (SE-5) or Silt Fence (SE-1).
- Avoid water, sewer, and other wet utilities by calling USA North at 811 prior to digging.
- Protect drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- EC-2 – Preservation of Existing Vegetation
- SE-1 – Silt Fence
- SE-5 – Fiber Rolls
- SE-6 – Gravel Bag Berm
- SE-10 – Storm Drain Inlet Protection
- TC-1 – Stabilized Construction Entrance
- TC-2 – Stabilized Construction Roadway

Stabilized and clean entrance in place

Spill Kit

2.2 Demolition, Dismantling, and Sawcutting

Description:
Consider these BMPs if the following occurs on the construction site:

- Dismantling or removal of any existing structures, vegetation, fences, or equipment
- Sawcutting existing concrete or pavement (See Sawcutting, Grinding, and Paving A-ESCP).

Requirements:

- Consult the EFS should any substances be observed to be leaking or contributing to an environmentally harmful situation.
- Barricade or cover storm drains with impervious material while performing demolition activities that involve liquid pollutants or chemicals (i.e. transformer removal).
- Protect drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- Sawcutting, Grinding and Paving A-ESCP
- SE-6 – Gravel Bag Berms
- SE-10 – Storm Drain Inlet Protection

Removal of existing equipment

Sawcutting in preparation of Excavation

2.3 Excavation or Potholing

Description:
Consider the following BMPs for all excavation or potholing activities related to the project.

Requirements:
- Do not place excavated materials into environmentally sensitive areas.
- Maintain environmentally sensitive area protection BMPs.
- Cover or backfill all excavations at the end of each work day.
- Ensure that exposed soil is protected from erosion if rain occurs or is forecast. Typical cover application may be Hydraulic Mulch (EC-3), Straw Mulch (EC-6) or Erosion Control Blankets (EC-7).
- Ensure that all vacuumed materials are properly disposed of or placed into drying basins and that all water from the operation is contained such that no discharge will occur to storm drains or surface waters.
- Protect drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:
- EC-3 - Hydraulic Mulch
- EC-6 – Straw Mulch
- EC-7 – Erosion Control Blankets
- EC-16 – Non-Vegetative Stabilization
- SE-6 – Gravel Bag Berm
- SE-10 – Storm Drain Inlet Protection

Active Excavation

Stockpile in need of attention

2.4 Concrete

Description:
Consider concrete BMPs for use during activities that include the following:
- Concrete footings.
- Concrete replacement.
- Any other cement based product use.

Requirements:
- Barricade or cover storm drains with impermeable material within reasonable proximity to the work area.
- Re-schedule concrete work when rain is forecast.
- Avoid mixing or ordering excess amounts of concrete.
- Do not wash equipment or any concrete materials into footing excavations.
- Do not allow excess concrete to be dumped onsite, except in appropriate washout facilities.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:
- Sawcutting, Grinding, and Paving A-ESCP
- NS-3 – Paving and Grinding Operations
- WM-2 – Material Use

Pole with concrete footing

Concrete placement

2.5 Site Stabilization

Description:
Consider site stabilization BMPs if soil disturbance occurs on the construction site.

Requirements:
- Upon completion of the activity, stabilize all project related disturbed soil to return the area to pre-project condition which may include pavement, concrete, gravel/rock, soil cover, or seeding.
- Cover disturbed soil areas that are to be vegetated with a combination of temporary and permanent vegetative stabilization.
- Soil stabilization may be in the form of Erosion Control Blankets (EC-7), or Hydraulic Mulch (EC-3), along with Hydroseed (EC-4) or hand spread seed.
- Install biodegradable fiber rolls and blankets to protect against any transport of sediment offsite or to environmentally sensitive areas.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:
- Sawcutting, Grinding, and Paving A-ESCP
- EC-3 – Hydraulic Mulch
- EC-4 - Hydroseed
- EC-7 - Erosion Control Blankets
- EC-16 – Non-Vegetative Stabilization
- TC-2 - Stabilized Construction Roadway
- WM-2 – Material Use

Stabilized disturbed soil areas (gravel road base)

Gravel surface with asphalt lined ditch

2.6 Where to Obtain BMP Materials

BMP products in Table 1 can be obtained through PG&E materials warehouses using project order numbers and established materials codes. Should the materials be unavailable from PG&E warehouses, BMP materials and products may be obtained from sources shown below, but may be obtained elsewhere depending on location and urgency of need.

TABLE 1
BMP PRODUCTS INFORMATION

Category	Product Name	Units
Geotextiles and Mats (EC-7) Geotextile Fabric	Mirafi 600	Rolls: 12.5' x 360' 17.5' x 238'
Geotextiles and Mats (EC-7) Jute Mesh	jmesh-4225	4'x225' (staples required)
Geotextiles and Mats (EC-7) Plastic Sheeting	Visqueen	Rolls: 20 or 40'x 100'; 10ml thick
Silt Fence (SE-1)	sfo-b-6	100 feet with 36-inch wood posts at 6 foot spacing
Fiber Roll (SE-5)	Sediment Log Type II	25 foot rolls x 6 or 9" diameter
Fiber Roll (SE-5) Animal Friendly Wattle	BioFiber Roll	8"x12' or 8"x24' (wood stakes required)
Fiber Roll (SE-5) HDPE Wattle	ERTEC ProWattle	5" x 7' (wood stakes and rebar j-hooks required at 5' spacing)
Gravel Bags (SE-6)	Roc Soc	mono filament
Inlet Protection (SE-10) Gravel Bag	Same as SE-6	
Inlet Protection (SE-10) Fiber Roll	Same as SE-5	
Inlet Protection (SE-10) Filter Guard	ERTEC Gr8 Guard	Each (UV stable zip ties required)
Inlet Protection (SE-10) Hard Surface Guard	Product #344321	6.5" x 7' (nails with pre-mounted steel washers required)

Example suppliers include Reed & Graham and White Cap. Other options may include feed stores, retail building supply stores, or hardware stores.

3.0 BMP INSPECTION AND MAINTENANCE

BMP installation, inspection, and maintenance will be performed by the PG&E construction crew. BMPs should be inspected daily during construction activities. In the event that BMPs appear to require maintenance or are not functioning as expected, the BMP will be maintained, repaired, or replaced to correct the deficiency.

4.0 WHOM TO CALL

If the project receives a written notice or order from any regulatory agency, immediately contact your local EFS for further direction.

Contact the local EFS if any of the following conditions occur:

- Visually cloudy/muddy water is observed leaving the work or staging area.
- Discharge or spill of hazardous substance.
- Project area increases.
- Procedures within this A-ESCP are ineffective.
- An environmental Regulator visits the site.
- An underground storage tank is discovered.
- A subsurface component related to site remediation activities (e.g., monitoring well, recovery well, injection well) is discovered.

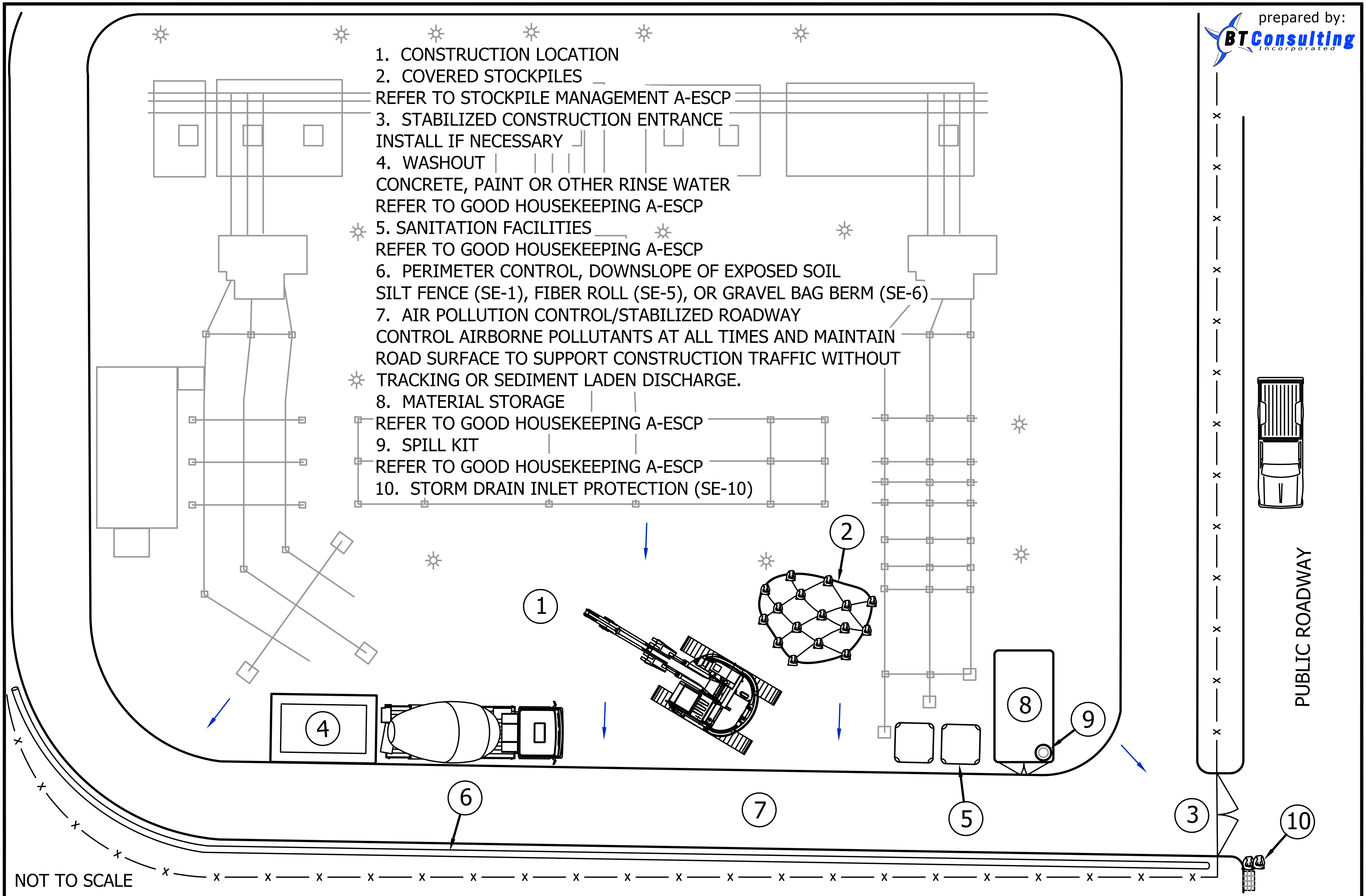
After hours or if the local EFS are unavailable, call the following 800 number:
800-874-4043.

5.0 POST-CONSTRUCTION

Upon completion of construction within the project area:

- Remove all temporary, non-biodegradable BMPs.
- Remove all construction equipment from the site.
- Clear all staging areas of any debris, construction materials, and contaminants.
- Return all drainage ways to their pre-construction line and grade.
- Cover disturbed soil areas with a combination of temporary and permanent vegetative stabilization.

Attachment A
Activity Specific Installation Detail



Pacific Gas and Electric Company®

TYPICAL BMP USE DETAIL

A-ESCP - SMALL CONSTRUCTION AT SUBSTATIONS

SS-01

Attachment B
Activity Specific Erosion & Sediment Control Plans (A-ESCPs)

The following A-ESCPs are included in the Plan by reference only and can be found in the Field Manual. A full version of the Field Manual that includes the A-ESCPs is located on SharePoint.

GH	Good Housekeeping
SM	Stockpile Management
SP	Sawcutting, Grinding, and Paving
PR	Pole Replacement
RF	Rural Fencing
SC	Small Excavation, Construction, and Potholing

Attachment C
PG&E Best Management Practice (BMP) Cut-Sheets

The following BMP Fact Sheets are included in the Plan by reference only and can be found in Appendix C of the Field Manual. A full version of the Field Manual that includes the cut-sheets is located on SharePoint.

EC-3	Hydraulic Mulch
EC-4	Hydroseed
EC-7	Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
EC-16	Non-Vegetative Stabilization
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-10	Storm Drain Inlet Protection
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
WM-2	Material Use

Attachment D
Requirement Summary Table

Pacific Gas and Electric Company®

Best Management Practices to Reduce Environmental Impacts

Proper implementation of Best Management Practices (BMP) during Small Construction at Substation projects can reduce adverse effects to water resources by reducing pollutant migration from facilities.

No.	Small Construction at Substations	A-ESCP Section
1	Be familiar with and follow the requirments of the Good Housekeeping A-ESCP	2.0
2	Be familiar with and follow the requirments of the Stockpile Management A-ESCP	2.0
3	Schedule activities to minimize soil disturbance during rain.	2.0
4	Observe the site and access routes for any locations where any pollutant may be discharged.	2.1
5	Provide Stabilized Construction Entrance if there is potential for tracking to any roadways.	2.1
6	Provide sediment control downslope of any soils exposed as a result of the project.	2.1
7	If rain is forecast, stabilize all project related disturbed soils.	2.1, 2.3
8	Protect downslope drainage inlets.	2.1, 2.2, 2.3, 2.4
9	Avoid water, sewer, and other wet utilities by calling USA North at 811 prior to digging.	2.2
10	Consult the EFS should any substances be observed to be leaking or contributing to an environmentally harmful situation.	2.2
11	Barricade or cover storm drains with impervious material while performing demolition activities that involve liquid pollutants or chemicals	2.2, 2.4
12	Do not place excavated materials into environmentally sensitive areas.	2.5
13	Cover or backfill all excavations at the end of each work day.	2.5
14	Ensure that all vacuumed materials are properly disposed of or placed into drying basins and that all water from the operation is contained such that no discharge will occur to storm drains or surface waters.	2.5

Pole Replacement
(Rural, Agricultural, and Urban Settings)

Activity Specific Erosion and Sediment Control Plan
(A-ESCP)

If Cumulative Soil Disturbance Changes,
Contact the Environmental Field Specialists (EFS)
For Re-Evaluation of Storm Water Protection Needs

Prepared by

PG&E Water Quality Group

November 2013

TABLE OF CONTENTS

Attachments

1.0 WHAT IS COVERED UNDER THIS A-ESCP?

1.1 Rural, Agricultural, and Urban Pole Replacement

Construction, demolition, clearing, grading, excavation, and other land disturbance activities associated with pole replacement operations have the potential to release sediment and other pollutants, potentially causing negative impacts to the environment.

This Activity Specific Erosion and Sediment Control Plan (A-ESCP) sets forth minimum Best Management Practices (BMPs) for Pole Replacement at all Pacific Gas and Electric Company (PG&E) construction projects. Construction projects include all permitted, non-permitted, and maintenance operations/projects.

If specific environmental concerns are encountered, or if the procedures contained within this A-ESCP prove ineffective, contact your local Environmental Field Specialist (EFS).

1.2 Typical A-ESCPs Related to Pole Replacement

In many cases, Pole Replacement activities involve procedures, requirements, or prohibition of practices covered under existing A-ESCPs which include:

- Good Housekeeping
- Stockpile Management
- Sawcutting, Grinding, and Paving
- Small Excavation, Construction, and Potholing

1.3 Site Conditions Covered in this A-ESCP

This document is intended to apply to all PG&E Pole Replacement projects as well as any Pole Replacement being completed as a result of a larger project, and must be used as a reference for specific BMPs.

1.4 Scheduling Good Housekeeping BMP Installation

Planning for storm water pollution prevention is required for all PG&E construction projects throughout the year. The applicable BMPs described in this A-ESCP shall be implemented on all projects, regardless of the time of year and weather forecast.

2.0 BEST MANAGEMENT PRACTICES

The purpose of this A-ESCP is to specify appropriate BMPs for all Pole Replacement projects. 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.

All PG&E Projects, Crews, and Subcontractors are required to be familiar with and follow, at a minimum, housekeeping and stockpile management standards as detailed in the Good Housekeeping A-ESCP and Stockpile Management A-ESCP prior to starting work. Should site personnel be unfamiliar with the requirements for Good Housekeeping or Stockpile Management, PG&E expects that they will obtain a copy of the A-ESCPs which are available on SharePoint. Good Housekeeping and Stockpile Management A-ESCP requirements may apply to all activities within this Plan, and therefore are not mentioned in each subsection.

It is recommended that construction activities are scheduled to minimize soil disturbing activities during rain events.

The BMPs for the project should be installed in areas similar to those shown on the Typical BMP Use Detail, Attachment A.

Existing A-ESCPs related to this activity are referenced in Attachment B and can be found in the Field Manual. A full version of the Field Manual is located on SharePoint.

PG&E has detailed Cut-Sheets for specific BMPs which include: when to use the BMP, how to use and install the BMP, and maintenance and inspection guidance for the BMP. BMP Cut-Sheets associated with Pole Replacement are referenced in Attachment C and can be found in the Field Manual which is located on SharePoint.

The following activity specific procedures are intended to address activities related to any pole replacement activity. Although your project may not include all such activities, the project shall follow the procedures contained within this Section that relate to your project.

2.1 Site Access

Description:
Consider site access if any of the following apply to the project:

- Access is not available from an existing stable roadway.
- Soil must be disturbed in order to gain access.
- The existing roadway is not passable without maintenance or additional stabilization.

Requirements:

- Conduct an assessment of the access routes available.
- Determine if specialized equipment may allow access without additional grading.
- Ensure all access is either within existing PG&E Easements or Temporary Access Easements have been established.
- Contact the EFS should any concerns exist regarding Environmentally Sensitive Areas.
- Do not change or alter drainage patterns in any way.
- Provide Stabilized Construction Entrance (TC-1) or Roadway (TC-2) if there is potential for tracking onto roadways.
- Provide sediment control downslope of any soils exposed as a result site access for the project. Sediment control will typically be in the form of Silt Fence (SE-1) or Fiber Rolls (SE-5), but may include Gravel Bag Berms (SE-6) if concentrated flow areas exist.
- If rain is forecast, stabilize project related disturbed soils, as necessary. Soil stabilization may be in the form of Stabilized Construction Roadway (TC-2), Non Vegetative Stabilization (EC-16), Straw Mulch (EC-6), or Hydraulic Mulch (EC-3).
- Protect downslope drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- TC-1 - Stabilized Construction Entrance
- TC-2 - Stabilized Construction Roadway
- EC-3 – Hydraulic mulch
- EC-6 - Straw Mulch
- EC-16 - Non-Vegetative Stabilization
- SE-1 - Silt Fence
- SE-5 - Fiber Rolls
- SE-6 - Gravel Bag Berms
- SE-10 – Storm Drain Inlet Protection

Access in agricultural environment

Access stabilized after completion

2.2 Site Preparation

Description:
Consider site preparation BMPs if any of the following activities are expected to occur on the project:

- Soil disturbance.
- Sawcutting or grinding.
- Work upstream of an environmentally sensitive area.
- Equipment or materials storage or staging.

Requirements:

- Observe the site and access routes for locations where any pollutant, including sediment, may be discharged.
- Protect existing vegetation to the extent possible.
- Install appropriate perimeter control BMPs, typically Fiber Roll (SE-5) or Silt Fence (SE-1) downslope of any location where activities may lead to any pollutant discharge.
- Protect any environmentally sensitive areas, especially those with running or standing surface water (streams, rivers, ponds, marshes, creeks, lakes, wetlands etc.) with appropriate perimeter control BMPs, typically Fiber Roll (SE-5) or Silt Fence (SE-1).
- Protect downslope drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- EC-2 – Preservation of Existing Vegetation
- SE-1 – Silt Fence
- SE-5 – Fiber Rolls
- SE-6 – Gravel Bag Berms
- SE-10 – Storm Drain Inlet Protection

Perimeter control and fencing in place

Perimeter control in place

2.3 Demolition, Dismantling, and Sawcutting

Description:
Consider demolition, dismantling, and sawcutting BMPs if any of the following occurs on the construction site:

- Demolition, dismantling, or removal of any existing poles, related structures or equipment, concrete, pavement, or other existing site material.
- Sawcutting of existing concrete or pavement at the location of the Pole Replacement

Requirements:

- Follow the practices and procedures included within the Sawcutting, Grinding, and Paving A-ESCP when any sawcutting activity is required.
- Consult the EFS should any substances be observed to be leaking or contributing to an environmentally harmful situation.
- Barricade or cover storm drains with impervious material while performing demolition activities that involve liquid pollutants or chemicals.
- Protect downslope drainage inlets from sediment, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- Sawcutting, Grinding, and Paving A-ESCP
- SE-^ - Gravel Bag Berms
- SE-10 – Storm Drain Inlet Protection

Dismantling of existing equipment

Proper sawcutting procedure

2.4 Excavation

Description:
Consider excavation BMPs for all excavation activities related to the project, including:

- Pole footing excavation.
- Related utility excavation such as conduits, grounding equipment, or vaults.
- Pole removal and placement excavation.
- Access road excavation.

Requirements:

- Do not place excavated materials in environmentally sensitive areas.
- Protect any environmentally sensitive areas, especially those with running or standing surface water (streams, rivers, ponds, marshes, creeks, lakes, wetlands etc.) with appropriate perimeter control BMPs, typically Fiber Roll (SE-5) or Silt Fence (SE-1).
- Cover or backfill all excavations at the end of each work day.
- Ensure that exposed soil is protected from erosion if rain occurs or is forecast. Typical cover application may be Straw Mulch (EC-6) or Erosion Control Blankets (EC-7).
- Protect downslope drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- EC-6 – Straw Mulch
- EC-7 – Erosion Control Blankets
- EC-16 – Non-Vegetative Stabilization
- SE-6 – Gravel Bag Berms
- SE-10 – Storm Drain Inlet Protection

Active excavation

Excavation covered for safety at end of day

2.5 Concrete

Description:

Consider concrete BMPs for use during pole installation activities that include the following:

- Concrete footings.
- Concrete replacement.
- Any other cement based product use.

Requirements:

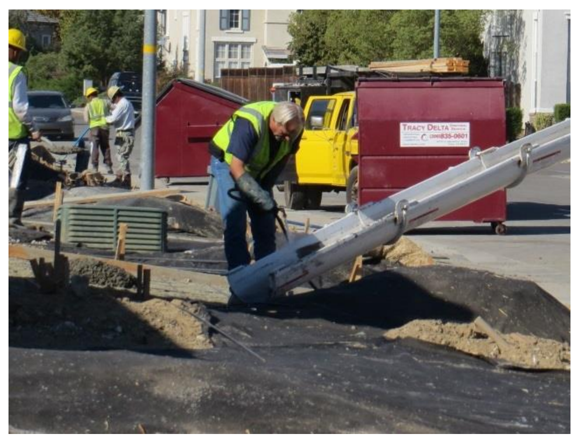
- Cover or barricade storm drains within reasonable proximity to the work area.
- Re-schedule concrete work when rain is forecast.
- Avoid mixing or ordering excess amount of concrete.
- Do not wash equipment or any concrete materials into footing excavations.
- Do not allow excess concrete to be dumped onsite, except in appropriate washout facilities.

Associated BMPs and Other Plans:

For additional detail and guidance, refer to the following:

- Sawcutting, Grinding, and Paving A-ESCP
- NS-3 – Paving and Grinding Operations
- WM-2 – Material Use

Pole with concrete footing



Concrete placement

2.6 Site Stabilization

Description:
Consider this site stabilization BMPs if the following occur on the construction site:

- Disturbance of soil

Requirements:

- Upon completion of the Pole Replacement, stabilize all project related disturbed soils to return the area to pre-project condition which may include pavement, concrete, gravel/rock, landscaping, soil cover, seeding, or agricultural conditions.
- Cover disturbed soil areas with a combination of temporary and permanent vegetative stabilization.
- Soil stabilization may be in the form of Erosion Control Blankets (EC-7), Straw Mulch (EC-6), Hydraulic Mulch (EC-3), and/or Hydroseed (EC-4).
- Install biodegradable fiber rolls and blankets to protect against any transport of sediment offsite or to environmentally sensitive areas.
- Some projects require stabilization on non-PG&E property. In some cases the landowner may request that PG&E does not re-stabilize the soil disturbance. In an effort to avoid conflicts with landowners, property specific agreements can be established. These agreements will be coordinated by the PG&E Land Agent.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- Sawcutting, Grinding, and Paving A-ESCP
- EC-3 – Hydraulic Mulch
- EC-4 - Hydroseed
- EC-6 - Straw Mulch
- EC-7 - Erosion Control Blankets
- EC-16 - Non-Vegetative Stabilization
- TC-2 - Stabilized Construction Roadway

Stabilized disturbed soil with perimeter treatment

Stabilized disturbed soil

2.7 Where to Obtain BMP Materials

BMP products in Table 1 can be obtained through PG&E materials warehouses using project order numbers and established materials codes. Should the materials be unavailable from PG&E warehouses, BMP materials and products may be obtained from sources shown below, but may be obtained elsewhere depending on location and urgency of need.

TABLE 1
BMP PRODUCTS INFORMATION

Category	Product Name	Units
Vegetation Protection Fencing (EC-2)	Orange Plastic Fence	
Certified Weed-Free Straw Mulch (EC-6)	Weed-Free Straw	Bales
Geotextiles and Mats (EC-7) Geotextile Fabric	Mirafi 600	Rolls: 12.5' x 360' 17.5' x 238'
Geotextiles and Mats (EC-7) Jute Mat	Eco-Jute	Rolls: 4' x 225'
Geotextiles and Mats (EC-7) Jute Mesh	jmesh-4225	4'x225' (staples required)
Geotextiles and Mats (EC-7) Plastic Sheeting	Visqueen	Rolls: 20 or 40'x 100'; 10ml thick
Silt Fence (SE-1)	sfo-b-6	100 feet with 36-inch wood posts at 6 foot spacing
Fiber Roll (SE-5)	Sediment Log Type II	25 foot rolls x 6 or 9" diameter
Fiber Roll (SE-5) Animal Friendly Wattle	BioFiber Roll	8"x12' or 8"x24' (wood stakes required)
Fiber Roll (SE-5) HDPE Wattle	ERTEC ProWattle	5" x 7' (wood stakes and rebar j-hooks required at 5' spacing)
Gravel Bags (SE-6)	Roc Soc	mono filament
Inlet Protection (SE-10) Gravel Bag	Same as SE-6	
Inlet Protection (SE-10) Fiber Roll	Same as SE-5	
Inlet Protection (SE-10) Filter Guard	ERTEC Gr8 Guard	Each (UV stable zip ties required)
Inlet Protection (SE-10) Hard Surface Guard	Product #344321	6.5" x 7' (nails with pre-mounted steel washers required)

Example suppliers include Reed & Graham and White Cap. Other options may include feed stores, retail building supply stores, or hardware stores.

3.0 BMP INSPECTION AND MAINTENANCE

BMP installation, inspection and maintenance will be performed by the PG&E construction crew. BMPs should be inspected daily during construction activities. In the event that BMPs appear to require maintenance or are not functioning as expected, the BMP will be maintained, repaired, or replaced to correct the deficiency.

4.0 WHOM TO CALL

If the project receives a written notice or order from any regulatory agency, immediately contact your local EFS for further direction.

Contact the local EFS if any of the following conditions occur:

- Visually cloudy/muddy water is observed leaving the work or staging area.
- Discharge or spill of hazardous substance.
- Project area increases.
- Procedures within this A-ESCP are ineffective.
- An environmental Regulator visits the site.
- An underground storage tank is discovered.
- A subsurface component related to site remediation activities (e.g., monitoring well, recovery well, injection well) is discovered.

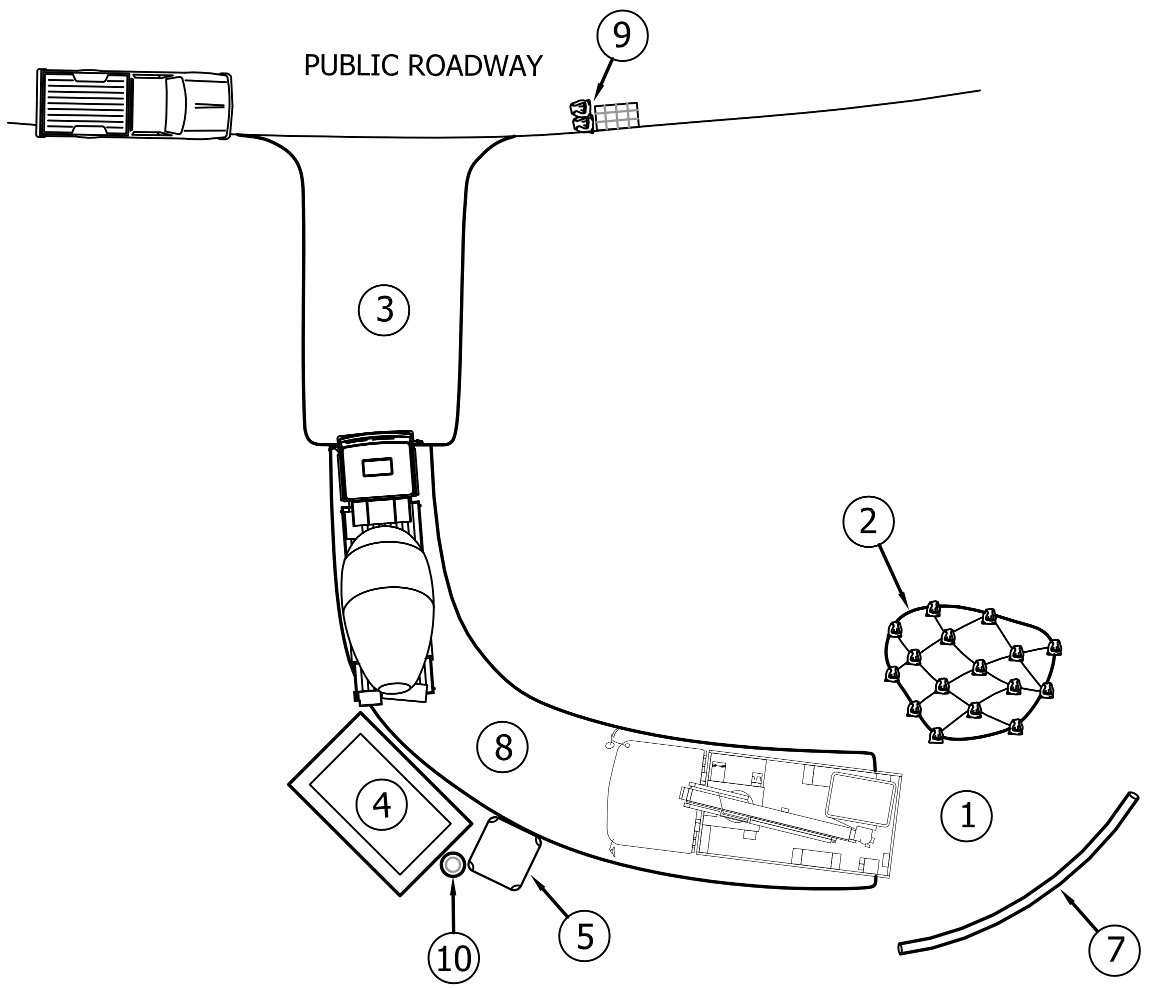
After hours or if the local EFS are unavailable, call the following 800 number: **800-874-4043.**

5.0 POST-CONSTRUCTION

Upon completion of construction within the project area:

- Remove all temporary, non-biodegradable BMPs.
- Remove all construction equipment from the site.
- Clear all staging areas of any debris, construction materials, and contaminants.
- Return all drainage ways to their pre-construction line and grade.
- Cover disturbed soil areas with a combination of temporary and permanent vegetative stabilization.

Attachment A
Activity Specific Installation Detail



NOTES:
1. POLE REPLACEMENT LOCATION
STORE OR STAGE TREATED POLES ON STRINGERS (NOT ON GROUND)

2. COVERED STOCKPILES
REFER TO STOCKPILE MANAGEMENT A-ESCP

3. STABILIZED CONSTRUCTION ENTRANCE
USE IF NECESSARY

4. WASHOUT
CONCRETE, PAINT OR OTHER RINSE WATERS
REFER TO GOOD HOUSEKEEPING A-ESCP

5. SANITATION FACILITIES
REFER TO GOOD HOUSEKEEPING A-ESCP

6. STABILIZED CONSTRUCTION ROADWAY
REFER TO SECTION 2.1

7. PERIMETER CONTROL, DOWNSLOPE OF EXPOSED SOIL
SILT FENCE (SE-1), FIBER ROLL (SE-5), OR GRAVEL BAG BERM (SE-6)

8. AIR POLLUTION CONTROL/STABILIZED ROADWAY
CONTROL AIRBORNE POLLUTANTS AT ALL TIMES AND MAINTAIN ROAD SURFACE TO SUPPORT CONSTRUCTION TRAFFIC WITHOUT TRACKING OR SEDIMENT LADEN DISCHARGE

9. STORM DRAIN INLET PROTECTION (SE-10)

10. SPILL KIT
REFER TO GOOD HOUSEKEEPING A-ESCP

prepared by: BT Consulting Incorporated

NOT TO SCALE

Pacific Gas and Electric Company®

TYPICAL BMP USE DETAIL

A-ESCP - POLE REPLACEMENT

PR-01

Attachment B
Activity Specific Erosion & Sediment Control Plans (A-ESCPs)

The following A-ESCPs are included in the Plan by reference only and can be found in the Field Manual. A full version of the Field Manual that includes the A-ESCPs is located on SharePoint.

GH	Good Housekeeping
SM	Stockpile Management
SP	Sawcutting, Grinding, and Paving
SC	Small Excavation, Construction, and Potholing

Attachment C
PG&E Best Management Practice (BMP) Cut-Sheets

The following BMP Fact Sheets are included in the Plan by reference only and can be found in Appendix C of the Field Manual. A full version of the Field Manual that includes the cut-sheets is located on SharePoint.

EC-2	Preservation of Existing Vegetation
EC-3	Hydraulic Mulch
EC-4	Hydroseed
EC-6	Straw Mulch
EC-7	Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
EC-16	Non-Vegetative Stabilization
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-10	Storm Drain Inlet Protection
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
WM-2	Material Use

Attachment D
Requirement Summary Table

Pole Replacement

Best Management Practices to Reduce Environmental Impacts

Proper implementation of Best Management Practices (BMP) during Pole Replacement projects can reduce adverse effects to water resources by reducing pollutant migration from facilities.

No.	Pole Replacement Requirement	A-ESCP Section
1	Be familiar with and follow the requirments of the Good Housekeeping A-ESCP	2.0
2	Be familiar with and follow the requirments of the Stockpile Management A-ESCP	2.0
3	Schedule activities to minimize soil disturbance during rain.	2.0
4	Conduct an assessment of the access routes available.	2.1
5	Determine if specialized equipment may allow access without additional grading.	2.1
6	Ensure all access is either over existing PG&E Easements or Temporary Access Easements	2.1
7	Contact the EFS with concerns regarding sensitive areas or environmentally harmful situations.	2.1, 2.3
8	Do not change or alter drainage patterns in any way.	2.1
9	Provide Stabilized Construction Entrance if there is potential for tracking to any roadways.	2.1
10	Provide sediment control downslope of any soils exposed as a result of the project.	2.1
11	If rain is forecast, stabilize all project related disturbed soils.	2.1
12	Protect downslope drainage inlets.	2.1, 2.2, 2.3, 2.4
13	Observe the site and access routes for any locations where any pollutant may be discharged.	2.2
14	Protect existing vegetation to the extent possible.	2.2
15	Install appropriate perimeter control BMPs downslope of any locations with potential discharge.	2.2
16	Protect any environmentally sensitive areas.	2.2, 2.4
17	Follow the practices and procedures included within the Sawcutting, Grinding, and Paving A-ESCP.	2.3
18	Barricade or cover storm drains with impervious material while performing demolition activities that involve liquid pollutants or chemicals.	2.3
19	Do not place excavated materials in environmentally sensitive areas.	2.4
20	Cover or backfill all excavations at the end of each work day.	2.4
21	Ensure that exposed soils are protected from erosion if rain occurs or is forecast.	2.4
22	Cover or barricade drains within reasonable proximity to the work area during concrete work.	2.5
23	Re-schedule concrete work if rain is forecast.	2.5
24	Avoid mixing or ordering excess amount of concrete.	2.5
25	Do not wash equipment or any concrete materials into footing excavations.	2.5
26	Stabilize all project disturbed soils to return the area to pre-project condition at end of project.	2.6, 5.0
27	Cover disturbed soils with a combination of temporary and permanent vegetative stabilization.	2.6
28	When a landowner does not want disturbed soils stabilized, contact the PG&E Land Agent to corredinate a specific agreement with the landowner.	2.6
29	Inspect BMPs daily and maintain, replace, or repair as necessary.	3.0

Small Rural Access Road Construction and Maintenance Projects

Activity Specific Erosion and Sediment Control Plan
(A-ESCP)

If Cumulative Soil Disturbance Changes,
Contact PG&E Environmental Operations - Environmental Field Specialists (EFS)
For Re-Evaluation of Storm Water Protection Needs

Prepared by

PG&E Storm Water Program Group

January 2011

TABLE OF CONTENTS

Attachments

1.0 WHAT IS COVERED UNDER THIS A-ESCP?

1.1 Routine Road Construction and Maintenance

This Activity Specific Erosion and Sediment Control Plan (A-ESCP) is applicable to routine small road construction and maintenance activities that are not near sensitive habitat, surface waters or wetlands, or located along steep slopes. If you encounter one of those conditions, contact your local Environmental Field Specialist (EFS). This A-ESCP sets forth minimum Best Management Practices (BMPs) for small rural road construction and maintenance projects.

1.2 Project Activities

Typical activities performed might include the following:

- Establish a lay down area
- Trim vegetation as needed to provide unimpeded access on the road
- Mobilize equipment and materials
- Blade the transmission access road as needed to provide a smooth base
- Manage stockpiles from excavations
- Install new gravel or paved surface and/or rolling dips (RD) and water bars (WB) on the access road as specified by PG&E project plans and specifications
- Demobilize after removing all temporary BMPs

1.3 Site Conditions Not Covered in this A-ESCP

This is a small project that should not include nearby site conditions such as:

- Nearby water bodies
- Wetlands/vernal pools
- Environmentally sensitive areas or protectable vegetation
- Steep slopes

Should any of these conditions be visible or become apparent in the near vicinity during mobilization activity, contact your local EFS for further direction.

1.4 Scheduling BMP Installation

Planning for storm water pollution prevention is required for all PG&E construction and maintenance projects throughout the year. However during the dryer summer months between June and September, for short duration projects (projects less than one week in duration), erosion and sediment control BMPs may not have to be implemented unless there is a possibility of precipitation. Storm water pollution prevention planning must be done prior to starting the project and erosion and sediment control BMPs must be on hand in the event there is a sudden rain event, but only need to be deployed if precipitation occurs. Good housekeeping and tracking control BMPs must be implemented for each project, regardless of time of year.

For longer duration projects, and all small construction projects from October to May, BMPs shall be installed prior to the soil disturbing activities, maintained during soil disturbing activities and removed at the conclusion of soil disturbing activities.

2.0 BEST MANAGEMENT PRACTICES

The purpose of this A-ESCP is to specify appropriate BMPs for routine rural road construction and maintenance. It is recommended that construction activities are scheduled to minimize soil disturbing activities during rain events.

The BMPs for the project should be installed in areas similar to those shown on the Typical BMP Installation Map, Attachment A.

Detailed cut-sheets on each BMP are provided in Attachment B.

In addition to the activity specific erosion and sediment control BMPs recommended in this A-ESCP, good housekeeping BMPs should be followed to minimize contamination of storm water runoff with construction associated chemicals and to maintain a clean construction site (refer to the Good Housekeeping A-ESCP).

2.1 Where to Obtain BMP Materials

BMP products in Table 1 can be obtained through PG&E materials warehouses using project order numbers and established materials codes.

TABLE 1

BMP PRODUCTS INFORMATION

Category	Supplier	Product Name	Units
Certified Weed-Free Straw Mulch (EC-6)	Reed & Graham	Weed-Free Straw	Bales
Geotextiles and Mats (EC-7) Geotextile Fabric	Reed & Graham	Mirafi 600	Rolls: 12.5’ x 360’ 17.5’ x 238’
Geotextiles and Mats (EC-7) Jute Mat	Reed & Graham	Eco-Jute	Rolls: 4’ x 225’
Geotextiles and Mats (EC-7) Plastic Sheeting	Reed & Graham	Visqueen	Rolls: 20 or 40’x 100’; 10ml thick
Silt Fence (SE-1)	Reed & Graham	Caltrans Grade Silt Fence	100 feet with 36-inch wood posts at 6 foot spacing
Fiber Roll (SE-5)	Curlex	Sediment Log Type II	25 foot rolls x 6 or 9” dia
Gravel Bags (SE-6)	Reed & Graham	Roc Soc	mono filament
Inlet Protection (SE-10) Gravel Bag	Reed & Graham	Same as SE-6	
Inlet Protection (SE-10)	Curlex	Same as SE-5	

2.2 Erosion Control

Erosion control practices consist of source control measures designed to prevent soil particles from becoming dislodged and transported in storm water runoff.

Soil-disturbing activities will be addressed as follows:

TABLE 2

BMP Number	BMP Name
EC-2	Preservation of Existing Vegetation
EC-6	Straw Mulch
EC-7	Geotextiles and Mats

For BMP installation procedures refer to the cut-sheets in Attachment B.

EC-2 Preservation of Existing Vegetation

Vegetation is one of the most effective erosion controls, protecting existing vegetative cover on the site is a cost-effective, beneficial erosion control measure. For small construction projects, preservation of existing vegetation is most easily accomplished by limiting the work area and disturbed soil areas to the extent practicable. Details for implementation of this BMP are in the cut sheets found in Attachment B. Key points are:

- Install fencing, barriers, or other markings to delineate vegetated areas to be preserved
- Suitable areas include but are not limited to: slopes, areas on site where no construction activity is planned, and areas near watercourses
- Locate staging and laydown areas outside of the drip line of existing trees
- Remove any fencing, barriers, or markings after the project is completed


Preserve vegetation between construction areas and sensitive areas whenever possible.

EC-6 Straw Mulch

Straw mulch is one of the preferred BMPs to protect soil from rain impacts. Straw mulch is typically used when the terrain is relatively flat or on slopes that are less than 2-3 feet in length. On longer slopes, jute matting should be used along with velocity dissipation BMPs such as fiber rolls.

Details for the implementation of this BMP are in the cut-sheets found in Attachment B. Key points are:

- Weed-free agricultural straw must be used to avoid the spread of unwanted weeds
- Apply a sufficient amount to provide 100% ground coverage
- Apply a layer 1-3 inches thick, applying a thicker layer on sloped areas
- Crimping or track walking can be used to hold straw on sloped areas

- Can be left in place at the end of the project, but is not a final stabilization measure

Straw mulch protecting a disturbed area.

<u>EC-7 Geotextiles and Mats</u>

Geotextiles and mats come in many different types. This plan covers the use of three types:

- Geotextile fabrics – for shielding soil from flowing water
- Plastic sheeting – for covering stockpiles from rain impacts
- Jute mats – for shielding soil from rain impacts on steep slopes and embankments

Geotextile Fabrics – Geotextile fabrics are used to protect soil from flowing water. Fabric is laid over the soil in areas where the flowing water is concentrated and moving fast enough to cause erosion. Details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Can be used on slopes or in channels.
- Must prepare the site to ensure complete contact of the fabric with the soil
- Should be installed vertically down-slope and overlapped
- Must be properly anchored using anchor trenches and pins/nails
- Can be left in place at the end of the project if it is covered by rock or gravel otherwise it should be removed

Plastic Sheeting – Generally, plastic sheeting should be used only as a covering for stockpiles or for very small graded areas for short periods of time (e.g., to protect against an imminent storm). Details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Plastic sheeting should have a minimum thickness of 6 mils
- Secure with gravel bags or other weights placed no more than 10 ft apart
- Inspect frequently because plastic degrades quickly and is easily damaged by wind
- Keep secure so fragments will not be blown into electrical equipment
- Must be removed at the end of the project

Plastic sheeting over stockpiles properly and improperly secured.

Jute Mats – Jute is used mostly to protect slopes and embankments. It is made of natural fiber and can be left in place at the completion of the project to maintain protection of the slopes until vegetation is reestablished. Jute is less effective than geotextiles and is usually used in conjunction with vegetation. The details of installation are the same as geotextile fabrics.

Jute mat used to protect soil on slope and embankment.

2.3 Sediment Controls

Sediment controls filter storm water and trap soil particles before they move offsite. Table 3 has a selection of BMPs used to filter storm water.

TABLE 3

BMP Number	BMP Name
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-10	Inlet Protection

For BMP installation procedures refer to the cut-sheets in Attachment B.

<u>SE-1 Silt Fence</u>

Silt fence is one of the most commonly used BMPs. It traps sediment by intercepting and detaining small amounts of sediment laden sheet flow runoff from disturbed areas to promote sedimentation behind the fence. It can be used in the following applications:

- Along the perimeter of a project
- Below the toe or down-slope of exposed erodible slopes
- Along drainage ways and channels to prevent sediment from entering these areas
- Around stockpiles

Details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Used principally in areas where sheet flow occurs
- Install along a level contour, perpendicular to slope, so water does not flow along fence causing a concentrated flow
- Provide room for runoff to pond behind fence
- Bury bottom of fencing material to prevent water from running underneath
- Overlap ends of fence so flow is not concentrated in gaps between adjacent sections
- Stakes should be on the down-slope side of the fence

- Turn the ends of the fence uphill to prevent storm water from flowing around fence

Silt fence may be used to protect small maintenance or expansion projects from run-on, to protect inlets, swales, and channels in unpaved areas, or to protect downgradient drainages from runoff from the work area. Silt fence is installed in unpaved areas. To protect paved areas, refer to SE-6 Gravel Bag Berm.

Silt fence reinforced with gravel bags, protecting a drainage channel.

<u>SE-5 Fiber Rolls</u>

Fiber rolls and silt fence can be used in many of the same applications. Fiber rolls can be used in the following applications:

- Along the perimeter of a project
- Below the toe or down-slope of exposed erodible slopes
- Along drainage ways and channels to prevent sediment from entering these areas
- Around stockpiles

Fiber rolls may have an advantage over silt fence in certain applications such as high wind areas and along slopes. The pictures below show fiber rolls being used at the toe of a slope to trap any sediment that comes off the slope and fiber rolls on the down-slope side of a pole replacement site. Fiber rolls may also be used at the base of stockpiles. The details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Locate fiber rolls on level contours on slopes at intervals of 10 – 20 ft

- Install fiber rolls in trenches that are 2 – 3 inches deep
- Stake at end of roll and at a maximum spacing of 4 ft using 24 inch long stakes
- Turn the ends of the fiber rolls up slope to prevent runoff from going around the roll
- Overlap at junction of two rolls
- They may be left at sites in sensitive areas if they are biodegradable


Fiber roll at foot of slope and protecting channel prior to pole replacement.

Fiber roll protecting a pole replacement site

SE-6 Gravel Bag Berms

Gravel bags are a good option for use in concentrated flow areas because their weight will keep them in place. Gravel bags can be formed into berms or check dams in channels. The picture below shows gravel bags used as both a berm and check dams. They may be suitable for:

- Diverting water running onto or off of the project site
- Slowing water on disturbed slopes
- Below the toe of slopes
- As sediment traps in channels
- Around temporary stockpiles including those on paved areas

The details for installation of this product are in the cut-sheets found in Attachment B. Key points are:

- Installation can be labor intensive
- Degraded gravel bags may rupture when removed, spilling contents
- Easily damaged by construction equipment
- Must be removed at end of project

For small maintenance or expansion projects, gravel bag berms may be used in paved areas for similar applications to silt fence.

Gravel bags used to slow sheet flow run-on into the lined swale, and as check dams to slow flow within the swale.

SE-10 Storm Drain Inlet Protection

All storm drain inlets that will receive storm water runoff from the construction project must be protected. Storm drain inlet protection consists of gravel bags to filter sediment upstream of drop or curb inlets as shown below. The gravel bags also temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Different measures are available for storm drain inlets in unpaved or otherwise stabilized areas. Details of implementation of this BMP are in the cut-sheets found in Attachment B. Key points are:

- Place gravel bags so there is an opening to the street to allow for excessive water to enter the storm drain rather than flood the street
- Requires frequent maintenance

Appropriate inlet protection.

Inlet before and after maintenance.

Additional methods of inlet protection using fiber rolls and gravel bags.

2.4 Tracking Controls

Tracking of mud and dirt onto public roads must always be controlled at construction sites. Access roads, parking lots, and other onsite vehicle transportation routes should be stabilized after they are graded if they will be used during or after periods of rain. The tracking control measures are:

TABLE 4

BMP Number	BMP Name
TC-1/2	Tracking Control

For BMP installation procedures refer to the cut-sheets in Attachment B.

TC-1/TC-2 Tracking Control:

Tracking controls consist of preventing or reducing the tracking of sediment off-site by vehicles leaving the construction area. Tracking control BMPs include TC-1 Stabilized Construction Entrance/Exit and TC-2 Stabilized Construction Roadway. Details of tracking control BMPs are in the cut-sheets found in Attachment B.

Tracking control is important for any construction project large or small. Track-out of mud, rock, or dirt onto paved streets is visible to the public and any city or county staff will identify this as a storm water violation. Pictured below is an example of a construction entrance/exit that is well maintained in which no muddy wheel tracks are visible on the pavement.

Clean and well maintained construction entrance/exit.

Depending on the size of your project, tracking control can be accomplished in various ways. If you are working on a very small, short duration project, tracking control can be as simple as sweeping during and at the end of the day. Sites that have a construction entrance/exit that transitions from dirt to pavement may require more attention. Pictured here is an example of a construction entrance before and after stabilization:

Construction entrance/exit before and after installation.

Larger sites may require the use of temporary construction roadways. Temporary roads should follow the contours of the natural terrain to the maximum extent possible. Roadways should be graded to prevent runoff from leaving the construction site. Drainage should flow across the roadway width to one or both sides of the roadway, where a trench may be dug and stabilized to direct concentrated flow or a gravel bag berm may be installed along the perimeter of the road.

Make the tracking control fit the size of the project

2.5 Good Housekeeping BMPs

Good housekeeping covers general practices that keep a construction site clean and neat. It also designates specific areas where such things as refueling can be done safely so that any incidental spills will not end up in storm water runoff from the site. The good housekeeping practices covered in this plan are:

TABLE 5

BMP Number	BMP Name
WM-3	Stockpile Management

WM-3 Stockpile Management

Stockpile management procedures are designed to reduce or eliminate air and storm water pollution from soil, paving and construction materials stockpiles. Details from implementing stockpile management practices are on the cut-sheets provided in Attachment B. Stockpile management requirements include:

- Protection of stockpiles must be implemented during the entire year, not just during the rainy season
- All stockpiles should be covered prior to the onset of rain and in windy conditions
- Protect the perimeter of stockpiles from stormwater run-on
- Inspect frequently because plastic degrades quickly and is easily damaged by wind
- Keep secure so fragments will not be blown into electrical equipment

Proper securing of plastic sheeting.

3.0 BMP INSPECTION AND MAINTENANCE

BMP installation, inspection and maintenance will be performed by the PG&E construction crew. BMPs should be inspected daily during construction activities. In the event that BMPs appear to require maintenance or are not functioning as expected, the BMP will be repaired or replaced to correct the deficiency.

4.0 WHOM TO CALL

If the project receives a written notice or order from any regulatory agency, contact your local EFS for further direction immediately.

Contact the local EFS if any of the following conditions occur:

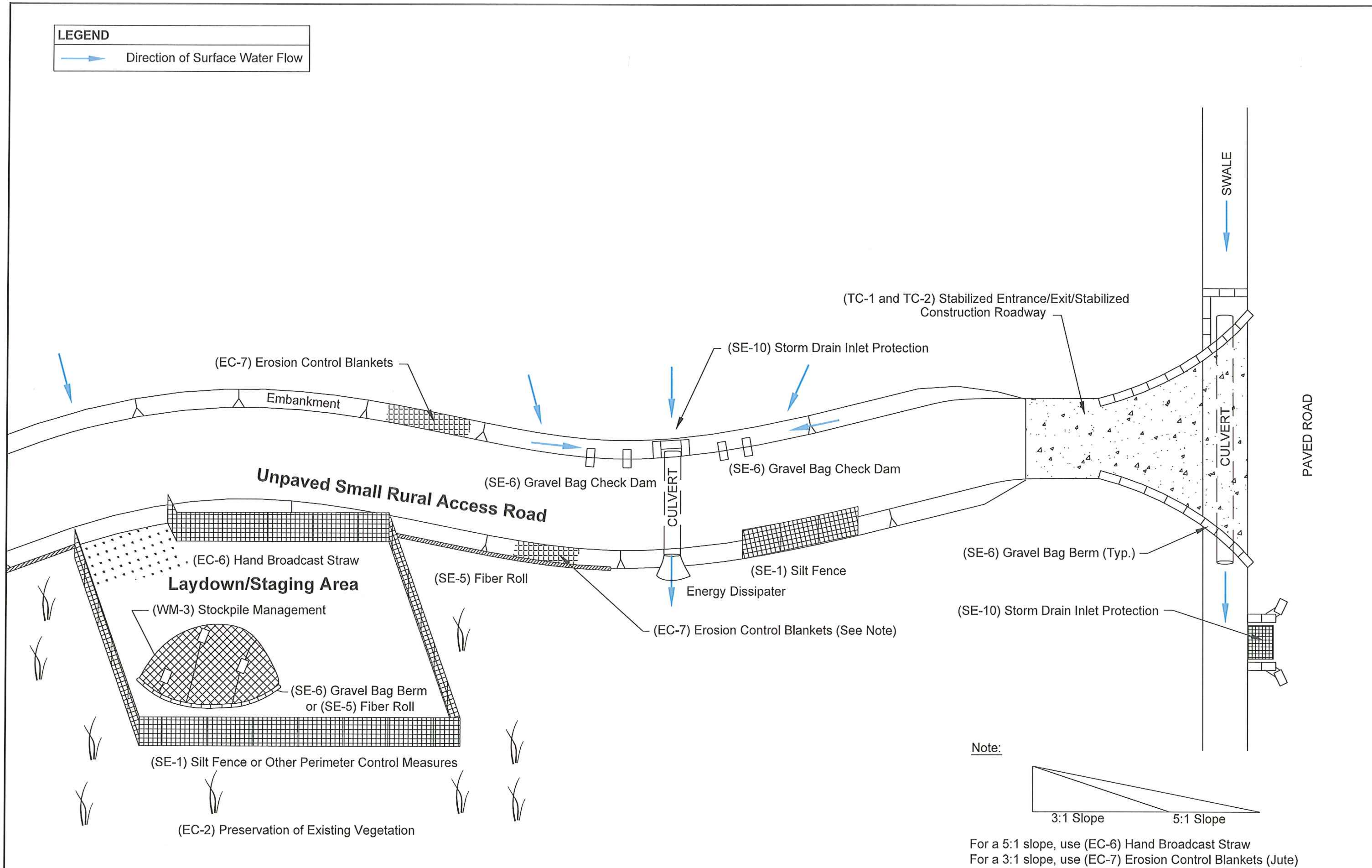
- Visually cloudy/muddy water is observed leaving the work area
- Discharge or spill of hazardous substance

After hours or if the local EFS are unavailable, call the following 800 number:
800-874-4043.

5.0 POST-CONSTRUCTION

Upon completion of construction within the project area, all temporary, non-biodegradable BMPs will be removed. All construction equipment will be demobilized and removed from the site.

Attachment A Typical BMP Installation Map



ETIC ENGINEERING

A-ESCP SMALL RURAL ROAD CONSTRUCTION TYPICAL BMP USE MAP
PACIFIC GAS AND ELECTRIC COMPANY

FIGURE: 1

Attachment B PG&E Best Management Practice (BMP) Cut-sheets

Cut-sheets for BMPs described in this A-ESCP are included in this attachment, as follows:

EC-2 Preservation of Existing Vegetation
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-10 Storm Drain Inlet Protection
TC-1 Stabilized Construction Entrance/Exit
TC-2 Stabilized Construction Roadway
WM-3 Stockpile Management

When

This BMP is applicable to projects when:

- There are areas onsite where no construction activity is planned or will occur later
- Areas to be preserved are in the immediate vicinity of the construction site. Mark as appropriate before clearing and grubbing or other soil disturbance activities begin
- Areas with vegetation that can be preserved to protect against soil erosion, such as on steep slopes, watercourses, and building sites in wooded areas
- Areas designated as Environmentally Sensitive Areas (ESAs), or where federal, state, or local government regulations require preservation, such as wetlands, vernal pools, marshes, etc. These areas are typically flagged by a qualified biologist

How

Use the following measures as applicable:

- Preserve existing vegetation whenever possible
- If necessary, contact the project Environmental Representative for clarification regarding areas to be preserved
- Whenever possible, minimize disturbed areas by locating temporary roadways to avoid stands of trees and shrubs, and follow existing contours to reduce cutting and filling
- Locate construction materials, equipment storage, and parking areas outside the drip line of any tree to be retained
- Consider the impact of grade changes to existing vegetation and the root zone
- Remove any markings, barriers, or fencing after project is completed

Maintenance and Inspection

To preserve vegetation, maintain the clearly marked limits of disturbance during construction.

- Routinely inspect barriers during construction
- Repair or replace barriers as needed during construction

Mark vegetated area to be preserved

This slope should have been protected and will now be susceptible to erosion.

Ensure that vegetation protection barriers are adequate in length and delineation.

When

Straw mulch is used when:

- Temporary soil stabilization surface cover is needed on disturbed areas until soils can be prepared for re-vegetation and permanent vegetation is established
- In combination with temporary and/or permanent seeding strategies to enhance plant establishment
- Straw has a potential for introduction of weed-seed and unwanted plant material

How

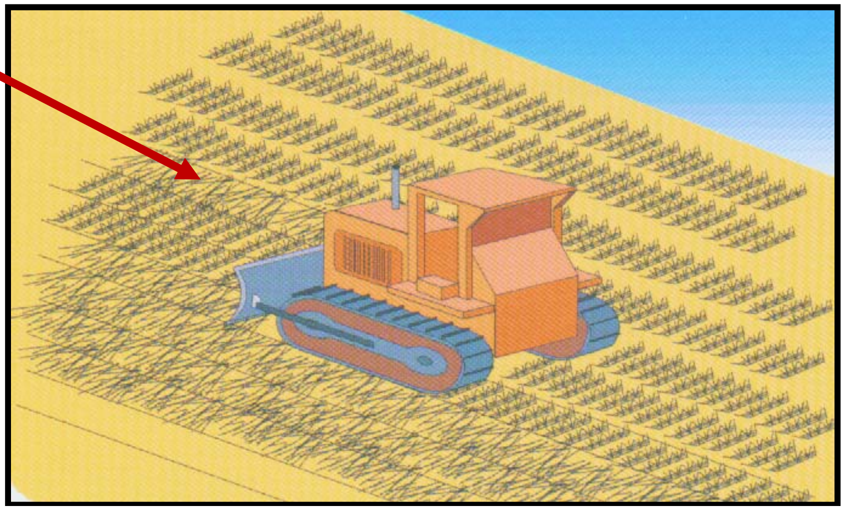
A tackifier is the preferred method for anchoring straw mulch to the soil on slopes. Tackifiers glue the straw fibers together and to the soil surface. Select the tackifier based on longevity and ability to hold the fibers in place. Soil binders (tackifier) will generally experience spot failures during heavy rainfall events.

- A tackifier is typically applied at a rate of 125 pounds per acre. In windy conditions, the rates are typically 150 pounds per acre
- Crimping, punch roller-type rollers, or track-walking may also be used to incorporate straw mulch into the soil on slopes
- Avoid placing straw onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation
- Do not apply straw mulch with tackifier during or immediately before rainfall
- Apply loose straw at a minimum rate of 4,000 pounds per acre, either by machine using a straw blower or by hand
- Evenly distribute the straw mulch on the soil surface
- Anchor the mulch in place by using a tackifier or by punching it into the soil mechanically. Straw punching does not work in sandy soils
- Methods for holding the straw mulch in place depend on the slope steepness, accessibility, soil conditions, and longevity. If the selected method is incorporation of straw mulch into the soil, then follow these guidelines:
    - Use a spade or shovel on small areas
    - On slopes with soils, which are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be punched into the ground using a knife-blade roller or a straight bladed coulter, known commercially as a crimper
    - On small areas and/or steep slopes, straw can also be held in place using plastic netting or jute. Use 11 gauge wire staples, geotextile pins, or wooden stakes (as described in BMP EC-7 on Geotextiles, Plastic Covers, and Erosion Control Blankets/Mat) to hold the netting in place
- Remove straw as necessary before permanent seeding or soil stabilization

Maintenance and Inspection

- The key consideration in maintenance and inspection is that the straw needs to last long enough to achieve erosion control objectives
- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes
- After any rainfall event, maintain all slopes to prevent erosion

On slopes, straw should be crimped or track walked in.



Straw mulch should be evenly distributed.

Layer of straw mulch should be:

Flat areas = 1 inch thick
Slopes = 3 inches thick

When

Use the following methods when disturbed soils may be particularly difficult to stabilize or access, including the following situations:

- Steep slopes, generally steeper than 1:3 (V:H)
- Slopes where the erosion hazard is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop adequate protective cover
- Channels with high flows
- Channels intended to be vegetated
- Slopes adjacent to water bodies of Environmentally Sensitive Areas (ESAs)
- Blankets and mats are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (because staples and netting can catch in mowers)

Plastic results in 100 percent runoff; their use is limited to:

- o Covering stockpiles
- o Covering small graded areas for short periods, such as through an imminent storm event, until an alternative protection measure is implemented

How

Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil:

- Grade and shape the area of installation
- Remove all rocks, clods, vegetation, or other obstructions, so that the installed blankets or mats have complete, direct contact with the soil
- Prepare seedbed by loosening topsoil
- 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 before blanket installation, re-seed all check slots and other areas disturbed during installation. Where soil filling is specified, seed the matting and the entire disturbed area after installation and before filling the mat with soil
- Use u-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes to anchor mats and blankets to the ground surface
- Drive wire staples and metal stakes flush to the soil surface
- All anchors should be 6 inches to 18 inches long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils
- For installation on slopes, consult the manufacturer's recommendations. Generally:
    - o Begin at the top of the slope and anchor the blanket in a 6 inch deep by 6 inch wide trench. Backfill trench and tamp earth firmly

- o Unroll the blanket down slope in the direction of water flow
- o Overlap the edges of adjacent parallel rolls 2 inches to 3 inches and staple every 3 feet
- o When blankets must be spliced, place blankets end-over-end (shingle style) with 6-inch overlap. Staple through overlapped area, approximately 12 inches apart
- o Lay blankets loosely and maintain direct contact with the soil. Do not stretch
- o Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Place staples down the center and stagger with the staples placed along the edges

- Remove and dispose of blankets and mats before applying permanent soil stabilization measures

Maintenance and Inspection

- Routinely inspect areas treated with temporary soil stabilization before and after significant forecasted storm events. Immediately repair any failures. Maintain areas treated with temporary soil stabilization to provide adequate erosion control. Re-apply or replace temporary soil stabilization on exposed soils when greater than 10 percent of the previously treated area becomes exposed or exhibits visible erosion
- If washout or breakage occurs, reevaluate the original materials installation. Repair damage to the slope or channel. If appropriate, re-install the material or implement a revised BMP

Several types of Erosion Control Blankets.

Remove all rocks, clods, vegetation, or other obstructions to install the blankets or mats.

Installed blankets or mats need to have direct contact with the soil in order to be effective.

Be sure to use enough staples to adequately secure the blankets or mats.

SEDIMENT CONTROLS
Silt Fence

SE-1

When

Silt fences are temporary linear sediment barriers of permeable fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff. Silt fences allow sediment to settle from runoff before water leaves the construction site.

Silt fences are placed:

- Below the toe of exposed and erodible slopes
- Down slope of exposed soil areas
- Around temporary stockpiles
- Along streams and channels
- Along the perimeter of a project

How

Construct silt fences with a setback of at least 3 feet from the toe of a slope in areas suitable for temporary ponding or deposition of sediment. Where a 3-foot setback is not practicable, construct as far from the toe of the slope as practicable.

- Generally, use silt fences in conjunction with erosion controls up slope to provide effective control, particularly for slopes adjacent to water bodies or Environmentally Sensitive Areas
- Construct the length of each reach (length of fence) so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; each reach should not exceed 500 feet. The last 6 feet of the reach should be turned up slope
- The maximum length of slope draining to the silt fence should be 200 feet or fewer
- Excavate a trench for the bottom of the silt fence that is not wider or deeper than necessary
- Key in, or bury the bottom of silt fence fabric at least 12 inches deep in trench and tamp into place. If it is not feasible to trench along the slope contour, use sand bags or backfilling to key in the bottom of the fabric
- Install fence post at least 12 inches below grade on down slope side of trench
- Silt fences should not be considered for installation below slopes steeper than 1:1 (horizontal:vertical) or that contain a high number of rocks or loose dirt clods

Maintenance and Inspection

- Repair or replace split, torn, slumping, undercut, or weathered fabric
- Inspect silt fences before and after each storm event and routinely throughout the rainy season
- Remove accumulated sediment when it reaches 1/3 of the barrier height. Incorporate removed sediment into the project at appropriate locations or dispose of at a PG&E-approved site

- Remove and dispose of silt fences that are damaged and become unsuitable for the intended purpose and replace with new silt fence barriers
- Remove silt fence when the upgradient area is stabilized. Fill and compact post-holes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground

Silt fence installed at the toe of an erodible slope for perimeter control.

Silt fence needs to be properly keyed in 12 inches below the ground surface.

When

A fiber roll consists of straw, flax, or other similar bio-degradable materials that are rolled and bound into a tight roll or stuffed in a photo-degradable open weave netting or burlap that is generally placed on the face of slopes at regular intervals to intercept runoff, reduce flow velocity, release the runoff as sheet flow, and provide the removal of sediment.

- May be used along the top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- May be used as check dams in unlined ditches
- May be used where flows are moderately concentrated, such as ditches, swales, and unpaved storm drain inlets (Storm Drain Inlet Protection to divert and/or detain flows)
- Are appropriate in unpaved areas for perimeter site control or along streams, channels, storm drain inlets, or around stockpiles to intercept sediment laden storm water and non-storm water runoff

How

<u>Installation</u>

Follow the manufacturer’s recommendations for installation. In general:

- Locate fiber rolls on level contours spaced 8 to 20 feet apart along the face of the slope
- Key fiber rolls into a trench with a depth of ¼ to 1/3 the roll thickness and width equal to the diameter of the fiber roll
- Drive stakes at least 24 inches in length into fiber rolls at a minimum of 4-foot intervals
- If more than one fiber roll is placed in a row, fiber rolls should be overlapped and not abutted end to end to ensure no sediment escapes
- Install fiber rolls in contours starting at the toe of slope and moving up

<u>Removal</u>

- If used on slopes, leave fiber rolls in place
- If used as Storm Drain Inlet Protection, stockpile control, or other temporary control measures, remove fiber rolls at the completion of the construction project
- If removed, collect and dispose of fiber rolls and sediment accumulation as appropriate. Fill and compact holes, trenches, depressions, or any other ground disturbance to blend with adjacent ground

Maintenance and Inspection

- Repair or replace split, torn, unraveling, or slumping fiber rolls
- Inspect fiber rolls if rain is forecasted and perform maintenance as

needed

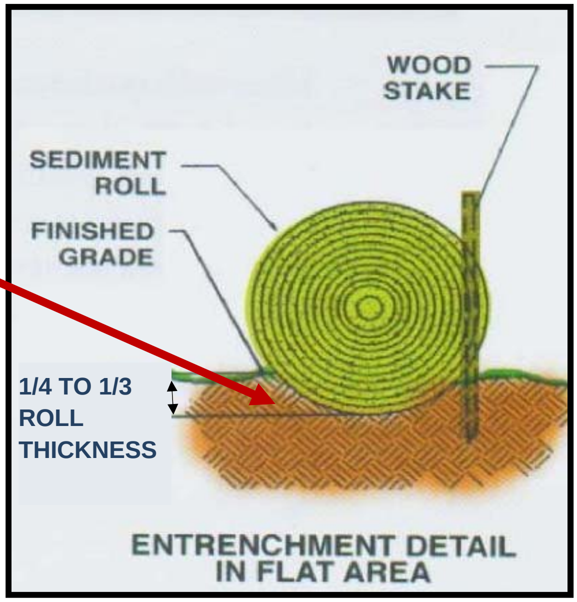
- Inspect fiber rolls before and after each storm event, and routinely during throughout the rainy season
- Sediment should be removed when sediment accumulation reaches 1/3 the distance from the top of the fiber roll and the adjacent ground surface. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location

Limitations

Fiber rolls are not effective unless trenched.

- When working in a habitat/species sensitive area:
  - Use 'certified weed free' wattles
  - Use burlap covered wattles in lieu of plastic netting

Fiber rolls need to be properly keyed in ¼ to 1/3 roll thickness into the ground surface to be effective.



Be sure to place stakes no more than 4 feet apart from each other.

When

A gravel bag berm consists of a single row of gravel bags that are installed end-to-end to form a barrier across a slope to intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide some sediment removal. Gravel bags can also be used where flows are moderately concentrated, such as ditches, swales, and storm drain inlets (Storm Drain Inlet Protection to divert and/or detain flows). Gravel bag berms are appropriate for perimeter site control or along streams, channels, storm drain inlets, or around stockpiles to intercept sediment laden storm water and non-storm water runoff.

- Where it is desirable to filter sediment in runoff. Note that gravel bag berms are generally more permeable than sand bags. Sand bag barriers should be used where it is desirable to block and pond flows (e.g., for containment of non-storm water flows)
- Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- On a project-by-project basis to maximize effectiveness
- With other BMPs to maximize sediment containment

How

When used as a linear control for sediment removal:

  - Install along a level contour
  - Space rows 8 to 20 feet apart
  - Turn ends of gravel bag row up slope to prevent flow around the ends
  - Use in conjunction with temporary soil stabilization controls up slope to provide effective control

- When used for concentrated flows:
  - Stack gravel bags to required height. When the height requires 3 rows or more, use a pyramid approach
  - Overlap upper rows of gravel bags with overlap joints in lower rows
- Construct gravel bag barriers with a setback of at least 3 feet from the toe of a slope. Where a 3-foot setback is not practicable, construct as far from the toe of the slope as practicable

Maintenance and Inspection

- Inspect gravel bag berms before and after each storm event and routinely throughout the rainy season
- Reshape or replace gravel bags as needed
- Repair washouts or other damages as needed
- Inspect gravel bag berms for sediment accumulation and remove sediments when accumulation reaches 1/3 of the berm height. Incorporate removed sediment into the project at appropriate locations or dispose of it at a PG&E-approved site
- Remove gravel bag berms when no longer needed. Remove

sediment accumulation, and clean, re-grade, and stabilize the area. Incorporate removed sediment into the project at appropriate locations or dispose of it at a PG&E-approved site

Gravel bag berm used for perimeter control.

Gravel bag check dams installed to slow the water down and encourage sediments to drop out.

When

A device used at storm drain inlets to protect against the discharge of sediment-laden storm water and non-storm water runoff from construction activities. The device develops a pond behind it, giving the sediment time to settle out before discharging to the storm drain. Do not construct such that runoff will result in:

- Ponding into road traffic or onto erodible surfaces or slopes
- Overflowing onto the sidewalk

This BMP is required on all construction projects where sediment laden or otherwise impacted surface runoff may enter a storm drain inlet and watercourses.

How

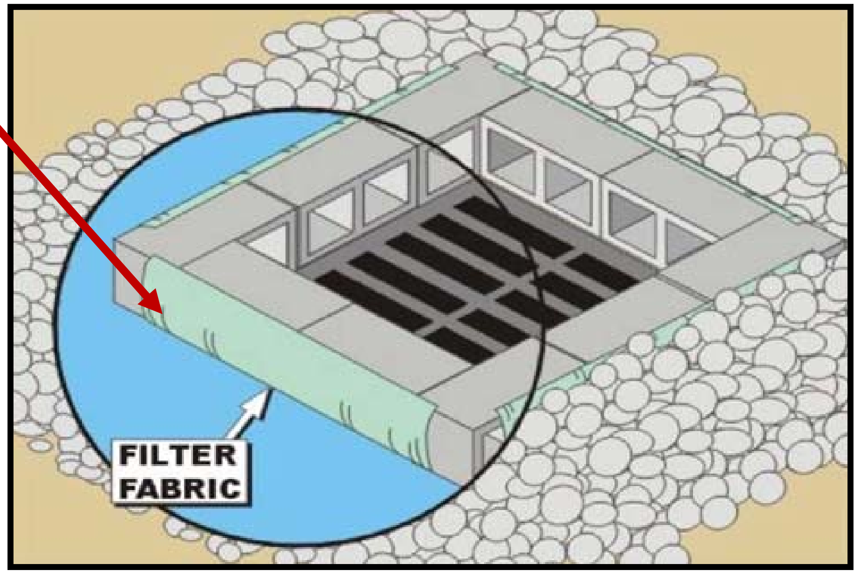
Identify downstream storm drain inlets that have the potential to run off from construction activities.

- Where a storm drain inlet is on or at the bottom of a slope, a series of small check dams (i.e., gravel bags) constructed at intervals along the slope may be required to slow the runoff
- Select appropriate protection and construct inlet protection based on the configuration of inlets at the site

Maintenance and Inspection

- Inspect inlet protection devices before and after each storm event and routinely throughout the rainy season
- Remove inlet protection devices at the end of the construction period, or when the project can no longer impact the inlet
- During inspections:
    - o Inspect bags, silt fence, or filter fabric for holes, gashes, and snags
    - o Check gravel bags for proper arrangement and displacement
    - o Remove the sediment behind the barrier when it reaches 1/3 the height of the barrier. Removed sediment should be incorporated in the project or disposed of properly

Maintenance is critical on drain inlets to prevent flooding or failure of the BMP.



Block and gravel-type inlet protection.

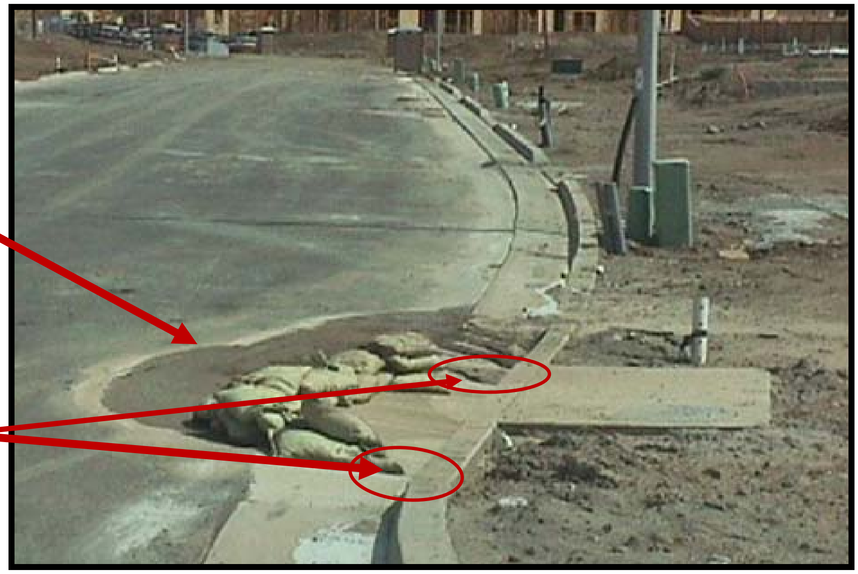
Sediment buildup needs to be cleaned out on a regular basis to prevent flooding or overwhelming of the BMP.

Curb inlet protection that blocks flow is good for preventing non-storm water discharges from entering the drain.

These gravel bags are slowing down the water to encourage sediments to drop out behind them….

BUT

The gravel bags are not completely protecting the drain inlet and sediments are still able to be discharged.



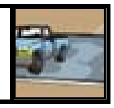
Gravel bag inlet protection slows flow and filters sediment from drainage.

Fiber rolls slow sheet flow and concentrated flow down to allow sediments to drop out before reaching the drain inlet.

Instead of fiber rolls, a gravel bag berm could be used here.

Geotextile fabric helps prevent the disturbed soil surrounding the drain from eroding.

Straw fiber rolls combined with geotextile fabric for drain inlet protection.



When

Tracking controls reduce offsite tracking of sediment and other pollutants by providing a stabilized entrance at defined construction site entrances and exits and/or providing methods to clean up sediment or other materials to prevent them from entering a storm drain by sweeping or vacuuming.

- Stabilize entrances on a project-by-project basis in addition to other BMPs
- Implement sweeping or vacuuming when sediment is tracked from the project site onto public or private paved roads, typically at points of site exit
- Use stabilized entrances and/or sweeping at construction sites:
    - Where dirt or mud is tracked onto public roads adjacent to water bodies
    - Where poor soils are encountered, such as soils containing clay
    - Where dust is a problem during dry weather conditions

How

<u>Stabilized Construction Entrances</u>

- Limit the points of entrance/exit to the construction site by designating combination or single-purpose entrances and exits. Require all employees, subcontractors, and others to use them. Limit speed of vehicles to control dust
- 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 the heaviest vehicles and equipment that will use it
- Select construction access stabilization (aggregate, asphaltic concrete, and concrete) based on longevity, required performance, and site conditions
- Use of constructed or constructed/manufactured steel plates with ribs for entrance/exit access is permitted
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 inches deep, or place aggregate to a depth recommended by a geotechnical engineer. Use crushed aggregate of more than 3 inches but fewer than 6 inches
- If possible, construct aggregate area with a minimum length of 50 feet and width of 30 feet

<u>Street Sweeping and Vacuuming</u>

- Routinely inspect potential sediment tracking locations, at least daily
- Sweep or vacuum visible sediment tracking as needed
- Manual sweeping is appropriate for small projects. For larger

projects, use sweeping methods that collect removed sediment and material

- If not mixed with debris or trash, incorporate the removed sediment into the project or dispose of it at a PG&E-approved disposal site

Maintenance and Inspection

Stabilized Construction Entrance

- Inspect routinely for damage and assess effectiveness. Repair if access is clogged with sediment
- Sweep where tracking has occurred on roadways, on the same day. Do not use water to wash sediment off the streets. If water must be used, it should be captured to prevent sediment-laden water from running off the site
- Keep all temporary roadway ditches clear

Street Sweeping and Vacuuming

- Inspect inlet and outlet access points routinely and sweep tracked sediment as needed
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous
- After sweeping, properly dispose of sweeper wastes

Depending on the project area soil types, these metal plates may be sufficient enough to prevent track out onto paved roads.

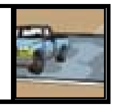
Regularly clean the plates to prevent buildup of sediments, mud, or construction debris from being tracked onto the paved road.

Manufactured metal plates knock dirt off vehicles before exiting a site.

One way to prevent bypassing would be to install a barrier such as safety cones or K-rails.

For rocked construction entrances/exits, use crushed aggregate of more than 3 inches but fewer than 6 inches.

Traditional rocked construction entrance/exit.



When

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

How

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surface. During wet weather, they often become muddy and can generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather.

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5 percent.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15 percent. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of the crowned section or one side in the case of the super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (see SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered:

- Road should follow topographic contours to reduce erosion of the roadway

- The roadway slope should not exceed 15 percent
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust
- Properly grade roadway to prevent runoff from leaving the construction site
- Design stabilized access to support heaviest vehicles and equipment that will use it
- Stabilized roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete grindings for stabilized construction roadway is not allowed
- Coordinate materials with those used for stabilized construction entrance/exit points
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 inch depth

Maintenance and Inspection

- 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, impact weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation
- Keep all temporary roadway ditches clear
- When no longer required, removed stabilized construction roadway and re-grade and repair slopes
- Periodically apply additional aggregate on gravel roads
- Active dirt construction roads are commonly watered three or more times per day during the dry season

Install filter fabric, place stabilization materials and compact.

In areas where run-on onto the road may be an issue install BMPs such as fiber rolls or silt fence to protect the road.

Stabilized construction road.

When

Use this BMP when projects require stockpiled soil and paving materials. The stockpile management practices differ based on forecasted weather or terrain.

- Protection of stockpiles must be implemented whenever there is a potential for transport of materials by a water source (forecast precipitation, windy conditions, or any non-storm water runoff)

How

Use one or more of the following options to manage stockpiles and prevent stockpile erosion and sediment discharges for storm water and non-storm water runoff/run-on:

  - Return stockpile to the excavation if precipitation is forecast
  - Protect stockpiles from storm water run-on with temporary perimeter sediment barriers such as berms, silt fences, fiber rolls, covers, sand/gravel bags, or straw bale barriers, as appropriate
  - Remove or temporarily store stockpiles in a protected location offsite

- **Stockpiles should be covered, stabilized, or protected with a perimeter sediment barrier before the onset of precipitation**
- Secure plastic coverings tightly. Ensure no plastic is blown into electrical equipment
- Keep stockpiles organized and surrounding areas clean
- Protect storm drain inlets, watercourses, and water bodies from stockpiles, as appropriate
- Implement dust control practices as appropriate on all stockpiled material

Maintenance and Inspection

Repair and/or replace covers and perimeter containment structures as needed. Plastic sheeting requires frequent inspection for sun and wind damage.

This stockpile should have perimeter control around it. Such as, fiber rolls, a gravel bag berm, or silt fencing.

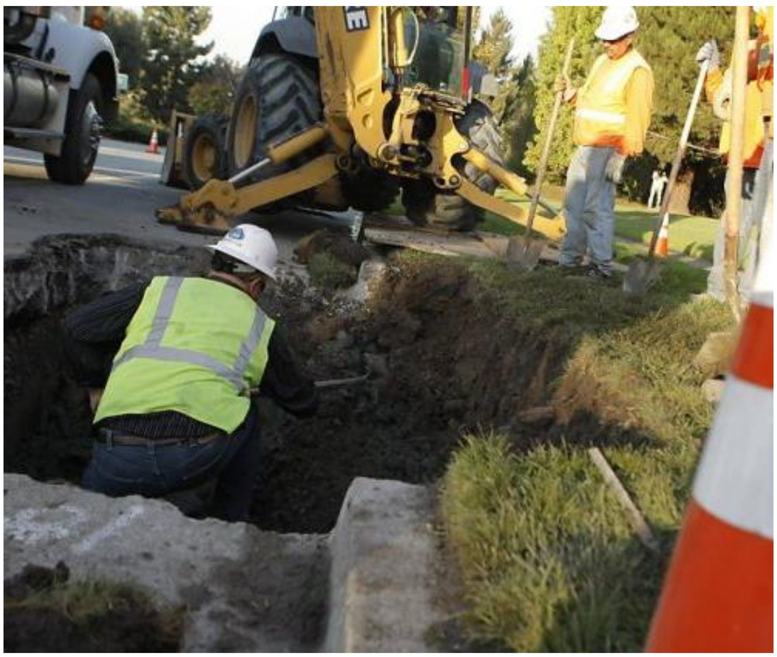
Stockpile covered with plastic and secured with large rocks. Where more than one sheet of covering is required, overlap sheets and secure at seam.

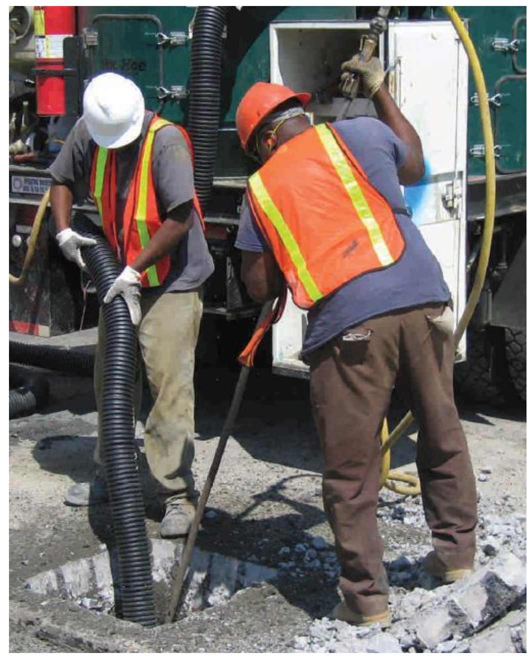
This stockpile should be covered even though it has perimeter control.

Silt fence as stockpile perimeter control.

Small Excavation, Construction, and Potholing

Activity Specific Erosion and Sediment Control Plan
(A-ESCP)





If Cumulative Soil Disturbance Changes,
Contact the Environmental Field Specialists (EFS)
For Re-Evaluation of Storm Water Protection Needs

Prepared by

PG&E Water Quality Group

November 2013

TABLE OF CONTENTS

Attachments

Attachment A	**Activity Specific Installation Detail**
SC-01	Typical BMP Use Detail
Attachment B	**Activity Specific Erosion & Sediment Control Plans (A-ESCPs)**
GH	Good Housekeeping
SM	Stockpile Management
SP	Sawcutting, Grinding, and Paving
Attachment C	**PG&E Best Management Practice (BMP) Cut-sheets**
EC-2	Preservation of Existing Vegetation
EC-3	Hydraulic mulch
EC-4	Hydroseed
EC-6	Straw Mulch
EC-7	Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
EC-16	Non-Vegetative Stabilization
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-10	Storm Drain Inlet Protection
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
WM-2	Material Use
Attachment D	**Requirement Summary Table**

1.0 WHAT IS COVERED UNDER THIS A-ESCP?

1.1 Small Excavation, Construction, and Potholing

Construction, demolition, clearing, grading, excavation, and other land disturbance activities associated with small excavation, construction, and potholing operations have the potential to release sediment and other pollutants, potentially causing negative impacts to the environment.

This Activity Specific Erosion and Sediment Control Plan (A-ESCP) sets forth minimum Best Management Practices (BMPs) for Small Excavation, Construction, and Potholing at all Pacific Gas and Electric Company (PG&E) construction projects. Construction projects include all permitted, non-permitted, and maintenance operations/projects.

If specific environmental concerns are encountered, or if the procedures contained within this A-ESCP prove ineffective, contact your local Environmental Field Specialist (EFS).

1.2 Typical A-ESCPs Related to Small Excavation, Construction and Potholing

In many cases, small excavation, construction, and potholing activities involve procedures, requirements, or prohibition of practices covered under existing A-ESCPs which include:

- Good Housekeeping
- Stockpile Management
- Sawcutting, Grinding, and Paving

1.3 Site Conditions Covered in this A-ESCP

This A-ESCP is applicable to any small construction project that disturbs less than 0.9 acres, including all access roadways, staging areas that include the disturbance of soil, excavations, trenches, trench spoils, stockpiles, and any other land disturbance. Small construction activities include, but are not limited to: exploratory potholing and excavation, gas line replacement projects (GLRP), leak repairs, emergency excavation, relocation or installation of underground facilities, Work Requested by Others (WRO), vault, valve, transformer or, switch pad repair, replacement, removal, relocation, or upgrade, and other similar projects.

This document is intended to apply to all PG&E Small Excavation, Construction, and Potholing projects as well as any Small Excavation, Construction, and Potholing being completed as a result of a larger project, and must be used as a reference for specific BMPs.

1.4 Scheduling Small Excavation, Construction, and Potholing BMP Installation

Planning for storm water pollution prevention is required for all PG&E construction projects throughout the year. The applicable BMPs described in this A-ESCP shall be implemented on all projects, regardless of the time of year and weather forecast.

2.0 BEST MANAGEMENT PRACTICES

The purpose of this A-ESCP is to specify appropriate BMPs for all Small Excavation, Construction, and Potholing projects. 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.

All PG&E Projects, Crews, and Subcontractors are required to be familiar with and follow, at a minimum, housekeeping and stockpile management standards as detailed in the Good Housekeeping A-ESCP and Stockpile Management A-ESCP prior to starting work. Should site personnel be unfamiliar with the requirements for Good Housekeeping or Stockpile Management, PG&E expects that they will obtain a copy of the A-ESCPs which are available on SharePoint. Good Housekeeping and Stockpile Management A-ESCP requirements may apply to all activities within this Plan, and therefore are not mentioned in each subsection.

Construction activities should be scheduled to minimize soil disturbing activities during rain events, if possible.

The BMPs for the project should be installed in areas similar to those shown on the Typical BMP Use Detail, Attachment A.

Existing A-ESCPs related to this activity are referenced in Attachment B and can be found in the Field Manual. A full version of the Field Manual is located on SharePoint.

PG&E has detailed Cut-Sheets for specific BMPs which include: when to use the BMP, how to use and install the BMP, and maintenance and inspection guidance for the BMP. BMP Cut-Sheets associated with Small Excavation, Construction, and Potholing are referenced in Attachment C and can be found in the Field Manual which is located on SharePoint.

The following activity specific procedures are intended to address activities related to any small excavation, construction, or potholing activity. Although your project may not include all such activities, the project shall follow the procedures contained within this Section that relate to your project.

2.1 Site Access

Description:
Consider site access if any of the following apply to the project:

- Access is not available from an existing stable roadway.
- Soil must be disturbed in order to gain access.
- The existing roadway is not passable without maintenance or additional stabilization.

Requirements:

- Conduct an assessment of the access routes available.
- Determine if specialized equipment may allow access without additional grading.
- Ensure all access is either within existing PG&E Easements or Temporary Access Easements have been established.
- Contact the EFS should any concerns exist regarding Environmentally Sensitive Areas.
- Do not change or alter drainage patterns in any way.
- Provide a Stabilized Construction Entrance (TC-1) if there is any potential for sediment to be tracked onto public or private roadways.
- Provide sediment control downslope of any soils exposed as a result site access for the project. Sediment control will typically be in the form of Silt Fence (SE-1) or Fiber Rolls (SE-5), but may include Gravel Bag Berms (SE-6) if concentrated flow areas exist.
- If rain is forecast, stabilize project related disturbed soils, as necessary. Soil stabilization may be in the form of a Stabilized Construction Roadway (TC-2), Non Vegetative Stabilization (EC-16), Straw Mulch (EC-6), or Hydraulic Mulch (EC-3).
- Protect downslope drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- TC-1 - Stabilized Construction Entrance
- TC-2 - Stabilized Construction Roadway
- SE-1 - Silt Fence
- SE-5 - Fiber Rolls
- SE-6 - Gravel Bag Berms
- EC-3 – Hydraulic Mulch
- EC-6 - Straw Mulch
- EC-16 - Non-Vegetative Stabilization
- SE-10 – Storm Drain Inlet Protection

Access in agricultural environment

Access stabilized after completion

2.2 Site Preparation

Description:
Consider site preparation BMPs if any of the following activities are expected to occur on the project:

- Soil disturbance.
- Sawcutting or grinding.
- Work upstream of an environmentally sensitive area.
- Equipment or materials storage, staging or use.

Requirements:

- Observe the site and access routes for locations where pollutants, including sediment, may be discharged.
- Protect existing vegetation to the extent possible (EC-2).
- Install appropriate perimeter control BMPs, typically Fiber Roll (SE-5) or Silt Fence (SE-1) downslope of any location where activities may lead to any pollutant discharge.
- Protect any environmentally sensitive areas, especially those with running or standing surface water (streams, rivers, ponds, marshes, creeks, lakes, wetlands etc.) with appropriate perimeter control BMPs, typically Fiber Roll (SE-5) or Silt Fence (SE-1).
- Avoid water, sewer, and other wet utilities by calling USA North at 811 prior to digging.
- Protect downslope drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- EC-2 – Preservation of Existing Vegetation
- SE-1 – Silt Fence
- SE-5 – Fiber Rolls
- SE-6 – Gravel Bag Berm
- SE-10 – Storm Drain Inlet Protection

Perimeter control and fencing in place

Perimeter control in place

2.3 Demolition, Dismantling, and Sawcutting

Description:
Consider these BMPs if the following occurs on the construction site:

- Dismantling or removal of any existing structures, vegetation, fences, or equipment
- Sawcutting existing concrete or pavement at the location of the Small Excavation, Construction, or Potholing.

Requirements:

- Follow the practices and procedures included within the Sawcutting, Grinding, and Paving A-ESCP when any such activity is occurring.
- Consult the EFS should any substances be observed to be leaking or contributing to an environmentally harmful situation.
- Barricade or cover storm drains with impervious material while performing demolition activities that involve liquid pollutants or chemicals.
- Protect downslope drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- Sawcutting, Grinding, and Paving A-ESCP
- SE-6 – Gravel Bag Berms
- SE-10 – Storm Drain Inlet Protection

Removal of existing equipment

Sawcutting in preparation of Excavation

2.4 Excavation or Potholing

Description:
Consider the following BMPs for all excavation or potholing activities related to the project.

Requirements:
- Do not place excavated materials into environmentally sensitive areas.
- Protect any environmentally sensitive areas, especially those with running or standing surface water (streams, rivers, ponds, marshes, creeks, lakes, wetlands etc.) with appropriate perimeter control BMPs, typically Fiber Roll (SE-5) or Silt Fence (SE-1).
- Cover or backfill all excavations at the end of each work day.
- Ensure that exposed soil is protected from erosion if rain occurs or is forecast. Typical cover application may be Hydraulic Mulch (EC-3), Straw Mulch (EC-6) or Erosion Control Blankets (EC-7).
- Protect downslope drainage inlets, including culvert inlets with Gravel Bag Berms (SE-6) and/or Storm Drain Inlet Protection (SE-10), or other effective combination.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:
- EC-3 - Hydraulic Mulch
- EC-6 – Straw Mulch
- EC-7 – Erosion Control Blankets
- EC-16 – Non-Vegetative Stabilization
- SE-6 – Gravel Bag Berm
- SE-10 – Storm Drain Inlet Protection

Active excavation

Excavation covered for safety at end of day

2.5 Concrete

Description:
Consider concrete BMPs for use during excavation, construction, or potholing activities that include the following:

- Concrete footings.
- Concrete replacement.
- Any other cement based product use.

Requirements:

- Cover or barricade storm drains within reasonable proximity to the work area.
- Re-schedule concrete work when rain is forecast.
- Avoid mixing or ordering excess amounts of concrete.
- Do not wash equipment or any concrete materials into footing excavations.
- Do not allow excess concrete to be dumped onsite, except in appropriate washout facilities.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- Sawcutting, Grinding, and Paving A-ESCP

Pole with concrete footing

Concrete placement

2.6 Site Stabilization

Description:
Consider this site stabilization BMP if the following occur on the construction site:

- Disturbance of soil

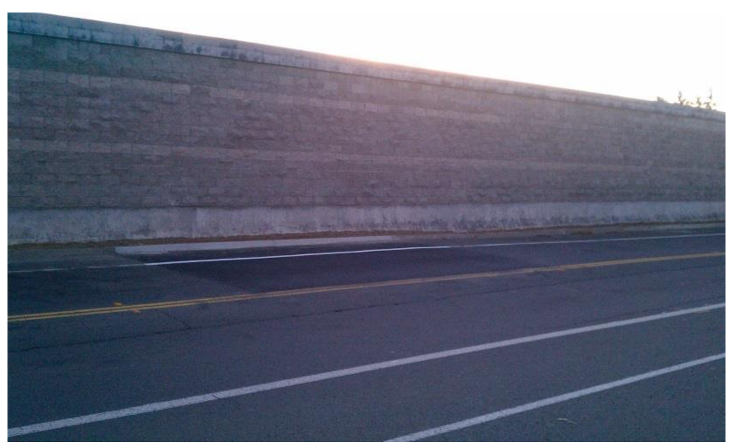
Requirements:

- Upon completion of the activity, stabilize all project related disturbed soil to return the area to pre-project condition which may include pavement, concrete, gravel/rock, landscaping, soil cover, seeding, or agricultural conditions.
- Cover disturbed soil areas with a combination of temporary and permanent vegetative stabilization.
- Soil stabilization may be in the form of Erosion Control Blankets (EC-7), Straw Mulch (EC-6), or Hydraulic Mulch (EC-3), along with Hydroseed (EC-4) or hand spread seed.
- Install biodegradable fiber rolls and blankets to protect against any transport of sediment offsite or to environmentally sensitive areas.
- Some projects require stabilization on non-PG&E property. In some cases the landowner may request that PG&E does not re-stabilize the soil disturbance. In an effort to avoid conflicts with landowners, property specific agreements can be established. These agreements will be coordinated by the PG&E Land Agent.

Associated BMPs and Other Plans:
For additional detail and guidance, refer to the following:

- Sawcutting, Grinding, and Paving A-ESCP
- EC-3 – Hydraulic Mulch
- EC-4 - Hydroseed
- EC-6 - Straw Mulch
- EC-7 - Erosion Control Blankets
- EC-16 - Non-Vegetative Stabilization
- NS-3 - Paving and Grinding Operations
- TC-2 - Stabilized Construction Roadway

Stabilized disturbed soil with perimeter treatment



Repaved area

2.7 Where to Obtain BMP Materials

BMP products in Table 1 can be obtained through PG&E materials warehouses using project order numbers and established materials codes. Should the materials be unavailable from PG&E warehouses, BMP materials and products may be obtained from sources shown below, but may be obtained elsewhere depending on location and urgency of need.

TABLE 1
BMP PRODUCTS INFORMATION

Category	Product Name	Units
Vegetation Protection Fencing (EC-2)	Orange Plastic Fence	
Certified Weed-Free Straw Mulch (EC-6)	Weed-Free Straw	Bales
Geotextiles and Mats (EC-7) Geotextile Fabric	Mirafi 600	Rolls: 12.5’ x 360’ 17.5’ x 238’
Geotextiles and Mats (EC-7) Jute Mat	Eco-Jute	Rolls: 4’ x 225’
Geotextiles and Mats (EC-7) Jute Mesh	jmesh-4225	4’x225’ (staples required)
Geotextiles and Mats (EC-7) Plastic Sheeting	Visqueen	Rolls: 20 or 40’x 100’; 10ml thick
Silt Fence (SE-1)	sfo-b-6	100 feet with 36-inch wood posts at 6 foot spacing
Fiber Roll (SE-5)	Sediment Log Type II	25 foot rolls x 6 or 9” diameter
Fiber Roll (SE-5) Animal Friendly Wattle	BioFiber Roll	8”x12’ or 8”x24’ (wood stakes required)
Fiber Roll (SE-5) HDPE Wattle	ERTEC ProWattle	5” x 7’ (wood stakes and rebar j-hooks required at 5’ spacing)
Gravel Bags (SE-6)	Roc Soc	mono filament
Inlet Protection (SE-10) Gravel Bag	Same as SE-6	
Inlet Protection (SE-10) Fiber Roll	Same as SE-5	
Inlet Protection (SE-10) Filter Guard	ERTEC Gr8 Guard	Each (UV stable zip ties required)
Inlet Protection (SE-10) Hard Surface Guard	Product #344321	6.5” x 7’ (nails with pre-mounted steel washers required)

Example suppliers include Reed & Graham and White Cap. Other options may include feed stores, retail building supply stores, or hardware stores.

3.0 BMP INSPECTION AND MAINTENANCE

BMP installation, inspection, and maintenance will be performed by the PG&E construction crew. BMPs should be inspected daily during construction activities. In the event that BMPs appear to require maintenance or are not functioning as expected, the BMP will be maintained, repaired, or replaced to correct the deficiency.

4.0 WHOM TO CALL

If the project receives a written notice or order from any regulatory agency, immediately contact your local EFS for further direction.

Contact the local EFS if any of the following conditions occur:

- Visually cloudy/muddy water is observed leaving the work or staging area.
- Discharge or spill of hazardous substance.
- Project area increases.
- Procedures within this A-ESCP are ineffective.
- An environmental Regulator visits the site.
- An underground storage tank is discovered.
- A subsurface component related to site remediation activities (e.g., monitoring well, recovery well, injection well) is discovered.

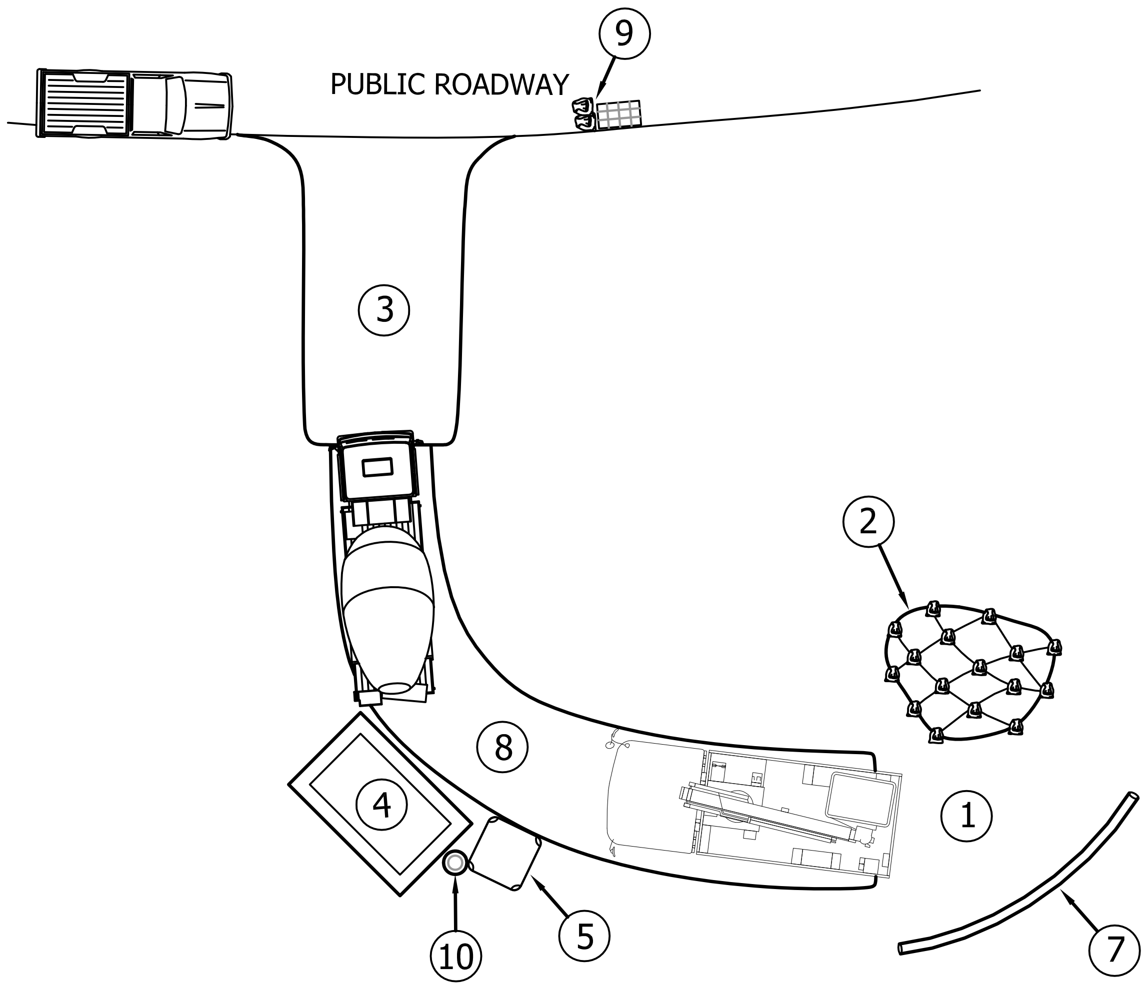
After hours or if the local EFS are unavailable, call the following 800 number:
800-874-4043.

5.0 POST-CONSTRUCTION

Upon completion of construction within the project area:

- Remove all temporary, non-biodegradable BMPs.
- Remove all construction equipment from the site.
- Clear all staging areas of any debris, construction materials, and contaminants.
- Return all drainage ways to their pre-construction line and grade.
- Cover disturbed soil areas with a combination of temporary and permanent vegetative stabilization.

Attachment A
Activity Specific Installation Detail



NOT TO SCALE

NOTES:
1. EXCAVATION LOCATION

2. COVERED STOCKPILES
REFER TO STOCKPILE MANAGEMENT A-ESCP

3. STABILIZED CONSTRUCTION ENTRANCE
USE IF NECESSARY

4. WASHOUT
CONCRETE, PAINT OR OTHER RINSE WATERS
REFER TO GOOD HOUSEKEEPING A-ESCP

5. SANITATION FACILITIES
REFER TO GOOD HOUSEKEEPING A-ESCP

6. STABILIZED CONSTRUCTION ROADWAY
REFER TO SECTION 2.1

7. PERIMETER CONTROL, DOWNSLOPE OF EXPOSED SOIL
SILT FENCE (SE-1), FIBER ROLL (SE-5), OR GRAVEL BAG BERM (SE-6)

8. AIR POLLUTION CONTROL/STABILIZED ROADWAY
CONTROL AIRBORNE POLLUTANTS AT ALL TIMES AND MAINTAIN ROAD SURFACE TO SUPPORT CONSTRUCTION TRAFFIC WITHOUT TRACKING OR SEDIMENT LADEN DISCHARGE

9. STORM DRAIN INLET PROTECTION (SE-10)

10. SPILL KIT
REFER TO GOOD HOUSEKEEPING A-ESCP

prepared by: BT Consulting Incorporated

Pacific Gas and Electric Company®

TYPICAL BMP USE DETAIL

A-ESCP - SMALL EXCAVATION, CONSTRUCTION, AND POTHOLING

SC-01

Attachment B
Activity Specific Erosion & Sediment Control Plans (A-ESCPs)

The following A-ESCPs are included in the Plan by reference only and can be found in the Field Manual. A full version of the Field Manual that includes the A-ESCPs is located on SharePoint.

GH	Good Housekeeping
SM	Stockpile Management
SP	Sawcutting, Grinding, and Paving

Attachment C
PG&E Best Management Practice (BMP) Cut-Sheets

The following BMP Fact Sheets are included in the Plan by reference only and can be found in Appendix C of the Field Manual. A full version of the Field Manual that includes the cut-sheets is located on SharePoint.

EC-2	Preservation of Existing Vegetation
EC-3	Hydraulic Mulch
EC-4	Hydroseed
EC-6	Straw Mulch
EC-7	Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
EC-16	Non-Vegetative Stabilization
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-7	Street Sweeping and Vacuuming
SE-10	Storm Drain Inlet Protection
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
WM-2	Material Use

Attachment D
Requirement Summary Table

Small Excavation, Construction, and Potholing

Pacific Gas and Electric Company®

Best Management Practices to Reduce Environmental Impacts

Proper implementation of Best Management Practices (BMP) during Small Excavation, Construction, and Potholing projects can reduce adverse effects to water resources by reducing pollutant migration from facilities.

No.	Small Excavation, Construction, and Potholing Requirement	A-ESCP Section
1	Be familiar with and follow the requirments of the Good Housekeeping A-ESCP	2.0
2	Be familiar with and follow the requirments of the Stockpile Management A-ESCP	2.0
3	Schedule activities to minimize soil disturbance during rain.	2.0
4	Conduct an assessment of the access routes available.	2.1
5	Determine if specialized equipment may allow access without additional grading.	2.1
6	Ensure all access is either over existing PG&E Easements or Temporary Access Easements	2.1
7	Contact the EFS with concerns regarding sensitive areas or environmentally harmful situations.	2.1, 2.3
8	Do not change or alter drainage patterns in any way.	2.1
9	Provide Stabilized Construction Entrance if there is potential for tracking to any roadways.	2.1
10	Provide sediment control downslope of any soils exposed as a result of the project.	2.1
11	If rain is forecast, stabilize all project related disturbed soils.	2.1
12	Protect downslope drainage inlets.	2.1, 2.2, 2.3, 2.4
13	Observe the site and access routes for any locations where any pollutant may be discharged.	2.2
14	Avoid water, sewer, and other wet utilities by calling USA North at 811 prior to digging.	
15	Protect existing vegetation to the extent possible.	2.2
16	Install appropriate perimeter control BMPs downslope of any locations with potential discharge.	2.2
17	Protect any environmentally sensitive areas.	2.2, 2.4
18	Follow the practices and procedures included within the Sawcutting, Grinding, and Paving A-ESCP.	2.3
19	Barricade or cover storm drains with impervious material while performing demolition activities that involve liquid pollutants or chemicals.	2.3
20	Do not place excavated materials in environmentally sensitive areas.	2.4
21	Cover or backfill all excavations at the end of each work day.	2.4
22	Ensure that exposed soils are protected from erosion if rain occurs or is forecast.	2.4
23	Cover or barricade drains within reasonable proximity to the work area during concrete work.	2.5
24	Re-schedule concrete work if rain is forecast.	2.5
25	Avoid mixing or ordering excess amount of concrete.	2.5
26	Do not wash equipment or any concrete materials into footing excavations.	2.5
27	Stabilize all project disturbed soils to return the area to pre-project condition at end of project.	2.6, 5.0
28	Cover disturbed soils with a combination of temporary and permanent vegetative stabilization.	2.6
29	When a landowner does not want disturbed soils stabilized, contact the PG&E Land Agent to corredinate a specific agreement with the landowner.	2.6
30	Inspect BMPs daily and maintain, replace, or repair as necessary.	3.0

Appendix I

Training Documentation

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)

AND

QUALIFIED SWPPP PRACTITIONER (QSP)

Ashley Gaskell

Oct 05, 2016 - Oct 17, 2018

Certificate # 24970

CASQA

CALIFORNIA STORMWATER QUALITY ASSOCIATION®

California Stormwater Quality Association and
California Construction General Permit Training Team

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP PRACTITIONER (QSP)

STEVEN STETSON

Sep 11, 2017 - Dec 09, 2019

Certificate # 24740

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

California Stormwater Quality Association and
California Construction General Permit Training Team

Appendix J

Completed Forms

Place Newest On Top