Prepared for:

Sapphos Environmental Inc.
430 North Halstead Street
Pasadena, California 91107

In support of:

Southern California Gas Company
555 West 5th Street, GT14E7
Los Angeles, California 90013

PRELIMINARY GEOTECHNICAL STUDY
Southern California Gas Company North-South Project
San Bernardino and Riverside Counties, California

Prepared by:

Geosyntec Consultants, Inc.
10875 Rancho Bernardo Road, Suite 200
San Diego, California, 92127
Telephone: (858) 674- 6559
Fax (858) 674-6586
www.geosyntec.com

Geosyntec Project Number: SC0763

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Geosyntec
consultants

10875 Rancho Bernardo Road, Suite 200
San Diego, CA 92127
PH 858.674.6559
FAX 858.674.6586
www.geosyntec.com

20 July 2015

Ms. Marie Campbell
Sapphos Environmental, Inc.
430 North Halstead Street
Pasadena, California 91107

Subject: Preliminary Geotechnical Study
Southern California Gas Company
North-South Project
San Bernardino and Riverside Counties, California

Dear Ms. Campbell:

Geosyntec Consultants Inc. (Geosyntec) is pleased to present Sapphos Environmental, Inc. (Sapphos) this report presenting the results of our preliminary geotechnical study report for the Southern California Gas Company (SoCalGas) and San Diego Gas & Electric Company (SDG&E) proposed North-South Project (Proposed Project) located in San Bernardino and Riverside Counties, California.

This report details Geosyntec's review of available information used to evaluate potential geotechnical hazards and geotechnical conditions to support preparation of the Environmental Impact Report/Environmental Impact Statement for the Proposed Project. Our scope included a site reconnaissance, public records search and review of: publically available aerial imagery and geologic information; publically available geotechnical borings performed for projects by others near the Proposed Project alignment; and an environmental assessment and a geologic hazards evaluation performed for the Proposed Project.

Geosyntec appreciates this opportunity to assist Sapphos and SoCalGas with this important project. Please contact us at (858) 674-6559 if you have any questions, comments, or if you need additional information.

Sincerely,

Alexander J. Greene
No. 2249
Exp. 12-31-15

Alexander Greene, C.E.G. 2249
Senior Engineering Geologist

Jennifer Nevius

Jennifer L. Nevius
No. G 2825
Exp. 6-30-17

Jennifer Nevius, G.E. 2825
Senior Engineer

cc: Ron Bott and Jessica Kinnahan, SoCalGas

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

Page

LIST OF TABLES

TABLE OF CONTENTS (Continued)

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)

LIST OF ACRONYMS AND ABBREVIATIONS

APM	Applicants' Proposed Measures
Applicants	SoCal Gas and SDG&E
Caltrans	California Department of Transportation
CBC	California Building Code
CBSC	California Building Standards Code
CCR	California Code of Regulations
CDMG	California Division of Mines and Geology
CEQA	California Environmental Quality Act
CGS	California Geological Survey
CPUC	California Public Utilities Commission
DOGGR	California Department of Conservation, Division of Oil, Gas & Geothermal Resources
ECSZ	Eastern California Shear Zone
EFZ	Earthquake Fault Zone
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
ft	feet
g	units of gravity
Geosyntec	Geosyntec Consultants, Inc.
IBC	International Building Code
km	kilometer
LCI	Lettis Consultants International, Inc.
LiDAR	Light Detection and Ranging
MP	Mile Post
m	meter
M	Moment Magnitude
mm	millimeter
MSL	Mean Sea Level

NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
PEA	Proponent's Environmental Assessment
PDCC	Pipeline Design and Construction Corridor
PGA	Peak Ground Acceleration
SBNF	San Bernardino National Forest
SDG&E	San Diego Gas & Electric Company
SEI	Sapphos Environmental, Inc.
SoCalGas	Southern California Gas Company
SWRCB	State Water Resources Control Board
UCERF3	Uniform California Earthquake Rupture Forecast Version 3
USDA	United States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geological Survey
yr	year

EXECUTIVE SUMMARY

Geosyntec Consultants, Inc. (Geosyntec) prepared this Preliminary Geotechnical Study to inform the environmental review process for the Southern California Gas Company (SoCalGas) and San Diego Gas & Electric Company (SDG&E), collectively "Applicants," proposed North-South Project (Proposed Project). The primary components of the Proposed Project include constructing a 36-inch-diameter natural gas transmission pipeline along a 65-mile-long alignment between Adelanto and Moreno Valley, and rebuilding the Adelanto Compressor Station. The Proposed Project is located in San Bernardino and Riverside Counties, California.

This Preliminary Geotechnical Study is based on a thorough review of available information to characterize the geology and soils of the proposed alignment, assess the potential for risk and hazards to people and property from the Proposed Project, and identify design efforts required to remediate risks to people and property to an acceptable level. The review included the "Proponent's Environmental Assessment, North-South Project" (PEA), dated 6 June 2014, prepared by Applicants; a report for the Proposed Project titled "Proposed North-South Pipeline Alignment, Geologic Hazards Evaluation," dated 29 June 2015, prepared by Lettis Consultants International, Inc. (LCI) for SoCalGas and publically available regional and geological information. Indirect and direct public records searches for geotechnical data (specifically boring logs and plans identifying boring locations) along the Proposed Project alignment. This Preliminary Geotechnical Study will be augmented with the results of soil borings along the Proposed Project alignment planned in the summer of 2015.

As detailed by LCI [2015], the Proposed Project alignment crosses several active or potentially active faults strands. The potential for surface rupture associated with a seismic event on either the San Andreas or San Jacinto Fault Zones is considered high, requiring the implementation of mitigation measures (i.e., safety measures and geotechnical investigation and standard project design features detailed herein and in the Applicants' PEA) to avoid or reduce impacts from the Proposed Project.

As detailed by LCI [2015], as a result of its location in a seismically active region, the Proposed Project area would likely experience moderate to severe ground shaking in response to a large-magnitude earthquake occurring on a local or more distant active fault during the expected life of the Proposed Project, thus requiring the preparation of site-specific geotechnical recommendations to inform the design of the proposed pipeline and safety features in the event of seismic ground-shaking.

As detailed by LCI [2015], the Proposed Project alignment has been routed around major landslide hazard areas and is predominantly located within existing utility

corridors, existing roads, and valley bottoms that demonstrate low landslide hazard potential. However, potential landslide hazard conditions exist within the Cajon Pass and Loma Linda Hills area that may result in previously unmapped landslides due to strong seismic shaking, adverse structural conditions (out of slope bedding), or oversaturation of hill slope deposits during years of above-normal wet weather.

As detailed by LCI [2015], approximately 23 miles of the 65-mile Proposed Project alignment are located in areas mapped as having soil liquefaction potential, primarily in the vicinity of the Santa Ana River Basin and Loma Linda in San Bernardino County and Moreno Valley in Riverside County. The potential for liquefaction ranges from low to very high along the Proposed Project alignment, with several miles of the alignment mapped with significant liquefaction hazard requiring site-specific geotechnical recommendations to inform the design of the proposed pipeline, and safety features in the event of seismically induced liquefaction.

Other potential geologic hazards, such as expansive and collapsible soils, subsidence, hazardous materials, volcanism, flooding, tsunamis, seiches, radon gas, and naturally occurring asbestos, were evaluated and considered to have a moderate to very low hazard potential for the Proposed Project.

A site-specific, design-level geotechnical investigation would be conducted prior to final Proposed Project design and include subsurface explorations and laboratory testing at selected locations along the Proposed Project alignment and at other Proposed Project components to collect data for detailed evaluation of potential geologic hazards and geotechnical considerations.

The most significant geologic hazard impacts identified by this Preliminary Geotechnical Study include fault rupture, seismic shaking, landslides, and liquefaction and its secondary effects, with less significant geologic hazard impacts associated with subsidence, flooding, and soil erosion. However, with site-specific investigation and standard project design features, these potential geologic hazards would be reduced to below the level of significance, and the potential for substantially adverse hazards would be mitigated to an acceptable level.

1.0 INTRODUCTION

This report documents findings from a Preliminary Geotechnical Study for the Proposed Project. This report was prepared by Geosyntec under contract to Sapphos Environmental, Inc. (SEI) on behalf of SoCalGas.

The Proposed Project is located in San Bernardino and Riverside Counties, California, and a 13.0-mile pipeline portion within the San Bernardino National Forest (SBNF). The pipeline would be largely located within existing SoCalGas right-of-way or public right-of-way; however, Proposed Project construction would require temporary access roads, staging areas, and work areas that may extend beyond the existing right-of-way. This area, which includes temporary work space, is known as the Pipeline Design and Construction Corridor (PDCC).

1.1 Proposed Project Description and Location

The primary components of the Proposed Project include construction and installation of a 36-inch-diameter natural gas transmission pipeline and rebuilding the Adelanto Compressor Station. The Proposed Project also includes installation of additional pressure-limiting equipment at the Moreno, Whitewater, and Shaver Summit Pressure Limiting Stations and upgrades to the existing pressure-limiting equipment at the Desert Center Compressor Station.

As presented on Exhibit 1 (Appendix A), the proposed pipeline extends approximately 65 miles, beginning at the Adelanto Compressor Station in the City of Adelanto and proceeds in a southerly direction through unincorporated San Bernardino County and the City of Victorville. The alignment then runs along Interstate 15 through the Cajon Pass and the SBNF, through urbanized San Bernardino and Moreno Valley, and terminates at the Moreno Pressure Limiting Station in the City of Moreno Valley.

1.2 Regulatory Authority

The Proposed Project alignment lies within two counties and seven cities: San Bernardino and Riverside Counties and the Cities of Adelanto, Victorville, San Bernardino, Highland, Colton, Loma Linda, and Moreno Valley. A portion of the Proposed Project alignment is located on lands administered by the SBNF. Table 1 summarizes the length of the Proposed Project pipeline within each jurisdiction. Environmental review for the Proposed Project includes the preparation of an Environmental Impact Report/Environmental Impact Statement (EIR/EIS) in accordance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The federal and state lead agencies for the environmental review process are the SBNF and the California Public Utilities Commission (CPUC), respectively.

To facilitate the evaluation of the Proposed Project, the discussion of the pipeline alignment has been broken into four segments. These alignment segments are based on existing land use characteristics or regulatory jurisdiction. Proposed Project Segment 1 encompasses the portion of the alignment that traverses the high desert area in San Bernardino County; Segment 2 traverses the SBNF; Segment 3 traverses metropolitan San Bernardino; and Segment 4 traverses Riverside County.

1.2.1 Segment 1 – High Desert

Segment 1 is an approximately 14.0-mile segment extending from the Adelanto Compressor Station to the SBNF boundary traversing the Cities of Adelanto and Victorville and a portion of unincorporated San Bernardino County. This segment is located between milepost [MP] 0.0 and MP 14.0 of the Proposed Project.

1.2.2 Segment 2 – San Bernardino National Forest

Segment 2 is an approximately 13.0-mile segment extending from the northern SBNF administrative boundary to the southern SBNF administrative boundary, including a portion of unincorporated San Bernardino County. This segment is located from MP 14.0 to MP 27.0, approximately 10.2 miles under SBNF jurisdiction and 2.8 miles within unincorporated areas of San Bernardino County.

1.2.3 Segment 3 – San Bernardino Urbanized Area

Segment 3 is an approximately 24.3-mile segment, traversing a portion of unincorporated San Bernardino County and the Cities of San Bernardino, Highland, Loma Linda, and Colton. This segment extends from the southern administrative boundary of SBNF to the County of San Bernardino/County of Riverside boundary. This segment is located between MP 27.0 and MP 51.3 of the Proposed Project.

1.2.4 Segment 4 – Riverside County

Segment 4 is an approximately 13.7-mile segment of the Proposed Project in Riverside County. For this segment, the Proposed Project alignment extends from Reche Canyon Road at the County of San Bernardino/County of Riverside boundary to the Moreno Pressure Limiting Station. This segment extends through unincorporated Riverside County and the City of Moreno Valley and is located between MP 51.3 and MP 65.0 of the Proposed Project.

1.2.5 Other Proposed Project Components

Other components of the Proposed Project include planned upgrades at the Whitewater Pressure Limiting Station, Shaver Summit Pressure Limiting Station, and Desert Center Compressor Station located along the Interstate 10 corridor in unincorporated Riverside County at respective distances of approximately 29, 80, and 101 miles east of the Proposed Project alignment.

Exhibits 1 and 2a through 2d (Appendix A) present the location of the Proposed Project alignment, and Exhibit 2e (Appendix A) presents the location of other Proposed Project components.

1.3 Purpose and Scope of Study

The purpose of this Preliminary Geotechnical Study was to prepare a technical report to support preparation of an EIR/EIS. The Geosyntec scope of work included review and compilation of multiple data sources and evaluating available data to identify geologic and soils resources and potential hazards in the Proposed Project area. Data sources utilized to prepare this Preliminary Geotechnical Study report include publically available aerial imagery and geologic information, publically available geotechnical borings performed for projects by others near the Proposed Project alignment, and an environmental assessment and a geologic hazards evaluation performed for the Proposed Project. Design-level geotechnical investigation and preparation of design recommendations were not included and will be performed during later stages of the Proposed Project.

1.4 Regulatory Setting

This Preliminary Geotechnical Study was performed for the Proposed Project in consideration of applicable regulatory setting, specifically applicable federal and state regulations, jurisdictional planning documents, and CEQA significance criteria.

1.4.1 Federal Regulations

International Building Code (IBC)

The IBC is published by the International Code Council and forms the basis for California’s building code and other state-specific building codes in the United States. The IBC has been adopted by the California Legislature to address the specific building conditions and structural requirements for California and provide guidance on foundation design and structural engineering for different soil types. The IBC also provides seismic design guidelines for building structures and infrastructure improvements.

USDA Natural Resources Conservation Service (NRCS)

The NRCS maps soils and farmland uses to provide comprehensive information necessary for understanding, managing, conserving, and sustaining the nation's limited soil resources. In addition to many other natural resource conservation programs, the NRCS manages the Farmland Protection Program, which provides funds to help purchase development rights to keep productive farmland in agricultural uses. Working through existing programs, the USDA joins with state, tribal, and local governments to acquire conservation easements or other interests from landowners.

SBNF Land Management Plan

Within the Cajon Pass, the Proposed Project (Segment 2) crosses through the SBNF. The SBNF Land Management Plan provides regulatory guidance for projects within the SBNF, including the Proposed Project. Part 2 of this plan [United States Forest Service (USFS), 2005], titled "San Bernardino National Forest Strategy," contains program strategies and tactics related to geology and soils within the National Forest. Program strategy and tactic AM 2, titled "Forest-wide Inventory," states:

AM 2 - Forest-wide Inventory. *Develop and maintain the capacity (processes and systems) to provide, store, and analyze the scientific and technical information needed to address agency priorities including...(the identification of) geologic hazards (i.e., seismic activity, landslides, land subsidence, flooding and erosion) through landscape and watershed planning, sediment placement site planning, engineering design, reclamation and maintenance as part of landscape or project assessment.*

1.4.2 State Regulations

CPUC

The CPUC has primary state jurisdiction over the Proposed Project by virtue of its discretionary approval authority over construction, operation, and maintenance of public utility facilities. Because local governments generally do not have discretionary authority over projects within CPUC jurisdiction, such projects are generally exempt from local land use and zoning regulations and permitting. However, as part of the CEQA impact analysis, SoCalGas considered local and state land use plans and policies.

Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act)

The Alquist-Priolo Act provides policies and criteria to assist cities, counties, and state agencies in the development of structures for human occupancy across the trace of active faults. The Alquist-Priolo Act was intended to provide the citizens of the state with increased safety and to minimize the loss of life during and immediately following earthquakes by facilitating seismic retrofitting to strengthen buildings, including historical buildings, against ground shaking.

The Alquist-Priolo Act requires that special geologic studies be conducted to locate and assess any active fault traces in and around known active fault areas prior to development of structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The Alquist-Priolo Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. This Act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards.

California Building Code (CBC)

The CBC is another name for the body of regulations contained in Title 24, Part 2, of the California Code of Regulations (CCR), which is a portion of the California Building Standards Code (CBSC). Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards [CBC, 2013]. The CBC incorporates by reference the IBC published by the International Code Council [IBC, 2012] with necessary California amendments. The CBC has been tailored for California earthquake conditions.

California Department of Transportation (Caltrans) Regulations

Caltrans' jurisdiction includes rights-of-way of state and interstate routes within California. Work within the right-of-way of a federal or state transportation corridor is subject to Caltrans' regulations governing allowable actions and modifications to the right-of-way. Caltrans issues permits to encroach on land within their jurisdiction. The encroachment permit requirement applies to persons, corporations, cities, counties, utilities, and other government agencies. A permit is required for specific activities including opening or excavating a state highway for any purpose, constructing or maintaining road approaches or connections, grading within rights-of-way on any state highway, or planting or tampering with vegetation growing along any state highway. The encroachment permit application requirements relating to geology, seismicity, and soils include information on road cuts, excavation size, engineering and grading cross-sections, hydraulic calculations, and mineral resources approved under the Surface Mining Area Reclamation Act.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. The purpose of the Act is to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The program and actions mandated by the Seismic Hazards Mapping Act closely resemble those of the Alquist-Priolo Act.

Southern California Catastrophic Earthquake Preparedness Plan

The Southern California Catastrophic Earthquake Preparedness Plan, adopted in 2008, examines the initial impacts, inventories resources, cares for those wounded and homeless, and develops a long-term recovery process. The process of Long-Term Regional Recovery provides a mechanism for coordinating federal support to state, tribal, regional, and local governments; nongovernmental organizations; and the private sector to enable recovery from long-term consequences of extraordinary disasters. The Long-Term Regional Recovery process accomplishes this by identifying and facilitating the availability and use of recovery funding sources, and providing technical assistance (such as impact analysis) for recovery and recovery planning support. “Long term” refers to the need to reestablish a healthy, functioning region that will sustain itself over time. The Long-Term Regional Recovery’s three main focus areas are housing, infrastructure (including transportation), and economic development.

1.4.3 County Jurisdictional Regulations

San Bernardino County

The County of San Bernardino 2007 Developmental Code (as amended 15 January 2015) details the Geologic Hazard Overlay and includes the requirements of Amended County Ordinance 4067, related to the evaluation of geologic hazards. The Geologic Hazard Overlay established by Sections 82.01.020 (Land Use Plan and Land Use Zoning Districts) and 82.01.030 (Overlays) was created to provide greater public safety by establishing investigation requirements for areas subject to potential geologic problems, including active faulting, landsliding, debris flow/mud flow, rockfall, liquefaction, seiche, and adverse soil conditions [County of San Bernardino, 2015]. Proposed Project Segments 1, 2, and 3 are located in San Bernardino County.

Riverside County

The County of Riverside Code of Ordinances, Title 15, Chapters 15.60 (Earthquake Fault Area Construction Regulations) and 15.80 (Regulating Special Flood Hazard Areas and Implementing the National Flood Insurance Program) regulate construction within areas with elevated hazards related to earthquakes and flooding [County of Riverside, 2015]. Chapter 15.60 is enforced pursuant to County of Riverside Ordinance 547, which implements the Alquist-Priolo Act, whereas Chapter 15.80 implements Ordinance 458, "An Ordinance of the County of Riverside Regulating Special Flood Hazard Areas and Implementing the National Flood Insurance Program." Proposed Project Segment 4 is located within the County of Riverside.

1.4.4 Municipal Regulations

Proposed Project construction will occur across various municipal jurisdictions including the Cities of Adelanto, Victorville, Highland, San Bernardino, Loma Linda, Colton, and Moreno Valley. Municipal regulations and/or geologic hazard information for these areas are included in various city ordinances, codes, or hazard mitigation plans. Excluding the unincorporated area of Phelan, information was available for each municipality. A summary of these resources includes the following:

- *City of Adelanto*: Adelanto North 2035 Sustainable by Design Technical Report [City of Adelanto, 2012]. Includes a general list of potential hazards for new development in the Adelanto North Planning Area. Relevant hazards included geologic and seismic hazards and flooding hazards. A portion of Segment 1 of the Proposed Project alignment is located in the City of Adelanto.
- *City of Victorville*: Code of Ordinances, Title 16 Developmental Code, Chapter 5 Building and Fire Regulations [City of Victorville, 2014]. These sections include ordinances related to the prevention of loss of life and property resulting from floods/inundation and seismic events. A portion of Segment 1 of the Proposed Project alignment is located in the City of Victorville.
- *City of San Bernardino*: Chapter 15, Buildings and Construction [City of San Bernardino, 2009]. Referred to as the City of San Bernardino Building Code, includes requirements for evaluating and mitigating liquefaction with the focus on reducing property damage and loss of life during earthquake events. A portion of Segment 3 of the Proposed Project alignment is located within the City of San Bernardino.
- *City of Highland*: Municipal Code, Title 15 Building and Construction, and Title 16 Land Use and Development [City of Highland, 2015]. These sections include ordinances related to the adoption of Appendix Chapter M of the CBC, establishing a seismic hazards identification program and establishing standards of construction in all areas of special flood hazard (respectively). A portion of Segment 3 of the Proposed Project alignment is located in the City of Highland.
- *City of Loma Linda*: Local Hazard Mitigation Plan [City of Loma Linda, 2011]. The plan was prepared pursuant to the Stafford Act, as amended by the Disaster

Mitigation Act of 2000. This document includes a hazard assessment for several naturally occurring and man-made hazards. Pertinent hazards discussed include earthquakes, flooding (including inundation), and slope failure. A portion of Segment 3 of the Proposed Project alignment is located within the City of Loma Linda.

- *City of Colton*: Title 15 Buildings and Construction [City of Colton, 2014]. Includes provisions and minimum standards for structural seismic resistance and floodplain management regulations. A portion of Segment 3 of the Proposed Project alignment is located within the City of Colton.
- *City of Moreno Valley*: Local Hazard Mitigation Plan [City of Moreno Valley, 2011]. The plan was prepared pursuant to the requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by Section 322 of the Disaster Mitigation Act of 2000 and the 44 Code of Federal Regulations Part 201 – Mitigation Planning. The plan provides a summary and risk evaluation of specific naturally occurring and man-made hazards. Pertinent hazards discussed include earthquakes, landslides, flooding, and dam failure/inundation. A portion of Segment 4 of the Proposed Project alignment is located within the City of Moreno Valley.

1.4.5 CEQA Significance Criteria

Section VI – Geology and Soils

The CEQA significance criteria used to evaluate Proposed Project impacts are defined in *Appendix G, Section VI - Geology and Soils*, of the state CEQA Guidelines (Title 14 of the CCR, Section 15000 et seq.). A significant impact would occur if the Proposed Project would:

a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

  (i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

  (ii) Strong seismic ground shaking?

  (iii) Seismic-related ground failure, including liquefaction?

  (iv) Landslides?

b. Result in substantial soil erosion or the loss of topsoil?

c. *Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?*

d. *Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?*

e. *Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?*

Section VIII – Hazards and Hazardous Materials

For the purpose of this report, the applicable CEQA significance criteria used to evaluate Proposed Project impacts are defined in *Appendix G, Section VIII – Hazards and Hazardous Materials*, of the state CEQA Guidelines (Title 14 of the CCR, Section 15000 et seq.). A significant impact would occur if the Proposed Project would:

g. *Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or environment?*

Section IX – Hydrology and Water Quality

For the purpose of this report, the applicable CEQA significance criteria used to evaluate Proposed Project impacts are defined in *Appendix G, Section IX – Hydrology and Water Quality*, of the state CEQA Guidelines (Title 14 of the CCR, Section 15000 et seq.). A significant impact would occur if the Proposed Project would:

h. *Place within a 100-year flood hazard area structures which would impede or redirect flood flows?*

j. *Inundation by seiche, tsunami, or mudflow?*

2.0 METHODS

This report section outlines the methods used by Geosyntec to conduct this Preliminary Geotechnical Study, including site reconnaissance, review of Proposed Project information, and review of public information.

2.1 Site Reconnaissance

Geosyntec and SEI personnel attended a site reconnaissance for the Proposed Project on 30 April 2015 in conjunction with a site meeting conducted by SoCalGas with attendees from CPUC, SBNF, and other members of the SoCalGas team of consultants. After introductions and a safety briefing, attendees met at two locations along the Proposed Project alignment near the intersection of Interstate 15 and Highway 138. Subsequently, the members of the SEI consultant team (including Geosyntec) performed visual site reconnaissance, walking and driving along selected segments of the Proposed Project alignment.

2.2 Review of Proposed Project Information

Geosyntec performed a review of information prepared for the Proposed Project to support this Preliminary Geotechnical Study, including the PEA [SoCalGas and SDG&E, 2014] and a focused geologic hazards evaluation [LCI, 2015] as discussed in Section 2.2 herein. Our scope included review of the data presented, identification of data gaps, and assessment of the evaluation methodology and conclusions but did not include performing or checking detailed calculations.

2.2.1 PEA

The Applicants prepared a PEA dated 6 June 2014 [SoCalGas and SDG&E, 2014]. This PEA presents an environmental impact assessment for the Proposed Project, including evaluation regarding geology, soils and seismicity. The PEA characterized the level of significance for applicable CEQA criterion and provided a rationale for Applicants' Proposed Measures (APMs) to reduce the identified impacts to less than significant for the Proposed Project. As summarized below and presented in detail in Table 2, the PEA presented the following APMs related to geology, soils, and seismicity, designated APM-GEO-1 through APM-GEO-8.

- APM-GEO-1, Geotechnical investigation;
- APM-GEO-2, Determination of active or potentially active faults;
- APM-GEO-3, Appropriate design ground motion values;
- APM-GEO-4, Appropriate design features to prevent or limit liquefaction;

- APM-GEO-5, Appropriate design features to prevent or limit landslide/slope instability;
- APM-GEO-6, Soil erosion or loss of topsoil;
- APM-GEO-7, Appropriate design features to prevent or limit damage to the pipeline and appurtenant structures on unstable geologic unit or soil; and
- APM-GEO-8, Appropriate design and construction recommendations to prevent or limit expansive material damage to the pipeline and appurtenant structures.

The APMs outlined in the PEA provided mitigation related to site-specific investigations (APM-GEO-1; APM-GEO-2, APM-GEO-6) and appropriate design features (APM-GEO-3, APM-GEO-4, APM-GEO-5, APM-GEO-7, and APM-GEO-8) to mitigate potential hazards relative to geology, soils, and seismicity. Site-specific investigations (including soil borings) to evaluate potential hazards and standard project design features to avoid/limit these hazards would be part of the Proposed Project. Therefore, the APMs from the PEA are not used in this study.

2.2.2 Geologic Hazards Evaluation

Under contract to SoCalGas, LCI prepared a report for the Proposed Project titled "Proposed North-South Pipeline Alignment, Geologic Hazards Evaluation," dated 29 June 2015 [LCI, 2015]; a copy of this evaluation report is presented in Appendix B. In general, the LCI report presents the results of a focused geologic hazards evaluation for the Proposed Project pipeline alignment, specifically addressing fault rupture, liquefaction, and landslide hazards. The LCI report did not evaluate hazards associated with other Proposed Project components at the Desert Center Compressor Station and the Whitewater and Shaver Summit Pressure Limiting Stations. LCI performed a data review consisting of compiling and evaluating regional geologic data along the Proposed Project alignment, including:

- Quaternary faults published by the California Geological Survey (CGS);
- Alquist-Priolo Earthquake Fault Hazard Zones (AP-EFZ) and active faults;
- Quaternary faults published by the U.S. Geological Survey (USGS);
- Modeled displacement estimates from ShakeOut;
- Distribution of ShakeOut displacement estimates in the Cajon Pass area;
- Geomorphic offset measurements compiled in Uniform California Earthquake Rupture Forecast, version 3 (UCERF3);

- AP Fault Investigation Reports and subsurface investigations therein;
- Available historic (1930s era) topographic maps;
- Available Dibblee geologic maps;
- Available USGS geologic maps;
- Available CGS geologic maps;
- Available historical (pre-1945) aerial photographs;
- Available Light Detection and Ranging (LiDAR) data; and
- Liquefaction hazards maps.

The LCI report comprises a screening level compilation, review, and interpretation of published information and models for selected geologic hazards, supported by field reconnaissance performed by LCI personnel.

2.3 Review of Available Public Information

2.3.1 Regional Information

Geosyntec reviewed publically available regional geologic information to support this Preliminary Geotechnical Study. Such information includes, but is not limited to, aerial imagery, geologic maps, hazard maps, and technical publications on geologic hazards pertaining to faulting, landslides, and liquefaction prepared by the CGS, USGS, and others. Geosyntec also reviewed publically available EIR/EIS documents from other large infrastructure projects within the Proposed Project area such as the Calnev Pipeline Expansion Project [Bureau of Land Management, 2012] and the BNSF Cajon Third Main Track Summit to Keenbrook Project [URS Corporation, 2007].

2.3.2 Public Records

Geosyntec conducted indirect and direct public records searches for geotechnical data (specifically subsurface exploration logs and plans identifying exploration locations) along the Proposed Project alignment. The search focused on select locations considered to have a higher potential for publically available geotechnical information (i.e., roadway intersections and larger developed commercial/municipal properties as identified from aerial imagery). Geosyntec requested a search of public records from the following jurisdictions and municipalities:

- SBNF;
- Caltrans District 8;

- City of Adelanto;
- City of Colton;
- City of Moreno Valley;
- Phelan, Unincorporated
- City of San Bernardino; and
- County of San Bernardino.

The SBNF provided regional geologic reference information but did not locate publically available project information in close proximity to the Proposed Project alignment. The Caltrans records search was still in progress at the time of this report. Limited information was available as a result of the records search for the selected parcels at the noted municipalities. Two municipalities provided geotechnical information for specified parcels along the Proposed Project alignment; Table 3 presents a summary of these sites and the geotechnical data obtained. Exhibits 2a through 2d (Appendix A) present the site locations for which geotechnical data was obtained by Geosyntec for this study. Copies of selected borings logs and boring location maps, where available, are provided in Appendix C.

Geosyntec also directly searched the State Water Resources Control Board (SWRCB) database for available geotechnical information. GeoTracker is the SWRCB system for managing sites that impact groundwater, especially those that require groundwater cleanup and permitted facilities such as those with operating underground storage tanks and land disposal sites [SWRCB, 2010, 2015]. GeoTracker provides most of the public record for these sites through its Document Manager Module, including regulatory communication with responsible parties, regulatory actions, and data and documents submitted by the responsible party. As such, the SWRCB GeoTracker website (http://geotracker.waterboards.ca.gov/) provides a repository of a variety of environmental data for regulated facilities in California. These data include boring logs, primarily for borings advanced for subsurface characterization, monitoring well installation, or remediation system installation.

Geosyntec identified eleven sites near the Proposed Project alignment where the GeoTracker website provided geotechnical information; Table 4 presents a summary of these sites and the geotechnical data obtained. Exhibits 2a through 2d (Appendix A) present the site locations for which geotechnical data was obtained by Geosyntec for this study. Copies of selected borings logs and boring location maps, where available, are provided in Appendix C. Additional information regarding these sites can be obtained from the GeoTracker website, searching by site identification criteria (i.e., site name, identification number, or address).

The boring logs presented in Appendix C were performed for other projects by other consultants and are provided for information only. Geosyntec makes no representation regarding the information prepared by others.

3.0 RESULTS

This discussion of Preliminary Geotechnical Study results is based on limited site reconnaissance and our review of available information provided by others as discussed herein. At the time of the preparation of this report (June 2015), no site-specific field explorations have been performed for the Proposed Project.

3.1 Environmental Setting

3.1.1 Topography

As presented on Exhibit 2a through 2d (Appendix A), the Proposed Project pipeline alignment traverses varied and complex terrain from its northernmost point at the Adelanto Compressor Station in the Mojave Desert to the Moreno Pressure Limiting Station in Moreno Valley at its southernmost point.

Segment 1 (MP 0.0 to MP 14.0)

Segment 1 of the Proposed Project alignment encounters low-relief terrain incised by numerous drainages extending to the north from the adjacent topographic highlands. Based on GoogleEarth™, elevations within Segment 1 of the Proposed Project alignment range from 2,962 feet (ft) above Mean Sea Level (MSL) at the Adelanto Compressor Station to 4,083 ft above MSL near MP 13.

Segment 2 (MP 14.0 to MP 27.0)

Segment 2 of the Proposed Project alignment encounters a series of low-lying channels and washes surrounded by the topographic highlands of the San Bernardino and the San Gabriel Mountains. Based on GoogleEarth™, elevations within Segment 2 of the Proposed Project alignment range from 4,490 ft above MSL near MP 15 at the SBNF northern boundary to 2,303 ft above MSL near MP 27.

Segment 3 (MP 27.0 to MP 51.3)

Segment 3 of the Proposed Project alignment transverses terrain of moderate to low relief incised by numerous drainages that generally flow to the south within the San Bernardino Valley. Based on GoogleEarth™, elevations within Segment 3 of the Proposed Project alignment range from 2,303 ft above MSL near MP 27 to 1,311 ft above MSL near MP 51.

Segment 4 (MP 51.3 to MP 65.0)

Segment 4 of the Proposed Project alignment transverses through hilly terrain within the Loma Linda Hills and terminates within areas of low relief in the Moreno Valley. Based on GoogleEarth™, elevations within Segment 4 of the Proposed Project alignment range from 2,446 ft above MSL near MP 56.6 to 1,558 ft above MSL near MP 65 at the Moreno Pressure Limiting Station.

Other Proposed Project Components

As presented on Exhibit 2e (Appendix A), other Proposed Project components at the existing Whitewater and Shaver Summit Limiting Stations and the Desert Center Compressor Station are located east of the Proposed Project alignment. The three other Proposed Project component sites are located on relatively flat to gently sloping ground that has previously been graded as part of the original project component construction. Based on GoogleEarth™, respective elevations at the Whitewater and Shaver Summit Limiting Stations and the Desert Center Compressor Station are 1,055, 1,690, and 880 feet above MSL, respectively.

3.1.2 Physiographic Setting

The Proposed Project alignment traverses through the Mojave Desert, Transverse Ranges, and Peninsular Ranges physiographic provinces as presented in Exhibit 3 (Appendix A).

Segment 1 (MP 0.0 to MP 14.0)

The proposed pipeline originates and continues south through the southern Mojave Desert Province for the initial 12 miles of the alignment. The Mojave Desert Province extends north from the Cajon Pass, north of the San Andreas Fault zone, and eastward to the Nevada state line as presented in Exhibit 3 (Appendix A). The majority of Segment 1 of the Proposed Project alignment (approximately MP 0.0 to MP 12.0) is located within this Province. The Mojave Desert is a broad interior region of Southern California characterized by isolated north-trending mountain ranges separated by broad expanses of alluvial-filled desert plains [CGS, 2002]. The Province is bounded on the southwest by the San Andreas Fault and the Transverse Ranges, on the north and northeast by the Garlock Fault, and to the east by the Basin and Range Province near the California-Nevada state line. The Mojave Desert is a late Tertiary- and Quaternary-aged in-filled basin comprised of mostly aggrading surfaces receiving nonmarine continental deposits from adjacent uplands. Segment 1 of the Proposed Project alignment is situated within the western edge of the Mojave Desert between the City of Adelanto and the SBNF northern boundary.

Between MP 12.0 and MP 14.0, the proposed alignment continues southward into the east-west trending Transverse Range Province at the Cajon Pass between the San Gabriel and San Bernardino Mountains. This Province is an east-west trending physiographic-structural controlled feature bounded by the Mojave Desert to the north and the Peninsular Ranges and Colorado Desert to the south and southeast as presented in Exhibit 3 (Appendix A). The San Gabriel Mountains are situated in the center of the Transverse Ranges, with the San Bernardino Mountains bounding the eastern portion. Within its eastern extension, the San Bernardino Mountains have been displaced to the south along the San Andreas Fault, and the Province is subjected to intense north-south compression as a result of the left bend on the San Andreas Fault [CGS, 2002].

Segment 2 (MP 14.0 to 27.0)

Segment 2 of the Proposed Project alignment extends through the east-west trending Transverse Ranges Province, as described for Segment 1, for approximately 13 miles.

Segment 3 (MP 27.0 to 51.3)

The northern portion of Segment 3 between MP 27.0 and MP 38.0 also extends through the east-west trending Transverse Ranges Province, as described for Segment 1, for approximately 11 miles. Between MP 38.0 and MP 51.3, Segment 3 lies within the western flank of the Peninsular Ranges Province, a northwest-oriented physiographic structure of blocks separated by similarly trending faults as presented in Exhibit 3 (Appendix A). The Peninsular Ranges extend south of the San Gabriel and Santa Monica Mountains into Mexico, forming the Baja California peninsula [CGS, 2002]. The Province extends west offshore to the continental margin and east to the western edge of the Salton Trough. The Peninsular Range is a complex mixture of Jurassic and Cretaceous-age igneous and metamorphic rocks associated with the Nevadan plutonism [Walawender, 2000].

Segment 4 (MP 51.0 to 65.0)

Segment 4 of the alignment extends through the Peninsular Ranges Province, as described for Segment 3.

Other Proposed Project Components

The Shaver Summit Limiting Station and Desert Center Compressor Station are located within the southern portion of the Mojave Desert with comparable physiographic setting to that described for Segment 1.

The Whitewater Limiting Station is located in the southeastern portion of the Transverse Ranges Province within the Coachella Valley, with comparable physiographic setting to that described for Segment 1.

3.1.3 Geologic Setting

The Proposed Project pipeline alignment extends through an area of complex geologic structure that lies along the transform boundary between the North American and Pacific continental plates and marks the convergence of several structural blocks bounded by faults. Geological conditions encountered by the alignment are highly varied as a result of complex strike-slip faulting, thrust faulting, and deformation. The surface expression of these complex geologic conditions range from bare bedrock and soil-mantled bedrock in areas of greater relief to unconsolidated to partially lithified alluvial deposits in canyon and valley floors.

Segment 1 (MP 0.0 to MP 14.0)

This segment is located in the Antelope Valley, a broad, triangular-shaped alluvial valley bounded by the Garlock Fault to the north and the San Andreas Fault to the south. With the immediate vicinity of Segment 1, the Proposed Pipeline alignment is underlain by Quaternary-age alluvial fan and wash deposits. At the southern end of Segment 1, the Proposed Project alignment is bordered by Cretaceous-age granitic crystalline rock in areas of greater relief associated with the San Gabriel Mountains. The mapped geologic units encountered within Segment 1 are presented in Figure 17 of the LCI report (Appendix B).

Segment 2 (MP 14.0 to 27.0)

This segment is characterized by highly folded and faulted sedimentary rock associated with the active San Andreas Fault. Within the immediate vicinity of Segment 2, the Proposed Project alignment is underlain by geologic units associated with the Miocene-age Cajon Valley Formation and Quaternary-age alluvial fan and wash deposits. Older bedrock units exposed adjacent to the alignment near the San Andreas Fault include Cretaceous-age granitic and metamorphic bedrock. The mapped geologic units encountered within Segment 2 are presented in Figures 17 and 18 of the LCI report (Appendix B).

Segment 3 (MP 27.0 to 51.3)

This segment is located adjacent to the foothills of the San Bernardino Mountains and traverses the Santa Ana River drainage. Within the immediate vicinity of Segment 3, the Proposed Project alignment is underlain by geologic units associated with Quaternary-age alluvial fan and wash deposits. The mapped geologic units encountered within Segment 3 are presented in Figure 19 of the LCI report (Appendix B).

Segment 4 (MP 51.3 to 65.0)

Within the immediate vicinity of Segment 4, the Proposed Project alignment is underlain by Quaternary-age alluvial fan and wash deposits. Cretaceous-age granitic rocks are encountered adjacent to Segment 4 in Reche Canyon within the Loma Linda Hills and are characterized by shallow bedrock or boulders weathered from bedrock. Within the Moreno Valley, the alignment is underlain by Quaternary-age alluvium. The mapped geologic units encountered within Segment 4 are presented in Figure 20 of the LCI report (Appendix B).

Whitewater Limiting Station

The Whitewater Limiting Station is located within the western portion of the Coachella Valley. The Coachella Valley is an alluvial valley that extends southeast from the San Gorgonio Pass to the north end of the Salton Sea. This region is traversed by multiple strands of the San Andreas Fault and is underlain by a thick sequence of alluvial sediments being shed off of the surrounding granitic and metamorphic bedrock within the topographic highlands of the San Bernardino Mountains to the north and San Jacinto Mountains to the south. The Whitewater Limiting Station is located along the eastern margin of the Whitewater River drainage and is underlain by Quaternary-age alluvium [California Division of Mines and Geology (CDMG), 1965].

Shaver Summit Limiting Station

The Shaver Summit Limiting Station is located just west of Chiriaco Summit within an east-west trending alluvial valley. The site area is bounded to the north by granitic bedrock exposed in the Eagle Mountains and to the south by Cretaceous-age granitic and pre-Cambrian-age metamorphic bedrock exposed in the Orocopia Mountains. The Shaver Summit site is underlain by Quaternary-age alluvium [CDMG, 1967].

Desert Center Compressor Station

The Desert Center Compressor Station is located just east of the town of Desert Center along the southwestern flank of the Chuckwalla Valley. To the south, the general site area is bounded by the Chuckwalla Mountains composed of Cretaceous-age granitic and pre-Cambrian-age metamorphic bedrock. The Desert Center site is underlain by Quaternary-age alluvial fan deposits [CDMG, 1967].

3.1.4 Geologic Materials

This discussion of geologic materials was prepared based on information presented by LCI [2015] as presented in the geologic hazards evaluation report for the Proposed

Project (Appendix B). Table 6 [LCI, 2015] summarizes the surficial geologic materials along the Proposed Project alignment.

Segment 1 (MP 0.0 to MP 14.0)

Segment 1 of the Proposed Project alignment encounters two geologic units both consisting of Quaternary alluvial deposits. Figure 17 in the LCI report [2015] depicts simplified geology after Bedrossian et al. [2012] along Segment 1 of the Proposed Project alignment; Figure 21 [LCI 2015] presents a legend of units depicted on the map. The younger Quaternary alluvial materials make up approximately 86% of materials along Segment 1, while the older Quaternary deposits of the Manzanita Wash make up approximately 14%.

Segment 2 (MP 14.0 to 27.0)

Segment 2 of the Proposed Project alignment encounters a variety of geologic materials including Quaternary alluvial valley and fan deposits, Tertiary and Quaternary bedrock, granitic and other intrusive crystalline rock, and artificial fill. Figures 17 and 18 in the LCI report [2015] depict simplified geology after Bedrossian et al. [2012] along Segment 2 of the Proposed Project alignment; Figure 21 [LCI 2015] presents a legend of units depicted on the maps. Materials along Segment 2 consist of approximately 87% Quaternary alluvial deposits, 6% coarse-grained Tertiary bedrock, 5% artificial fill, 1% granitic and other intrusive crystalline rock, and 1% Quaternary coarse-grained bedrock.

Segment 3 (MP 27.0 to 51.3)

Segment 3 of the Proposed Project alignment excavation encounters Quaternary alluvial valley and fan deposits, Tertiary and Quaternary bedrock, granitic and other intrusive crystalline rock, and metamorphic rock of sedimentary and volcanic origin. Figures 18 and 19 in the LCI report [2015] depict simplified geology after Bedrossian et al. [2012] along Segment 3 of the Proposed Project alignment; Figure 21 [LCI 2015] presents a legend of units depicted on the maps. Materials along Segment 3 consist of approximately 87% Quaternary alluvial deposits, 5% Quaternary coarse-grained bedrock, 4% metamorphic rock, 2% coarse-grained Tertiary bedrock, and 2% granitic and other intrusive crystalline rock.

Segment 4 (MP 51.3 to 65.0)

Segment 4 of the Proposed Project alignment excavation encounters Quaternary alluvial deposits, older Quaternary alluvial fan deposits, Quaternary bedrock, and granitic and other intrusive crystalline rock. Figures 19 and 20 in the LCI report [2015] depict simplified geology after Bedrossian et al. [2012] along Segment 4 of the Proposed Project alignment; Figure 21 [LCI 2015] presents a legend of units depicted on the maps. Materials along Segment 4 consist of approximately 80% Quaternary alluvial and alluvial fan deposits, 18% granitic and other intrusive crystalline rock, and 2% Quaternary coarse-grained bedrock.

Other Proposed Project Components

The Whitewater and Shaver Summit Limiting Stations and the Desert Center Compressor Station are underlain by Quaternary alluvial deposits.

3.1.5 Faults and Seismicity

Fault maps, which present the San Andreas Fault system and the Eastern California Shear Zone (ECSZ), are presented on Exhibit 4 (Appendix A) and Figures 1 through 8b of the LCI [2015] report (Appendix B).

San Andreas Fault System

Segment 2 of the Proposed Project alignment traverses through the complex neotectonic structure of the active San Andreas Fault System in the Cajon Pass region as presented on Exhibit 1 and 2b (Appendix A). The dominant and most well-known geologic structures are the northwest-oriented right lateral strike-slip fault zones of the San Andreas, San Jacinto, and Elsinore Fault Zones. The right-slip displacements of these fault zones have contemporaneous compressional and uncommon extensional faults, such as the Cucamonga Fault Zone and the left-slip Cleghorn Fault, respectively [Morton and Miller, 2006]. Along Segment 3 of the Proposed Project alignment in the San Bernardino Valley area, the extensional San Bernardino basin, filled by Quaternary-age deposits, occurs between the San Andreas and San Jacinto Fault Zones [Morton and Miller, 2006].

Within the eastern Transverse Ranges Province, the San Andreas Fault Zone is a well-expressed continuous fault zone with active and older abandoned fault strands. Older fault zones within the Transverse Ranges Province proximal to the Proposed Project considered inactive by Morton and Miller [2006] include the San Gabriel, Punchbowl, and the north branch of the San Bernardino fault segment. However, these fault zones may still be potentially active and/or active according to the Earthquake Fault Zone (EFZ) maps in the Southern California region [Dibblee and Minch, 2003].

The San Bernardino (north and south) segments of the San Andreas Fault, also referred to as the south branch, are considered to be the active section of the San Andreas Fault between the Salton Sea and the Cajon Pass. The Working Group on California Earthquake Probabilities estimated that the southern San Andreas Fault has a 59% probability of an earthquake of at least a moment magnitude (**M**, defined as a measurement of the size of an earthquake in terms of energy released) greater than

M6.7 to occur during the 30-year period between 2007 and 2037. Estimated slip rate for the San Andreas Fault system is presented in Section 3.1.5.3.

ECSZ

The ECSZ is an important component of the Pacific-North American plate boundary. This region of active, predominantly right-lateral strike-slip deformation east of the San Andreas Fault is thought to accommodate approximately 20% to 25% of total relative motion between the Pacific and North American plates [Frankel et al., 2008]. This area of active deformation extends northward from eastern end of the "Big Bend" in the San Andreas Fault near Palm Springs northward through the Mojave Desert and along the east side of Sierra Nevada and into western Nevada. The Mojave Desert portion of ECSZ is bounded to the west by the Helendale-South Lockhart Fault Zone and to the east by the Calico-Hidalgo and Pisgah-Bullion Fault Zones. Fault zones within the ECSZ (west to east) include the northwest striking Helendale-South Lockhart, Lenwood-Lockhart, and Harper-Camp Rock Fault Zones.

The ECSZ is considered a highly seismically active region. Recent work in the Mojave Desert section of the ECSZ indicates the total long-term slip rate across this fault is on the order of 5 to 7 millimeters/year (mm/yr) [Oskin et al., 2006, 2007; and Frankel et al., 2008], suggesting a pronounced strain transient across the Mojave section of the ECSZ. Several faults classified as potentially active (including sections of the Johnson Valley, Homestead, Emerson, and Camp Rock Faults) within the southern ECSZ ruptured during the 1992 **M**7.3 Landers earthquake [Southern California Earthquake Center (SCEC), 2013]. Rupture along the Lavic Lake Fault and the central Bullion Fault also occurred as a result of the 1999 **M**7.1 Hector Mine earthquake [SCEC, 2013].

Regional Historic Events and Recurrence

Several paleoseismic sites have been investigated along the San Andreas Fault Zone proximal to the Proposed Project alignment, including Wrightwood, Pitman Canyon, and Plunge Creek, which are situated approximately 2 to 20 miles from the Cajon Pass crossing area within Segment 2 of the Proposed Project alignment [Weldon et al., 2013]. Previous geologic hazard studies performed at these sites identified 15 separate seismic events at the Wrightwood young sedimentary site, 14 events at the Wrightwood old sedimentary section, 7 events at Pitman Canyon, and 3 events at Plunge Creek site, ranging in age from 2915 BC to AD 1857 based on age dating of stratigraphic offset across the fault zone, as summarized in Table 4 of the LCI report (Appendix B). These studies suggest large surface-rupturing earthquakes occur on the San Andreas Fault at approximately 100- to 200-year intervals. The most recent earthquake includes the 1857 Fort Tejon earthquake which occurred on the north San Bernardino segment of the San

Andreas Fault. Based on the evaluation performed by LCI [2015], which considered these previous paleoseismic studies, an estimated slip rate for the primary strand of the San Andreas Fault was assigned a value of 20 to 30 mm/yr.

Located on the San Jacinto Fault, the Mystic Lake paleoseismic site is situated approximately 2 miles southeast of the Moreno Pressure Limiting Station at the southern end of Segment 4 of the Proposed Project alignment. This site shows evidence of seven earthquakes since AD 579 with a recurrence interval of approximately 181 years [Onderdonk et al., 2013; and Weldon et al., 2013]. Similar to the evaluation performed on the San Andreas Fault Zone, LCI [2015] developed an estimated slip rate for the San Jacinto Fault based on the findings of the paleoseismic studies and assigned a value of 2 to 10 mm/yr for the primary strand of the fault.

Exhibit 4 (Appendix A) presents historic earthquake epicenter map for historical earthquake events within a 100-kilometer radius of the Proposed Project based on data from SCEC [2015].

3.2 Geologic Hazards

3.2.1 Fault Rupture

Fault rupture hazard was evaluated to assess the exposure to people or structures to substantial adverse effects, including the risk of loss, injury, or death per *Appendix G – Section VI Geology and Soils, subsections a(i),* of the state CEQA Guidelines. The potential for fault surface rupture is generally considered to be significant along “active” faults (defined as exhibiting surface rupture within the past 11,000 years) and to a lesser degree along “potentially active faults” (exhibiting surface rupture within the past 1.6 million years). As illustrated on Figures 1 through 5b, 8a and 8b prepared by LCI [2015] (Appendix B), a review of published geologic maps and previous geotechnical and geologic hazard investigations identified that Segments 2 and 3 of the Proposed Project alignment cross the San Andreas and San Jacinto Fault Zones, respectively. LCI [2015] identified “preferred” crossings, defined as the most likely fault crossing, based on an evaluation of existing data and additional interpretation. Both the San Andreas and San Jacinto Fault Zones have complex fault traces with multiple strands that have been zoned as active Earthquake Fault Hazard Zones by the State of California’s Alquist-Priolo Act. In addition to the San Andreas and San Jacinto Faults, the Proposed Project alignment crosses active or potentially active faults strands associated with the Punchbowl and Cleghorn Faults within the Cajon Pass area of Segment 2, and the Loma Linda Fault within the Loma Linda Hills of Segment 3.

Active faults do not cross Segments 1 and 4 and, therefore, fault rupture hazard is not considered to pose a threat as a result of the Proposed Project within these segments.

Based on a preliminary review of available fault maps, the Shaver Summit Limiting Station and Desert Center Compressor Station are not situated within close proximity of active faults. The Whitewater Limiting Station is located approximately 2 miles south of the San Bernardino Section of the San Andreas Fault and 0.4 miles south of the Garnet Hill Fault. However, the site is not located within an Alquist-Priolo Earthquake Fault Zone. Therefore, fault rupture hazard is not considered to pose a threat as a result of the Proposed Project at these other Proposed Project components.

Segment 2 - Fault Rupture Hazard

LCI [2015] presents a detailed evaluation of deterministic fault displacement estimates utilizing multiple approaches and datasets to characterize potential future displacements on the San Andreas Fault Zone and Cleghorn Fault within Segment 2 of the Proposed Project alignment. Estimates of potential displacement were developed by calculating average and maximum displacement for deterministic earthquake scenarios using Wells and Coppersmith [1994], model-derived displacement values from the USGS ShakeOut Scenario for the San Andreas [Jones et al., 2008], observed displacements from past earthquakes compiled and reassessed in UCERF3 [Madden et al., 2013], and strain accumulation based on geologic slip rates versus elapsed time since last rupture. Utilizing an estimated **M**7.8 value on the San Andreas Fault, best-estimate mean surface displacement near Cajon Pass and the Proposed Project alignment range from 1.0 to 4.4 meters (m) (3.2 to 14.4 ft) with an uncertainty ranging from 0.4 to 5.1 m (1.3 to 16.7 ft) as presented on Figure 7 in Appendix B. Historic displacement data is not available for the Cleghorn Fault; therefore, magnitude-average displacement relationships from Wells and Coppersmith were used for all slip types to estimate potential future displacements on this fault. Based on a rupture area of 401 square kilometers taken from UCERF3, a moment magnitude estimate of **M**6.6, an average displacement of 0.6 m (2.0 ft) and maximum displacement of 0.9 m (3.0 ft) was estimated for the Cleghorn Fault.

The potential for surface rupture associated with a seismic event on the San Andreas Fault Zone is considered high, requiring the consideration of mitigation measures to avoid or reduce impacts from the Proposed Project. However, with site-specific investigation, standard project design features, and consideration of mitigation measures requiring specialized design features for fault crossings to avoid or reduce impacts, fault rupture hazard would not be likely to represent a significant or substantially adverse hazard, as a result of the Proposed Project.

Segment 3 - Fault Rupture Hazard

LCI [2015] presents a detailed evaluation of deterministic fault displacement estimates utilizing multiple approaches and datasets to characterize potential future displacements on the San Jacinto Fault Zone within Segment 3 of the Proposed Project alignment. Estimates of potential displacement were developed by calculating average and maximum displacement for deterministic earthquake scenarios using Wells and Coppersmith [1994], model-derived displacement values from the USGS ShakeOut Scenario for the San Andreas [Jones et al., 2008], observed displacements from past earthquakes compiled and reassessed in UCERF3 [Madden et al., 2013], and strain accumulation based on geologic slip rates versus elapsed time since last rupture. Based on the event histories developed at the Mystic Lake and Hog Lake paleoseismic studies, Rockwell et al. [2014] suggests rupture of the Claremont section of the San Jacinto Fault would result in a **M**7.1 event. LCI [2015] suggests rupture along the Claremont (northern) and Clark (central) sections of the San Jacinto Fault would produce **M**7.4 event, providing a maximum displacement of 2.3 and 4.0 m for both scenarios. The potential for surface rupture associated with a seismic event on the San Jacinto Fault Zone is considered high, requiring the consideration of mitigation measures to avoid or reduce impacts from the Proposed Project. However, with site-specific investigation, standard project design features, and consideration of mitigation measures requiring specialized design features for fault crossings to avoid or reduce impacts, fault rupture hazard would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.2.2 Seismic Shaking

Segments 1 through 4 and Other Proposed Project Components – Seismic Shaking Hazard

Seismic shaking hazard was evaluated to assess the exposure to people or structures to substantial adverse effects, including the risk of loss, injury, or death per *Appendix G – Section VI Geology and Soils, subsections a(ii),* of the state CEQA Guidelines. The study area is situated within a seismically active region, and the entire Proposed Project alignment and the other three Proposed Project component sites would likely experience moderate to severe ground shaking in response to a large-magnitude earthquake during the expected life of the Proposed Project. The potential for significant seismically induced ground shaking in response to an earthquake occurring on a nearby active fault, such as the San Andreas or San Jacinto Fault Zones, or a regional fault, such as the ECSZ, is relatively high within the Proposed Project area. Exhibit 5 (Appendix A) presents a regional map of Peak Ground Acceleration (PGA) with a 2% probability of exceedance in 50 years (2,475-year recurrence interval) as mapped by the USGS

[Peterson et al., 2015]; the estimated PGA values range between 0.6g (units of gravity) and 1.3g, with the highest in the Cajon Pass area. These values are presented for impact assessment only and should not be used for engineering design.

The potential for strong seismic shaking is considered high, requiring the consideration of mitigation measures to avoid or reduce impacts from the Proposed Project. However, with site-specific investigation and standard project design features addressing seismic shaking, this hazard would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.2.3 Landslides

Landslide hazard was evaluated to assess the exposure to people or structures to substantial adverse effects, including the risk of loss, injury, or death per *Appendix G – Section VI Geology and Soils, subsections a(iv) and c,* of the state CEQA Guidelines. The Proposed Project alignment traverses several areas with the potential for landslide hazards due to the steep topography and the underlying geologic formations susceptible to mass wasting. LCI [2015] compiled landslide hazards from various published maps and supplemented their evaluation with localized mapping of potential landslides. LCI [2015] identified two primary areas along the alignment subject to potential landslide hazards, including Segment 2 within the Cajon Pass in the San Gabriel Mountains and Segment 4 within the Loma Linda Hills near Loma Linda, California, requiring the consideration of mitigation measures to avoid or reduce impacts to people and property from the Proposed Project. Landslides do not pose a threat as a result of the Proposed Project in Segments 1 and 3 and at the three other Proposed Project component sites to the east.

Segment 2 - Landslide Hazard

Through the Cajon Pass, Segment 2 of the Proposed Project alignment is predominantly located within existing utility corridors, existing roads, and valley bottoms that demonstrate low landslide hazard potential. Near the intersection of Interstate 15 and California Highway 138 in the Cajon Pass area, the Proposed Project alignment crosses a mountainous region with potential landslide hazards as a result of the area’s high relief and localized dip-slope conditions on the east and northeast facing slopes. LCI [2015] mapped 25 potential landslides within the Cajon Pass region (as presented in Figure 3 in Appendix B). Many of the mapped landslides are adjacent to the Proposed Project alignment; however, the alignment does not cross these landslides. Landslides located near the Proposed Project alignment and Highway 138 are concentrated in east- to northeast-dipping Tertiary-age coarse-grained sedimentary formations consisting predominantly of sandstone and conglomerate. LCI [2015] also evaluated potential landslides as mapped by the CGS [Bedrossian et al., 2012], who mapped 27 landslides within 0.5 miles of the Proposed Project alignment, one of which is intersected by the Proposed Project alignment between approximately MP 21.5 and MP 21.8. However, the location of the Proposed Project alignment where it intersects this previously mapped landslide is situated within an area of low topographic relief along the eastern margin of the landslide and therefore does not represent a significant risk.

The Proposed Project alignment has been routed around major landslide hazard areas within Segment 2. However, potential landslide hazard conditions exist in the Cajon Pass area that may result in previously unmapped landslides due to strong seismic shaking, adverse structural conditions (out of slope bedding), or oversaturation of hill slope deposits during years of above-normal wet weather. Therefore, landslides present a potential hazard within Segment 2 of the Proposed Project alignment requiring the consideration of mitigation measures to avoid or reduce impacts from the Proposed Project. However, with site-specific investigation and standard project design features addressing landslides, this hazard would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

Segment 4 - Landslide Hazard

Several landslides are mapped within the northeastern margin of the Loma Linda Hills [Dibblee and Minch, 2003] within Segment 4 of the Proposed Alignment and are likely the result of mass wasting along out of slope dipping bedding planes. However, none of these mapped slides intersect the Proposed Project alignment.

The Proposed Project alignment has been routed around major landslide hazard areas within Segment 4. However, potential landslide hazard conditions exist in the Loma Linda Hills area between approximately MP 51.0 and MP 58.0 that may result in previously unmapped landslides due to strong seismic shaking, adverse structural conditions (out of slope bedding), or oversaturation of hill slope deposits during years of above-normal wet weather. Therefore, landslides present a potential hazard within Segment 4 of the Proposed Project alignment requiring the consideration of mitigation measures to avoid or reduce impacts from the Proposed Project. However, with site-specific investigation and standard project design features addressing landslides, this hazard would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.2.4 Liquefaction and Secondary Effects

Liquefaction, and secondary effects associated with liquefaction, were evaluated to assess the exposure to people or structures to substantial adverse effects, including the risk of loss, injury, or death per *Appendix G – Section VI Geology and Soils, subsections* *a(iii) and c,* of the state CEQA Guidelines. Seismically induced soil liquefaction can be described as a significant loss of strength and stiffness due to cyclic pore water pressure generation from seismic shaking or other large cyclic loading. The material types considered most susceptible to classical liquefaction are saturated, loose to medium dense granular soils, and low-plasticity fine grained soils. Although not considered classically liquefiable, clay materials can also exhibit strength loss (cyclic softening) due to seismic shaking. The potential for liquefiable soil and the potential impacts to the Proposed Project from liquefaction and secondary effects, including loss of bearing capacity below foundations, increased lateral and uplift pressures on buried structures, total and differential vertical settlement, cyclic softening of clays, and horizontal movement and instability in areas of sloping ground (landslides and lateral spreading), are not readily quantifiable at this level of study.

Lateral spreading (defined as finite, lateral movement of gently to steeply sloping, saturated soil deposits caused by earthquake-induced liquefaction) is a function of liquefaction susceptibility and localized site conditions including ground slope and distance to a free face. Localized liquefaction-induced slope instability and lateral spreading hazards would likely be adjacent to drainages where slopes are steeper and water accumulates.

In addition to high seismic shaking levels, two other key conditions conducive to liquefaction, shallow groundwater and cohesionless sands, likely exist along Segments 3 and 4 of the Proposed Project alignment. Clay soils subject to potential cyclic softening from earthquake shaking are anticipated to exist in lesser quantities along the Proposed Project alignment. As presented in Appendix B, LCI [2015] performed a preliminary evaluation of liquefaction hazard potential and an analysis of liquefaction-induced settlement for the Proposed Project. The LCI [2015] evaluation concluded that the expected level of seismic shaking in the Proposed Project area is high enough to initiate liquefaction, requiring the consideration of mitigation measures to avoid or reduce impacts from the Proposed Project. Figure 15 in the LCI [2015] report illustrates areas with mapped liquefaction potential. Due to the anticipated lack of shallow groundwater, the potential for liquefaction does not pose a threat as a result of the Proposed Project within Segments 1 and 2 of the Proposed Project alignment.

Segment 3 - Liquefaction Hazard

As illustrated on Figure 15 of the LCI [2015] report, mapped liquefaction hazard exists along approximately 12 miles of Segment 3 of the Proposed Project alignment primarily in the Cajon Wash, within the Santa Ana River basin, and to a lesser extent below the drainage of the San Bernardino. LCI [2015] estimated that the magnitude of liquefaction-induced settlement could range between 0 and 4.3 inches based on published regional geotechnical exploration data in the San Bernardino Valley, requiring the consideration of mitigation measures to avoid or reduce impacts from the Proposed Project. However, with site-specific investigation and standard project design features addressing liquefaction, this hazard would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

Segment 4 - Liquefaction Hazard

As illustrated on Figure 15 of the LCI [2015] report, mapped liquefaction hazard exists along approximately 11 miles of Segment 4 of the Proposed Project alignment primarily in the Moreno Valley, and to a lesser extent within the localized alluvial drainages in the Loma Linda Hills. The potential for liquefaction ranges from low to moderate within Segment 4 of the Proposed Project alignment. Due to the similar geologic setting of the area, LCI [2015] estimated that like Segment 3, the magnitude of liquefaction-induced settlement could range between 0 and 4.3 inches based on published regional geotechnical exploration data, requiring the consideration of mitigation measures to avoid or reduce impacts to from the Proposed Project. However, with site-specific investigation and standard project design features addressing liquefaction, this hazard would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project along Segment 4.

Other Proposed Project Components

Liquefaction hazard may exist at the Whitewater and Shaver Summit Limiting Stations and at the Desert Center Compressor Station given the loosely consolidated alluvial material and susceptibility to strong seismic ground shaking from nearby seismic sources, but groundwater depths at these sites were not available. However, with site-specific investigation and standard project design features addressing liquefaction, this hazard, if encountered, would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project at the other Proposed Project component sites.

3.2.5 Expansive and Collapsible Soils

Expansive and collapsible soils were evaluated to assess the exposure to people or structures to substantial adverse effects, including the risk of loss, injury, or death per *Appendix G – Section VI Geology and Soils, subsection d*, of the state CEQA Guidelines. Some soils and bedrock formations that contain clay minerals are susceptible to expansion under wetting conditions and contraction under drying conditions. Depending on the type and amount of clay present in a geologic deposit, the volume change from expansion and contraction (swell and shrink) can damage pipelines, slabs, foundations, and hardscape. Collapse (also called hydrocompaction) can occur in dry soils that have an unstable soil structure due to deposition processes, typically with a skeletal structure that is weakly cemented by soluble salts or clay. Increases in moisture can cause the inter-particle cementation to reduce, causing changes in volume (collapse) especially when loaded.

Expansive soils are not mapped at the regional level within Segments 1 through 4 of the Proposed Project alignment or at the Whitewater, Shaver, or Desert Center sites. Expansive soils are not anticipated to require the consideration of mitigation measures to avoid or reduce impacts to people and property from the Proposed Project. This is due to the majority of the Proposed Project alignment and associated Proposed Project component sites being underlain by granular alluvial fan, wash, and sedimentary deposits. Potential impacts from expansive soils are considered a more significant hazard to rigid structures at or near the ground surface (i.e., features at the Adelanto and Desert Center Compressor Stations and Moreno, Whitewater, and Shaver Summit Pressure Limiting Stations). However, with site-specific investigation and standard project design features addressing expansive soil, this hazard, if encountered, would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project along the Proposed Project alignment or associated Proposed Project components.

The potential for collapsible soil is not readily quantifiable at the current level of study. However, with site-specific investigation and standard project design features addressing collapsible soil, this hazard, if encountered, would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project along the Proposed Project alignment or other Proposed Project components.

3.2.6 Regional Subsidence

Regional subsidence was evaluated to assess the exposure to people or structures to substantial adverse effects, including the risk of loss, injury, or death per *Appendix G – Section VI Geology and Soils, subsection c*, of the state CEQA Guidelines. Subsidence is the gradual settling of the ground surface with little to no horizontal movement and can be caused by many factors such as fluid (i.e., oil or groundwater) extraction, mining operations, or karst terrain. Within Southern California, extraction of large fluid volumes (such as water, oil, or gas) from thick layers of poorly consolidated sediments is the principal cause of subsidence. The potential for subsidence due to karst, pseudo karst, or mining features is considered very low in relation to the geologic setting and absence of large or commercial subsurface mining within the Proposed Project area.

Subsidence hazard is considered very low within Segment 2 of the Proposed Project alignment through the Cajon Pass area due to the presence of relatively shallow bedrock and formational deposits. Along Segment 4, a review of Riverside County mapped areas susceptible to subsidence and areas of documented subsidence (primarily young alluvial deposits) suggest that no portion of the Proposed Project alignment traverses these areas of mapped subsidence [County of Riverside, 2014]. Based on this information, the potential for regional subsidence does not pose a threat, as a result of the Proposed Project, within Segments 2 and 4 of the Proposed Project alignment. Given the geologic conditions and remote and relatively undeveloped nature of the other Proposed Project component sites at the Whitewater and Shaver Summit Limiting Stations and the Desert Center Compressor Station, the presence of other factors which typically result in subsidence are not anticipated. Therefore, subsidence hazard does not pose a threat as a result of the Proposed Project at the other Proposed Project component sites.

Segment 1 - Subsidence Hazard

Within Antelope Valley north of the Cajon Pass, significant fluctuations of groundwater have been documented within the Mojave River groundwater basin due to domestic, agricultural, and municipal water consumption between 1992 and 2002 [USGS, 2015a]. Although significant subsidence has not been documented, increased demand on local water supplies has resulted in overdraft conditions within the Mojave River groundwater basin, which may lead to land subsidence. Subsidence hazard due to groundwater extraction is considered low to medium within Segment 1 of the Proposed Project alignment, which crosses through the Mojave River groundwater basin, requiring the consideration of mitigation measures to avoid or reduce impacts to people and property from the Proposed Project. However, with site-specific investigation and standard project design features addressing subsidence, this hazard would not be likely to represent a significant or substantially adverse hazard to people and property as a result of the Proposed Project.

Segment 3 - Subsidence Hazard

Within the Bunker Hill groundwater basin in San Bernardino County, groundwater elevations in production wells were noted to have dropped as much as 70 feet locally during the period from fall of 2012 to 2013 due to recent drought conditions [San Bernardino Valley Water Conservation District (SBVWCD), 2014]. Although subsidence within the Bunker Hill groundwater basin has not been documented recently, historic subsidence of up to a foot may have occurred within the City of San Bernardino as result of groundwater pumping. However, within the San Bernardino area, the potential for subsidence has been significantly reduced since 1972, when the San Bernardino Municipal Water District began to maintain groundwater levels to allow recharge of the underlying alluvial deposits. If this current practice were to change due to increased demands on water during drought conditions, such groundwater fluctuations may once again lead to localized subsidence. Subsidence hazard due to groundwater extraction is considered low to medium within Segment 3 of the Proposed

Project alignment, which crosses through the Bunker Hill groundwater basin, requiring the consideration of mitigation measures to avoid or reduce impacts to people and property from the Proposed Project. However, with site-specific investigation and standard project design features addressing subsidence, this hazard would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.2.7 Hazardous Materials

Hazardous materials sites were evaluated to assess the impact to the public or environment per *Appendix G – Section VIII Hazards and Hazardous Materials, subsection g*, of the state CEQA Guidelines. Although evaluation of hazardous materials is not covered under *Section VI – Geology and Soils* of the state CEQA Guidelines, naturally occurring hazardous materials as a result of regional geologic conditions are present within the Proposed Project area. Segments 1 through 4 of the Proposed Project alignment do not traverse areas of hazardous materials including methane gas, hydrogen-sulfide gas, and tar seeps [USGS, 2011]. Based on available data from the California Department of Conservation, Division of Oil, Gas & Geothermal Resources (DOGGR) [2014], only one active well was identified within 300 ft of the Proposed Project centerline. Based on a review of well construction log for this location, the constructed well depth exceeds 5,000 ft below the ground surface. Assuming that the constructed well depth coincides with the most productive oil/gas bearing zones, it is unlikely that Proposed Project construction would encounter hazardous materials associated with these operations. However, monitoring for hazardous materials should be performed during pipeline construction within 300 ft of the active and inactive wells for worker safety and potential impacts to sensitive receptors, specifically within excavations or other confined spaces. Although not anticipated to be encountered along the Proposed Project alignment, with site-specific investigation and standard projectdesign features addressing hazardous materials, this hazard would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

Hazardous materials are not anticipated to be encountered at Proposed Project components for the Whitewater and Shaver Summit Limiting Stations and Desert Center Compressor Station due to the geologic conditions and remote and relatively undeveloped nature of those site areas. Therefore, hazardous materials would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project at the other Proposed Project component locations.

3.2.8 Volcanic Eruptions

Based on the geographic setting of the Proposed Project alignment and other Proposed Project components, the distance to active or other non-active volcanoes, and review of the Volcano Hazards Program maps and current activity alerts [USGS, 2015b], the potential for volcanic eruptions within the vicinity of the Proposed Project is very low. Therefore volcanic eruption would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.2.9 Flooding

Flooding was evaluated to assess the Proposed Project impacts to flood hazard areas per *Appendix G – Section IX Hydrology and Water Quality, subsection g and h*, of the state CEQA Guidelines. Additional evaluation of flood hazard will be described in a separate specific Hydrology Report, including a scour study. At stream and river crossings with the potential for scour erosion as a result of seasonal flooding or other causes, the pipeline would be protected by deep burial. The burial depth will be based on the results of the hydrologic analyses. The Federal Emergency Management Agency (FEMA) presents flood hazard evaluation as part of their Flood Insurance Rate Maps (FIRM). As presented on Exhibit 6 in Appendix A, the FIRM maps indicate that localized portions of the Proposed Project alignment traverse or parallel special flood hazard areas subject to inundation by flooding with a 1 percent probability of occurrence in a given year (100-year recurrence interval). Segments 1, 2, and 4, in addition to the Whitewater and Shaver Summit Limiting Station and Desert Center Compressor Station, are not located within a mapped special flood hazard area. Therefore, with standard project design features addressing flooding and scour potential, flooding would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

Segment 3 – Flood Hazard

Based on a review of available FIRM maps, Segment 3 of the Proposed Project crosses special flood hazards areas within the Old Waterman Canyon drainage (MP 38) and the Santa Ana River drainage (MP 45). The Proposed Project also parallels special flood hazard areas within the Cajon Creek drainage (MP 28 to MP 32). However, considering the planned pipeline burial depths, the potential for flooding to adversely affect the Proposed Project, or result in impacts to impede or redirect flood flows, is very low. With standard project design features addressing the potential for flooding and scour, flooding would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.2.10 Tsunami and Seiche Inundation

Tsunami and seiche inundation was evaluated to assess the exposure to people or structures to substantial adverse effects, including the risk of loss, injury, or death per *Appendix G – Section IX Hydrology and Water Quality, subsection j,* of the state CEQA Guidelines. Additional evaluation of tsunami and seiche inundation hazard will be described in a separate specific Hydrology Report. Based on the physiographic setting of the study area, the distance to the ocean, the alignment elevation, and review of California Tsunami Inundation Maps [State of California, 2009], the potential for flooding from seismically induced tsunamis is very low.

The closest large water bodies, Silverwood Lake and Lake Perris, are located several miles from the Proposed Project alignment as illustrated on Exhibit 1 (Appendix A). Silverwood Lake is situated approximately 6 miles east of the Proposed Project alignment near Cajon Pass and approximately 8 miles north of the Proposed Project alignment in San Bernardino. Lake Perris is situated approximately 3.5 miles southwest of the Moreno Pressure Limiting Station. Topographic highlands within the San Bernardino Mountains separate the Proposed Project alignment from Silverwood Lake and Lake Perris. The potential for a seismically induced seiche to adversely affect, or result in impacts to, the Proposed Project is very low. Therefore, inundation resulting from a tsunami or seiche would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.2.11 Radon-222 Gas

Radon-222 gas is radioactive, colorless, and odorless and forms from the radioactive decay of small amounts of naturally occurring uranium and thorium present in rocks and soil. Certain rock types common in California, such as black (organic-rich) shales, and some granitic rocks, and rhyolites can have uranium and thorium in amounts higher than is typical of the earth’s crust. Breathing air with a concentrated level of radon gas can result in an increased risk of developing lung cancer. Radon-222 is the isotope of most concern to public health because it has a much longer half-life (3.8 days) than other radon isotopes [CGS, 2013]. The longer half-life allows randon-222 to migrate further through rock and soil through micro-fractures and through pore-spaces between mineral grains. Radon gas moves from the soil into buildings and enters cracks in building slabs or basement walls and concentrate in a building indoor air. Based on a review of mapped radon zones in California [Environmental Protection Agency (EPA), 2013], the risk of naturally occurring randon-222 gas along the Proposed Project alignment and at the other Proposed Project component sites is considered to be very low. Therefore, potential hazards resulting from Radon-222 would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.2.12 Naturally Occurring Asbestos

Chrysotile and amphibole asbestos (such as tremolite) occur naturally in certain geologic units in California, most commonly associated with ultramafic rocks along associated faults [CGS, 2000]. Asbestos is a well-known carcinogen, and inhalation can result in the development of lung cancer or mesothelioma. Based on a review of areas likely to contain ultramafic rocks [CGS, 2000], natural occurrences of asbestos are not anticipated to be present along the Proposed Project alignment or at the other Proposed Project component sites. Therefore, potential hazards resulting from naturally occurring asbestos would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.3 Geotechnical Considerations

3.3.1 Construction Blasting

Based on the anticipated geologic conditions and construction depths along the Proposed Project alignment, construction blasting is not anticipated to be required to install the majority of the pipeline. Construction blasting may be required in limited areas to remove boulders or excavate trenches for pipeline construction in unweathered rock at the ground surface. If required, blasting would be planned in accordance with applicable regulations and would be performed during daylight hours. A blast plan would be developed to address specifications for the following items: use of explosives; blasting; notification; transportation of blasting material; methods for limiting ground vibrations, air-overpressure levels, records requirements, and safety and warning programs; and vibrations predictions based on project parameters. Additionally, the U.S. Department of Labor’s Occupational Safety and Health Administration has detailed safety requirements that would be followed for each blasting event to ensure worker safety. In addition to the site safety (existing site improvements and public and worker safety), the effects of construction blasting on subsurface aquifers would be evaluated prior to construction blasting for the Proposed Project. The distance from the construction blasting to the existing aquifer, the nature of the rock to be blasted, and the potential for soil or subsurface water impacts would be considered prior to construction blasting. However, with site-specific investigation and standard project design features, construction blasting, if required, would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

3.3.2 Soil Erosion and Loss of Topsoil

The Proposed Project alignment generally traverses areas that have already been disturbed, such as roadways or existing utility corridors. However, temporary disturbance of soils would occur as a result of construction activities, making soil erosion, as a result of wind and water exposure, a potential hazard that would require the consideration of mitigation measures to avoid or reduce impacts from the Proposed Project. However, with site-specific investigation and standard project design features, soil erosion and loss of topsoil would not be likely to represent a significant or substantially adverse hazard as a result of the Proposed Project.

Furthermore, standard erosion and sediment control Best Management Practices as required by a project-specific Storm Water Pollution Prevention Plan per the California Construction General Permit (CGP - Order No. 2009-009-DWQ) would prevent soils disturbance leading to erosion.

3.4 Soils Incapable of Adequately Supporting Septic Tanks or Alternative Waste Water Disposal Systems

The Proposed Project would not require the use of septic tanks or alternative waste water disposal systems.

3.5 Conclusions

As part of a design-level geotechnical investigation and exploration program, subsurface explorations and laboratory testing would be performed at selected locations along the Proposed Project alignment to collect site-specific data for more refined evaluation of potential geologic hazards and geotechnical considerations and to support development of associated design recommendations.

The most significant potential geologic hazard impacts identified are fault rupture, seismic shaking, landslides, and liquefaction and its secondary effects. Less significant potential geologic hazard impacts are associated with subsidence, flooding related to scour, and soil erosion. However, with site-specific investigation, evaluation, standard project design features addressing potential geologic hazards and geotechnical considerations, and specialized design for fault rupture, the identified geologic hazards would not represent a significant or substantially adverse hazard as a result of construction and operation of the Proposed Project.

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TABLES

Table 1. Affected Jurisdictions

Segment	Affected Jurisdiction	Length [a] (miles)
Segment 1: High Desert (MP 0.0-14.0)	City of Adelanto	2.2
	City of Victorville	2.0
	Unincorporated San Bernardino County	9.8
	Subtotal Segment 1	***14.0***
Segment 2: San Bernardino National Forest [b] (MP 14.0-27.0)	San Bernardino National Forest	10.2
	Unincorporated San Bernardino County [c]	2.8
	Subtotal Segment 2	***13.0***
Segment 3: San Bernardino Urbanized Area (MP 27.0-51.3)	City of San Bernardino	14.7
	City of Highland [d]	0.0
	City of Loma Linda	0.8
	City of Colton	2.2
	Unincorporated San Bernardino County	6.6
	Subtotal Segment 3	***24.3***
Segment 4: Riverside County (MP 51.3-65.0)	City of Moreno Valley	6.8
	Unincorporated Riverside County	6.9
	Subtotal Segment 4	***13.7***
	TOTAL	**65.0**

Notes:

a. Miles are approximate and rounded to the nearest tenth of a mile.

b. Segment 2 covers the 13.0-mile portion of the Proposed Project located within the administrative boundary of the San Bernardino National Forest (SBNF), which includes unincorporated territory of San Bernardino County.

c. Within unincorporated San Bernardino County, the limits of the SBNF extend approximately 13 miles; however, due to private holdings within the SBNF, only 10.2 miles are under the jurisdiction of the SBNF.

d. The Proposed Project is within the City of Highland for approximately 0.04 mile, which, when rounded, is less than 0.1 mile. However, 1.3 miles of the alignment abuts the City of Highland boundary.

Table 2. Applicants' Proposed Measures Related to Geology, Soils, and Seismicity

APM No.	Applicants' Proposed Measures
APM-GEO-1	***Geotechnical Investigation.*** *One or more project-specific geotechnical investigations conducted under the most current state and county guidelines will be completed by a California-licensed geotechnical engineer and California-certified engineering geologist. The investigation will address the Proposed Project design to minimize effects from: adverse soil conditions including any liquefiable or otherwise unstable/consolidation-prone soils; bedrock characteristics; subsidence; earthquake ground shaking; slope instability; subsurface gas; groundwater; fault rupture; and/or other geotechnical and engineering geologic hazards. The design and construction recommendations will be incorporated in to the foundation, structural, and pipeline design of Proposed Project components, implemented in accordance with the design, and subjected to inspection by the relevant entities/agencies. Grading/building inspectors would perform site inspections to assure construction occurs in accordance with any building permits and plans.*
APM-GEO-2	***Fault Rupture.*** *It will be necessary to determine each location where the pipeline crosses an active or potentially active fault. For each fault crossing location, determination will be made as to the estimate fault rupture characteristics, such as movement direction and amount, likely intervals between movements, and the width of the zone that may experience movement. Design recommendations will be incorporated to establish block valve locations.*
APM-GEO-3	***Strong Seismic Ground Shaking.*** *The geotechnical investigation required by APM-GEO-1 will provide appropriate design ground motion values that will assist in the design to prevent or limit damage during earthquake events that may impact specific sections of the pipeline, compressor station, and appurtenant structures.*
APM-GEO-4	***Seismic-Related Ground Failure, Including Liquefaction.*** *The engineering geologic investigations and reports will map the locations and define the nature of any areas that may experience seismic-related ground failure, including liquefaction. Reports will provide appropriate hazard information that will assist in the design to prevent or limit liquefaction damage to the pipeline, compressor station, and appurtenant structures during earthquake events.*
APM-GEO-5	***Landslides.*** *The engineering geologic and geotechnical investigations will map the locations and define the nature of any landslides or landslide-prone areas that could impact the Proposed Project. Reports will provide appropriate hazard information to prevent or limit landslide/slope instability damage to the pipeline.*

Table 2. Applicants' Proposed Measures Related to Geology, Soils, and Seismicity (Continued)

APM No.	Applicant's Proposed Measures
APM-GEO-6	***Soil Erosion or Loss of Topsoil.*** *The geotechnical investigations will evaluate the erosion characteristics of soils and geologic formations/sub-units along the length of the Proposed Project. Reports will provide appropriate construction, design, and operational measures to prevent or limit surface erosion due to the pipeline construction and due to runoff from conditions near the Proposed Project.*
APM-GEO-7	***Unstable Geologic Unit or Soil – Off-site Landslide, Lateral Spreading, Subsidence Liquefaction or Collapse****. The engineering geologic and geotechnical investigations will map the locations and define the nature of any areas of unstable geologic units or soils that could affect off-site areas or be affected by off-site areas. Considerations include, but are not limited to, landslides, lateral spreads, subsidence, and soil collapse. Reports will provide appropriate design measures to prevent or limit damage to the pipeline and appurtenant structures due to these conditions.*
APM-GEO-8	***Expansive Soil.*** *The engineering geologic and geotechnical investigations will define formations that contain sufficient clay materials to be considered sufficiently expansive to affect the pipeline and appurtenant facilities. These formations shall be mapped and analyzed (sampled and tested) to determine the degree of expansion that may be expected. Reports shall provide appropriate design and construction measure to prevent or limit expansive material damage to the pipeline and appurtenant structures.*

Table 3. Summary of Geotechnical Data Obtained from Municipal Sources

Approximate Mile Post [a]	Site Name [b]	Site Address	Year(s) Drilled	Number of Available Boring Logs/Test Pits	Investigator	Exploration Identification
1.0	Adelanto Industrial Park III	Industrial Way at Koala Road (multiple addresses)	1989	18	American Engineering Laboratories, Inc.	Test Pit No. 1 through Test Pit No. 18
62	Residential Development Tract Nos. 31268 and 31269	Redlands Boulevard and Cottonwood Avenue (multiple addresses)	2003	12	Petra Geotechnical, Inc.	Borings B-1 through B-12

Notes:

a. Approximate Proposed Project mile post from GIS data provided by SoCalGas.

b. Excerpts, including site plans and boring/well logs retrieved from GeoTracker website presented in Appendix C1.

Table 4. Summary of Geotechnical Data Obtained from SWRCB GeoTracker Website

Approximate Mile Post [a]	Site Name [b]	GeoTracker Case Identification [c]	Site Address	Year(s) Drilled	Number of Available Boring Logs	Investigator	Boring Identification [d]
18.8	Circle K Station 5961	T0607151980	8324 Highway 138, Phelan 92371	2007	5	TRC	CB-1 to CB-5
29.0	Glen Helen Regional Park Maintenance Facility	T0607100575	2555 Glen Helen Pkwy., San Bernardino 92407	2004, 2007	2	Geo-Cal, Inc.	MW-4, CB-1
				2009	1	ERRG	MW-5
41.8	Mobile #18 Sterling Ave	T0607100246	25699 E Baseline St., Highland 92410	1992, 1996	19	Irwin Environmental	B1 to B4, B5-VEW1, B6 toB13, B14-VEW2, B16, B16-MW1, B17, B18, B20, VEW-2A
				1997, 1998, 2001, 2002, 2005, 2009	15	Kleinfelder	B21 to B26, MW2 to MW-5, MW-5A, MW-6 to MW-8, MW-8A
43.2	Iskandar Texaco	T0607100550	24914 E 5th St., San Bernardino 92410	2008	8	Ami Adini & Associates, Inc.	SB1 to SB8
46.5	Bear Oil Co./ Former Texaco	T0607100598	24913 Redlands Blvd., Loma Linda 92354	1999, 2000	9	Converse Consultants	BH-1 to BH-9
				2003	3	Kleinfelder	BH-10, BH-12, BH-13
46.2	Former M&M Smog and Muffler	T10000003588	1915 East Tippecanoe Ave., San Bernardino 92410	2011, 2012, 2013	18	Stantec	GB-1 toGB-3, SB-12, SB-13, SB-14/GW-6, SB-15/GW-7, SB-16/GW-8, SB-17, SB-18/GW-10, SB-19 to SB-22, SVE-1-SVE-3, VW-4
46.3	Equilon Enterprises/ Shell	T0607100504	1973 Tippecanoe Ave., San Bernardino 92408	2005	4	Miller Brooks Environmental, Inc.	CB-1 to CB-4
46.5	Unocal #2417	T0607100008	24891 W Redland Blvd., Loma Linda 92408	2009	3	Conestoa-Rovers & Associates, Inc.	CB-10B, CB-11, CB-12
				2005, 2007	10	TRC	SB-1 to SB-7, MW-21, MW-22, MW-23
47.2	ARCO #5214	T0607100180	305 Redlands Blvd., San Bernardino 92408	2007	3	Stratus Environmental, Inc.	CB-3, CB-4, CB-5
47.8	Eric Realty Property	T10000001230	495 Commercial Road East, San Bernardino 92408	2002, 2003, 2004, 2008	15	Advanced GeoEnvironmental, Inc.	PB1 to PB7, B8, MW1/VW1, MW2/VW2, MW3/VW3, MW4, MW5 to MW9, MW12-MW17
48.1	Food N Fuel	T0607100528	2649 S. Waterman Ave., San Bernardino 92409	2001, 2004, 2005, 2006, 2008, 2012	21	Alta EM, Inc.	Boring A to Boring E, CB1, CB2, CB3, FVW, MW1 to MW6, MW6A, MW7 to MW11

Notes:

a. Approximate Proposed Project mile post from GIS data provided by SoCalGas.

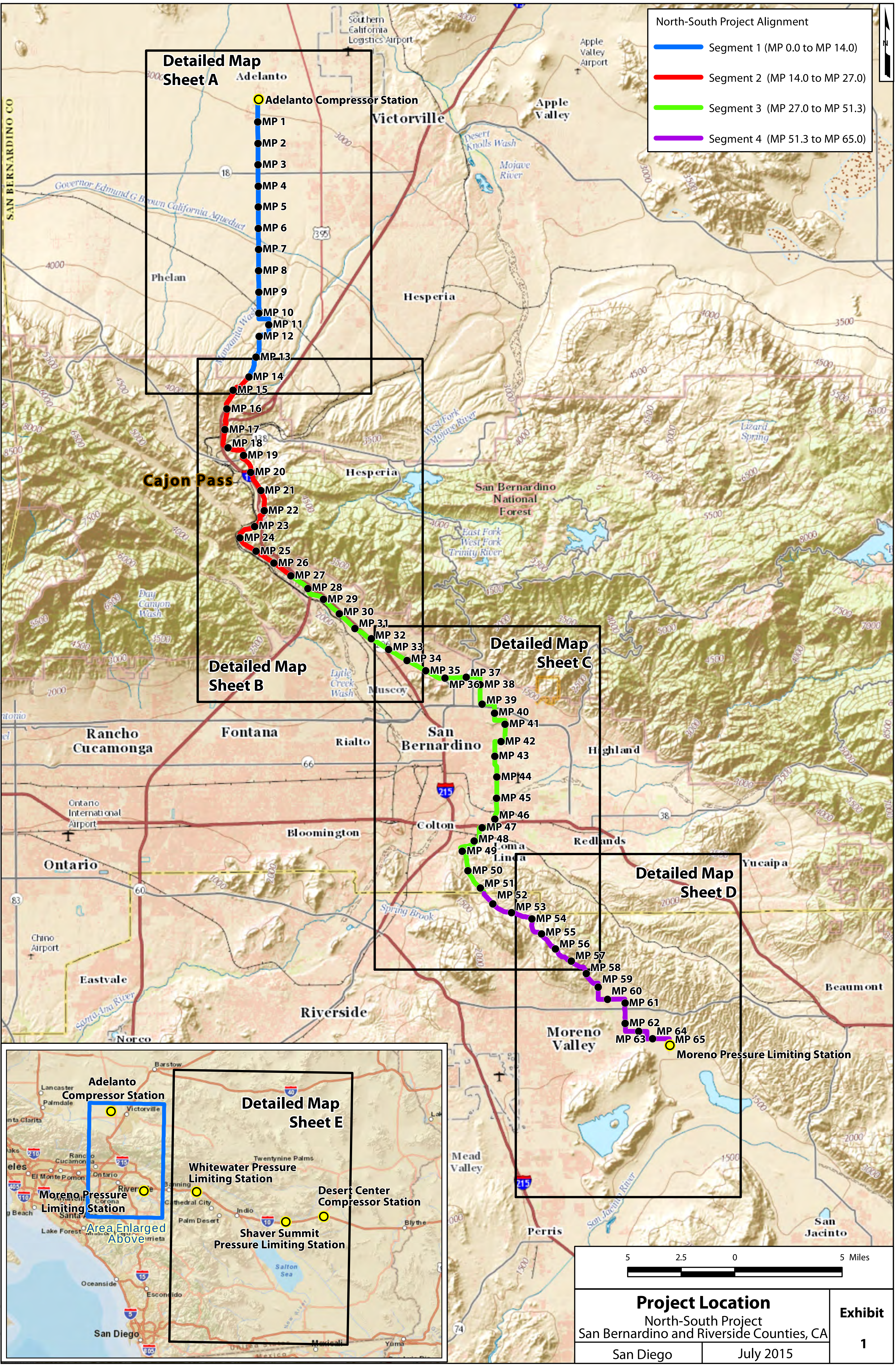
b. Excerpts, including site plans and boring/well logs retrieved from GeoTracker website are presented in Appendix C2.

c. Site location and identification information from the SWRCB GeoTracker website (http://geotracker.waterboards.ca.gov/).

d. Data summarized represents geotechnical information retrieved from SWRCB GeoTracker website for selected locations near the Proposed Project alignment.

APPENDIX A

Exhibits

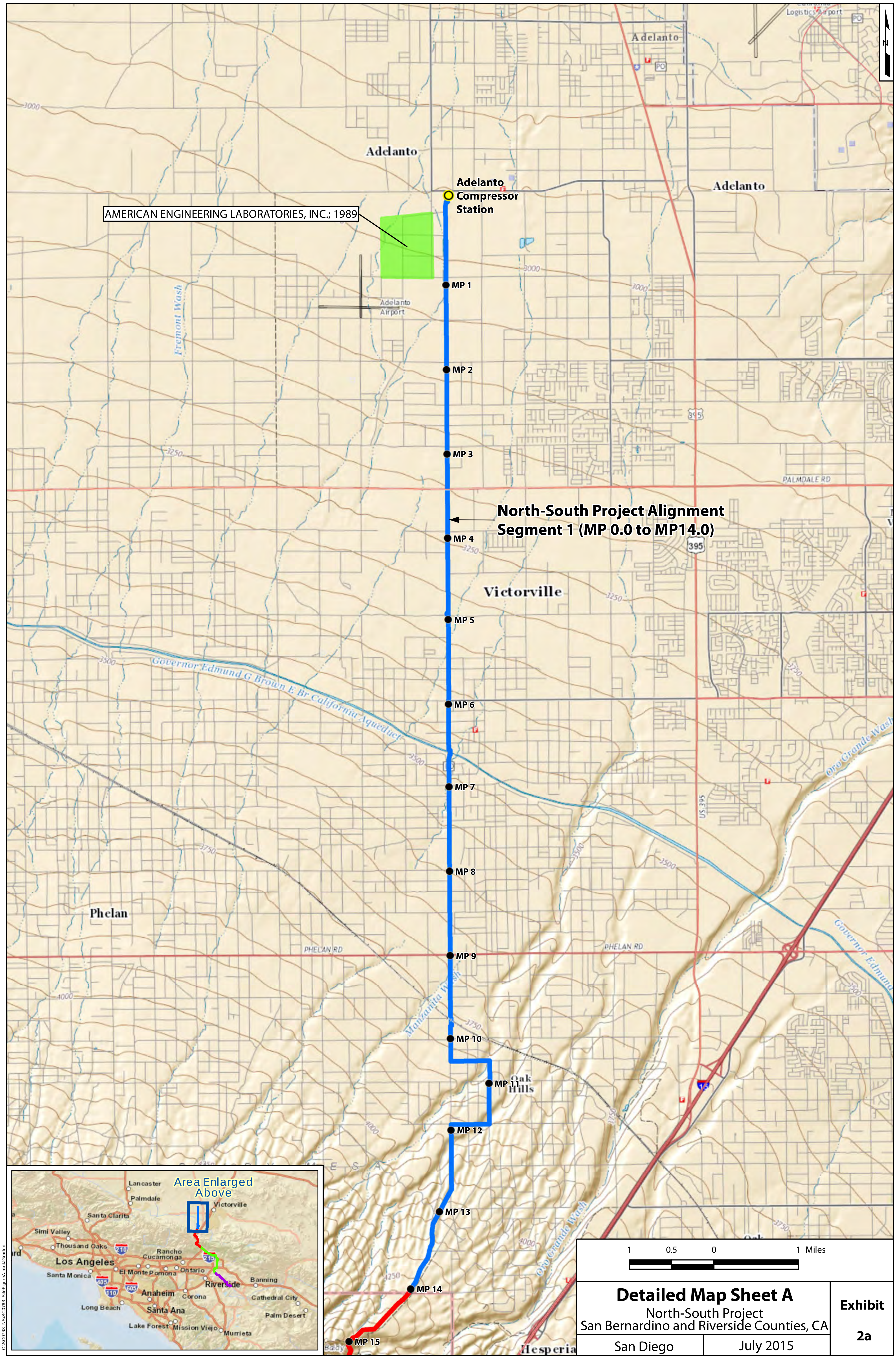


Project Location

North-South Project
San Bernardino and Riverside Counties, CA

San Diego
July 2015

Exhibit
1



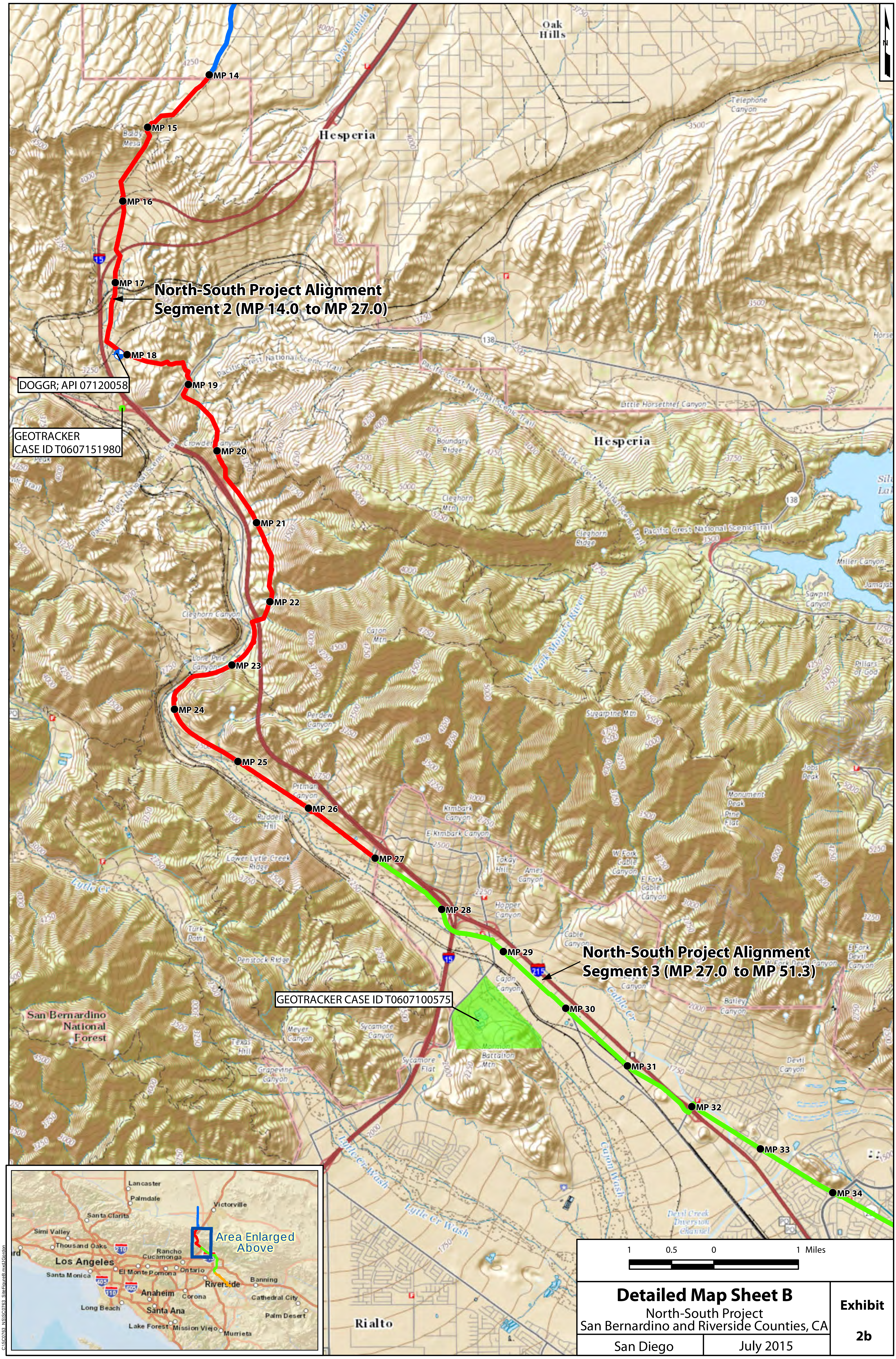
Detailed Map Sheet A

North-South Project
San Bernardino and Riverside Counties, CA

San Diego | July 2015

Exhibit

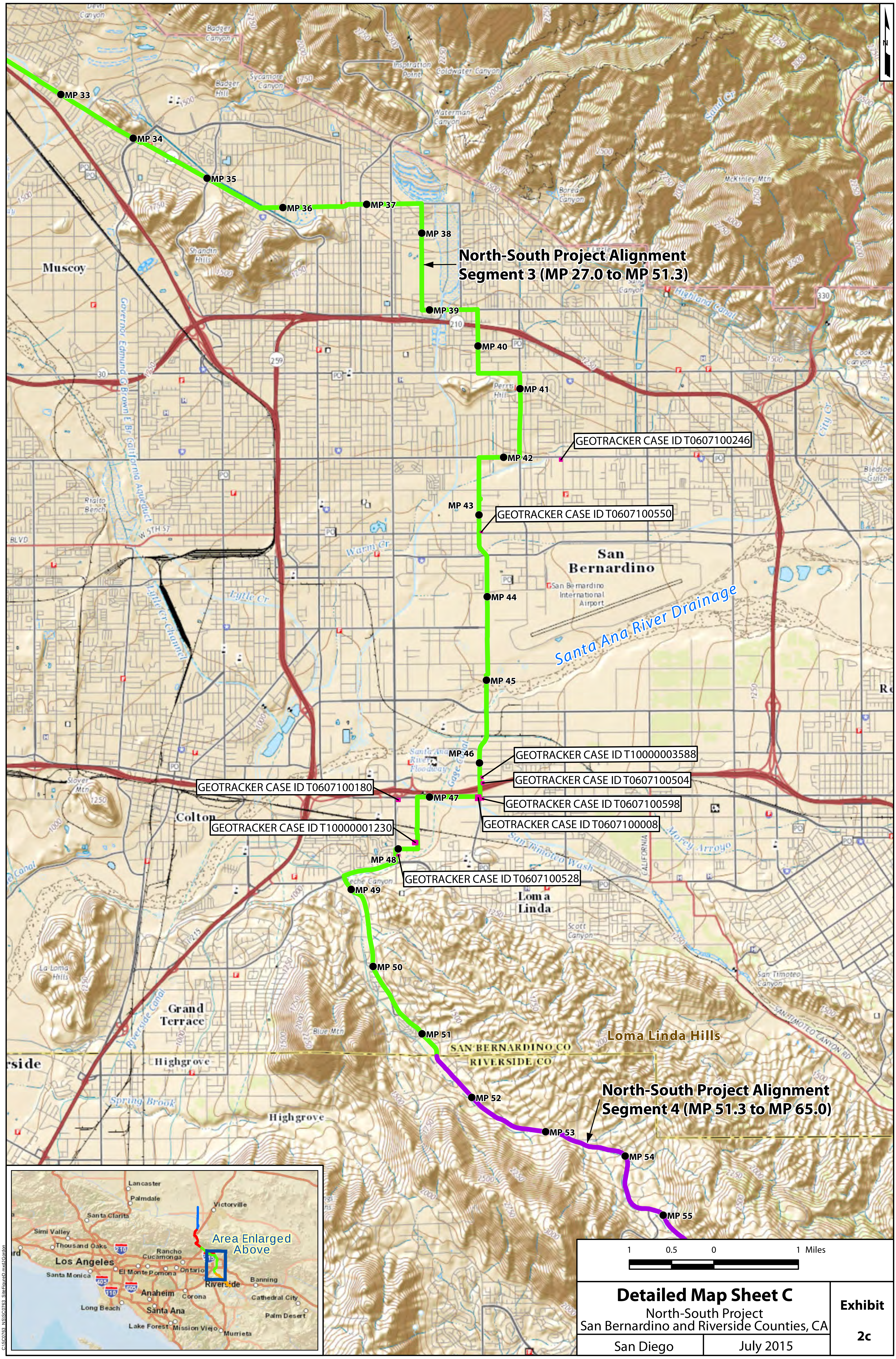
2a



Detailed Map Sheet B
North-South Project
San Bernardino and Riverside Counties, CA

San Diego
July 2015

Exhibit
2b



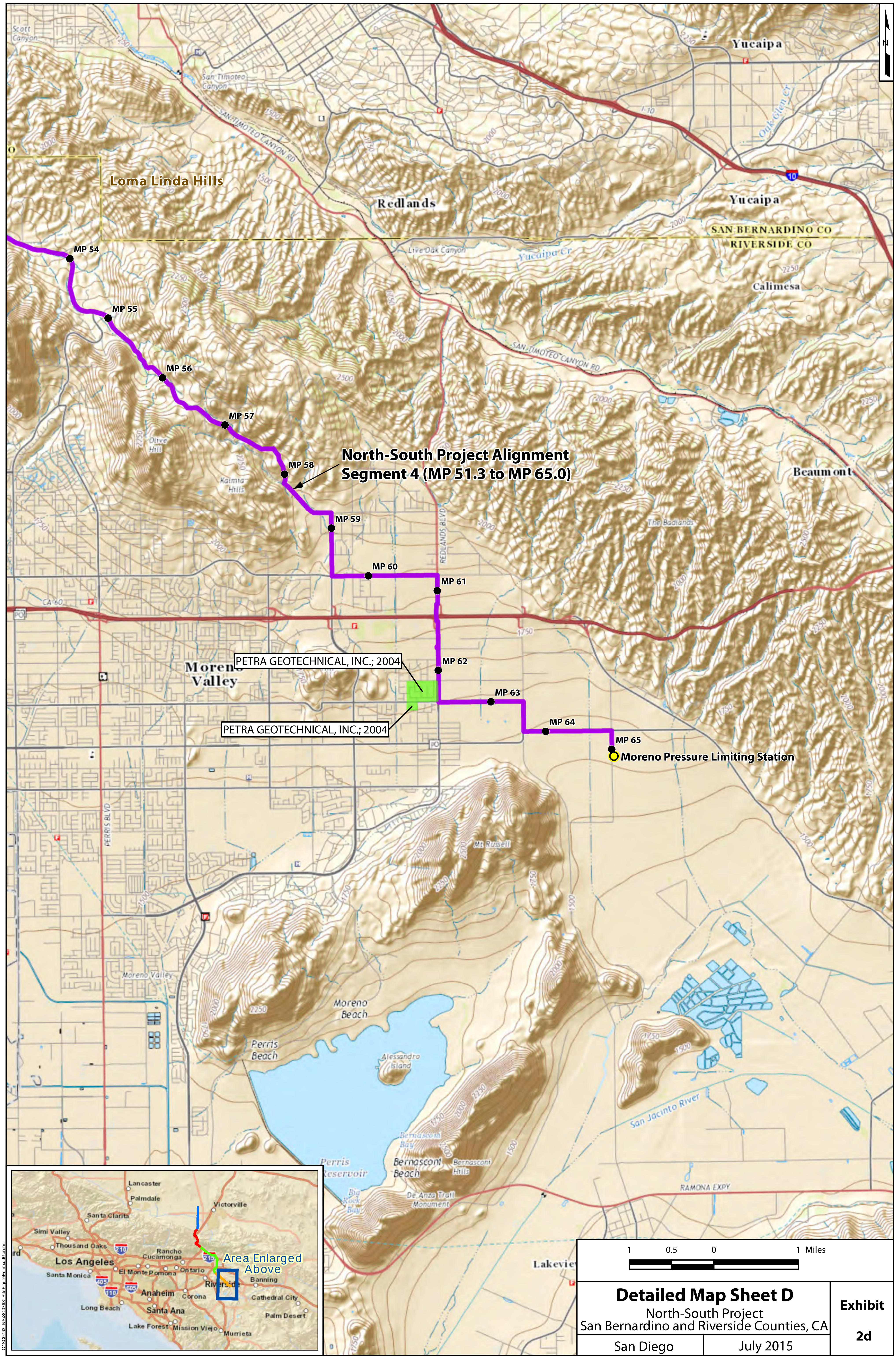
Detailed Map Sheet C

North-South Project
San Bernardino and Riverside Counties, CA

San Diego | July 2015

Exhibit

2c



Detailed Map Sheet D

North-South Project

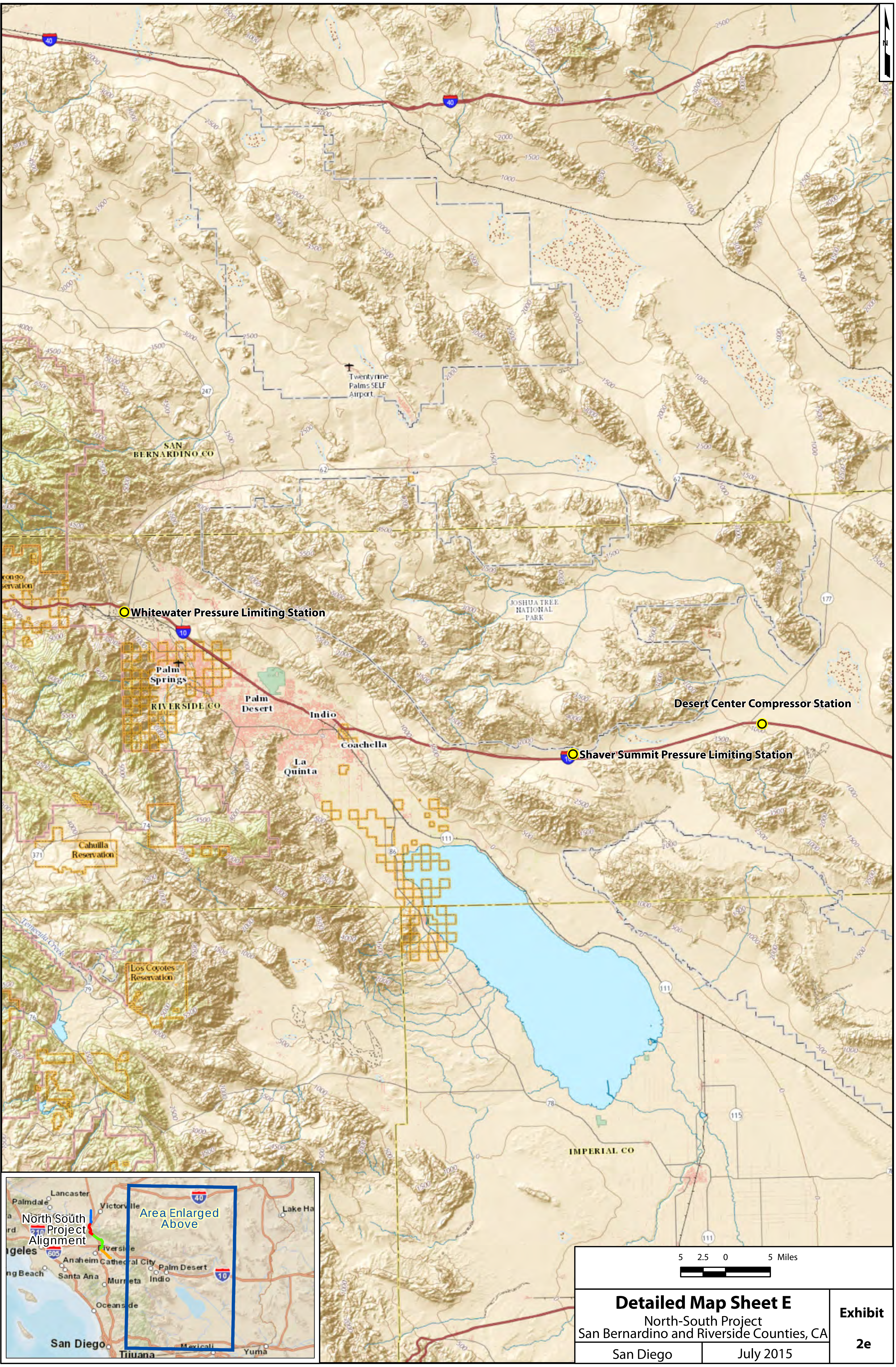
San Bernardino and Riverside Counties, CA

San Diego

July 2015

Exhibit

2d



Detailed Map Sheet E

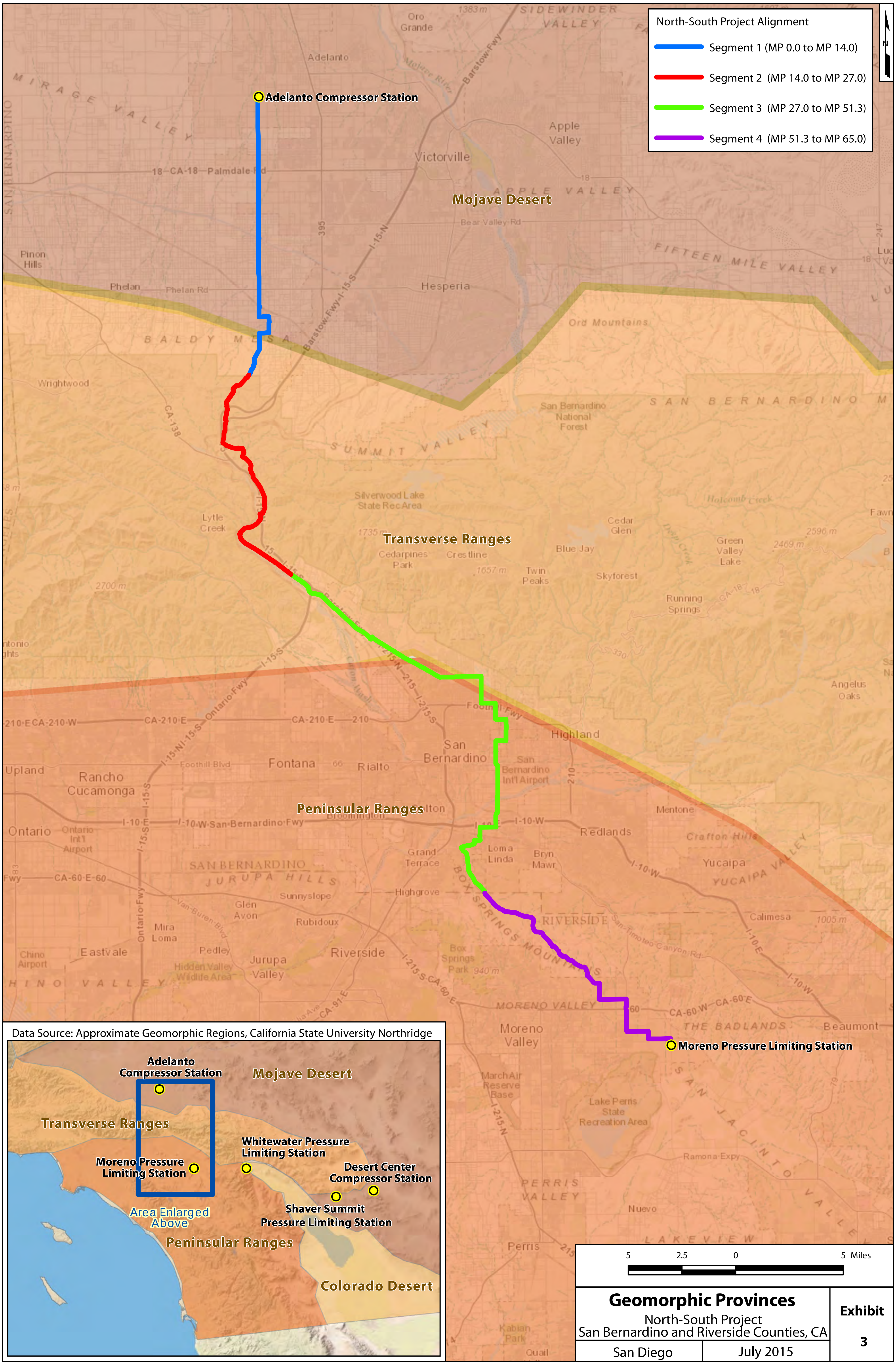
North-South Project
San Bernardino and Riverside Counties, CA

San Diego

July 2015

Exhibit

2e



North-South Project Alignment

- Segment 1 (MP 0.0 to MP 14.0)
- Segment 2 (MP 14.0 to MP 27.0)
- Segment 3 (MP 27.0 to MP 51.3)
- Segment 4 (MP 51.3 to MP 65.0)

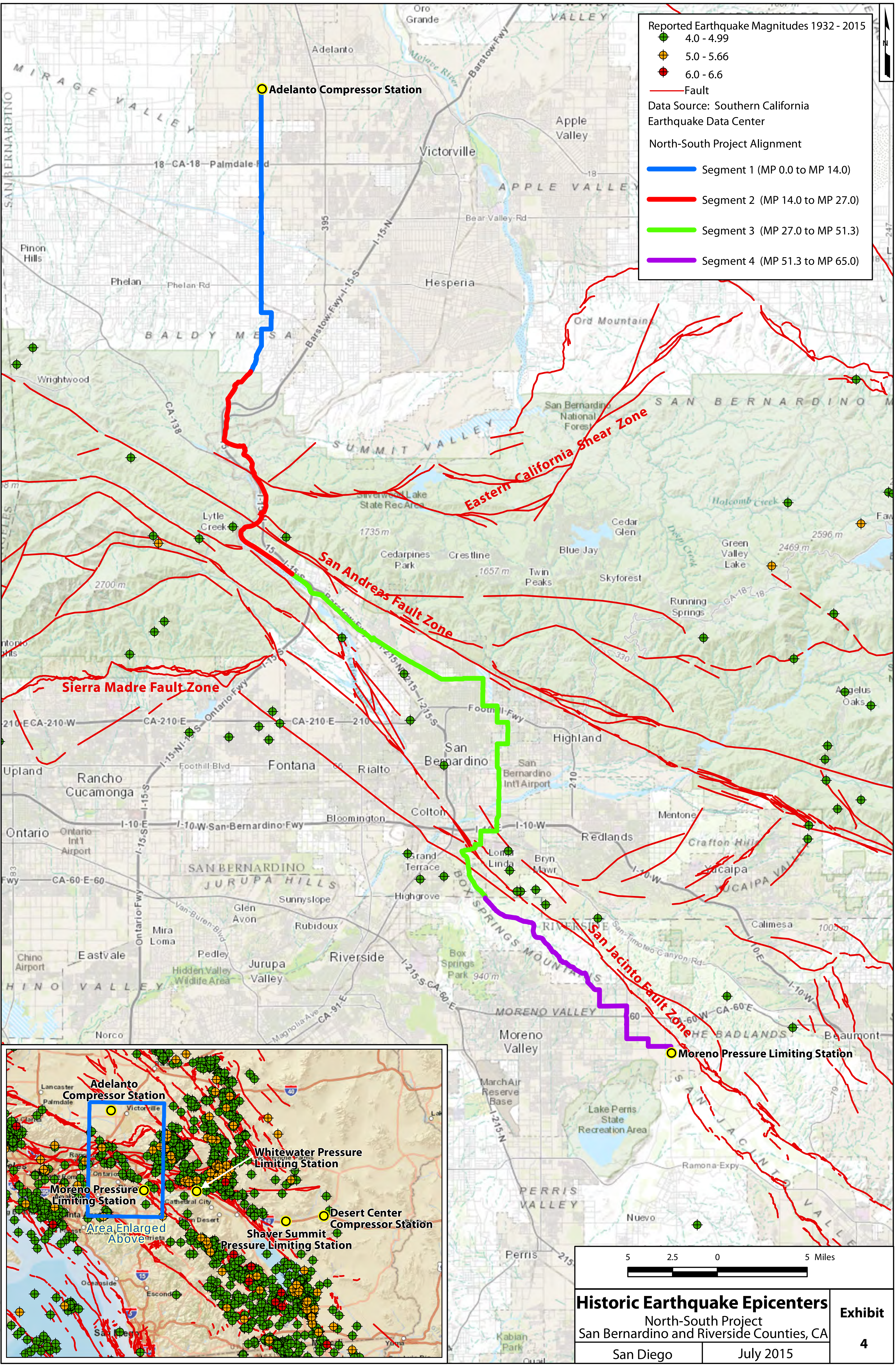
Data Source: Approximate Geomorphic Regions, California State University Northridge

Geomorphic Provinces

North-South Project
San Bernardino and Riverside Counties, CA

San Diego | July 2015

Exhibit
3



Historic Earthquake Epicenters

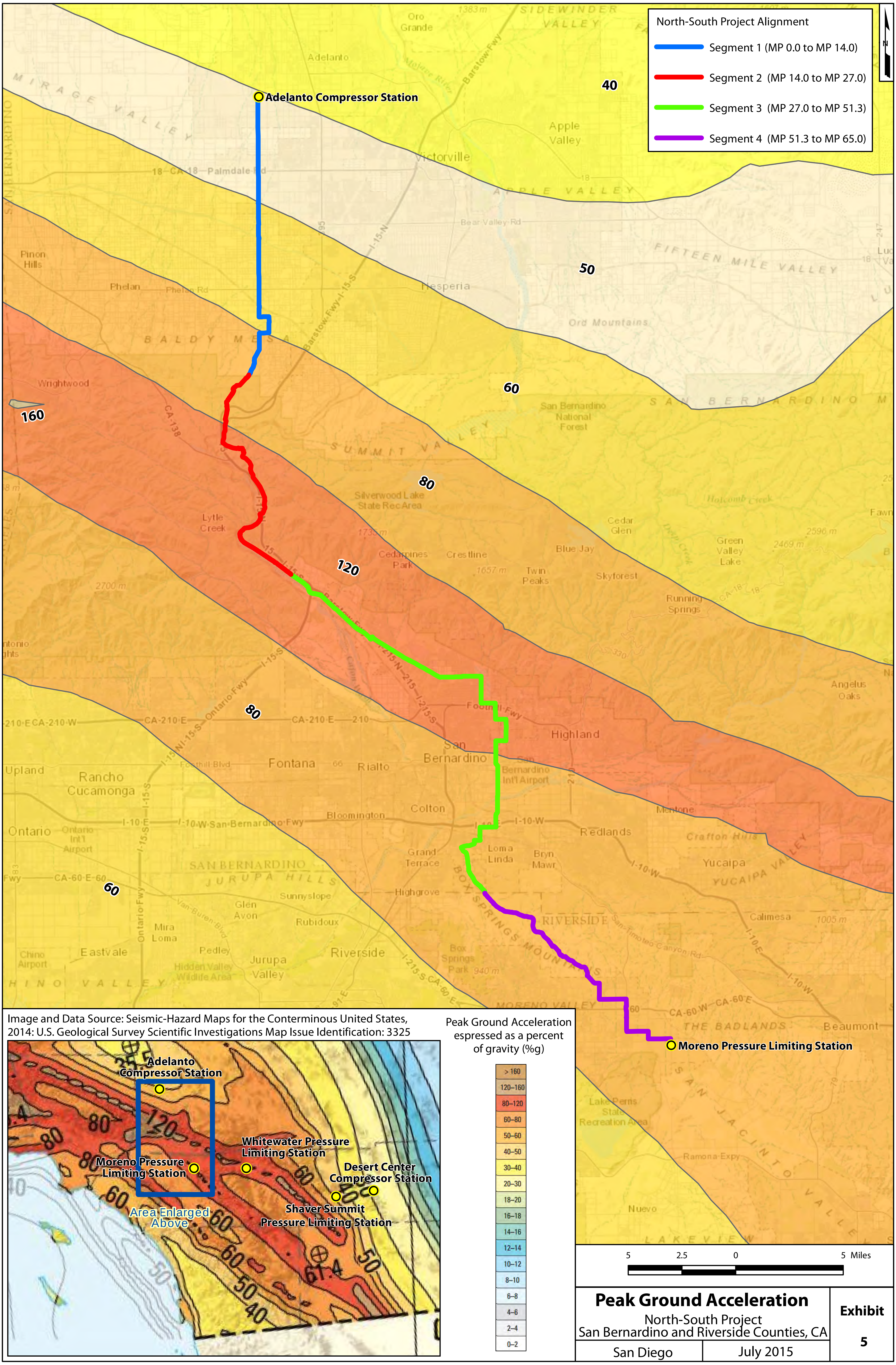
North-South Project
San Bernardino and Riverside Counties, CA

San Diego

July 2015

Exhibit

4



North-South Project Alignment

- Segment 1 (MP 0.0 to MP 14.0)
- Segment 2 (MP 14.0 to MP 27.0)
- Segment 3 (MP 27.0 to MP 51.3)
- Segment 4 (MP 51.3 to MP 65.0)

Image and Data Source: Seismic-Hazard Maps for the Conterminous United States, 2014: U.S. Geological Survey Scientific Investigations Map Issue Identification: 3325

Peak Ground Acceleration espressed as a percent of gravity (%g)

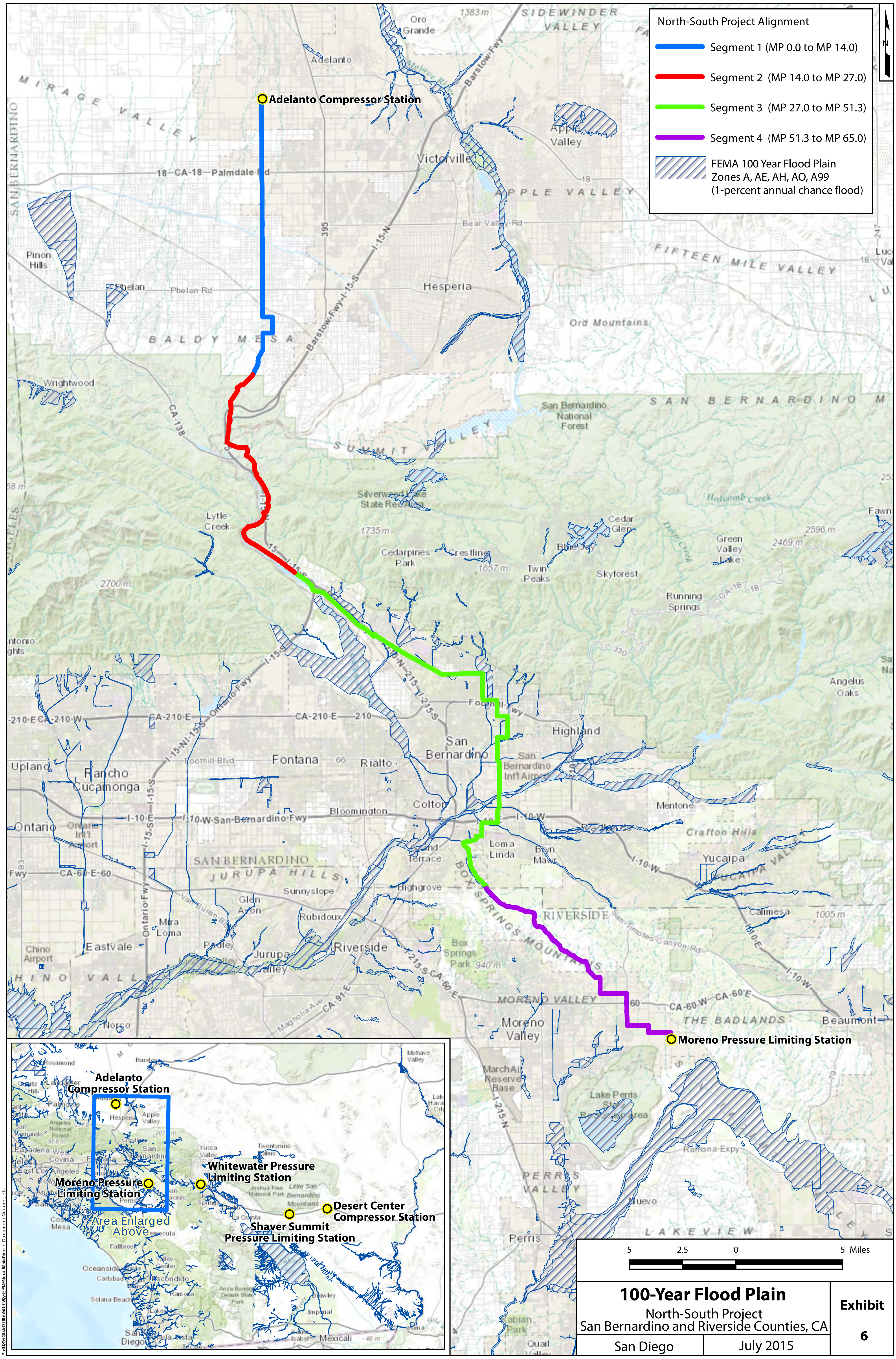
- > 160
- 120–160
- 80–120
- 60–80
- 50–60
- 40–50
- 30–40
- 20–30
- 18–20
- 16–18
- 14–16
- 12–14
- 10–12
- 8–10
- 6–8
- 4–6
- 2–4
- 0–2

Peak Ground Acceleration

North-South Project
San Bernardino and Riverside Counties, CA

San Diego | July 2015

Exhibit
5



100-Year Flood Plain

North-South Project
San Bernardino and Riverside Counties, CA

San Diego | July 2015

Exhibit 6

APPENDIX B

LCI [2015] Geologic Hazards Evaluation

LCI
EARTH SCIENCE CONSULTANTS

Lettis Consultants International, Inc.
27441 Tourney Road, Suite 220
Valencia, CA 91355
(661) 287-9900; fax (661) 287-9990

Proposed North-South Pipeline Alignment
Geologic Hazards Evaluation

Prepared for:

Southern California Gas Company
555 West Fifth Street
Los Angeles, California 90051

Prepared by:

Lettis Consultants International, Inc.
27441 Tourney Road, Suite 220
Valencia, CA 91355

June 29, 2015

LCI
EARTH SCIENCE CONSULTANTS

Lettis Consultants International, Inc.
27441 Tourney Road, Suite 220
Valencia, CA 91355
(661) 287-9900; fax (661) 287-9990

June 29, 2015

Mr. Ron Bott
Southern California Gas Company
555 West Fifth Street
Los Angeles, CA 90051

Subject: Proposed North-South Pipeline Alignment Geologic Hazards Evaluation

Dear Mr. Bott:

Lettis Consultants International, Inc. (LCI) is pleased to present to you our final draft report on the geologic and seismic hazards investigation for the proposed North-South Pipeline alignment. We identified and evaluated 60 alignment-fault crossings and provide within our report the results of our evaluation. Based on our evaluation and additional mapping of the identified fault crossings, LCI was able to refine and identify the principal fault crossings on the San Andreas and San Jacinto faults. The principal alignment-fault crossings will most likely experience the highest amount of ground rupture failure during the next major earthquake on these fault systems. We identified three principal fault crossings on the San Andreas Fault and two principal fault crossings on the San Jacinto fault.

We also compiled and evaluated landslide and liquefaction hazards along the proposed alignment. Liquefaction data was provided by the counties of San Bernardino and Riverside. The highest risk of permanent ground deformation due to liquefaction is located along the Santa Ana river corridor which has a large accumulation of loose, sandy alluvial materials and historically high groundwater levels. In addition to summarizing the liquefaction hazards within San Bernardino and Riverside counties, we have also provided an assessment of liquefaction induced settlement for San Bernardino County where risk of liquefaction is highest along the proposed alignment. Landslide hazards were compiled from various published maps and supplemented by LCI with localized mapping of potential landslides. The proposed alignment has been routed effectively around major landslide hazard areas, although potential landslide hazard areas exist in the Cajon Pass area that may generate new landslides due to strong ground shaking or oversaturation of hillslope deposits during years of above normal wet weather.

Please do not hesitate to contact us with any questions, comments, or concerns you may have regarding this report. You may contact us directly at 661-287-9900.

Sincerely,

Lettis Consultants International, Inc.

Scott Lindvall

SCOTT C. LINDVALL
NO. 1711

Scott C. Lindvall, CEG 1711
Senior Principal Geologist

RICHARD MICHAEL ORTIZ
No. 2621

Richard M. Ortiz, CEG 2621
Senior Project Geologist

Christopher D. Kemp
Project Geologist

Table of Contents

1.0 INTRODUCTION

This report summarizes our findings regarding the geologic and seismic hazards identified along the proposed North-South Pipeline alignment. The principal issues addressed by this study are fault rupture, liquefaction and landslide hazards along the proposed alignment. We also performed an analysis of liquefaction induced settlement (Attachment 1).

The proposed pipeline alignment generally trends north-south between the Adelanto Compressor Station in the Mojave Desert and the Moreno Valley Large PLS Station in Moreno Valley. The proposed alignment is approximately 65-miles-long and traverses two major fault zones (Figures 1 and 2), the San Andreas fault zone (Figure 3) and the San Jacinto fault zone (Figure 4), along its planned route. Portions of both fault zones have been designated Alquist-Priolo (AP) Earthquake Fault Zones (Figure 2) and contain multiple Holocene (less than 11,000 years) active and Quaternary (less than 2.5 million years) active fault strands. Additionally, landslide hazards are present near the alignment in locations where the proposed alignment crosses steep terrain such as Cajon Pass and Reche Canyon, and liquefaction hazards are present in areas with high ground water and young, sandy alluvial materials, such as the Santa Ana River corridor in the San Bernardino Valley (Figure 1).

2.0 METHODOLOGY

2.1 Data Review

LCI compiled and reviewed a comprehensive set of geologic data which covers the proposed North-South Pipeline alignment. These data include:

- Quaternary faults published by the California Geological Survey (CGS) (Figure 1)
- Alquist-Priolo (AP) Earthquake Fault Zones and active faults (Figure 2)
- Quaternary faults published by the U.S. Geological Survey (USGS) (Figure 2)
- Modeled displacement estimates from ShakeOut (Figure 5B)
- Distribution of ShakeOut displacement estimates in the Cajon Pass crossing area (Figure 6)
- Geomorphic offset measurements compiled in UCERF3 (Figure 7)
- Available historic (1930s era) topographic maps (Figure 9)
- Available Dibblee geologic maps (1:24k scale) (Figure 10)
- Available USGS geologic maps (1:24k scale) (Figure 11)
- Available CGS geologic maps (1:100k scale) (Figure 12)
- Available historical (pre-1945) aerial photograph coverage for the pipeline alignment (Figure 13)
- Available lidar coverages for the pipeline alignment (Figure 14)
- Liquefaction hazards maps that cover the proposed pipeline alignment (Figure 15)

2.2 Identification of Fault Crossings

As noted above, the proposed pipeline alignment crosses the high slip rate San Andreas and San Jacinto fault zones, the main strands of which are high slip rate Holocene (less than 11,000 years) faults, as well as lower slip rate, Holocene and Quaternary (less than about 2.6 million years) faults such as the Cleghorn fault.

To identify fault crossings for the proposed pipeline alignment, fault traces were compiled from several map sources, including native digital sources and traces digitized from scanned paper maps. The data sources include:

- AP Earthquake Fault Zone Maps (CDMG 1974a, 1974b, 1974c, 1977a, 1977b),
- AP Fault Evaluation Reports (Burnett and Hart, 1976; Hart, 1977),
- USGS Quaternary Fault and Fold Database (USGS and CGS, 2006, accessed 2014),
- 2010 Fault Activity Map of California (Jennings and Bryant, 2010),
- Geologic maps from Bedrossian et al. (2012), Bedrossian and Roffers (2012), and Dibblee and Minch (2003a, b, c, d; 2004a, b).

A compilation of fault crossings from these sources (of various map scales) is listed in Table 1. Fault crossings are listed sequentially from north to south along the proposed pipeline alignment. The fault crossings also include faults mapped by LCI based on interpretation of lidar, aerial photography, and trench logs from existing consultant reports. Each fault crossing has been assigned a unique identifier which provides information on the pipeline alignment, fault crossed and source map of the fault trace. For example crossing ID “ADM-SAF-AP-01” corresponds with North-South Pipeline (ADM) - San Andreas Fault (SAF) – AP Map Source (AP) – Crossing #1 (01).

Table 1 provides the following information for each fault crossed by the proposed pipeline alignment:

- Unique fault crossing identification (Crossing ID)
- Location information is provided as State Plane (ft) and latitude and longitude coordinate pairs
- The fault name listed is the published fault name
- Dominant sense of slip, if known
- Age of the most recent fault movement (e.g. Holocene, Quaternary, etc.)
- Source of original mapping

The next step involved distilling this initial compilation of fault crossings from multiple sources (Table 1) into a final set of Holocene or probable Holocene fault crossings that are considered to represent a potential rupture hazard to the proposed pipeline alignment (Table 2). Table 1 includes duplicates of the same fault and in some cases, slightly different depictions of the same fault. In areas where the same fault has been depicted slightly differently by different mappers, we typically chose to use the AP fault strand locations, as this represented the best available information. The exceptions to this rule were where trench logs or modern lidar was available to help refine and improve a fault's location. In these cases, the fault crossings are labeled as "LCI-preferred." Table 2 also includes fault crossing locations based on local geologic maps (Cleghorn and Loma Linda faults). Bedrock faults classified as pre-Quaternary in age are not considered as they do not represent a surface rupture hazard due to the lack of evidence for recent displacement and are not included in the final tabulation of fault crossings (Table 2).

Table 2 also includes the following information on the characteristics of each fault and the fault crossing:

- "Primary" or "secondary" designation for each fault crossing
- Published slip rates for primary fault strands
- Estimated fault displacement to consider for design
- Angle of incidence between alignment and fault
- Type of pipe deformation
- Figure showing location of fault crossing

Portions of the San Andreas and the San Jacinto fault zones were designated under the AP Act as Earthquake Fault Zones in the mid-1970s. As such, the State of California mandates the completion of a fault rupture hazard investigation for large developments and structures designed for human occupancy that are located within the designated fault zone. CGS has made fault investigation reports (FIRs) from these investigations performed between 1974 and 2000 available to the public, of which 26 studies have been performed along the San Andreas and San Jacinto faults in the vicinity of the proposed pipeline alignment. These studies were reviewed to determine locations of fault strands, and in some cases, which strands might be active.

In addition to FIRs, this study further refined the locations of the pipeline alignment-fault crossings of primary fault strands through interpretation of historic aerial photography and modern lidar based topographic data. All fault locations were assessed using these data, however, only the primary fault strands were well enough expressed that their previously mapped locations warranted revising. We have provided refined crossing locations for the primary and secondary strands of the San Andreas Fault in Cajon Pass (Figures 5a and 5b), and the principal strand of the San Jacinto fault near Loma Linda, CA (Figures 8a and 8b). LCI anticipates the majority of surface displacement will occur at these primary fault crossings during the next large magnitude earthquake on the San Andreas and San Jacinto faults.

2.3 Liquefaction Hazard Evaluation

We reviewed available USGS, CGS, and San Bernardino and Riverside County and City general plan safety elements to evaluate liquefaction hazards along the proposed pipeline alignment (Figure 15). Based on the review of available studies, Matti and Carson (1991) provide a comprehensive assessment of liquefaction susceptibility for the San Bernardino Valley that was incorporated into the Safety Element of the San Bernardino County General Plan. We performed an analysis of liquefaction induced settlement (Attachment 1) based on data utilized by Matti and Carson (1991). For this approach, the liquefaction induced settlements are calculated numerically using the SPT data and the approach described by Tokimatsu and Seed (1987). The Riverside County General Plan (County of Riverside, 2003) assigned the liquefaction susceptibility as low for the pipeline alignment within Riverside County due to a lack of groundwater data along the alignment. Therefore, the settlement analysis was performed for San Bernardino County only.

For San Bernardino County, Matti and Carson (1991) used four data sources for the assessment of the liquefaction susceptibility: (1) soil and foundation investigations filed with city and county agencies in compliance with permitting procedures, (2) subsurface investigations for flood-control structures and building projects prepared by the U.S. Army Corps of Engineers, (3) logs of test borings for bridges on State and Federal highways prepared by the California Department of Transportation (CalTrans), and (4) SPT data obtained during a 27-site drilling project conducted in the San Bernardino Valley area by the U.S. Geological Survey.

GIS data provided by Riverside County (County of Riverside, 2014) was utilized for this study and provides the best liquefaction information for the Moreno Valley section of the alignment. The San Bernardino Valley and Moreno Valley represent the only areas along the proposed alignment where liquefaction hazards have been defined in previous studies. Liquefaction hazards may be present in areas along portions of the proposed pipeline alignment north of Cajon Pass, within Cajon Pass, or within Reche Canyon that were not classified by previous studies, but no additional known data is available, therefore, at a minimum, these areas should be considered to have a low probability of liquefaction hazard in areas dominated by alluvial materials.

2.4 Landslide Hazard Evaluation

The proposed pipeline alignment crosses two areas of landslide hazard potential due to steep topography and the presence of geologic formations susceptible to mass wasting: Cajon Pass and Loma Linda Hills. In addition to evaluation of published maps, this study also reviewed available aerial photographs (Table 3) and lidar topographic data to identify potential landslides that could potentially affect the proposed pipeline alignment. We limited our desktop assessment of landslide hazards to areas within 0.5 miles of the proposed pipeline alignment. We also performed a field assessment for observable landslides visible from CA-138, I-15/U.S. 66 through Cajon Pass, and along Reche Canyon Road.

3.0 RESULTS

Based on our review of the published studies and maps described above, the potential fault, liquefaction and landslide hazards along the planned pipeline alignment can be characterized as described below.

3.1 Fault Crossing Evaluation

The proposed North-South Pipeline alignment crosses 60 mapped fault strands, all of which are listed in Table 1. Many of the 60 individual crossings represent duplicate depictions of the same fault strand mapped by different authors and published at different scales. This study evaluated each of the crossings listed in Tables 1 and 2 and utilized historical aerial photography, lidar topographic data, and FIRs to further refine and characterize the locations of major fault crossings along the proposed alignment. Table 2 lists the results of the evaluation and refinement of fault crossing locations based on existing data and additional interpretation performed for this study. These final fault crossings (Table 2) represent the alignment fault crossings with the greatest exposure to surface fault rupture hazards. The greatest anticipated hazards are located where the alignment crosses the San Andreas and San Jacinto faults zones. The San Andreas and San Jacinto faults are both high slip rate faults that make up the primary components of the dextral boundary between the North American and Pacific Plates. As such, there is a potential that the proposed pipeline alignment could experience surface fault rupture on either one or both of these faults during the life of the project.

3.1.1 San Andreas fault zone

The proposed pipeline alignment traverses the North San Bernardino section of the southern San Andreas Fault in Cajon Pass (Figure 1). This section of the fault has a UCERF3 preferred geologic slip rate of 20 to 30 mm/yr based on consideration of several of nearby studies compiled in Appendix B of UCERF3 (Dawson and Weldon, 2013). This section of the fault ruptured during the 1857 Fort Tejon earthquake, the most recent event on the southern San Andreas Fault. Based on previous studies, the surface rupture appears to have terminated about 8 miles south of the pass near Devil Canyon (Zielke et al., 2012; Madden et al., 2013).

Where it is crossed by the proposed pipeline alignment, the San Andreas fault zone is about 1.25 miles wide and comprises several discrete fault strands, as well as the potential for fault strands that cannot be identified in young material or steep bedrock slopes (Figure 3). Due to curves and bends, the alignment crosses multiple strands of the San Andreas fault zone over approximately 1.4 mi as measured along the alignment. The locations of strands comprising the primary fault zone were refined from previously published mapping through our interpretation of lidar and 1930s era aerial photography, which displayed strong geomorphic evidence for the locations of the primary fault strands. The 350-ft-wide zone between fault crossings “ADM-SAF-LCI_Preferred-02” and “ADM-SAF-LCI_Preferred-03” defines the primary zone of the fault and the section of the proposed pipeline alignment that could experience the greatest amount of surface displacement during the next ground rupturing earthquake (Figures 5a and 5b). It is unclear how slip may be distributed within this primary fault zone, however, it appears slip will likely be concentrated along the faults bounding the zone, while interstitial strands may carry subordinate amounts of slip.

A secondary strand of the San Andreas fault zone, “ADM-SAF-LCI_Preferred-01”, is located to the northeast of the primary fault zone crossing (Figure 5b). This strand was included in Bedrossian’s (2012) mapping and its location was refined on the basis of offset terrace risers on the east side of the valley, and geomorphology suggestive of faulting to the west observed in lidar data. We interpret that this secondary strand is likely to carry less than a meter, or about three feet of slip in the next large earthquake, consistent with Trieman et al. (2008) who interpret that all slip in the ShakeOut scenario is concentrated on the primary fault zone through Cajon Pass.

3.1.2 San Jacinto fault zone

The entire width of the San Jacinto fault is crossed by the pipeline alignment in the cities of Colton, San Bernardino and Loma Linda (Figure 1). The alignment crosses the San Bernardino Valley section of the fault, which has a UCERF3 preferred slip rate of 2 to 10 mm/yr including uncertainty (Dawson and Weldon, 2013).

The San Jacinto fault zone is about 0.5 miles wide where it is crossed by the proposed alignment; however, the length of the alignment within the fault zone is about 0.6 miles (Figure 4). If the Loma Linda fault (early Holocene-late Pleistocene age) to the northeast and the Rialto- Colton fault (late Quaternary age) to the southwest, are considered secondary strands of the San Jacinto fault zone, the entire fault zone width increases to nearly 2 miles. The length of the proposed alignment between the Loma Linda fault and Rialto-Colton fault is about 3 miles (Figure 4).

Near the towns of San Bernardino, Colton, and Loma Linda the primary strand of the San Jacinto fault is located as a single point crossing identified as “ADM-SJF-LCI_Preferred-01" (Figures 8a and 8b). This pipeline alignment crosses the fault within the intersection of Wier Road and East Washington Street, and replaces the “ADM-SJF-AP-03” as the location of the main fault strand. The location of the primary stand is well constrained locally because the fault was exposed in multiple trenches excavated by Sieh et al. (1973) and by Leighton (1980) prior to the construction of the Village Park subdivision. The nearest trench exposure was approximately 350 ft northwest of the Wier Road and East Washington Street intersection and the fault was expressed as a prominent west-facing fault scarp. These studies postdate the publishing of the official AP Earthquake Fault Zone Map for this area and therefore, have helped to improve the understanding of the fault zone that was originally shown on the AP map. Sieh et al. (1973) utilized C14 dating of unbroken layers above the last observed faulting event, which indicated an age of 670 years before present; however, the Leighton (1980) study found offset sediments containing manmade artifacts (square headed nails) which suggests a surface rupturing earthquake occurred after the valley was settled in the early 1800s. This rupture may be associated with the 1899 M_L6.5 or the 1918 M_L6.8 San Jacinto Earthquakes, which both had epicenters south of Moreno Valley in Hemet, CA. The rupture may also be associated with the closer, but smaller magnitude 1923 M_L6.3 North San Jacinto Fault Earthquake, with an epicenter located near the alignment in Reche Canyon (Laughlin et al., 1923).

South of the primary San Jacinto fault crossing, fault crossing “ADM-SJF-LCI_Preferred-02” is located in Reche Canyon based on interpretation of geomorphic features identified within lidar data. The fault crossing identified at this location is considered to be a secondary fault strand, which has been referred to the “Rialto-Colton fault” in previous fault compilations (e.g. USGS and CGS, 2006). At this location within the Loma Linda Hills, the fault is expressed as a series of well-defined linear ridges and scarps that project toward the proposed pipeline alignment. At the crossing location in the base of the canyon, deformed Holocene alluvial deposits (vertically separated) are observed in lidar data, as well as tonal lineations in aerial photography. Therefore, this strand is interpreted to be active and thus pose a hazard for potential ground rupture during a large earthquake on the San Jacinto fault zone.

3.1.3 Minor faults

In addition to the main strands of the San Andreas and San Jacinto fault zones, the proposed pipeline alignment crosses several minor faults or secondary strands located well away from the major fault zones.

Several lower slip rate faults that do not comprise major elements of the plate boundary are crossed by the proposed alignment. These include the Cleghorn fault, Punchbowl fault, Peters fault, the Frontal Fault Zone of the San Bernardino Mountains, the Loma Linda fault, and the Colton-Rialto fault, which have been mapped by multiple authors (Bedrossian, 2012; Dibblee and Minch, 2003a; Jennings and Bryant, 2010; USGS and CGS, 2006) in the Cajon Pass area (Figures 1 and 2). Within Cajon Pass, none of these faults are well expressed in Quaternary deposits on the basis of lidar and aerial photo interpretation; their locations in previously published maps appear to be primarily based on bedrock relationships. With the exception of the Cleghorn fault, none of these faults are independently seismogenic (i.e., capable of generating earthquakes), therefore, we estimate earthquake surface rupture displacements below only for the Cleghorn fault.

The Cleghorn fault is a left-lateral, Quaternary active fault with a reported slip rate of 0.3 to 0.6 mm/yr based on studies compiled in UCERF3 Appendix B (Dawson and Weldon, 2013). The fault shares a similar orientation and sense of slip with other roughly east-west-striking faults in the Transverse Ranges and, therefore, may rupture independently of the San Andreas Fault. The fault is readily apparent in aerial photography along much of its trace, expressed prominently as erosional contrasts between different bedrock juxtaposed by the fault. The fault is considered pre-Holocene by Bryant (2003), however it is included as a seismic source in

UCERF3 (Field et al., 2013). As such, we conservatively assess the Cleghorn fault to be a probable Holocene fault and include it as a hazardous fault crossing in Table 2.

The Punchbowl fault is a secondary strand of the San Andreas fault zone. It is considered an AP fault, although no FER exists to evaluate the basis for its inclusion (Figure 3). In general, AP-mapped faults are included in the UGSS Quaternary fault and fold database exactly as they were drafted in official AP maps; however, the Punchbowl fault is not. As with other secondary faults crossed by the alignment, the Punchbowl fault is not well expressed in young alluvium; however, it is clearly expressed as linear valleys, aligned saddles, and ridge notches in steep bedrock terrain. Nearest the crossing area, expression fades, therefore, we adopt the traces depicted in AP maps. We conclude that the fault is likely an older strand of the San Andreas fault zone that does not independently generate earthquakes and has carried a small amount of slip (three feet or less) in Holocene earthquakes. This determination was made on the basis of the lack of expression in younger deposits.

Peters fault is also considered a secondary strand of the San Andreas fault and is zoned as an AP fault. It branches west off the San Andreas fault and crosses the pipeline alignment approximately 3.5 miles (along the pipeline alignment) southeast of the primary San Andreas fault crossing (labeled as “ADM-SAF-Bedrossian-10” crossing in Figure 2).

Trenching by Sieh et al. (1973) and Leighton (1980) identified the primary strand of the San Jacinto fault zone near the proposed North-South pipeline alignment (Figures 8a and 8b). The faults exposed within the trenches record the most recent rupture on the principal trace of the fault, but given the young, historic age of the deposits, not all secondary faults may have been recognized in these excavations.

Outboard of the primary San Jacinto fault zone, the Loma Linda fault to the northeast and the Rialto-Colton fault to the southwest are also considered secondary strands of the San Jacinto fault. The Loma Linda fault is approximately 1.7 miles (along the pipeline) northeast of the primary San Jacinto fault crossing, whereas the Rialto-Colton fault (labeled as “ADM-SJF-LCI_Preferred-02” crossing in Figure 4) is approximately 1.3 miles (along the pipeline) southwest of the primary San Jacinto fault crossing.

3.1.4 Earthquake recurrence

Paleoseismic sites on the San Andreas Fault in the vicinity of the alignment include Wrightwood, Pitman Canyon and Plunge Creek paleoseismic sites, which are located about 2 to 20 miles from the Cajon Pass crossing area (Figure 7). Table 4 contains a summary of data (after Weldon et al., 2013) from each of these paleoseismic sites. Results of these paleoseismic studies suggest that large, surface-rupturing earthquakes on the San Andreas Fault occur at approximately 100 to 200 year intervals. The most recent event on the San Andreas Fault was the 1857 Fort Tejon earthquake.

On the San Jacinto fault, the Mystic Lake paleoseismic site lies about 10 miles southeast of the San Bernardino crossing area of the alignment (Figure 7). This site revealed evidence of 7 earthquakes since 579 A.D. with an average recurrence interval of 181 years (Onderdonk et al., 2013; Weldon et al., 2013). Accounting for uncertainty in age dating, a recurrence interval range of 150-212 years was obtained for past earthquake ruptures at the Mystic Lake site on the San Jacinto fault.

No recurrence information exists for the Cleghorn fault, however, a recurrence interval can be approximated based on a strain accumulation and existing data. Based on a slip rate of 0.3 to 0.6 mm/yr and the average displacement for a 25.9-km-long fault using Wells and Coppersmith (1994) surface rupture length-displacement relationships, the Cleghorn fault has a recurrence interval of approximately 1,400 to 1,900 years. However, based on the expression of the fault in aerial photography, the recurrence interval is likely much longer and on the order of a few to several thousand years.

3.2 Displacement Estimates

Deterministic fault displacement estimates were developed by incorporating multiple approaches and datasets to characterize potential future fault displacements on the San Andreas fault zone, San Jacinto fault zone, and Cleghorn fault. The single recommended displacement value to consider for design, listed for each crossing in Table 2, were developed by considering the following approaches:

1) Calculate average and maximum displacements for deterministic earthquake scenarios using Wells and Coppersmith (1994) empirical relations (Table 5).
2) Consider model-derived displacement values from the USGS ShakeOut Scenario for the San Andreas fault zone (Jones et al., 2008).
3) If available, use observed displacements from past earthquakes to inform measurements of offset landforms along the San Andreas and San Jacinto faults, compiled and reassessed in UCERF3 (Madden et al., 2013).
4) Assess strain accumulation based on geologic slip rates and elapsed time since the last rupture.

For the San Andreas fault, we describe displacement estimates from these four approaches. There is less information available, however, for the San Jacinto and Cleghorn faults, and only certain approaches for these faults are described. As noted above, there are also several secondary fault strands crossed by the proposed alignment (Table 2), that could produce small displacements. Given their short lengths and spatial association with the San Andreas and San Jacinto fault zones, these secondary faults are not considered independent seismogenic sources and will only accommodate secondary or sympathetic slip in larger, main fault ruptures. For the purposes of characterizing fault displacement, secondary fault strands are simply assigned a conservative, upper-bound displacement of 1 m (3 ft). Slip on secondary strands will typically be significantly less than this upper-bound estimate.

3.2.1 San Andreas Fault

Fault displacements are commonly estimated using empirical relations relating earthquake magnitude to average or maximum displacement. The Wells and Coppersmith (1994) magnitude-displacement relations for all-slip-types were used to calculate average and maximum predicted displacements for a **M**7.8 San Andreas earthquake (Table 5). This deterministic scenario is the same magnitude as the 1857 earthquake and what was used for the ShakeOut Scenario (Jones et al, 2008). An average displacement of 3.8 m (12.5 ft) and a maximum displacement of 8.6 m (28.2 ft) is calculated for a **M**7.8 San Andreas earthquake (Table 5).

The ShakeOut Scenario was a CGS and USGS study that evaluated the impacts of a moment-magnitude 7.8 (**M**7.8) San Andreas scenario earthquake on southern California. This scenario assumed the San Andreas fault ruptured between the Salton Sea and Lake Hughes. Among other effects of the earthquake (e.g., damage, economic), the study estimated displacements of various lifelines (e.g., gas pipelines, power lines) that cross the fault. Displacement values were modeled at approximately 1,000 ft intervals along a single, simplified fault trace with modeled estimates taking into account observed paleoseismic slip measurements where available.

The two nearest ShakeOut estimates of net displacement values on either side of the proposed pipeline alignment crossing of San Andreas fault suggest a range from 3.5 to 4.0 m (11.5 to 13.1 ft) (Figure 5b). The San Andreas fault zone at Cajon Pass comprises several strands, each of which may carry a subordinate amount of net slip in an earthquake. For the ShakeOut study, Trieman et al. (2008) estimated the distribution of modeled net displacement on various fault strands in Cajon Pass. Trieman et al. (2008) concluded that all slip would be concentrated on strands within the primary fault zone as shown in Figure 6.

An alternative approach is to consider that future displacement at a point on a fault will be similar to observed displacements from past earthquakes at that location (e.g., Hecker et al., 2013). The UCERF3 study included an evaluation of offset geomorphic features (e.g., ridges or stream channels) that have been documented along the San Andreas fault. The observed displacements, which are based on measurements from the field, aerial photos, and lidar data, are listed below:

- Single-event displacement measurements nearest the proposed pipeline alignment crossing of the San Andreas fault are shown on Figure 7. All of these displacements were measured by Zielke and others (2012) and reassessed and compiled in UCERF3 Appendix R (Madden et al. (2013). These single-event displacements are interpreted by Madden et al. (2013) to represent displacement from the 1857 Fort Tejon earthquake, the most recent surface rupturing earthquake on the southern San Andreas fault.
- Best-estimate mean measurements near Cajon Pass and the proposed North-South pipeline alignment (Figure 7) range from 1.0 to 4.4 m (3.2 to 14.4 ft) with uncertainty ranges from 0.4 to 5.1 m (1.3 to 16.7 ft).

- Note that displacement values in the cluster to the southeast are relatively small and likely represent a steeply decreasing slip gradient related to the southeast end of the 1857 surface rupture (Figure 7).

The accumulated strain stored on a fault since the last earthquake can provide a rough estimate of the potential displacement if the next rupture were to occur today. For faults with well-constrained slip rates and well-defined most recent event ages, potential displacement can be approximated by multiplying the slip rate with the time elapsed since the most recent event. The most recent earthquake on this portion of the San Andreas fault was the 1857 Fort Tejon earthquake, which was 157 years ago. Multiplying the UCERF3 slip rate of 20 to 30 mm/yr for the North San Bernardino section of the fault (Dawson and Weldon, 2013) by 157 years of elapsed time, yields 3.1 to 4.7 m of accumulated strain. This is relatively consistent with the average offset per event of 3.28 m measured at the Wrightwood paleoseismic site (Figure 7).

In summary, the four different approaches yield potential displacements that approach about 4 to 5 m. The only exception to this is the estimate of maximum displacement (8.6 m) from the empirical relations. We suggest that a potential displacement of 5 m (16 ft) be considered for the San Andreas fault. Pipeline engineers should anticipate dominantly right-lateral slip on the order of 5 m (16 ft) at the fault crossing. Based on the topographic expression of the fault in lidar, the primary San Andreas fault crossing could experience a minor component of south-side-up displacement. We anticipate that the majority of this displacement would be concentrated on the primary fault (ADM-SAF-LCI_Preferred-03).

3.2.2 San Jacinto fault

The proposed pipeline alignment crosses the northern San Jacinto fault zone (Claremont section), which extends from the San Andreas/San Jacinto fault juncture to the Mystic Lake step-over in San Jacinto Valley. The Mystic Lake step-over and paleoseismic site (Onderdonk et al., 2013) is located about 2 miles south of Moreno Compressor Station. Comparing the timing of earthquakes from long event histories developed at Mystic Lake and Hog Lake paleoseismic studies, Rockwell et al. (2014) have modeled the behavior of the northern and central San Jacinto fault zone, respectively. Their data suggest that the Claremont section (northern) of the fault commonly fails in earthquakes by itself, but may fail less frequently in larger events involving the Clark section to the south. The Hog Lake site and Clark section of the fault zone are located southeast of the Mystic Lake site and beyond the extent of Figure 7. We use this information on potential earthquake size to estimate displacements using empirical relations of Wells and Coppersmith (1994).

Rockwell et al. (2014) suggest that a rupture of the Claremont section of the San Jacinto fault would be a **M**7.1. For this magnitude, the Wells and Coppersmith (1994) relation provides an average displacement of 1.3 m (4.3 ft) and a maximum displacement of 2.3 m (7.5 ft) (Table 5). If the northern (Claremont) and central (Clark) sections of the fault ruptured together, their combined length (~170 km) and width (~15 km) would produce a **M**7.4 event using Wells and

Coppersmith (1994) rupture area-magnitude relation for all-slip-types. For a **M**7.4 earthquake on the San Jacinto fault, the empirical relations provide an average displacement of 2.0 m (6.6 ft) and a maximum displacement of 4.0 m (13.1 ft) (Table 5).

Unlike the San Andreas fault, there are no observations of past displacements near the proposed North-South Pipeline alignment crossing of the San Jacinto fault. The nearest offset measurements for the San Jacinto fault in the UCERF3 compilation are located on the Clark segment of the fault zone and are about 35 miles southeast of the proposed pipeline alignment crossing of the San Jacinto fault. Best-estimate mean measurements range from 1.3 to 2.8 m (4.3 to 9.2 ft) with a range of uncertainty from 1.0 to 3.3 m (3.3 to 10.8 ft) (Madden et al., 2013). These offset measurements provide insights into the past behavior of the Clark segment of the fault zone, but are not directly used to estimate displacement for the proposed pipeline alignment, given that these observations are located about 35 miles southeast of the proposed fault crossing.

The accumulated strain on the northern San Jacinto fault can be estimated using the time elapsed since the last event and slip rate. At Mystic Lake, Onderdonk et al. (2013) established the timing of the most recent event to have occurred between 1738 and 1850 A.D., yielding 164 to 276 years since the last event. Using a slip rate of 12.5 mm/yr (Blisniuk et al., 2013) produces accumulated strain of about 2.1 to 3.5 m (6.9 to 11.5 ft).

In summary, simple strain accumulation calculations suggest that the potential displacement stored on the fault may be about 2.1 to 3.5 m. Average displacements associated with M7.1 and M7.4 earthquakes are 1.3 and 2.0 m. Maximum displacements for these two scenarios are 2.3 and 4.0 m. The west-facing scarp described by Leighton and Associates (1980) indicates a minor component of east-side-up vertical displacement could occur at the primary San Jacinto fault crossing. We recommend that a dominant right-lateral slip in the order of 4 m (13 ft) be considered for engineering assessment and project design of the proposed pipeline alignment. This displacement recommendation is more conservative than other crossings, given the urban setting of this crossing location, as it incorporates a maximum displacement from a **M**7.4 event. Based on the expression of faults in lidar and aerial photographs at the San Jacinto fault zone crossing area, we anticipate that the majority of any displacement would be concentrated on the primary fault (ADM-SJF-LCI_Preferred_01), with no more than 1 m (3 ft) of slip on individual secondary strands.

3.2.3 Cleghorn fault

Historic displacement data are not available for the Cleghorn fault, therefore, we rely on the magnitude-average displacement relationship of Wells and Coppersmith (1994) for all slip types to estimate potential future displacements. Using a rupture area of 401 km^2 from the UCERF3 model, a moment magnitude (**M)** 6.6 earthquake is obtained from the Wells and Coppersmith (1994) rupture area-magnitude relation. A **M**6.6 event yields an average displacement of 0.6 m (2.0 ft). A maximum displacement of 0.9 m (3.0 ft) is obtained using the maximum displacement relation of Wells and Coppersmith (1994). Dawson and Weldon (2013) postulated future displacement on the Cleghorn fault may be dominantly left-lateral. This fault is not expressed at the ground surface near the crossing; therefore, we rely on mapping by USGS and CGS (2006) for the crossing location tabulated in Table 2.

3.3 Liquefaction Hazards

This study utilized liquefaction susceptibility mapping published by San Bernardino and Riverside Counties to evaluate the liquefaction hazard along the proposed ADM pipeline alignment. Liquefaction hazard zones are typically located in areas underlain by poorly compacted late Quaternary alluvial deposits with groundwater located close to the ground surface (50 ft or less). The alignment is exposed to potential liquefaction hazards in the Santa Ana River basin near San Bernardino and Loma Linda and in the Moreno Valley. Figure 15 shows the identified liquefaction hazard zones along the proposed alignment.

The San Bernardino segment (I-15/215 Interchange to Loma Linda) of the proposed alignment traverses multiple zones of localized liquefaction hazard (Figure 15). The liquefaction hazard ranges from low to moderate to high (Matti and Carson, 1991). As shown on Figure 15, zones of high to moderate liquefaction hazard are limited to the mouths of canyons and along the Santa Ana River corridor. In San Bernardino County, the majority, or 39.5 miles of the proposed pipeline alignment, is located in unclassified areas or areas of no liquefaction hazard due primarily to the lack of information on shallow groundwater. The sediments in these areas are susceptible to liquefaction if groundwater levels rise to within 50 ft of the ground surface and these areas could locally liquefy during a large earthquake. Six (6.0) miles are located in moderate to moderately high liquifaction hazard areas, 4.3 miles of the proposed alignment are located in areas of high liquefaction hazard, and 1.5 miles are located in low liquefaction hazard areas.

Riverside County provides even more robust and extensive liquefaction hazard zonation maps. The Riverside segment (Loma Linda to Moreno Valley) of the proposed alignment traverses multiple zones of localized liquefaction hazard. The liquefaction hazard ranges from very low to moderate (County of Riverside, 2014). As shown on Figure 15, the Riverside segment of the proposed pipeline alignment is underlain primarily by zones of moderate to low liquefaction hazard. In Riverside County, the majority of liquefaction hazards, or 8.9 miles of the proposed alignment is located in zones of moderate liquefaction hazard, 2.0 miles are located in low liquefaction hazard areas. 0.1 miles is located in areas of very low liquefaction hazard. 2.7 miles of the planned alignment is located in unclassified areas or areas of no liquefaction hazard areas, which includes areas where the proposed alignment is located in granitic bedrock materials.

As shown on Figure 15, the Riverside segment of the proposed alignment is underlain primarily by zones of moderate to low liquefaction hazard. However, in San Bernardino County, 4.3 miles of the proposed alignment are located in areas of high liquefaction hazard, 6.0 miles are located in moderate to moderately high liquefaction hazard areas, and 1.5 miles are located in low liquefaction hazard areas. In this report, the regional geotechnical investigation in the San Bernardino Valley (Carson et al., 1986) is used to evaluate the liquefaction-induced settlement for the proposed alignment in the absence of site-specific geotechnical studies along the proposed alignment. Using the regional information, a regional site class is assigned to the proposed alignment to estimate the ground motions using 2008 USGS hazard maps. The highest PGA from USGS hazard maps in San Bernardino valley region is used for the calculation of the liquefaction-induced settlement for the propped alignment. This approach is conservative since the ground motions might be lower than the regional maximum at different segments of the proposed alignment. Moreover, the use of site-specific geotechnical investigations along the proposed alignment would result in a more robust estimation of settlements compared to use of regional studies.

The liquefaction-induced settlement analysis indicates settlements ranging from 0 inches to 4.3 inches for different boreholes shown in Figure 1 of Attachment 1. Regardless of the relative position of the boreholes, a maximum differential settlement of 4.3 inches is considered for the region. Assuming that this settlement occurs across a distance of 100 feet, a maximum angular distortion of about of 0.004 inches per inch may result (Attachment 1).

3.4 Landslide Hazards

The proposed pipeline alignment traverses two areas with potential for landslide hazards the Cajon Pass in the San Gabriel Mountains and the Loma Linda Hills near Loma Linda, CA. (Figure 1). Through the Cajon Pass the alignment is predominantly located within to existing utility corridors, existing roads and valley bottoms which in general have low landslide hazard potential. In the vicinity of CA Highway 138, the alignment crosses a mountainous region with potential landslide hazards due to the area’s high relief and localized dip-slope conditions on east and north-east facing slopes. In this area LCI mapped 25 potential landslides in the vicinity of the alignment. These are shown on the geologic base map of Dibblee in Figure 3. Many of these mapped landslides are adjacent to the proposed pipeline alignment, but the alignment does not cross any potential landslides mapped for this study. As shown in Figure 3, the landslides located near the proposed alignment and CA Highway 138, are concentrated in east to northeast dipping Tertiary coarse-grained sedimentary formations that are predominantly sandstone and conglomerate. In addition to the landslides mapped by LCI, we also evaluated potential landslides published by the CGS (Bedrossian et al, 2012). Bedrossian et al. (2012) mapped 27 landslides within ½ mile of the proposed alignment, no landslides were intersected by the proposed alignment (Figure 12).

3.5 Field Reconnaissance

LCI geologists Richard M. Ortiz and Christopher Kemp completed field visits to multiple key areas along the alignment and visited readily accessible fault crossings and areas with potential landslide hazards along the proposed alignment. In the Cajon Pass area, a broad zone of faulted materials that corresponded to the multiple strands of the San Andreas Fault in Cajon Pass was observed, however, discrete fault strands were not identified in the immediate crossing area. Faulted alluvial materials along the mapped fault trace that correspond to the zone of faulting between alignment fault crossings “ADM-SAF-LCI_Preferred-02” and “ADM-SAF-LCI_Preferred-03” (Figures 5 and 16) were observed. The area surrounding the San Jacinto fault crossings near Loma Linda, CA has been completely developed. The building set back recommended by Leighton (1980) and associated with the primary trace of the San Jacinto fault zone and the crossing “ADM-SJF-LCI_Preferred_01” has been established as a green belt within the housing development north of E. Washington Street.

For this study, off highway access to the areas along the proposed alignment north of highway CA-138 in Cajon Pass was not available. Features suggestive of landslides were observed in the areas adjacent to CA-138, such as probable head scarps and accumulated landslide deposits at the base of slopes, but no landslide features were observed directly within the visible alignment corridor accessible to LCI. No landslide features within the granite cored ridges and hillslopes along the proposed alignment within Reche Canyon south of Loma Linda, CA were observed.

3.6 Geologic Materials

The proposed pipeline excavation will encounter a variety of geologic materials along the alignment. These materials may range from bare bedrock and soil-mantled bedrock in areas of greater relief, to unconsolidated to partially lithified alluvial deposits in canyon and valley floors. Figures 17 through 20 depict simplified geology after Bedrossian et al. (2012) along the proposed alignment; Figure 21 is a legend of units depicted on the maps. Table 6 summarizes the geologic materials expected to be encountered along the proposed alignment. Unconsolidated Quaternary materials make up about 82% of materials along the alignment, while more lithified Quaternary deposits make up about 10%. Solid bedrock units encountered include about 3% sandstones/conglomerates, 1% metamorphic rock, and 5% granitic rock. Most of the granitic materials encountered are located in Reche Canyon, which is characterized by shallow bedrock and boulders weathered out of bedrock.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The final fault crossing locations identified on Table 2 represent our best estimates of the location of the main trace and major secondary faults associated with the San Andreas and San Jacinto fault zones. Previously published map traces were evaluated and compared against the modern lidar topographic data and historic aerial photographs. The preferred fault traces identified in Table 2 include those fault strands that were assessed to be the most accurately located (where multiple mapped interpretations existed) and also instances where mapping for this project had been improved using the lidar. Therefore, this study refined the fault crossing locations utilizing highly detailed topographic data (lidar) that was not available to many of the original sources.

Based on the short recurrence intervals and amount of elapsed time since the most recent events, there is a high likelihood that the pipeline alignment fault crossings identified at the San Andreas Fault (ADM-SAF-LCI_Preferred-02 and -03) and at the San Jacinto fault zone (ADM-SJF-LCI_Preferred-01) may experience large-magnitude, ground-rupturing earthquakes during the design lifetime of the proposed pipeline.

We recommend that dominantly right-lateral displacement for the San Andreas Fault crossing on the order of 5 m (16 ft) and dominantly right-lateral displacement for the San Jacinto fault crossing on the order of 4 m (13 ft) be considered in pipeline engineering and design. It appears the San Andreas fault zone will accommodate this displacement across a roughly 450-ft-wide zone with displacement concentrated on the primary fault (ADM-SAF-LCI_Preferred03) and a secondary fault (ADM-SAF-LCI_Preferred-02) bounding this zone. It appears that the San Jacinto fault zone will accommodate displacement along a much narrower zone, perhaps a single strand (ADM-SJF-LCI_Preferred-01), on the basis of faulting exposed in trenches excavated by Leighton and Associates (1980). We recommend that dominantly left-lateral displacement at the Cleghorn fault crossing on the order of 1 m (3.3 ft) be considered in pipeline engineering and design.

It is anticipated that an unknown amount of surface displacement may occur on secondary faults within the San Andreas and San Jacinto fault zones. Future right-lateral displacements along these secondary strands would be significantly less than displacement on primary faults. We recommend that a conservative estimate of displacements of up to 1 m (3 ft) be considered in pipeline engineering and design. In most cases, secondary fault displacements will likely be much less than this 1 m (3 ft) upper-bound estimate.

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Table 1. Compilation of fault crossings along the proposed North-South Pipeline alignment.

CROSSING ID	STATE PLANE X (FT)	STATE PLANE Y (FT)	LONGITUDE	LATITUDE	FAULT NAME	SENSE OF SLIP	AGE	SOURCE	COMMENTS
SAN ANDREAS FAULT CROSSINGS									
ADM-SAF-AP-01	6728281.18	1923484.08	-117.4485	34.2766	San Andreas Fault	right-lateral strike-slip	Historic	CDMG, 1974 (Cajon Quad)	
ADM-SAF-AP-02	6727599.74	1922335.67	-117.4508	34.2734	San Andreas Fault	right-lateral strike-slip	Historic	CDMG, 1974 (Cajon Quad)	
ADM-SAF-AP-03	6725999.48	1920193.65	-117.4561	34.2676	San Andreas Fault	right-lateral strike-slip	Historic	CDMG, 1974 (Cajon Quad)	
ADM-SAF-AP-04	6724311.74	1919652.66	-117.4617	34.2661	San Andreas Fault	right-lateral strike-slip	Historic	CDMG, 1974 (Cajon Quad)	
ADM-SAF-AP-05	6723312.43	1919167.72	-117.4650	34.2648	Punchbowl (SAF)	right-lateral strike-slip	Historic	CDMG, 1974 (Cajon Quad)	
ADM-SAF-Bedrossian-01	6728393.67	1923768.11	-117.4481	34.2773	San Andreas Fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SAF-Bedrossian-02	6728246.09	1923395.96	-117.4486	34.2763	San Andreas Fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SAF-Bedrossian-04	6727084.30	1921052.01	-117.4525	34.2699	San Andreas Fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	projected 65 feet from west
ADM-SAF-Bedrossian-05	6726003.09	1920195.69	-117.4561	34.2676	San Andreas Fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SAF-Bedrossian-06	6725894.92	1920135.88	-117.4564	34.2674	San Andreas Fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SAF-Bedrossian-07	6724237.18	1919644.74	-117.4619	34.2661	San Andreas Fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SAF-Bedrossian-08	6724078.56	1919629.16	-117.4625	34.2660	San Andreas Fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SAF-Bedrossian-09	6723330.31	1919189.79	-117.4649	34.2648	Punchbowl (SAF)	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SAF-Bedrossian-10	6733834.53	1909210.77	-117.4304	34.2373	San Andreas Fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SAF-CGS-01	6725950.73	1920166.30	-117.4563	34.2675	San Andreas Fault	right-lateral strike-slip	Historic	Jennings and Bryant, 2010	
ADM-SAF-Dibblee-01	6727115.06	1921095.19	-117.4524	34.2700	San Andreas Fault	right-lateral strike-slip	Historic	Dibblee, 2003 (Cajon quad)	
ADM-SAF-Dibblee-02	6726170.39	1920292.04	-117.4555	34.2678	San Andreas Fault	right-lateral strike-slip	Historic	Dibblee, 2003 (Cajon quad)	
ADM-SAF-Dibblee-03	6723658.44	1919510.01	-117.4638	34.2657	Punchbowl (SAF)	right-lateral strike-slip	Historic	Dibblee, 2003 (Cajon Quad)	
ADM-SAF-Dibblee-04	6723370.94	1919240.46	-117.4648	34.2650	Punchbowl (SAF)	right-lateral strike-slip	Historic	Dibblee, 2003 (Cajon Quad)	
ADM-SAF-LCI_Preferred-01	6726981.86	1920933.61	-117.4528	34.2696	San Andreas Fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SAF-LCI_Preferred-02	6726491.18	1920512.06	-117.4544	34.2684	San Andreas Fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SAF-LCI_Preferred-03	6726098.68	1920249.35	-117.4558	34.2677	San Andreas Fault	right-lateral strike-slip	Historic	LCI, this study	

CROSSING ID	STATE PLANE X (FT)	STATE PLANE Y (FT)	LONGITUDE	LATITUDE	FAULT NAME	SENSE OF SLIP	AGE	SOURCE	COMMENTS
ADM-SAF-LCI-01	6728276.99	1923473.37	-117.4485	34.2765	San Andreas Fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SAF-LCI-02	6754274.63	1892797.74	-117.3631	34.1918	San Andreas Fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SAF-LCI-03	6754830.19	1892525.27	-117.3612	34.1911	San Andreas Fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SAF-USGS-01	6733809.15	1909227.30	-117.4304	34.2373	San Andreas Fault	right-lateral strike-slip	Historic	USGS and CGS, 2006	
SAN JACINTO FAULT CROSSINGS									
ADM-SJF-AP-01	6780827.10	1842912.66	-117.2765	34.0542	San Jacinto fault	right-lateral strike-slip	Historic	CDMG, 1977 (San Bernardino So. Quad)	
ADM-SJF-AP-02	6779533.95	1841872.97	-117.2808	34.0514	San Jacinto fault	right-lateral strike-slip	Historic	CDMG, 1977 (San Bernardino So. Quad)	
ADM-SJF-AP-03	6778944.81	1841680.21	-117.2827	34.0509	San Jacinto fault	right-lateral strike-slip	Historic	CDMG, 1977 (San Bernardino So. Quad)	
ADM-SJF-AP-04	6778428.24	1841595.70	-117.2844	34.0507	San Jacinto fault	right-lateral strike-slip	Historic	CDMG, 1977 (San Bernardino So. Quad)	
ADM-SJF-Bedrossian-01	6784107.57	1846140.49	-117.2656	34.0631	San Jacinto fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SJF-Bedrossian-02	6779342.37	1841805.66	-117.2814	34.0512	San Jacinto fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SJF-Bedrossian-03	6779137.39	1841730.22	-117.2821	34.0510	San Jacinto fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SJF-Bedrossian-04	6778565.85	1837003.70	-117.2841	34.0381	San Jacinto fault	right-lateral strike-slip	Historic	Bedrossian, et al., 2012	
ADM-SJF-CGS-01	6784951.40	1846145.29	-117.2628	34.0630	San Jacinto fault	right-lateral strike-slip	Historic	Jennings and Bryant, 2010	
ADM-SJF-CGS-02	6778483.35	1837498.40	-117.2843	34.0394	San Jacinto fault	right-lateral strike-slip	Historic	Jennings and Bryant, 2010	
ADM-SJF-Dibblee-01	6778827.52	1841654.00	-117.2831	34.0508	San Jacinto fault	right-lateral strike-slip	Historic	Dibblee, 2004 (San Bernardino So. quad)	
ADM-SJF-LCI_Preferred-01	6779117.22	1841723.05	-117.2821	34.0510	San Jacinto fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SJF-LCI_Preferred-02	6778480.88	1837530.88	-117.2843	34.0395	San Jacinto fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SJF-LCI-01	6783455.43	1846136.79	-117.2677	34.0631	San Jacinto fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SJF-LCI-02	6779010.83	1841694.97	-117.2825	34.0509	San Jacinto fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SJF-LCI-03	6778455.00	1837855.19	-117.2844	34.0404	San Jacinto fault	right-lateral strike-slip	Historic	LCI, this study	
ADM-SJF-USGS-01	6784174.42	1846140.87	-117.2653	34.0631	San Jacinto fault	right-lateral strike-slip	Historic	USGS and CGS, 2006	
ADM-SJF-USGS-02	6778527.49	1837190.00	-117.2842	34.0386	San Jacinto fault	right-lateral strike-slip	Historic	USGS and CGS, 2006	

CROSSING ID	STATE PLANE X (FT)	STATE PLANE Y (FT)	LONGITUDE	LATITUDE	FAULT NAME	SENSE OF SLIP	AGE	SOURCE	COMMENTS
OTHER FAULT CROSSINGS									
ADM-Banning-Dibblee-01	6785819.01	1858719.21	-117.2596	34.0976	Banning fault	right-lateral strike-slip/oblique right-reverse	Holocene	Dibblee, 2004 (San Bernardino South Quad)	inferred buried trace based gravity data of Williangham, 1981
ADM-BrA-Bedrossian-01	6719088.25	1945447.97	-117.4785	34.3370	unnamed bedrock fault A	thrust	unknown	Bedrossian, et al., 2012	
ADM-BrA-Bedrossian-02	6721023.86	1939233.79	-117.4722	34.3199	unnamed bedrock fault A	thrust	unknown	Bedrossian, et al., 2012	
ADM-BrB-Bedrossian-01	6728651.90	1926172.16	-117.4472	34.2839	unnamed bedrock fault B	unknown	unknown	Bedrossian, et al., 2012	
ADM-BrC-Bedrossian-01	6794520.10	1823581.26	-117.2317	34.0009	unnamed bedrock fault C	unknown	unknown	Bedrossian, et al., 2012	field observations suggest this is not a fault
ADM-BrD-Bedrossian-01	6805882.93	1812166.66	-117.1946	33.9692	unnamed bedrock fault D	unknown	unknown	Bedrossian and Roffers, 2012	inferred bedrock fault
ADM-BrD-Bedrossian-02	6807787.89	1810592.78	-117.1883	33.9649	unnamed bedrock fault D	unknown	unknown	Bedrossian and Roffers, 2012	inferred bedrock fault
ADM-BrD-Bedrossian-03	6810762.20	1807845.49	-117.1786	33.9573	unnamed bedrock fault D	unknown	unknown	Bedrossian and Roffers, 2012	inferred bedrock fault
ADM-Cleghorn-Bedrossian-01	6727041.10	1930387.87	-117.4525	34.2955	Cleghorn fault	left-lateral strike-slip	Holocene(?)	Bedrossian, et al., 2012	
ADM-Cleghorn-CGS-01	6725901.51	1931883.58	-117.4562	34.2997	Cleghorn fault	left-lateral strike-slip	Holocene(?)	Jennings and Bryant, 2010	
ADM-Cleghorn-LCI-01	6725913.39	1931869.30	-117.4562	34.2996	Cleghorn fault	left-lateral strike-slip	Holocene(?)	LCI, this study	
ADM-Cleghorn-USGS-01	6725795.06	1932013.82	-117.4566	34.3000	Cleghorn fault	left-lateral strike-slip	Holocene(?)	USGS and CGS, 2006	
ADM-FFZ-Dibblee-01	6726341.64	1931345.73	-117.4548	34.2982	Frontal Fault Zone	thrust	Holocene to Quaternary	Dibblee, 2003 (Cajon Quad)	
ADM-FFZ-Dibblee-02	6728564.61	1925108.51	-117.4475	34.2810	Frontal Fault Zone	thrust	Holocene to Quaternary	Dibblee, 2003 (Cajon Quad)	
ADM-FFZ-Dibblee-03	6728244.90	1923392.98	-117.4486	34.2763	Frontal Fault Zone	thrust	Holocene to Quaternary	Dibblee, 2003 (Cajon Quad)	
ADM-FFZ-Dibblee-04	6727768.39	1923087.75	-117.4502	34.2755	Frontal Fault Zone	thrust	Holocene to Quaternary	Dibblee, 2003 (Cajon Quad)	

Table 2. Hazardous fault crossings along the proposed North-South Pipeline alignment.

CROSSING ID	STATE PLANE X (FT)	STATE PLANE Y (FT)	LONGITUDE	LATITUDE	FAULT NAME	SENSE OF SLIP	AGE	PRIMARY (SLIP RATE) OR SECONDARY STRAND?	EST. DISPLACEMENT	ANGLE OF INCIDENCE	TYPE OF ANTICIPATED PIPE DEFORMATION	SHOWN IN FIGURE	SOURCE FOR LOCATION
ADM-Cleghorn-USGS-01	6725795.06	1932013.82	-117.4566	34.3000	Cleghorn	LL	Holocene(?)	Primary (0.3-0.6 mm/yr)	1m	20	tension	3	USGS and CGS, 2006
ADM-SAF-AP-01	6728281.18	1923484.08	-117.4485	34.2766	SAF	RL	Historic	Secondary	<1m	85	tension	3	CDMG, 1974
ADM-SAF-AP-02	6727599.74	1922335.67	-117.4508	34.2734	SAF	RL	Historic	Secondary	<1m	75	tension	3	CDMG, 1974
ADM-SAF-LCI_Preferred-01	6726981.86	1920933.61	-117.4528	34.2696	SAF	RL	Historic	Secondary	<1m	90	tension	5B	LCI, this study
ADM-SAF-LCI_Preferred-02	6726491.18	1920512.06	-117.4544	34.2684	SAF	RL	Historic	Secondary	<1m	72	tension	5B	LCI, this study
ADM-SAF-LCI_Preferred-03	6726098.68	1920249.35	-117.4558	34.2677	SAF	RL	Historic	Primary (20-30 mm/yr)	5 m	65	tension	5B	LCI, this study
ADM-SAF-AP-04	6724311.74	1919652.66	-117.4617	34.2661	SAF	RL	Historic	Secondary	<1m	45	tension	5B	CDMG, 1974
ADM-SAF-AP-05	6723312.43	1919167.72	-117.4650	34.2648	SAF - Punchbowl	RL	Historic	Secondary	<1m	90	tension	5B	CDMG, 1974
ADM-SAF-Bedrossian-10	6733834.53	1909210.77	-117.4304	34.2373	SAF – Peters	RL	Historic	Secondary	<1m	33	compression	2	Bedrossian, et al., 2012
ADM-SJF-Bedrossian-01	6784107.57	1846140.49	-117.2656	34.0631	SJF – Loma Linda	RL	Historic	Secondary	<1m	60	tension	4	Bedrossian, et al., 2012
ADM-SJF-AP-01	6780827.10	1842912.66	-117.2765	34.0542	SJF	RL	Historic	Secondary	<1m	35	tension	8B	CDMG, 1977
ADM-SJF-AP-02	6779533.95	1841872.97	-117.2808	34.0514	SJF	RL	Historic	Secondary	<1m	75	tension	8B	CDMG, 1977
ADM-SJF-LCI_Preferred-01	6779060.17	1841788.88	-117.2823	34.0512	SJF	RL	Historic	Primary (2-10 mm/yr)	4m	65	tension	8B	LCI, this study
ADM-SJF-AP-04	6778428.24	1841595.70	-117.2844	34.0507	SJF	RL	Historic	Secondary	<1m	50	tension	8B	CDMG, 1977
ADM-SJF-LCI_Preferred-02	6778480.88	1837530.88	-117.2843	34.0395	SJF - Colton	RL	Historic	Secondary	<1m	53	compression	4	LCI, this study

Table 3. Summary of aerial photographs reviewed for this study.

FLIGHT	DATE	SCALE	FRAME NUMBERS	FORMAT
C-910	3/25/1930	1:24,000	78; 92; 88; 101	black & white 7"x9" scanned print
C-1940D	2/22/1932	1:14,400	14; 15	black & white 7"x9" scanned print
AXL-1938	1938	1:20,000	63-81; 79-25; 79-27; 61-23 61-25; 65-85; 67-47	black & white 7"x9" scanned print
AXM-1938A	1938	1:20,000	36-40; 53-98; 36-73; 36-75	black & white 7"x9" scanned print
C-8305	3/12/1943	1:14,400	1; 26; 30	black & white 9"x9" scanned print

Table 4. Summary of San Andreas and San Jacinto fault earthquake recurrence information from nearby trench sites.

SITE NAME	NO. OF EVENTS	OLDEST EVENT	MOST RECENT EVENT	RECURRENCE RANGE (YEARS)	AVERAGE RECURRENCE (YEARS)
SAN ANDREAS FAULT					
Wrightwood (young sedimentary section)	15	533 A.D.	1857 A.D.	90 to 100	95
Wrightwood (old sedimentary section)	14	1503 B.C.	2915 B.C.	96 to 124	110
Pitman Canyon	7	931 A.D.	1812 A.D.	132 to 162	147
Plunge Creek	3	1499 A.D.	1812 A.D.	100 to 214	157
SAN JACINTO FAULT					
Mystic Lake	7	712 A.D.	1799 A.D.	150 to 212	181

After Weldon et al., 2013

Table 5. Fault displacements for deterministic earthquake scenarios.

FAULT	MOMENT MAGNITUDE	AVERAGE DISPLACEMENT[a]		MAXIMUM DISPLACEMENT[a]	
		meters	feet	meters	feet
San Andreas	7.8	3.8	12.5	8.6	28.2
San Jacinto	7.1	1.3	4.3	2.3	7.5
San Jacinto	7.4	2.0	6.6	4.0	13.1
Cleghorn	6.6	0.6	2.0	0.9	3.0

Notes:

a. Calculated using the empirical Wells and Coppersmith (1994) magnitude-average displacement and magnitude-maximum displacement relations for all-slip-types. Displacements rounded to the nearest tenth in meters and feet.

Table 6. Geologic materials encountered along the proposed North-South Pipeline alignment.

MAP SYMBOL	UNIT NAME	AGE	PERCENT OF ALIGNMENT LENGTH	COMMENTS
af	**Artificial Fill**	Late Holocene	**0.3%**	
Qa	**Alluvial Valley Deposits**	Late Holocene	**14.0%**	includes 3.85 miles at N end of alignment not mapped, but considered Qa
Qf	**Alluvial Fan Deposits**	Late Holocene	**13.5%**	
Qw	**Alluvial Wash Deposits**	Late Holocene	**14.7%**	
Qy	**Young Alluvium - undifferentiated**	Holocene to Late Pleistocene	**39.8%**	
Qo	**Old Alluvium - undifferentiated**	Late to Middle Pleistocene	**6.7%**	
Qoa	**Old Alluvial Valley Deposits**	Late to Middle Pleistocene	**0.2%**	
Qof	**Old Alluvial Fan Deposits**	Late to Middle Pleistocene	**2.3%**	
Qvo	**Very Old Alluvium - undifferentiated**	Middle to Early Pleistocene	**0.3%**	
Tss	**Coarse-grained sedimentary formations**	Tertiary	**2.5%**	primarily sandstone and conglomerate
pKm	**Metamorphic formations**	Cretaceous and older	**0.7%**	sedimentary and volcanic origin
gr	**Granitic and other intrusive crystalline rocks**	Cretaceous and older	**4.8%**	

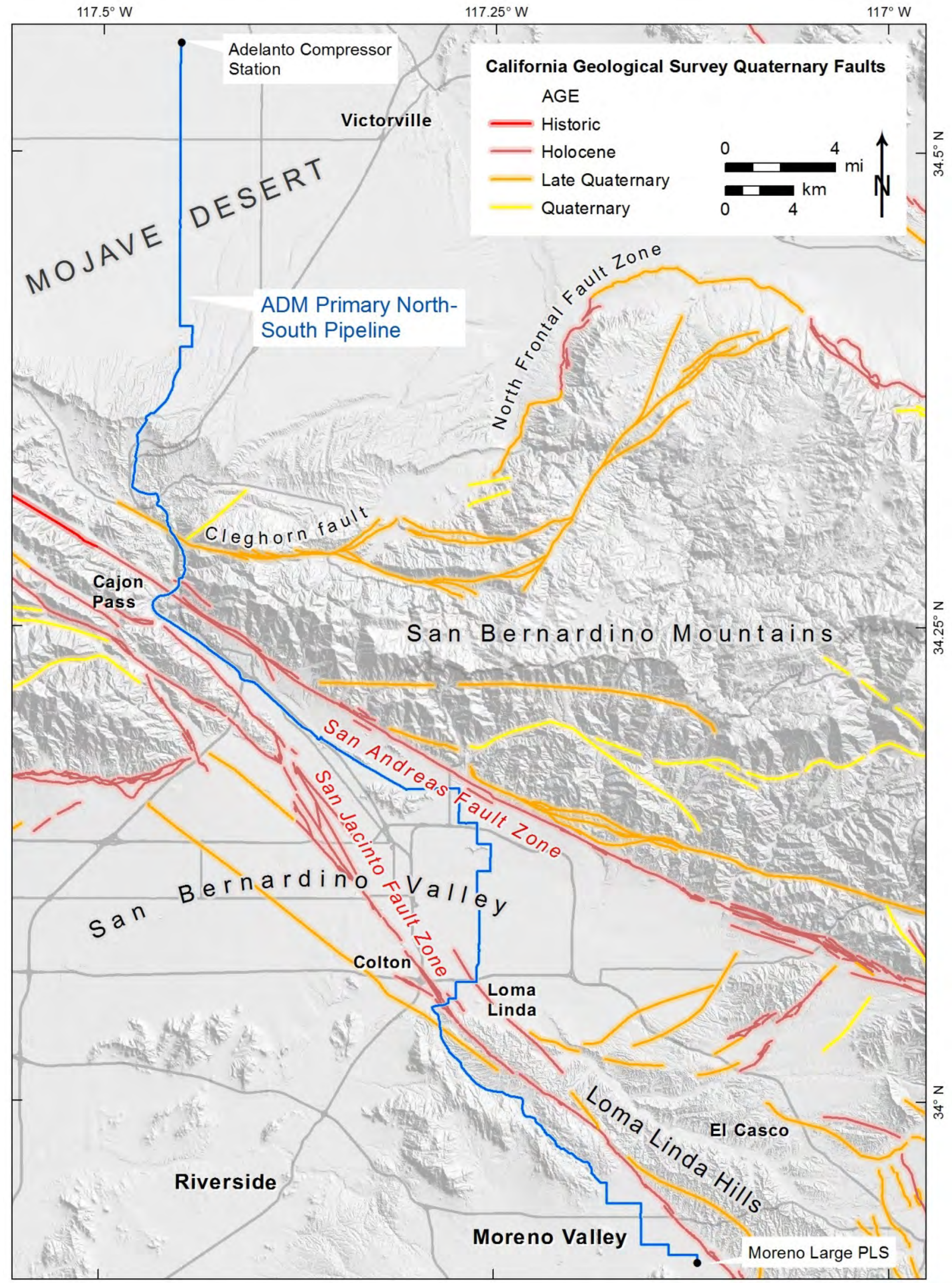

Figure 1. Proposed North-South Pipeline alignment and Quaternary faults published by California Geological Survey (Jennings and Bryant, 2010).

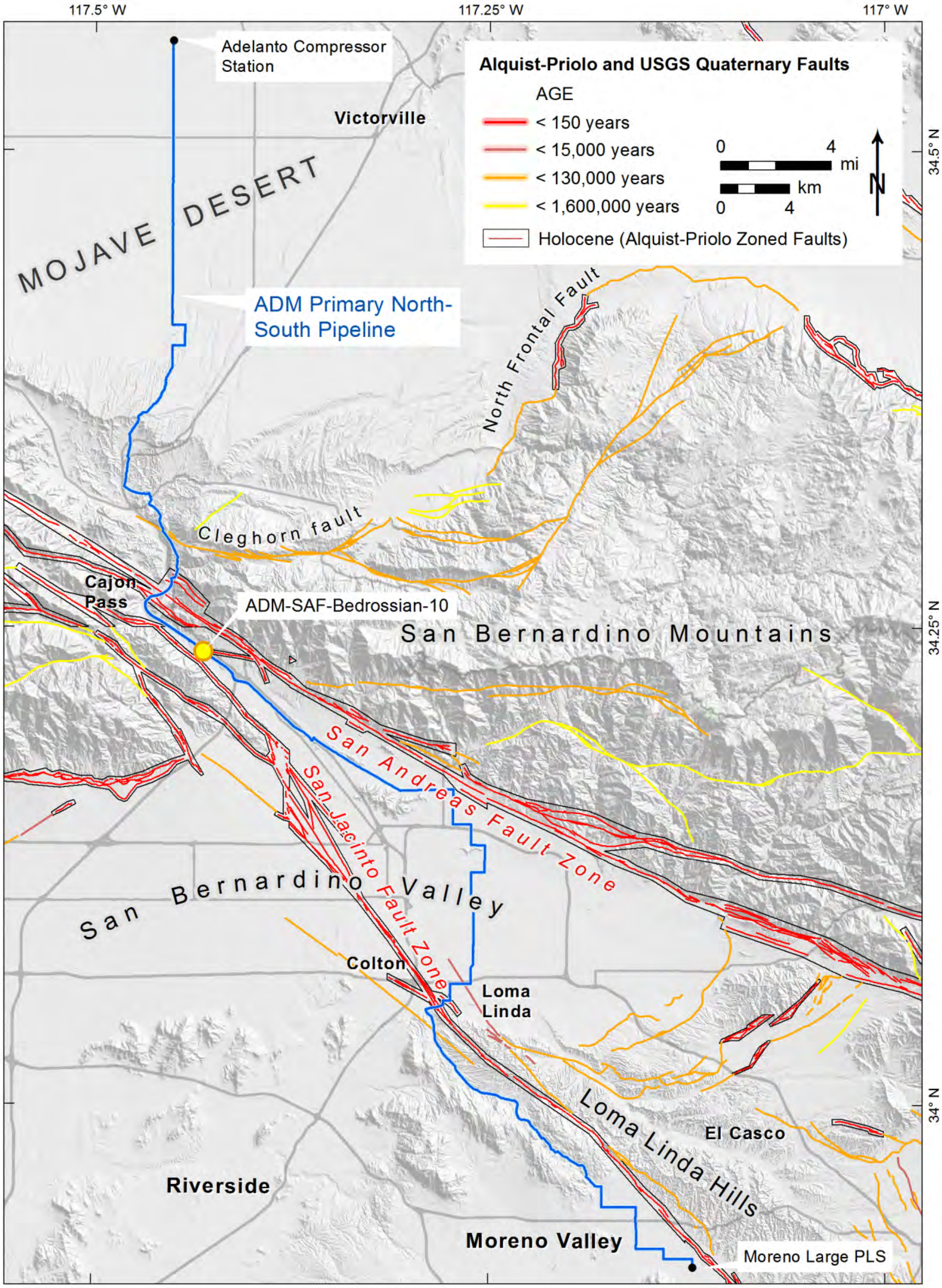

Figure 2. Location Map of proposed North-South Pipeline alignment with AP Earthquake Fault Zones and Quaternary faults published by United States Geological Survey (USGS and CGS, 2006).

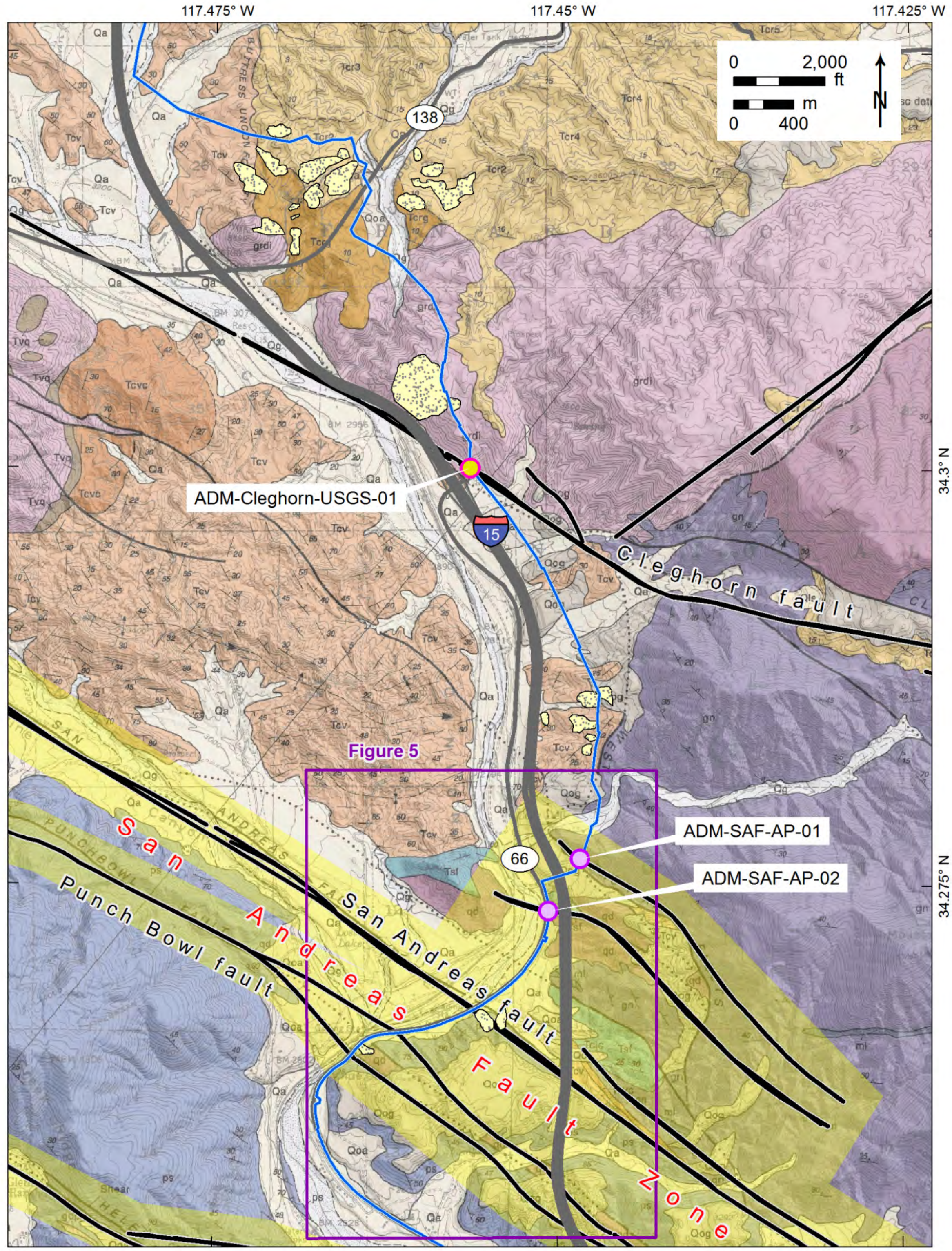

Figure 3. Proposed North-South Pipeline alignment fault crossings of the San Andreas fault zone at Cajon Pass. Base geologic map from Dibblee and Minch (2003). Yellow shading depict AP Earthquake Fault Zones; yellow stippled polygons are landslides mapped by LCI for this study; faults from CGS (1974a) and USGS and CGS (2006).

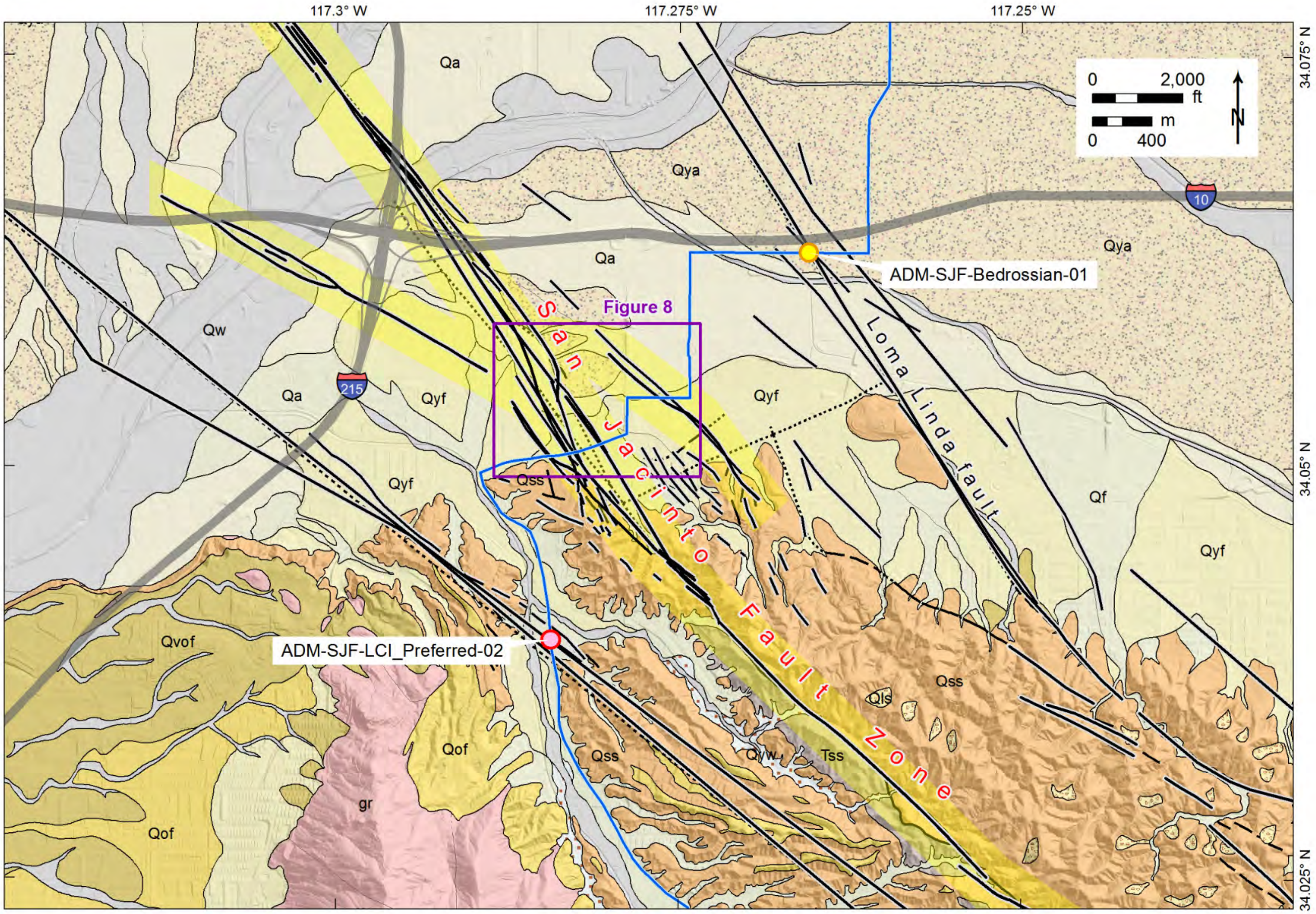

Figure 4. Proposed North-South Pipeline alignment crossings of the San Jacinto fault zone in the southern San Bernardino Valley. Base geologic map from Bedrossian et al. (2012). Yellow shading depicts AP Earthquake Fault Zones, faults from AP and USGS and CGS (2006).

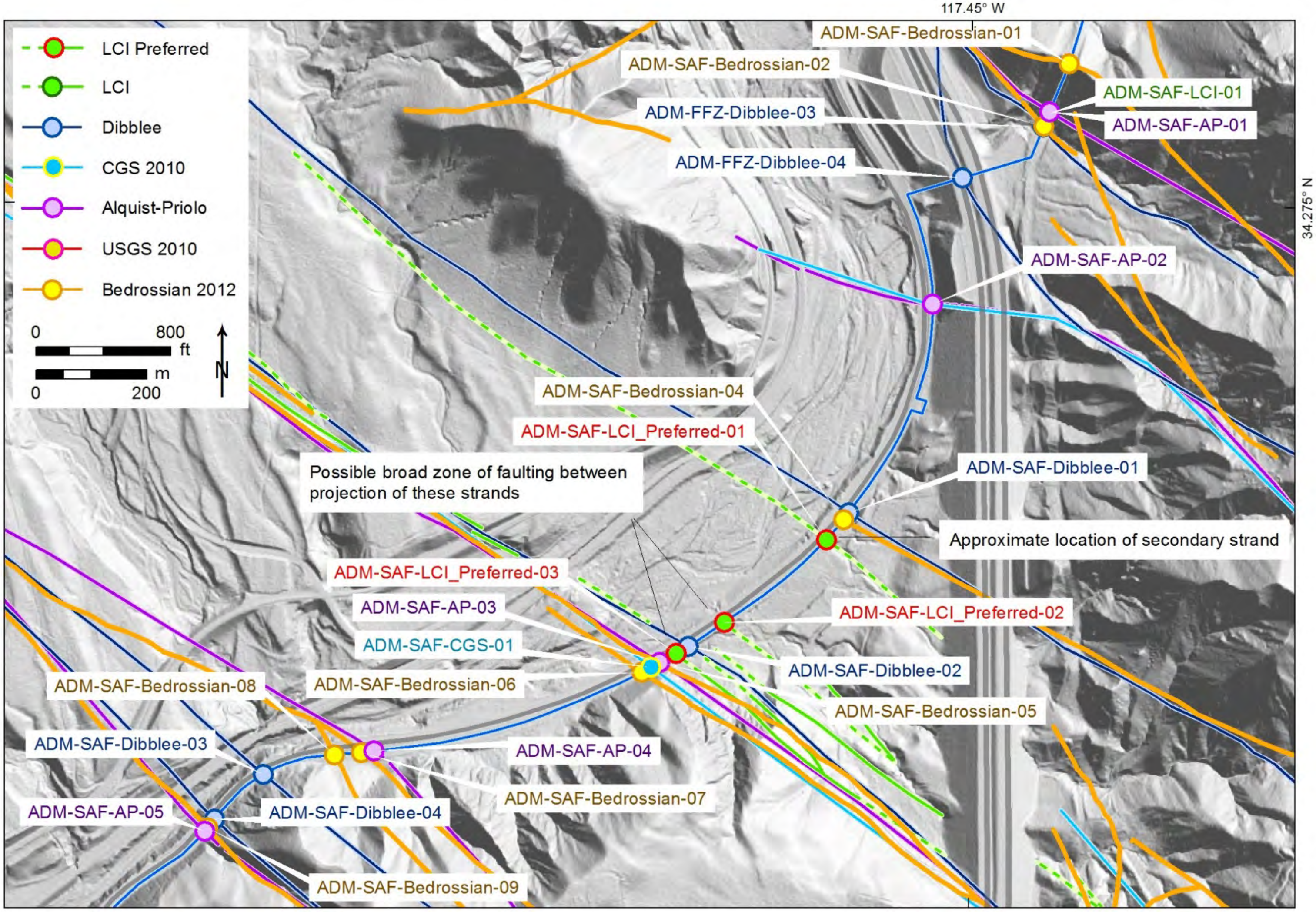

Figure 5a. All fault crossings of the proposed North-South Pipeline alignment through Cajon Pass.

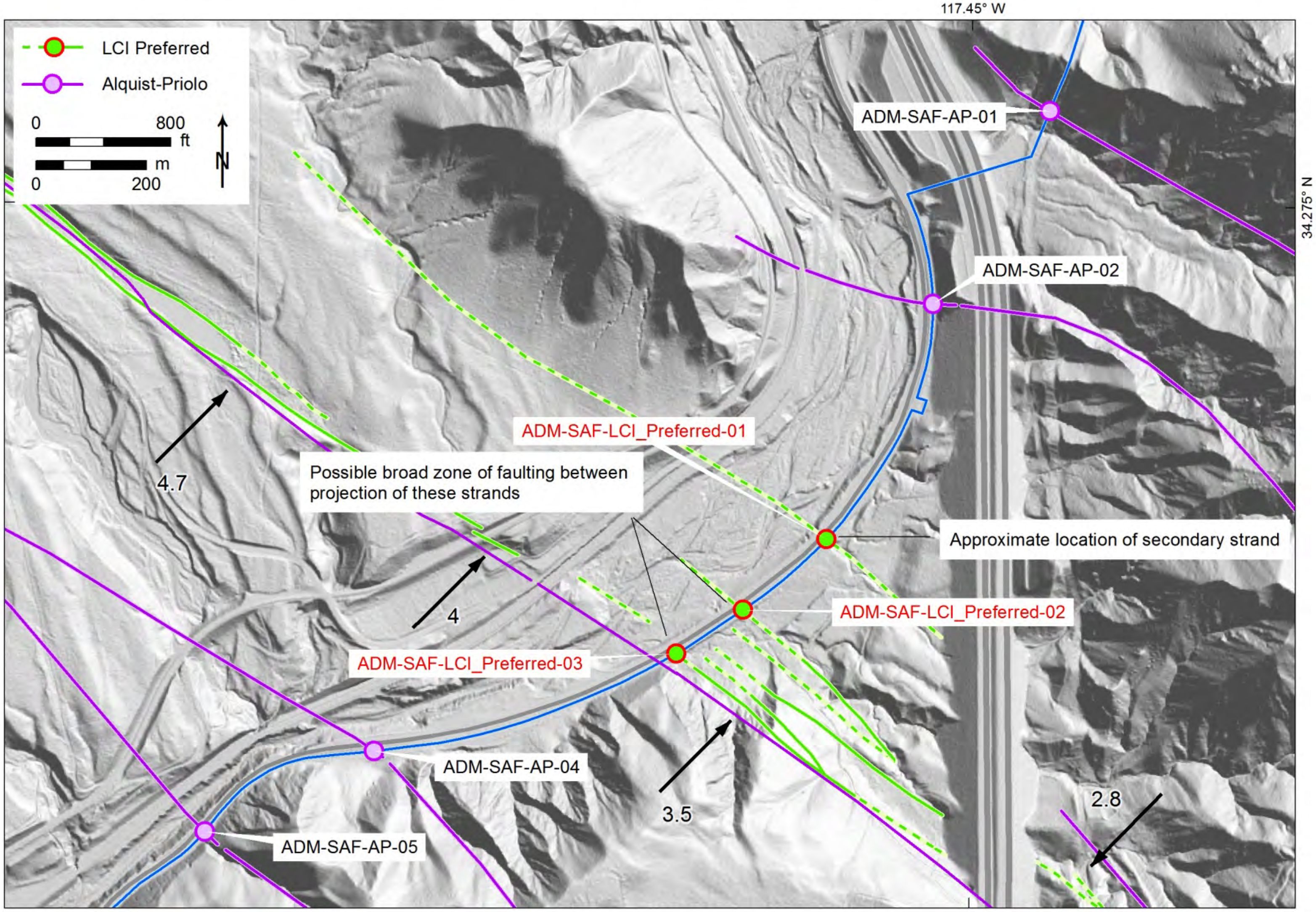

Figure 5b. Hazardous fault crossing locations from Table 2 along the proposed North-South Pipeline alignment through Cajon Pass. Also shown with arrows are modeled displacement values from the ShakeOut Scenario (values in meters).

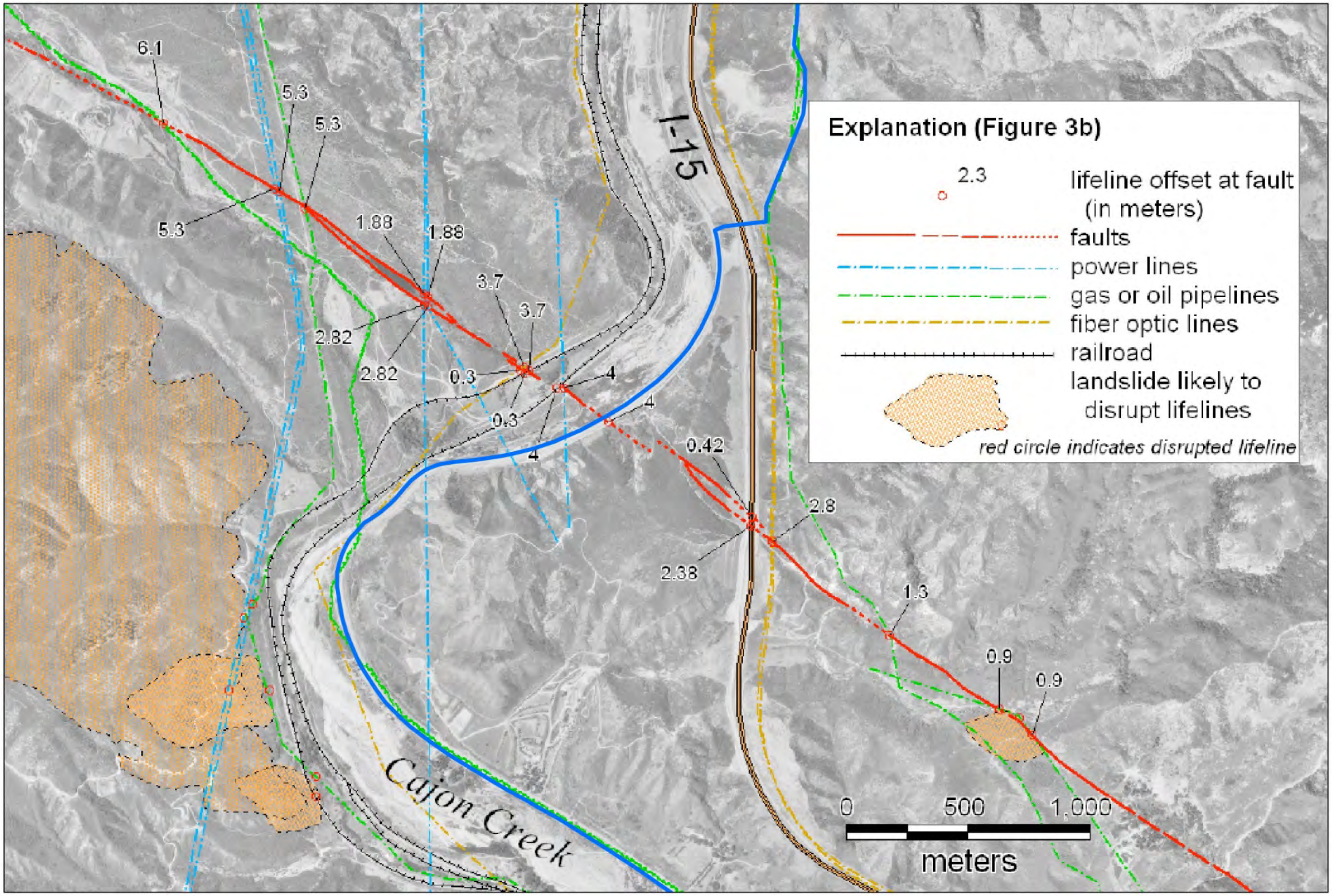

Figure 6. Distribution of modeled ShakeOut displacement estimates in the Cajon Pass crossing area, modified from Figure 3b of Trieman et al. (2008). Proposed North-South Pipeline alignment shown with thick blue line.

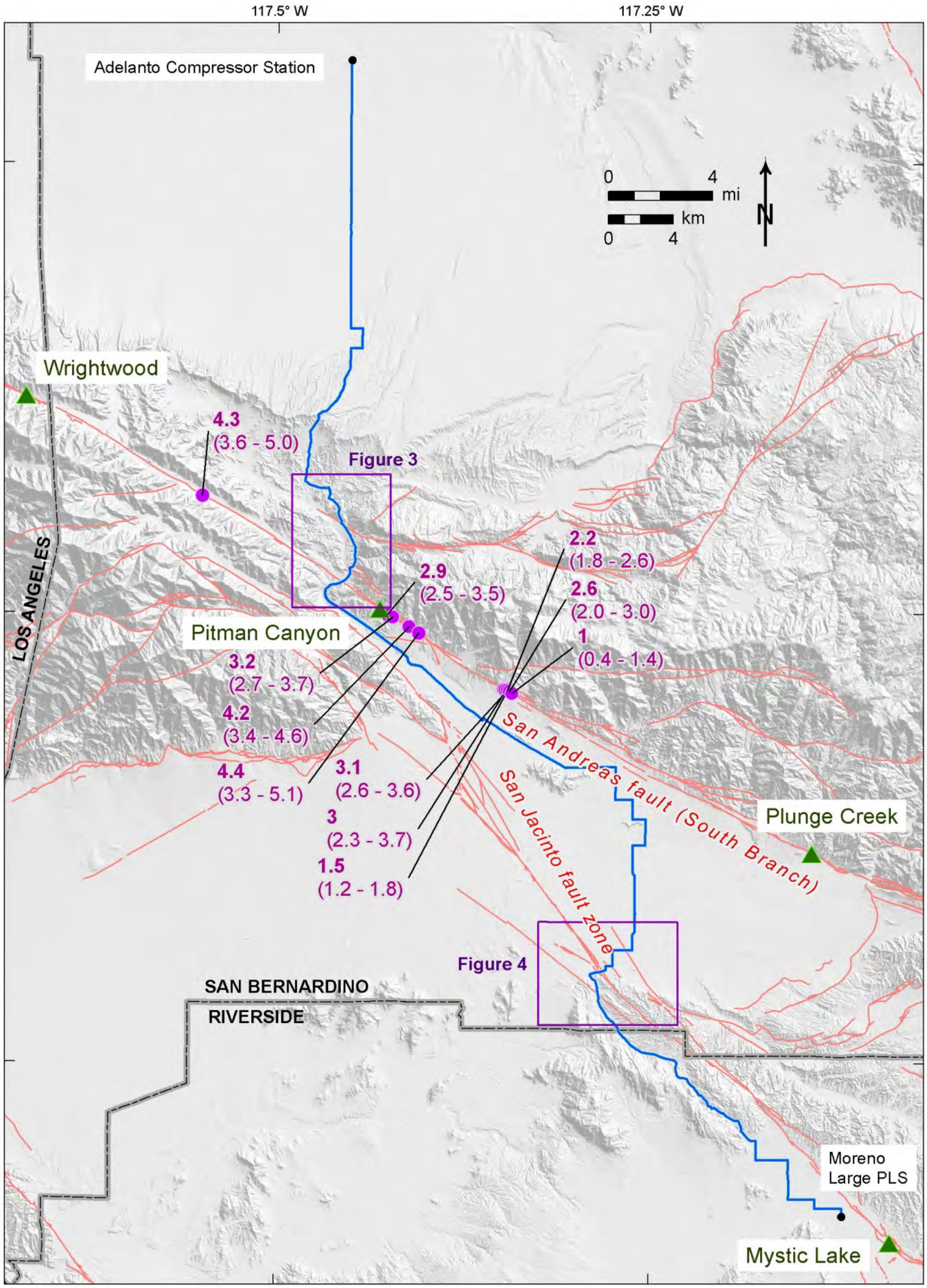

Figure 7. Displacement measurements from offset geomorphic features in lidar from (purple dots from Madden et al., 2013) and paleoseismic sites (green triangles). Displacement values in meters; bold values represent best estimates and values in parentheses represent uncertainty range.

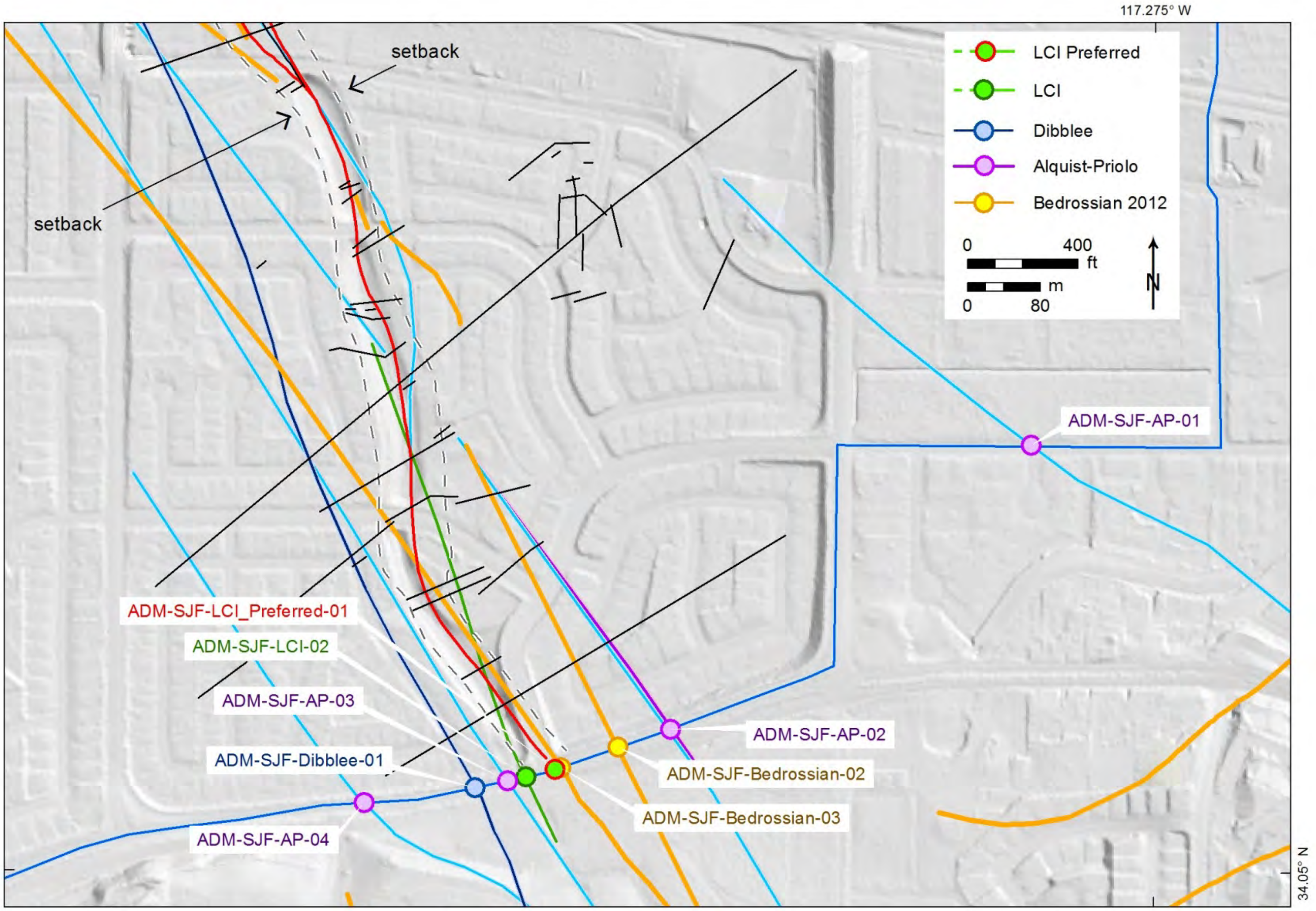

Figure 8a. All San Jacinto fault crossings of the proposed North-South Pipeline alignment near Loma Linda. Black lines are trenches; red line is fault depicted by Leighton and Associates (1980).

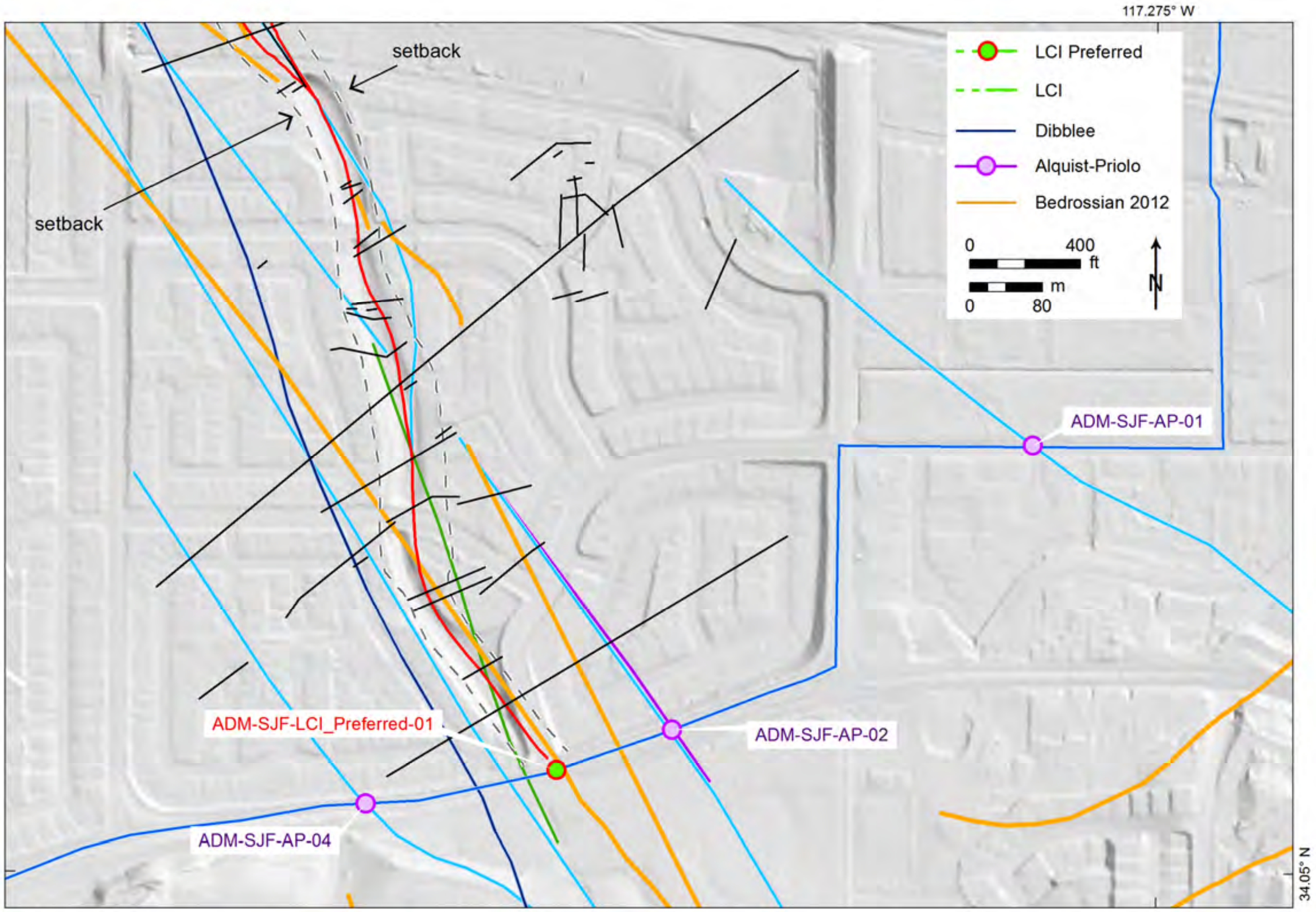

Figure 8b. Hazardous San Jacinto fault crossings from Table 2 of the proposed North-South pipeline alignment.

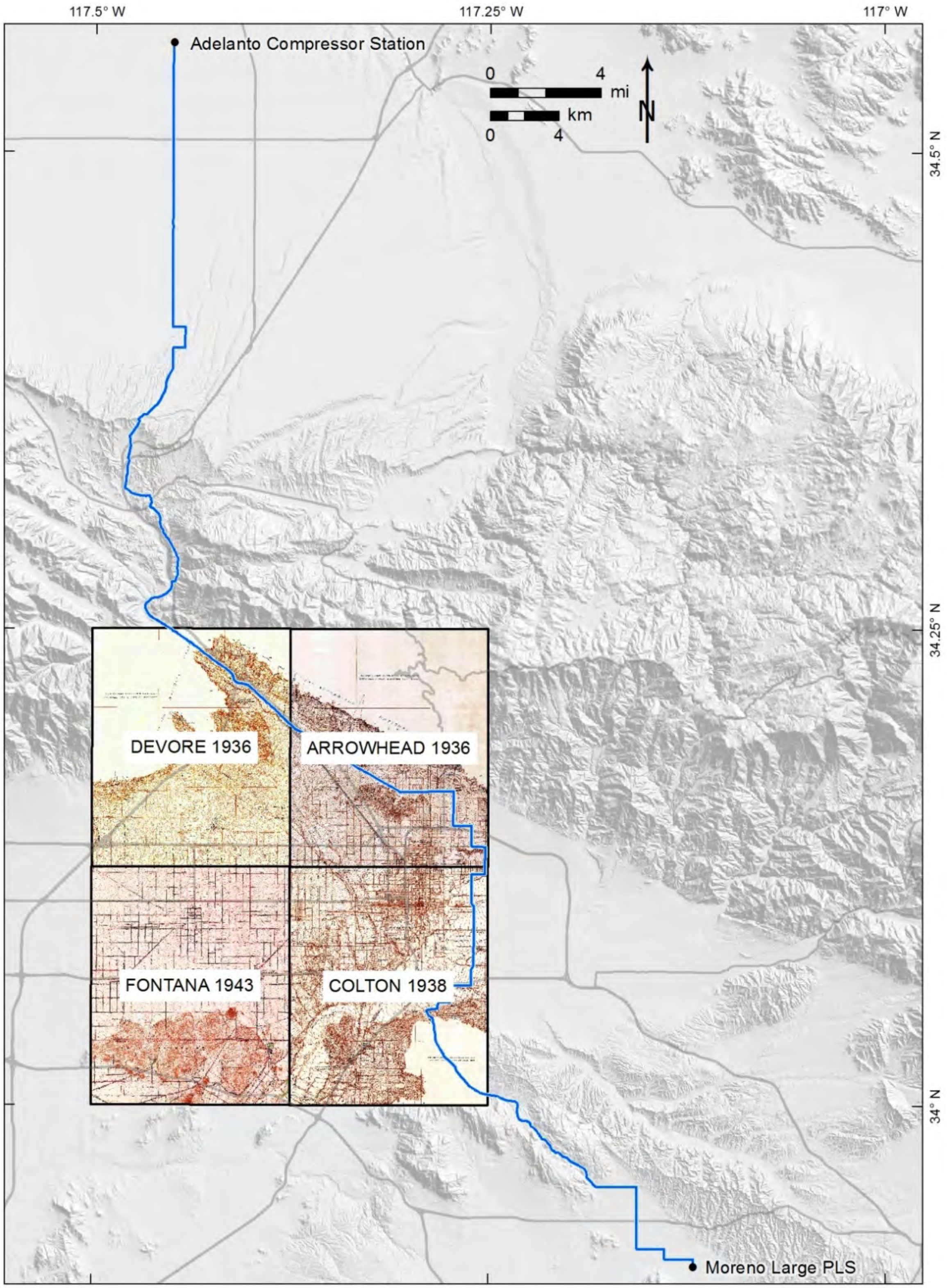

Figure 9. Coverage of available historic (1930's) topographic maps in the vicinity of the proposed North-South Pipeline alignment.

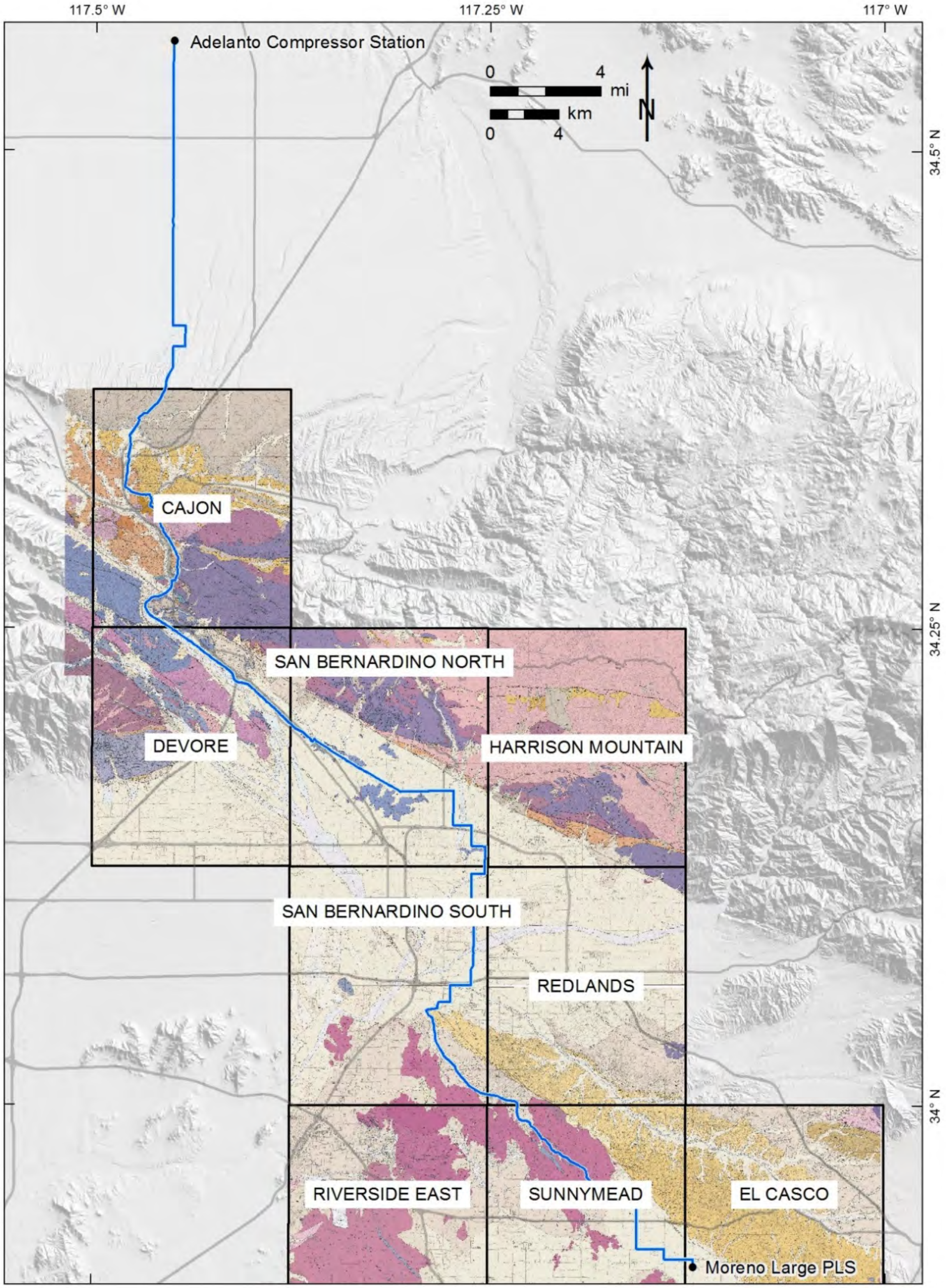

Figure 10. Available coverage of Dibblee Foundation geologic maps (1:24,000 scale) along the proposed North-South Pipeline alignment.

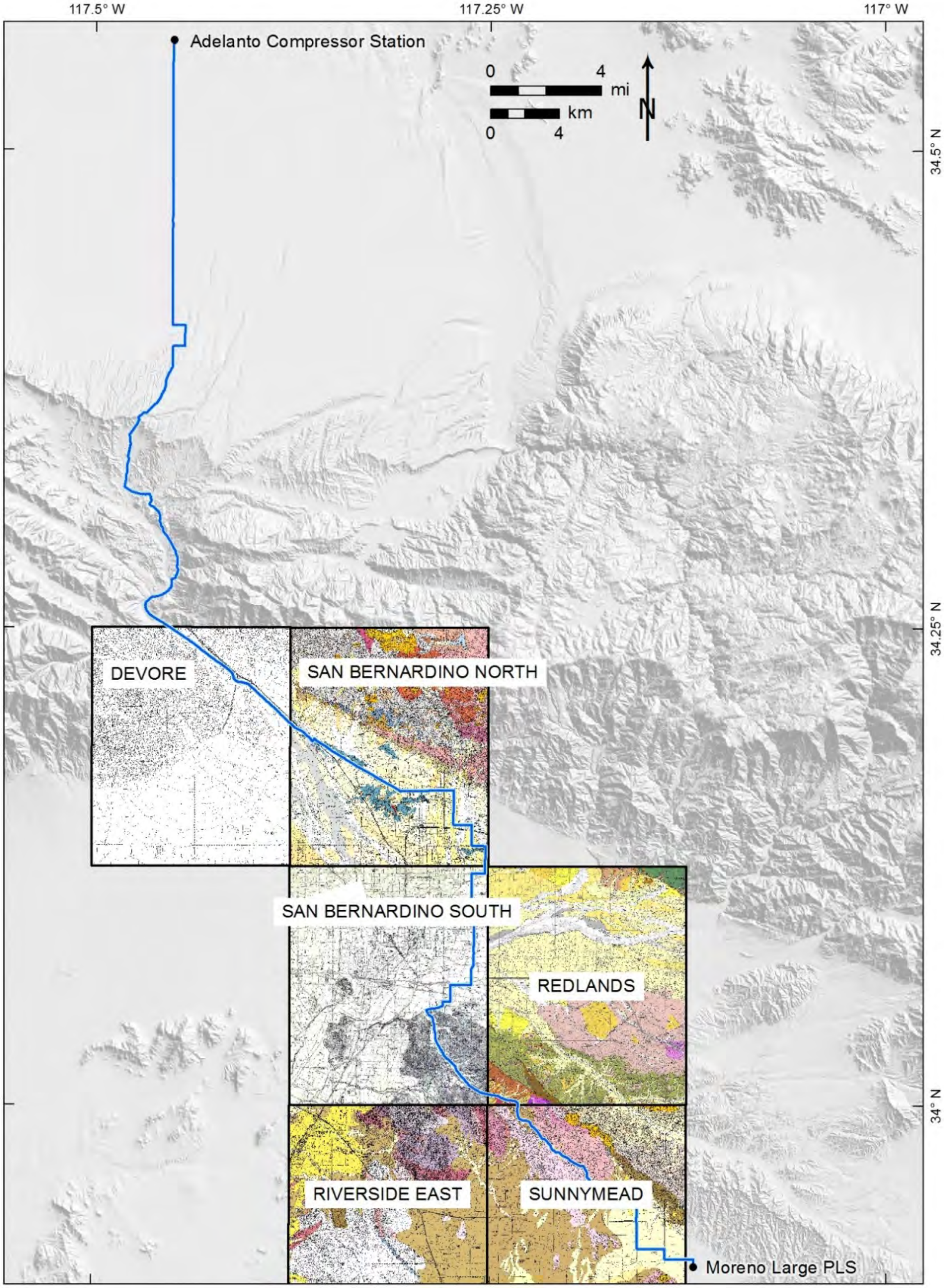

Figure 11. Available coverage of USGS geologic maps (1:24,000 scale) along the proposed North-South Pipeline alignment.

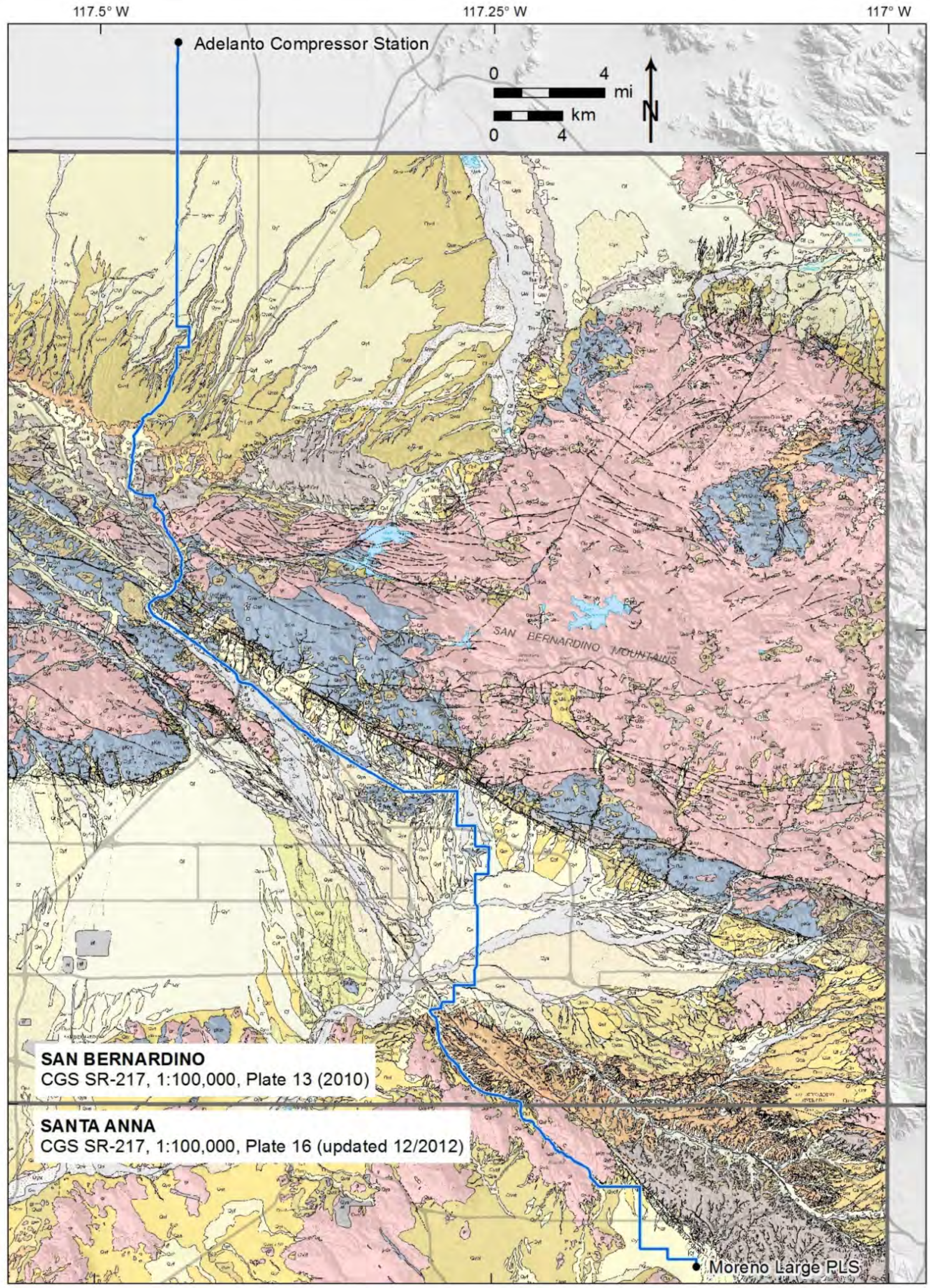

Figure 12. Available coverage of USGS surficial geologic maps (1:100,000 scale) along the proposed North-South Pipeline alignment.

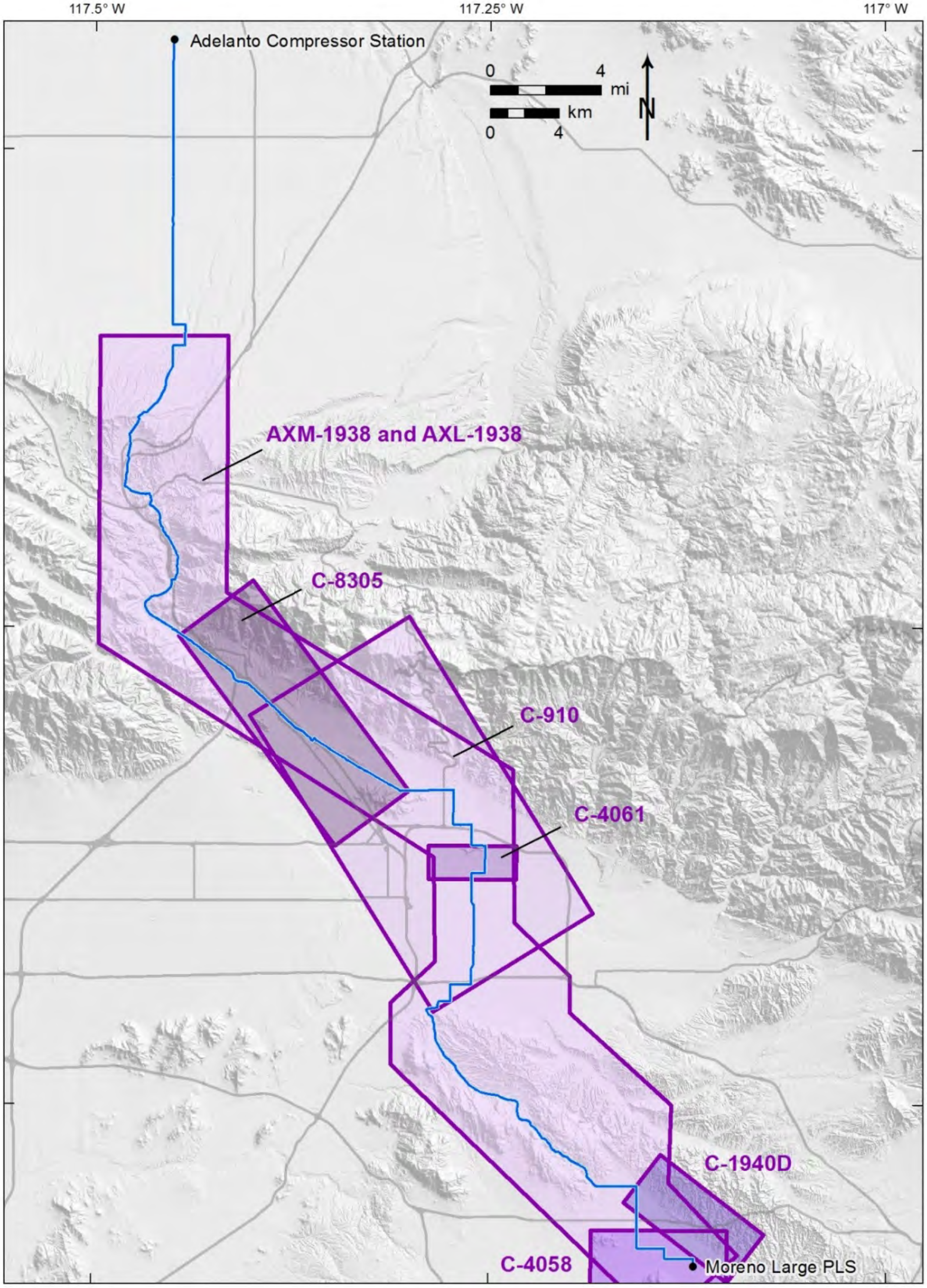

Figure 13. Available coverages of historic (pre-1945) aerial photograph flights along the proposed North-South Pipeline alignment.

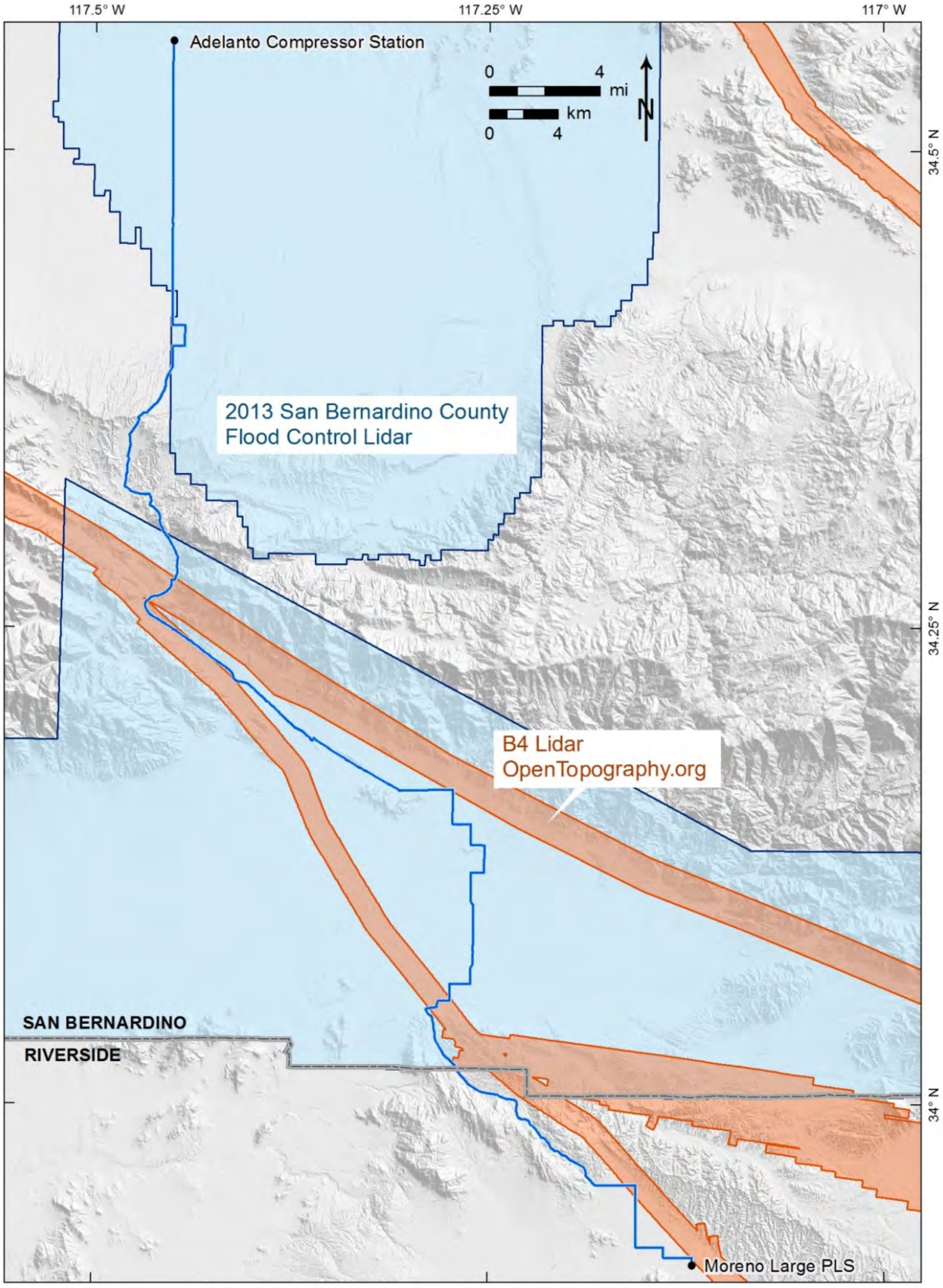

Figure 14. LiDAR coverage available in the vicinity of the proposed North-South Pipeline alignment.

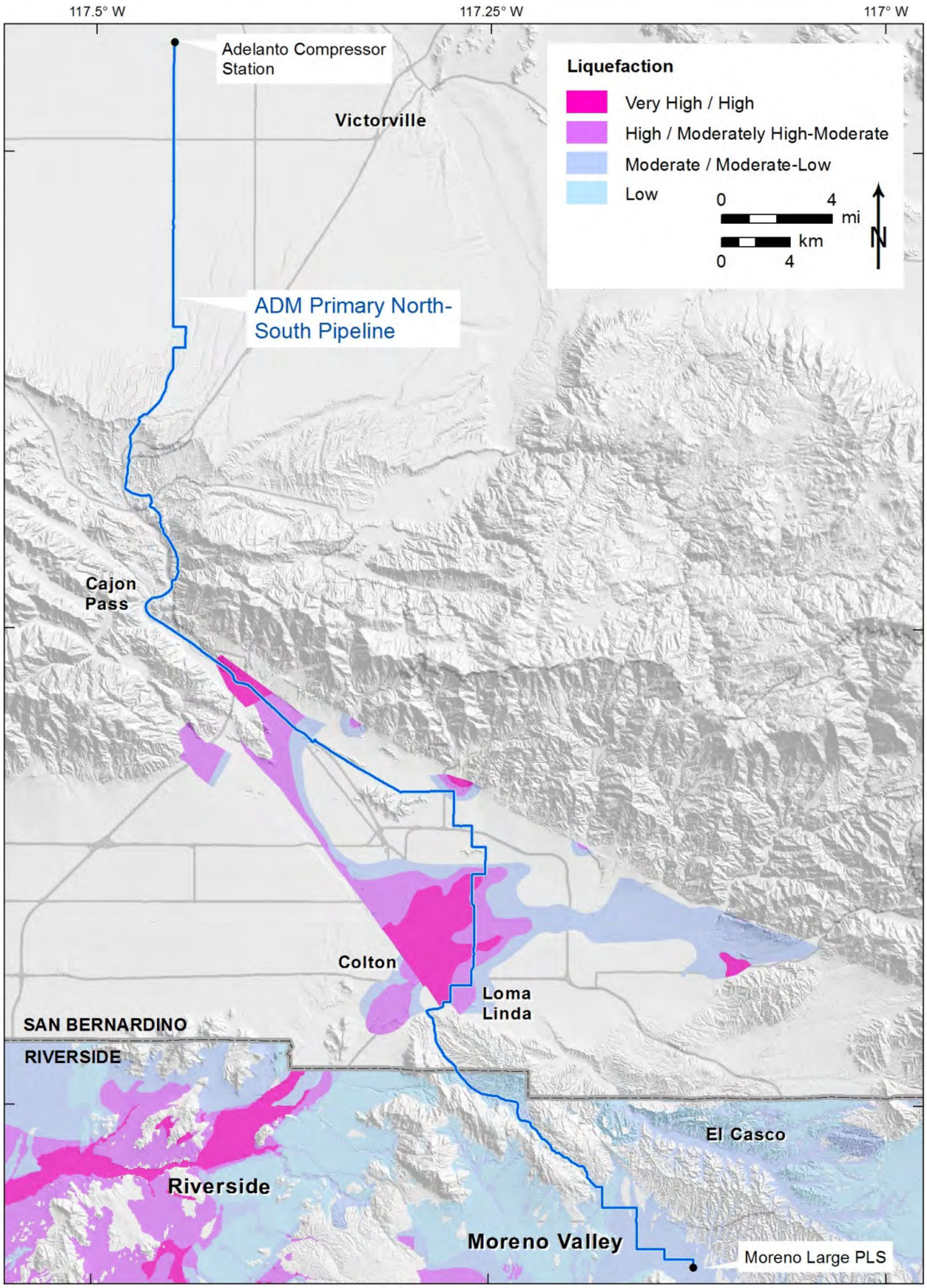

Figure 15. Compilation of liquefaction hazards from Matti and Carson (1991) in San Bernardino County and the County of Riverside (2014) in Riverside County.

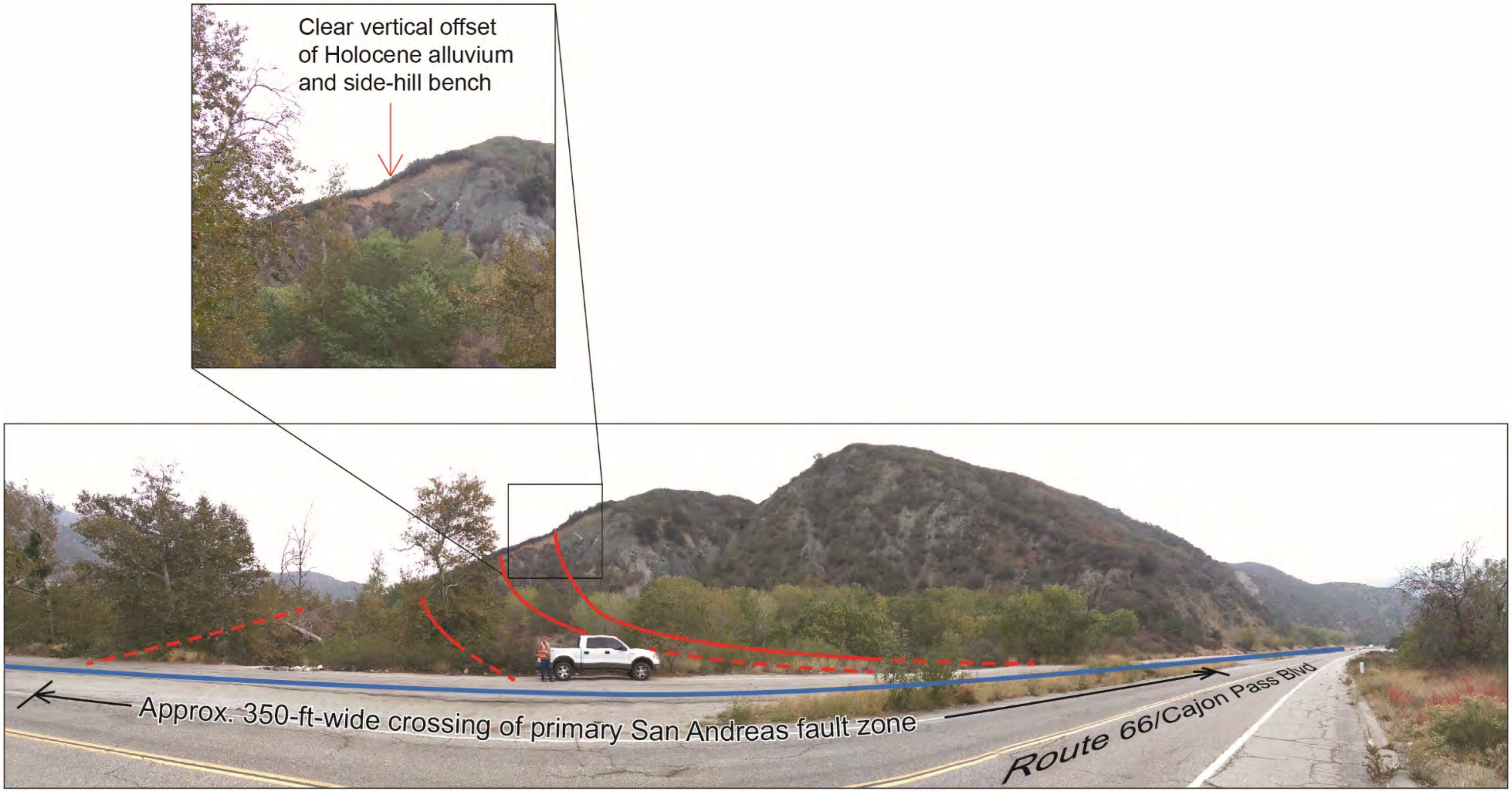

Figure 16. Annotated photo of San Andreas Fault observed along Route 66/Cajon Pass Boulevard

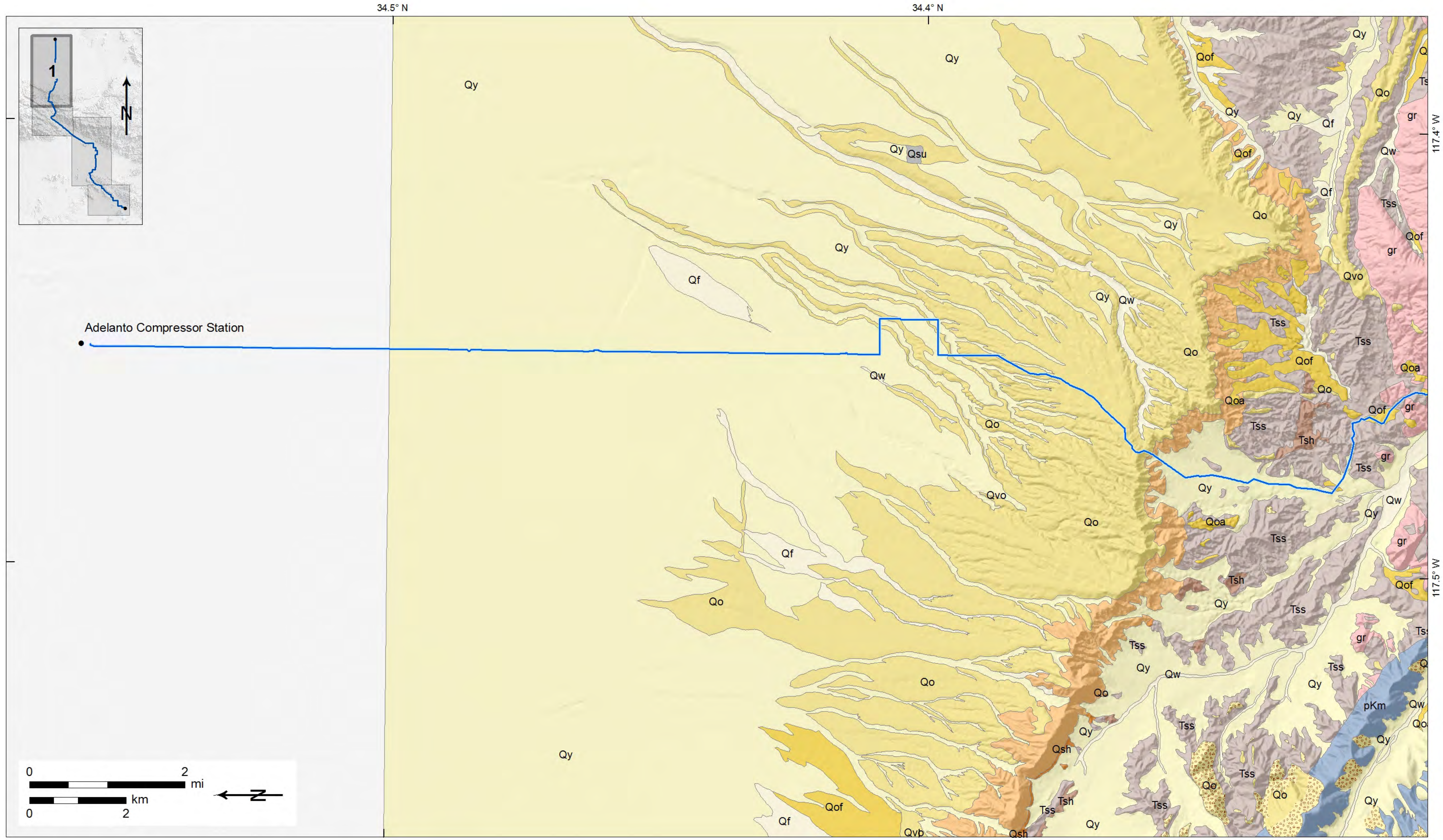

Figure 17. Geologic units along the proposed North-South Pipeline alignment (Panel 1 of 4; legend on Figure 21). Geologic basemap modified from Bedrossian et al. (2012).

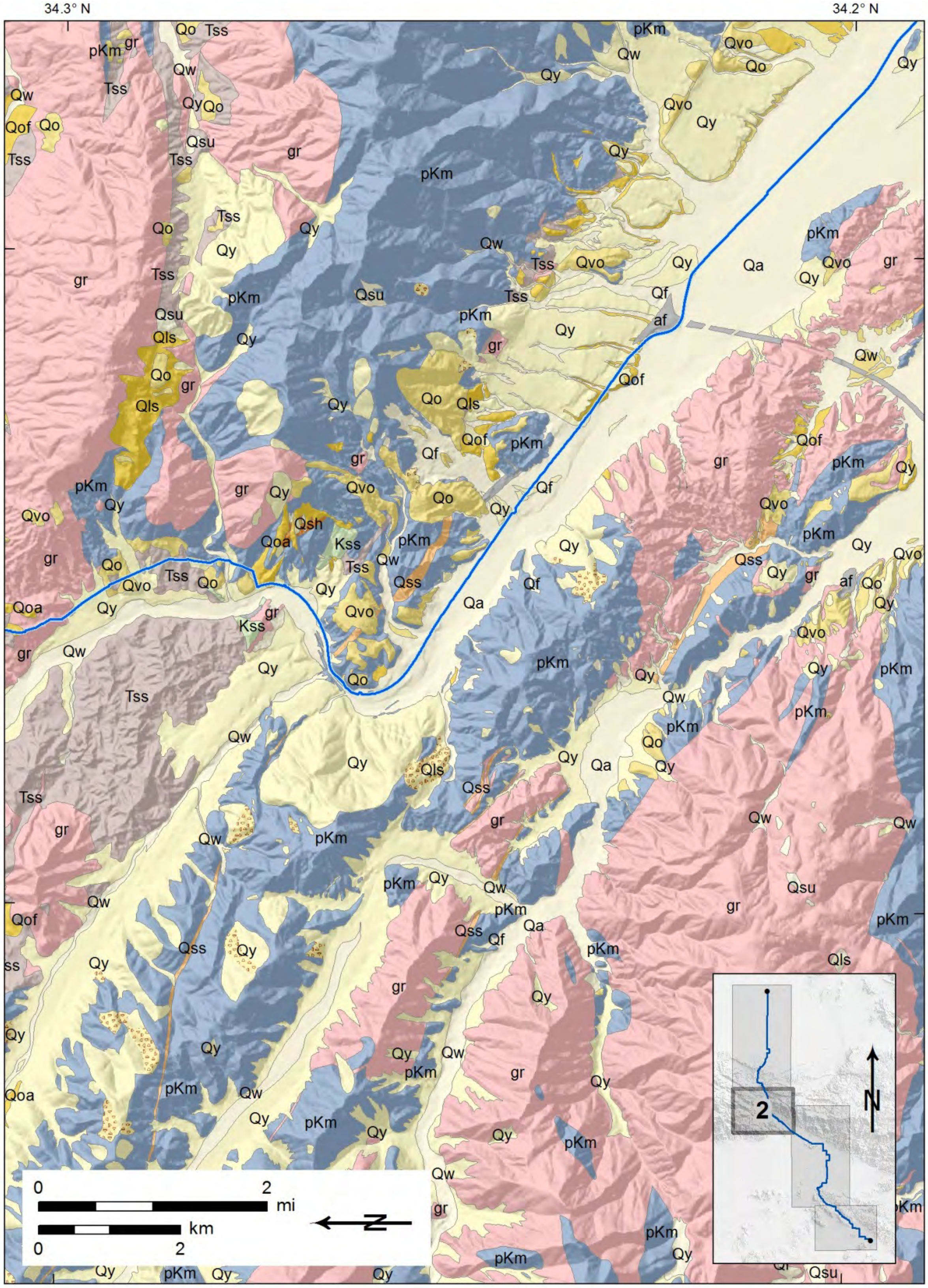

Figure 18. Geologic units along the proposed North-South Pipeline alignment (Panel 2 of 4; legend on Figure 21). Geologic basemap modified from Bedrossian et al. (2012).

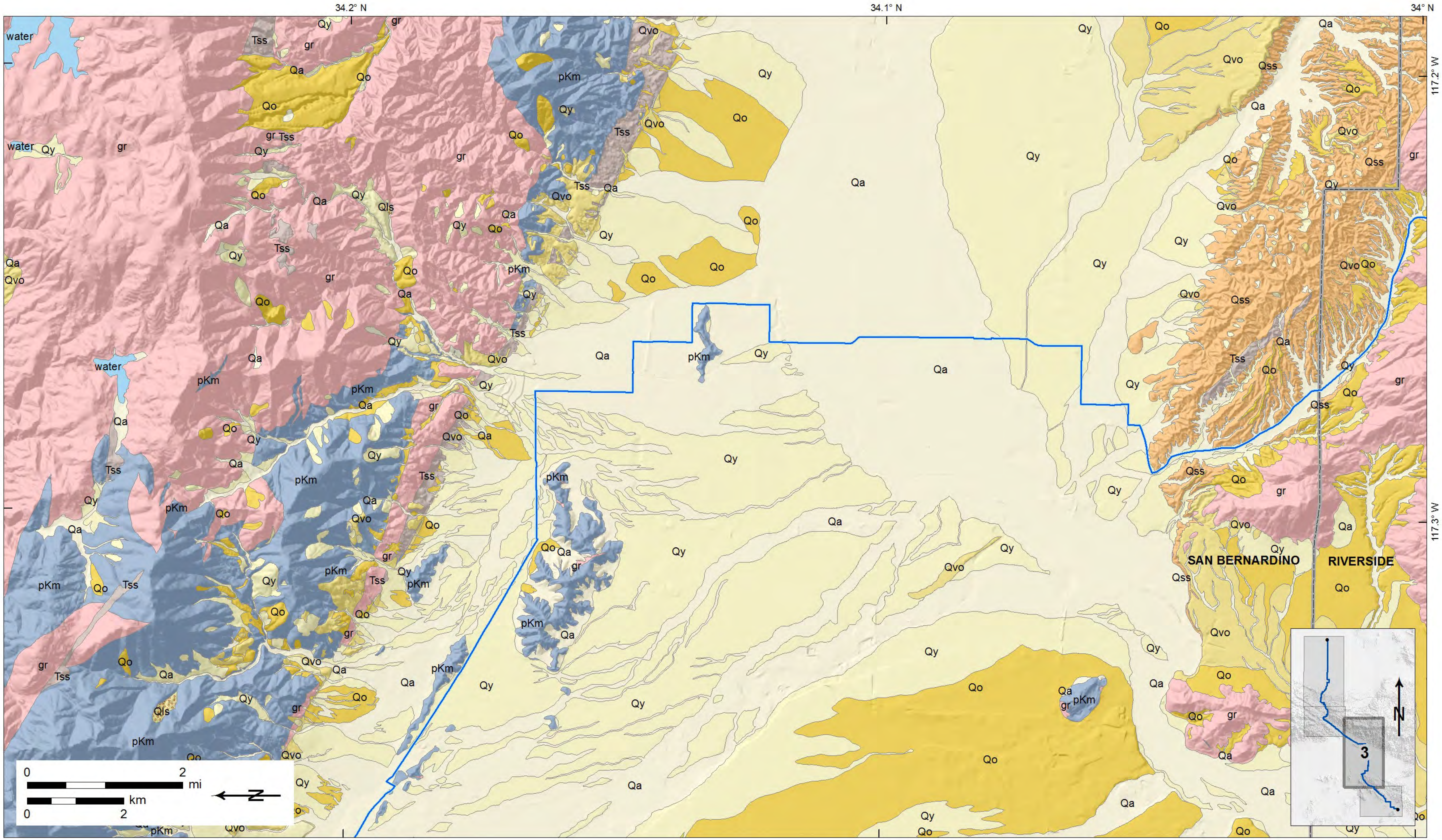

Figure 19. Geologic units along the proposed North-South Pipeline alignment (Panel 3 of 4; legend on Figure 21). Geologic basemap modified from Bedrossian et al. (2012).

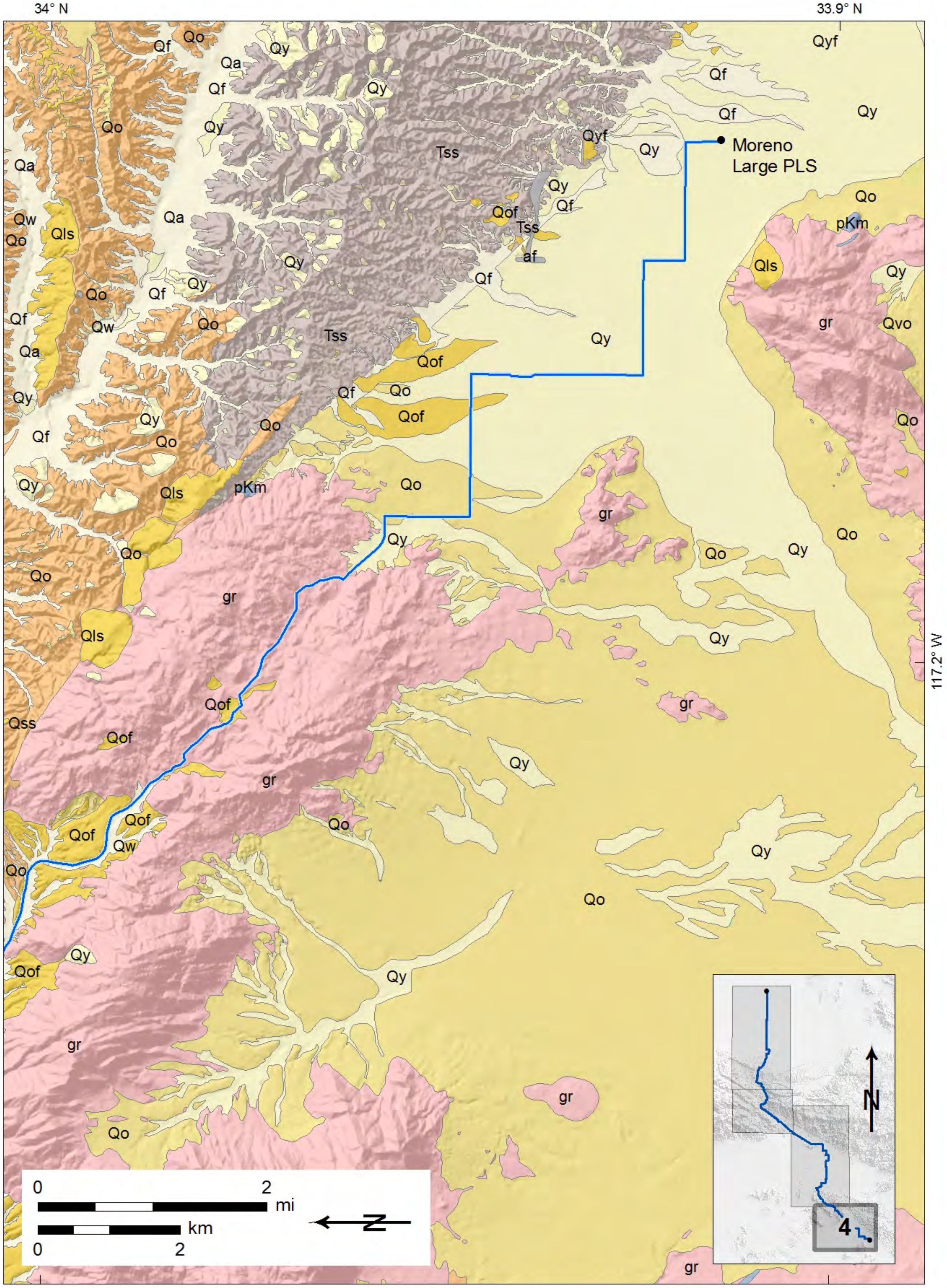

Figure 20. Geologic units along the proposed North-South Pipeline alignment (Panel 4 of 4; legend on Figure 21). Geologic basemap modified from Bedrossian et al. (2012).

Surficial Deposits

af	Artificial fill
Qy	Young alluvial deposits
Qsu	Undifferentiated deposits
Qls	Landslide deposits
Qw	Alluvial wash deposits
Qf	Alluvial fan deposits
Ql	Alluvial valley deposits Lacustrine, playa, and estuarine deposits
Qe	Eolian and dune deposits
Qyf	Young alluvial fan deposits
Qo	Old alluvial deposits
Qof	Old alluvial fan deposits
Qoa	Old alluvial valley deposits
Qoe	Old eolian and dune deposits
Qvo	Very old alluvial deposits
Qss	Quaternary bedrock; coarse-grained formations of Pleistocene age and younger
Qsh	Quaternary bedrock; fine-grained formations of Pleistocene age and younger
Tss	Tertiary bedrock; coarse-grained Tertiary age formations
Tsh	Tertiary bedrock; fine-grained Tertiary age formations
Tv	Tertiary bedrock; Tertiary age formations of volcanic origin
Kss	Cretaceous coarse-grained age formations of sedimentary origin
Kv	Cretaceous age formations of volcanic origin
pKm	Cretaceous and pre-Cretaceous metamorphic formations of sedimentary and volcanic origin.
gr	Mesozoic and older bedrock; Granitic and other intrusive crystalline rocks of all ages

Figure 21. Legend for geologic units depicted in Figures 17 through 20. Modified from Bedrossian et al. (2012)

Attachment 1

Liquefaction Induced Settlement Analysis

Earthquake and Seismic Design Considerations

The project site is located within a municipality that employs the 2013 California Building Code (CBC). As a part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site. Within the procedure to evaluate seismic forces, the code requires an evaluation of the Seismic Site Class, which categorizes the site by Vs30, the average shear-wave velocity (Vs) in the upper 30 m (100 ft) below the ground surface.

Site Class

In this study, data obtained from the Standard Penetration Test (SPT) presented in Table 8 of Matti and Carson (1991) are used to evaluate Vs30. To estimate Vs30 from SPT, the recommended Vs-SPT correlation for Quaternary Sands in Equation 4.77 of Wair et al. (2012) is used:

$$Vs = 30 \times {(N_1)_{60}}^{0.23} \times {\sigma'_{vo}}^{0.25}$$

where Vs is for Quaternary Sand in m/s, $(N_1)_{60}$, is the corrected SPT blow count number, and σ'_{vo} is the effective vertical overburden stresses. The effect of the geologic age is incorporated by the use of age scaling factors. Wair et al. (2012) recommended age scaling factors of 0.9 for Holocene soils and 1.17 for Pleistocene soil deposits.

Matti and Carson (1991) used the stratigraphic and geotechnical data from a drilling investigation in the San Bernardino Valley (Carson et al., 1986) to evaluate liquefaction susceptibility in the region. They evaluated the liquefaction susceptibility for SPT samples collected by Carson et al. (1986). The parameters used by Matti and Carson (1991) to evaluate liquefaction susceptibility for SPT data of Carson et al. (1986) are shown in Table 8 of Matti and Carson (1991). The location of drill sites in Carson et al. (1986) investigation is shown in Figure 1.

Matti and Carson (1991) corrected the raw SPT numbers of Carson et al. (1986) to compensate for effective overburden pressure, for silty or partially silty materials, and for differences in the length and type of the rod used to drive the sampler during the penetration test. However, they did not correct the SPT numbers to an energy ratio of 60% (the average ratio of the actual energy delivered by safety hammers to the theoretical free-fall energy). The correction factor for energy ratio is defined in Kramer et al. (1996) as:

$$(N_1)_{60} = N_1 \frac{E_m}{0.6E_{ff}}$$

where $(N_1)_{60}$ is the corrected SPT number including the energy ratio correction, N_1 is the corrected SPT number excluding the energy ratio correction, E_m is the actual hammer energy, and E_{ff} is the theoretical free-fall hammer energy.

Matti and Carson (1991) provided the N_1.They applied no energy ratio correction to the data. However, they stated that the USGS system used for SPT actually has a driving efficiency of 68 percent. Therefore, $E_m = 0.68E_{ff}$ and $(N_1)_{60} = 1.13N_1$. In this study, a correction factor of 1.13 is applied to N_1 values reported in Matti and Carson (1991) to obtain $(N_1)_{60}$.

In this study, values of σ'_{vo} calculated in Matti and Carson (1991) are used for SPT data. Using $(N_1)_{60}$ and σ'_{vo}, Vs for each of the SPT sample data in Matti and Carson (1991) are calculated using Equation 4.77 of Wair et al. (2012) . The calculation of Vs for each SPT sample is tabulated in Appendix A of this report and shown as function of depth below the ground surface in Figure 2. A linear regression using the power law functional form is performed to estimate Vs as a function of depth and also shown in Figure 2.

Vs data in this study do not extend to a depth of 30 m (Figure 2). Therefore, an extrapolation of shallow velocity data is required to estimate Vs30 (Wair et al., 2012). Boore (2004) proposed an extrapolation method based on statistical analysis of borehole data in California. The Boore (2004) model involves a correlation between Vs30 and the time-averaged Vs to the terminal depth of measurement (Vsd). Boore (2004) proposed the following equation:

$$\log Vs30 = a + b.\log Vsd$$

The SPT data used in this study extend to the depth of about 10 m. We used the Vs-depth relation shown in Figure 2 to calculate Vs10. Then we used Boore (2004) model to calculate Vs30 from Vs10.

Using the above procedure, a Vs30 of 197 m/s is calculated for the region. Section 1613.3.2 of CBC 2013 defines the site classes in accordance with Chapter 20 of ASCE 7-10. Based on the calculated Vs30 the site is classified as Site Class D.

Ground Motion Parameters

The USGS *Custom Hazard Maps* tool (http://geohazards.usgs.gov/hazards/apps/cmaps/) is used to create a peak ground acceleration (PGA) map for a hazard level corresponding to 2% probability of exceedance in 50 years for the San Bernardino region (Figure 3).

The USGS *2008 Interactive Deaggregations* tool (http://geohazards.usgs.gov/deaggint/2008/) is used for a site within the region with highest PGA values in Figure 3 to obtain mapped PGA (PGA_{mapped}), mapped 5 percent damped response spectral acceleration (Sa) at short periods (S_S), and mapped 5 percent damped Sa at a period of 1 second (S_1) at the site corresponding to the same hazard level as follows:

- PGA=1.2052 g
- S_S=3.1895 g
- S_1=1.2330 g

The USGS deaggregation tool indicates that the mean event contributing to this level of PGA is an earthquake with moment magnitude (M_W) of 7.5.

The short-period site coefficient at 0.2 second, F_a, and the long-period site coefficient at 1.0 second, F_v, are calculated as 1.0 and 1.5, respectively from Tables 1613.3.3(1) and 1613.3(2) of CBC 2013. Moreover, from Section 1613.3.3 of CBC 2013 the design 5 percent damped Sa at short periods (S_{DS}) and the design 5 percent damped Sa at a period of 1 second (S_{D1}) are calculated as 2.13 g and 1.23 g, respectively. Therefore, according to Tables 1613.3.5(1) and 1613.5(2) of CBC 2013, the seismic design category is D.

According to Section 1803.5.12 of the CBC 2013 for seismic design category D, when evaluating the potential for liquefaction and soil strength loss, PGA shall be determined in accordance with Section 11.8.3 of ASCE 7-10 as F_{PGA}xPGA_{mapped}; where F_{PGA} is a site coefficient from Table 11.8.1 of the ASCE 7-10. For Site Class D and $PGA_{mapped} \geq 0.5$ g, F_{PGA} is equal to 1. Therefore, the mapped PGA of 1.2052 g can be used for the liquefaction analysis.

Liquefaction-Induced Settlement

The methodology introduced by Tokimatsu and Seed (1987) for saturated sands is used to evaluate the potential for liquefaction-induced settlement. This procedure utilizes SPT values for sand layers to obtain an estimate of how much the settlement due to liquefaction may be expected.

In this study, the SPT data from Table 8 of Matti and Carson (1991) is used to estimate liquefaction-induced settlement, which Matti and Carson (1991) obtained from the Carson et al. (1986) drilling investigation in the San Bernardino Valley. Matti and Carson (1991) used data from 22 boreholes drilled in Carson et al. (1986) investigation. The location of drill sites in Carson et al. (1986) investigation is shown in Figure 1. This study utilizes the same SPT data for each borehole as shown in Table 8 of Matti and Carson (1991), and includes the correction from N_1 to $(N_1)_{60}$ as discussed earlier.

The lithology of each stratigraphic unit in which the SPT sample is collected is provided in Carson et al. (1986). Each SPT number is assigned to entire stratigraphic unit in which the SPT sample was collected. The depths associated with each stratigraphic unit are provided in Carson et al. (1986).

Tokimatsu and Seed (1987) provide the chart in Figure 4 for the case of saturated sands. Figure 4 is used in this study to estimate the corresponding volumetric strain of each soil layer. Settlement is calculated by multiplying the volumetric strain by the layer thickness. The total settlement then is the sum of the settlements for each of the layers. In Figure 4, the volumetric strain is calculated using $(N_1)_{60}$ and cyclic stress ratio (CSR) defined as:

$$CSR = 0.65 \frac{a_{max}}{g} \frac{\sigma_{vo}}{\sigma'_{vo}} r_d$$

where a_{max} is the PGA at ground surface generated by the earthquake, g is the acceleration of gravity, and σ_{vo} is the total vertical overburden stresses, respectively, and r_d is a nonlinear stress reduction coefficient that varies with depth and can be obtained from Brandes (2002) .

Figure 4 corresponds to an earthquake of magnitude 7.5. For earthquakes with magnitudes other than 7.5, the volumetric strain can be obtained from the volumetric strain scaling factors provided in Tokimatsu and Seed (1987). For this study, since the deaggregated earthquake for PGA has an Mw of 7.5 the scaling factor of 1.0 is used for volumetric strains.

Matti and Carson (1991) calculated σ_{vo} and σ'_{vo} for each SPT sampling depth by using hypothetical values for ground-water depth. The hypothetical ground-water depth corresponds to the nearest ground-water multiple of 10 ft overlying the SPT depth. We used the same definition of the ground-water table and calculated σ'_{vo} and σ_{vo} for the midpoint of each sand layer in this study.

The liquefaction induced settlement analysis is tabulated in Appendix B of this report. The settlement is calculated for each stratigraphic layer in which the SPT sample is collected. For each borehole, the total settlement is obtained as the summation of the settlements for each of the layers. Note that the volumetric strain from the Tokimatsu and Seed (1987) curves (Figure 4) reaches a maximum when CSR is greater than 0.5. In this study, CSR is greater than 0.5 for all the boreholes. When $(N_1)_{60}$ is greater than about 32 and CSR is greater than 0.5, Figure 4 does not estimate any volumetric strain. Therefore, we did not calculate any settlement when $(N_1)_{60}$ is greater than 32.

The liquefaction-induced settlement analysis shown in Appendix B indicates settlements ranging from 0 inches to 4.3 inches for different boreholes. Regardless of the relative position of the boreholes, a maximum differential settlement of 4.3 inches is considered for the region. Assuming that this settlement occurs across a distance of 100 feet, a maximum angular distortion of about of 0.004 inches per inch would result.

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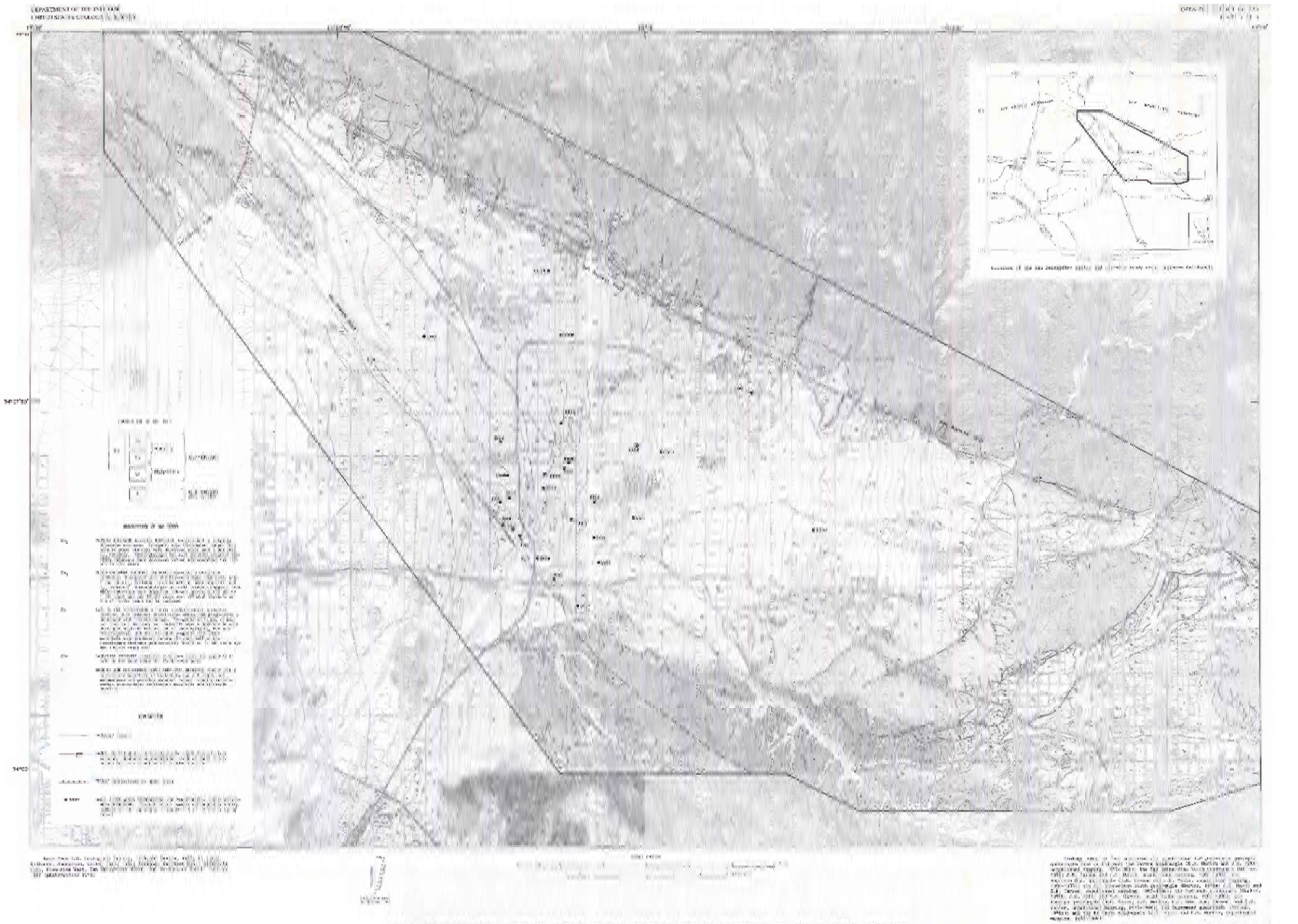


MAP SHOWING LOCATION AND GEOLOGIC SETTING OF DRILL SITES
SAN BERNARDINO, CALIFORNIA

Figure 1. Map showing location and geologic setting of drill sites, San Bernardino, California (Adopted from Carson et al. 1986)

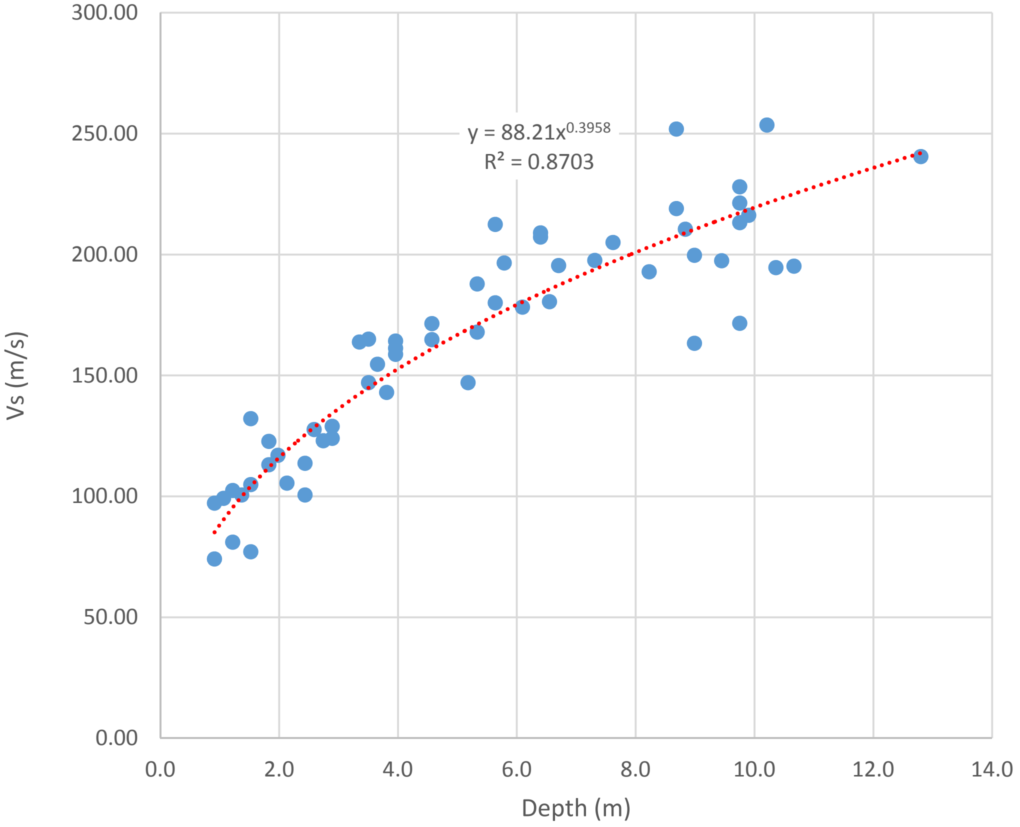
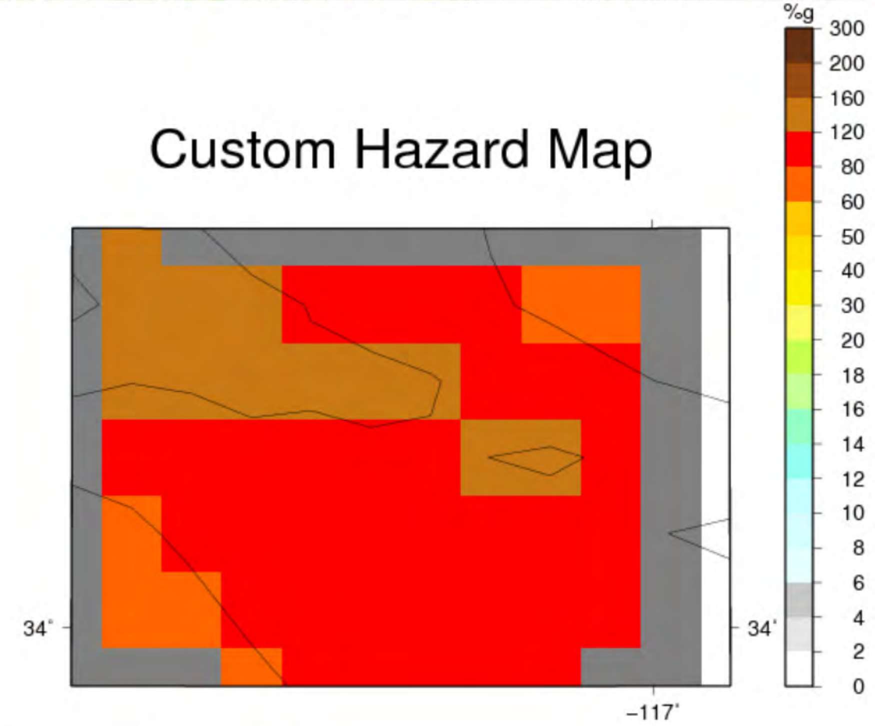


Figure 2. Vs versus depth calculated form SPT data in Matti and Carson (1991) [blue circles]. A power law linear regression is shown for Vs-depth relationship [red dotted line].



Peak Ground Acceleration

Figure 3. Selected region (top) and the contour map for PGA for 2% probability of exceedance in 50 years from USGS *Custom Hazard Maps* tool (bottom).

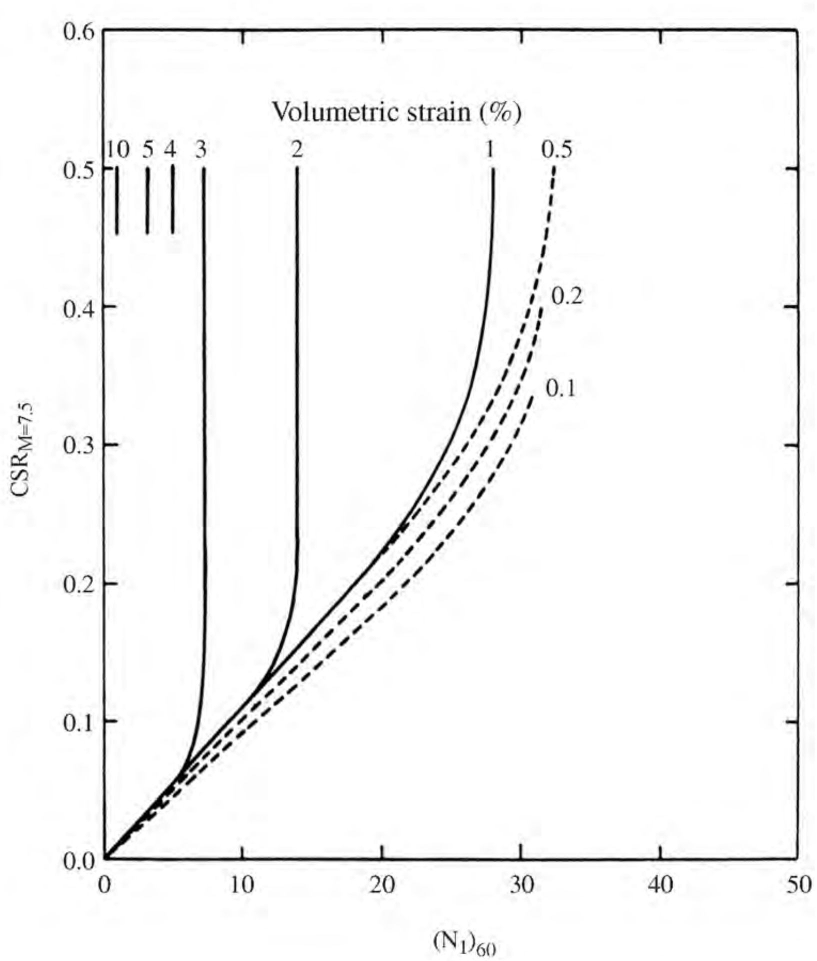


FIGURE 4. Relationship between cyclic stress ratio and volumetric strain for saturated clean sands. (Adopted from Tokimatsu, and Seed, 1987)

Appendix A

Calculation of Vs

Borehole	Geologic unit[1]	SPT sampling depth (ft)	SPT sampling depth (m)	Raw SPT *N*	Corrected SPT N_1	$(N_1)_{60}$	Ground water depth (ft)	σ'_{vo} (lb/ft^2)	σ'_{vo} (kPa)	Age Scaling Factors	Vs (m/s)
DRQ--02	Qh1	8	2.4	7	7.8	8.8	0	541.0	25.9	0.9	111.72
DRQ--02	Qh1	13	4.0	19	22.8	25.8	10	1253.0	60.0	0.9	176.39
DRQ--02	Qh1	27	8.2	27	24.3	27.5	20	2573.0	123.2	0.9	214.27
DRQ--02	Qh1	32	9.8	36	28.8	32.6	30	3285.0	157.3	0.9	236.84
DSN--02	Qh2	4.5	1.4	5	14.6	16.5	0	304.0	14.6	0.9	111.73
DSN--03	Qh2	5	1.5	3	4.1	4.6	0	338.0	16.2	0.9	85.67
DSN--03	Qh2	9.5	2.9	11	19.1	21.6	0	642.0	30.7	0.9	143.28
DSS--01	Qh1	6	1.8	14	25.4	28.8	0	405.0	19.4	0.9	136.34
DSS--01	Qh1	17.5	5.3	23	23	26.1	10	1557.0	74.5	0.9	186.61
DSS--01	Qh1	28.5	8.7	76	74.4	84.3	20	2674.0	128.0	0.9	279.84
DSS--01	Qh1	33.5	10.2	74	59.2	67.1	30	3387.0	162.2	0.9	281.68
DSS--02	Qh2	25	7.6	29	33.6	38.1	20	2438.0	116.7	0.9	227.76
DSS--02	Qh2	28.5	8.7	40	40.5	45.9	20	2674.0	128.0	0.9	243.31
DSS--02	Qh2	32	9.8	33	33.9	38.4	30	3285.0	157.3	0.9	245.89
DSS--02	Qh2	42	12.8	45	36	40.8	40	4335.0	207.6	0.9	267.21
DSS--03	Qh2	17.5	5.3	34	37.4	42.4	10	1557.0	74.5	0.9	208.69
DSS--03	Qh2	34	10.4	30	27	30.6	30	2420.0	115.9	0.9	216.19
DSS--04	Qh1	11	3.4	17	29.6	33.5	10	1118.0	53.5	0.9	182.04
DSS--04	Qh1	21	6.4	34	41.5	47.0	20	2168.0	103.8	0.9	232.18
DSS--04	Qh1	31	9.4	17	21.1	23.9	30	3218.0	154.1	0.9	219.35
DSS--05	Qh1	12.5	3.8	12	14.9	16.9	10	1219.0	58.4	0.9	158.85
DSS--05	Qh1	21.5	6.6	24	21.6	24.5	20	2201.0	105.4	0.9	200.56
DSS--05	Qh1	29.5	9.0	33	26.4	29.9	20	2742.0	131.3	0.9	221.90
DSS--05	Qh1	32	9.8	42	38.6	43.7	30	3285.0	157.3	0.9	253.34
DSS--06	Qh2	4	1.2	4	6.5	7.4	0	270.0	12.9	0.9	90.05
DSS--07	Qh2	9	2.7	12	16.5	18.7	0	608.0	29.1	0.9	136.67
DSS--07	Qh2	29.5	9.0	11	11	12.5	20	2742.0	131.3	0.9	181.43
DSS--08	Qh2	18.5	5.6	27	29.7	33.7	10	1624.0	77.8	0.9	200.01
DSS--09	Qh2	3.5	1.1	12	18	20.4	0	237.0	11.3	0.9	110.17
DSS--09	Qh2	8.5	2.6	13	20.6	23.3	0	574.0	27.5	0.9	141.77
DSS-10	Qh1	5	1.5	26	42.6	48.3	0	338.0	16.2	0.9	146.78
DSS-10	Qh1	15	4.6	15	24	27.2	10	1388.0	66.5	0.9	183.11
DSS-10	Qh1	35	10.7	23	18.4	20.9	30	3488.0	167.0	0.9	216.88
DSS-11	Qh2	6	1.8	10	17.8	20.2	0	405.0	19.4	0.9	125.64
DSS-11	Qh2	15	4.6	20	28.5	32.3	10	1388.0	66.5	0.9	190.49
DSS-11	Qh2	32	9.8	14	11.2	12.7	30	3285.0	157.3	0.9	190.60
DSS-12	Qh2	3	0.9	4	6	6.8	0	203.0	9.7	0.9	82.32
DSS-12	Qh2	13	4.0	22	26.4	29.9	10	1253.0	60.0	0.9	182.44

Borehole	Geologic unit[1]	SPT sampling depth (ft)	SPT sampling depth (m)	Raw SPT *N*	Corrected SPT N_1	$(N_1)_{60}$	Ground water depth (ft)	σ'_{vo} (lb/ft^2)	σ'_{vo} (kPa)	Age Scaling Factors	Vs (m/s)
DSS-12	Qh2	19	5.8	39	42.5	48.2	10	1658.0	79.4	0.9	218.32
DSS-12	Qh2	22	6.7	28	30	34.0	20	2235.0	107.0	0.9	217.13
DSS-13	Qh2	7	2.1	3	11.1	12.6	0	473.0	22.6	0.9	117.17
DSS-13	Qh2	12	3.7	18	21.6	24.5	10	1185.0	56.7	0.9	171.80
DSS-14	Qh2	5	1.5	6	15.6	17.7	0	338.0	16.2	0.9	116.50
DSS-14	Qh2	21	6.4	34	40	45.3	20	2168.0	103.8	0.9	230.22
DSS-15	Qh1	3	0.9	8	19.5	22.1	0	203.0	9.7	0.9	107.96
DSS-15	Qh1	9.5	2.9	11	16.1	18.2	0	642.0	30.7	0.9	137.76
DSS-15	Qh1	13	4.0	13	24.4	27.7	10	1253.0	60.0	0.9	179.16
DSS-15	Qh1	24	7.3	22	29.5	33.4	20	2370.0	113.5	0.9	219.49
DSS-15	Qh1	29	8.8	29	33.6	38.1	20	2708.0	129.7	0.9	233.82
DSS-15	Qh1	32.5	9.9	27	30.3	34.3	30	3319.0	158.9	0.9	240.24
DSS-16	Qp	18.5	5.6	12	19.5	22.1	10	1624.0	77.8	1.17	181.56
DSS-17	Qh2	6.5	2.0	9	18.9	21.4	0	439.0	21.0	0.9	129.98
DSS-17	Qh2	11.5	3.5	17	29.6	33.5	10	1151.0	55.1	0.9	183.37
DSS-20	Qh1	17	5.2	12	13.2	15.0	10	1523.0	72.9	0.9	163.33
DSS-20	Qh1	20	6.1	14	21.5	24.4	20	2100.0	100.5	0.9	198.01
DSS-21	Qh2	4	1.2	9	18	20.4	0	270.0	12.9	0.9	113.82
DSS-21	Qh2	8	2.4	6	13.3	15.1	0	541.0	25.9	0.9	126.31
DSS-21	Qh2	11.5	3.5	8	17.9	20.3	10	1151.0	55.1	0.9	163.34

[1] Qh1: Younger Holocene deposits include sedimentary materials that Matti and Carson (1991) interpreted to have accumulated within the last 500 to 1,000 yr.

Qh2: Older Holocene deposits include sedimentary materials that Matti and Carson (1991) interpreted to have accumulated between 500 or 1,000 yr ago and 10,000 to perhaps 15,000 yr ago.

Qp: Pleistocene deposits include sedimentary materials that Matti and Carson (1991) interpreted to have accumulated between 10,000 or 15,000 yr ago and about 750,000 yr ago.

Appendix B

Liquefaction Induced Settlements

Borehole	Geologic unit[1]	$(N_1)_{60}$	Ground water depth (ft)	σ'_{vo} (mid height) (lb/ft^2)	σ_{vo} (mid height) (lb/ft^2)	Depth to the top of layer (ft)	Depth to the bottom of layer (ft)	Layer thickness (ft)	Depth to midpoint (ft)	Depth to midpoint (m)	r_d	CSR	Volumetric strain	Settlement of the layer (inch)	Total settlement (inch)
DRQ--02	Qh1	8.8	0	557.5	1072.5	6.50	10.00	3.50	8.25	2.51	0.98	1.472	2.8%	1.16	3.87
DRQ--02	Qh1	25.8	10	1556.8	2025.0	10.00	25.00	15.00	17.50	5.33	0.96	0.973	1.2%	2.08	
DRQ--02	Qh1	27.5	20	2606.8	3075.0	25.00	30.00	5.00	27.50	8.38	0.94	0.861	1.0%	0.62	
DRQ--02	Qh1	32.6	30	3487.9	3800.0	30.00	40.00	10.00	35.00	10.67	0.89	0.756	-	-	
DSN--02	Qh2	16.5	0	388.5	747.5	3.00	8.50	5.50	5.75	1.75	0.99	1.481	1.8%	1.20	1.20
DSN--03	Qh2	4.6	0	270.3	520.0	0.00	8.00	8.00	4.00	1.22	0.99	1.487	4.2%	4.02	4.37
DSN--03	Qh2	21.6	0	608.1	1170.0	8.00	10.00	2.00	9.00	2.74	0.98	1.469	1.5%	0.35	
DSS--01	Qh1	28.8	0	337.9	650.0	0.00	10.00	10.00	5.00	1.52	0.99	1.483	0.9%	1.10	2.33
DSS--01	Qh1	26	10	1354.1	1635.0	10.00	19.00	9.00	14.50	4.42	0.97	0.910	1.1%	1.23	
DSS--01	Qh1	84.3	20	2488.5	2847.5	21.50	30.00	8.50	25.75	7.85	0.94	0.839	-	-	
DSS--01	Qh1	67.1	30	3386.5	3605.0	30.00	37.00	7.00	33.50	10.21	0.90	0.748	-	-	
DSS--02	Qh2	38.1	20	2336.5	2555.0	22.00	25.00	3.00	23.50	7.16	0.95	0.806	-	-	0.00
DSS--02	Qh2	45.9	20	2674.3	3205.0	27.00	30.00	3.00	28.50	8.69	0.93	0.873	-	-	
DSS--02	Qh2	38.4	30	3217.6	3280.0	30.00	32.00	2.00	31.00	9.45	0.92	0.733	-	-	
DSS--02	Qh2	41	40	4301.4	4395.0	40.00	43.00	3.00	41.50	12.65	0.84	0.666	-	-	
DSS--03	Qh2	42.4	10	1556.8	2025.0	16.50	18.50	2.00	17.50	5.33	0.96	0.973	-	-	0.38
DSS--03	Qh2	31	30	3302.0	3442.5	30.00	34.50	4.50	32.25	9.83	0.91	0.741	0.7%	0.38	
DSS--04	Qh1	33.5	10	1235.8	1407.5	10.00	15.50	5.50	12.75	3.89	0.97	0.862	-	-	1.16
DSS--04	Qh1	47.0	20	2336.5	2555.0	20.00	27.00	7.00	23.50	7.16	0.95	0.806	-	-	
DSS--04	Qh1	23.9	30	3403.4	3637.5	30.00	37.50	7.50	33.75	10.29	0.90	0.750	1.3%	1.16	
DSS--05	Qh1	16.9	10	1185.1	1310.0	10.00	14.00	4.00	12.00	3.66	0.97	0.838	1.8%	0.86	2.03
DSS--05	Qh1	24.5	20	2319.6	2522.5	20.00	26.50	6.50	23.25	7.09	0.95	0.802	1.3%	0.98	
DSS--05	Qh1	29.9	20	2708.1	3270.0	28.00	30.00	2.00	29.00	8.84	0.93	0.878	0.8%	0.19	
DSS--05	Qh1	43.7	30	3285.1	3410.0	30.00	34.00	4.00	32.00	9.75	0.91	0.740	-	-	

Borehole	Geologic unit[1]	$(N_1)_{60}$	Ground water depth (ft)	σ'_{vo} (mid height) (lb/ft^2)	σ_{vo} (mid height) (lb/ft^2)	Depth to the top of layer (ft)	Depth to the bottom of layer (ft)	Layer thickness (ft)	Depth to midpoint (ft)	Depth to midpoint (m)	r_d	CSR	Volumetric strain	Settlement of the layer (inch)	Total settlement (inch)
DSS--06	Qh2	7.4	0	337.9	650.0	3.00	7.00	4.00	5.00	1.52	0.99	1.483	3.0%	1.44	1.44
DSS--07	Qh2	18.7	0	692.6	1332.5	6.00	14.50	8.50	10.25	3.12	0.98	1.465	1.7%	1.70	2.10
DSS--07	Qh2	12	20	2725.0	3302.5	28.50	30.00	1.50	29.25	8.92	0.93	0.881	2.2%	0.40	
DSS--08	Qh2	33.7	10	1641.2	2187.5	15.00	22.50	7.50	18.75	5.72	0.96	0.994	-	-	0.00
DSS--09	Qh2	20	0	168.9	325.0	0.00	5.00	5.00	2.50	0.76	0.99	1.492	1.5%	0.93	1.49
DSS--09	Qh2	23.3	0	557.5	1072.5	6.50	10.00	3.50	8.25	2.51	0.98	1.472	1.3%	0.56	
DSS-10	Qh1	48.3	0	337.9	650.0	0.00	10.00	10.00	5.00	1.52	0.99	1.483	-	-	1.92
DSS-10	Qh1	27	10	1371.0	1667.5	11.50	18.00	6.50	14.75	4.50	0.97	0.916	1.1%	0.83	
DSS-10	Qh1	20.9	30	3352.7	3540.0	30.00	36.00	6.00	33.00	10.06	0.91	0.746	1.5%	1.09	
DSS-11	Qh2	20.2	0	388.5	747.5	0.00	11.50	11.50	5.75	1.75	0.99	1.481	1.6%	2.15	3.59
DSS-11	Qh2	32.3	10	1371.0	1667.5	11.50	18.00	6.50	14.75	4.50	0.97	0.916	-	-	
DSS-11	Qh2	12.7	30	3335.8	3507.5	30.00	35.50	5.50	32.75	9.98	0.91	0.744	2.2%	1.44	
DSS-12	Qh2	7	0	202.7	390.0	0.00	6.00	6.00	3.00	0.91	0.99	1.490	3.2%	2.32	3.07
DSS-12	Qh2	29.9	10	1320.3	1570.0	10.00	18.00	8.00	14.00	4.27	0.97	0.897	0.8%	0.75	
DSS-12	Qh2	48.2	10	1658.1	2220.0	18.00	20.00	2.00	19.00	5.79	0.96	0.998	-	-	
DSS-12	Qh2	34	20	2235.1	2360.0	20.00	24.00	4.00	22.00	6.71	0.95	0.781	-	-	
DSS-13	Qh2	12.6	0	506.8	975.0	5.00	10.00	5.00	7.50	2.29	0.98	1.474	2.2%	1.32	2.68
DSS-13	Qh2	24.5	10	1354.1	1635.0	10.00	19.00	9.00	14.50	4.42	0.97	0.910	1.3%	1.35	
DSS-14	Qh2	17.7	0	337.9	650.0	0.00	10.00	10.00	5.00	1.52	0.99	1.483	1.7%	2.08	2.08
DSS-14	Qh2	45	20	2184.5	2262.5	18.50	24.00	5.50	21.25	6.48	0.95	0.768	-	-	
DSS-15	Qh1	22.1	0	287.2	552.5	0.00	8.50	8.50	4.25	1.30	0.99	1.486	1.4%	1.45	2.57
DSS-15	Qh1	18.2	0	709.5	1365.0	8.50	12.50	4.00	10.50	3.20	0.98	1.464	1.7%	0.81	
DSS-15	Qh1	27.7	10	1539.9	1992.5	16.00	18.50	2.50	17.25	5.26	0.96	0.969	1.0%	0.31	
DSS-15	Qh1	33.4	20	2252.0	2392.5	18.50	26.00	7.50	22.25	6.78	0.95	0.786	-	-	
DSS-15	Qh1	38.1	20	2674.3	3205.0	26.00	31.00	5.00	28.50	8.69	0.93	0.873	-	-	
DSS-15	Qh1	34.3	30	3369.6	3572.5	31.00	35.50	4.50	33.25	10.13	0.90	0.747	-	-	
DSS-16	Qp	22.1	10	1624.3	2155.0	17.00	20.00	3.00	18.50	5.64	0.96	0.990	1.4%	0.51	0.51
DSS-17	Qh2	21.4	0	439.2	845.0	4.00	9.00	5.00	6.50	1.98	0.98	1.478	1.5%	0.88	0.88

Borehole	Geologic unit[1]	$(N_1)_{60}$	Ground water depth (ft)	σ'_{vo} (mid height) (lb/ft^2)	σ_{vo} (mid height) (lb/ft^2)	Depth to the top of layer (ft)	Depth to the bottom of layer (ft)	Layer thickness (ft)	Depth to midpoint (ft)	Depth to midpoint (m)	r_d	CSR	Volumetric strain	Settlement of the layer (inch)	Total settlement (inch)
DSS-17	Qh2	33.5	10	1134.5	1212.5	10.00	12.50	2.50	11.25	3.43	0.97	0.812	-	-	
DSS-20	Qh1	15.0	10	1556.8	2025.0	16.50	18.50	2.00	17.50	5.33	0.96	0.973	1.9%	0.46	0.77
DSS-20	Qh1	24.4	20	2471.6	2815.0	24.50	26.50	2.00	25.50	7.77	0.94	0.836	1.3%	0.30	
DSS-21	Qh2	20.4	0	236.5	455.0	2.00	5.00	3.00	3.50	1.07	0.99	1.488	1.5%	0.56	1.94
DSS-21	Qh2	15.1	0	473.0	910.0	5.00	9.00	4.00	7.00	2.13	0.98	1.476	1.9%	0.92	
DSS-21	Qh2	20.3	10	1134.5	1212.5	10.00	12.50	2.50	11.25	3.43	0.97	0.812	1.6%	0.47	

[1] Qh1: Younger Holocene deposits include sedimentary materials that Matti and Carson (1991) interpreted to have accumulated within the last 500 to 1,000 yr.

Qh2: Older Holocene deposits include sedimentary materials that Matti and Carson (1991) interpreted to have accumulated between 500 or 1,000 yr ago and 10,000 to perhaps 15,000 yr ago.

Qp: Pleistocene deposits include sedimentary materials that Matti and Carson (1991) interpreted to have accumulated between 10,000 or 15,000 yr ago and about 750,000 yr ago.

APPENDIX C

Public Records Search

APPENDIX C1

Municipal Public Records Requests

APPENDIX C1.1

Adelanto Industrial Park III

American Engineering Laboratories, Inc.
13641 John Glenn Rd., Suite C
Apple Valley, CA 92307
Telephone (619) 247-8445
FAX (619) 247-8029
San Diego • Modesto • Corona • Yucca Valley • Apple Valley

December 25, 1989

A.E.L. Project # 45024
Report No. 1

City of Adelanto
P. O. Box 10
Adelanto, CA 92301

Attn: Mr. Roland "Dee" Dorval, City Engineer

Subject: REPORT OF GEOTECHNICAL INVESTIGATION
ADELANTO INDUSTRIAL PARK III
INDUSTRIAL WAY AT KOALA ROAD
ADELANTO, CALIFORNIA

Gentlemen:

In accordance with your request, we have completed a geotechnical investigation for the proposed project. We are presenting herein our findings and recommendations.

The findings of this study indicate that the site is suitable for the proposed development provided the recommendations presented in the attached report are complied with.

If you have any questions after reviewing the findings and recommendations contained in the attached report, please do not hesitate to contact this office. This opportunity to be of professional service is sincerely appreciated.

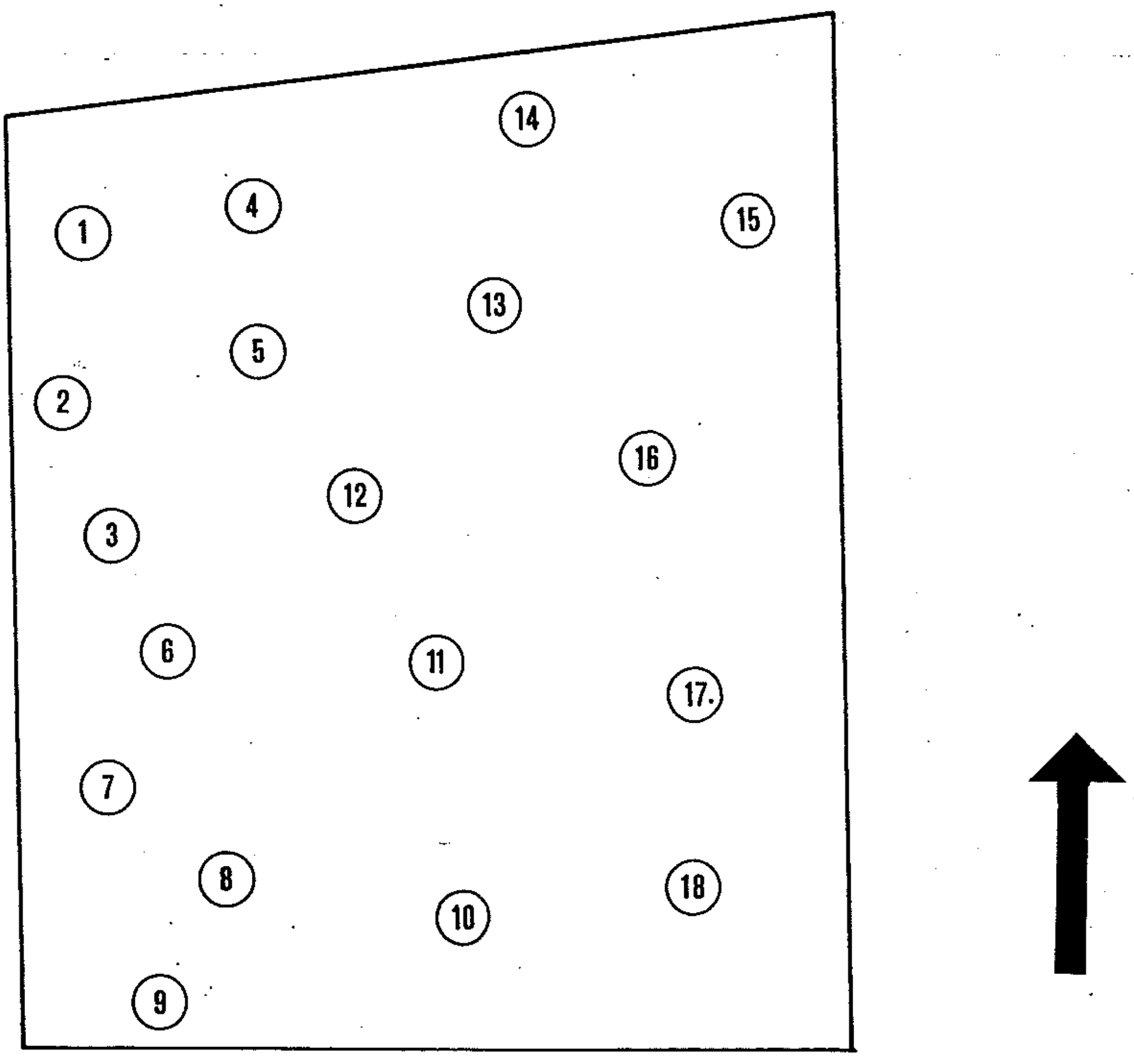
Respectfully submitted,
AMERICAN ENGINEERING LABORATORIES, INC.

Michael B. Andres
Staff Civil Engineer
RCE No. C034288

REGISTERED PROFESSIONAL ENGINEER
MICHAEL B. ANDRES
NO. C 034288
CIVIL
STATE OF CALIFORNIA

Dan D. Goodwin
Project Manager

American Engineering Laboratories

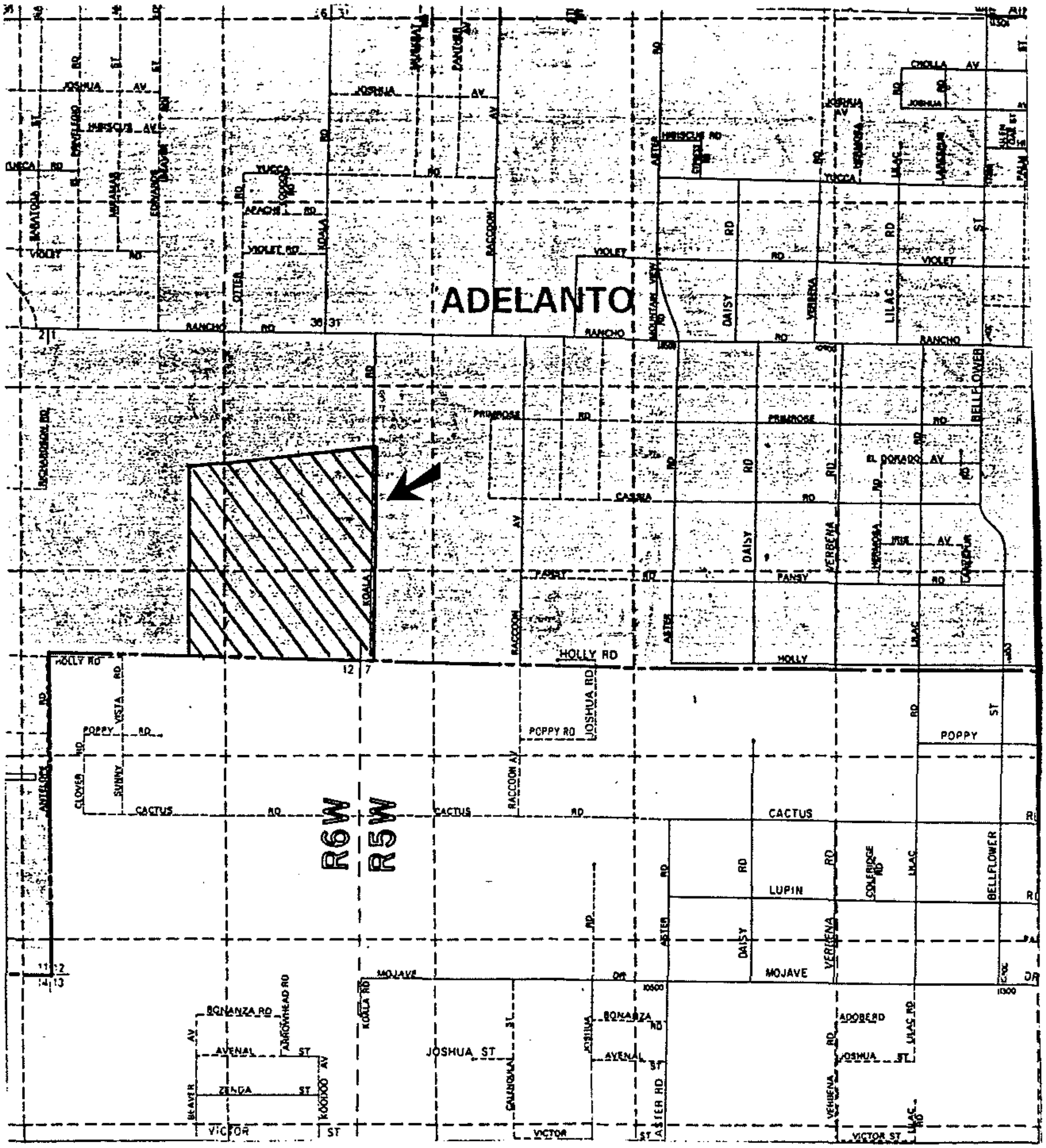


APPROXIMATE TEST PIT LOCATIONS

PLOT PLAN

JOB NO.	DATE:	PLATE #1
45024	12-29-89	

American Engineering Laboratories



SITE LOCATION MAP

JOB NO. 45024

DATE: 12-29-89

FIG 1A

AMERICAN ENGINEERING LABORATORIES

DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS		SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	∴	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			⁘	GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	▥	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			▨	GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	⁘	SW	Well graded sands, gravelly sands, little or no fines.
			∴	SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	▥	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			▨	SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		▥	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			▨	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays.
			▥	OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		▥	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			▨	CH	Inorganic clays of high plasticity, fat clays.
			▨	OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			≈	Pt	Peat and other highly organic soils.

GRAIN SIZES

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

200 40 10 4 3/4" 3" 12"

U.S. STANDARD SERIES SIEVE CLEAR SQUARE SIEVE OPENINGS

RELATIVE DENSITY

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENGTH**	BLOWS/FOOT*
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

*NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30-INCHES TO DRIVE A 2-INCH O.D. (1-3/8-INCH I.D.) SPLIT SPOON (ASTM D-1586).

**UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST (ASTM D-1586), POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION

KEY TO LOGS - UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

JOB NO.: 45024	DATE: 12-29-89	FIGURE: 2A

DATE OBSERVED: NOV. 14, 1989 METHOD OF DRILLING: CASE 580 C EXTENDAHOE

LOGGED BY: P.H. GROUND ELEVATION: EXISTING GRADE LOCATION: SEE LOCATION PLAN

TEST PIT NO. 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM	N/A		X			VERY LOOSE LT. BROWN SILTY MEDIUM TO COARSE SAND (RECENT ALLUVIUM)	SEE TEST RESULTS
	SM		X	X			GRAYISH BROWN FINE SILTY SAND, MODERATELY CEMENTED/TRACE OF CALICHE	
5	SM SC		X	X			LT. BROWN SILTY FINE TO MEDIUM SAND MODERATE TO STRONGLY CEMENTED. CALCAREOUS WEBBING THROUGHOUT (CALICHE)	
10	SM SC		X	X			GRAY SILTY MEDIUM TO LOOSE SILTY SAND W/COBBLES TO 2" TO 5"/ WITH MORE CALICHE	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED NOTE: TRENCH LOCATED IN MINOR "WASH"	

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 2

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM			X			DARK BROWN SILTY FINE SAND W/ TRACE OF ORGANIC/ROOTS (TOPSOIL)	SEE TEST RESULTS
	SM SC		X	X			LT. BROWN SILTY FINE-MEDIUM SAND, VERY STRONGLY CEMENTED	
5	SM SC		X	X			REDDISH BROWN MEDIUM TO COARSE SLIGHTLY SILTY SAND-MILD TO STRONGLY CEMENTED	
10	SM ML		X	X			GRAYISH BROWN SILTY VERY FINE TO FINE SAND, STRONGLY CEMENTED WITH INTERBEDDED LAYERS IF WHITISH CALCAREOUS MATERIAL	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024	LOG OF TEST PIT	FIGURE: 1

AMERICAN ENGINEERING LABORATORIES

DATE OBSERVED: NOV. 14, 1989 METHOD OF DRILLING: CASE 580 C EXTENDAHOE

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 3

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	GP			X			VERY LOOSE MEDIUM CLEAN COARSE GRAVELY SAND	SEE TEST RESULTS
	SM		X	X			LT. BROWN WELL GRADED SILTY SAND, MEDIUM CEMENTED W/TRACE OF CALCAREOUS WEBBING	
5 10	SM		X	X			BROWN SILTY FINE TO MEDIUM SAND/MEDIUM DENSE	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED NOTE: TRENCH LOCATED IN MEDIUM WASH	

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 4

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM			X			GRAYISH BROWN FINE TO MEDIUM SANDY SILT (TOPSOIL) W/TRACE OF ROOTS	SEE TEST RESULTS
5	SM		X	X			LT. REDDISH BROWN FINE TO COARSER WITH DEPTH SILTY SAND. MEDIUM CEMENTATION/NO EVIDENT WEBBING	
	SM SC		X	X			WHITISH GRAY SILTY FINE TO MEDIUM SAND-STRONG CEMENTATION WITH WEBBING AND CALCAREOUS CHUNKS	
10	SM		X	X			GRAY SILTY VERY FINE SAND, MEDIUM DENSE	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024	LOG OF TEST PIT	FIGURE: 2

AMERICAN ENGINEERING LABORATORIES

DATE OBSERVED: NOV. 15, 1989 METHOD OF DRILLING: CASE 580 C EXTENDAHOE

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 5

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM			X			LT. GRAYISH BROWN SILTY FINE TO MEDIUM SAND W/GRAVEL (LOOSE TO MED. DENSE)	SEE TEST RESULTS
	SM SC		X	X			LT. BROWN SILTY FINE TO MEDIUM SAND/ CALCAREOUS/STRONGLY CEMENTED	
5	SC		X	X			WHITISH GRAY VERY SILTY SAND-HIGHLY CEMENTED-VERY DIFFICULT DIGGING	
	SM SC		X	X			LT. BROWN SILTY MED. SAND W/CALCAREOUS WEBBING.	
10	SM		X	X			GRAY VERY FINE SILTY SAND, MEDIUM DENSE WITH INTERBEDDED LAYERS OF CEMENTED SAND	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 6

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM			X			VERY THIN TOPSOIL, THEN LT. GRAYISH WHITE SILTY MEDUIM TO COARSE SAND VERY DENSE	SEE TEST RESULTS
	SM SC		X	X			GRAYISH BROWN SILTY FINE TO MEDIUM COARSE SAND-EXTREMELY DENSE, CEMENTED	
5	SM SC		X	X			LT. BROWN SILTY FINE TO MEDIUM SAND WITH CALCAREOUS WEBBING THROUGHOUT. VERY DENSE	
10	GM SM		X	X			MOTTLED BROWNISH ORANGE GRAVELLY MED. TO COARSE SAND, MEDIUM TO STRONGLY CEMENTED. COBBLES TO 6" AT 9-9½ FT.	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024	LOG OF TEST PIT	FIGURE: 3

AMERICAN ENGINEERING LABORATORIES

DATE OBSERVED: NOV. 15, 1989 **METHOD OF DRILLING:** CASE 580 C EXTENDAHOE

LOGGED BY: P.H. **GROUND ELEVATION:** E.G. **LOCATION:** SEE LOCATION PLAN

TEST PIT NO. 7

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM	N/A		X			VERY DRY FIRM LIGHT BROWN FINE TO MEDIUM SILTY SAND W/THIN TOPSOIL	SEE TEST RESULTS
	SM SC		X	X			BROWN SILTY SAND W/TRACE OF CLAY-MEDIUM DENSE TO DENSE	
5 10	SM SC		X	X			LT. BROWN SILTY FINE/MEDIUM SAND WITH EXRENSIVE CALCAREOUS WEBBING AND STRONGLY CEMENTED	
	SM SC		X	X			WHITISH GRAY SLIGHTLY SILTY HIGHLY CEMENTED FINE TO COARSE SAND DIFFICULT TO DIG	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

LOGGED BY: P.H. **GROUND ELEVATION:** E.G. **LOCATION:** SEE LOCATION PLAN

TEST PIT NO. 8

0	SM	N/A		X			LT. BROWN LOOSE TO MEDIUM DENSE GRAVELLY SILTY SAND W/THIN TOPSOIL	SEE TEST RESULTS
	SM SC		X	X			LT. BROWN HIGHLY CEMENTED FINE TO MEDIUM SILTY SAND	
5	SC ML		X	X			AS ABOVE BUT "EXTREMELY DENSE MARGINAL REJECTION OF HOE	
10 15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024 **LOG OF TEST PIT** **FIGURE:** 4

DATE OBSERVED: NOV. 15, 1989 **METHOD OF DRILLING:** CASE 580 C EXTENDAHOE

LOGGED BY: P.H. **GROUND ELEVATION:** E.G. **LOCATION:** SEE LOCATION PLAN

TEST PIT NO. 9

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM						BROWN SILTY MEDIUM SAND W/TRACE GRAVEL-LOOSE TO MEDIUM DENSE,THIN TOPSOIL	SEE TEST RESULTS
	SM SC		X	X			GRAYISH BROWN HIGHLY CALCAREOUS SILTY SAND, FIRM -NON CEMENTED	
5	SM GM		X	X			BROWN GRAVELLY SILTY FINE TO COARSE SAND/HIGHLY CEMENTED	
	SM GM		X	X			AS ABOVE WITH CALCAREOUS WEBBING	
	SM SC		X				LT. GRAYISH BROWN GRAVELLY SLITY WELL GRADED SAND-MODERATELY CEMENTED	
10	SM SC						BROWN SILTY WELL GRADED SAND, STRONGLY CEMENTED-VERY DIFFICULT DIGGING	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

LOGGED BY: P.H. **GROUND ELEVATION:** E.G. **LOCATION:** SEE LOCATION PLAN

TEST PIT NO. 10

0	SM			X			BROWN SILTY MEDIUM SAND W/TRACE GRAVEL-LOOSE TO MEDIUM DENSE, THIN TOPSOIL	SEE TEST RESULTS
	SM SC		X	X			BROWN SILTY MEDIUM TO COARSE CEMENTED SAND	
5	SM SC		X				SAME AS ABOVE WITH CALCAREOUS WEBBING THROUGHOUT	
	SM GM		X	X			WHITISH GRAY GRAVELLY SILTY SAND, STRONGLY CEMENTED WITH WEBBING AND COBBLES TO 4"	
10	SC ML		X				MEDIUM GRAY VERY FINE SANDY SILT MEDIUM DENSE, SLIGHTLY PLASTIC, NO CEMENTATION	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024	LOG OF TEST PIT	FIGURE: 5

AMERICAN ENGINEERING LABORATORIES

DATE OBSERVED: NOV. 16, 1989 **METHOD OF DRILLING:** CASE 580 C EXTENDAHOE

LOGGED BY: P.H. **GROUND ELEVATION:** E.G. **LOCATION:** SEE LOCATION PLAN

TEST PIT NO. 11

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM	N/A		X			LT. BROWN SILTY MEDIUM/COARSE SAND, LOOSE (RECONT ALLUVIUM)	SEE TEST RESULTS
	SM		X	X			GRAY SILTY WELL GRADED HIGHLY CEMENTED SAND, TRACE OF WEBBING	
5	SM		X	X			BROWN GRAVELLY SILTY SAND /SANDY SILT , MODERATELY DENSE	
	SM SC		X				LT. BROWN SILTY FINE TO MEDIUM SAND W/CALCAREOUS WEBBING STRONGLY CEMENTED	
	SM SC		X				LT. GRAY FINE SANDY SILT-STRONGLY CEMENTED	
10	SM		X					
	SM		X				ORANGISH BROWN MED. TO COARSE SLIGHTY CEMENTED SAND W/TRACE GRAVEL	
15							MOTTLED BROWN/WHITE/ORANGE CLAYEY SILT/SANDY SILT-SOFT TO FIRM	
							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED NOTE: TRENCH IN DRAINAGE "WASH"AREA	

LOGGED BY: P.H. **GROUND ELEVATION:** E.G. **LOCATION:** SEE LOCATION PLAN

TEST PIT NO. 12

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM	N/A		X			LT. GRAY FINE SILTY SAND W/TRACE OF GRAVEL & THIN TOPSOIL	SEE TEST RESULTS
	SM		X				LT. GRAY FINE TO MEDIUM SAND SILT/ SILTY SAND.NUMEROUS VOIDS(ROOTS) & HIGHLY CEMENTED	
5	SM SP		X				GRAY SLIGHTLY CEMENTED MEDIUM-COARSE SAND, W/COBBLES 5"-7" AT BOTTOM	
10	SM		X				LT. GRAY VERY FINE SANDY SILT/ SILTY SAND-SLIGHTLY CEMENTED	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024	**LOG OF TEST PIT**	**FIGURE:** 6

AMERICAN ENGINEERING LABORATORIES

DATE OBSERVED: NOV. 16, 1989 METHOD OF DRILLING: CASE 580 C EXTENDAHOE

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 13

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM			X			DARK REDDISH BROWN FINE TO MEDIUM SANDY SILT W/TRACE OF GRAVEL-ROOTS-THIN TOPSOIL	SEE TEST RESULTS
	SM SC		X				MEDIUM BROWN HIGHLY CEMENTED SILTY FINE TO MEDIUM SAND W/CALCAREOUS WEBBING	
5	SM		X				GRAY VERY FINESANDY SILT/SILTY SAND	
	SM SC		X				GRAY STRONGLY CEMENTED WELL GRADED SAND, VERY CALCAREOUS. LENSES OF SLIGHTLY PLASTIC SILT W/TRACES OF SOFT WHITE CALCAREOUS MATEIAL	
10	SM		X					
							GRAY VERY FINE SANDY SILT/SILTY SAND-MEDIUM DENSE	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 14

0	SM GP			X			GRAY FINE SANY DILT/SILTY SAND W/ ANGULAR AND SUBANGULAR SMALL ROCKS OF VARIOUS TYPES	SEE TEST RESULTS
	SM		X				LT. GRAY VERY FINE SILTY LENSE	
	SM SC		X				WHITE/GRAY HIGHLY CEMENTED CALCAREOUS LENSE	
5	SM		X	X			GRAY VERY FINE SANDY SILT/SILTY SAND	
10	SM		X				GRAY LOOSE TO MEDIUM DENSE FINE TO MEDIUM SANDY SILT/SILTY SAND	
	SM SC		X				GRAY FINE TO MEDIUM SANDY SILT, FIRM TO STIFF, SLIGHTLY MOIST, APPEARS SLIGHTLY PLASTIC	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024	LOG OF TEST PIT	FIGURE: 7

AMERICAN ENGINEERING LABORATORIES

DATE OBSERVED: NOV. 16, 1989 METHOD OF DRILLING: CASE 580 C EXTENDAHOE

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 15

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM	N/A		X			LT. BROWN VERY FINE SANDY SILT/SILTY SAND W/COARSE SAND & GRAVEL (RECENT ALLUVIUM)THIN TOPSOIL	SEE TEST RESULTS
5	SM GM		X	X			BROWN SILTY WELL GRADED SAND W/GRAVEL (COARSER)	
	SM		X				BROWN SILTY COARSE SAND, SLIGHTLY CEMENTED	
	SC		X				HIGHLY CEMENTED VERY CALCAREOUS LENSE	
10	SM		X				BROWN SILTY FINE TO MEDIUM SAND. CEMENTED, CALCAREOUS WEBBING	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

LOGGED BY: P.H. GROUND ELEVATION: E.G. LOCATION: SEE LOCATION PLAN

TEST PIT NO. 16

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM	N/A		X			MED. BROWN SILTY SAND, TRACE OF GRAVEL-LOOSE	SEE TEST RESULTS
	SM		X	X			BROWN CEMENTED SILTY FINE TO MEDIUM SAND-DIFFICULT DIGGING	
5	SM SC		X				WHITISH GRAY SILTY FINE TO MEDIUM SAND, VERY STRONGLY CEMENTED MODERATE REJECTION	
10 15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024	LOG OF TEST PIT	FIGURE: 8

AMERICAN ENGINEERING LABORATORIES

DATE OBSERVED: NOV. 16, 1989 **METHOD OF DRILLING:** CASE 580 C EXTENDAHOE

LOGGED BY: P.H. **GROUND ELEVATION:** E.G. **LOCATION:** SEE LOCATION PLAN

TEST PIT NO. 17

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	SOIL TEST
0	SM			X			LT. TO MEDIUM BROWN SILTY VERY FINE TO MEDIUM SAND W/TRACE OF GRAVEL VERY LOOSE	SEE TEST RESULTS
5	SM		X				BROWN CEMENTED SILTY FINE TO MEDIUM SAND	
	SM SC		X				WHITISH GRAY VERY STRONGLY CEMENTED SILTY FINE SAND (CALCAREOUS) STRONG REJECTION	
10 15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

LOGGED BY: P.H. **GROUND ELEVATION:** E.G. **LOCATION:** SEE LOCATION PLAN

TEST PIT NO. 18

0	SM	N/A		X			BROWN SILTY SAND W/GRAVEL LOOSE TO MEDIUM DENSE WITH NUMEROUS ROOTS	SEE TEST RESULTS
5	SM SC		X	X			GRAYISH BROWN VERY DENSE CALCAREOUS STRONGLY CEMENTED WELL GRADED SAND.	
			X				6" LENSE OF BROWN FINE SAND W/SLIGHT CEMENTATION AT 7' 6"	
10							REJECTION	
15							BOTTOM OF EXCAVATION NO WATER ENCOUNTERED	

JOB NO.: 45024

LOG OF TEST PIT

FIGURE: 9

AMERICAN ENGINEERING LABORATORIES

APPENDIX C1.2

Track Nos. 31286 and 91269, City of Moreno Valley

PETRA

OFFICES IN THE COUNTIES OF
ORANGE ▪ SAN DIEGO ▪ RIVERSIDE ▪ LOS ANGELES ▪ SAN BERNARDINO

May 3, 2004
J.N. 289-03

Mr. Mike McGovern
RICHMOND AMERICAN HOMES OF CALIFORNIA, INC.
16845 Von Karman Avenue, Suite 100
Irvine, CA 92606

Subject: **Geotechnical Review of Rough Grading Plans, Tract Nos. 31268 and 31269, City of Moreno Valley, Riverside County, California**

References: See Attached List

Dear Mr. McGovern:

In accordance with your request, we have reviewed the 40-scale rough grading plans for the site prepared by Adams Streeter Civil Engineers, Inc., dated February, 2004. This report presents a summary of our review of the plans, as well as our geotechnical recommendations for rough grading of the site and for design and construction of foundations for the proposed structures.

Petra Geotechnical, Inc., appreciates this opportunity to be of continued service. Please call if you have any questions pertaining to the information presented in this report.

Respectfully submitted,

PETRA GEOTECHNICAL, INC.

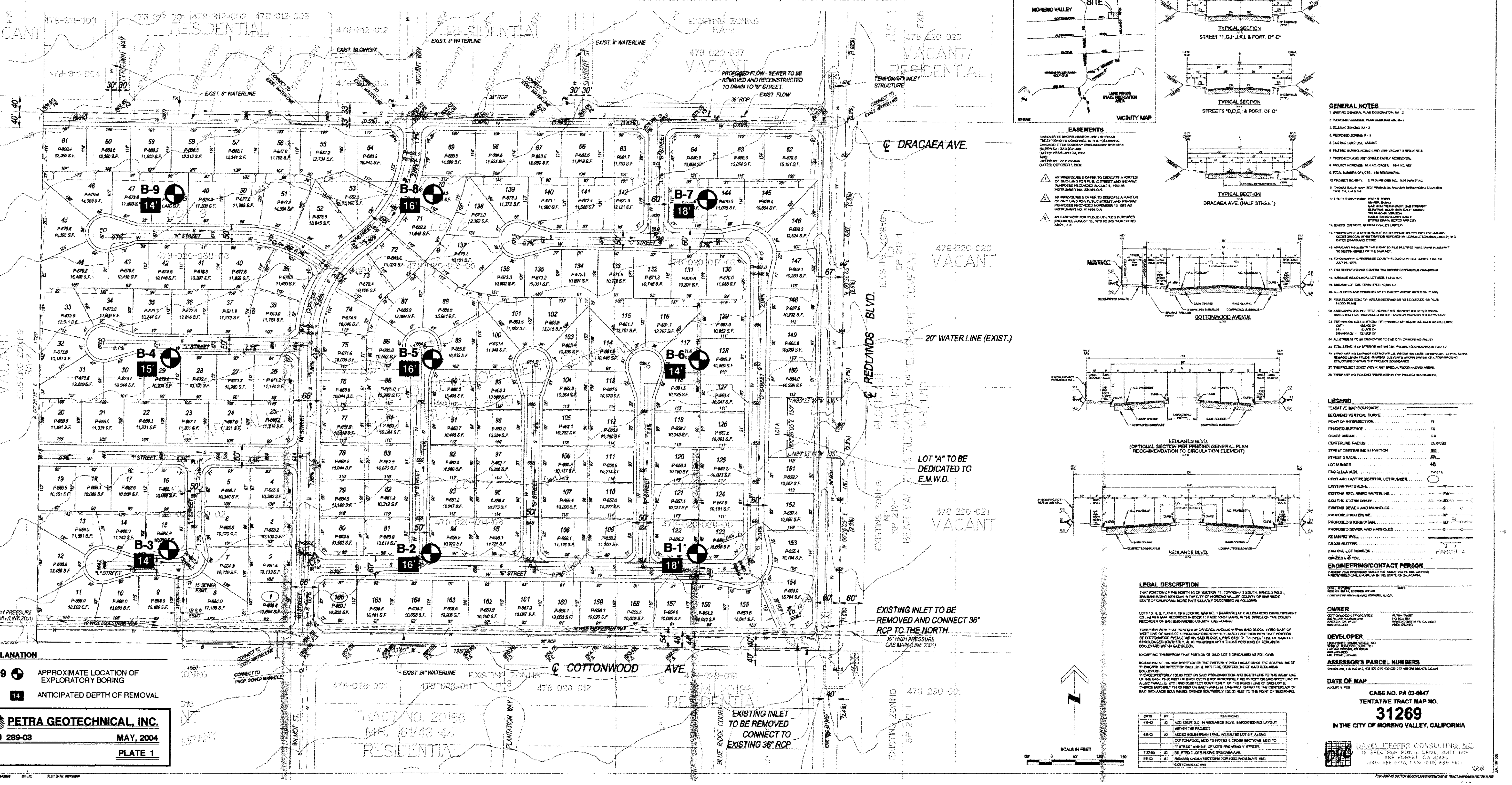
Robert W. Ruff
Vice President

CITY OF MORENO VALLEY

TENTATIVE TRACT MAP NO. 31269

JULY 24, 2003 - 55.81 ACRES

AP# 478-020-010, 478-020-013, 478-020-014, 478-020-017, 478-020-038, 478-020-039



EXPLANATION

B-9 ⊕ APPROXIMATE LOCATION OF EXPLORATORY BORING

14 ANTICIPATED DEPTH OF REMOVAL

PETRA GEOTECHNICAL, INC.

JN 289-03 MAY, 2004

PLATE 1

ASSESSOR'S PARCEL NUMBERS

DATE OF MAP

CASE NO. PA 03-0047

TENTATIVE TRACT MAP NO.

31269

IN THE CITY OF MORENO VALLEY, CALIFORNIA

DAVID JEFFERS CONSULTING, INC.

TENTATIVE TRACT MAP 31268

8.9 ACRES±/APN 478-030-013-6

MARCH, 2003

OWNER:

MICHAEL T. & DONNA S. LUA
C/O HIGHPOINTE COMMUNITES
24361 EL TORO RD. STE. 100
LAGUNA WOODS, CA. 92653-2738
(949) 472-0800

APPLICANT:

STEVE LUDWIG
HIGHPOINTE COMMUNITIES
24361 EL TORO RD. STE. 100
LAGUNA WOODS, CA. 92653-2738
(949) 472-0800

ENGINEER/REPRESENTATIVE:

DAVID CURRINGTON-R.C.E. 58883
ENGINEERING SOLUTIONS
1465 SPRUCE ST. STE. B
RIVERSIDE, CA [illegible]
(909) 784-0286

EARTHWORK

	CUT (CY)	FILL (CY)
RAW VOLUMES:	34,638	15,445
SUBSIDENCE (0.2'):	–	2,893
OVEREX (10'):	144,667	144,667
SUBTOTAL:	179,305	163,005
SHRINKAGE (10%):	–	16,300
TOTAL:	179,305	179,305

NET EXPORT/IMPORT: 0 CY IMPORT

GENERAL NOTES:

1. ASSESSORS PARCEL NO. : 478-030-013-6
2. THIS MAP IS LOCATED WITHIN RIVERSIDE COUNTY.
3. CURRENT ZONING : R-3
4. PROPOSED ZONING : R-3
5. SURROUNDING ZONING: AS SHOWN
6. ACREAGE BEING DIVIDED :
   GROSS AREA: (LESS CURRENT R/W) 8.91 AC.
   NET AREA: (LESS R/W DEDICATED BY THIS MAP) 8.82 AC.
7. THE PROJECT IS NOT SUBJECT TO OVERFLOW, INUNDATION, OR FLOOD HAZARD.
8. THIS PROJECT IS LOCATED IN ZONE X, FEMA PANEL #065074-0030B
9. TOTAL LOTS : 26 RESIDENTIAL
10. MINIMUM LOT SIZE : 10,000 SF
11. ADJACENT LAND USE : SINGLE FAMILY RESIDENTIAL
12. EXISTING LAND USE : VACANT
13. PROPOSED LAND USE : SINGLE FAMILY RESIDENTIAL
14. STREET IMPROVEMENTS: PER ORDINANCE 460, SCHEDULE A.
15. YEAR 2002 THOMAS BROS. MAP BOOK PAGE: 688 COORD.: E-4
16. ALL LOTS SHALL HAVE 1% MIN. GRADE TOWARD STREET FOR DRAINAGE PURPOSES.
17. THE PROJECT IS NOT SUBJECT TO LIQUEFACTION OR OTHER GEOLOGIC HAZARDS, AND IS NOT WITHIN A SPECIAL STUDIES ZONE.
18. THIS PROJECT IS NOT LOCATED WITHIN A COMMUNITY SERVICE AREA.
19. ALL EXISTING EASEMENTS ARE TO REMAIN IN THEIR CURRENT DESIGNATED LOCATION UNLESS OTHERWISE NOTED.
20. NO SUBSURFACE SEPTIC SEWAGE DISPOSAL IS PROPOSED.
21. THERE ARE NO MOBILE HOMES OR RECREATIONAL VEHICLE SPACES, UNITS OR LOTS PROPOSED WITHIN THIS TRACT.
22. ALL SLOPES ARE 2:1 UNLESS OTHERWISE NOTED.
23. THERE ARE NO KNOWN WELLS ON THE PROPERTY OR WITHIN 200 FEET OF THE TRACT BOUNDARY
24. NO EXISTING DWELLINGS OR BUILDINGS ON THE SITE
25. CONTOURS DERIVED FROM PHOTO MAP PREPARED BY RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT MAP IS OF SECTION 11, T.3S., R.3W. SBB&M
26. NO COMMON AREAS OR OPEN SPACES ARE PLANNED.
27. THERE ARE NO EXISTING TREES OR ROCK FEATURES ON SITE.

UTILITIES:

WATER & SEWER : EASTERN MUNICIPAL WATER DISTRICT
P.O. BOX 8300
PERRIS, CA. 92572
(909) 928-5379

ELEC. : SOUTHERN CALIFORNIA EDISON CO.
26100 MENIFEE RD.
ROMOLAND, CA 92585
(909) 928-8207

TEL : VERIZON
150 SOUTH JUANITA ST.
HEMET, CA 92543
(800) 483-4000

GAS : SOUTHERN CALIFORNIA GAS CO.
25528 KELVIN COURT
MURRIETA, CA 92562
(909) 304-0093

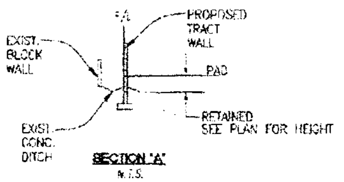
CATV : ADELPHIA CABLE
4077 W. STETSON AVE
HEMET, CA 92545
(909) 859-0020

CONTIGUOUS OWNERSHIP:

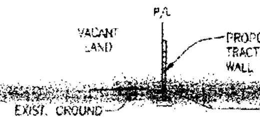
THE OWNERS REPRESENT THIS TO BE ALL OF THEIR ENTIRE CONTIGUOUS OWNERSHIP.

SCHOOL DISTRICT:

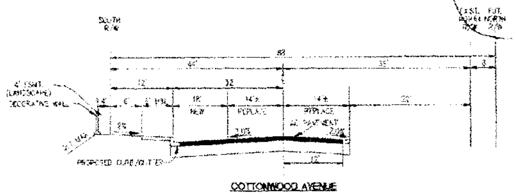
MORENO VALLEY UNIFIED SCHOOL DISTRICT
25634 ALLESANDRO BLVD.
MORENO VALLEY, CA. 92553
(909) 485-5600



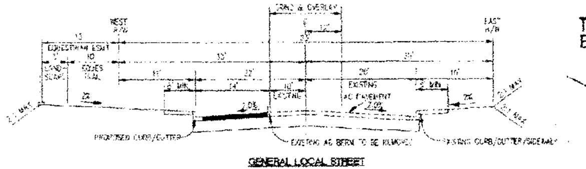
SECTION 'A'
N.T.S.



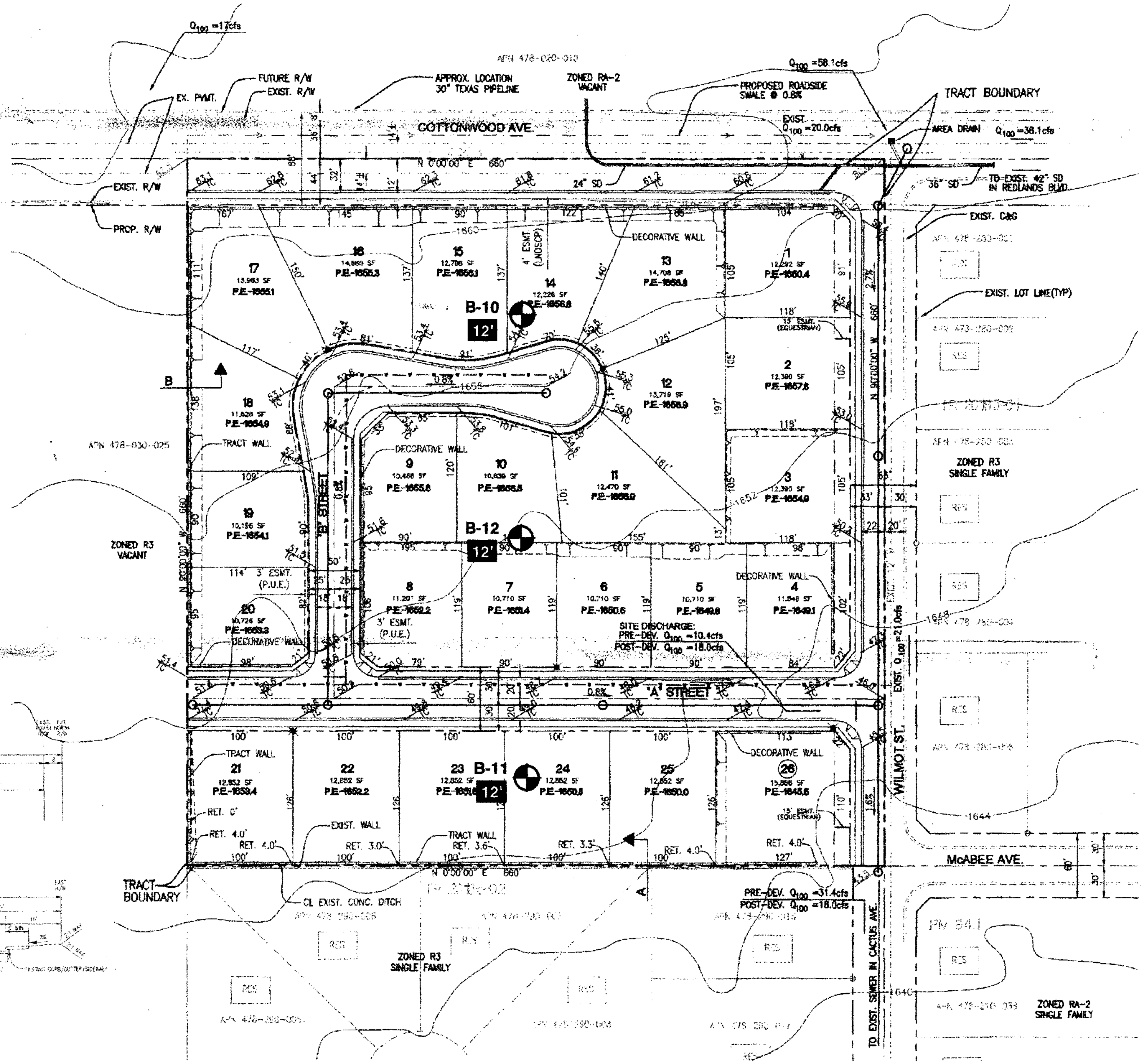
SECTION 'B'
N.T.S.

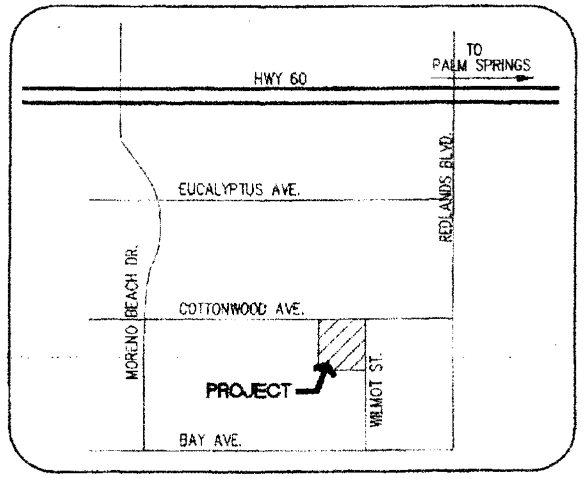


COTTONWOOD AVENUE
N.T.S.



GENERAL LOCAL STREET
WILMOT STREET
N.T.S.





VICINITY MAP

NTS

LEGEND

— · — · —	TRACT BOUNDARY
- - - - -	CENTERLINE
——1652——	EXISTING CONTOUR
————	PROPOSED CONTOUR
————	LOT LINE
1	LOT NUMBER
P.E.=1660.0	PAD ELEVATION
TOP / TOE	SLOPE (2:1 UNLESS OTHERWISE NOTED)
—○—	SEWER LINE WITH MANHOLE
	CROSS GUTTER WITH FLOW DIRECTION
✱	PROPOSED STREET LIGHT
○	EXISTING STREET LIGHT

G.B.	GRADE BREAK
T.C.	TOP/CURB
F.S.	FINISH SURFACE
F.L.	FLOW LINE
C.L.	CENTER LINE
R	RADIUS
L	LENGTH
B.V.C.	BEGIN VERTICAL CURVE
E.V.C.	END VERTICAL CURVE

LEGAL DESCRIPTION

THE LAND SHOWN HEREON IS SITUATED IN THE STATE OF CALIFORNIA, COUNTY OF RIVERSIDE AND IS DESCRIBED AS FOLLOWS:

LOT 3 OF BLOCK 89, BEAR VALLEY AND ALLESANDRO DEVELOPMENT CO. MAP NO. 1, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 11, PAGE 10 OF MAPS, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA.

TOGETHER WITH THAT PORTION OF COTTONWOOD AVENUE WITHIN SAID BLOCK LYING BETWEEN THE NORTHERLY PROLONGATIONS OF THE EAST AND WEST LINES OF SAID LOT.

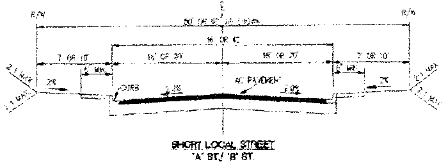
0 30' 60' 120' 180'

EXPLANATION

B-12 ⊕ APPROXIMATE LOCATION OF EXPLORATORY BORING

12 ANTICIPATED DEPTH OF REMOVAL

PETRA GEOTECHNICAL, INC.
JN 289-03 MAY, 2004
PLATE 2



SHORT LOCAL STREET
'A' ST./'B' ST.
N.T.S.

SEAL-ENGINEER
No. CE 58883
Exp. 6-30-07

NO.	DATE	REVISIONS
1	8/6/03	EXTENDED 'A' STREET TO WEST PROPERTY LINE DECREASED LOT COUNT TO 26 REVISED LAYOUT DECREASED WILMOT ST. TO 33' HALF WIDTH

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
1465 SPRUCE STREET - STE. B
RIVERSIDE, CA. 92507
PHONE - 909.784.0286
FAX - 909.784.0287

PREPARED BY:

DAVID G. CURRINGTON
R.C.E. C58883

DATE
EXP. 06-30-07

COUNTY OF RIVERSIDE

TENTATIVE TRACT 31268
MORENO VALLEY, CA.

CITY PROJECT NO.
PA 03003B

SHEET 1
OF 1

Key to Soil and Bedrock Symbols and Terms

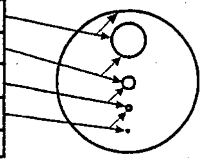
PETRA

Unified Soil Classification System

Coarse-grained Soils > 1/2 of materials is larger than #200 sieve	The No. 200 U.S. Standard Sieve is about the smallest particle visible to the naked eye	GRAVELS more than half of coarse fraction is larger than #4 sieve	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
			Gravels with fines	GM	Silty Gravels, poorly-graded gravel-sand-silt mixtures
				GC	Clayey Gravels, poorly-graded gravel-sand-clay mixtures
		SANDS more than half of coarse fraction is smaller than #4 sieve	Clean Sands (less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
			Sands with fines	SM	Silty Sands, poorly-graded sand-gravel-silt mixtures
				SC	Clayey Sands, poorly-graded sand-gravel-clay mixtures
Fine-grained Soils > 1/2 of materials is smaller than #200 sieve		SILTS & CLAYS Liquid Limit Less Than 50		ML	Inorganic silts & very fine sands, silty or clayey fine sands, clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts & clays of low plasticity
		SILTS & CLAYS Liquid Limit Greater Than 50		MH	Inorganic silts, micaceous or diatomaceous fine sand or silt
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic silts and clays of medium-to-high plasticity
Highly Organic Soils				PT	Peat, humus swamp soils with high organic content

Grain Size

Description		Sieve Size	Grain Size	Approximate Size
Boulders		>12"	>12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized to
Fines		Passing #200	<0.0029"	Flour-sized and smaller



Laboratory Test Abbreviations

MAX	Maximum Dry Density	MA	Mechanical (Particle Size) Analysis
EXP	Expansion Potential	AT	Atterberg Limits
SO4	Soluble Sulfate Content	#200	#200 Screen Wash
RES	Resistivity	DSU	Direct Shear (Undisturbed Sample)
pH	Acidity	DSR	Direct Shear (Remolded Sample)
CON	Consolidation	HYD	Hydrometer Analysis
SW	Swell	SE	Sand Equivalent
CL	Chloride Content	OC	Organic Content
RV	R-Value	COMP	Mortar Cylinder Compression

Modifiers

Trace	< 1 %
Few	1 - 5%
Some	5 - 12 %
Numerous	12 - 20 %

Sampler and Symbol Descriptions

▽	Approximate Depth of Seepage
▼	Approximate Depth of Standing Groundwater
■	Modified California Split Spoon Sample
▨	Standard Penetration Test
░	Bulk Sample
◫	Shelby Tube
⊠	No Recovery in Sampler

Bedrock Hardness

Soft	Can be crushed and granulated by hand; "soil like" and structureless
Moderately Hard	Can be grooved with fingernails; gouged easily with butter knife; crumbles under light hammer blows
Hard	Cannot break by hand; can be grooved with a sharp knife; breaks with a moderate hammer blow
Very Hard	Sharp knife leaves scratch; chips with repeated hammer blows

Notes:

Blows Per Foot: Number of blows required to advance sampler 1 foot (unless a lesser distance is specified). Samplers in general were driven into the soil or bedrock at the bottom of the hole with a standard (140 lb.) hammer dropping a standard 30 inches unless noted otherwise in Log Notes. Drive samples collected in bucket auger borings may be obtained by dropping non-standard weight from variable heights. When a SPT sampler is used the blow count conforms to ASTM D-1586

EXPLORATION LOG

Project: Moreno 192		**Boring No.:** B- 1	
Location: Tentative Tracts 31268 & 31269, Moreno Valley, Calif.		**Elevation:** 1656	
Job No.: 289-03	**Client:** Richmond American	**Date:** 8/18/03	
Drill Method: Hollow-Stem Auger	**Driving Weight:** 140 lbs / 30 in	**Logged By:** DPO/EP	

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal) Silty Sand (SM): Olive gray; dry to slightly moist; loose to medium dense; fine-grained sand; porous.				▨			MAX EXP SO4 pH RES CL RV
				3 3 6	■		4.8	99.2	
5									
		Silty Sand (SM): Olive gray; dry; loose to medium dense; very fine- to fine-grained sand; some medium- and coarse-grained sand, trace of fine-grained gravel; porous.		3 5 8	■		4.9	99.5	
		@9 Feet: Less porosity.		4 5 9	■		3.4	103.7	
10									
		@12 Feet: Occasional root filaments.		4 5 10	■		4.0	98.9	
15		Silty Sand (SM): Olive gray; dry; medium dense; very fine- to fine-grained sand.		5 7 7	■		2.0	101.0	
		Sand (SP): Gray; dry to slightly moist; medium dense; fine-grained sand; some light brown silt inclusions, less porous, slightly more friable than material above.		5 6 9	■		2.0	98.6	CON
20									
		Silty Sand (SM): Gray; dry; medium dense; fine-grained sand; some pods of course grained sand, slightly porous.		5 7 11	■		4.0	100.5	
		@24 Feet: Becomes dry to slightly moist, some inclusions of tan and white silt, some porosity.		4	■		6.9	97.0	CON

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 1**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1656**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
				5 7	■				
30		Silty Sand (SM): Reddish-brown; moist; medium dense to dense; fine-grained sand; some medium- to coarse-grained sand, porous.		7 11 13	■		3.7	115.7	
						▨			
35		Silty Sand (SM): Reddish-brown; moist; medium dense to dense; fine-grained sand; moderately to very porous.		6 9 10	■	▨			
40		Silty Sand (SM): Reddish-brown to light grayish brown; slightly moist; dense; fine-grained sand; slight pinhole porosity, abundant caliche.		11 25 43	■				
45		Sandy Silt to Silty Sand (ML/SM): Gray; dry to slightly moist; dense; fine-grained sand; pods of medium- and coarse-grained sand, slight porosity.		15 24 26	■				
		Sandy Silt to Silty Sand (ML/SM): Reddish-brown; moist; dense; fine-grained sand; some lenses of medium- and coarse-grained sand,		14	■				

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 1**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1656**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per 6-inch	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		slight porosity.		31 43	■				
		Total Depth = 50.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 2**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1660**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Material Description	Water	Samples			Laboratory Tests		
			Blows Per 6-inch	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	ALLUVIUM (Qal) Silty Sand (SM): Light grayish-brown; dry; loose; fine-grained sand; some medium- and coarse-grained sand, porous, rootlets.		2 4 3	■				
5	Silty Sand (SM): Light grayish-brown; dry to slightly moist; loose to medium dense; fine-grained sand; some medium- and coarse-grained sand, moderately porous, some caliche.		3 6 7	■		5.7	94.4	
10	Silty Sand (SM): Light grayish-brown; slightly moist; loose to medium dense; fine- to coarse-grained sand; rare fine-grained gravel, sub-angular, trace rootlets.		4 6 6	■		1.6	108.5	
	Silty Sand (SM): Pale olive-gray; slightly moist to moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, some gravel, slightly porous, minor caliche.		3 4 4	■		3.7	103.4	
15			3 4 6	■		4.6	103.8	
			2 3 4	■		4.4	104.7	CON
20	Sand to Silty Sand (SP/SM): Pale olive-gray; moist; loose to medium dense; fine-grained sand; some medium- and coarse-grained sand.		2 3 3	■		3.2	102.3	
	Silty Sand (SM): Pale olive-gray; slightly moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, moderately porous.		3 4 6	■		9.7	98.7	CON

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 2**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1660**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

				Samples			Laboratory Tests		
Depth (Feet)	Lith-ology	Material Description	Water	Blows Per 6-inch	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		Silty Sand (SM): Pale olive-gray; slightly moist to moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, micaceous, no visible porosity,.		4 5 6	■				
30		@29 Feet: Some black iron-oxide mineral grains.		6 6 7	■				
		Total Depth = 30.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project:	**Moreno 192**	Boring No.:	**B- 3**
Location:	**Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**	Elevation:	**1664**
Job No.: **289-03**	Client: **Richmond American**	Date:	**8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By:	**DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal) Silty Sand (SM): Pale olive-gray; dry; medium dense; fine-grained sand; some pods of medium- and coarse-grained sand, slightly to moderately porous, trace roothairs, minor caliche.							
5				4 7 11	■		4.8	106.8	
		@7 Feet: Becomes moderately porous, some gray silt inclusions.		3 5 5	■		5.7	92.9	
10		@10 Feet: Becomes moderately to very porous.		4 4 8	■		6.9	95.8	CON
		@13 Feet: Decrease in porosity.		4 5 7	■		6.4	97.6	
15									
		Silty Sand (SM): Pale olive-gray; dry; medium dense; fine-grained sand; slight to moderate porosity.		4 5 8	■		6.5	99.8	CON
20		Sand (SP): Gray; dry; medium dense to dense; fine- to coarse-grained sand; some gravel up to 0.75".		6 7 8	■		1.3	104.3	
		Silty Sand (SM): Pale olive-gray; dry to slightly moist; medium dense to dense; fine-grained sand; some pods of medium- to coarse-grained sand, slightly to moderately porous, trace roothairs, minor caliche.		9 11 15	■		7.4	115.4	

PLATE A-6

EXPLORATION LOG

Project: **Moreno 192**		Boring No.:	**B- 3**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation:	**1664**
Job No.: **289-03**	Client: **Richmond American**	Date:	**8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By:	**DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per 6-inch	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		Silty Sand (SM): Pale olive-gray; dry to slightly moist; medium dense to dense; fine-grained sand; rare fine-grained gravel, sub-rounded, moderately porous, pores filled with caliche, no burrows.		7 13 20	■		9.9	104.8	
30									
		Clayey Silt (ML): Medium brown; moist; stiff to very stiff; some fine-grained sand, parting surfaces.		10 20 29	■				
35									
		Clayey Silt (ML): Medium brown; moist; stiff to very stiff; some fine-grained sand, moderate porosity.		7 9 15	■				
		Total Depth = 38.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 4**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1674**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per 6-inch	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		ALLUVIUM (Qal) Silty Sand (SM): Pale olive-gray; dry; loose to medium dense; fine-grained sand; some medium- to coarse-grained sand, moderate porosity, roothairs, some caliche filled pores.							
				4 4 6	■		4.1	104.0	
5									
		@6 Feet: Becomes fine- to coarse-grained sand, less porosity, no caliche.		4 4 7	■		2.8	105.6	
10		Silty Sand (SM): Pale olive-gray; dry; loose to medium dense; fine-grained sand; some coarse-grained sand, rare fine-grained gravel, moderate porosity.		4 7 8	■		3.6	101.8	
		@12 Feet: Becomes slightly porous.		5 7 8	■		4.3	96.7	
15		Silty Sand (SM): Pale olive-gray; dry; loose to medium dense; fine-grained sand; some coarse-grained sand, rare gravel up to 0.5", moderately porous.		6 9 12	■		2.6	106.9	
		Sand (SP): Pale olive-gray; dry; medium dense to dense; fine- to coarse-grained sand.		4 7 11	■		1.2	109.9	CON
20									
		Clayey Silt (ML): Pale olive-gray; slightly moist; stiff to very stiff; micaceous, caliche infilling.		10 11 12	■		5.9	112.5	
		Silty Sand (SM): Pale reddish-brown; slightly moist; medium dense to dense; fine-grained sand; some medium- and coarse-grained sand.		7	■				

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 4**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1674**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
				8 9	■				
		Silty Sand (SM): Reddish-brown; slightly moist; dense; fine-grained sand; very slight pinhole porosity.		6 9 16	■				
30		Silty Sand (SM): Yellowish-brown; slightly moist; dense; fine-grained sand; very slight pinhole porosity.		7 7 9	■				
		Total Depth = 31.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 5**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1671**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
	ALLUVIUM (Qal) Silty Sand (SM): Pale olive-gray; dry; loose; fine-grained sand; porous, some caliche filled pores.		4 4 5	■	▨	4.4	96.9	SO4 pH RES CL
5	Silty Sand (SM): Pale olive-gray; dry; loose; fine-grained sand; some medium-grained sand, less silt.		4 5 8	■	▨	4.3	97.7	
	Silty Sand (SM): Pale olive-gray; dry; medium dense; fine-grained sand; some silt inclusions, porous.		5 6 7	■		4.9	106.8	
10								
	@11 Feet: some medium- to coarse-grained sand, moderately porous, some caliche filled pores.		5 6 9	■		4.7	106.8	CON
	@14 Feet: Dry, some gravel up to 2.0".		5 7 8	■		1.7	118.6	
15								
	Sand (SP): Pale gray; dry; medium dense to dense; fine- to coarse-grained sand; gravel up to 1.5".		7 11 14	■		1.1	100.0	
20	@20 Feet: Becomes dense to very dense, gravel up to 0.5".		9 11 12	■		1.2	113.1	
	Silty Sand (SM): Pale tan-gray; dry; medium dense to dense; fine-grained sand; rare silt inclusions, some pinhole porosity.		4 5 7	■				

EXPLORATION LOG - V3 289-03.GPJ PETRA.GDT 4/29/04

PLATE A-10

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 5**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1671**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lithology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per 6-inch	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	▥								
	▨	Clayey Sand (SC): Dark brown; moist; dense to very dense; fine-grained sand; some medium-grained sand, slight pinhole porosity, some caliche filled pores.		6 12 14	■		6.2	117.8	
		Total Depth = 27.5 Feet No Groundwater Encountered.							

PLATE A-11

EXPLORATION LOG

Project:	**Moreno 192**	Boring No.:	**B- 6**
Location:	**Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**	Elevation:	**1666**
Job No.: **289-03**	Client: **Richmond American**	Date:	**8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By:	**DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal) Silty Sand (SM): Pale olive-gray; dry; medium dense; fine-grained sand; some gravel up to 0.75", slight pinhole porosity.							
5				11 11 11	■		3.9	111.2	
		@7 Feet: Becomes very porous, increase in silt content.		5 5 6	■		8.6	92.7	CON
10		Silty Sand (SM): Pale olive-gray; dry; medium dense; fine-grained sand; some silt inclusions, slightly less porous, minor caliche stringers.		4 7 8	■		5.0	100.9	
		@13 Feet: Trace increase in moisture and caliche content.		6 7 10	■		7.7	99.2	
15									
		@16 Feet: Porous, pods of medium- to coarse-grained sand.		4 6 6	■		2.6	101.1	CON
20		Sand (SP): Pale brownish-gray; dry; medium dense to dense; very fine- to fine-grained sand; micaceous.		6 7 6	■		3.0	83.9	CON
		@22 Feet: Some pods of coarse-grained sand and fine-grained gravel.		4 5 5	■		3.0	98.3	

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 6**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1666**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/18/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples Blows Per 6-inch	Samples Core	Samples Bulk	Laboratory Tests Moisture Content (%)	Laboratory Tests Dry Density (pcf)	Laboratory Tests Other Lab Tests
	⁞	Silty Sand (SM): Pale olive-gray; slightly moist; dense; fine-grained sand; some medium- and coarse-grained sand, some pinhole porosity.		4 5 9	■				
	⁞	@28 Feet: Becomes slightly less porous.		5 6 8	■				
30	⁞								
	▨	Sandy Clay (CL): Dark reddish-brown; moist; dense to very dense; very slight pinhole porosity, few fine caliche stringers.		5 7 9	■				
		Total Depth = 31.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 7**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1674**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal) Silty Sand (SM): Pale olive-gray; slightly moist; loose; fine-grained sand; some medium- and coarse-grained sand, moderate porosity,.							
5				3 4 4	■		5.4	102.6	
		@8 Feet: Becomes slightly more moist, very slight porosity, some fine-grained gravel.		5 8 11	■		5.6	106.9	
10									
		Silty Sand (SM): Pale olive-gray; dry to slightly moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, slight pinhole porosity.		5 6 10	■		3.7	101.0	CON
		@14 Feet: Some silt inclusions, becomes moderately porous, rare roothairs.		5 6 10	■		6.8	104.5	
15									
		@17 Feet: Becomes moderately porous to porous, with some pores up to 1/8".		4 5 8	■		4.5	99.6	CON
20		@20 Feet: Decrease in porosity and silt content.		5 7 9	■		5.6	99.8	
				4 5 7	■		3.8	99.0	CON

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 7**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1674**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Interbedded Sand and Silty Sand (SP/SM): Pale olive-gray to gray; dry to slightly moist; dense; fine- to coarse-grained sand; Some gravel up to 1.0", no visible porosity.		7 9 10	■		2.3	108.4	
30	▨	Silty Sand with trace Clay (SC/SM): Reddish-brown; moist; dense; fine-grained sand; some coarse-grained sand, slight porosity, some pores caliche-filled.		6 9 11	■				
		Total Depth = 30.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project:	**Moreno 192**	Boring No.:	**B- 8**
Location:	**Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**	Elevation:	**1678**
Job No.: **289-03**	Client: **Richmond American**	Date:	**8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By:	**DPO/EP**

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal) Silty Sand (SM): Pale olive-gray; dry; loose; fine-grained sand; some silt inclusions, rare gravel up to 3/8", porous.							
				3 3 4	■		4.7	98.0	
5									
		Silty Sand (SM): Pale olive-gray; dry to slightly moist; loose; fine-grained sand; less silt inclusions, slightly porous.		4 5 8	■		4.1	100.0	
10		Silty Sand (SM): Pale olive-gray; dry to slightly moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, rare fine-grained gravel, moderate porosity.		6 7 9	■		6.3	101.0	
				4 5 6	■		3.8	104.6	CON
15		Silty Sand (SM): Pale olive-gray; dry to slightly moist; medium dense; fine-grained sand; decrease in silt content, slight to moderate porosity.		5 5 7	■		3.2	106.2	CON
		Sand (SP): Pale gray; dry; medium dense to dense; fine-grained sand.		4 5 6	■		1.7	97.9	
20									
		Silty Sand (SM): Pale tan; dry to slightly moist; dense; fine-grained sand; some fine-grained gravel, slight pinhole porosity.		4 4 6	■		2.4	105.6	CON
		@24 Feet: Some silt inclusions, slight porosity.		6	■				

EXPLORATION LOG - V3 289-03.GPJ PETRA.GDT 4/29/04

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 8**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1678**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
				7 9	■				
		@27 Feet: Becomes mottled pale tan to gray, some caliche.		7 10 12	■				
		Total Depth = 28.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 9**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1682**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal) Silty Sand (SM): Pale olive-gray; dry; medium dense; fine-grained sand; some fine-grained gravel, pinhole porosity.							
5				6 7 7			4.6	104.1	
		Silty Sand (SM): Pale olive-gray; slightly moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, rare fine-grained gravel, moderate porosity, caliche stringers.		4 6 7			4.9	98.9	
10		Silty Sand (SM): Pale olive-gray; slightly moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, some fine-grained gravel, little or no porosity.		4 5 5			3.4	99.0	
		@13 Feet: Slight porosity.		4 6 5			2.4	109.2	
15									
		Gravelly Sand (SP): Pale olive-gray; slightly moist; dense; fine- to coarse-grained sand; some gravel up to 1.25".		7 13 13			1.2	113.9	
20		Silty Sand (SM): Pale olive-gray; slightly moist to moist; medium dense; fine-grained sand; moderate porosity.		4 6 9			12.1	100.0	CON
		Silty Sand (SM): Pale olive-gray; slightly moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, lenses of medium- and coarse grained sand, slight porosity.		6 8 8			4.1	103.6	

EXPLORATION LOG

Project: **Moreno 192**		Boring No.:	**B- 9**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation:	**1682**
Job No.: **289-03**	Client: **Richmond American**	Date:	**8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By:	**DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per 6-inch	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	▨	Silty Sand with Clay (SM): Mottled olive and olive gray; moist; dense; fine-grained sand; slight porosity, some caliche filled pores.		5 10 12	■				
30	▨	Clayey Sand (SC): Reddish-brown; moist; very stiff/dense; fine- to medium-grained sand; some fine-grained sand inclusions, slight pinhole porosity.		6 6 8	■		9.2	102.7	
35	▨	Clayey Sand (SC): Reddish-brown; moist; very stiff/dense; fine-grained sand; some medium-grained sand.		13 20 22	■				
40	▨	Clayey Sand (SC): Reddish-brown; moist; stiff to very stiff; fine-grained sand; some medium- and coarse-grained sand, slight pinhole porosity, caliche filled pores.		9 16 16	■				
45		Clayey Silt (ML): Pale olive-gray; moist; stiff; some fine-grained sand, few coarse-grained sand, slight porosity, some caliche filled pores.		10 12 16	■				

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B- 9**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1682**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
	▨	Silty Sand (SM): Reddish-brown; moist; medium dense to dense; fine-grained sand; some medium- and coarse-grained sand, slight porosity.		8 14 24	■				
		Total Depth = 51.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B-10**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1658**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per 6-inch	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
5	▒	**ALLUVIUM (Qal)** Silty Sand (SM): Pale tan; dry; loose; fine-grained sand; some medium- and coarse-grained sand, some pinhole porosity, few roothairs.		3 5 5	■		4.2	105.0	
	▒	Silty Sand (SM): Pale gray; dry; loose; fine-grained sand; slight porosity.		3 4 5	■		3.9	101.7	
10	▒	Silty Sand (SM): Pale yellowish-tan; dry to slightly moist; medium dense; fine-grained sand; some pinhole porosity, minor caliche stringers.		4 6 9	■		7.4	100.5	CON
15	▒	Silty Sand (SM): Pale yellowish-tan; dry to slightly moist; medium dense; fine-grained sand; moderate porosity, minor caliche.		4 5 6	■		6.2	99.1	
	▒	Silty Sand (SM): Pale gray; dry; medium dense; fine-grained sand; slightly porous.		3 5 7	■		3.4	99.5	
20	▒	Silty Sand (SM): Pale gray; dry to slightly moist; medium dense; fine-grained sand; some medium- and coarse-grained sand, some fine-grained gravel, some silt inclusions, slightly porous.		4 6 9	■		7.1	96.3	CON
	▨	Clayey Sand (SC): Reddish-brown; slightly moist; dense; fine-grained sand; slight porosity, very minor caliche.		7 11 13	■		9.3	111.0	

EXPLORATION LOG

Project: **Moreno 192**		Boring No.:	**B-10**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation:	**1658**
Job No.: **289-03**	Client: **Richmond American**	Date:	**8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By:	**DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
	▨	Sandy Clay (CL): Yellowish-brown; moist; stiff; fine-grained sand; some medium- and coarse-grained sand, very slight porosity, minor caliche stringers.		11 17 17	■		6.4	119.0	
30	▨	Clayey Sand (SC): Yellowish-brown; moist; dense; fine-grained sand; very slight pinhole porosity, some caliche stringers.		8 11 15	■				
35	▨	@35 Feet: Becomes very dense, no visible porosity.		16 22 26	■				
40	▨	@40 Feet: Becomes dense, slight to moderate porosity.		8 17 22	■				
45	⁝	Silty Sand (SM): Pale gray; slightly moist; dense; fine- to coarse-grained sand; some fine-grained gravel, no visible porosity.		7 10 11	■				

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B-11**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1649**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
	▨			11 13	■				
30	▨	@29 Feet: Some caliche filled pores.		8 12 14	■				
		Total Depth = 30.5 Feet No Groundwater Encountered.							

EXPLORATION LOG

Project: **Moreno 192**		Boring No.: **B-12**
Location: **Tentative Tracts 31268 & 31269, Moreno Valley, Calif.**		Elevation: **1652**
Job No.: **289-03**	Client: **Richmond American**	Date: **8/19/03**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **DPO/EP**

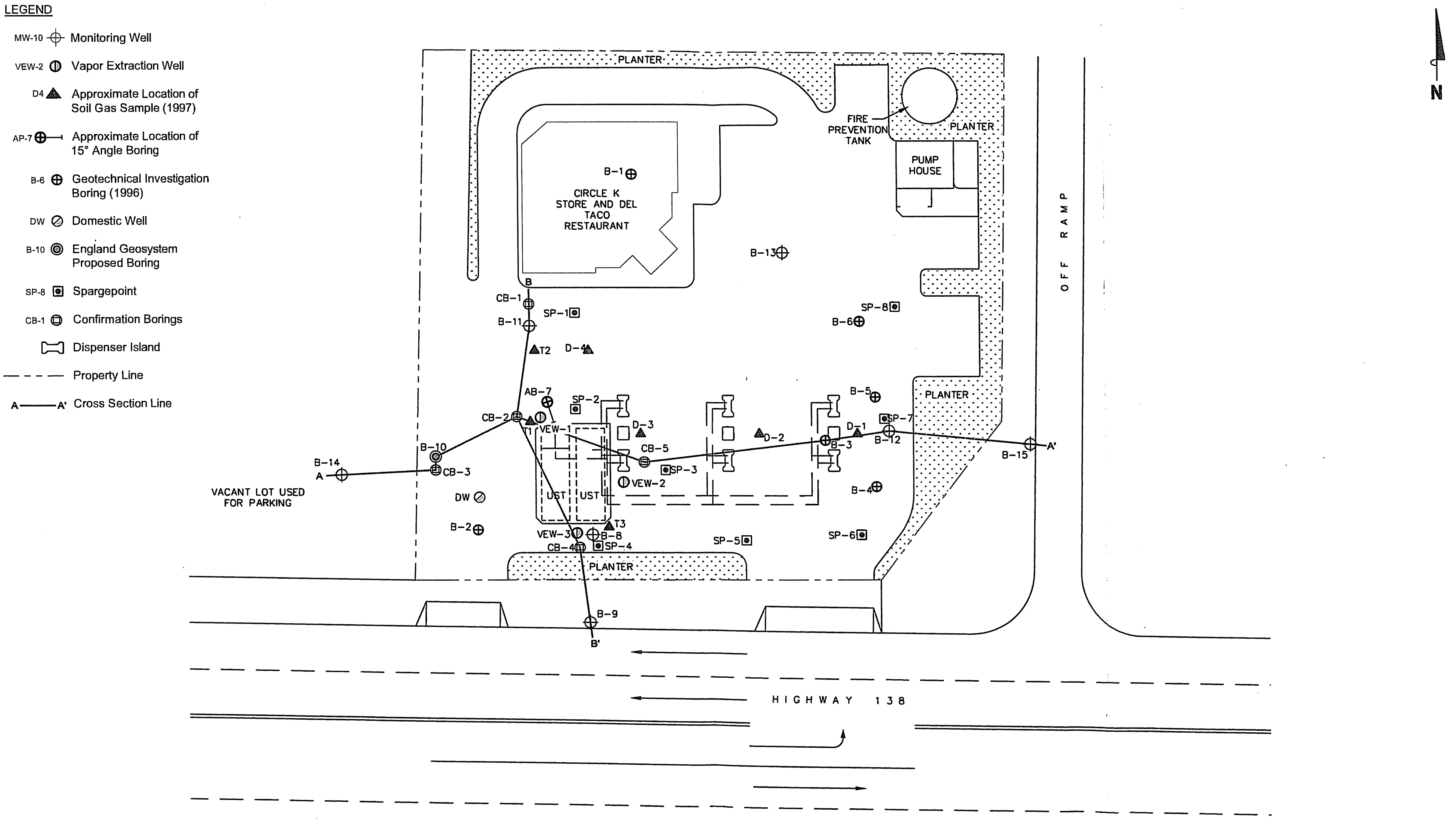
Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per 6-inch	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
	▨	@26 Feet: Becomes dense to very dense, some fine-grained gravel, some sand inclusions.		6 9 12	■				
30	░	Silty Sand with Clay (SM): Yellowish-brown; moist; dense to very dense; fine-grained sand; some caliche.		8 17 22	■				
		Total Depth = 31.5 Feet No Groundwater Encountered.							

APPENDIX C2

SWRCB GeoTracker Database

APPENDIX C2.1

Circle K Station 5961



NOTES:

UST = Underground Storage Tanks. All dimensions and locations are approximate

SOURCE:

Modified from a figure produced for ConocoPhillips by England Geosystem Environmental Engineering

SCALE (FEET)
0 30

TRC

PROJECT: **20040090**

FACILITY:
Circle K Station 5961
8324 Highway 138
Phelan, California

SITE PLAN SHOWING CROSS SECTION LOCATION LINES

FIGURE 2

MS=1:1 N:□PROJECTS□76PROD□5961□GRAPHICS□5961_Site Plan.dwg; X-sect, May 15, 2007-3:41pm kdrilling

PROJECT NO.: 600629
LOCATION: Circle K Station 5961
8324 Highway 138
Phelan, California

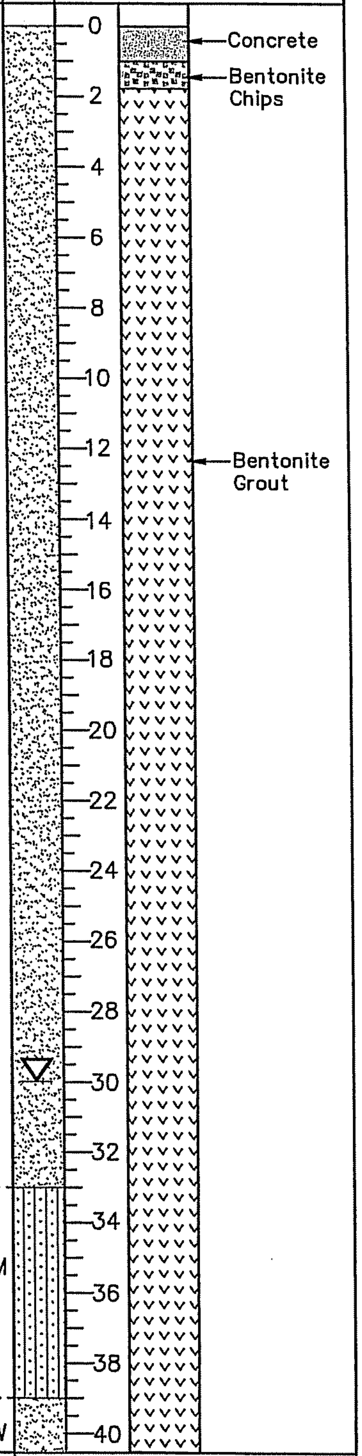
DATE DRILLED: April 17, 2007
LOGGED BY: M. Furtaw
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 30 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Surface Material: 3" Asphalt. Air-knifed to 5 feet below grade.	SW
9/10/12	0.0		5	SAND: moderate yellowish brown (10YR 5/4), medium dense, slightly moist, fine- to coarse-grained sand, some gravel, well graded.	
12/12/14	0.0		10	Same as above.	
17/21/17	0.0		15	Same as above; dense.	
12/17/23	0.0		20	Same as above.	
14/19/21	0.0		25	Same as above.	
19/22/24	0.0		30	Same as above; wet.	
19/19/21	0.0		35	SILTY SAND: moderate yellowish brown (10 YR 5/4), dense, wet, fine- to coarse-grained sand, some clay, well graded.	SM
			39.5		SW

GRAPHIC LOG

BORING CONSTRUCTION DETAIL



TRC

LOG OF EXPLORATORY BORING

CB-1

PAGE 1 OF 2

PROJECT NO.: 600629
LOCATION: Circle K Station 5961
8324 Highway 138
Phelan, California

DATE DRILLED: April 17, 2007
LOGGED BY: M. Furtaw
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 30 feet

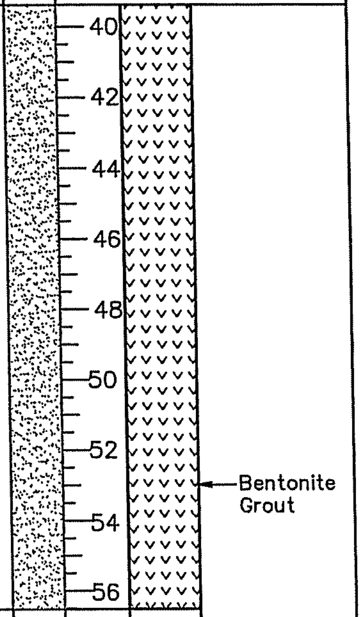
BLOWS PER 6 INCHES	PID (ppm)	DEPTH (feet below grade)	DESCRIPTION	USCS
17/21/23	0.0	40	SAND: moderate yellowish brown (10YR 5/4), dense, wet, fine- to coarse-grained sand, some gravel, well graded.	SW
18/25/26	0.0	45	Same as above; very dense.	
20/23/28	0.0	50	Same as above.	
21/23/27	0.0	55	Same as above.	

Bottom of Boring: 56.5 fbg.

Approximate materials used:

1.4 cu.ft. of Concrete
19 cu.ft. of Bentonite

PROFESSIONAL GEOLOGIST
JOSEPH M. CARUSO
NO. 7879
STATE OF CALIFORNIA



LOG OF EXPLORATORY BORING

CB-1
PAGE 2 OF 2

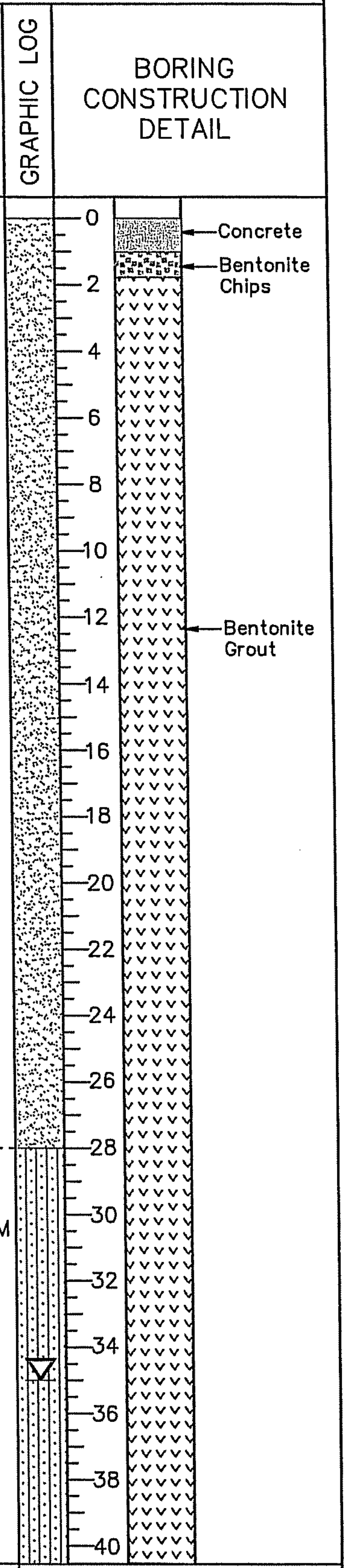
N:\PROJECTS\76PROD\5961\GRAPHICS\5961_BLOG_CB-1 through CB-5.dwg; CB-1 (2 of 2), May 08, 2007-1:59pm kdrilling

PROJECT NO.: 600629
LOCATION: Circle K Station 5961
8324 Highway 138
Phelan, California

DATE DRILLED: April 17, 2007
LOGGED BY: M. Furtaw
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 35 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Surface Material: 3" Asphalt. Air-knifed to 5 feet below grade.	SW
5/7/10	0.0			SAND: moderate yellowish brown (10YR 5/4), medium dense, moist, fine- to coarse-grained sand, some gravel, well graded.	
18/14/18	0.0		10	Same as above; dense.	
20/23/24	0.0			Same as above; dusky yellowish brown (10YR 2/2), abundant decomposed black wood material.	
20/25/28	0.0		20	Same as above; moderate yellowish brown (10YR 5/4).	
18/23/26	0.0			Same as above.	
			28		
19/27/28	0.0		30	SILTY SAND: moderate yellowish brown (10YR 5/4), dense, moist, fine- to coarse-grained sand, some gravel, well graded.	SM
22/23/27	0.0			Same as above; wet.	



TRC

LOG OF EXPLORATORY BORING

CB-2
PAGE 1 OF 2

PROJECT NO.: 600629	DATE DRILLED: April 17, 2007
LOCATION: Circle K Station 5961 8324 Highway 138 Phelan, California	LOGGED BY: M. Furtaw
	APPROVED BY: J. Caruso, PG
	DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow–Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 35 feet

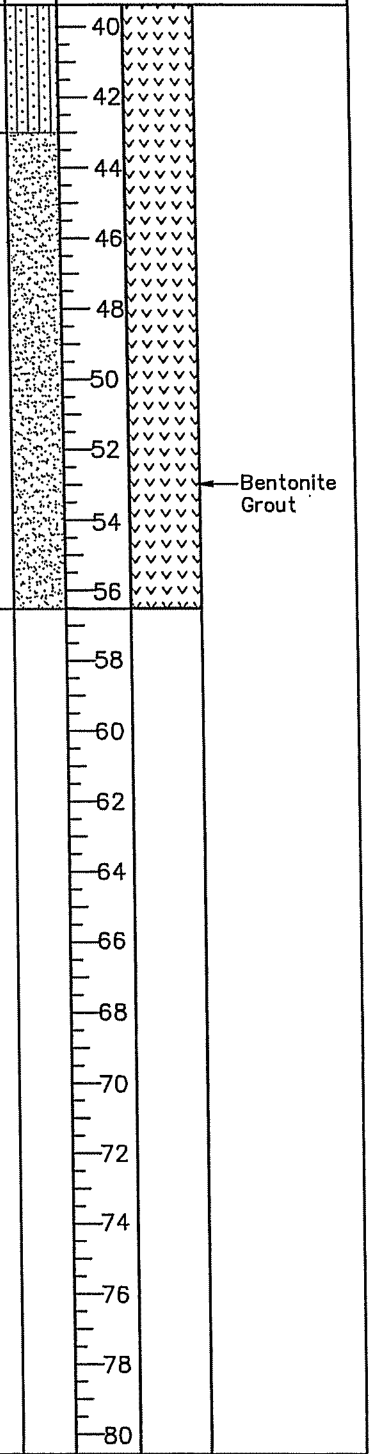
BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
21/25/30	0.0			Same as above.	SM
22/32/32	0.0			SAND: moderate yellowish brown (10YR 5/4), dense, wet, fine- to coarse-grained sand, some gravel, well graded.	SW
23/27/31	0.0			Same as above.	
22/25/30	0.0			Same as above.	

Bottom of Boring: 56.5 fbg.

Approximate materials used:

1.4 cu.ft. of Concrete
19 cu.ft. of Bentonite

JOSEPH M. CARUSO
NO. 7879



TRC

LOG OF EXPLORATORY BORING

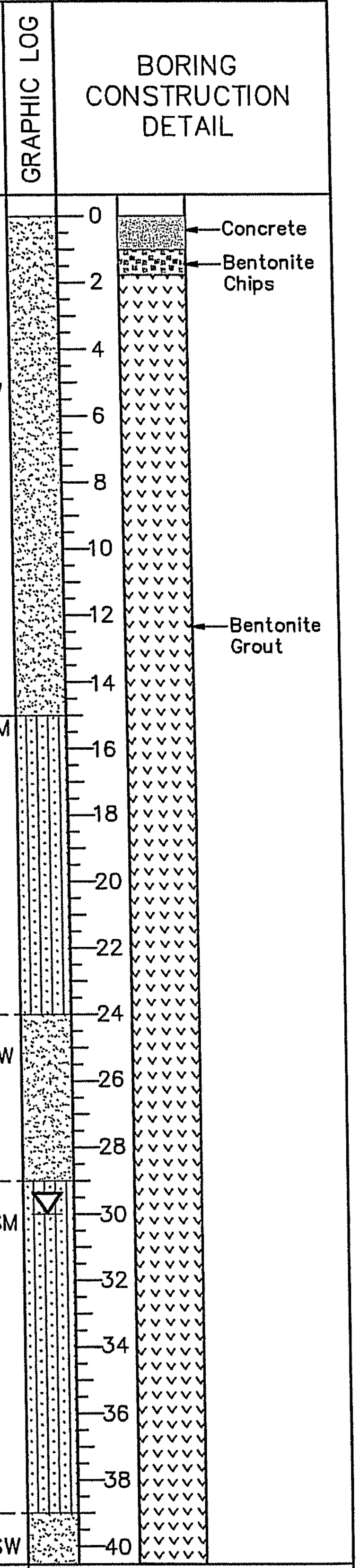
CB-2

PROJECT NO.: 600629
LOCATION: Circle K Station 5961
8324 Highway 138
Phelan, California

DATE DRILLED: April 17, 2007
LOGGED BY: M. Furtaw
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 30 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Surface Material: 2" Asphalt. Air-knifed to 5 feet below grade.	
14/18/20	0.0	☐	5	SAND: moderate yellowish brown (10YR 5/4), dense, moist, fine- to coarse-grained sand, well graded.	SW
18/20/20	0.0	☐	10	Same as above.	
13/14/17	0.0	☐	15	SILTY SAND: dusky yellowish brown (10YR 2/2), dense, moist, fine- to coarse-grained sand, some gravel, well graded.	SM
18/23/25	0.0	☐	20	Same as above.	
13/17/21	0.0	☐	25	SAND: moderate yellowish brown (10YR 5/4), dense, moist, fine- to coarse-grained sand, well graded.	SW
18/23/25	0.0	☐	30	SILTY SAND: dusky yellowish brown (10YR 2/2), dense, moist, fine- to coarse-grained sand, some gravel, well graded.	SM
12/17/19		☒	35	No soil recovered, dense.	
			40		SW



LOG OF EXPLORATORY BORING

CB-3
PAGE 1 OF 2

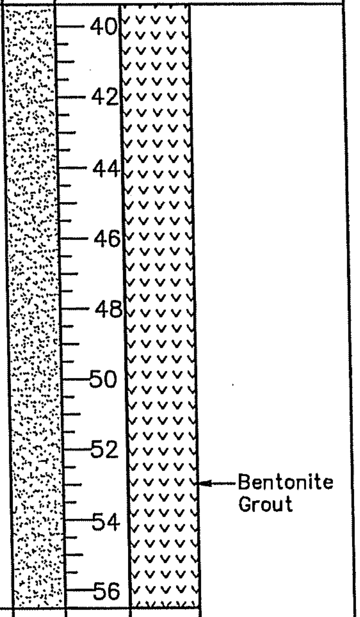
N: \PROJECTS\76PROD\5961\GRAPHICS\5961_BLOG_CB-1 through CB-5.dwg; CB-3 (1 of 2), May 08, 2007-1:59pm kdrilling

PROJECT NO.: 600629
LOCATION: Circle K Station 5961
8324 Highway 138
Phelan, California

DATE DRILLED: April 17, 2007
LOGGED BY: M. Furtaw
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 30 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
19/22/22	0.0		40	SAND: moderate yellowish brown (10YR 5/4), dense, moist, fine- to coarse-grained sand, some gravel, well graded.	SW
9/21/22	0.0		45	Same as above.	
19/23/25	0.0		50	Same as above.	
19/23/27	0.0		55	Same as above.	
			56.5	Bottom of Boring: 56.5 fbg.	



Approximate materials used:

1.4 cu.ft. of Concrete
19 cu.ft. of Bentonite

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NO. 7879
STATE OF CALIFORNIA

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LOG OF EXPLORATORY BORING

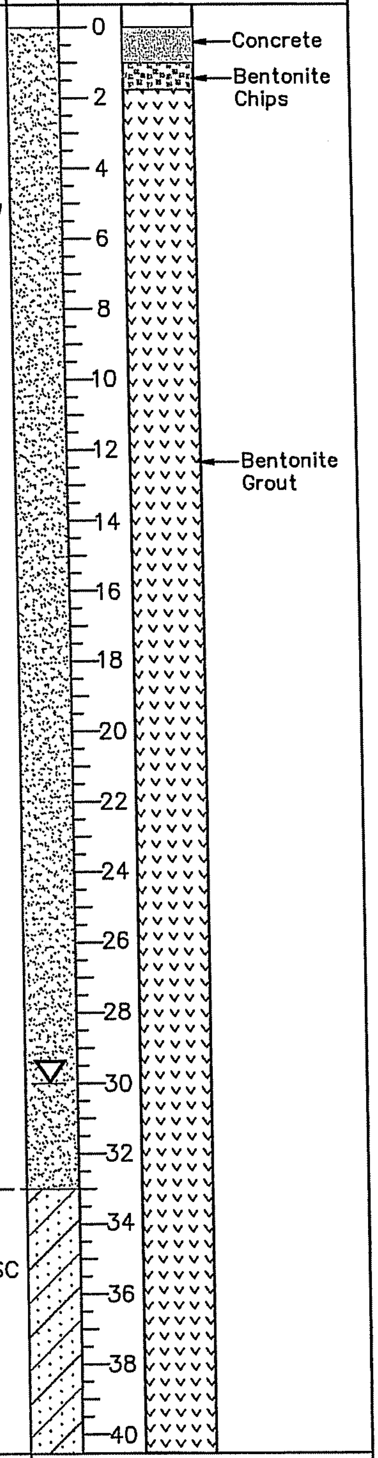
CB-3

PROJECT NO.: 600629
LOCATION: Circle K Station 5961
8324 Highway 138
Phelan, California

DATE DRILLED: April 16, 2007
LOGGED BY: M. Furtaw
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 30 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Surface Material: 6" Concrete. Air-knifed to 5 feet below grade.	
				Silty sand with cobbles.	
5/8/10	0.0			SAND: moderate yellowish brown (10YR 5/4), medium dense, moist, fine- to coarse-grained sand, some gravel, well graded.	SW
14/18/22	0.0		10	Same as above; dense.	
13/19/20	0.0			Same as above.	
19/23/25	0.0		20	Same as above.	
21/23/25	0.0			Same as above.	
12/14/18	0.0		30	Same as above; wet.	
14/19/19	0.0			CLAYEY SAND: moderate yellowish brown (10YR 5/4), dense, wet, fine- to coarse-grained sand, some gravel, well graded.	SC
			40		



TRC

LOG OF EXPLORATORY BORING

CB-4

PROJECT NO.: 600629	DATE DRILLED: April 16, 2007
LOCATION: Circle K Station 5961	LOGGED BY: M. Furtaw
8324 Highway 138	APPROVED BY: J. Caruso, PG
Phelan, California	DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 30 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS	GRAPHIC LOG	BORING CONSTRUCTION DETAIL
19/21/21	0.0			Same as above.	SC		
19/22/25	0.0			SAND: moderate yellowish brown (10YR 5/4), dense, wet, fine- to coarse-grained sand, some gravel, well graded.	SW		
12/17/25	0.0			Same as above.			Bentonite Grout
17/19/23	0.0			Same as above; with gravel.			
				Bottom of Boring: 56.5 fbg.			

Approximate materials used:

1.4 cu.ft. of Concrete
19 cu.ft. of Bentonite

PROFESSIONAL GEOLOGIST
JOSEPH M. CARUSO
NO. 7879
STATE OF CALIFORNIA

TRC

LOG OF EXPLORATORY BORING

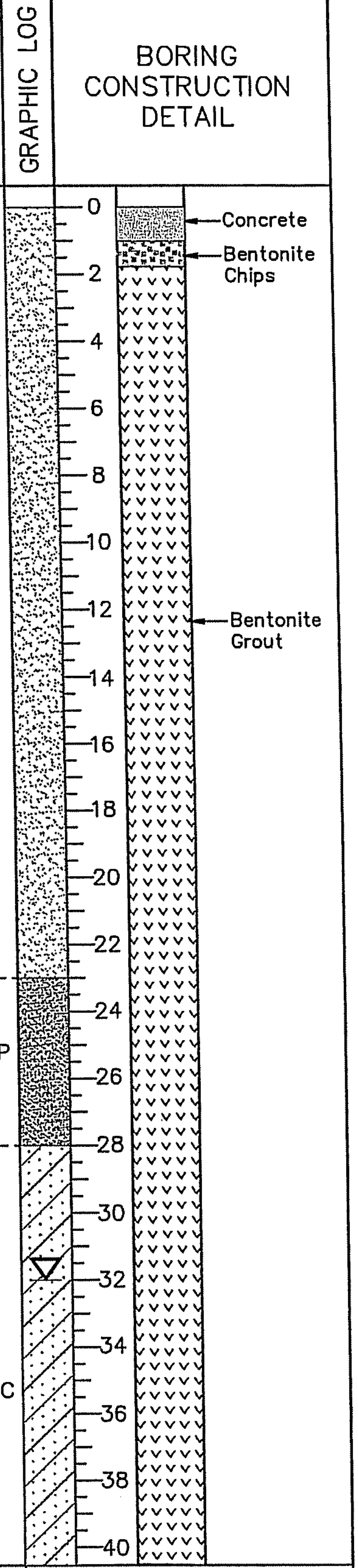
CB-4
PAGE 2 OF 2

PROJECT NO.: 600629
LOCATION: Circle K Station 5961
8324 Highway 138
Phelan, California

DATE DRILLED: April 16, 2007
LOGGED BY: M. Furtaw
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 32 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Surface Material: 6" Concrete. Air-knifed to 5 feet below grade.	
12/14/18	0.0		5	SAND WITH GRAVEL: moderate yellowish brown (10YR 5/4), dense, moist, fine- to coarse-grained sand, well graded.	SW
10/21/25	0.0		10	Same as above.	
21/25/30	0.0		15	Same as above; dusky yellowish brown (10YR 2/2).	
23/23/25	0.0		20	Same as above; some clay (10YR 5/4), very dense.	
26/24/28	0.0		25	Same as above; very dense, less fines, poorly graded.	SP
80 for 3"	0.0		30	CLAYEY SAND: dark yellowish brown (10YR 4/2), very dense, very moist, fine- to coarse-grained sand, well graded.	
7/14/21	0.0		35	Same as above; dense, wet.	SC



TRC

LOG OF EXPLORATORY BORING

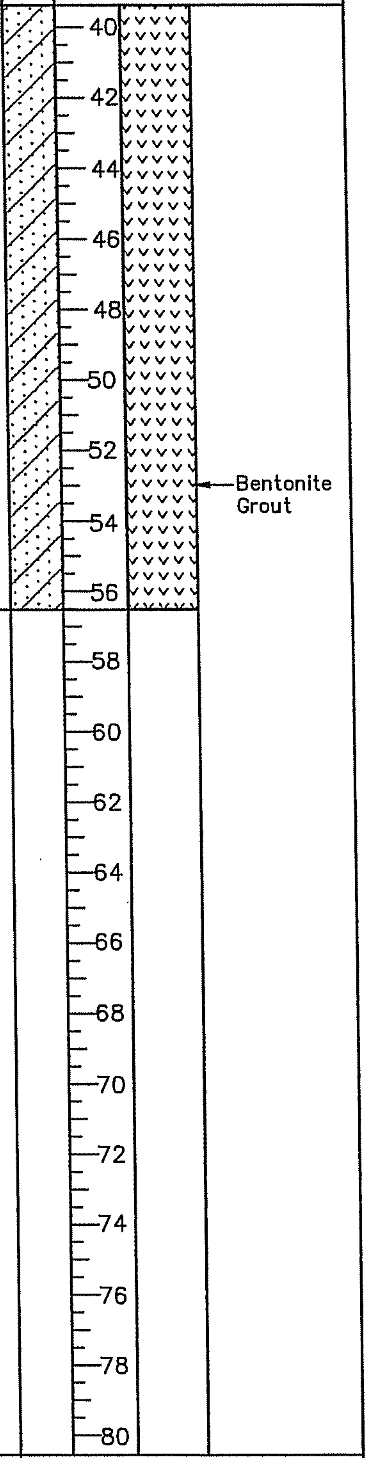
CB-5

PROJECT NO.: 600629
LOCATION: Circle K Station 5961
8324 Highway 138
Phelan, California

DATE DRILLED: April 16, 2007
LOGGED BY: M. Furtaw
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/LAR

DRILLING METHOD: Hollow-Stem Auger (8" diameter)
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 56.5 feet DEPTH TO WATER: 32 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
22/23/24	0.0	▯	40	Same as above.	SC
18/23/25	0.0	▯	45	Same as above.	
27/30/33	0.0	▯	50	Same as above; very dense.	
28/30/35	0.0	▯	55	Same as above.	
			56.5	Bottom of Boring: 56.5 fbg. Approximate materials used: 1.4 cu.ft. of Concrete 19 cu.ft. of Bentonite	



PROFESSIONAL GEOLOGIST
JOSEPH M. CARUSO
NO. 7879
STATE OF CALIFORNIA

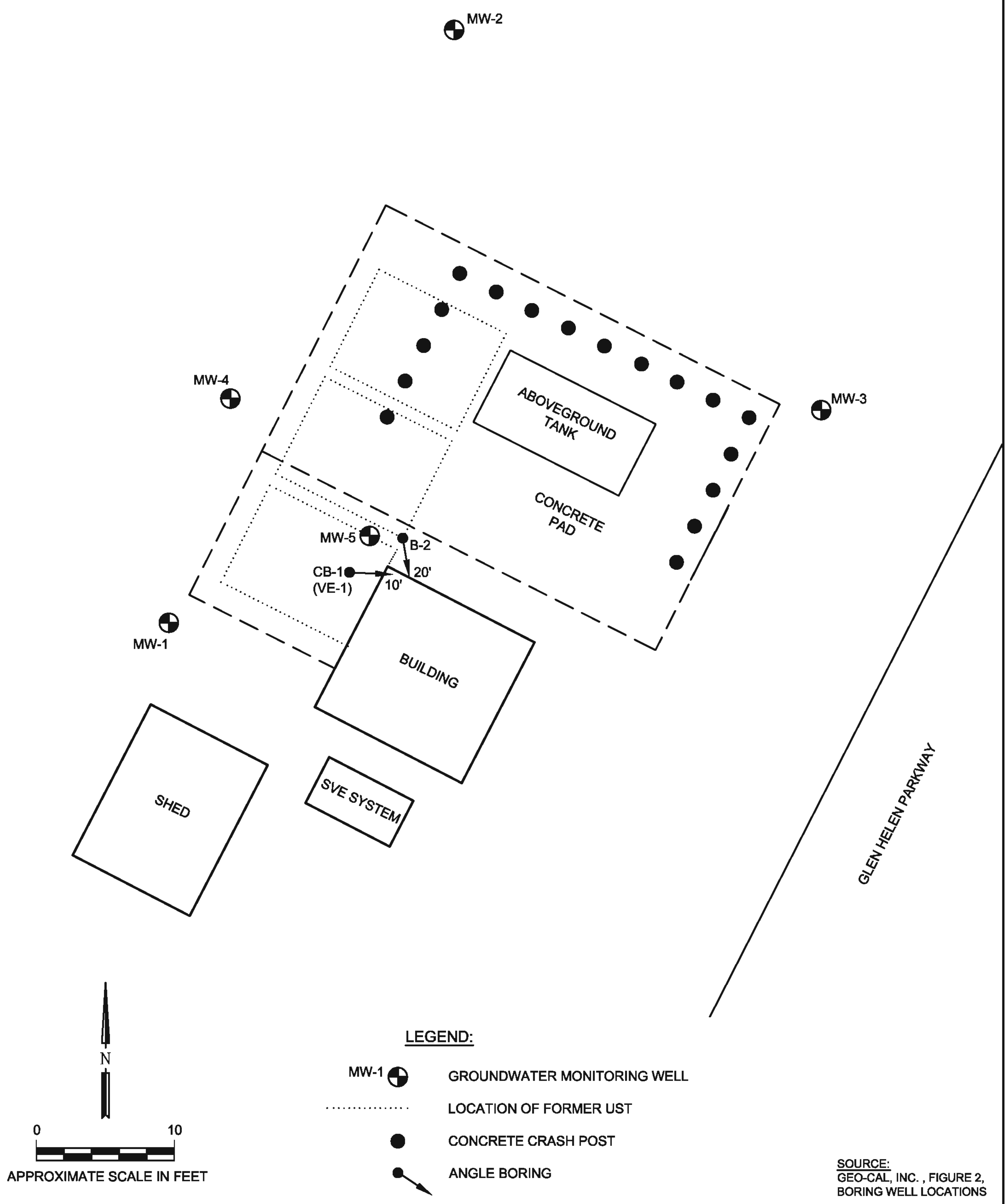
TRC

LOG OF EXPLORATORY BORING

CB-5
PAGE 2 OF 2

APPENDIX C2.2

Glen Helen Regional Park



LEGEND:

MW-1 ⊕ GROUNDWATER MONITORING WELL

········ LOCATION OF FORMER UST

● CONCRETE CRASH POST

●→ ANGLE BORING

SOURCE:
GEO-CAL, INC. , FIGURE 2,
BORING WELL LOCATIONS

Engineering/Remediation
Resources Group, Inc.
5363 Alhambra Ave.
Los Angeles, California 90032
(323) 224-8300
ERRG

CLIENT: SAN BERNARDINO COUNTY, CA SAN BERNARDINO, CA	DESIGNED BY: RDB 1-8-10	MONITORING WELL LOCATIONS
LOCATION: GLEN HELEN PARK 2555 GLEN HELEN PARKWAY SAN BERNARDINO COUNTY, CA	CHECKED BY: KVF 1-8-10 P.E/P.G.: KVF 1-8-10	

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
29-166	0	1	1	2

FILE NAME: N:\projects\2009_Projects\29-166_San Bernardino Co. SVE System\N_Maps and Drawings\Monitoring Well Locations.dwg LAYOUT NAME: Layout1 PLOTTED: Tuesday, February 09, 2010 - 12:00pm

Geo-Cal, inc.
Environmental & Geotechnical Engineering
4370 Hallmark Parkway, Suite 101
San Bernardino, CA 92407
(909) [illegible]

LOG OF BORING CB-1

(Page 1 of 2)

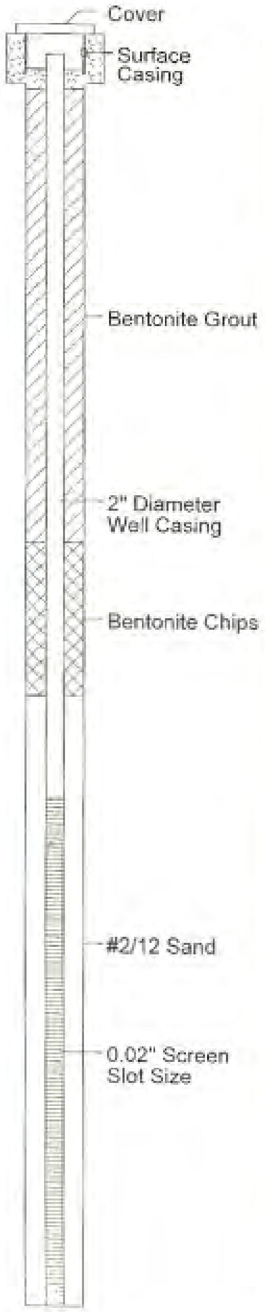
Glen Helen Park Maintenance Facility
2555 Glen Helen Parkway
Devore, CA

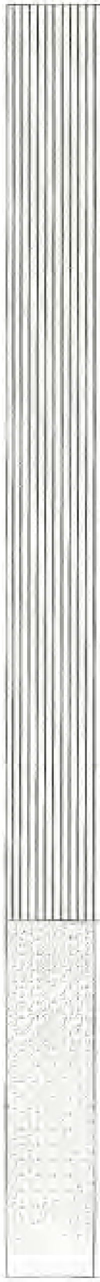
Drilled By: : ABC Liovin Drilling
Drill Method: : Hollow Stem Auger
Date: : 8/03/07
Hole Size: : 8 inch
Engineer: : Fred Bigony
Total Depth: : 45 Feet

Sample Condition
- ☒ Remoulded
- ▇ Undisturbed
- ☐ Not Recovered
- ▩ Rock Core

Water Levels
- ▼ During Drilling
- ▽ After Completion

Boring: CB-1
Elev.:





Depth in feet	Sample ID	PID (ppm)	Samples	Blow Count	GRAPHIC	DESCRIPTION
0						SANDY SILT with small gravel, brown, dry, medium dense.
5	CB-1 5'		▇			SANDY SILT with small gravel, brown, dry, medium dense.
10	CB-1 10'		▇			SANDY SILT , olive brown, dry, medium dense.
15	CB-1 15'		▇			SANDY SILT , olive brown, dry, medium dense.
20	CB-1 20'		▇			Degraded granite, breaking down to sand and silt size, yellowish brown, slighlty moist, faint petroleum odor.
25						

08-28-2007 C:\Program Files\Vntech532\Glen Helen Park Maintenance Yard\CB-1.BOR

Geo-Cal, inc.
Environmental & Geotechnical Engineering
4370 Hallmark Parkway, Suite 101
San Bernardino, CA 92407
(909) 880-1146

LOG OF BORING CB-1

(Page 2 of 2)

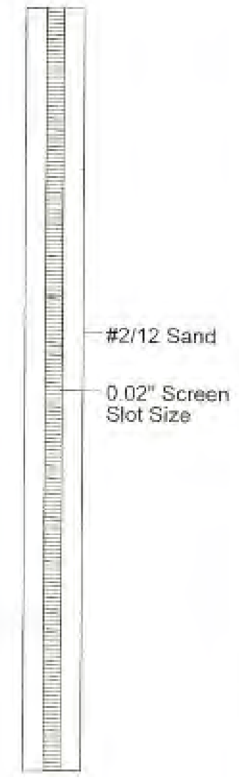
Glen Helen Park Maintenance Facility
2555 Glen Helen Parkway
Devore, CA

Drilled By: ABC Liovin Drilling
Drill Method: Hollow Stem Auger
Date: 8/03/07
Hole Size: 8 inch
Engineer: Fred Bigony
Total Depth: 45 Feet

Sample Condition
- ☒ Remoulded
- ■ Undisturbed
- ☐ Not Recovered
- ▩ Rock Core

Water Levels
- ▼ During Drilling
- ▽ After Completion

Boring: CB-1
Elev.:



Depth in feet	Sample ID	PID (ppm)	Samples	Blow Count	Boring: CB-1	GRAPHIC	DESCRIPTION
25	CB-1 25'		■			▨	Degraded granite, breaking down to sand and silt size, yellowish brown, slighlty moist, faint petroleum odor.
30	CB-1 30'		■			▨	Degraded granite, breaking down to sand and silt size, brown, slighlty moist, faint petroleum odor.
35	CB-1 35'		■			▨	Degraded granite, breaking down to sand and silt size, yellowish brown, slighlty moist, faint petroleum odor.
40	CB-1 40'		■			▨	Degraded granite, breaking down to sandy silt size, olive brown, slighlty moist, faint petroleum odor.
45	CB-1 45'		■		▼		Degraded granite, breaking down to sandy silt size, olive brown, saturated, faint petroleum odor.
50							

08-28-2007 C:\Program Files\mtech532\Glen Helen Park Maintenance Yard\CB-1.BOR

Geo-Cal, inc.
Environmental & Geotechnical Engineering
4370 Hallmark Parkway, Suite 101
San Bernardino, CA 92407
(909) 880-1146

LOG OF BORING MW-4

(Page 1 of 3)

Glen Helen Park Maintenance Facility
2555 Glen Helen Parkway
Devore, CA

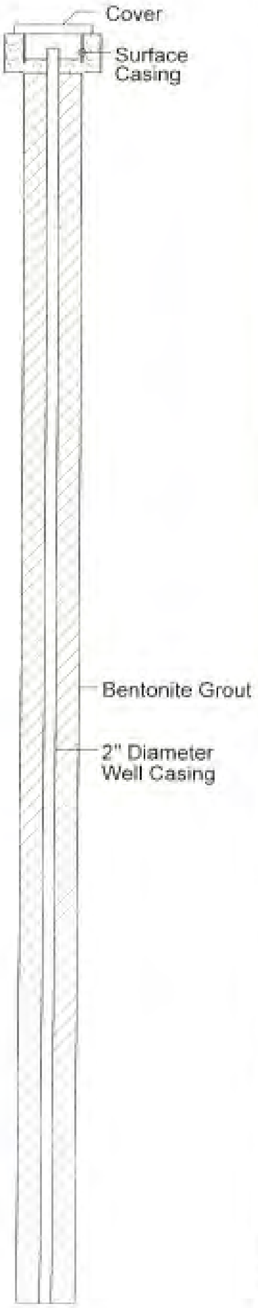
Drilled By: : ABC Liovin
Drill Method: : Hollow Stem Auger
Date: : 8/05/04
Hole Size: : 8 inch
Engineer: : Fred Bigony
Total Depth: : 100 Ft.

Sample Condition
- ☒ Remoulded
- ■ Undisturbed
- ☐ Not Recovered
- ▩ Rock Core

Water Levels
- ▼ During Drilling
- ▽ After Completion

Boring: MW-4
Elev.:

Depth in feet	Sample ID	PID (ppm)	Samples	Blow Count	GRAPHIC	DESCRIPTION
0						4" Concrete Slab.
						SANDY SILT (ML), reddish brown, dense, low moisture.
5						SANDY SILT (ML), reddish brown, dense, low moisture.
10	MW-4 10'		■	35 5"		SANDY SILT (ML), reddish brown, dense, low moisture.
15						
20	MW-4 20'		■	50 5"		SAND (SP), yellowish red, fine grained, slightly moist.
25						
30	MW-4 30'		■	22 44 50"		Degraded Granite (Dg), breaking down to silt-sized material.
35						



Geo-Cal, inc.
Environmental & Geotechnical Engineering
4370 Hallmark Parkway, Suite 101
San Bernardino, CA 92407
(909) 880-1146

LOG OF BORING MW-4

(Page 2 of 3)

Glen Helen Park Maintenance Facility
2555 Glen Helen Parkway
Devore, CA

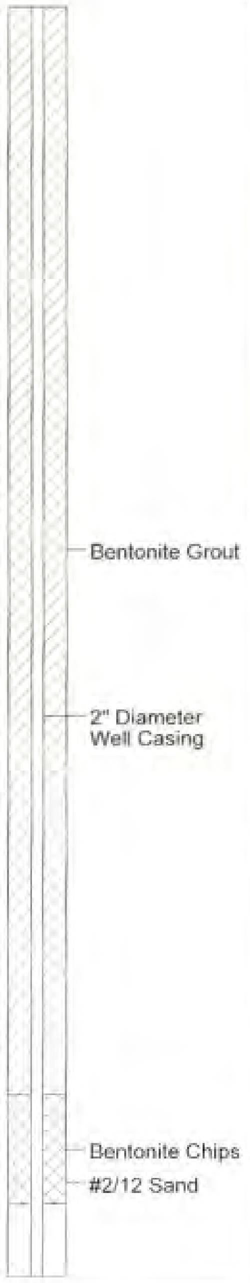
Drilled By:	: ABC Liovin	Total Depth:	: 100 Ft
Drill Method:	: Hollow Stem Auger		
Date:	: 8/05/04		
Hole Size:	: 8 inch		
Engineer:	: Fred Bigony		

Sample Condition
- ☒ Remoulded
- ■ Undisturbed
- ☐ Not Recovered
- ▩ Rock Core

Water Levels
- ▼ During Drilling
- ▽ After Completion

Boring: MW-4
Elev.:

Depth in feet	Sample ID	PID (ppm)	Samples	Blow Count	GRAPHIC	DESCRIPTION
35					▨	
40	MW-4 40'		■	50 5"	▨	Degraded Granite (Dg), decomposed into sandy silt with minor clay, brown, very dense, moist.
45					▨	
50	MW-4 50'		■	27 50 5"		SAND (SW), brown, fine-coarse grained with interbedded silt, decomposition product, very dense, slightly moist, no odor.
55						
60	MW-4 60'		■	50 5"		SAND (SW), brown, fine-coarse grained with interbedded silt, decomposition product, very dense, slightly moist, no odor.
65	MW-4 65'		■	50 5"		SAND (SW), brown, fine-coarse grained with interbedded silt, decomposition product, very dense, slightly moist, no odor.
70						



09-21-2007 C:\Program Files\mtech\532\Glen Helen Park Maintenance Yard\MW-4.BOR

Project: Glen Helen SVE System
Project Location: San Francisco, CA
Project Number: 29-166

Log of Boring MW-5

Sheet 1 of 2

Date (s) Drilled: 11/12/2009	Logged By: K. Foley	Checked By: J. Steller
Drilling Method: Air Rotary Casing Hammer	Drill Bit Size / Type: 9	Total Depth Drilled (feet): 95.0
Drill Rig Type: Shram 660	Drilled By: Test America	Hammer Weight / Drop (lb/in):
Groundwater Depth (feet): 80.0	Date Measured: 11-12-2009	Approx. Surface Elevation (feet):
Location: Glen Helen Regional Park: 2555 Glen Helen Parkway, Devore, CA		Borehole Backfill: Monitoring Well

Depth, feet	Sample Name	Sample Type	Sample	Corrected Blows/Foot	Lithology	Soil Classification	MATERIAL DESCRIPTION	Water Content %	Dry Unit Weight, pcf	Lab Tests / Remarks
						ML	Hand Augered to 5 feet			Sample from cyclone
							Sandy SILT; dark yellowish brown; medium stiff; dry; trace gravel; fine-medium grained sand			Sample from cyclone
10	MW-5-A	SS	☒	36						11-11.5 feet poor recovery
										Sample from cyclone
20	MW-5-B	SS	☒	>50			Sandy SILT; dark yellowish brown; dry; very stiff; medium-coarse grained sand			21-21.5 feet poor recovery
						SM	Silty SAND; dark yellowish brown; dry; dense; medium-coarse grained			Sample from cyclone
30	MW-5-C	SS	☒	>50			fine gravel to 3/8"			30-31.5 feet no recovery
						ML	Sandy SILT; yellowish brown; moist; stiff; fine-grained sand			Sample from cyclone
40	MW-5-D	SS	☒	>50			SILT; olive brown; moist; with gravel composed of gray and white decomposed granite			40-40.5 feet no reocvery
						SM	Silty SAND; dark yellowish brown; moist; dense; fine to medium grained			Sample from cyclone
50	MW-5-E	SS	☒	>50		GP	GRAVEL; white and gray with olive brown; silt and sand; very dense			50-503.5 feet no recovery
						SM	Silty SAND with gravel; dark olive brown; moist; very dense; gravel is white and gray decomposed granite			Sample from cyclone
60										

Figure 1

Project: Glen Helen SVE System
Project Location: San Francisco, CA
Project Number: 29-166

Log of Boring MW-5

Sheet 2 of 2

Depth, feet	Sample Name	Sample Type	Sample	Corrected Blows/Foot	Lithology	Soil Classification	MATERIAL DESCRIPTION	Water Content %	Dry Unit Weight, pcf	Lab Tests / Remarks
	MW-5-F	SS	☒	>50		GP	GRAVEL; white and gray decomposed granite with olive brown; silt and sand; moist; very dense			
						SM	Silty SAND; dark olive brown; moist; very dense			Sample from cyclone
70	MW-5-G	SS	☒	>50			No recovery			No recovery
										Sample from cyclone
80	MW-5-H	SS	☒	>50			Silty SAND with gravel; dark olive brown; wet; very dense; gravel composed of pink, white, and gray decopmposed granite	▼		80-80.5; 81-81.5 feet no recovery
						GP	GRAVEL; pink-white and gray decomposed granite; moist; with olive-brown silt; fine grained gravel; very dense			Sample from cyclone
90	MW-5-I	SS	☒	>50		SM	Silty SAND with gravel; olive brown; wet; very dense; fine-medium grained; gravel composed of pink, white, and gray decomposed granite			90-90.5 feet no recovery
							Bottom of boring at 95.0 feet			
100										
110										
120										
130										

GINT.GPJ 1/22/10

APPENDIX C2.3

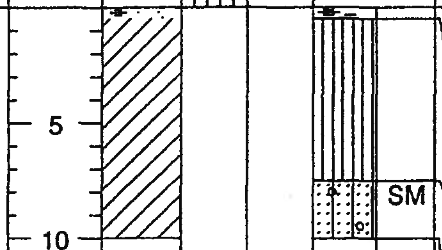
Mobil #18 Sterling Ave
GeoTracker Case I.D. T0607100246

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: hang auger	**Date Drilled:** 3-3-92	**Logged By:** T. Brown
Boring Dia: 4"	**Boring Number:** B1	

Sample Type	Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
							CONCRETE
		5					**SILT**, brown, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA 0 ppm
		10				SM	**SAND**, very fine to fine grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
							Total depth approx. 10 feet bgs.



Completion Notes:

Boring filled with bentonite chips, 6" concrete cap.

▽ ▼

SITE:

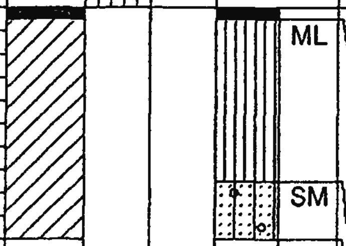
Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig:	SIMCO 2400	**Date Drilled:**	3-2-92	**Logged By:**	T. Brown
Boring Dia:	6 3/4"	**Boring Number:**	B2		



Sample Type	Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
							ASPHALT
■	10-15-15	5				ML	**SILT**, brown, some sand, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA 0 ppm
■	6-8-9	10				SM	**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
							Total depth 10 feet bgs.

Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

∇ ▼

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

page 1 of 1

irwin ENVIRONMENTAL

2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: SIMCO 2400	**Date Drilled:** 3-2-92	**Logged By:** T. Brown
Boring Dia: 6 3/4"	**Boring Number:** B3	

Sample Type	Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
		0				ML	**ASPHALT**
■	10-10-10	5					**SILT**, brown, some sand, very fine grained, grains, subrounded, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA 0 ppm
■	10-18-18	10				SM	**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, loose, trace silt, NO ODOR, OVA 0 ppm
■	10-13-38	15				SW	**SAND**, light brown to yellowish orange, medium to coarse grained, grains subrounded, slightly damp, no plasticity, loose, feldspar and quartz present, NO ODOR, OVA 0 ppm
■	20-20-30	20					**SAND**, as above, OVA 0 ppm
							Total depth 20 feet bgs.

Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

page 1 of 1

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig:	SIMCO 2400	**Date Drilled:**	3-3-92	**Logged By:**	T. Brown
Boring Dia:	6 3/4"	**Boring Number:**	B4		

Sample Type	Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
							CONCRETE
■	20-20-20	5				ML	**SILT**, brown, some sandy, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA O ppm
■	20-20-20	10				SM	**SAND**, light brown, fine grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
							Total depth 10 feet bgs.

Completion Notes:

Boring filled with bentonite chips, 6" concrete patch.

▽ ▼

SITE:

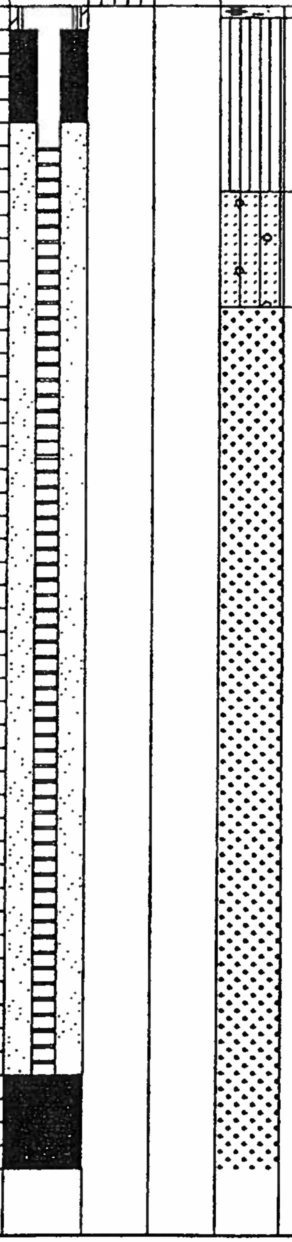
Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

ENVIRONMENTAL irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: SIMCO 2400	**Date Drilled:** 3-3-92	**Logged By:** T. Brown
Boring Dia: 6 3/4"	**Boring Number:** B5-VEW1	



Sample Type	Sample Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
							CONCRETE
■	7-7-5	5				ML	**SILT**, brown, some sand, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, NO ODOR, OVA 0 ppm
■	7-5-5	10				SM	**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, ODOR, OVA 500 ppm
■	10-15-20	15				SW	**SAND**, light brown to yellowish orange, medium to coarse grained, grains subrounded, slightly damp, no plasticity, loose, feldspar and quartz present, ODOR, OVA 1000 ppm
■	12-19-17	20					**SAND**, as above, OVA 1000 ppm
■	22-20-25	25					**SAND**, as above, OVA 500 ppm
■	22-25-30	30					**SAND**, as above, OVA 200 ppm
■	22-20-30	35					**SAND**, as above, OVA 200 ppm
■	20-20-30	40					**SAND**, as above, OVA 200 ppm
■	24-36-28	45					**SAND**, as above, damp, OVA 30 ppm
		50					

Completion Notes:

Backfilled with bentonite 51-46' bgs, 5-1' bgs. Set 40' of 2" slotted 0.02" PVC casing, then 6' of 2" blank PVC casing. Backfilled with #3 monterey sand 45.5-5' bgs, finished with concrete traffic rated cover to ground surface.

▽ ▼

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: SIMCO 2400	**Date Drilled:** 3-3-92	**Logged By:** T. Brown
Boring Dia: 6 3/4"	**Boring Number:** B5-VEW1	

Sample Type	Sample Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
■	20-20-10		■			▨	**SAND**, as above, wet, OVA 0 ppm
							Total depth approx. 51 feet bgs.

Completion Notes:

Backfilled with bentonite 51-46' bgs, 5-1' bgs. Set 40' of 2" slotted 0.02" PVC casing, then 6' of 2" blank PVC casing. Backfilled with #3 monterey sand 45.5-5' bgs, finished with concrete traffic rated cover to ground surface.

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SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

page 2 of 2

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75

Date Drilled: 3-3-92

Logged By: T. Brown

Boring Dia: 8"

Boring Number: B6

Sample Type	Sample Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
						ML	**ASPHALT**
■	4-5-5	5					**SILT**, brown, slightly damp, slight plasticity, loose, NO ODOR, OVA 0 ppm
■	4-5-5	10				SM	**SAND**, light brown, fine grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
							Total depth approx.10 bgs.

Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

▽ ▼

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

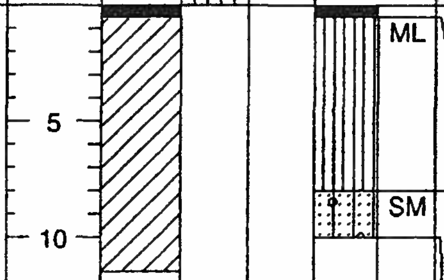
Project No. 29506.00

page 1 of 1

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75	**Date Drilled:** 3-3-92	**Logged By:** T. Brown	
Boring Dia: 8"	**Boring Number:** B7		



Sample Type	Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
							ASPHALT
■	5-4-5	5				ML	**SILT**, brown, some sand, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, NO ODOR, OVA 0 ppm
■	4-5-5	10				SM	**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
							Total depth approx. 10 feet bgs.

Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

▽ ▼

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

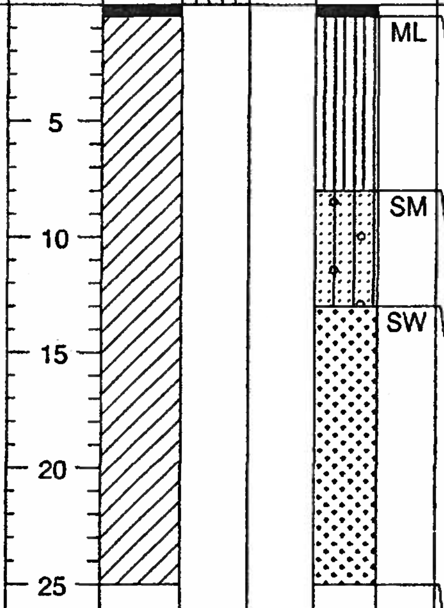
page 1 of 1

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75	**Date Drilled:** 3-3-92	**Logged By:** T. Brown	
Boring Dia: 8"	**Boring Number:** B8		

Sample Type	Sample Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
							ASPHALT
						ML	**SILT**, brown, some sand, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
						SM	**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
						SW	**SAND**, light brown to yellowish orange, medium to coarse grained, grains subrounded, slightly damp, no plasticity, loose, feldspar and quartz present, NO ODOR, OVA 0 ppm **SAND**, as above, OVA 0 ppm **SAND**, as above, OVA 0 ppm
							Total depth approx. 25 feet bgs.



Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

▽ ▼

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

page 1 of 1

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75	**Date Drilled:** 3-3-92	**Logged By:** T. Brown	
Boring Dia: 8"	**Boring Number:** B9		

Sample Type	Sample Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
		0					**ASPHALT**
						ML	
■	5-5-5	5					**SILT**, brown, some sand, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA 0 ppm
						SM	
■	5-5-10	10					**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
						SW	
■	9-9-10	15					**SAND**, light brown to yellowish orange, medium to coarse grained, grains subrounded, slightly damp, no plasticity, loose, feldspar and quartz grains abundant, NO ODOR, OVA 0 ppm
■	18-16-28	20					**SAND**, as above, OVA 0 ppm
■	7-4-3	25					**SAND**, as above, OVA 0 ppm
■	10-10-10	30					**SAND**, as above, OVA 0 ppm
■	10-10-10	35					**SAND**, as above, OVA 0 ppm
■	10-10-14	40					**SAND**, as above, OVA 0 ppm
■	14-14-21	45					**SAND**, as above, OVA 0 ppm
							Total depth 45 feet bgs.

Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

▽ ▼

SITE:

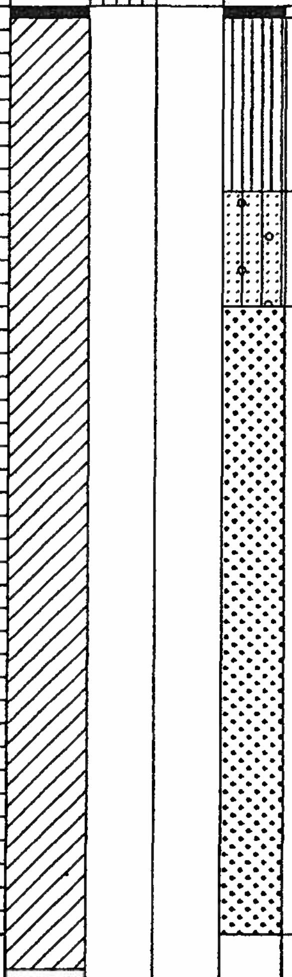
Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

ENVIRONMENTAL irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75	**Date Drilled:** 3-2-92	**Logged By:** T. Brown
Boring Dia: 8"	**Boring Number:** B10	



Sample Type	Blow Count	Depth Feet	Elev. Feet	Soil Type	Description and Remarks
					ASPHALT
■	10-14-15	5		ML	**SILT**, brown, some sand, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA 0 ppm
■	10-14-15	10		SM	**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppM
■	9-14-20	15		SW	**SAND**, light brown to yellowish orange, medium to coarse grained, grains subrounded, slightly damp, no plasticity, loose, feldspar and quartz present, NO ODOR, OVA 0 ppm
■	18-16-28	20			**SAND**, as above, OVA 0 ppm
■	20-25-30	25			**SAND**, as above, OVA 0 ppm
■	20-25-30	30			**SAND**, as above, OVA 0 ppm
■	20-25-30	35			**SAND**, as above, OVA 0 ppm
■	10-13-37	40			**SAND**, as above, OVA 0 ppm
					Total depth approx. 40 feet bgs.

Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

▽ ▼

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

page 1 of 1

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: Hand auger	**Date Drilled:** 3-2-92	**Logged By:** T. Brown
Boring Dia: 4"	**Boring Number:** B11	

Sample Type	Sample Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
							CONCRETE
		5	▨			ML	**SILT**, brown, slightly damp, loose, SLIGHT ODOR, OVA 0 ppm
		10					**SAND**, as above, OVA 0 ppm Total depth approx. 10 feet bgs.

Completion Notes:

Boring filled with bentonite chips, 6" concrete patch.

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

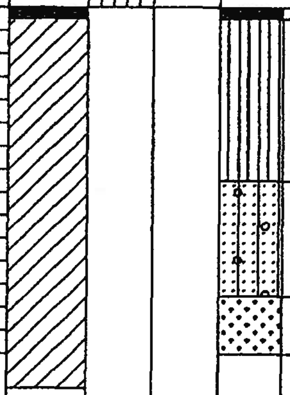
Project No. 29506.00

page 1 of 1

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig:	SIMCO 2400	**Date Drilled:**	3-2-92	**Logged By:**	T. Brown
Boring Dia:	8"	**Boring Number:**	B12		



Sample Type	Blow Count	Depth Feet	Soil Type	Description and Remarks
		0		**ASPHALT**
■	5-5-5	5	ML	**SILT**, brown, some sand, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA 0 ppm
■	10-10-12	10	SM	**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
■	10-22-25	15	SW	**SAND**, light brown to yellowish orange, medium to coarse grained, grains subrounded, slightly damp, no plasticity, loose, feldspar and quartz grains abundant, NO ODOR, OVA 0 ppm
				Total depth approx. 15 feet bgs.

Casing (in.) 10 20

Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

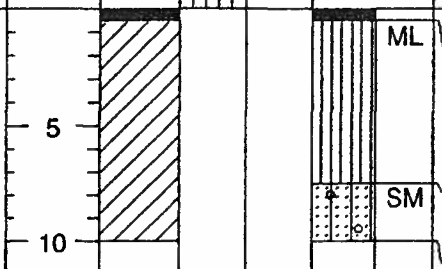
Project No. 29506.00

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75	**Date Drilled:** 3-3-92	**Logged By:** T. Brown
Boring Dia: 8"	**Boring Number:** B13	

Sample Type	Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
							ASPHALT
						ML	**SILT**, brown, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA 0 ppm
						SM	**SAND**, light brown, very fine grained, grains subrounded, slightly damp, no plasticity, loose, some silt, NO ODOR, OVA 0 ppm
							Total depth approx. 10 feet bgs.



Completion Notes:

Boring filled with bentonite chips, 6" asphalt patch.

SITE:

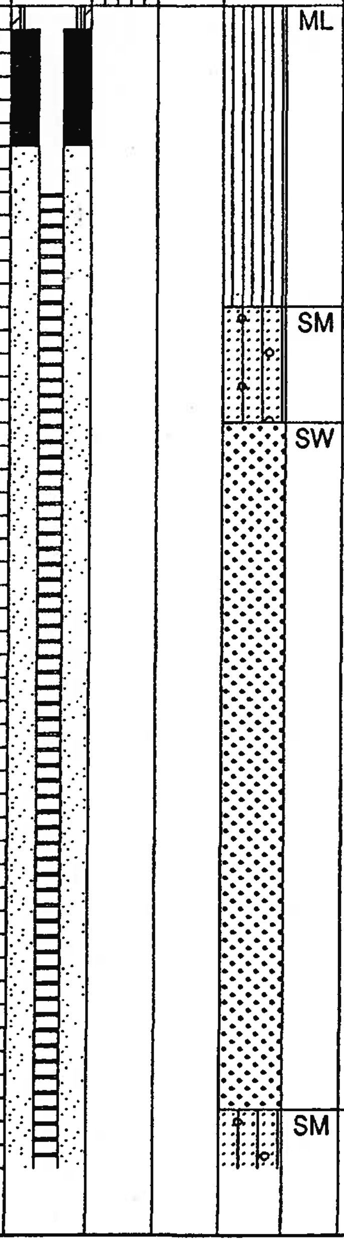
Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75	**Date Drilled:** 3-4-92	**Logged By:** T. Brown	
Boring Dia: 10"	**Boring Number:** B14-VEW2		



Sample Type	Blow Count	Depth Feet	Soil Type	Description and Remarks
			ML	
■	5-5-7	5		**SILT**, brown, slightly damp, slight plasticity, loose, NO ODOR, OVA 0 ppm
■	7-7-7	10		**SILT**, some sand, very fine grained, grains subrounded, slightly damp, slight plasticity, loose, NO ODOR, OVA 0 ppm
			SM	
■	7-10-10	15		**SAND**, light brown, fine to medium grained, grains subrounded, slightly damp, no plasticity, loose, NO ODOR, OVA 0 ppm
			SW	
■	10-10-10	20		**SAND**, light brown to yellowish orange, fine to coarse grained, grains subrounded, slightly damp, no plasticity, loose, feldspar and quartz grains present, NO ODOR, OVA 0 ppm
■	10-15-15	25		**SAND**, as above, ODOR, OVA 100 ppm
■	10-10-20	30		**SAND**, as above, ODOR, OVA 100 ppm
■	10-10-24	35		**SAND**, as above, ODOR, OVA 100 ppm
■	7-12-19	40		**SAND**, as above, ODOR, OVA 20 ppm
■	15-23-28	45		**SAND**, as above, damp, ODOR, OVA 10 ppm
			SM	
		50		

Completion Notes:

Backfilled with bentonite 65-60' bgs, 6-1' bgs. Set 50' of 4" slotted 0.02" PVC casing, then 8' of 4" blank PVC casing. Backfilled with #3 monterey sand 60-6' bgs, finished with concrete traffic rated cover to ground surface.

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SITE:

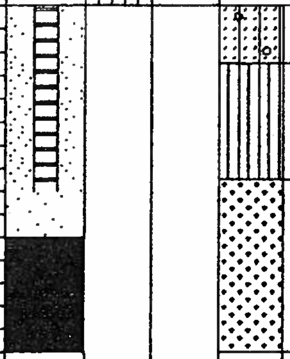
Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

ENVIRONMENTAL irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75	**Date Drilled:** 3-4-92	**Logged By:** T. Brown
Boring Dia: 10"	**Boring Number:** B14-VEW2	



Sample Type	Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
■	8-7-8						**SAND**, brown, very fine to medium grained, grains subrounded, wet, no plasticity, loose, some silt, ODOR, OVA 0 ppm
■	4-7-18	55				ML	**SILT**, brown, wet medium plasticity, medium dense, some clay, ODOR, OVA 0 ppm
■	50-50-50	60				SW	**SAND**, light brown, fine to coarse grained, grains subrounded, slightly damp, no plasticity, quartz grains present, NO ODOR, OVA 0 ppm
■	30-30-30	65					**SAND**, light brown, fine to coarse grained, grains subrounded, slightly damp, no plasticity, dense, quartz grains present, NO ODOR, OVA 0 ppm
							Total depth 65 feet bgs.

Completion Notes:

Backfilled with bentonite 65-60' bgs, 6-1' bgs. Set 50' of 4" slotted 0.02" PVC casing, then 8' of 4" blank PVC casing. Backfilled with #3 monterey sand 60-6' bgs, finished with concrete traffic rated cover to ground surface.

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SITE:

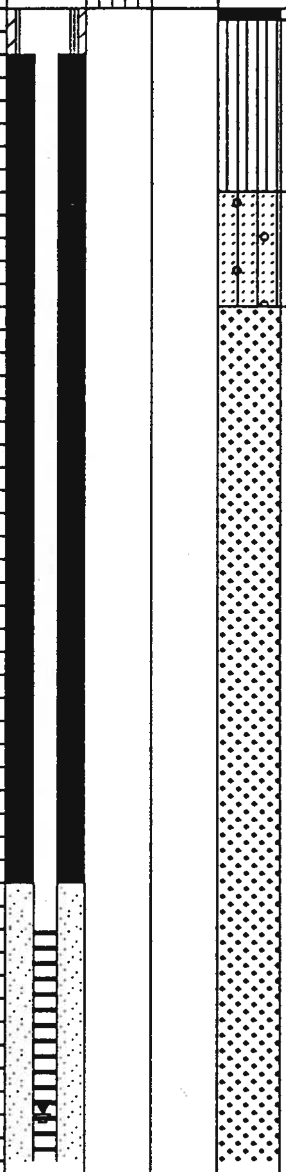
Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75
Date Drilled: 3-4-92
Logged By: T. Brown
Boring Dia: 10"
Boring Number: MW1 B16



Sample Type	Blow Count	Depth Feet	Soil Type	Description and Remarks
			ML	**ASPHALT**
■	5-5-7	5		**SILT**, brown, slightly damp, slight plasticity, loose, trace clay, NO ODOR, OVA 0 ppm
■	5-7-7	10	SM	**SAND**, light brown, fine to very fine grained, grains subrounded, slightly damp, no plasticity, loose, trace silt, NO ODOR, OVA 0 ppm
■	7-13-13	15	SW	**SAND**, light brown to rust to yellowish orange, medium to coarse grained, grains subrounded, slightly damp, no plasticity, loose, feldspar and quartz grains, NO ODOR, OVA 0 ppm
■	10-10-15	20		**SAND**, as above, OVA 0 ppm
■	15-20-20	25		**SAND**, as above, OVA 0 ppm
■	10-22-20	30		**SAND**, as above, OVA 0 ppm
■	20-20-30	35		**SAND**, as above, OVA 0 ppm
■	25-30-29	40		**SAND**, as above, damp, OVA 0 ppm
■	20-20-25	45		**SAND**, as above, damp to wet, OVA 0 ppm
		50		

Completion Notes:

Set 35' of 4" slotted 0.02" PVC casing, then 40' of 4" blank PVC casing. Backfilled with #3 monterey sand 75-38' bgs, bentonite seal 38-2' bgs, finished with concrete traffic rated cover to ground surface.

∇ ▼

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

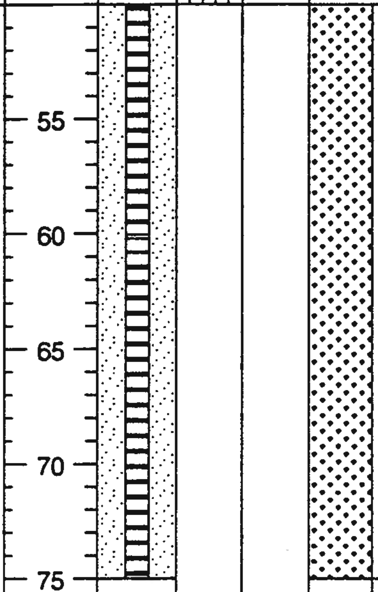
Project No. 29506.00

ENVIRONMENTAL
irwin
2750 Signal Pkwy.
Long Beach, CA 90806

BORING LOG

Drill Rig: CME 75	**Date Drilled:** 3-4-92	**Logged By:** T. Brown
Boring Dia: 10"	**Boring Number:** B16 MW1	

Sample Type	Sample Blow Count	Depth Feet	Well Const.	Casing (in.) 10 20	Elev. Feet	Soil Type	Description and Remarks
		75					Total depth approx. 75 feet bgs.



Completion Notes:

Set 35' of 4" slotted 0.02" PVC casing, then 40' of 4" blank PVC casing. Backfilled with #3 monterey sand 75-38' bgs, bentonite seal 38-2' bgs, finished with concrete traffic rated cover to ground surface.

▽ ▼

SITE:

Mobil Station 18 HVF
25699 Baseline Road
Highland, California

Project No. 29506.00

page 2 of 2

GEOSCIENCES & ENGINEERING

IRWIN

Environmental
Construction
Maintenance

42111 Avenida Alvarado,
Temecula, California 92590

BORING LOG

DRILL RIG: MOBILE DRILL B-61	DATE DRILLED: 10-15-92
BORING DIAMETER: 8"	BORING NUMBER: B16
LOGGED BY: JEREMIAH STOCK	

SAMPLE TYPE	BLOW COUNT	DEPTH FEET	WELL CONST.	ELEV FEET	SOIL TYPE	DESCRIPTION AND REMARKS
					ML	SILT: brown with very fine sand, slightly damp slight plasticity, loose, no odor
■	2-2-2	5				SILT: as before, stiff, no odor
■	12-10-9	10			SM	SAND: light brown, fine to medium, trace gravel grains subrounded to rounded, slightly damp no plasticity, medium dense, trace silt no odor
■	28-30-17	15				
					SW	SAND: light brown, medium to coarse, some gravel and cobbles, grains subrounded to rounded cobbles granitic and metamorphic, slightly damp no plasticity, medium to very dense, no odor
■	30-30-22	20				
■	11-12-9	25				SAND: as before, no odor, OVA 58 ppm
■	14-27-36	30				SAND: as before, no odor
■	25-27-28	35				SAND: as before, no odor, OVA 44 ppm
■	9-15-27	40				SAND: as before, no odor
■	32-46-50/4	45				SAND: as before, no odor, OVA 50 ppm
■	12-23-11	50				

COMPLETION NOTES:

BACKFILLED WITH MEDIUM BENTONITE CHIPS

SITE:

FORMER MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO.
29506.02

GEOSCIENCES & ENGINEERING

IRWIN

Environmental
Construction
Maintenance

42111 Avenida Alvarado,
Temecula, California 92590

BORING LOG

DRILL RIG: MOBILE DRILL B-61	DATE DRILLED: 10-15-92	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER: 8"	BORING NUMBER: B16	

SAMPLE TYPE	BLOW COUNT	DEPTH FEET	WELL CONST.	ELEV FEET	SOIL TYPE	DESCRIPTION AND REMARKS
					SW	SAND: as before, no odor
■	6-5-15	55			ML	SILT: brown with some very fine sand and clay, wet medium plasticity, medium stiff, no odor OVA 46 ppm
■	25-50-55	60			SW	SAND: light brown, medium to coarse, some gravel and cobbles, grains subrounded to rounded cobbles granitic and metamorphic, slightly damp no plasticity, medium to very dense, no odor
■	38-50/3	65				SAND: as before, no odor, OVA 95 ppm
■	34-46-50/2	70				SAND: as before, no odor, OVA 62 ppm

Total depth approximately 70 feet bgs.

COMPLETION NOTES:

BACKFILLED WITH MEDIUM BENTONITE CHIPS

SITE:

FORMER MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO.
29506.02

IRWIN

GEOSCIENCES & ENGINEERING

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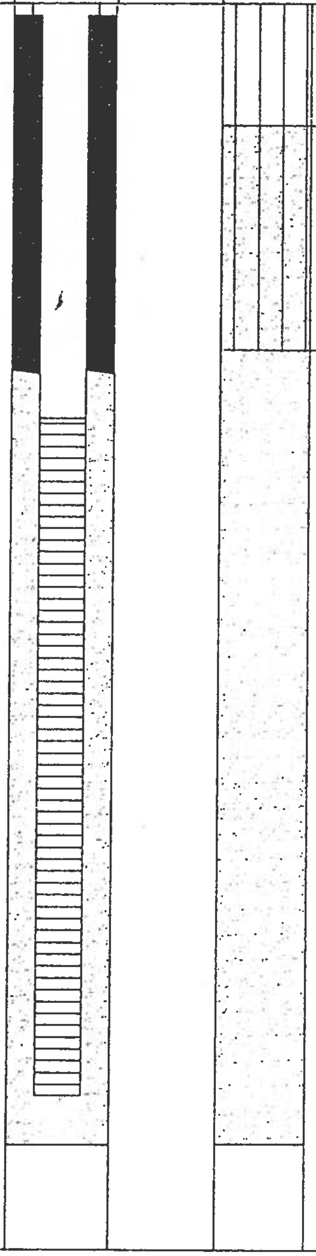
42111 Avenida Alvarado,
Temecula, California 92590

BORING LOG

DRILL RIG: MOBILE DRILL B-61	DATE DRILLED: 10-15-92	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER: 8"	BORING NUMBER: B17	



SAMPLE TYPE	SAMPLE BLOW COUNT	DEPTH FEET	SOIL TYPE	DESCRIPTION AND REMARKS
		0	ML	SILT: brown with very fine sand, slightly damp slight plasticity, loose, no odor
■	4-4-4	5	SM	SAND: light brown, fine to medium, trace gravel grains subrounded to rounded, slightly damp no plasticity, medium dense, trace silt no odor OVA 60 ppm
■	6-7-7	10		
■	18-22-25	15	SW	SAND: light brown, medium to coarse, some gravel and cobbles, grains subrounded to rounded cobbles granitic and metamorphic, slightly damp no plasticity, medium to very dense, no odor OVA 70 ppm
■	19-21-22	20		
■	11-12-12	25		SAND: as before, no odor OVA 70 ppm
■	26-37-42	30		SAND: as before, strong odor OVA 500 ppm
■	19-28-40	35		SAND: as before, strong odor
■	11-6-9	40		SAND: as before, strong odor OVA 1000 ppm
■	23-28-50/5	45		SAND: as before, moderate odor OVA 200 ppm
■	5-7-12	50		

COMPLETION NOTES:

BACKFILLED WITH MEDIUM BENTONITE CHIPS FROM 75-50' BGS AND 16-0' BGS. SET 4" SLOTTED 0.02" PVC SCREEN FROM 48-18' BGS. SET 4" PVC CASING FROM 18-0' BGS. BACKFILLED WITH #3 MONTEREY SAND FROM 50-16' BGS. FINISHED WITH CONCRETE AND TRAFFIC RATED COVER TO GROUND SURFACE.

SITE:

FORMER MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO.
29506.02

PAGE 1 OF 2

IRWIN GEOSCIENCES & ENGINEERING
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42111 Avenida Alvarado,
Temecula, California 92590

BORING LOG

DRILL RIG: MOBILE DRILL B-61	DATE DRILLED: 10-15-92	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER: 8"	BORING NUMBER: B17	

SAMPLE TYPE	BLOW COUNT	DEPTH FEET	WELL CONST	ELEV FEET	SOIL TYPE	DESCRIPTION AND REMARKS
					ML	SILT: brown with some very fine sand and clay, wet medium plasticity, medium stiff, no odor OVA 200 ppm
■	40-50/4	55			SW	SAND: light brown, medium to coarse, some gravel and cobbles, grains subrounded to rounded cobbles granitic and metamorphic, slightly damp no plasticity, medium to very dense, no odor OVA 100 ppm
■	26-38-33	60				
■	32-50-50/5	65				SAND: as before, slight odor OVA 70 ppm
■	38-50/2	70				SAND: as before, no odor OVA 110 ppm
■		75				SAND: as before, no odor
						Total depth approximately 75 feet bgs.

COMPLETION NOTES:

BACKFILLED WITH MEDIUM BENTONITE CHIPS FROM 75–50' BGS AND 16–0' BGS. SET 4" SLOTTED 0.02" PVC SCREEN FROM 48–18' BGS. SET 4" PVC CASING FROM 18–0' BGS. BACKFILLED WITH #3 MONTEREY SAND FROM 50–16' BGS. FINISHED WITH CONCRETE AND TRAFFIC RATED COVER TO GROUND SURFACE.

SITE:

FORMER MOBIL STATION #18–HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO. 29506.02

PAGE 2 OF 2

GEOSCIENCES & ENGINEERING
IRWIN
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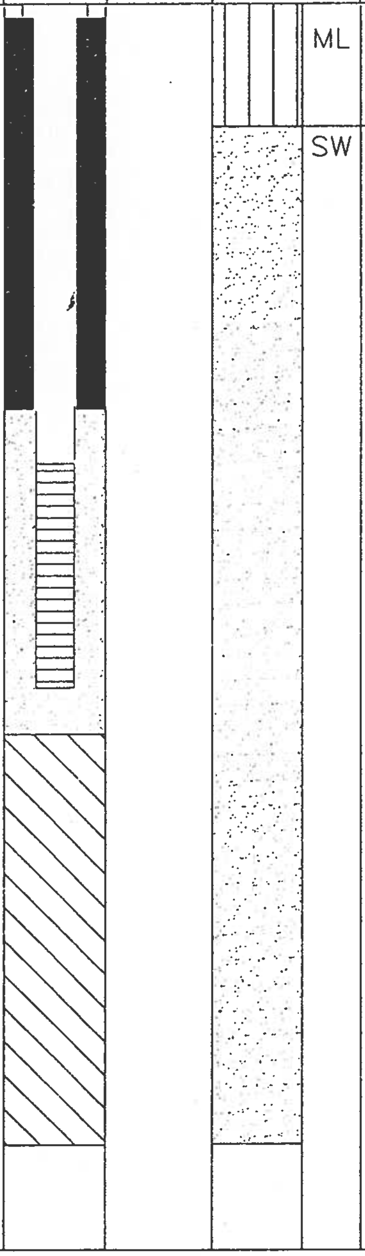
42111 Avenida Alvarado,
Temecula, California 92590

BORING LOG

DRILL RIG: MOBILE DRILL B-61	DATE DRILLED: 10-16-92	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER: 8"	BORING NUMBER: B18	



SAMPLE TYPE	BLOW COUNT	DEPTH FEET	WELL CONST	ELEV FEET	SOIL TYPE	DESCRIPTION AND REMARKS
					ML	SILT: brown with very fine sand, slightly damp slight plasticity, loose, no odor
■	6-8-10	5			SW	SAND:light brown, medium to coarse, some gravel and cobbles, grains subrounded to rounded cobbles granitic and metamorphic with longest dimension up to 4", slightly damp, no plasticity medium to very dense, no odor, OVA 50 ppm
■	5-8-10	10				
■	18-30-50	15				SAND: as before, no odor, OVA 47 ppm
■	45-50/2	20				SAND: as before, cobbles up to 6", strong odor OVA 500 ppm
■	12-13-26	25				SAND: as before, very slight odor, OVA 60 ppm
■	46-40-42	30				SAND: as before, very slight odor, OVA 60 ppm
■	16-22-38	35				SAND: as before, no odor, OVA 90 ppm
■	30-40-50	40				SAND: as before, very slight odor, OVA 85 ppm
■	19-32-50/3	45				SAND: as before, slight odor, OVA 64 ppm
■	60-20-25	50				

COMPLETION NOTES:

BACKFILLED WITH MEDIUM BENTONITE CHIPS FROM 65-32' BGS AND 17.5-0' BGS. SET 4" SLOTTED 0.02" PVC SCREEN FROM 30-20' BGS. SET 4" PVC CASING FROM 20-0' BGS. BACKFILLED WITH #3 MONTEREY SAND FROM 32-17.5' BGS. FINISHED WITH CONCRETE AND TRAFFIC RATED COVER TO GROUND SURFACE.

SITE:

FORMER MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO.
29506.02

GEOSCIENCES & ENGINEERING

IRWIN

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Construction
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Temecula, California 92590

BORING LOG

DRILL RIG: MOBILE DRILL B-61	DATE DRILLED: 10-16-92	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER: 8"	BORING NUMBER: B18	

SAMPLE TYPE	SAMPLE BLOW COUNT	DEPTH FEET	WELL CONST.	ELEV FEET	SOIL TYPE	DESCRIPTION AND REMARKS
					ML	SILT: brown with some very fine sand and clay, wet medium plasticity, medium stiff, no odor
■	15-50/5	55				SILT: as before, no odor, OVA 64 ppm
					SW	SAND: light brown, medium to coarse, some gravel and cobbles, grains subrounded to rounded cobbles granitic and metamorphic, slightly damp no plasticity, medium to very dense, no odor OVA 60 ppm
■	43-50/5	60				
■	23-44-50	65				SAND: as before, no odor , OVA 70 ppm
						Total depth approximately 65 feet bgs.

COMPLETION NOTES:

BACKFILLED WITH MEDIUM BENTONITE CHIPS FROM 65-32' BGS AND 17.5-0' BGS. SET 4" SLOTTED 0.02" PVC SCREEN FROM 30-20' BGS. SET 4" PVC CASING FROM 20-0' BGS. BACKFILLED WITH #3 MONTEREY SAND FROM 32-17.5' BGS. FINISHED WITH CONCRETE AND TRAFFIC RATED COVER TO GROUND SURFACE.

SITE:

FORMER MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO.
29506.02

IRWIN

GEOSCIENCES & ENGINEERING

Environmental
Construction
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42111 Avenida Alvarado,
Temecula, California 92590

BORING LOG

DRILL RIG: MOBILE DRILL B-61	DATE DRILLED: 10-16-92	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER: 8"	BORING NUMBER: B20	

SAMPLE TYPE	SAMPLE BLOW COUNT	DEPTH FEET	WELL CONST.	ELEV FEET	SOIL TYPE	DESCRIPTION AND REMARKS
					ML	SILT: brown with very fine sand, slightly damp slight plasticity, loose, no odor OVA 120 ppm
■	4-7-12	5			SM	SAND: light brown, fine with trace silt, slightly damp no plasticity, medium dense, no odor OVA 78 ppm
■	7-9-10	10				SAND: as before, no odor OVA 92 ppm
■	15-22-26	15			SW	SAND: light brown, medium to coarse, some gravel and cobbles, grains subrounded to rounded cobbles granitic and metamorphic, slightly damp no plasticity, medium to very dense, no odor OVA 110 ppm
■	17-30-34	20				
■	13-10-14	25				SAND: as before, no odor OVA 70 ppm
■	18-19-25	30				SAND: as before, no odor OVA 180 ppm
■	14-20-23	35				SAND: as before, no odor OVA 82 ppm
■	11-10-34	40				SAND: as before, no odor OVA 90 ppm
■	21-20-19	45				SAND: as before, no odor OVA 120 ppm
■	16-21-24	50				

COMPLETION NOTES:

BACKFILLED WITH MEDIUM BENTONITE CHIPS

SITE:

FORMER MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO.
29506.02

GEOSCIENCES & ENGINEERING
IRWIN
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Construction
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42111 Avenida Alvarado,
Temecula, California 92590

BORING LOG

DRILL RIG: MOBILE DRILL B-61	DATE DRILLED: 10-16-92	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER: 8"	BORING NUMBER: B20	

SAMPLE TYPE	BLOW COUNT	DEPTH FEET	WELL CONST.	ELEV FEET	SOIL TYPE	DESCRIPTION AND REMARKS
					SW	SAND: as before, no odor OVA 120 ppm
■	5-6-10	55			ML	SILT: brown with some very fine sand and clay, wet medium plasticity, medium stiff, no odor
■	24-29-23	60			SW	SAND: light brown, medium to coarse, some gravel and cobbles, grains subrounded to rounded cobbles granitic and metamorphic, slightly damp no plasticity, medium to very dense, no odor OVA 96 ppm
■	25-33-40	65				SAND: as before, no odor OVA 150 ppm
						Total depth approximately 65 feet bgs.

COMPLETION NOTES:
BACKFILLED WITH MEDIUM BENTONITE CHIPS

SITE:
FORMER MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO. 29506.02

KLEINFELDER

9555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

BORING LOG

DRILL RIG. CME-85	DATE DRILLED: 10-30-97	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER: 8"	BORING NUMBER: B21	

SAMPLE TYPE & % RECOVERY	SAMPLE BLOW COUNT	DEPTH (feet)	WELL CONST	OVA (ppm)	SOIL TYPE	DESCRIPTION AND REMARKS
					SM	
100%	3-4-4	5		0		SAND. fine to medium, some silt, trace gravel, brown, loose, slightly damp, no odor
50%	2-2-3	10		0		SAND· as above, gravelly at 11 to 12 feet
100%	13-18-28	15		0	SP	SAND: medium, tan, dense, damp, no odor
100%	22-35-43	20		0		GRAVELLY SAND: medium to coarse, tan, very dense, damp, no odor
100%	18-20-26	25		0		GRAVELLY SAND· as above
					ML	SILT dark gray, stiff, slightly damp, no odor
100%	35-50	30		414	SP	SAND· medium, tan, very dense, damp, moderate odor
100%	28-42-43	35		228		GRAVELLY SAND: medium to coarse, tan, very dense, slightly damp, moderate odor
100%	11-25-35	40		692	SM	SILTY SAND: fine, yellow brown, very dense, damp, moderate odor
100%	18-30-32	45		71	SP	SAND medium to coarse, tan, very dense, damp, slight odor
100%	10-12-14	50		∇ 700		SAND as above, wet, moderate odor
50%				589	ML	SILT trace fine sand, brown, stiff, damp, moderate odor
100%		55				
				76		
				31		SILT light brown, stiff, moist, very slight odor
50%				87	SP	GRAVELLY SAND: medium to coarse, dark gray, very dense, moist, slight odor
		60				

SITE:

FORMER MOBIL SERVICE STATION #18-HVF
25699 BASELINE STREET
HIGHLAND, CALIFORNIA

COMPLETION NOTES:

BORING BACKFILLED WITH HYDRATED BENTONITE GROUT

PROJECT NO.
51-4294-01

PAGE 1 OF 2

KLEINFELDER
9555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

BORING LOG

DRILL RIG. CME-85	DATE DRILLED: 10-30-97	LOGGED BY: JEREMIAH STOCK
BORING DIAMETER. 8"	BORING NUMBER: B21	

SAMPLE TYPE & % RECOVERY	BLOW COUNT	DEPTH (feet)	WELL CONST.	OVA (ppm)	SOIL TYPE	DESCRIPTION AND REMARKS
50%				28	SP	
				9		SAND: medium to coarse, some gravel, dark gray, very dense, moist, slight odor
50%		65				
				9		SAND: fine to coarse, some gravel, brown, very dense, moist, no odor
50%		70				
				4 6	SM	
100%	30-50	75		0		SILTY SAND: fine, tan, very dense, slightly damp, no odor
					SP	
100%	28-50	80	▽	0		SAND fine to medium, trace silt, tan, very dense, wet, no odor
100%	26-36-50	85		0		SAND: fine to coarse, with lenses of silt, brown, very dense, wet, no odor
					ML	SANDY SILT: orange brown, very stiff, damp, no odor
100%	32-50	90		0		

SITE:

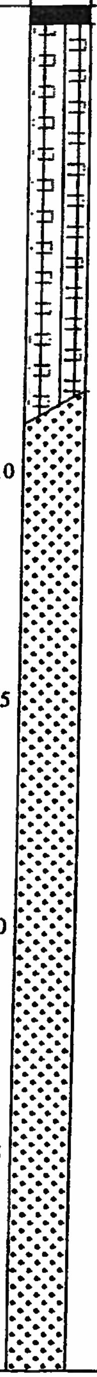
FORMER MOBIL SERVICE STATION #18-HVF
25699 BASELINE STREET
HIGHLAND, CALIFORNIA

COMPLETION NOTES:

BORING BACKFILLED WITH HYDRATED BENTONITE GROUT

PROJECT NO:
51-4294-01

Drilled By: Cascade Drilling
Drilling Method: Hollow Stem Auger 8"
Logged By: Virginia Moore
Date Measured: 4/17/02
Reference Elevation: N.A.
Datum: N.A.



ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION

Elevation (feet) Depth	Sample	Dry Density	Sample No.	Environmental Description and Classification	Blow Count (Blows/ft.)	Moisture Content (%)	PID (ppm)
0				ASPHALT:			
1–2				SILTY SAND (SM): brown, fine grained, dense, no odor			
5				HOLE CLEARED TO 5 FEET BEFORE SAMPLING			
10	■		B22-10	SAND (SW): light brown, moist, loose, medium to coarse grained, no odor	31		0
15	■		B22-15		31 50-6"		8
20	■		B22-20	-- brown, dense, fine to medium grained, no odor	35 50-6"		0
25	■		B22-25	-- rock lodged in shoe of sampler	50-6"		0
30							

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California

LOG OF BORING B22

PLATE 1a

Elevation (feet) Depth	Sample	Dry Densit	Sample No.	Graphic Lo	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*	Blow Coun (Blows/ft)	Moisture Content (	PID (ppm)
30	■		B22-30		-- increasing percentage of coarse gravel	50-6"		21
31								
32								
33								
34								
35	■		B22-35			25		1
36						50-6"		
37								
38								
39	■		B22-40			26		3
40					Boring terminated at 40 feet. Groundwater not encountered. Boring backfilled with bentonite grout slurry and capped with asphalt patch.	50-6"		

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California

LOG OF BORING B22

PLATE 1b

Date Drilled:	4/17/02	Water Depth:	> 40 feet
Drilled By:	Cascade Drilling	Date Measured:	4/17/02
Drilling Method:	Hollow Stem Auger 8"	Reference Elevation:	N.A.
Logged By:	Virginia Moore	Datum:	N.A.

Elevation (feet) Depth	Sample	Dry Density	Sample No.	Graphic Log	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION	Blow Count (Blows/ft.)	Moisture Content (%)	PID (ppm)
0								
1					SAND (SP): brown, moist, dense, medium grained, no odor			
2								
3								
4								
5					HOLE CLEARED TO 5 FEET BEFORE SAMPLING			
6								
7								
8					---------------------------------			
9								
10	■		B23-10		SAND (SW): brown, moist, loose, some gravel, no odor	10 50-6"		0
11								
12								
13								
14								
15	■		B23-15		-- increasing percentage of gravel	23 50-6"		2
16								
17								
18								
19								
20	■		B23-20			50-6"		7
21								
22					---------------------------------			
23								
24								
25	■		B23-25		SAND (SP): brown, moist, loose, medium grained, odor present	32		1291
26								
27								
28								
29								
30								

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California

LOG OF BORING B23

PLATE

2a

Elevation (feet) Depth	Sample	Dry Densit	Sample No.	Graphic Lo	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*	Blow Count (Blows/ft.	Moisture Content (%	PID (ppm)
30	▨		B23-30		-- trace gravel	20 50-6"		596
31								
32								
33								
34								
35	▨		B23-35		**SILTY SAND (SM):** dark brown, dense, fine to medium grained, odor present	50-6"		702
36								
37								
38								
39					**SAND (SP):** brown, dense, fine to medium grained, odor present			60
40	▨		B23-40			50-6"		

Boring terminated at 40 feet.
Groundwater not encountered.
Boring backfilled with bentonite grout slurry.

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California
LOG OF BORING B23

PLATE

2b

Drilled By:	Cascade Drilling	Date Measured:	4/17/02
Drilling Method:	Hollow Stem Auger 8"	Reference Elevation:	N.A.
Logged By:	Virginia Moore	Datum:	N.A.

Elevation (feet) Depth	Sample	Dry Density	Sample No.	Graphic Log	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION	Blow Count (Blows/ft.)	Moisture Content (%)	PID (ppm)
0					**SILTY SAND (SM):** brown, moist, dense, fine to medium grained, no odor			
1								
2								
3								
4								
5					**HOLE CLEARED TO 5 FEET BEFORE SAMPLING**			
6								
7								
8								
9								
10	■		B24-10		**SAND (SW):** light brown, moist, loose, medium to coarse grained, no odor	35		0
11								
12								
13								
14								
15	■		B24-15			25 50-6"		
16								
17								
18								
19								
20	■		B24-20			28 50-6"		0
21								
22								
23								
24								
25	■		B24-25		-- brown, dense, fine to medium grained, no odor	30 50-6"		0
26								
27								
28								
29								
30								

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California

LOG OF BORING B24

PLATE

3a

Elevation (feet) Depth	Sample	Dry Densi	Sample No.	Graphic L	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*	Blow Coun (Blows/ft.	Moisture Content (	PID (ppm)
30	■		B24-30	░		29		1694
31				▥		50-6"		
32				░	**SILT (ML)**: gray, dense, some fine grained sand, odor present			
33				░				
34				░				
35	■		B24-35	░	**SAND (SW)**: brown, moist, dense, fine to medium grained	90		1260
36	■			░				
37				░				
38				░				
39	■		B24-40	░		38		1146
40						50-6"		

Boring terminated at 40 feet.
Groundwater not encountered.
Boring backfilled with bentonite slurry grout.

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California

LOG OF BORING B24

PLATE

3b

Drilled By:	Cascade Drilling	Date Measured:	4/17/02
Drilling Method:	Hollow Stem Auger 8"	Reference Elevation:	N.A.
Logged By:	Virginia Moore	Datum:	N.A.

Elevation (feet) Depth	Sample	Dry Density	Sample No.	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION	Blow Count (Blows/ft.)	Moisture Content (%)	PID (ppm)
0				**SILTY SAND (SM):** brown, moist, medium dense, fine to coarse grained, no odor			
1							
2							
3							
4							
5				**HOLE CLEARED TO 5 FEET BEFORE SAMPLING**			
6							
7							
8							
9							
10	■		B25-10	-- medium to coarse grained, trace gravel, no odor	32		0
11	■						
12							
13				- - - - - - - - - - - -			
14							
15	■		B25-15	**SAND (SW):** brown, moist, dense, medium to coarse grained, increasing percentage of gravel, no odor	25 50-6"		0
16							
17							
18							
19							
20	■		B25-20		25 50-6"		4
21							
22							
23							
24							
25	■		B25-25	-- trace gravel, strong odor	15 50-6"		3343
26							
27							
28							
29							
30							

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California

LOG OF BORING B25

PLATE

4a

Elevation (feet) Depth	Sample	Dry Densit	Sample No.	Graphic Lo	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*	Blow Coun (Blows/ft	Moisture Content (	PID (ppm)
30	■		B25-30			21 50-6"		2162
31								
32								
33								
34								
35	■		B25-35			25 50-6"		899
36								
37								
38								
39								423
40	■		B25-40		Boring terminated at 40 feet. Groundwater not encountered. Boring backfilled with bentonite grout slurry.	50-6"		

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California

LOG OF BORING B25

PLATE

4b

Drilled By:	Cascade Drilling	Date Measured:	4/17/02
Drilling Method:	Hollow Stem Auger 8"	Reference Elevation:	N.A.
Logged By:	Virginia Moore	Datum:	N.A.

Elevation (feet) Depth	Sample	Dry Density	Sample No.	Graphic Log	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION	Blow Count (Blows/ft.)	Moisture Content (%)	PID (ppm)
0					**ASPHALT:**			
1					**SILTY SAND (SM):** brown, moist, dense, fine grained, no odor			
2								
3								
4								
5					**HOLE CLEARED TO 5 FEET BEFORE SAMPLING**			
6								
7								
8								
9								
10			B26-10		-- dry, loose, no odor	27		0
11								
12								
13								
14								
15			B26-15		**SAND (SP):** brown, dry, loose, fine grained, trace gravel, no odor	50-6"		0
16								
17								
18								
19								
20			B26-20			50-6"		0
21								
22								
23								
24								
25			B26-25		-- medium to coarse grained, trace silt	36		0
26								
27								
28								
29								
30								

KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California

LOG OF BORING B26

PLATE

5a

ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION

(Continued From Previous Page)

Elevation (feet) Depth	Sample	Dry Densi	Sample No	Graphic L	ENVIRONMENTAL DESCRIPTION AND CLASSIFICATION	Blow Coun (Blows/ft	Moisture Content (	PID (ppm)
30	■		B26-30		-- no silt or gravel	27 50-6"		0
31								
32								
33								
34								
35	■		B26-35		**SAND (SW):** brown, dry, medium to coarse grained, increasing percentage of gravel	19 50-6"		0
36								
37								
38								
39	■		B26-40		-- increasing percentage of gravel	21 50-6"		0
40								

Boring terminated at 40 feet.
Groundwater not encountered.
Boring backfilled with bentonite grout slurry and capped with asphalt patch.

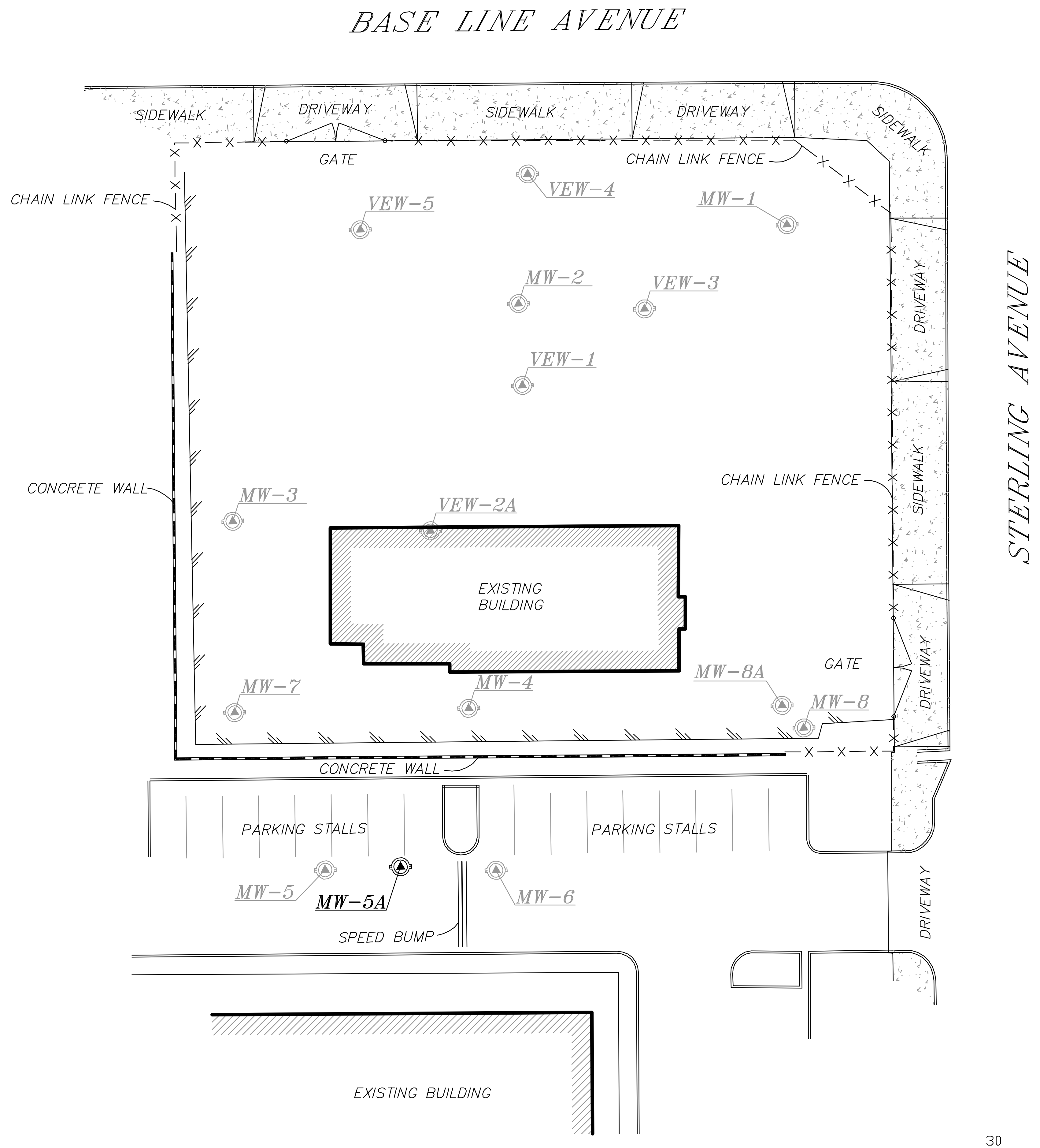
KLEINFELDER

PROJECT NO. 15353

Mobil Station No. 18-HVF FAX 101
25699 Baseline Street
Highland, California
LOG OF BORING B26

PLATE 5b

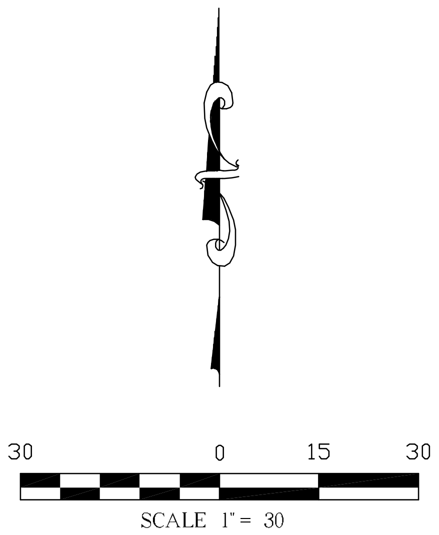
SITE PLAN
MONITORING WELL LOCATIONS
PROJECT: MOBIL STATION NO.18-HVF
25699 BASE LINE ST., HIGHLAND, CA. 92410

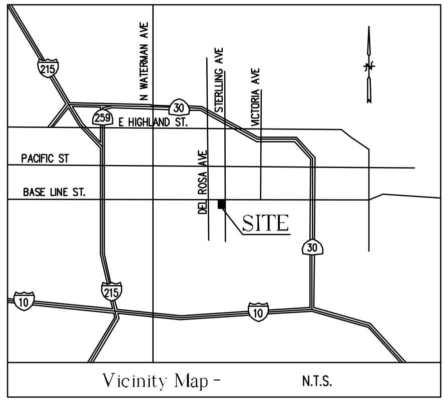


SURVEYED JULY 07, 2009

MONITORING WELLS								
WELL	NORTH	EAST	LATITUDE (DD)	LONGITUDE (DD)	TOR	FS	TOC	RISER_HT
					(ELEVATION)	(ELEVATION)	(ELEVATION)	
MW-5A	1867156.65	6790415.18	34.1206710	-117.2442103	1109.33	1109.32	1108.99	-0.33

RISER_HT – RISER HEIGHT
RISER HEIGHT DEFINITION: THE MEASURED DISTANCE FROM GROUND SURFACE TO TOP OF WELL CASING.





Vicinity Map - N.T.S.

Legend

FS	FINISH SURFACE	◎	MONITORING WELL
TOR	TOP OF RIM	—×—×—	CHAIN LINK FENCE
TOC	TOP OF CASING	☼	LIGHT
DD	DECIMAL DEGREES	⑊	EDGE OF PAVEMENT

PREPARED FOR
KLEINFELDER, INC
43218 BUSINESS PARK DRIVE, SUITE 201
TEMECULA, CA 92590
PHONE: (909) 506–1488
(909) 506–1491 Fax
KLEINFELDER PROJECT CODE: 51686
GLOBAL ID NUMBER: T0607100246

DATES OF SURVEY
SEPTEMBER 16, 2005
APRIL 27, 2009
JUNE 01, 2009
JUNE 05, 2009
JULY 07, 2009

BENCH MARK
THE ELEVATIONS SHOWN HEREON ARE BASED UPON THE NGS MONUMENT No."EV9325" ELEVATION = 1094.27 (NAVD 88)

COORDINATES
THE COORDINATES SHOWN HEREON ARE BASED UPON THE STATE PLANE COORDINATE SYSTEM (NAD83), CALIFORNIA ZONE V, BASED UPON STATIC GPS OBSERVATION, HOLDING NGS MONUMENT "EV1358"

NO.	DATE	REVISIONS	BY
1	06–08–09	ADDITIONAL WELLS	GBM
2	07–09–09	ADDITIONAL WELL	GBM

CALVADA SURVEYING, INC.
411 Jenks Cir., Suite 205, Corona, CA 92880
Phone: 951-280-9960 Fax: 951-280-9746
Toll Free: 800-CALVADA www.calvada.com
JOB NO. 09245

SUBMITTAL DATE 5/4/09_GBM

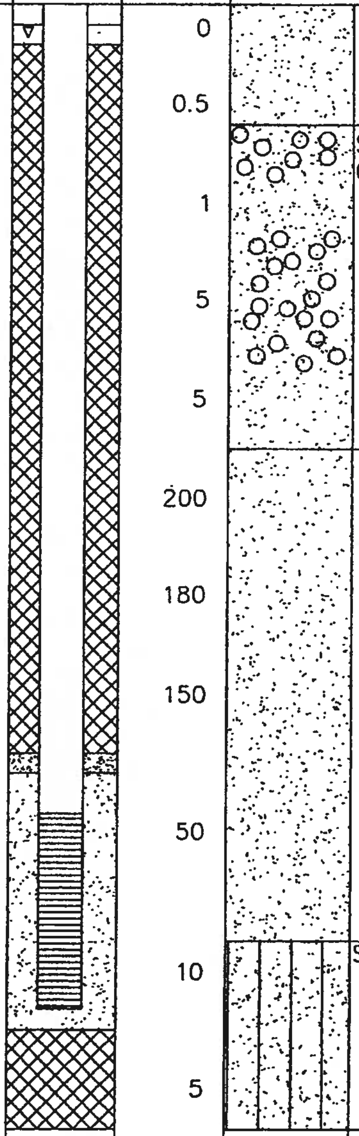
SHEET 1 OF 1

KLEINFELDER

9555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

BORING LOG

DRILL RIG: CME-75	DATE DRILLED: 11-19-98	LOGGED BY: KELLY WINTERS
BORING DIAMETER: 10"	BORING NUMBER: MW2	



SAMPLE TYPE	BLOW COUNT	DEPTH (feet)	OVA (ppm)	SOIL TYPE	DESCRIPTION AND REMARKS
			0	SP	SAND: medium, light to medium brown, dry to damp, no odor
■	6-10-11	5	0.5		SAND: as above, medium dense
				SW/GW	GRAVEL: with medium sand, brown, damp, no odor
■	25-45-49	10	1		GRAVELLY SAND: fine to coarse, reddish broan, damp, very dense, no odor
■	16-50/5"	15	5		GRAVEL: with fine to coarse sand, brown, damp, very dense, no odor
■	27-37-30	20	5		GRAVELLY SAND. fine to coarse, brown, damp to moist, very dense, no odor
■	16-26-32	25	200	SP	SAND: fine to medium, gray to brown, very moist, very dense, moderate odor
■	32-50/3"	30	180		SAND: as above
■	26-40-45	35	150		SAND: as above
■	18-38-50	40			
■	16-40-50		50		SAND: fine, tan, very moist, very dense, slight odor
■	45-50-50				
		45			
■	50/6"				
■	21-22-34		10	SM	SILTY SAND: fine to medium, gray, wet, very dense, slight odor
		50			
■	19-29-35				
■	35-25-35				
■	20-60-50	55	5		SILTY SAND: fine to coarse, brown, damp, very dense, no odor
		60			

SITE:

FORMER MOBIL STATION
25699 BASELINE STREET
HIGHLAND, CALIFORNIA

COMPLETION NOTES:

4" DIAMETER SCH 40 PVC 0.020" SLOTTED CASING FROM 41 TO 51 FEET BGS. 4" DIAMETER SCH 40 PVC BLANK CASING FROM 41 FEET BGS TO SURFACE. #3 MONTEREY SAND FROM 39 TO 52 FEET BGS. #0/60 SAND FROM 38 TO 39 FEET BGS. HYDRATED BENTONITE FROM 2 TO 38 AND 52 TO 57 FEET BGS. CONCRETE AND TRAFFIC RATED WELL BOX FROM 2 FEET BGS TO GROUND SURFACE.

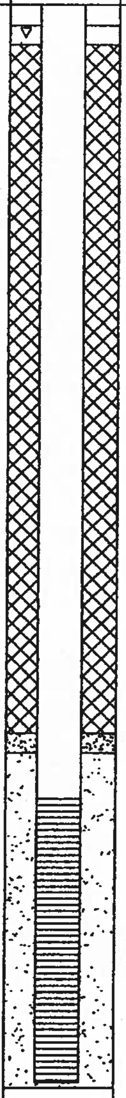
PROJECT NO: 51-4294-01

KLEINFELDER

9555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

BORING LOG

DRILL RIG: CME-75	DATE DRILLED: 11-20-98	LOGGED BY: KELLY WINTERS
BORING DIAMETER: 10"	BORING NUMBER: MW3	



SAMPLE TYPE	BLOW COUNT	DEPTH (feet)	OVA (ppm)	SOIL TYPE	DESCRIPTION AND REMARKS
		0	0	SP	SAND: medium, brown, damp, no odor
□		10		SM	SILTY SAND fine to medium, brown, damp, no odor
				SP	
		15	0		SAND: medium, tan to brown, damp, no odor
				GW	SANDY GRAVEL: brown, damp, no odor
■	11-19-20	20	0	SP	SAND: fine, light brown, damp, dense, no odor
		25			
■	18-30-37	30	0		SAND: fine, gray brown, moist, very dense, no odor
				SM	
		35	0		SILTY SAND: fine to medium, brown, damp to moist, no odor
■	10-14-20	40	0		
				GW	SANDY GRAVEL: brown, dry to damp, no odor
				SP	SAND. fine, brown, damp, no odor
■	29-50-40	45	0		
■	16-14-13		0	SM	SILTY SAND. fine to coarse, red brown, moist, medium dense, no odor
■			∇ 0		
■	17-42-43	50	0		SILTY SAND: as above, wet
■	10-12-16		0	ML	SANDY SILT: olive brown, wet, very stiff, no odor
□	10-10-11	55			
		60			

SITE:

FORMER MOBIL STATION
25699 BASELINE STREET
HIGHLAND, CALIFORNIA

COMPLETION NOTES:

4" DIAMETER SCH 40 PVC 0.020" SLOTTED CASING FROM 40 TO 55 FEET BGS. 4" DIAMETER SCH 40 PVC BLANK CASING FROM 40 FEET BGS TO SURFACE. #3 MONTEREY SAND FROM 38 TO 55 FEET BGS. #0/60 SAND FROM 37 TO 38 FEET BGS. HYDRATED BENTONITE FROM 2 TO 37 FEET BGS. CONCRETE AND TRAFFIC RATED WELL BOX FROM 2 FEET BGS TO SURFACE.

PROJECT NO: 51-4294-01

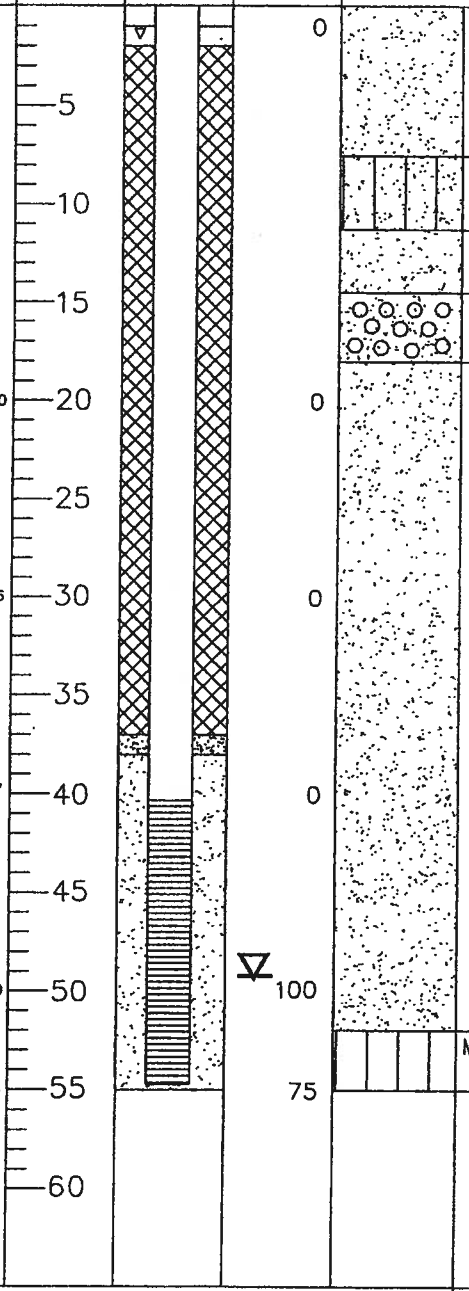
PAGE 1 OF 1

KLEINFELDER

9555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

BORING LOG

DRILL RIG: CME-75	DATE DRILLED: 11-20-98	LOGGED BY: KELLY WINTERS
BORING DIAMETER. 10"	BORING NUMBER: MW4	



SAMPLE TYPE	BLOW COUNT	DEPTH (feet)	WELL CONST.	OVA (ppm)	SOIL TYPE	DESCRIPTION AND REMARKS
				0	SP	SAND: fine, light brown, damp, no odor
					SM	SILTY SAND: fine to medium, brown, damp, no odor
					SP	SAND: medium, brown, damp, no odor
					GW	SANDY GRAVEL: brown, damp, no odor
■	13-26-40	20		0	SP	SAND: medium, tan to brown, damp, very dense, no odor
■	24-32-36	30		0		SAND. as above
■	26-45-50/5"	40		0		SAND: as above, moist
■	11-20-20	50		100		SAND: coarse, gray, wet, dense, slight odor
■	22-45-50	55		75	ML	SANDY SILT: olive brown, very moist, very stiff, slight odor

SITE:

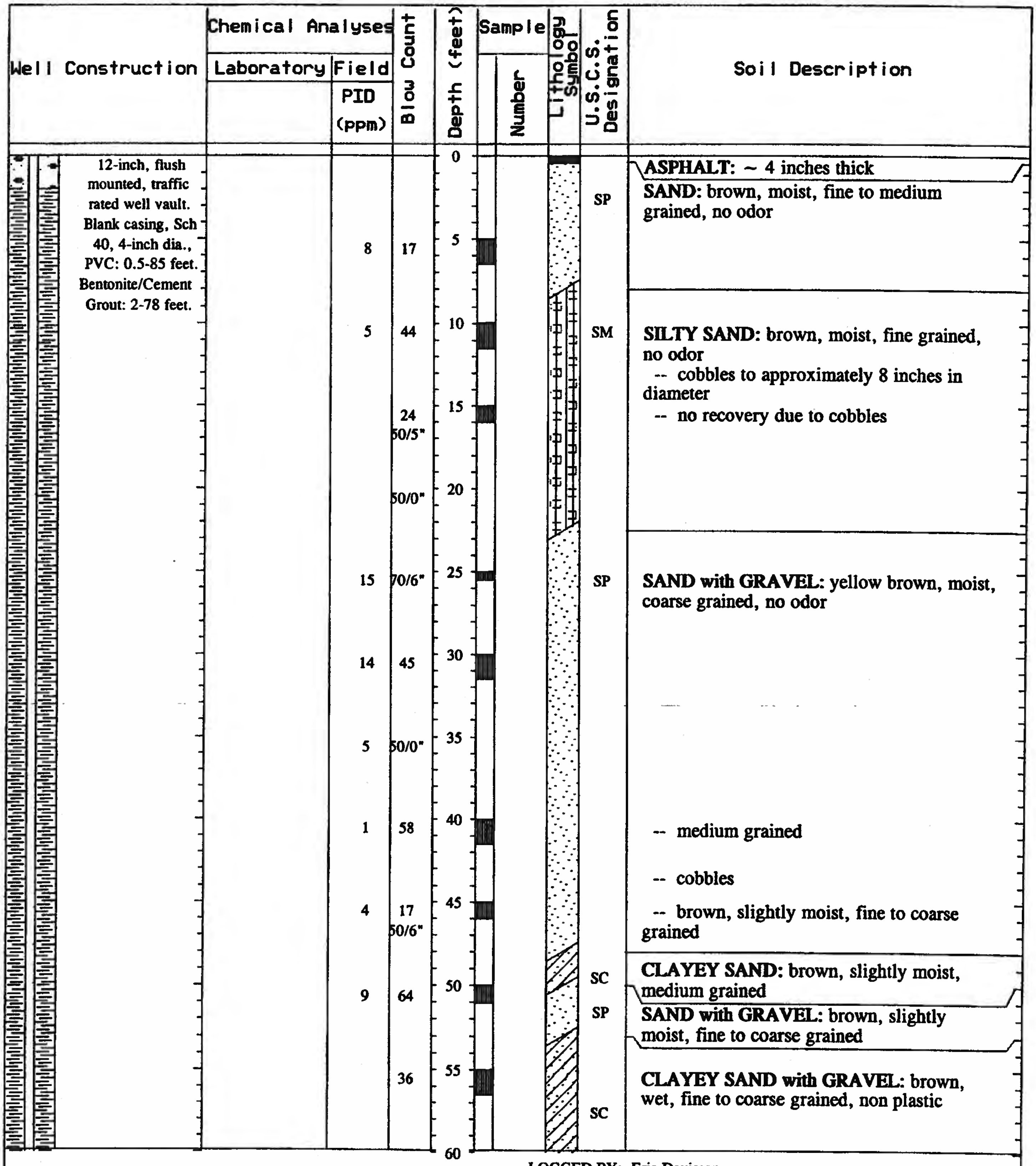
FORMER MOBIL STATION
25699 BASELINE STREET
HIGHLAND, CALIFORNIA

COMPLETION NOTES:

4" DIAMETER SCH 40 PVC 0.020" SLOTTED CASING FROM 40 TO 55 FEET BGS. 4" DIAMETER SCH 40 PVC BLANK CASING FROM 40 FEET BGS TO SURFACE. #3 MONTEREY SAND FROM 38 TO 55 FEET BGS. #0/60 SAND FROM 37 TO 38 FEET BGS. HYDRATED BENTONITE FROM 2 TO 37 FEET BGS. CONCRETE AND TRAFFIC RATED WELL BOX FROM 2 FEET BGS TO SURFACE.

PROJECT NO:
51-4294-01

PAGE 1 OF 1



Well Construction	Chemical Analyses: Laboratory	Chemical Analyses: Field PID (ppm)	Blow Count	Depth (feet)	Sample Number	Lithology Symbol	U.S.C.S. Designation	Soil Description
12-inch, flush mounted, traffic rated well vault. Blank casing, Sch 40, 4-inch dia., PVC: 0.5-85 feet. Bentonite/Cement Grout: 2-78 feet.				0				**ASPHALT:** ~ 4 inches thick
							SP	**SAND:** brown, moist, fine to medium grained, no odor
		8	17	5				
		5	44	10			SM	**SILTY SAND:** brown, moist, fine grained, no odor -- cobbles to approximately 8 inches in diameter -- no recovery due to cobbles
			24 50/5"	15				
			50/0"	20				
		15	70/6"	25			SP	**SAND with GRAVEL:** yellow brown, moist, coarse grained, no odor
		14	45	30				
		5	50/0"	35				
		1	58	40				-- medium grained
								-- cobbles
		4	17 50/6"	45				-- brown, slightly moist, fine to coarse grained
							SC	**CLAYEY SAND:** brown, slightly moist, medium grained
		9	64	50			SP	**SAND with GRAVEL:** brown, slightly moist, fine to coarse grained
			36	55			SC	**CLAYEY SAND with GRAVEL:** brown, wet, fine to coarse grained, non plastic
				60				

LOGGED BY: Eric Davisson

TOTAL DEPTH (feet): 113.0
DATE DRILLED: 4-26-01

DIAMETER OF BORING: 10"
APPROXIMATE DEPTH TO WATER (feet): 100.00

KLEINFELDER

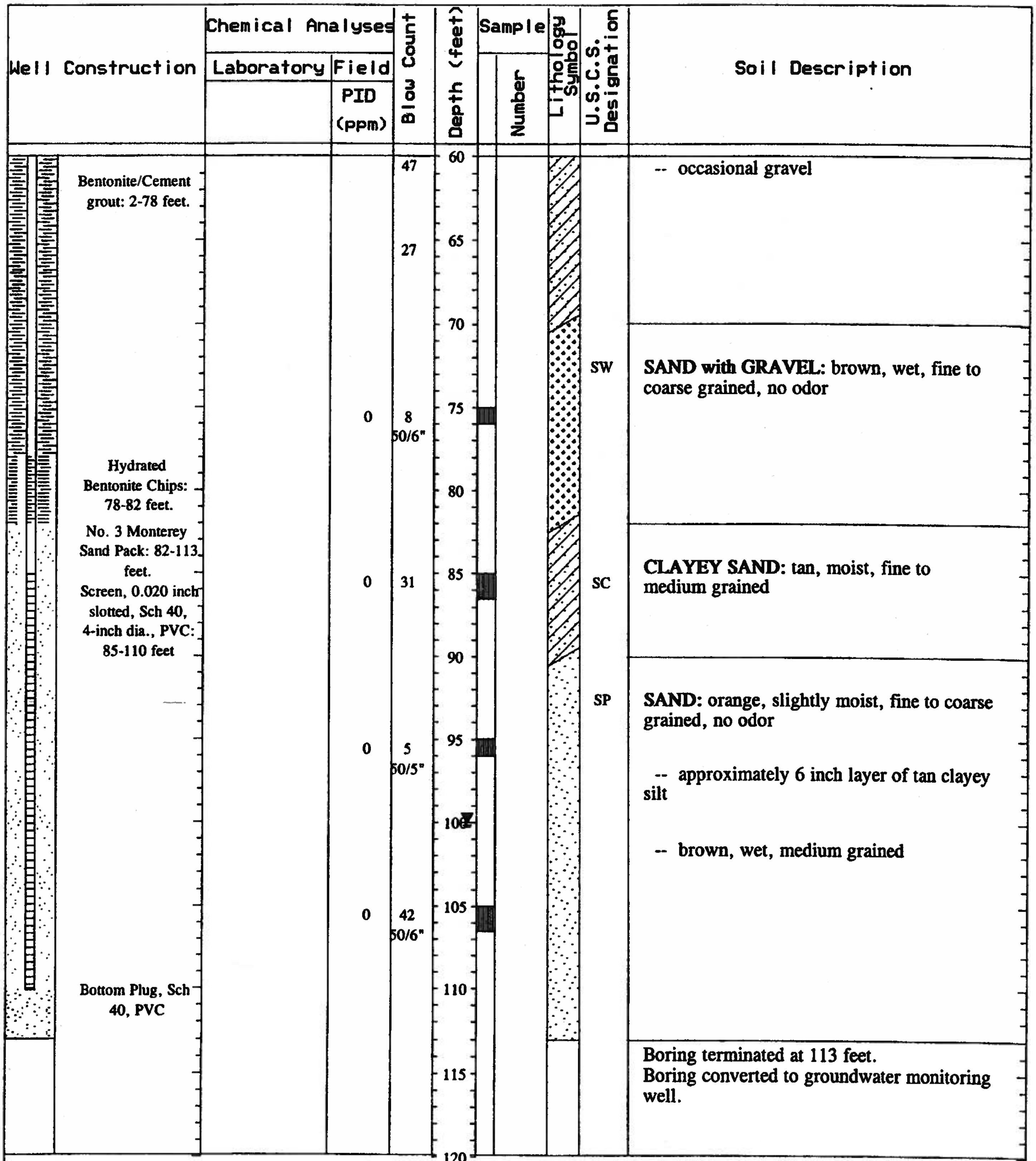
PROJECT NUMBER 56-4164-00/HVF

Former Mobil Station 18-HVF
Highland, California

LOG OF BORING MW-5

PLATE

A-1



Well Construction	Chemical Analyses: Laboratory	Chemical Analyses: Field PID (ppm)	Blow Count	Depth (feet)	Sample Number	Lithology Symbol	U.S.C.S. Designation	Soil Description
Bentonite/Cement grout: 2-78 feet.			47	60				-- occasional gravel
			27	65				
				70			SW	**SAND with GRAVEL:** brown, wet, fine to coarse grained, no odor
		0	8 50/6"	75				
Hydrated Bentonite Chips: 78-82 feet.				80				
No. 3 Monterey Sand Pack: 82-113 feet.								
Screen, 0.020 inch slotted, Sch 40, 4-inch dia., PVC: 85-110 feet		0	31	85			SC	**CLAYEY SAND:** tan, moist, fine to medium grained
				90			SP	**SAND:** orange, slightly moist, fine to coarse grained, no odor
		0	5 50/5"	95				-- approximately 6 inch layer of tan clayey silt
				100 ▼				-- brown, wet, medium grained
		0	42 50/6"	105				
Bottom Plug, Sch 40, PVC				110				
				115				Boring terminated at 113 feet. Boring converted to groundwater monitoring well.
				120				

LOGGED BY: Eric Davisson

TOTAL DEPTH (feet): 113.0
DATE DRILLED: 4-26-01

DIAMETER OF BORING: 10"
APPROXIMATE DEPTH TO WATER (feet): 100.00

KLEINFELDER

PROJECT NUMBER 56-4164-00/HVF

Former Mobil Station 18-HVF
Highland, California

LOG OF BORING MW-5

PLATE
A-1

PAGE 2 of 2

Well Construction	Analyses Lab.	Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION
12" Traffic-rated well box set in a 3'x3' concrete well pad									6" asphalt at surface.
			5						Boring air knifed to 8 feet below ground surface (bgs).
								SM	Silty Sand: Light brown, slightly moist, fine-grained sand, micaceous.
Backfilled with volclay grout (1-99.5 feet bgs)		3.6	10	MW-5A-10					
									Same as above, fine- to coarse-grained sand.
								SP	Poorly-Graded Sand: Pale brown, dry to slightly moist, fine- to medium-grained sand, with trace fine gravel.
4-inch sch-40 PVC blank casing (0.5-108 feet bgs)		1.6	15	MW-5A-15					Poorly-Graded Sand: Pale brown, dry to slightly moist, fine- to medium-grained sand, with some coarse-grained sand, trace fine gravel, some silt.
									Same as above, decreasing silt, increasing coarse-grained sand.
									Same as above, trace cobbles up to 4".
		2.5	20	MW-5A-20					
									Same as above, trace coarse gravel, no cobbles.
								SM	Silty Sand: Olive brown, slightly moist, fine-grained sand, weakly cemented.
								SP	Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand, with trace coarse sand.
		0.8	25	MW-5A-25					

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO STATIC WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street
Highland, California 92410

LOG OF BORING MW-5A

PLATE

1a

ENVIRONMENTAL MOBIL 18-HVF.GPJ KA_RDLND.GDT 8/28/09

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses Lab.	Analyses Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
								SP	Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand, with trace coarse sand. *(continued)*
									Same as above, olive-gray, some silt.
		2.6	30	MW -5A -30					
									Poorly-Graded Sand: Yellowish brown, moist, medium- to coarse-grained sand, with some silt.
									Same as above, medium-grained sand.
		4.9	35	MW -5A -35					
									Same as above, trace cobbles to 4". Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand.
									Occasional weakly-cemented silty nodules.
		4.1	40	MW -5A -40					
									Same as above, some coarse-grained sand.
									Two large cobbles stuck in drill bit. Recovered sample for 43 to 44 feet bgs consists mostly of rock flour and some coarse gravel.
		13.2	45	MW -5A -45					
									Same as above, trace gravel.
		5.2	50	MW -5A -50					Poorly-Graded Sand: Yellowish brown, moist, medium-gained sand, occasional thin weakly-cemented silty layers.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
TOTAL DEPTH (feet): 146
DATE DRILLED: 6-29-09
DRILLING COMPANY: WDC

LOGGED BY: D. Hasham
DIAMETER OF BORING (inches): 8
DEPTH TO STATIC WATER (feet): 136.76 (7/13/09)
DRILLING METHOD: Sonic w/ Continuous Core

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-5A

PLATE
1b

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses Lab.	Analyses Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
								SP	
								SM	Silty Sand: Light brownish gray, very moist, fine- to coarse-grained sand.
		5.0	55	MW -5A -55					
									Same as above, occasional gray fine sand layers.
								SP	Poorly-Graded Sand: Yellowish brown, moist, fine- to medium-grained sand, with trace coarse grained sand and cobbles, occasional stringers of dark gray micaceous sand.
		2.9	60	MW -5A -60					Same as above, with silt as layers, occasional peat-like nodules.
									Gravelly Sand: Light grayish brown, moist, fine- to coarse-grained sand, with fine gravel.
		13.7	65	MW -5A -65				SM	Silty Sand: Brown, moist, dense, fine-grained sand, with some coarse-grained sand.
								SW	Gravelly Sand: Brown, moist, fine- to coarse-grained sand, with some fine and coarse gravel, some silt.
		8.3	70	MW -5A -70					Same as above, trace cobbles.
									Same as above, increasing fine-grained sand and silt, decreasing fine and coarse gravel.
									Same as above, increasing fine and coarse gravel.
									Same as above, increasing silt and fine- to medium-grained sand, trace fine and coarse gravel.
		16.8	75	MW -5A -75				SM	Silty Sand: Brown, slightly moist, fine- to medium-grained, with some fine gravel, weakly-cemented fragments.
									Silty Sand: Olive brown, moist, fine-grained, with trace coarse sand.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO STATIC WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-5A

PLATE
1c

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

ENVIRONMENTAL MOBIL 18-HVF.GPJ KA_RDLND.GDT 8/28/09

Well Construction	Analyses Lab.	Analyses Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
		11.6	80	MW-5A-80				**SM**	Silty Sand: Brown, slightly moist, fine- to medium-grained, with some fine gravel, weakly-cemented fragments. *(continued)* Same as above, some medium- to coarse-grained sand, moderately cemented.
		11.4	85	MW-5A-85				**SP**	Poorly-Graded Sand: Olive brown, moist, fine- to medium-grained sand, with some silt.
								SM	Silty Sand: Olive brown, moist, weakly to moderately cemented, fine- to medium-grained sand, with trace coarse-grained sand, trace coarse gravel.
		8.1	90	MW-5A-90				**SC**	Clayey Sand: Yellowish brown, moist, fine- to coarse-grained sand, dense.
								SM	Silty Sand: Yellowish brown, moist, fine- to coarse-grained sand, dense.
		3.9	95	MW-5A-95				**SW**	Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with some silt, some iron oxide staining.
Hydrated bentonite chips (99.5-105.5 feet bgs)		29.5	100	MW-5A-100				**SM**	Silty Sand: Mottled yellowish brown and olive gray, moist, fine- to medium-grained sand, with trace coarse-grained sand, weakly cemented, dense.
								SW	Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with some silt.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO STATIC WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

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Former Mobil Service Station 18HVF
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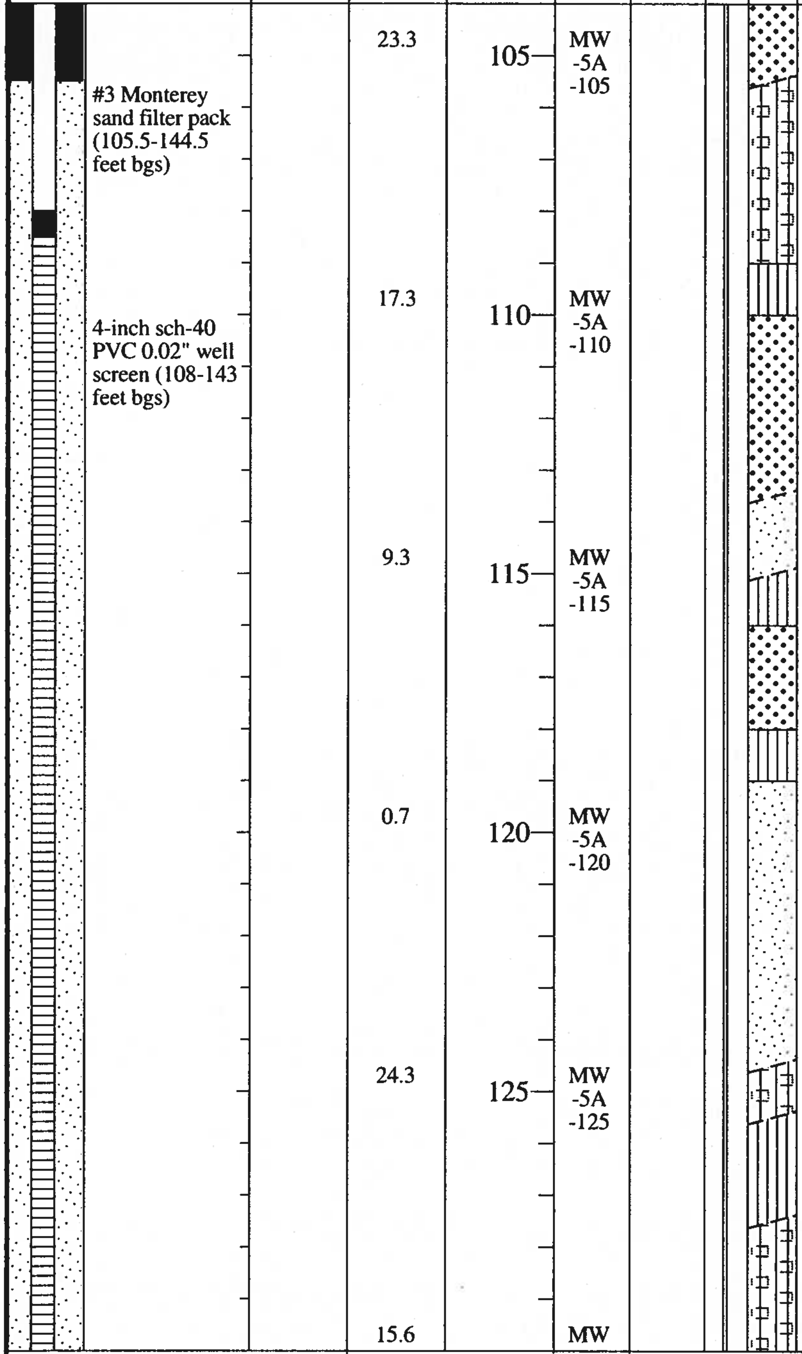
LOG OF BORING MW-5A

PLATE

1d

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.



Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	U.S.C.S. Designation
		23.3	105	MW-5A-105			SW
#3 Monterey sand filter pack (105.5-144.5 feet bgs)							SM
4-inch sch-40 PVC 0.02" well screen (108-143 feet bgs)		17.3	110	MW-5A-110			ML SW
		9.3	115	MW-5A-115			SP ML SW
		0.7	120	MW-5A-120			ML SP
		24.3	125	MW-5A-125			SM ML SM
		15.6		MW			

SOIL DESCRIPTION AND CLASSIFICATION

(Continued From Previous Page)

Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with some silt. *(continued)*

Silty Sand: Yellowish brown, slightly moist, fine- to coarse-grained sand, weakly cemented fragments.

Sandy Silt: Brown, moist, hard, with fine- to medium-grained sand, trace coarse-grained sand.

Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with some silt.

Gravelly Sand: Yellowish brown, moist, medium- to coarse-grained sand, with coarse gravel, some silt.

Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand, with occasional approximately 1" hard silt lenses.

Sandy Silt: Brown, moist, fine-grained, with some medium-grained sand, trace coarse-grained sand.

Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with trace silt, some coarse gravel.

Sandy Silt: Brown, moist, hard, fine-grained, with some medium- and coarse-grained sand.

Poorly-Graded Sand: Yellowish brown, slightly moist, medium-grained sand, with some coarse-grained sand, some silt.
Same as above, occasional thin (>1") weakly-cemented silty/clayey layers.
Same as above, increasing moisture, bottom of sample contains many hard, weakly-cemented, dry, silty fragments.

Silty Sand: Brown, moist, fine-grained sand, with some medium- and coarse-grained sand.

Sandy Silt: Brown, moist, hard, with fine-grained sand, some medium- and coarse-grained sand.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
TOTAL DEPTH (feet): 146
DATE DRILLED: 6-29-09
DRILLING COMPANY: WDC
LOGGED BY: D. Hasham
DIAMETER OF BORING (inches): 8
DEPTH TO STATIC WATER (feet): 136.76 (7/13/09)
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-5A

PLATE
1e

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses Lab.	Analyses Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
				-5A -130				SM	Silty Sand: Yellowish brown, slightly moist, fine- to medium-grained sand, with some coarse-grained sand. *(continued)*
			∇						
								SP	Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand, with trace coarse gravel.
		26.7	135	MW -5A -135					Same as above, some silt, very moist. Same as above, with silt, very fine-grained.
		3.0	140	MW -5A -140				SM	Silty Sand: Yellowish brown, wet, very fine grained.
								ML	Silt: Yellowish brown, very moist, stiff, with some fine-grained sand.
Bentonite pellets (144.5-146 feet bgs)		6.1	145	MW -5A -145					
									Boring terminated at 146 feet bgs.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
TOTAL DEPTH (feet): 146
DATE DRILLED: 6-29-09
DRILLING COMPANY: WDC

LOGGED BY: D. Hasham
DIAMETER OF BORING (inches): 8
DEPTH TO STATIC WATER (feet): 136.76 (7/13/09)
DRILLING METHOD: Sonic w/ Continuous Core

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Former Mobil Service Station 18HVF
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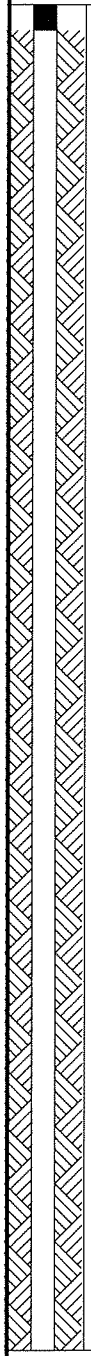
LOG OF BORING MW-5A

PLATE 1f

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.



Well Construction	Analyses Lab.	Analyses Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	**SOIL DESCRIPTION AND CLASSIFICATION**
12" Traffic-rated well box set in a 3'x3' concrete well pad									6" asphalt at surface.
			5						Boring air knifed to 8 feet below ground surface (bgs).
								SM	Silty Sand: Light brown, slightly moist, fine-grained sand, micaceous.
Backfilled with volclay grout (1-99.5 feet bgs)		3.6	10	MW-5A-10					
									Same as above, fine- to coarse-grained sand.
								SP	Poorly-Graded Sand: Pale brown, dry to slightly moist, fine- to medium-grained sand, with trace fine gravel.
4-inch sch-40 PVC blank casing (0.5-108 feet bgs)		1.6	15	MW-5A-15					
									Poorly-Graded Sand: Pale brown, dry to slightly moist, fine- to medium-grained sand, with some coarse-grained sand, trace fine gravel, some silt.
									Same as above, decreasing silt, increasing coarse-grained sand.
									Same as above, trace cobbles up to 4".
		2.5	20	MW-5A-20					
									Same as above, trace coarse gravel, no cobbles.
								SM	Silty Sand: Olive brown, slightly moist, fine-grained sand, weakly cemented.
								SP	Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand, with trace coarse sand.
		0.8	25	MW-5A-25					

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO ENCOUNTERED WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

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Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-5A

PLATE
1a

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
								SP	Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand, with trace coarse sand. *(continued)*
									Same as above, olive-gray, some silt.
		2.6	30	MW -5A -30					
									Poorly-Graded Sand: Yellowish brown, moist, medium- to coarse-grained sand, with some silt.
									Same as above, medium-grained sand.
		4.9	35	MW -5A -35					
									Same as above, trace cobbles to 4". Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand.
									Occasional weakly-cemented silty nodules.
		4.1	40	MW -5A -40					
									Same as above, some coarse-grained sand.
									Two large cobbles stuck in drill bit. Recovered sample for 43 to 44 feet bgs consists mostly of rock flour and some coarse gravel.
		13.2	45	MW -5A -45					Same as above, trace gravel.
		5.2	50	MW -5A -50					Poorly-Graded Sand: Yellowish brown, moist, medium-gained sand, occasional thin weakly-cemented silty layers.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO ENCOUNTERED WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

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LOG OF BORING MW-5A

PLATE
1b

ENVIRONMENTAL MOBIL 18-HVF.GPJ KA_RDLND.GDT 8/28/09

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
								SP	
								SM	Silty Sand: Light brownish gray, very moist, fine- to coarse-grained sand.
		5.0	55	MW -5A -55					
									Same as above, occasional gray fine sand layers.
								SP	Poorly-Graded Sand: Yellowish brown, moist, fine- to medium-grained sand, with trace coarse grained sand and cobbles, occasional stringers of dark gray micaceous sand.
		2.9	60	MW -5A -60					Same as above, with silt as layers, occasional peat-like nodules.
									Gravelly Sand: Light grayish brown, moist, fine- to coarse-grained sand, with fine gravel.
		13.7	65	MW -5A -65				SM	Silty Sand: Brown, moist, dense, fine-grained sand, with some coarse-grained sand.
								SW	Gravelly Sand: Brown, moist, fine- to coarse-grained sand, with some fine and coarse gravel, some silt.
		8.3	70	MW -5A -70					Same as above, trace cobbles.
									Same as above, increasing fine-grained sand and silt, decreasing fine and coarse gravel.
									Same as above, increasing fine and coarse gravel.
									Same as above, increasing silt and fine- to medium-grained sand, trace fine and coarse gravel.
		16.8	75	MW -5A -75				SM	Silty Sand: Brown, slightly moist, fine- to medium-grained, with some fine gravel, weakly-cemented fragments.
									Silty Sand: Olive brown, moist, fine-grained, with trace coarse sand.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO ENCOUNTERED WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

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LOG OF BORING MW-5A

PLATE

1c

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
								SM	Silty Sand: Brown, slightly moist, fine- to medium-grained, with some fine gravel, weakly-cemented fragments. *(continued)*
		11.6	80	MW -5A -80					Same as above, some medium- to coarse-grained sand, moderately cemented.
								SP	Poorly-Graded Sand: Olive brown, moist, fine- to medium-grained sand, with some silt.
		11.4	85	MW -5A -85					
								SM	Silty Sand: Olive brown, moist, weakly to moderately cemented, fine- to medium-grained sand, with trace coarse-grained sand, trace coarse gravel.
		8.1	90	MW -5A -90				**SC**	Clayey Sand: Yellowish brown, moist, fine- to coarse-grained sand, dense.
								SM	Silty Sand: Yellowish brown, moist, fine- to coarse-grained sand, dense.
								SW	Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with some silt, some iron oxide staining.
		3.9	95	MW -5A -95					
								SM	Silty Sand: Mottled yellowish brown and olive gray, moist, fine- to medium-grained sand, with trace coarse-grained sand, weakly cemented, dense.
Hydrated bentonite chips (99.5-105.5 feet bgs)		29.5	100	MW -5A -100					
								SW	Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with some silt.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO ENCOUNTERED WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
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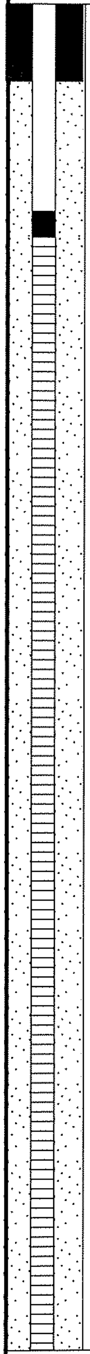
LOG OF BORING MW-5A

PLATE
1d

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.



Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
		23.3	105	MW -5A -105				SW	Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with some silt. *(continued)*
#3 Monterey sand filter pack (105.5-144.5 feet bgs)								SM	Silty Sand: Yellowish brown, slightly moist, fine- to coarse-grained sand, weakly cemented fragments.
		17.3	110	MW -5A -110				ML	Sandy Silt: Brown, moist, hard, with fine- to medium-grained sand, trace coarse-grained sand.
4-inch sch-40 PVC 0.02" well screen (108-143 feet bgs)								SW	Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with some silt.
									Gravelly Sand: Yellowish brown, moist, medium- to coarse-grained sand, with coarse gravel, some silt.
		9.3	115	MW -5A -115				SP	Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand, with occasional approximately 1" hard silt lenses.
								ML	Sandy Silt: Brown, moist, fine-grained, with some medium-grained sand, trace coarse-grained sand.
								SW	Well-Graded Sand: Yellowish brown, moist, fine- to coarse-grained sand, with trace silt, some coarse gravel.
								ML	Sandy Silt: Brown, moist, hard, fine-grained, with some medium- and coarse-grained sand.
		0.7	120	MW -5A -120				SP	Poorly-Graded Sand: Yellowish brown, slightly moist, medium-grained sand, with some coarse-grained sand, some silt. Same as above, occasional thin (>1") weakly-cemented silty/clayey layers.
		24.3	125	MW -5A -125					Same as above, increasing moisture, bottom of sample contains many hard, weakly-cemented, dry, silty fragments.
								SM	Silty Sand: Brown, moist, fine-grained sand, with some medium- and coarse-grained sand.
								ML	Sandy Silt: Brown, moist, hard, with fine-grained sand, some medium- and coarse-grained sand.
								SM	
		15.6		MW					

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC) LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO ENCOUNTERED WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-5A

PLATE
1e

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses Lab.	Analyses Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	**SOIL DESCRIPTION AND CLASSIFICATION** *(Continued From Previous Page)*
			▽	-5A -130				**SM**	Silty Sand: Yellowish brown, slightly moist, fine- to medium-grained sand, with some coarse-grained sand. *(continued)*
		26.7	135	MW -5A -135				**SP**	Poorly-Graded Sand: Yellowish brown, moist, medium-grained sand, with trace coarse gravel. Same as above, some silt, very moist. Same as above, with silt, very fine-grained.
		3.0	140	MW -5A -140				**SM**	Silty Sand: Yellowish brown, wet, very fine grained.
								ML	Silt: Yellowish brown, very moist, stiff, with some fine-grained sand.
Bentonite pellets (144.5-146 feet bgs)		6.1	145	MW -5A -145					
									Boring terminated at 146 feet bgs.

SURFACE ELEVATION: 1,109.33 feet (1,108.99 TOC)
LOGGED BY: D. Hasham
TOTAL DEPTH (feet): 146
DIAMETER OF BORING (inches): 8
DATE DRILLED: 6-29-09
DEPTH TO ENCOUNTERED WATER (feet): 136.76 (7/13/09)
DRILLING COMPANY: WDC
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
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LOG OF BORING MW-5A

PLATE
1f

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Chemical Analyses: Laboratory	Chemical Analyses: Field PID (ppm)	Blow Count	Depth (feet)	Sample Number	Lithology Symbol	U.S.C.S. Designation	Soil Description
12-inch, flush mounted, traffic rated well vault. Blank casing, Sch 40, 4-inch dia., PVC: 0-45 feet. Bentonite/Cement Grout: 2-40 feet.				0				**ASPHALT:** ~ 4 inches thick
							SP	**SAND:** dark brown, slightly moist, fine to medium grained, trace silt, no odor
			26	5				
			29	10				-- light brown, moist, loose, fine grained, trace coarse sand, no odor
							SP	**SAND:** tan, dry, fine to coarse grained, trace sub angular gravel to 1/2 inch, no odor
			66	15				-- slightly moist to moist, medium to coarse grained, trace fine gravel, no odor -- cobbles at approximately 17 feet
			54	20				-- slightly moist, trace sub rounded gravel to approximately 1/2 inch, no odor
			42	25				
							SP	**SAND:** red-brown, moist, fine grained, slightly micaceous, no odor
			48	30				-- fine to medium grained, some coarse sand, loose, no odor
							SP	**SAND:** gray-brown, slightly moist to moist, fine to medium grained, some coarse sand, loose, trace silt, no odor -- red-brown -- coarse granitic gravel, fairly weathered -- tan, slightly moist, fine to coarse grained sand
			62	35				
Bentonite Chips: 40-43 feet.			38	40				-- approximately 4 inch thick seam of red-orange, fine grained, highly oxidized sand
							SM	**SILTY SAND:** brown, fine grained, much silt
No. 3 Monterey Sand Pack: 43-56 feet.							SW	**SAND:** brown, slightly moist, loose, fine to coarse grained, with well rounded gravel to 3 inches, iron staining
Screen, 0.020 inch slotted, Sch 40, 4-inch dia., PVC: 45-55 feet.				45				
				50				

LOGGED BY: D. Grossman

TOTAL DEPTH (feet): 91.0
DATE DRILLED: 5-8-01

DIAMETER OF BORING: 10"
APPROXIMATE DEPTH TO WATER (feet): 53.00

KLEINFELDER

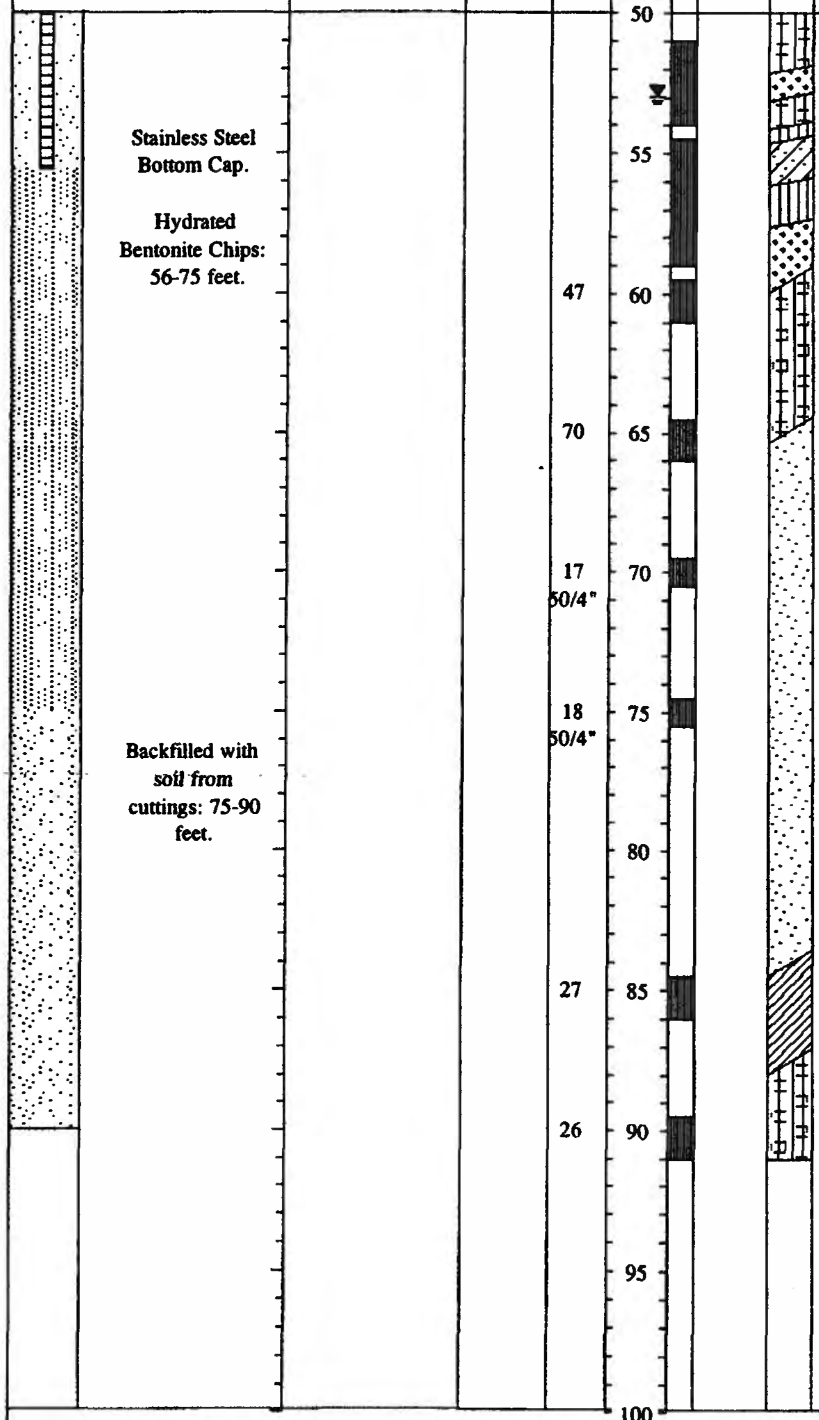
PROJECT NUMBER 56-4164-00/HVF

Former Mobil Station 18-HVF
Highland, California

LOG OF BORING
MW-6

PLATE
A-2

PAGE 1 of 2



Well Construction	Chemical Analyses Laboratory	Chemical Analyses Field PID (ppm)	Blow Count	Depth (feet)	Sample Number	Lithology Symbol	U.S.C.S. Designation	Soil Description
				50				
							SM	**SILTY SAND:** dark brown, slightly moist to moist, fine to medium grained, non plastic, with clay
							SW	**SAND:** brown, loose, fine to coarse grained, with fine gravel
							SM	**SILTY SAND:** gray, wet, fine to coarse grained, with iron staining -- groundwater encountered at approximately 53 feet
Stainless Steel Bottom Cap.							ML	**SILT:** olive, wet, micaceous
				55			SC	**CLAYEY SAND:** brown, fine to medium grained
Hydrated Bentonite Chips: 56-75 feet.							ML	**CLAYEY SILT:** brown, damp, plastic, approximately 18 inch aquiclude layer
							SW	**SAND:** brown, fine to coarse grained
			47	60			SM	**SILTY SAND:** gray-brown, wet, fine to medium grained, no odor, fines matrix supporting coarser grains
			70	65				
							SP	**SAND:** light brown, moist, medium grained, no odor
			17 50/4"	70				-- brown, medium to coarse grained, with rounded to sub rounded gravel to 1 inch, no odor
Backfilled with soil from cuttings: 75-90 feet.			18 50/4"	75				-- red-brown, trace granitic cobble
				80				-- light brown, slightly moist, medium grained, no odor
			27	85			CL	**CLAY:** light brown, slightly moist, hard, low plasticity, no odor
			26	90			SM	**SILTY SAND:** red-brown, moist, dense, fine grained, no odor
								Boring terminated at 91 feet. Groundwater encountered at approximately 53 feet. Borehole converted to groundwater monitoring well.
				95				
				100				

LOGGED BY: D. Grossman

TOTAL DEPTH (feet): 91.0
DATE DRILLED: 5-8-01

DIAMETER OF BORING: 10"
APPROXIMATE DEPTH TO WATER (feet): 53.00

KLEINFELDER

PROJECT NUMBER 56-4164-00/HVF

Former Mobil Station 18-HVF
Highland, California

LOG OF BORING
MW-6

PLATE
A-2

Well Construction	Chemical Analyses Lab.	Chemical Analyses Field PID (ppm)	Depth (feet)	Sample Type	Sample Number	Blows per Foot	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION
Morrison-Dubuque traffic rated well box set in 3X3' concrete pad									3-inches asphalt at grade Air knifed and cleared borehole to 8-feet bgs
2 to 29 feet bgs: Annulus backfilled with bentonite grout slurry			5					SP	
		2.6	10		MW7-10	12 15 20		SP	**Poorly-Graded Sand with Gravel**: Mottled light gray and orange-brown, moist, fine subangular sand, some fine subangular gravel, trace medium sand, dense, no odor
		1.8	15		MW7-15	14 21 27		SP	**Poorly-Graded Sand**: Mottled light gray and orange-brown, moist, fine to medium sand, dense, no odor
								SM	**Silty Sand**: Brown, moist, micaceous fine sand, some silt, dense, no odor
0.5 to 35 feet bgs: 4-inch dia. Schedule 40 PVC casing		1.4	20		MW7-20	14 21 30		SP	**Poorly-Graded Sand**: Same as above, very dense

TOP OF CASING ELEVATION (feet): MSL
TOTAL DEPTH (feet): 66.5
DATE DRILLED: 9-1-05

LOGGED BY: V. Prast
DIAMETER OF BORING (inches): 10
DEPTH TO STATIC WATER (feet): N/A bgs

ENVIRONMENTAL 18-HVF.GPJ KA RDLND.GDT 9/19/05

KLEINFELDER

PROJECT NO. 51686

Mobil 18-HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-7

PLATE
2a

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction

2 to 29 feet bgs: Annulus backfilled with bentonite grout slurry

0.5 to 35 feet bgs: 4-inch dia. Schedule 40 PVC casing

29 to 32 feet bgs: Hydrated bentonite chip seal

32 to 56 feet bgs: Monterey #3 filter sand

35 to 55 feet bgs: 4-inch dia. Schedule 40 PVC well screen with 0.02-inch slots

Chemical Analyses Lab.	Chemical Analyses Field PID (ppm)	Depth (feet)	Sample Type	Sample Number	Blows per Foot	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
	0.4			MW7-25	12 17 23		SP	Alternating layers of fine to coarse grained sand **Poorly-Graded Sand**: Mottled olive-gray and orange-brown, moist, dense, no odor
	2.8	30		MW7-30	17 19 32		SM	**Silty Sand**: Olive-gray, moist, fine to medium sand, some silt, very dense, no odor
	6.4	35		MW7-35	24 30 34		SP	**Poorly-Graded Sand**: Olive-brown, moist, fine to medium micaceous angular to subangular sand, trace gravel, very dense, no odor
	7.2	40		MW7-40	14 24 28		ML SP	**Sandy Silt**: Mottled olive-gray and orange-brown, moist, silt, some fine micaceous sand, hard, no odor **Poorly-Graded Sand**: Mottled orange-brown, fine to coarse sand, very dense, no odor
	9.2	45		MW7-45	30 50		SP	**Poorly-Graded Sand with Gravel**: Mottled light gray and orange-brown, moist, medium to coarse sand, some fine sand, some angular to subrounded gravel, very dense, no odor

TOP OF CASING ELEVATION (feet): MSL

TOTAL DEPTH (feet): 66.5

DATE DRILLED: 9-1-05

LOGGED BY: V. Prast

DIAMETER OF BORING (inches): 10

DEPTH TO STATIC WATER (feet): N/A bgs

KLEINFELDER

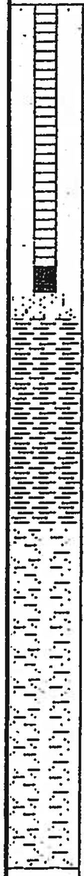
PROJECT NO. 51686

Mobil 18-HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-7

PLATE 2b

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.



Well Construction	Chemical Analyses: Lab.	Chemical Analyses: Field PID (ppm)	Depth (feet)	Sample Type	Sample Number	Blows per Foot	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
32 to 56 feet bgs: Monterey #3 filter sand 35 to 55 feet bgs: 4-inch dia. Schedule 40 PVC well screen with 0.02-inch slots		2.0		▥	MW7-50	24 33 42		SP-SM	Initial perched water at 50-feet bgs **Poorly-Graded Sand with Silt**: Gray, wet, fine to medium sand, very dense, no odor
Threaded bottom cap 56 to 60 feet bgs: Borehole backfilled with hydrated bentonite chips		3.7	55	▥	MW7-55	6 10 14		ML	**Sandy Silt**: Mottled orange-brown and olive-gray, moist, micaceous silt, some fine to medium sand, little to some clay, very stiff, no odor
60 to 66.5 feet bgs: Borehole caved, no backfill		3.7	60	▥	MW7-60	29 50		GM	**Silty Gravel with Sand**: Olive-gray, moist, schist gravel, some fine to coarse sand, some silt, very dense, no odor
		0.0	65	▥	MW7-65	33 35 50		GM	**Silty Gravel with Sand**: Mottled orange-brown and olive-gray, moist, metamorphic gravel, some fine to coarse sand, some silt, very dense, no odor

TOP OF CASING ELEVATION (feet): MSL
TOTAL DEPTH (feet): 66.5
DATE DRILLED: 9-1-05

LOGGED BY: V. Prast
DIAMETER OF BORING (inches): 10
DEPTH TO STATIC WATER (feet): N/A bgs

KLEINFELDER

PROJECT NO. 51686

Mobil 18-HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-7

PLATE 2c

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Chemical Analyses Lab.	Field PID (ppm)	Depth (feet)	Sample Type	Sample Number	Blows per Foot	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION
Morrison-Dubuque traffic rated well box set in 3X3' concrete pad									3-inches asphalt at grade Air knifed and cleared borehole to 8-feet bgs
2 to 30 feet bgs: Annulus backfilled with bentonite grout slurry			5					SP	
		38.8	10		MW8 -10	9 12 15		SP	**Poorly-Graded Sand with Gravel**: Olive-gray, fine to medium sand, some gravel, medium dense, no odor
		8.9	15		MW8 -15	14 19 26		SP	**Poorly-Graded Sand**: Mottled olive-gray and orange-brown, moist, fine to medium sand, dense, no odor
0.5 to 35 feet bgs: 4-inch dia. Schedule 40 PVC casing		14.1	20		MW8 -20	14 17 26		SP	**Poorly-Graded Sand with Gravel**: Mottled light gray and orange-brown, fine to medium sand, some fine gravel, dense
									Sandy Silt: Olive-gray, moist, silt, some fine

TOP OF CASING ELEVATION (feet): MSL
TOTAL DEPTH (feet): 56.5
DATE DRILLED: 9-1-05

LOGGED BY: V. Prast
DIAMETER OF BORING (inches): 10
DEPTH TO STATIC WATER (feet): N/A bgs

KLEINFELDER

PROJECT NO. 51686

Mobil 18-HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-8

PLATE

3a

ENVIRONMENTAL 18-HVF.GPJ KA RDLND.GDT 9/19/05

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Chemical Analyses Lab.	Field PID (ppm)	Depth (feet)	Sample Type	Sample Number	Blows per Foot	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
		--			MW8-25	15 20 25		ML	sand, very stiff, no odor
2 to 30 feet bgs: Annulus backfilled with bentonite grout slurry 0.5 to 35 feet bgs: 4-inch dia. Schedule 40 PVC casing								SP	**Poorly-Graded Sand**: Same as above
30 to 32 feet bgs: Hydrated bentonite chip seal		11.7	30		MW8-30	16 26 31		SP	**Poorly-Graded Sand**: Mottled light gray and orange-brown, moist, fine to medium sand, trace gravel, very dense, no odor
32 to 56 feet bgs: Monterey #3 filter sand									
		24.7	35		MW8-35	15 26 30		SP	**Poorly-Graded Sand**: Mottled light gray and orange-brown, fine to medium sand, little coarse sand, trace gravel, very dense, no odor
35 to 55 feet bgs: 4-inch dia. Schedule 40 PVC well screen with 0.02-inch slots		7.7	40		MW8-40	17 23 34		SP	**Poorly-Graded Sand with Gravel**: Mottled light gray and orange-brown, fine to coarse grained, predominantly fine to medium, some gravel, very dense, no odor
		9.2	45		MW8-45	15 23 30		SP	**Poorly-Graded Sand with Gravel**: Same as above

TOP OF CASING ELEVATION (feet): MSL
TOTAL DEPTH (feet): 56.5
DATE DRILLED: 9-1-05

LOGGED BY: V. Prast
DIAMETER OF BORING (inches): 10
DEPTH TO STATIC WATER (feet): N/A bgs

KLEINFELDER

PROJECT NO. 51686

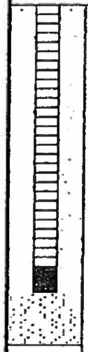
Mobil 18-HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-8

PLATE 3b

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Chemical Analyses: Lab.	Chemical Analyses: Field PID (ppm)	Depth (feet)	Sample Type	Sample Number	Blows per Foot	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
32 to 56 feet bgs: Monterey #3 filter sand		8.1			MW8-50	10 14 20		SP	Initial wet zone at 50-feet bgs **Poorly-Graded Sand with Gravel**: Light gray and orange-brown, wet, fine to coarse sand, predominantly medium grained, some gravel, dense
35 to 55 feet bgs: 4-inch dia. Schedule 40 PVC well screen with 0.02-inch slots								SM	**Silty Sand**: Brown, moist, fine sand, trace medium sand, trace clay, dense, no odor
Threaded bottom cap		9.4	55		MW8-55	6 9 13		ML	**Sandy Silt with Clay**: Olive-brown, moist, silt, some clay, fine to medium micaceous sand with iron oxde stained soil fractures, very stiff, no odor



TOP OF CASING ELEVATION (feet): MSL
TOTAL DEPTH (feet): 56.5
DATE DRILLED: 9-1-05

LOGGED BY: V. Prast
DIAMETER OF BORING (inches): 10
DEPTH TO STATIC WATER (feet): N/A bgs

KLEINFELDER

PROJECT NO. 51686

Mobil 18-HVF
25699 Baseline Street, Highland, California 92410

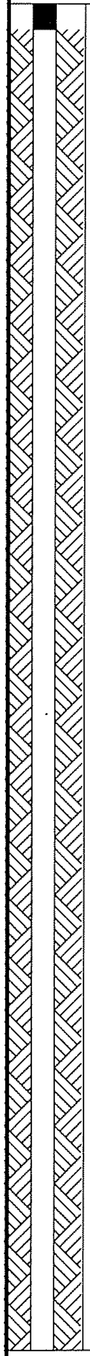
LOG OF BORING MW-8

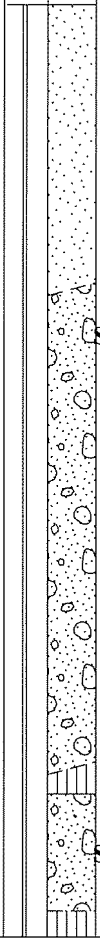
PLATE
3c

ENVIRONMENTAL 18-HVF.GPJ KA RDLND.GDT 9/19/05

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION
12" Traffic-rated well box set in a 3'x3' concrete well pad			0						2" asphalt at surface.
			5						Borehole airknifed to 8 feet below ground surface (bgs).
Backfilled with volclay grout (1-95.5 feet bgs)		1.6	10	MW-8A-10				SP	Poorly-Graded Sand: Brown, moist, fine-grained sand, trace silt, trace gravel up to 1/2", micaceous.
									Same as above, no silt.
4-inch sch-40 PVC blank casing (0.5-105 feet bgs)		7.8	15	MW-8A-15				SP/GP	Poorly-Graded Sand with Gravel: Light-brown, moist, medium- to coarse-grained sand, with gravel up to 2.5".
		3.8	20	MW-8A-20					
									Poorly-Graded Sand and Gravel: Light gray, slightly moist, fine- to medium-grained sand, with coarse gravel up to 3".
								ML	Sandy Silt: Olive gray, moist, stiff, with fine-grained sand.
		4.2	25	MW-8A				SP/GP	Poorly-Graded Sand and Gravel: Mottled light gray and orange, moist, fine- to





SURFACE ELEVATION: 1,109.66 feet (1,109.35 TOC)
TOTAL DEPTH (feet): 135
DATE DRILLED: 4-16-09
DRILLING COMPANY: WDC Exploration & Wells

LOGGED BY: V. Reynolds
DIAMETER OF BORING (inches): 8
DEPTH TO ENCOUNTERED WATER (feet): 121.01 (6/16/09)
DRILLING METHOD: Sonic w/ Continuous Core

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-8A

PLATE

2a

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses Lab.	Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
				-25					medium-grained sand, with some coarse-grained sand, gravel up to 2".
								ML	Sandy Silt: Olive gray, moist, with fine-grained sand, micaceous, red iron staining and dark gray staining. *(continued)*
								SP	Poorly-Graded Sand: Red-brown, moist, fine- to medium-grained sand.
								SM	Silty Sand: Olive-gray, moist, with fine- to medium-grained sand.
		0.0	30	MW -8A -30				SP	Poorly-Graded Sand: Brown, moist, fine- to medium-grained sand, with some subrounded coarse gravel up to 1".
									Same as above, some weakly-cemented fine-grained sand.
		1.9	35	MW -8A -35					Poorly-Graded Sand: Light-brown, moist, fine- to medium-grained sand, with some fine gravel.
									Poorly-Graded Sand: Light-brown, moist, fine to medium-grained sand, with trace silt, weak cementation.
		0.2	40	MW -8A -40					Same as above, trace fine gravel.
									Same as above, red-brown, some silt.
									Same as above, increasing gravel.
		0.0	45	MW -8A -45				SP/GP	Poorly-Graded Sand and Gravel: Brown, moist, fine- to medium-grained sand, with coarse subangular gravel up to 1.5".
								SP	Poorly-Graded Sand: Red-brown, moist, fine- to medium-grained sand.
		0.7	50	MW -8A -50					Same as above, mottled light brown and orange, increasing medium-grained sand, trace coarse gravel up to 1".

SURFACE ELEVATION: 1,109.66 feet (1,109.35 TOC)
LOGGED BY: V. Reynolds
TOTAL DEPTH (feet): 135
DIAMETER OF BORING (inches): 8
DATE DRILLED: 4-16-09
DEPTH TO ENCOUNTERED WATER (feet): 121.01 (6/16/09)
DRILLING COMPANY: WDC Exploration & Wells
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-8A

PLATE

2b

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses Lab.	Analyses Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
								SP	Same as above, increasing gravel.
		0.4	55	MW-8A-55				ML	Sandy Silt: Olive gray, moist, with fine- to medium-grained sand, with trace clay, trace red iron staining. Sandy Silt: Olive gray, very moist, stiff, with coarse gravel/cobbles up to 4".
		0.0	60	MW-8A-60				SP/GP	Poorly-Graded Sand and Gravel: Olive gray, moist, fine- to medium-grained sand, with coarse gravel up to 2", micaceous. Same as above, red-brown. Same as above, decreasing gravel.
								ML	Sandy Silt: Olive gray, moist, stiff, with fine- to medium-grained sand, red iron staining.
		0.0	65	MW-8A-65				SP	Poorly-Graded Sand: Brown, moist, fine- to medium-grained sand, with coarse gravel up to 1.5". Same as above, decreasing gravel, weakly-cemented sand.
		0.4	70	MW-8A-70				GP	Poorly-Graded Gravel: Light gray, slightly moist, coarse subangular gravel up to 2", possibly broken cobbles, with fine- to medium-grained sand.
								SM	Silty Sand: Brown, moist, fine-grained sand with silt.
		0.7	75	MW-8A-75					
								SP	Poorly-Graded Sand: Brown, moist, fine- to

SURFACE ELEVATION: 1,109.66 feet (1,109.35 TOC)
LOGGED BY: V. Reynolds
TOTAL DEPTH (feet): 135
DIAMETER OF BORING (inches): 8
DATE DRILLED: 4-16-09
DEPTH TO ENCOUNTERED WATER (feet): 121.01 (6/16/09)
DRILLING COMPANY: WDC Exploration & Wells
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-8A

PLATE
2c

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
								SP	medium-grained sand, micaceous.
		0.0	80	MW-8A-80					Same as above, wet.
								CL	Sandy Clay: Olive-gray, wet, stiff, with fine-grained sand, trace micas.
		0.3	85	MW-8A-85					
								SC	Clayey Sand: Olive gray, moist, fine- to medium-grained sand, with clay, trace silt.
		0.0	90	MW-8A-90					Same as above, decreasing clay.
								SP	Poorly-Graded Sand: Red-brown, moist, fine- to medium-grained sand, with some clay, trace fine gravel.
								CL	Sandy Clay: 3" thick layer, olive gray, moist, very stiff, with fine- to medium-grained sand.
Hydrated betonite chips (95.5-101.5 feet bgs)		0.3	95	MW-8A-95				SP	Poorly-Graded Sand: Light-brown, slightly moist, fine- to medium-grained sand, with some fine gravel, trace clay.
									Same as above, red-brown, moist, fine-grained sand, some coarse gravel up to 1".
		0.0	100	MW-8A-100					Same as above, trace clay.
#3 Monterey sand filter pack (101.5-135 ft bgs)									
								CL	Sandy Clay: 3" thick layer, olive gray, moist,

SURFACE ELEVATION: 1,109.66 feet (1,109.35 TOC)
LOGGED BY: V. Reynolds
TOTAL DEPTH (feet): 135
DIAMETER OF BORING (inches): 8
DATE DRILLED: 4-16-09
DEPTH TO ENCOUNTERED WATER (feet): 121.01 (6/16/09)
DRILLING COMPANY: WDC Exploration & Wells
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-8A

PLATE
2d

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
4-inch sch-40 PVC 0.02" well screen (105-135 ft bgs)									stiff, with fine- to medium-grained sand.
		0.4	105	MW-8A-105				SC	Clayey Sand: Brown, slightly moist, fine- to medium-grained sand, with clay, weakly cemented pieces, some gravel up to 0.5".
								SP	Poorly-Graded Sand: Light red-brown, slightly moist, fine- to medium-grained sand, with some fine gravel, trace clay.
		0.0	110	MW-8A-110				SC	Clayey Sand: Red-brown, moist, fine- to medium-grained sand, with clay, weakly cemented. Same as above, decreasing clay.
								SP	Poorly-Graded Sand: Red-brown, moist, weakly cemented, fine- to medium-grained sand, with some clay and gravel up to 1".
		0.0	115	MW-8A-115					Same as above, no gravel, some coarse-grained sand.
			▽						Same as above, increase in coarse-grained sand.
		0.0	120	MW-8A-120				SP-SC	Interbedded layers of Clayey Sand and Poorly-Graded Sand: Clayey Sand is olive brown, very moist, fine- to medium-grained sand, with clay. Poorly-Graded sand is mottled orange and light brown, very moist, fine- tomedium-grained sand.
								CL	Sandy Clay: Olive brown, very moist, soft, with fine-grained sand, micaceous.
		0.0	125	MW-8A-125				SP	Poorly-Graded Sand: Brown, very moist, fine- to medium-grained sand, micaceous.
								SC	Clayey Sand: Red-brown, moist, fine-grained sand with clay, micaceous.

SURFACE ELEVATION: 1,109.66 feet (1,109.35 TOC)
LOGGED BY: V. Reynolds
TOTAL DEPTH (feet): 135
DIAMETER OF BORING (inches): 8
DATE DRILLED: 4-16-09
DEPTH TO ENCOUNTERED WATER (feet): 121.01 (6/16/09)
DRILLING COMPANY: WDC Exploration & Wells
DRILLING METHOD: Sonic w/ Continuous Core

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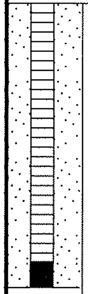
PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-8A

PLATE
2e

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.



Well Construction	Analyses: Lab.	Analyses: Field PID/OVA (ppmv)	Depth (feet)	Sample Number	Blows per Foot	Sample Type	Lithology Symbol	U.S.C.S. Designation	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*
		--		MW -8A -130			▨	**SC**	
			135	MW -8A -135			▨	**CL**	Sandy Clay: Brown, moist, with fine- to medium-grained sand, less sand than above.
									Boring terminated at 135 ft bgs.

SURFACE ELEVATION: 1,109.66 feet (1,109.35 TOC)
LOGGED BY: V. Reynolds
TOTAL DEPTH (feet): 135
DIAMETER OF BORING (inches): 8
DATE DRILLED: 4-16-09
DEPTH TO ENCOUNTERED WATER (feet): 121.01 (6/16/09)
DRILLING COMPANY: WDC Exploration & Wells
DRILLING METHOD: Sonic w/ Continuous Core

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PROJECT NO. 99863

Former Mobil Service Station 18HVF
25699 Baseline Street, Highland, California 92410

LOG OF BORING MW-8A

PLATE
2f

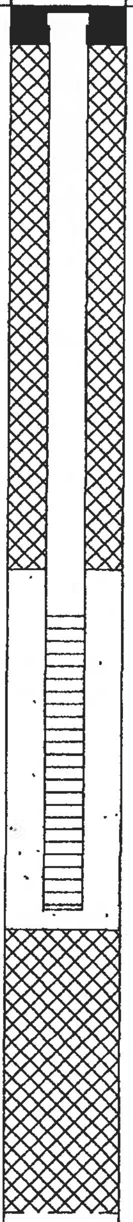
Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

IRWIN GEOSCIENCES & ENGINEERING
Environmental
Construction
Maintenance

43218 Business Park Drive
Temecula, California 92590

BORING LOG

DRILL RIG: CME 75	DATE DRILLED: 4-11-96	LOGGED BY: NJA
BORING DIAMETER: 8-INCH	BORING NUMBER: VEW-2A	



SAMPLE TYPE	BLOW COUNT	DEPTH FEET	OVA PPM
▯		5	0
▯		10	0
▯		15	0
▯		20	0
▯		25	0
▯		30	0
▯		35	0
▯		40	10
▯		45	20
▯		50	20
▯		55	20
▯		60	20

SOIL TYPE	DESCRIPTION AND REMARKS
SP	FINE TO MEDIUM SAND, brown, slightly damp, loose, no odor
SP	MEDIUM TO COARSE SAND with trace gravel, salt and pepper grey, slightly damp, no odor
SM	SILTY SAND, brown, slightly damp, no odor
SW	FINE TO COARSE SAND with trace gravel and cobbles, salt and pepper grey, slightly damp, no odor
ML	SILT, brown, dry, no odor
SW	FINE TO COARSE SAND with some silt, dk. brown, damp, no odor
SW	MEDIUM TO COARSE SAND with trace gravel, salt and pepper grey, dry, no odor
SW	FINE TO COARSE SAND with trace gravel, salt and pepper grey, slightly damp, no odor
SP	FINE SAND with trace silt, black, damp, slight odor
SP	GRAVELLY COARSE SAND, grey, slightly damp, slight odor
SP	FINE SAND, grey, slightly damp, slight odor
GP	GRAVEL AND COBBLES, grey, slightly damp, slight odor
SP	FINE TO MEDIUM SAND with trace gravel, salt and pepper grey, slightly damp, slight odor
SW	FINE SAND with trace coarse sand and silt, dk brown, slightly damp, slight odor
SW	FINE TO COARSE SAND with trace gravel, salt and pepper grey to brown, wet, slight odor
ML	SILT with trace sand and trace clay, brown, damp, slight plasticity, slight odor
SW	FINE TO COARSE SAND with trace gravel, cobbles and silt, salt and pepper grey to brown, damp, slight odor

COMPLETION NOTES:

0 - 30 FT BGS SCH. 40 4" DIA. BLANK CASING
30 - 45 FT BGS SCH. 40 4" DIA. 0.020 SCREENED CASING

0 - 2 FT BGS CONCRETE TRAFFIC RATED WELLBOX
2 - 28 FT BGS HYDRATED BENTONITE
28 - 46 FT BGS #3 SAND
46 - 84.5 FT BGS HYDRATED BENTONITE

SITE:

MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

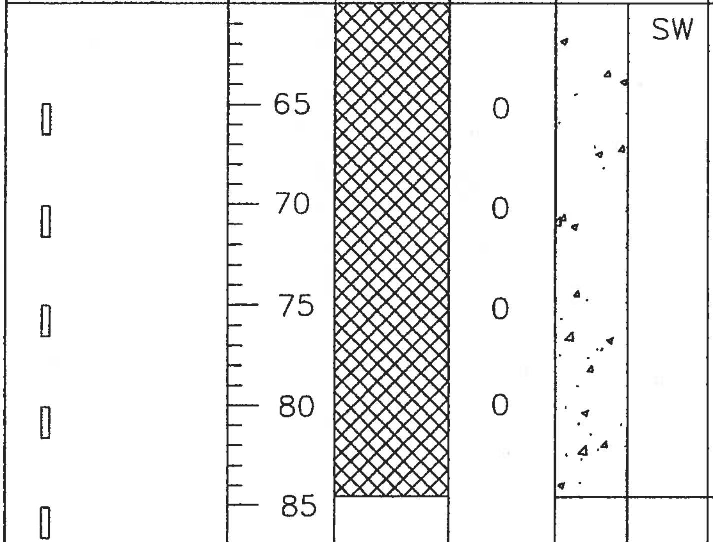
PROJECT NO. 29506.03

IRWIN
Environmental
Construction
Maintenance

43218 Business Park Drive
Temecula, California 92590

BORING LOG

DRILL RIG: CME 75	DATE DRILLED: 4-11-96	LOGGED BY: NJA
BORING DIAMETER: 8-INCH	BORING NUMBER: VEW-2A	



SAMPLE TYPE	SAMPLE BLOW COUNT	DEPTH FEET	WELL CONST.	OVA PPM	SOIL TYPE	DESCRIPTION AND REMARKS
					SW	FINE TO COARSE SAND with trace gravel, cobbles and silt, salt and pepper grey to brown, damp, slight odor
▯		65	▨	0		
▯		70	▨	0		
▯		75	▨	0		
▯		80	▨	0		
▯		85				

COMPLETION NOTES:

0 - 30 FT BGS SCH. 40 4" DIA. BLANK CASING
30 - 45 FT BGS SCH. 40 4" DIA. 0.020 SCREENED CASING

0 - 2 FT BGS CONCRETE TRAFFIC RATED WELLBOX
2 - 28 FT BGS HYDRATED BENTONITE
28 - 46 FT BGS #3 SAND
46 - 84.5 FT BGS HYDRATED BENTONITE

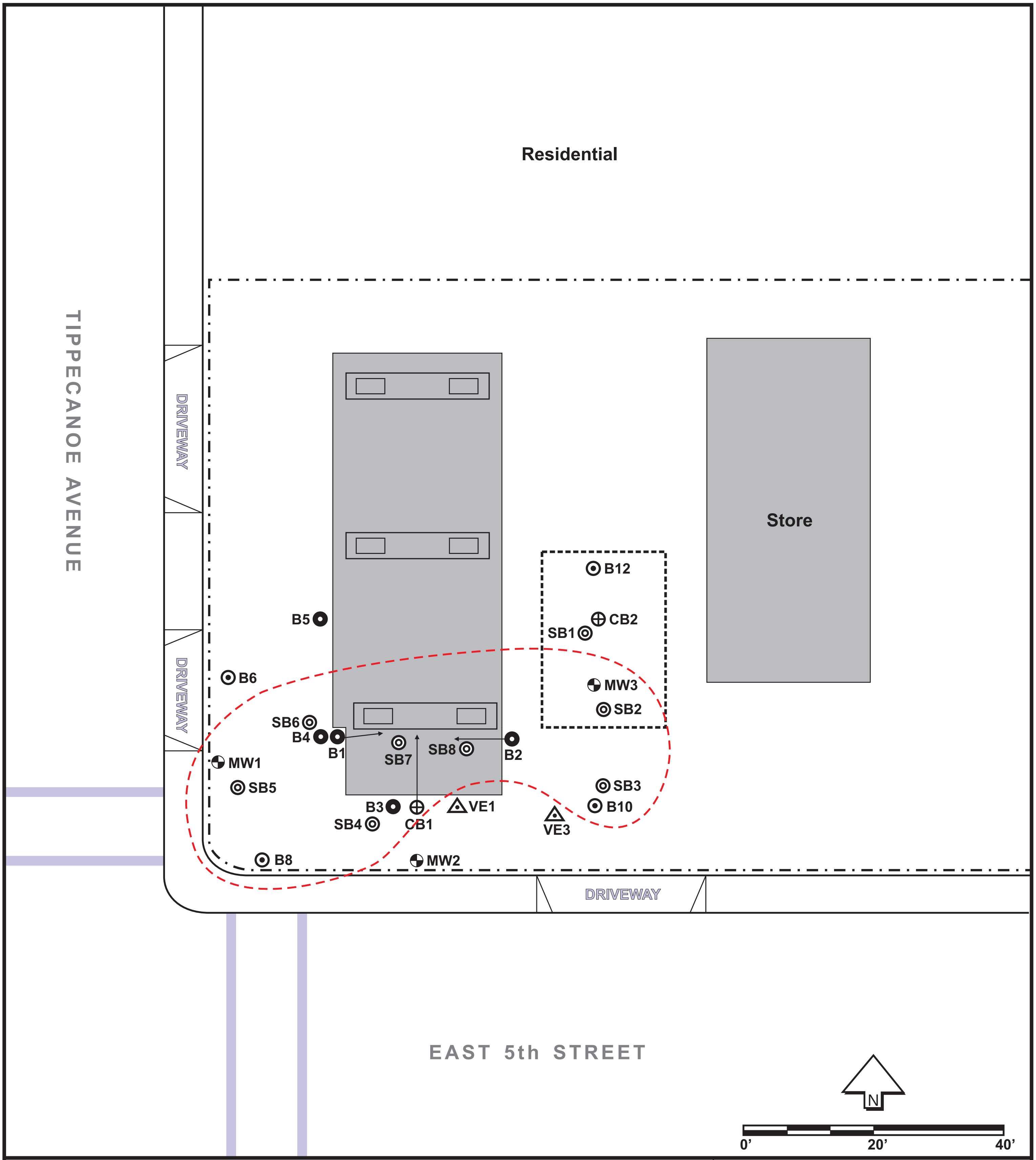
SITE:

MOBIL STATION #18-HVF
25699 BASELINE ROAD
HIGHLAND, CALIFORNIA

PROJECT NO.
29506.03

APPENDIX C2.4

Iskandar Texaco
GeoTracker Case I.D. T0607100550



LEGEND

SB1-SB8 ◎ Proposed Soil Boring
CB1-CB2 ⊕ Confirmation Soil Boring (GeoSec, 8/2005)
B6-B12 ⊙ Soil Boring (GeoSec, 6/2000)
B1-B5 ● Soil Boring (GeoSec, 10/1999)
MW1-MW3 ◐ Monitoring Well
VE1-VE4 △ Vapor Extraction
- - - - Approximate Extent of TPHg Contamination (>100 ppm)

⬚ Former UST Area
▭ Dispenser Island
-·-·- Property Line

Figure 2: Site Map
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

DRAWN BY:	DATE:	PROJECT:
AP	December 2007	Andrawis.p01

Ami Adini
& Associates, Inc.

Ami Adini & Associates, Inc.

LOG OF BORING SB1

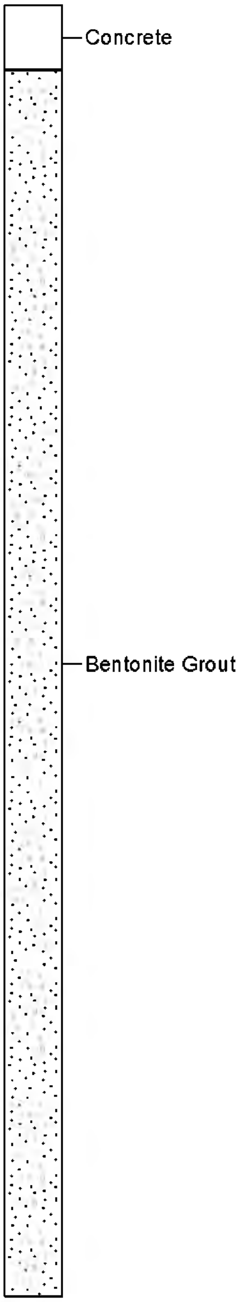
(Page 1 of 1)

Project: Andrawis.p01
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

Date Started : May 7, 2008
Date Completed : May 7, 2008
Boring Diameter 8 inches
Drilling Method Hollow Stem Auger
Sampling Method : California Split Spoon
Logged By : Aurora Pringle

Depth in Feet	Surf. Elev. 1065	Lab No.	USCS	GRAPHIC	DESCRIPTION	
0	1065	SB1-5			Excavation Fill	0 ppm
5	1060	SB1-10				0 ppm
10	1055	SB1-15				0 ppm
15	1050	SB1-20	SM	🟥	SILTY SAND, with subrounded gravel	5 ppm
20	1045	SB1-25		🟥		0 ppm
25	1040	SB1-30	SP	🟥	SAND, medium to coarse grained, brown	220 ppm
30	1035	SB1-35		🟥		20 ppm
35	1030	SB1-40		🟥		15 ppm
40	1025	SB1-45		🟥		0 ppm
45	1020	SB1-50		🟥		5 ppm
50	1015	SB1-55	SP	▒	SAND, coarse, with thin layers of clayey silt, gray	0 ppm
55	1010	SB1-60	MS	☰	CLAYEY SILT, plastic, gray	0 ppm
60						

Boring: SB1



Ami Adini
& Associates, Inc.

Project: Andrawis.p01
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

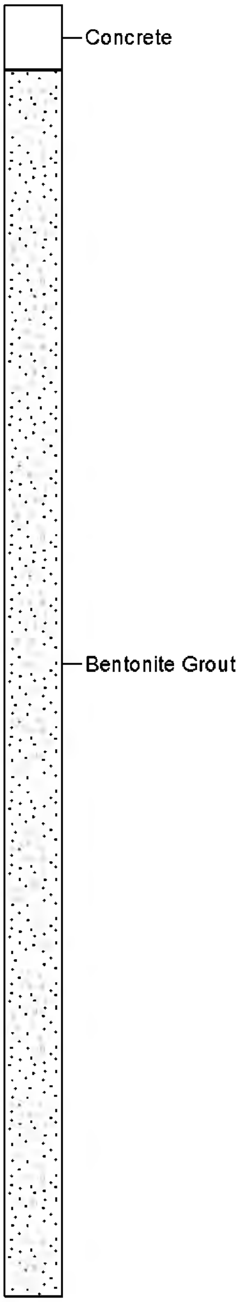
LOG OF BORING SB2

(Page 1 of 1)

Date Started : May 6, 2008
Date Completed : May 6, 2008
Boring Diameter 8 inches
Drilling Method Hollow Stem Auger
Sampling Method : California Split Spoon
Logged By : Aurora Pringle

Depth in Feet	Surf. Elev. 1065	Lab No.	USCS	GRAPHIC	DESCRIPTION	
0	1065				Excavation Fill	
		SB2-5				0 ppm
5	1060					
		SB2-10				0 ppm
10	1055					
		SB2-15				75 ppm
15	1050		SM	🟥	SILTY SAND, with subrounded gravel, brown	
		SB2-20				0 ppm
20	1045					
		SB2-25				
25	1040					
		SB2-30				
30	1035					
		SB2-35				45 ppm
35	1030		SP	░	SAND, coarse, wet, gray, slight hydrocarbon odor	
		SB2-40				30 ppm
40	1025					
		SB2-45				20 ppm
45	1020		CL	▨	CLAY, very stiff, gray	
		SB2-50				20 ppm
50	1015					
		SB2-55				25 ppm
55	1010		SP	🟥	SAND, medium to coarse grained, brown	
		SB2-60				30 ppm
60						

Boring: SB2



Ami Adini & Associates, Inc.

LOG OF BORING SB3

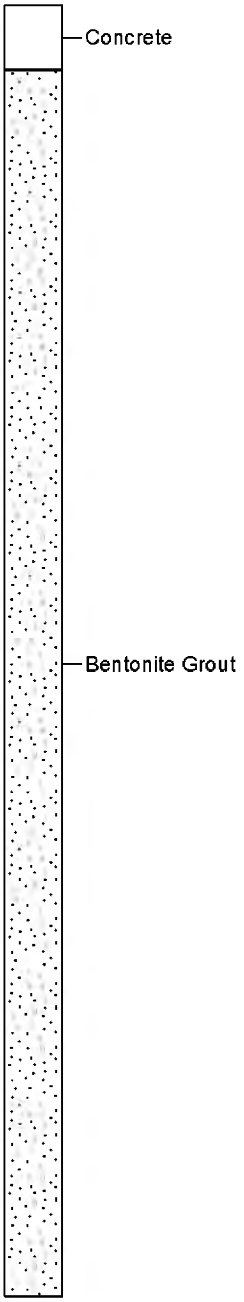
(Page 1 of 1)

Project: Andrawis.p01
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

Date Started	: May 6, 2008
Date Completed	: May 6, 2008
Boring Diameter	8 inches
Drilling Method	Hollow Stem Auger
Sampling Method	: California Split Spoon
Logged By	: Aurora Pringle

Depth in Feet	Surf. Elev. 1065	Lab No.	USCS	GRAPHIC	DESCRIPTION	
0	1065	SB3-5	SM	🟥	SILTY SAND, brown	25 ppm
5	1060	SB3-10		🟥		40 ppm
10	1055	SB3-15		🟥		0 ppm
15	1050	SB3-20		🟥		30 ppm
20	1045	SB3-25		🟥		0 ppm
25	1040	SB3-30	SP	🟥	SAND, medium to coarse grained, brown	0 ppm
30	1035	SB3-35		🟥		45 ppm
35	1030	SB3-40	SP	▨	SAND, medium to coarse grained, gray	40 ppm
40	1025	SB3-45		▨		75 ppm
45	1020	SB3-50		▨		55 ppm
50	1015	SB3-55	CL	▨	CLAY, with races of sand, gray	25 ppm
55	1010	SB3-60	SP	🟥	SAND,,medium to coarse grained, brown	55 ppm
60						

Boring: SB3



Ami Adini & Associates, Inc.

Project: Andrawis.p01
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

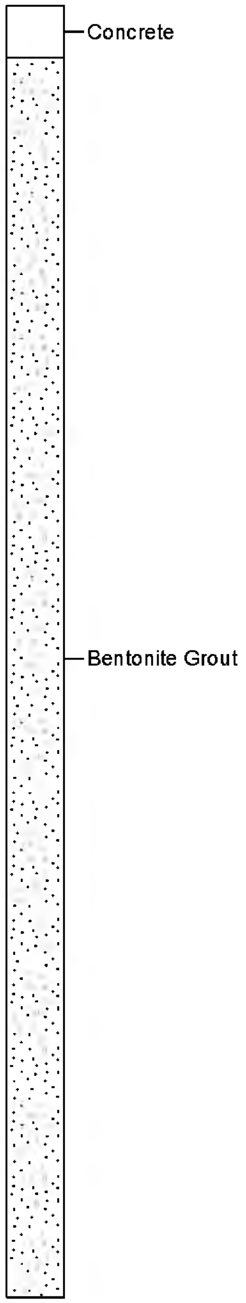
LOG OF BORING SB4

(Page 1 of 1)

Date Started : May 5, 2008
Date Completed : May 5, 2008
Boring Diameter 8 inches
Drilling Method Hollow Stem Auger
Sampling Method : California Split Spoon
Logged By : Aurora Pringle

Depth in Feet	Surf. Elev. 1065	Lab No.	USCS	GRAPHIC	DESCRIPTION	
0	1065			🟥	SILTY SAND, brown	
		SB4-5				0 ppm
5	1060					
		SB4-10	SM			0 ppm
10	1055					
		SB4-15				0 ppm
15	1050			🟥	SAND, medium to coarse grained, some gravel, brown	
		SB4-20				0 ppm
20	1045					
		SB4-25	SP			25 ppm
25	1040					
		SB4-30				100 ppm
30	1035			▒	SAND, fine to coarse grained, gray	
		SB4-35				260 ppm
35	1030					
		SB4-40				85 ppm
40	1025					
		SB4-45				100 ppm
45	1020					
		SB4-50	SP			100 ppm
50	1015					
		SB4-55				25 ppm
55	1010					
		SB4-60				85 ppm
60	1005					
		SB4-65				100 ppm
65	1000			▒	SILTY SAND, some gravel, gray	
		SB4-70	SM			0 ppm
70	995			🟥	SAND, medium to coarse grained, some gravel, brown	
		SB4-75	SP			0 ppm
75						

Boring: SB4



Ami Adini & Associates, Inc.

LOG OF BORING SB5

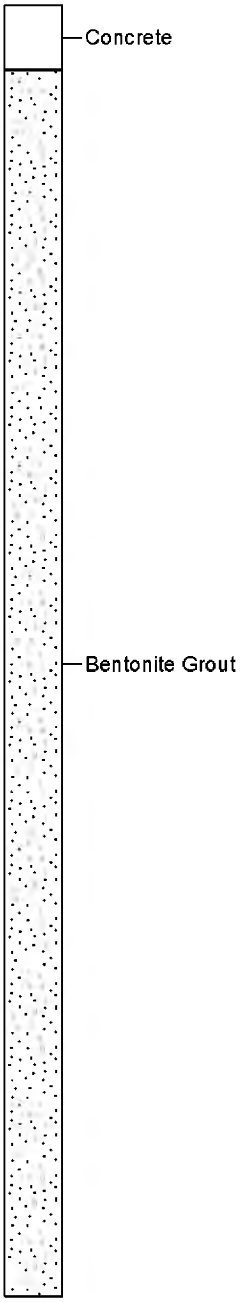
(Page 1 of 1)

Date Started : May 5, 2008
Date Completed : May 5, 2008
Boring Diameter 8 inches
Drilling Method Hollow Stem Auger
Sampling Method : California Split Spoon
Logged By : Aurora Pringle

Project: Andrawis.p01
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

Depth in Feet	Surf. Elev. 1065	Lab No.	USCS	GRAPHIC	DESCRIPTION	
0	1065	SB5-5	SM	🟥	SILTY SAND, brown	0 ppm
5	1060	SB5-10		🟥		0 ppm
10	1055	SB5-15		🟥		0 ppm
15	1050	SB5-20		🟥		5 ppm
20	1045	SB5-25	SP	🟥	SAND, coarse with subrounded gravel, brown	0 ppm
25	1040	SB5-30		🟥		0 ppm
30	1035	SB5-35	SP	▒	SAND, medium to coarse grained, damp, gray	100 ppm
35	1030	SB5-40		▒		25 ppm
40	1025	SB5-45		▒		0 ppm
45	1020	SB5-50		▒		0 ppm
50	1015	SB5-55	SP	▒	SAND, fine to coarse grained, gray	0 ppm
55	1010	SB5-60	SC	▨	CLAYEY SAND, plastic, gray	0 ppm
60						

Boring: SB5



Ami Adini & Associates, Inc.

LOG OF BORING SB6

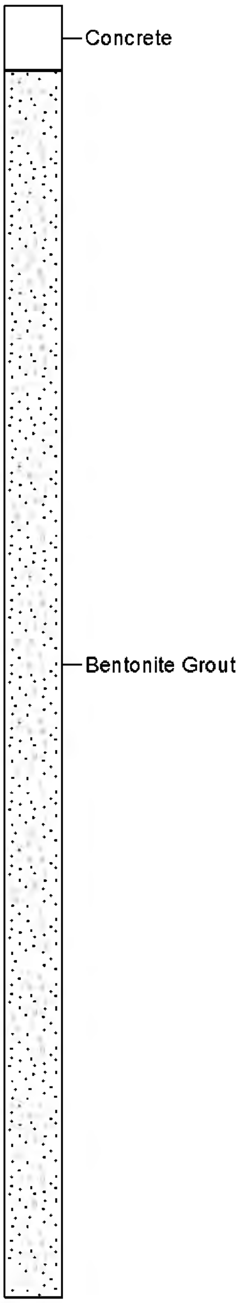
(Page 1 of 1)

Project: Andrawis.p01
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

Date Started	: May 5, 2008
Date Completed	: May 5, 2008
Boring Diameter	8 inches
Drilling Method	Hollow Stem Auger
Sampling Method	: California Split Spoon
Logged By	: Aurora Pringle

Depth in Feet	Surf. Elev. 1065	Lab No.	USCS	GRAPHIC	DESCRIPTION	
0	1065				SILTY SAND, brown	
		SB6-5				0 ppm
5	1060					
		SB6-10	SM			0 ppm
10	1055					
		SB6-15				75 ppm
15	1050				SAND, coarse with subrounded gravel, traces of silt, brown	
		SB6-20				30 ppm
20	1045					
		SB6-25	SP			25 ppm
25	1040					
		SB6-30				0 ppm
30	1035				SAND, medium to coarse grained, gray, damp at 35', slight hydrocarbon odor	
		SB6-35				45 ppm
35	1030					
		SB6-40	SP			0 ppm
40	1025					
		SB6-45				0 ppm
45	1020				SILTY SAND, fine grained, gray	
		SB6-50	SM			25 ppm
50	1015				CLAY, slightly plastic, stiff, gray	
		SB6-55				10 ppm
55	1010		CL			
		SB6-60				10 ppm
60						

Boring: SB6



Ami Adini & Associates, Inc.

LOG OF BORING SB7

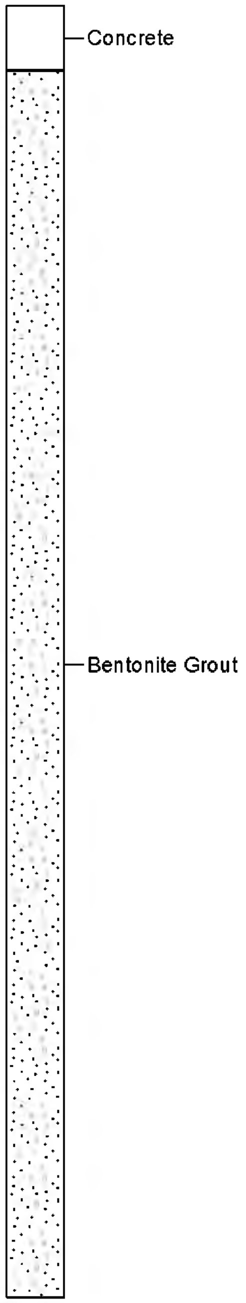
(Page 1 of 1)

Project: Andrawis.p01
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

Date Started	: May 5, 2008
Date Completed	: May 5, 2008
Boring Diameter	8 inches
Drilling Method	Hollow Stem Auger
Sampling Method	: California Split Spoon
Logged By	: Aurora Pringle

Depth in Feet	Surf. Elev. 1065	Lab No.	USCS	GRAPHIC	DESCRIPTION	
0	1065	SB7-5	SM	🟥	SILTY SAND, fine to coarse grained, brown	0 ppm
5	1060	SB7-10				10 ppm
10	1055	SB7-15	SP	🟥	SAND, coarse grained, with subrounded gravel, brown	0 ppm
15	1050	SB7-20	SM	🟥	SILTY SAND, fine to coarse grained, with subrounded gravel, brown	0 ppm
20	1045	SB7-25				5 ppm
25	1040	SB7-30				0 ppm
30	1035	SB7-35	SP	▨	SAND, medium to coarse grained, gray	0 ppm
35	1030	SB7-40				0 ppm
40	1025	SB7-45	SP	🟥	SAND, medium to coarse grained, with gravel, brown	0 ppm
45	1020	SB7-50				0 ppm
50	1015	SB7-55	SP	▨	SAND, coarse with traces of silt, gray	110 ppm
55	1010	SB7-60				0 ppm
60						

Boring: SB7



Ami Adini
& Associates, Inc.

LOG OF BORING SB8

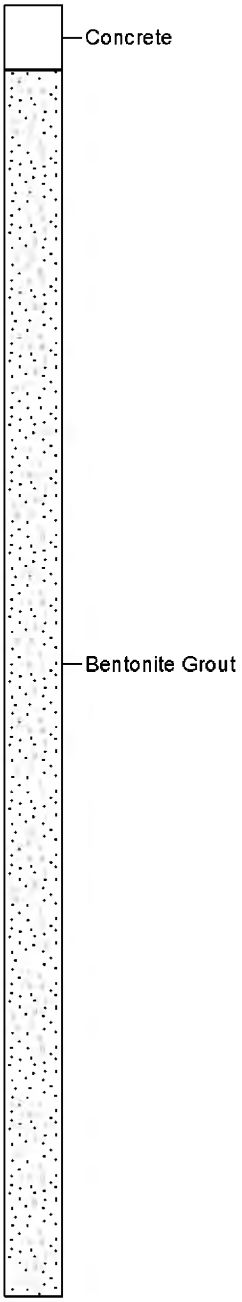
(Page 1 of 1)

Project: Andrawis.p01
Former Iskander Texaco Station
24914 E. 5th St.
San Bernardino, CA

Date Started : May 5, 2008
Date Completed : May 5, 2008
Boring Diameter 8 inches
Drilling Method Hollow Stem Auger
Sampling Method : California Split Spoon
Logged By : Aurora Pringle

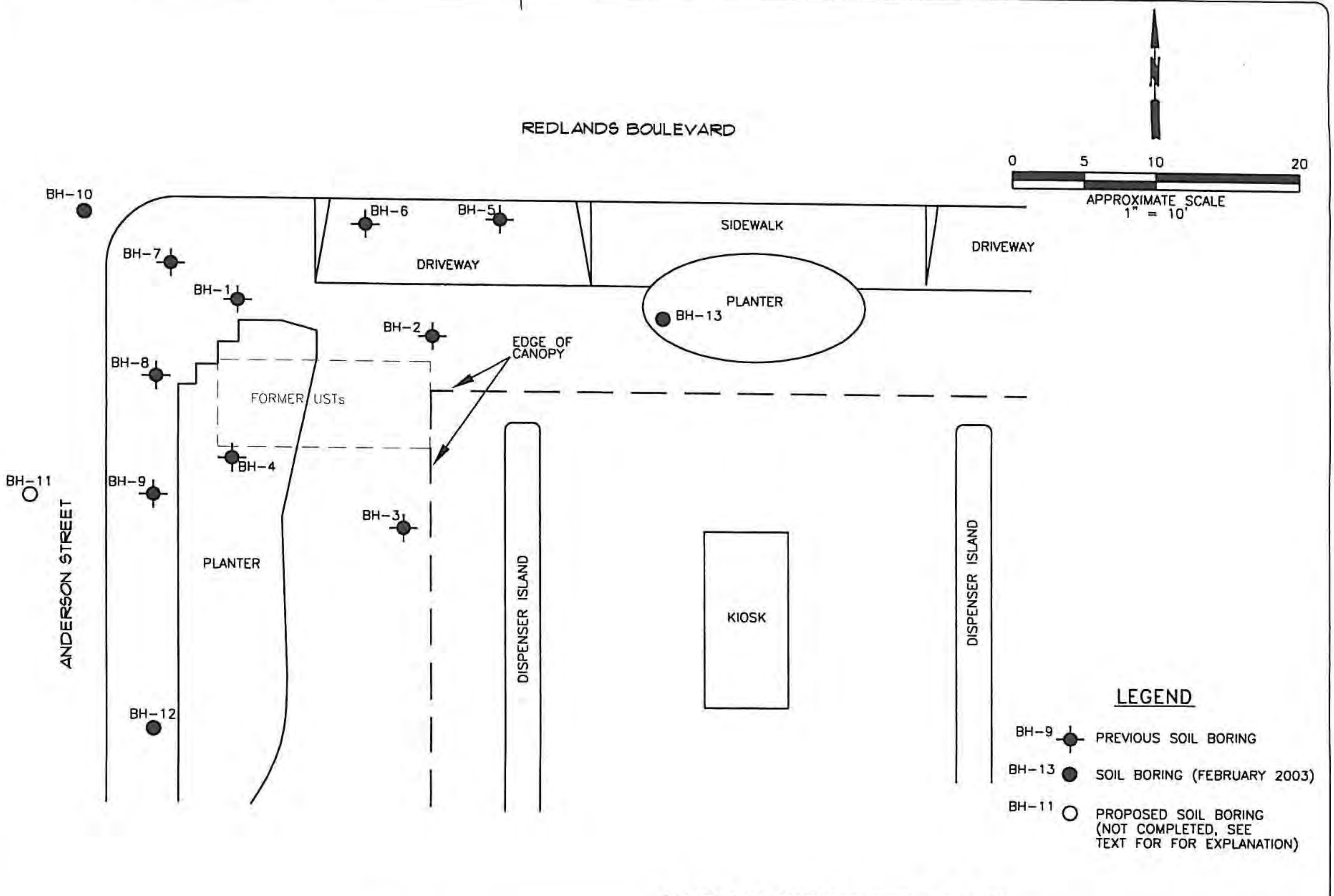
Depth in Feet	Surf. Elev. 1065	Lab No.	USCS	GRAPHIC	DESCRIPTION	
0	1065			🟥	SAND, medium to coarse grained, brown	
		SB8-5				0 ppm
5	1060					
		SB8-10				0 ppm
10	1055					
		SB8-15				0 ppm
15	1050		SP			
		SB8-20				0 ppm
20	1045					
		SB8-25				0 ppm
25	1040					
		SB8-30				200 ppm
30	1035			░	SAND, medium to coarse grained, gray	
		SB8-35				0 ppm
35	1030		SP			
		SB8-40				25 ppm
40	1025			🟥	SAND, medium to coarse grained, some gravel, brown	
		SB8-45				45 ppm
45	1020		SP			
		SB8-50				10 ppm
50	1015			░	SAND, coarse with traces of silt and thin layers of clay, gray	
		SB8-55	SP			15 ppm
55	1010			▨	CLAY, traces of sand, stiff, gray	
		SB8-60	CL			35 ppm
60						

Boring: SB8



APPENDIX C2.5

Bear Oil Co./ Former Texaco
GeoTracker Case I.D. T0607100598



BASE MAP SOURCE: CONVERSE CONSULTANTS, JUNE 28, 200.

KLEINFELDER

KLEINFELDER, INC.
1940 ORANGE TREE LANE, SUITE 100
REDLANDS, CALIFORNIA 92374

PROJECT: 24568 MARCH 2003

SITE PLAN

BEAR OIL COMPANY/FORMER TEXACO SITE
24913 REDLANDS BOULEVARD
LOMA LINDA, CALIFORNIA 92354

FIGURE
2

Log of Boring No. BH-1

Date Drilled: 10/27/99
Logged by: DM
Checked by: MOC
Equipment: Geoprobe 5400
Driving Weight and Drop: Direct Push
Ground Surface Elevation: N/A
Depth to Water: not encountered

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
5	▨	**SANDY CLAY (CL);** moist, grayish green	■					471
10	▨		■					737
15	▨	**CLAYEY SAND (SC);** green	■					274
20		**SAND AND SILTY SAND (SP-SM);** medium to coarse sand, slightly moist, brown	■					46.7
25	▨	**CLAYEY SAND (SC);** fine, gray, moist	■					2494
30	▨	brown	■					263
		End of boring at 34 feet No groundwater encountered Backfilled with Bentonite						

Converse Consultants

Project No. 99-41-277-01

Drawing No. B-1

Log of Boring No. BH-2

Date Drilled: 10/27/99
Logged by: DM
Checked by: MOC
Equipment: Geoprobe 5400
Driving Weight and Drop: Direct Push
Ground Surface Elevation: N/A
Depth to Water: not encountered

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
5	▨	**SANDY CLAY (CL)**; fine to medium, slightly moist, green	■					1080
10	▨	**CLAYEY SAND (SC)**; green	■					1228
15	▨	greenish brown	■					50.2
20	░	**SILTY SAND (SM)**; medium to coarse sand with gravel, slightly moist, brown	■					6
25	░	moist, light brown	■					66.5
30	▨	**CLAY (CL)**; moist, brown	■					750
35	░	**SILTY SAND (SM)**; moist, brown	■					
		End of boring at 36 feet No groundwater encountered Backfilled with Bentonite						

Converse Consultants

Project No.
99-41-277-01

Drawing No.
B-2

Log of Boring No. BH-3

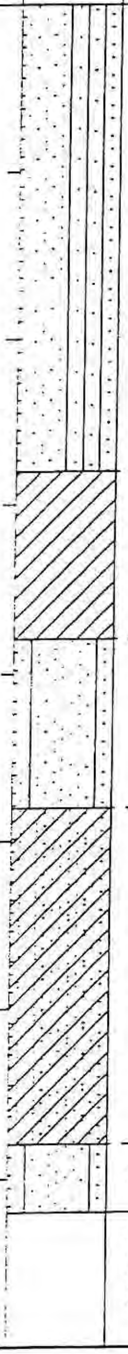
Date Drilled: **10/25/99** Logged by: **DM** Checked by: **MOC**

Equipment: **Geoprobe 5400** Driving Weight and Drop: **Direct Push**

Ground Surface Elevation: **N/A** Depth to Water: **not encountered**

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.



DEPTH (ft)	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
5	**SAND/SILTY SAND (SP-SM);** fine to coarse, dry to slightly moist, brown	■					
10		■					
15	**CLAY (CL);** slightly moist, green	■					
20	**SILTY SAND (SM);** with gravel, slightly moist, brown	■					
25	**CLAYEY SAND (SC);** moist, greenish brown	■					
30		■					
35	**SILTY SAND (SM);** moist, brown	■					

End of boring at 36 feet
No groundwater encountered
Backfilled with Bentonite

Converse Consultants

Project No. 99-41-277-01

Drawing No. **B-3**

Log of Boring No. BH-4

Date Drilled: 10/27/99
Logged by: DM
Checked by: MOC
Equipment: Geoprobe 5400
Driving Weight and Drop: Direct Push
Ground Surface Elevation: N/A
Depth to Water: not encountered

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
			DRIVE	BULK				
5	▨	CLAY (CL); slightly moist, brown	■					6.4
10	▒	CLAYEY SAND (SC); brown	■					
15	▨	CLAY (CL); moist, greenish	■					2022
20	░	SILTY SAND (SM); fine to medium, trace gravel, slightly moist, brown	■					1.4
25	▨	CLAY (CL); moist, brown	■					43.5
30	▒	SANDY CLAY (CL); moist, brown	■					26.5
35	░	SILTY SAND (SM); fine, moist, brown	■					
		End of boring at 36 feet No groundwater encountered Backfilled with Bentonite						

Converse Consultants

Project No. 99-41-277-01

Drawing No. B-4

Log of Boring No. BH-5

Date Drilled: 3/30/00 Logged by: WR Checked by: JRZ/RVH

Equipment: Geoprobe Driving Weight and Drop: N/A

Ground Surface Elevation: N/A Depth to Water: not encountered

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
5	▨	SANDY CLAY (CL); slightly moist, dark gray	■					0
10	░	SILTY SAND (SM); fine to medium, slightly moist, dark gray	■					0
15	▨	CLAY (CL); slightly moist, dark gray	■					0
20	░	SAND (SP); fine to medium, slightly moist, gray	■					0
25	░		■					0
30	▨	CLAY (CL); slightly moist, brown	■					0

End of boring at 30 feet
No groundwater encountered
Boring backfilled on 3/30/00

Log of Boring No. BH-6

Date Drilled: 3/30/00
Logged by: WR
Checked by: JRZ/RVH
Equipment: Geoprobe
Driving Weight and Drop: N/A
Ground Surface Elevation: N/A
Depth to Water: not encountered

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
5		CLAY (CL); moist, dark gray	■					7.5
10		SANDY CLAY (CL); slightly moist, dark gray	■					89.6
15		CLAY (CL); slightly moist, dark gray	■					216
20		SAND (SP); fine to medium, slightly moist, gray	■					1.4
25		CLAY (CL); slightly moist, reddish brown to gray	■					8.8
30		SILT (ML); slightly moist, gray	■					18.8

End of boring at 30 feet
No groundwater encountered
Boring backfilled on 3/30/00

Log of Boring No. BH-7

Date Drilled: 3/30/00
Logged by: WR
Checked by: JRZ/RVH
Equipment: Geoprobe
Driving Weight and Drop: N/A
Ground Surface Elevation: N/A
Depth to Water: not encountered

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
		Hand auger to approximately 3 feet						
5		CLAY (CL); slightly moist, dark gray	■					0
10		SANDY CLAY (CL); fine to medium, slightly moist, dark gray	■					99.8
15		CLAY (CL); slightly moist, dark gray	■					2654
20		SAND (SP); fine to medium, slightly moist, gray	■					4.8
25		CLAY (CL); slightly moist, dark brown-gray	■					15.1
30		SANDY CLAY (CL); slightly moist, brown-gray	■					0
		End of boring at 30 feet No groundwater encountered Boring backfilled on 3/30/00						

Converse Consultants

Loma Linda University

Project No. 99-41-277-02

Drawing No.

Log of Boring No. BH-8

Date Drilled: 3/30/00 Logged by: WR Checked by: JRZ/RVH

Equipment: Geoprobe Driving Weight and Drop: N/A

Ground Surface Elevation: N/A Depth to Water: not encountered

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
5	▨	CLAY (CL); moist, dark gray	■					8.4
10	▨	SANDY CLAY (CL); moist, dark gray	■					843
15	▨	CLAY (CL); moist, dark gray	■					1729
20	⁘	SAND (SP); fine to medium, slightly moist, gray	■					6
25	▨	CLAY (CL); slightly moist, gray	■					3.3
30	▥	SANDY SILT (ML); slightly moist, gray	■					0
		End of boring at 30 feet No groundwater encountered Boring backfilled on 3/30/00						

Converse Consultants

Loma Linda University

Project No. 99-41-277-02

Drawing No.

Log of Boring No. BH-9

Date Drilled: 3/30/00
Logged by: WR
Checked by: JRZ/RVH
Equipment: Geoprobe
Driving Weight and Drop: N/A
Ground Surface Elevation: N/A
Depth to Water: not encountered

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (psf)	PID (ppm)
5	▨	CLAY (CL); slightly moist, dark gray	■					965
10	░	SILTY SAND (SM); fine to medium, slightly moist, gray	■					89.6
15	▨	CLAY (CL); moist, gray	■					1200
20	░	SAND (SP); fine to medium, slightly moist, gray	■					0
25	░		■					0
	▥	SILT (ML); slightly moist, gray						
30	▥	SANDY SILT (ML); fine, slightly moist, gray	■					0
		End of boring at 30 feet No groundwater encountered Boring backfilled on 3/30/00						

Converse Consultants

Loma Linda University

Project No. 99-41-277-02

Drawing No.

PROJECT: **Bear Oil**
LOCATION: **24913 Redlands Blvd, Loma Linda, California**

BORING NO: **BH-10**

STARTED: 2/24/03 COMPLETED: 2/24/03
DRILLING COMPANY: Strongarm Environmental
DRILLING EQUIPMENT: Geoprobe
DIAMETER OF BORING: 1-1/2 inches

TOTAL DEPTH: 41.0 feet
WATER ENCOUNTERED: 38 ft bgs
LOGGED BY: Carlos Campos
CHECKED BY:

DEPTH (ft)	USCS	DESCRIPTION	SAMPLE No.	BLOW COUNTS	PID (ppm)	ELEV (ft)	BOREHOLE ABANDONMENT
		ASPHALT: ~ 6 inches thick **AGGREGATE BASE:**					
	SM	**SILTY SAND:** brown, slightly moist, medium dense, fine grained sand with gravel, some odor			198		Borehole backfilled with hydrated bentonite chips.
5		-- trace gravel, some odor	BH-10-5		265		
		-- strong odor			1789		
10		-- olive-green, slightly moist, loose, fine to medium grained sand, strong odor	BH-10-10		1584		
15		-- olive-green, wet, loose, fine grained sand, very strong odor, free product	BH-10-15		2743		
20	SP	**SAND:** light brown, slightly moist, loose, fine to medium grained, trace gravel, no odor	BH-10-20		1		
25	CL	**CLAY:** olive-green to brown, slightly moist, stiff, strong odor	BH-10-25		1783		
30	SM	**SILTY SAND:** olive-green, slightly moist, loose, fine to medium grained, slight odor	BH-10-30		27		
35	SP	**SAND:** brown, slightly moist, loose, medium grained, slight odor	BH-10-35		25		
		▼ -- groundwater encountered at approximately 38 feet, coarse grained sand					
40		-- gray, saturated, medium dense, very fine grained grading into coarse grained sand with depth					

Boring terminated at 41 feet.
Groundwater not encountered.

Kleinfelder
1940 Orange Tree Lane
Redlands, CA 92374

PROJECT NO. 24568

PROJECT: **Bear Oil**
LOCATION: **24913 Redlands Blvd, Loma Linda, California**

BORING NO:

BH-12

STARTED: 2/17/03 COMPLETED: 2/17/03
DRILLING COMPANY: Strongarm Environmental
DRILLING EQUIPMENT: Geoprobe
DIAMETER OF BORING: 2 inches

TOTAL DEPTH: 28.0 feet
WATER ENCOUNTERED: 23 ft bgs
LOGGED BY: Carlos Campos
CHECKED BY:

[Continuous Core]

DEPTH (ft)	GRAPHIC LOG	USCS	DESCRIPTION	SAMPLE	SAMPLE No.	BLOW COUNTS	PID (ppm)	ELEV (ft)	BOREHOLE ABANDONMENT
		SP	**SAND:** brown, wet, loose, medium grained, with gravel						Concrete cap.
5		SM	**SILTY SAND:** brown, slightly moist, dense, very fine grained – saturated, fine to medium grained sand						Borehole backfilled with hydrated bentonite chips.
10			– slightly moist, very fine grained, no odor	▥	BH-12-10		0.0		
		ML	**SILT:** brown, slightly moist, dense, very fine grained						
15		SP	**SAND:** brown, slightly moist, dense, medium to coarse grained, no odor	▥	BH-12-15		0.0		
		ML	**SILT:** brown, slightly moist, dense, very fine grained						
20			– no odor	▥	BH-12-20		0.0		
25		SP	▽ **SAND:** brown, saturated, loose, medium to coarse grained, groundwater encountered at approximately 23 feet						
30									
			Geoprobe terminated at 28 feet. Groundwater encountered at approximately 23 feet.						
35									
40									
45									

Kleinfelder
1940 Orange Tree Lane
Redlands, CA 92374

PROJECT NO. 24568

PROJECT: **Bear Oil**		BORING NO:	**BH-13**
LOCATION: **24913 Redlands Blvd, Loma Linda, California**			
STARTED: 2/17/03	COMPLETED: 2/17/03	TOTAL DEPTH: 43.0 feet	
DRILLING COMPANY: Strongarm Environmental		WATER ENCOUNTERED: 38 ft bgs	
DRILLING EQUIPMENT: Geoprobe		LOGGED BY: Carlos Campos	
DIAMETER OF BORING: 1-1/2 inches		CHECKED BY:	

DEPTH (ft)	GRAPHIC LOG	USCS	DESCRIPTION	SAMPLE	SAMPLE No.	BLOW COUNTS	PID (ppm)	ELEV (ft)	BOREHOLE ABANDONMENT
			SILTY SAND: brown, moist, loose, coarse grained, with gravel						Borehole backfilled with hydrated bentonite chips.
5		SM	-- no odor	▨	BH-13-5		0.0		
10			-- black, very moist, fine to medium grained, trace gravel, very strong odor	▨	BH-13-10		576.0		
15		ML	**SILT:** olive-green, moist, loose, very fine grained, slight odor	▨	BH-13-15		21.0		
20		SP	**SAND:** light brown, slightly moist, loose, medium to coarse grained, trace gravel, slight odor	▨	BH-13-20		28.7		
25		ML	**SILT:** green, moist, loose, very fine grained, some odor	▨	BH-13-25		35.7		
30		CL	**CLAY:** brown, moist, firm, trace very fine grained sand, slight odor	▨	BH-13-30		8.3		
35			**SILTY SAND:** brown, moist, loose, fine to medium grained, trace gravel, slight odor	▨	BH-13-35		9.4		
		SM	▼ -- groundwater encountered at approximately 38 feet						
40			-- saturated, slight odor				2.4		
45			Geoprobe terminated at 43 feet. Groundwater encountered at approximately 38 feet.						

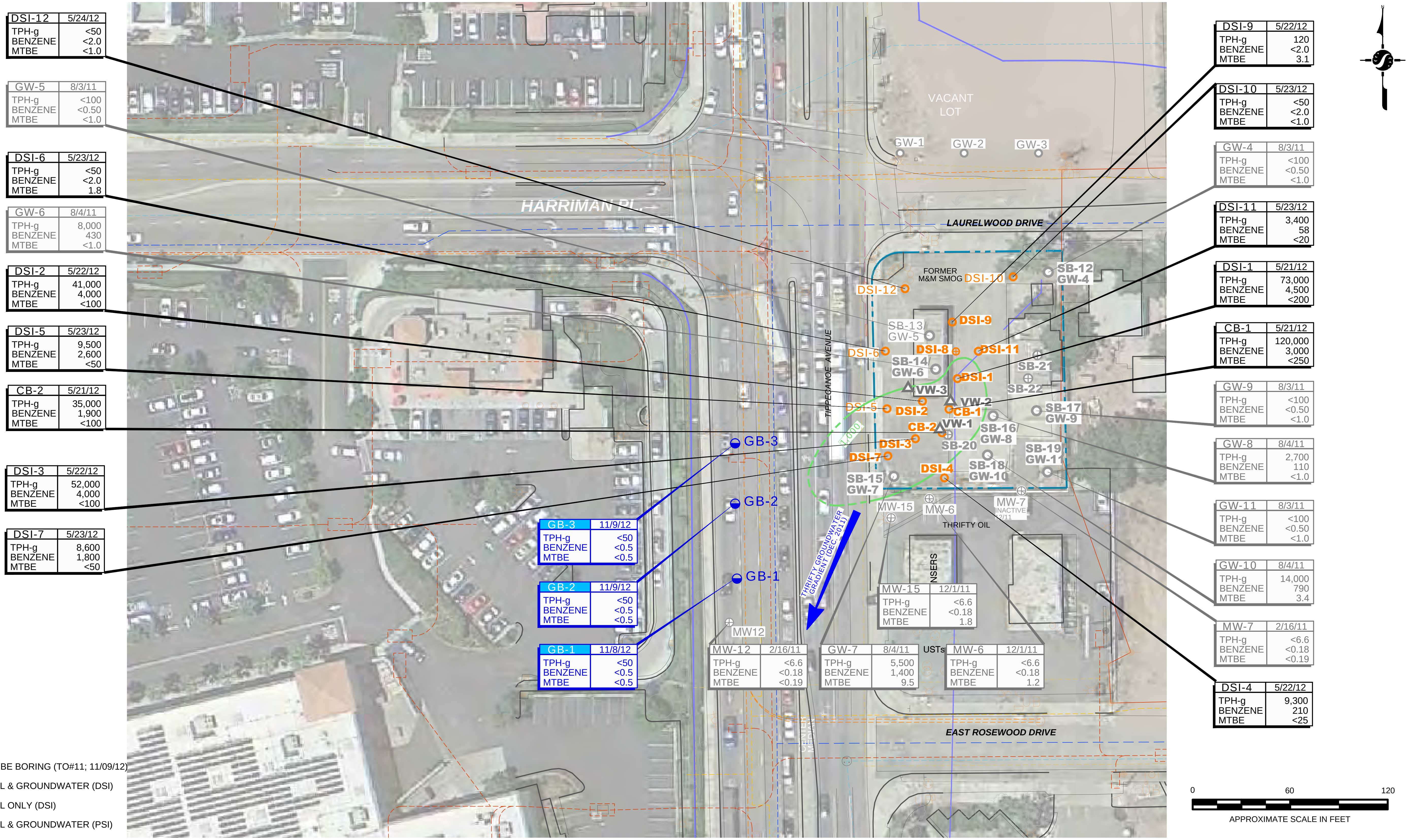
Kleinfelder

1940 Orange Tree Lane
Redlands, CA 92374

PROJECT NO. 24568

APPENDIX C2.6

Former M&M Smog and Muffler
GeoTracker Case I.D. T10000003588



DSI-12	5/24/12
TPH-g	<50
BENZENE	<2.0
MTBE	<1.0

GW-5	8/3/11
TPH-g	<100
BENZENE	<0.50
MTBE	<1.0

DSI-6	5/23/12
TPH-g	<50
BENZENE	<2.0
MTBE	1.8

GW-6	8/4/11
TPH-g	8,000
BENZENE	430
MTBE	<1.0

DSI-2	5/22/12
TPH-g	41,000
BENZENE	4,000
MTBE	<100

DSI-5	5/23/12
TPH-g	9,500
BENZENE	2,600
MTBE	<50

CB-2	5/21/12
TPH-g	35,000
BENZENE	1,900
MTBE	<100

DSI-3	5/22/12
TPH-g	52,000
BENZENE	4,000
MTBE	<100

DSI-7	5/23/12
TPH-g	8,600
BENZENE	1,800
MTBE	<50

GB-3	11/9/12
TPH-g	<50
BENZENE	<0.5
MTBE	<0.5

GB-2	11/9/12
TPH-g	<50
BENZENE	<0.5
MTBE	<0.5

GB-1	11/8/12
TPH-g	<50
BENZENE	<0.5
MTBE	<0.5

MW-15	12/1/11
TPH-g	<6.6
BENZENE	<0.18
MTBE	1.8

MW-12	2/16/11
TPH-g	<6.6
BENZENE	<0.18
MTBE	<0.19

GW-7	8/4/11
TPH-g	5,500
BENZENE	1,400
MTBE	9.5

MW-6	12/1/11
TPH-g	<6.6
BENZENE	<0.18
MTBE	1.2

DSI-9	5/22/12
TPH-g	120
BENZENE	<2.0
MTBE	3.1

DSI-10	5/23/12
TPH-g	<50
BENZENE	<2.0
MTBE	<1.0

GW-4	8/3/11
TPH-g	<100
BENZENE	<0.50
MTBE	<1.0

DSI-11	5/23/12
TPH-g	3,400
BENZENE	58
MTBE	<20

DSI-1	5/21/12
TPH-g	73,000
BENZENE	4,500
MTBE	<200

CB-1	5/21/12
TPH-g	120,000
BENZENE	3,000
MTBE	<250

GW-9	8/3/11
TPH-g	<100
BENZENE	<0.50
MTBE	<1.0

GW-8	8/4/11
TPH-g	2,700
BENZENE	110
MTBE	<1.0

GW-11	8/3/11
TPH-g	<100
BENZENE	<0.50
MTBE	<1.0

GW-10	8/4/11
TPH-g	14,000
BENZENE	790
MTBE	3.4

MW-7	2/16/11
TPH-g	<6.6
BENZENE	<0.18
MTBE	<0.19

DSI-4	5/22/12
TPH-g	9,300
BENZENE	210
MTBE	<25

LEGEND

◒	OFF SITE GEOPROBE BORING (TO#11; 11/09/12)
○	SOIL BORING - SOIL & GROUNDWATER (DSI)
⊕	SOIL BORING - SOIL ONLY (DSI)
○	SOIL BORING - SOIL & GROUNDWATER (PSI)
⊕	SOIL BORING - SOIL ONLY (PSI)
△	VAPOR WELL / SOIL BORING LOCATIONS
⊕	GROUNDWATER MONITORING WELL
— — —	STORM DRAINAGE
- - - -	SEWER
— — —	WATER
— — —	ELECTRIC
———	ELECTRIC- OVERHEAD
— — —	GAS
— — —	TELEPHONE
— — —	TV/FIBEROPTICS
———	PROPOSED RIGHT-OF-WAY
- - - -	DISSOLVED BENZENE CONTOUR µg/L

SAMPLE ID	SAMPLE DATE
CONSTITUENT	CONCENTRATION

ALL GROUNDWATER DATA REPORTED IN µg/L

TPHg TOTAL PETROLEUM HYDROCARBONS AS GASOLINE

MTBE METHYL TERTIARY BUTHYL ETHER

Stantec
25864-F BUSINESS CENTER DRIVE
REDLANDS, CALIFORNIA 92374
PHONE: (909) 335-6116 FAX: (909) 335-6120

TASK ORDER #11
GEOPROBE BORINGS
ON TIPPECANOE AVENUE
08-SBd-10-PM 26.0/27.3
PN#08-000-204671/EA#448121

SITE PLAN
FORMER M&M SMOG SITE
OFF-SITE BORING LOCATIONS

FIGURE: 2

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185802437	JCR	AP		NOV. 2012

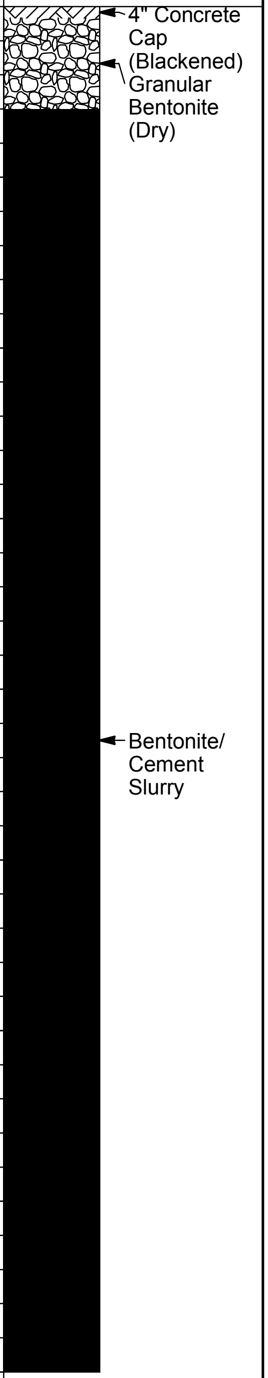
FILEPATH:P:\CADD\PROJECTS\CalTrans\TO11\TO11-2012.dwg|jresendiz|Dec 07, 2012 at 13:09|Layout: 1

PROJECT: **Former M&M Smog - Tippecanoe** LOCATION: **San Bernardino, CA** PROJECT NUMBER: **185802437**	WELL / PROBEHOLE / BOREHOLE NO: **GB-1** PAGE 1 OF 1

DRILLING: STARTED **11/8/12**	COMPLETED: **11/8/12**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **Core Probe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **7822DT Track Rig**		INITIAL DTW (ft): **35 11/8/12**	BOREHOLE DEPTH (ft): **40.0**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Encountered**	WELL DEPTH (ft): **---**
SAMPLING EQUIPMENT: **DPT**		WELL CASING DIAMETER (in): **1**	BOREHOLE DIAMETER (in): **2**
		LOGGED BY: **MFB**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
2240			8" Asphalt						
			8" Concrete/Lime Treated Base						
			Hand Auger to -5' Below Ground Surface (bgs)						
5			Direct Push to 25' bgs						5
25		CL	**CLAY** ; CL; GLEY1 3/1 very dark greenish gray; medium to high plasticity; moist; no odor; no staining; ~10% silt, trace very fine grained sand		2309 GB-1@25 8260 BTEX OXYS TPHg	0.5	--	0.0	25
30		SP	**POORLY GRADED SAND** ; SP; 10YR 4/4 dark yellowish brown; fine to medium-grained; slightly moist; no odor; no staining; few coarse grained sand; little silt		2310 GB-1@30 8260 BTEX OXYS TPHg	0.5	--	0.0	30
35			**...SAME AS ABOVE** ; GLEY1 5/1 grayish gray; fine to coarse-grained; moist; no odor; no staining; trace silt		2320 GB-1@35 8260 BTEX OXYS TPHg	0.5	--	0.0	∇ 35
2326 40		SP	**POORLY GRADED SAND** ; SP; 10YR 4/1 dark gray; fine to medium-grained; moist; no odor; no staining; trace coarse grained sand; ~20% silt		2326 GB-1@40 8260 BTEX OXYS TPHg	0.5	--	0.0	40
			Borehole terminated at 40 feet.						

Well Construction



PROJECT: **Former M&M Smog - Tippecanoe**
LOCATION: **San Bernardino, CA**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
GB-2 PAGE 1 OF 1

DRILLING: STARTED **11/8/12**	COMPLETED: **11/9/12**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **Core Probe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **7822DT Track Rig**		INITIAL DTW (ft): **34 11/9/12**	BOREHOLE DEPTH (ft): **40.0**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Encountered**	WELL DEPTH (ft): **---**
SAMPLING EQUIPMENT: **DPT**		WELL CASING DIAMETER (in): **1**	BOREHOLE DIAMETER (in): **2**
		LOGGED BY: **MFB**	CHECKED BY:

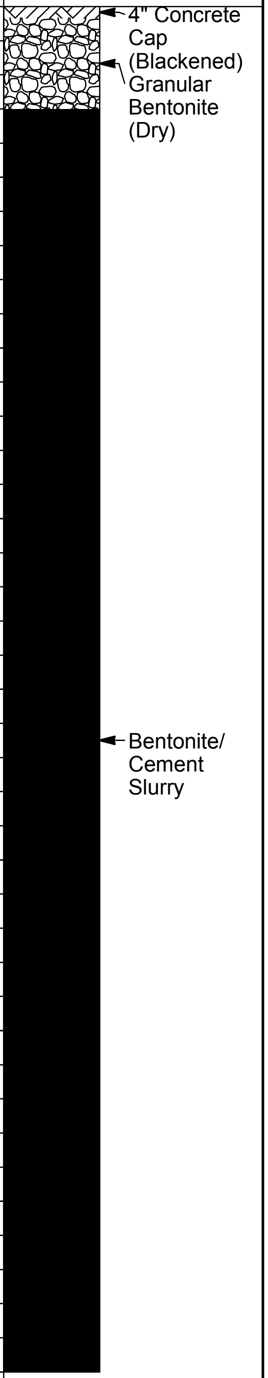
Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Well Construction
	■		8" Asphalt							4" Concrete Cap (Blackened)
	▒		8" Concrete/Lime Treated Base							Granular Bentonite (Dry)
	▨		Hand Auger to -5' Below Ground Surface (bgs)							
5			Direct Push to 25' bgs						5	
10									10	
15									15	
20									20	Bentonite/ Cement Slurry
25	🟩	CL	**CLAY** ; CL; GLEY1 3/1 very dark grayish gray; medium to high plasticity; moist; no odor; no staining; ~10% silt; trace very fine sand	■	0019 GB-2@25 8260 BTEX OXYS TPHg	0.5	--	0.0	25	
30	🟨	SP	**POORLY GRADED SAND** ; SP; 10YR 4/1 dark gray; fine to coarse-grained; slightly moist; no odor; no staining; ~10% fine gravel; trace silt	■	0020 GB-2@30 8260 BTEX OXYS TPHg	0.5	--	0.0	30	
									∇	
35	🟨	SP	**POORLY GRADED SAND** ; SP; GLEY1 4/1 dark greenish gray; fine to medium-grained; moist; no odor; no staining; trace coarse grained sand; ~10% silt	■	0025 GB-2@35 8260 BTEX OXYS TPHg	0.5	--	0.0	35	
40		SP	**POORLY GRADED SAND** ; SP; 10YR 4/1 dark gray; fine-grained; wet; no odor; no staining; ~30% medium grained sand; trace coarse grained sand; trace silt Borehole terminated at 40 feet.	■	0029 GB-2@40 8260 BTEX OXYS TPHg	0.5	--	0.0	40	

PROJECT: **Former M&M Smog - Tippecanoe**
LOCATION: **San Bernardino, CA**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
GB-3 PAGE 1 OF 1

DRILLING: STARTED **11/9/12**	COMPLETED: **11/9/12**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **Core Probe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **7822DT Track Rig**		INITIAL DTW (ft): **34 11/9/12**	BOREHOLE DEPTH (ft): **40.0**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Encountered**	WELL DEPTH (ft): **---**
SAMPLING EQUIPMENT: **DPT**		WELL CASING DIAMETER (in): **1**	BOREHOLE DIAMETER (in): **2**
		LOGGED BY: **MFB**	CHECKED BY:

Time & Depth (feet)	USCS	Description	Time Sample ID Method	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
0		8" Asphalt					
		8" Concrete/Lime Treated Base					
		Hand Auger to -5' Below Ground Surface (bgs)					
5		Direct Push to 25' bgs					5
10							10
15							15
20							20
25	CL	**CLAY** ; CL; 10YR 4/2 dark grayish brown; medium plasticity; slightly moist to moist; no odor; no staining; ~10% silt; trace very fine sand	0142 GB-3@25 8260 BTEX OXYS TPHg	0.5	--	0.0	25
30	SP	**POORLY GRADED SAND** ; SP; 10YR 5/3 brown; fine to medium-grained; slightly moist; no odor; no staining; trace coarse grained sand; trace silt	0143 GB-3@30 8260 BTEX OXYS TPHg	0.5	--	0.0	30
35	SP	**POORLY GRADED SAND** ; SP; 10YR 4/2 dark grayish brown; fine to medium-grained; wet; no odor; no staining; ~15% silt	0151 GB-3@35 8260 BTEX OXYS TPHg	0.5	--	0.0	35
40	SP	**POORLY GRADED SAND WITH SILT** ; SP; 10YR 4/1 dark gray; fine to medium-grained; moist to wet; no odor; no staining; ~20% silt Borehole terminated at 40 feet.	0155 GB-3@40 8260 BTEX OXYS TPHg	0.5	--	0.0	40



PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2
SB-12

Stantec

DRILLING: STARTED **8/3/11** COMPLETED: **8/3/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **Core Probe**
DRILLING EQUIPMENT: **6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Tube**

NORTHING (ft):
LATITUDE:
GROUND ELEV (ft):
INITIAL DTW (ft): **31**
STATIC DTW (ft): **Not Measured**
WELL CASING DIAMETER (in): **---**
LOGGED BY: **MZ**

EASTING (ft):
LONGITUDE:
TOC ELEV (ft):
BOREHOLE DEPTH (ft): **40**
WELL DEPTH (ft):
BOREHOLE DIAMETER (in): **2.5**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5	▨	SC	**CLAYEY SAND**; SC; 10YR 4/3 brown; fine-grained; dense; moist; micaceous; 20% fines	■	SB-12@5' 0715			504	5
10	▨		Same as above	■	SB-12@10' 0720			17.2	10
15	░	SM	**SAND** ; SM; 10YR 4/3 brown; fine-grained; dense; moist; micaceous; 20% fines	■	SB-12@15' 0725			6.5	15
20	░		Same as above	■	SB-12@20' 0730			4.0	20
	▨	SC	**CLAYEY SAND**; SC; 10YR 4/3 brown; fine-grained; dense; moist;	■	SB-12@25'			4.0	

PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2
SB-12

Stantec

DRILLING: STARTED **8/3/11**	COMPLETED: **8/3/11**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **Core Probe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **6610 DT**		INITIAL DTW (ft): **31**	BOREHOLE DEPTH (ft): **40**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
SAMPLING EQUIPMENT: **Acetate Tube**		WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
		LOGGED BY: **MZ**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
		SC	micaceous; 20% fines		0735				
30		CL	**SILTY CLAY**; CL; 10YR 4/3 brown; medium plasticity; soft; moist; micaceous	■	SB-12@30' 0740			0	30
1300									▽
35			Same as above	■	SB-12@35' 0745			0	35
40		SC	**CLAYEY SAND**; SC; 10YR 4/3 brown; fine-grained; dense; moist; 30% fines	■	SB-12@40' 0800			0	40
			Borehole terminated at 40 feet.						
45									45

PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2
SB-13

DRILLING: STARTED **8/3/11** COMPLETED: **8/3/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **Core Probe**
DRILLING EQUIPMENT: **6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Tube**

NORTHING (ft):
EASTING (ft):
LATITUDE:
LONGITUDE:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **31**
BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**
WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**
BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **MZ**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5		SM	**SILTY SAND**; SM; 10YR 4/3 brown; fine-grained; dense; moist; micaceous; 30% fines	■	SB-13@5' 1145			1.6	5
10			**CLAYEY**; 10YR 4/2 dark grayish brown; Same as above	■	SB-13@10' 1150			3.2	10
15			2.5Y 6/1 gray; 40% fines; Same as above	■	SB-13@15' 1155			2.9	15
20			2.5Y 5/1 gray; 50% fines; Same as above	■	SB-13@20' 1200			1.5	20
			30% fines; trace fine angular gravel; Same as above	■	SB-13@25'			10.0	

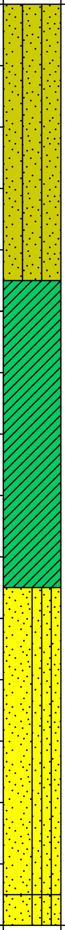
PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2 **SB-13**

DRILLING: STARTED **8/3/11** COMPLETED: **8/3/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **Core Probe**
DRILLING EQUIPMENT: **6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Tube**

NORTHING (ft):
LATITUDE:
GROUND ELEV (ft):
INITIAL DTW (ft): **31**
STATIC DTW (ft): **Not Measured**
WELL CASING DIAMETER (in): **---**
LOGGED BY: **MZ**

EASTING (ft):
LONGITUDE:
TOC ELEV (ft):
BOREHOLE DEPTH (ft): **40**
WELL DEPTH (ft):
BOREHOLE DIAMETER (in): **2.5**
CHECKED BY:



Time & Depth (feet)	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
				1205				
30	CL	**SILTY CLAY WITH SAND**; CL; 10YR 4/3 brown; low plasticity; micaceous; 15% fine grained sand	■	SB-13@30' 1210			2.2	30
1245								∇
35	SP-SM	**SAND WITH SILT**; SP-SM; 2.5Y 4/3 olive brown; fine-grained; dense; moist; micaceous; 10% fines	■	SB-13@35' 1215			2.4	35
40		10YR 5/1 gray	■	SB-13@40' 1220			0	40
		Borehole terminated at 40 feet.						
45								45

PROJECT: **I-10 @ Tippecanoe Interchange**	WELL / PROBEHOLE / BOREHOLE NO:
LOCATION: **NEC of Tippecanoe / Rosewood**	
PROJECT NUMBER: **185802437**	PAGE 1 OF 2 **SB-14/GW-6**

DRILLING: STARTED **8/4/11**	COMPLETED: **8/4/11**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **CoreProbe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **Geoprobe 6610 DT**		INITIAL DTW (ft): **Not Measured**	BOREHOLE DEPTH (ft): **40**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
SAMPLING EQUIPMENT: **Acetate Sleeves**		WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
		LOGGED BY: **M. Zellmer**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5	🟩	SC	**CLAYEY SAND**; SC; 10YR 4/2 dark grayish brown; fine-grained; dense; moist; 40% fines	■	SB-14@5 1440			0.6	5
10	🟩		10YR 4/3 brown	■	SB-14@10 1443			1.7	10
15	🟨	SP	**SAND** ; SP; 2.5Y 5/3 light olive brown; fine-grained; loose; dry; poorly graded	■	SB-14@15 1445			323	15
20	🟩	CL	**SILTY CLAY**; CL; 2.5Y 5/2 grayish brown; medium plasticity; firm; moist; strong HC odor	■	SB-14@20 1448			1693	20
	🟩	SC	**CLAYEY SAND**; SC; 2.5Y 5/2 grayish brown; fine-grained; dense;	■	SB-14@25			90.9	

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2
SB-14/GW-6

DRILLING: STARTED **8/4/11**	COMPLETED: **8/4/11**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **CoreProbe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **Geoprobe 6610 DT**		INITIAL DTW (ft): **Not Measured**	BOREHOLE DEPTH (ft): **40**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
SAMPLING EQUIPMENT: **Acetate Sleeves**		WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
		LOGGED BY: **M. Zellmer**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
		SC	moist; 30% fines		1450				
30		SM	**SILTY SAND**; SM; 2.5Y 5/1 gray; fine-grained; dense; moist; moderate HC odor; clayey; 30% fines	■	SB-14@30 1453 GW-6@31 1545			287	30
35		CL	**SANDY CLAY**; CL; 2.5Y 5/1 gray; non plastic; firm; wet; 30% fine grained sand; silty	■	SB-14@35 1455			78.9	35
40			Siltier; 35% sand	■	SB-14@40 1500			24.5	40
			Borehole terminated at 40 feet.						
45									45

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2 **SB-15/GW-7**

DRILLING: STARTED **8/4/11** COMPLETED: **8/4/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **CoreProbe**
DRILLING EQUIPMENT: **Geoprobe 6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Sleeves**

NORTHING (ft):
EASTING (ft):
LATITUDE:
LONGITUDE:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Measured**
BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**
WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**
BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **M. Zellmer**
CHECKED BY:

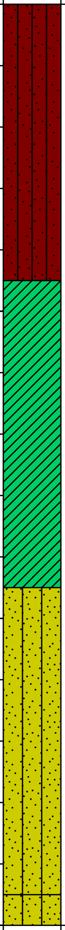
Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5	▨	SM	**SILTY SAND**; SM; 10YR 4/3 brown; fine to medium-grained; dense; moist; 30% fines	■	SB-15@5 0735			0.0	5
10	▨	CL	**SANDY CLAY**; CL; 10YR 5/2 grayish brown; medium plasticity; soft; moist; micaceous; 30% fine grained sand	■	SB-15@10 0738			0.0	10
15	▨	SP-SM	**SAND WITH SILT**; SP-SM; 2.5Y 6/3 light yellowish brown; fine-grained; dense; moist; 10% fines	■	SB-15@15 0740			7.3	15
20	▨	ML	**SANDY SILT**; ML; 10YR 4/2 dark grayish brown; firm; moist; medium dilatancy; 40% fine grained sand	■	SB-15@20 0743			12.3	20
	▨		2.5Y 4/2 dark grayish brown; clayey	■	SB-15@25			38.6	

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2 **SB-15/GW-7**

DRILLING: STARTED **8/4/11** COMPLETED: **8/4/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **CoreProbe**
DRILLING EQUIPMENT: **Geoprobe 6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Sleeves**

NORTHING (ft):
EASTING (ft):
LATITUDE:
LONGITUDE:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Measured**
BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**
WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**
BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **M. Zellmer**
CHECKED BY:



Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
					0745				
30		CL	**SANDY CLAY**; CL; 10YR 4/2 dark grayish brown; medium plasticity; hard; moist; micaceous; 30% fine grained sand	■	SB-15@30 0748 GW-7@31 1515			28.1	30
35		SM	**SILTY SAND**; SM; 2.5Y 4/1 dark gray; fine-grained; dense; moist; micaceous; 35% fines	■	SB-15@35 0750			32.6	35
40			Borehole terminated at 40 feet.	■	SB-15@40 0755			39.2	40
45									45

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2 **SB-16/GW-8**

Stantec

DRILLING: STARTED **8/4/11** COMPLETED: **8/4/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **CoreProbe**
DRILLING EQUIPMENT: **Geoprobe 6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Sleeves**

NORTHING (ft):
LATITUDE:
GROUND ELEV (ft):
INITIAL DTW (ft): **Not Measured**
STATIC DTW (ft): **Not Measured**
WELL CASING DIAMETER (in): **---**
LOGGED BY: **M. Zellmer**

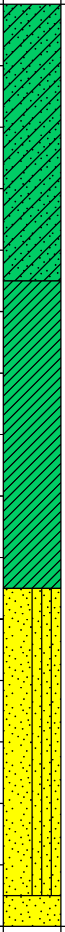
EASTING (ft):
LONGITUDE:
TOC ELEV (ft):
BOREHOLE DEPTH (ft): **40**
WELL DEPTH (ft):
BOREHOLE DIAMETER (in): **2.5**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5	▨	SC	**CLAYEY SAND**; SC; 10YR 4/3 brown; fine-grained; firm; moist; micaceous; 25% fines	■	SB-16@5 1230			0	5
10	▨	SP-SM	**SAND WITH SILT TRACE MEDIUM SAND**; SP-SM; 10YR 5/2 grayish brown; fine-grained; dense; moist; micaceous; 10% fines	■	SB-16@10 1235			0	10
15	▨	SM	**SILT SAND**; SM; 10YR 5/2 grayish brown; fine-grained; dense; moist; poorly graded; micaceous; 20% fines	■	SB-16@15 1240			591	15
20	▨	SC	**CLAYEY SAND**; SC; 2.5Y 4/2 dark grayish brown; fine-grained; dense; moist; moderate HC odor; micaceous; 30% fines	■	SB-16@20 1245			18.8	20
	▨		Silty; 15% fines	■	SB-16@25			80.2	

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2 **SB-16/GW-8**

DRILLING: STARTED **8/4/11**	COMPLETED: **8/4/11**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **CoreProbe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **Geoprobe 6610 DT**		INITIAL DTW (ft): **Not Measured**	BOREHOLE DEPTH (ft): **40**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
SAMPLING EQUIPMENT: **Acetate Sleeves**		WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
		LOGGED BY: **M. Zellmer**	CHECKED BY:



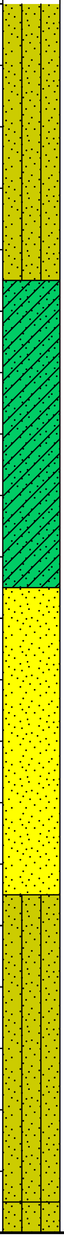
Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
					1250				
30		CL	**CLAY WITH SAND**; CL; 10YR 5/2 grayish brown; medium plasticity; hard; moist; micaceous; 15% fine grained sand	■	SB-16@30 1255 GW-8@31 1535			3.0	30
35		SP-SM	**SAND WITH SILT**; SP-SM; 2.5Y 4/3 olive brown; fine-grained; loose; moist; poorly graded; 10% fines	■	SB-16@35 1300			1.1	35
40		SP	**SAND TRACE FINES**; SP; 2.5Y 4/3 olive brown; fine-grained; dense; moist	■	SB-16@40 1305			0	40
			Borehole terminated at 40 feet.						
45									45

PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2
SB-17
Stantec

DRILLING: STARTED **8/3/11** COMPLETED: **8/3/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **Core Probe**
DRILLING EQUIPMENT: **6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Tube**

NORTHING (ft):
EASTING (ft):
LATITUDE:
LONGITUDE:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **31**
BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**
WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**
BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **MZ**
CHECKED BY:



Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5		SM	**SILTY SAND**; SM; 10YR 4/3 brown; fine-grained; firm; moist; micaceous; 30% fines; clayey	■	SB-17@5' 0915			0	5
10		SC	**CLAYEY SAND**; SC; 10YR 4/3 brown; fine-grained; dense; moist; micaceous; 40% fines; silty	■	SB-17@10' 0918			0	10
15		SP	**SAND** ; SP; 2.5Y 6/1 gray; fine-grained; dense; poorly graded; micaceous; 10% fines	■	SB-17@15' 0920			0	15
20		SM	**SILTY SAND**; SM; 10YR 4/1 dark gray; fine-grained; dense; poorly graded; micaceous; 25% fines; clayey	■	SB-17@20' 0923			0	20
			10YR 4/2 dark grayish brown; 20% fines; Same as above	■	SB-17@25'			6.0	

PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2
SB-17

DRILLING: STARTED **8/3/11** COMPLETED: **8/3/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **Core Probe**
DRILLING EQUIPMENT: **6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Tube**

NORTHING (ft):
EASTING (ft):
LATITUDE:
LONGITUDE:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **31**
BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**
WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**
BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **MZ**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
					0925				
30		CL	**SILTY CLAY WITH SAND**; CL; 10YR 4/3 brown; medium plasticity; firm; moist; micaceous; 15% fine grained sand	■	SB-17@30' 0928			3.2	30
1330									∇
35		SM	**SILTY SAND**; SM; 10YR 4/3 brown; fine-grained; dense; moist; micaceous; 15% fines	■	SB-17@35' 0930			3.8	35
40		SC	**CLAYEY SAND**; SC; 10YR 4/1 dark gray; fine-grained; dense; moist; micaceous; 20% fines	■	SB-17@40' 0935			2.1	40
			Borehole terminated at 40 feet.						
45									45

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2 **SB-18/GW-10**

DRILLING: STARTED **8/4/11** COMPLETED: **8/4/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **CoreProbe**
DRILLING EQUIPMENT: **Geoprobe 6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Sleeves**

NORTHING (ft): EASTING (ft):
LATITUDE: LONGITUDE:
GROUND ELEV (ft): TOC ELEV (ft):
INITIAL DTW (ft): **Not Measured** BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured** WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **M. Zellmer** CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5		SC	**CLAYEY SAND**; SC; 10YR 4/3 brown	■	SB-18@5 1240			17.9	5
		SW	**SAND** ; SW; white; hard; dry; angular; well graded						
10		SW	**SAND** ; SW; 10YR 3/2 very dark grayish brown; hard; moist; angular; well graded	■	SB-18@10 1245			10.8	10
15		SP	**SAND TRACE FINES**; SP; 10YR 4/1 dark gray; fine-grained; dense; poorly graded; micaceous	■	SB-18@15 1250			3.3	15
20		SP-SM	**SAND WITH SILT**; SP-SM; 2.5Y 5/1 gray; fine-grained; firm; moist; poorly graded; 10% fines	■	SB-18@20 1255			6.6	20
		SM	**SILTY SAND**; SM; 2.5Y 5/2 grayish brown; fine-grained; dense;	■	SB-18@25			32.4	

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2 **SB-18/GW-10**

DRILLING: STARTED **8/4/11**	COMPLETED: **8/4/11**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **CoreProbe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **Geoprobe 6610 DT**		INITIAL DTW (ft): **Not Measured**	BOREHOLE DEPTH (ft): **40**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
SAMPLING EQUIPMENT: **Acetate Sleeves**		WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
		LOGGED BY: **M. Zellmer**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
		SM	micaceous; clayey; 25% fines		1300				
30		SP	**SAND TRACE FINES**; SP; dark greenish gray; loose; moist; poorly graded; micaceous	■	SB-18@30 1305 GW-10@31 1525			12.1	30
35		SC	**CLAYEY SAND**; SC; 10YR 4/2 dark grayish brown; fine-grained; dense; moist; micaceous; 30% fines	■	SB-18@35 1310			6.1	35
40		SP	**SAND TRACE FINES**; SP; 10YR 4/1 dark gray; fine-grained; dense; moist; poorly graded Borehole terminated at 40 feet.	■	SB-18@40 1315			8.6	40
45									45

PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2 **SB-19**

DRILLING:	STARTED **8/3/11**	COMPLETED: **8/3/11**	
INSTALLATION:	STARTED	COMPLETED:	
DRILLING COMPANY: **Core Probe**			
DRILLING EQUIPMENT: **6610 DT**			
DRILLING METHOD: **Direct Push**			
SAMPLING EQUIPMENT: **Acetate Tube**			

NORTHING (ft):	EASTING (ft):
LATITUDE:	LONGITUDE:
GROUND ELEV (ft):	TOC ELEV (ft):
INITIAL DTW (ft): **31**	BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **MZ**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5	🟨	SM	**SILTY SAND**; SM; 10YR 4/3 brown; fine-grained; loose; moist; micaceous; 20% fines	■	SB-19@5' 0815			0	5
10	🟩	SC	**SILTY SAND**; SC; 10YR 4/3 brown; fine-grained; loose; moist; 30% fines; clayey	■	SB-19@10' 0818			0	10
15	🟨	SM	**SILTY SAND**; SM; 10YR 4/3 brown; fine-grained; loose; moist; 20% fines	■	SB-19@15' 0820			0	15
20	🟨	SM	**SILTY SAND**; SM; 2.5Y 4/1 gray; fine-grained; loose; moist	■	SB-19@20' 0823			0	20
	🟩	CL	**CLAY TRACE FINE SAND**; CL; 10YR 4/3 brown; medium plasticity;	■	SB-19@25'			0	

GEO FORM 304 10HWYTIPPECANOE_AUG2011.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 8/10/11

PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2
SB-19

DRILLING: STARTED **8/3/11** COMPLETED: **8/3/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **Core Probe**
DRILLING EQUIPMENT: **6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Tube**

NORTHING (ft):
LATITUDE:
GROUND ELEV (ft):
INITIAL DTW (ft): **31**
STATIC DTW (ft): **Not Measured**
WELL CASING DIAMETER (in): **---**
LOGGED BY: **MZ**

EASTING (ft):
LONGITUDE:
TOC ELEV (ft):
BOREHOLE DEPTH (ft): **40**
WELL DEPTH (ft):
BOREHOLE DIAMETER (in): **2.5**
CHECKED BY:

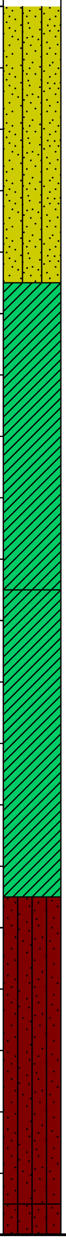
Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
	▨	CL	firm; moist		0825				
30	▨		**SILTY** ; 15% fine grained sand	■	SB-19@30' 0829			0	30
1315	▨								▽
35	▨	SM	**SILTY SAND**; SM; 10YR 4/3 brown; fine-grained; dense; moist; 35% fines	■	SB-19@35' 0830			0	35
40	▨	SC	**CLAYEY SAND**; SC; 2.5Y 5/3 light olive brown; fine-grained; dense; moist; micaceous; 30% fines Borehole terminated at 40 feet.	■	SB-19@40' 0835			0	40
45									45

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2 **SB-20**

DRILLING:	STARTED **8/4/11**	COMPLETED: **8/4/11**	
INSTALLATION:	STARTED	COMPLETED:	
DRILLING COMPANY: **CoreProbe**			
DRILLING EQUIPMENT: **Geoprobe 6610 DT**			
DRILLING METHOD: **Direct Push**			
SAMPLING EQUIPMENT: **Acetate Sleeves**			

NORTHING (ft):	EASTING (ft):
LATITUDE:	LONGITUDE:
GROUND ELEV (ft):	TOC ELEV (ft):
INITIAL DTW (ft): **Not Measured**	BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **M. Zellmer**	CHECKED BY:



Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5		SM	**SILT SAND**; SM; 10YR 4/3 brown; fine-grained; loose; moist; 20% fines	■	SB-20@5 0830			15.1	5
10		CL	**CLAY WITH SAND**; CL; 10YR 4/2 dark grayish brown; medium plasticity; soft; moist; silty; micaceous; 10% fine grained sand	■	SB-20@10 0833			19.4	10
15		CL	**SANDY CLAY**; CL; 10YR 4/2 dark grayish brown; low plasticity; firm; moist; 40% fine grained sand	■	SB-20@15 0835			98.3	15
20		ML	**SANDY SILT**; ML; 2.5Y 4/1 dark gray; soft; moist; moderate HC odor; 40% fine grained sand; medium dilatancy	■	SB-20@20 0838			894	20
			45% sand	■	SB-20@25			3.3	

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2
SB-20

Stantec

DRILLING: STARTED **8/4/11**	COMPLETED: **8/4/11**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED	COMPLETED:	LATITUDE:	LONGITUDE:
DRILLING COMPANY: **CoreProbe**		GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **Geoprobe 6610 DT**		INITIAL DTW (ft): **Not Measured**	BOREHOLE DEPTH (ft): **40**
DRILLING METHOD: **Direct Push**		STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
SAMPLING EQUIPMENT: **Acetate Sleeves**		WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
		LOGGED BY: **M. Zellmer**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
					0840				
30		CL	**SANDY CLAY**; CL; 2.5Y 4/2 dark grayish brown; low plasticity; firm; moist; micaceous; 40% fine grained sand	■	SB-20@30 0843			108.2	30
35			5Y 4/2 olive gray; medium plasticity; silty; 50% fine grained sand	■	SB-20@35 0845			449	35
40		SM	**SILTY SAND**; SM; 5Y 4/2 olive gray; fine-grained; dense; moist; micaceous; 20% fines Borehole terminated at 40 feet.	■	SB-20@40 0850			60.1	40
45									45

PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2
SB-21

DRILLING:	STARTED **8/3/11**	COMPLETED: **8/3/11**	
INSTALLATION:	STARTED	COMPLETED:	
DRILLING COMPANY: **Core Probe**			
DRILLING EQUIPMENT: **6610 DT**			
DRILLING METHOD: **Direct Push**			
SAMPLING EQUIPMENT: **Acetate Tube**			

NORTHING (ft):	EASTING (ft):
LATITUDE:	LONGITUDE:
GROUND ELEV (ft):	TOC ELEV (ft):
INITIAL DTW (ft): **Not Measured**	BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **MZ**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5		SC	**CLAYEY SAND**; SC; 10YR 4/3 brown; fine-grained; firm; moist; 40% fines	■	SB-21@5' 1025			0	5
10			**SILTY** ; 2.5Y 5/3 light olive brown	■	SB-21@10' 1028			0	10
15		SM	**SILTY SAND**; SM; 2.5Y 5/3 light olive brown; fine-grained; dense; moist; micaceous; 30% fines	■	SB-21@15' 1030			0	15
20		SP	**SAND TRACE FINES**; SP; 10YR 5/1 gray; fine-grained; moist; micaceous	■	SB-21@20' 1033			1.0	20
		SC	**CLAYEY SAND**; SC; 10YR 4/5 olive brown; fine-grained; dense;	■	SB-21@25'			5.9	

PROJECT: **Preliminary Site Investigation**
LOCATION: **I-10 at Tippecanoe**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2 **SB-21**

DRILLING:	STARTED **8/3/11**	COMPLETED: **8/3/11**	
INSTALLATION:	STARTED	COMPLETED:	
DRILLING COMPANY: **Core Probe**			
DRILLING EQUIPMENT: **6610 DT**			
DRILLING METHOD: **Direct Push**			
SAMPLING EQUIPMENT: **Acetate Tube**			

NORTHING (ft):	EASTING (ft):
LATITUDE:	LONGITUDE:
GROUND ELEV (ft):	TOC ELEV (ft):
INITIAL DTW (ft): **Not Measured**	BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**	WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**	BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **MZ**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
	🟩	SC	moist; micaceous; 30% fines		1035				
30	🟨	SM	**SILTY SAND**; SM; 2.5Y 5/3 light olive brown; fine-grained; dense; moist; micaceous; 40% fines	■	SB-21@30' 1038			1.5	30
35	🟨		**TRACE CLAY**; 2.5Y 5/2 grayish brown; 30% fines	■	SB-21@35' 1040			0.7	35
40	🟩	SC	**CLAYEY SAND**; SC; 2.5Y 5/3 light olive brown; fine-grained; dense; moist; micaceous; 30% fines Borehole terminated at 40 feet.	■	SB-21@40' 1045			0	40
45									45

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 1 OF 2
SB-22

DRILLING: STARTED **8/4/11** COMPLETED: **8/4/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **CoreProbe**
DRILLING EQUIPMENT: **Geoprobe 6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Sleeves**

NORTHING (ft):
LATITUDE:
GROUND ELEV (ft):
INITIAL DTW (ft): **Not Measured**
STATIC DTW (ft): **Not Measured**
WELL CASING DIAMETER (in): **---**
LOGGED BY: **M. Zellmer**

EASTING (ft):
LONGITUDE:
TOC ELEV (ft):
BOREHOLE DEPTH (ft): **40**
WELL DEPTH (ft):
BOREHOLE DIAMETER (in): **2.5**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5	🟩	SC	**CLAYEY SAND**; SC; 10YR 4/3 brown; fine-grained; dense; moist; 40% fines	■	SB-22@5 1050			2.2	5
10	🟨	SM	**SILTY SAND**; SM; 2.5Y 5/3 light olive brown; fine-grained; firm; moist; 40% fines	■	SB-22@10 1055			0.2	10
15	🟨		2.5Y 4/2 dark grayish brown	■	SB-22@15 1100			0.1	15
20	🟨		30% fines	■	SB-22@20 1105			0.2	20
	🟨		20% fines	■	SB-22@25			3.1	

PROJECT: **I-10 @ Tippecanoe Interchange**
LOCATION: **NEC of Tippecanoe / Rosewood**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
PAGE 2 OF 2 **SB-22**

DRILLING: STARTED **8/4/11** COMPLETED: **8/4/11**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **CoreProbe**
DRILLING EQUIPMENT: **Geoprobe 6610 DT**
DRILLING METHOD: **Direct Push**
SAMPLING EQUIPMENT: **Acetate Sleeves**

NORTHING (ft):
EASTING (ft):
LATITUDE:
LONGITUDE:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Measured**
BOREHOLE DEPTH (ft): **40**
STATIC DTW (ft): **Not Measured**
WELL DEPTH (ft):
WELL CASING DIAMETER (in): **---**
BOREHOLE DIAMETER (in): **2.5**
LOGGED BY: **M. Zellmer**
CHECKED BY:

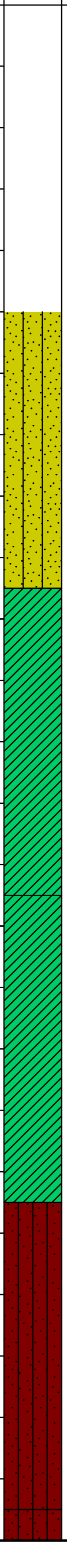
Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
					1125				
30		CL	**SANDY CLAY**; CL; 2.5Y 4/3 olive brown; medium plasticity; firm; moist; 20% fine grained sand	■	SB-22@30 1140			1.8	30
35		SM	**SILT SAND**; SM; 2.5Y 4/3 olive brown; fine-grained; dense; 30% fines	■	SB-22@35 1205			1.1	35
40		SP-SM	**SAND WITH SILT**; SP-SM; 2.5Y 4/3 olive brown; fine-grained; dense; poorly graded; 10% fines	■	SB-22@40 1210			1.1	40
			Borehole terminated at 40 feet.						
45									45

PROJECT: **I-10 at Tippecanoe**
LOCATION: **M&M Smog**
PROJECT NUMBER:

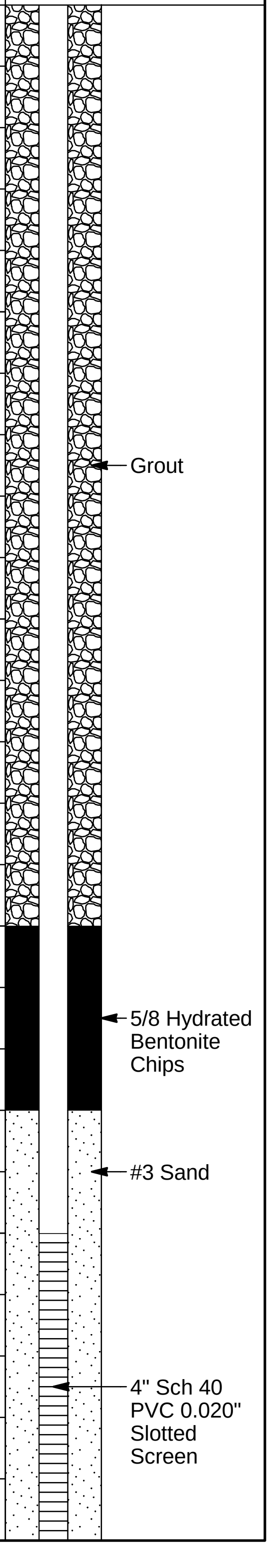
WELL / PROBEHOLE / BOREHOLE IDENTIFICATION: **SVE-1**
PAGE 1 OF 2

DRILLING: STARTED: **12/28/11** COMPLETED: **12/28/11**
INSTALLATION: STARTED: **12/28/11** COMPLETED: **12/28/11**
DRILLING COMPANY: **CalPac**
DRILLING EQUIPMENT: **B-61**
DRILLING METHOD: **HSA**
SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft):
EASTING (ft):
LAT:
LONG:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
WELL DEPTH (ft): **30**
STATIC DTW (ft): **Not Encountered**
BOREHOLE DEPTH (ft): **35.5**
WELL CASING DIA. (in): **4**
BOREHOLE DIA. (in): **10**
LOGGED BY: **ME**
CHECKED BY:



Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Well Construction
5	🟨	SM	**SILT SAND** ; SM; 10YR 4/3 brown; fine-grained; loose; moist; 20% fines						5	
10	🟩	CL	**CLAY WITH SAND** ; CL; 10YR 4/2 dark grayish brown; medium plasticity; soft; moist; silty; micaceous; 10% fine grained sand						10	
15	🟩	CL	**SANDY CLAY** ; CL; 10YR 4/2 dark grayish brown; low plasticity; firm; moist; 40% fine grained sand						15	
20	🟥	ML	**SANDY SILT** ; ML; 2.5Y 4/1 dark gray; soft; moist; moderate HC odor; 40% fine grained sand; medium dilatancy						20	
			45% sand							



PROJECT: **I-10 at Tippecanoe**
LOCATION: **M&M Smog**
PROJECT NUMBER:

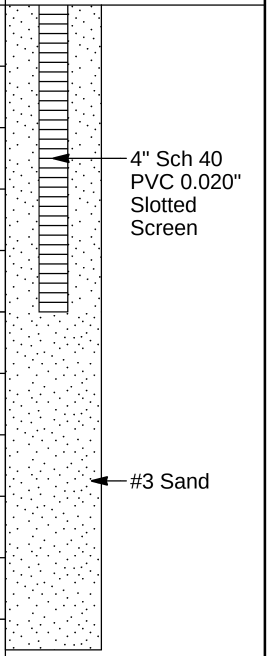
WELL / PROBEHOLE / BOREHOLE IDENTIFICATION: **SVE-1**
PAGE 2 OF 2

DRILLING: STARTED: **12/28/11** COMPLETED: **12/28/11**
INSTALLATION: STARTED: **12/28/11** COMPLETED: **12/28/11**
DRILLING COMPANY: **CalPac**
DRILLING EQUIPMENT: **B-61**
DRILLING METHOD: **HSA**
SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft):
EASTING (ft):
LAT:
LONG:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
WELL DEPTH (ft): **30**
STATIC DTW (ft): **Not Encountered**
BOREHOLE DEPTH (ft): **35.5**
WELL CASING DIA. (in): **4**
BOREHOLE DIA. (in): **10**
LOGGED BY: **ME**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
30	🟩	CL	**CLAY** ; CL; 10YR 5/3 brown; medium plasticity; firm; moist; silty	☒	0940 SVE-1@ 30-30.5'	1.5	6 8 20	25.9	30
35	🟥	ML	**SILT** ; ML; 2.5Y 6/2 brownish gray; low plasticity; firm; moist; clayey	☒	0950 SVE-1@ 35-35.5'	1.5	5 5 8	6.8	35
			Borehole terminated at 35.5 feet.						
40									40
45									45

Well Construction



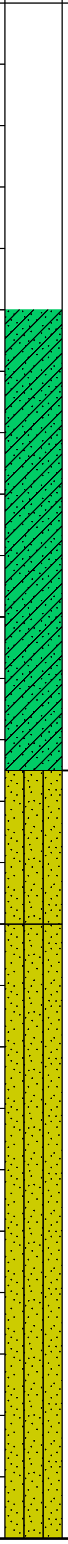
PROJECT: **I-10 at Tippecanoe**
LOCATION: **M&M Smog**
PROJECT NUMBER:

WELL / PROBEHOLE / BOREHOLE
IDENTIFICATION: **SVE-2**
PAGE 1 OF 2

DRILLING: STARTED: **12/28/11** COMPLETED: **12/28/11**
INSTALLATION: STARTED: **12/28/11** COMPLETED: **12/28/11**
DRILLING COMPANY: **CalPac**
DRILLING EQUIPMENT: **B-61**
DRILLING METHOD: **HSA**
SAMPLING EQUIPMENT: **Split Spoon**

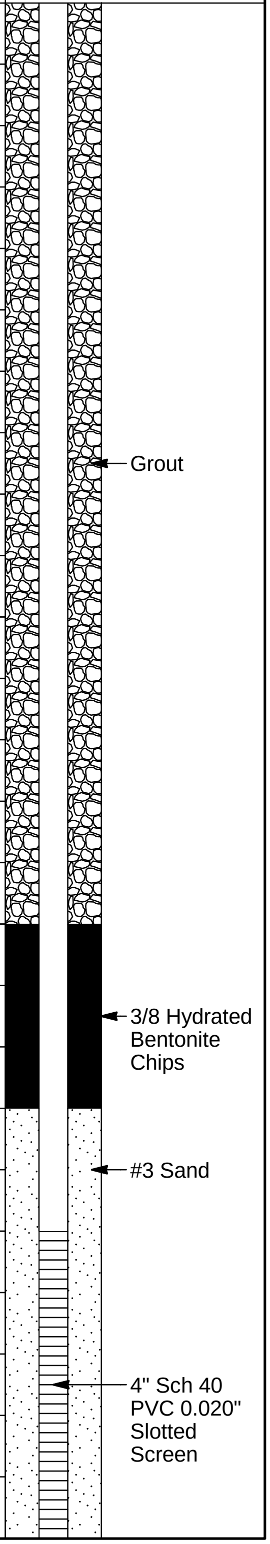
NORTHING (ft):
LAT:
GROUND ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
STATIC DTW (ft): **Not Encountered**
WELL CASING DIA. (in): **4**
LOGGED BY: **ME**

EASTING (ft):
LONG:
TOC ELEV (ft):
WELL DEPTH (ft): **35**
BOREHOLE DEPTH (ft): **35.5**
BOREHOLE DIA. (in): **10**
CHECKED BY:



Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
5		SC	**CLAYEY SAND** ; SC; 2.5Y 4/2 dark grayish brown; fine to medium-grained; moist; 15% fines; trace subrounded coarse grained sand		1110 SVE-2@ 5-5.5'	1.5	7 7 6	0	5
10			Same as above		1115 SVE-2@ 10-10.5'	1.5	6 7 10	0	10
15		SM	**SILTY SAND** ; SM; 5Y 4/2 olive brown; fine-grained; moist; 40% fines; micaceous		1120 SVE-2@ 15-15.5'	1.5	6 8 10	390	15
20			Same as above		1125 SVE-2@ 20-20.5'	1.5	7 8 8	1190	20
					1130	1.5	12 18		

Well Construction



PROJECT: **I-10 at Tippecanoe**
LOCATION: **M&M Smog**
PROJECT NUMBER:

WELL / PROBEHOLE / BOREHOLE IDENTIFICATION: **SVE-2**
PAGE 2 OF 2

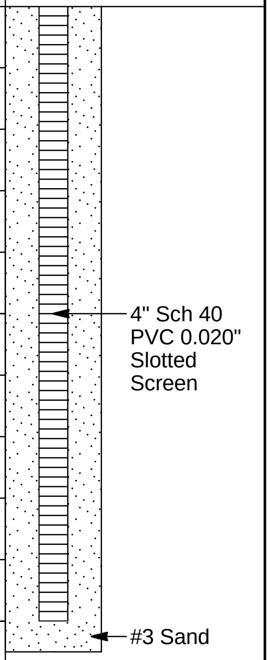
Stantec

DRILLING: STARTED: **12/28/11** COMPLETED: **12/28/11**
INSTALLATION: STARTED: **12/28/11** COMPLETED: **12/28/11**
DRILLING COMPANY: **CalPac**
DRILLING EQUIPMENT: **B-61**
DRILLING METHOD: **HSA**
SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft):
EASTING (ft):
LAT:
LONG:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
WELL DEPTH (ft): **35**
STATIC DTW (ft): **Not Encountered**
BOREHOLE DEPTH (ft): **35.5**
WELL CASING DIA. (in): **4**
BOREHOLE DIA. (in): **10**
LOGGED BY: **ME**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
		SM	**SILTY SAND** ; SM; 5Y 4/2 olive brown; fine to medium-grained; moist; 20% fines; micaceous	☒	SVE-2@ 25-25.5'		22	996	
30		ML	**SILT WITH SAND** ; ML; 2.5Y 4/3 olive brown; low plasticity; moist; 10% fine grained sand; slow dilation; micaceous	☒	1135 SVE-2@ 30-30.5'	1.5	5 8 22	651	30
35		CL	**CLAY WITH SAND** ; CL; 2.5Y 4/1 dark gray; low plasticity; moist; 15% silty fine grained sand; micaceous	☒	1140 SVE-2@ 35-35.5'	1.5	4 5 6	248	35
40			Borehole terminated at 35.5 feet.						40
45									45

Well Construction



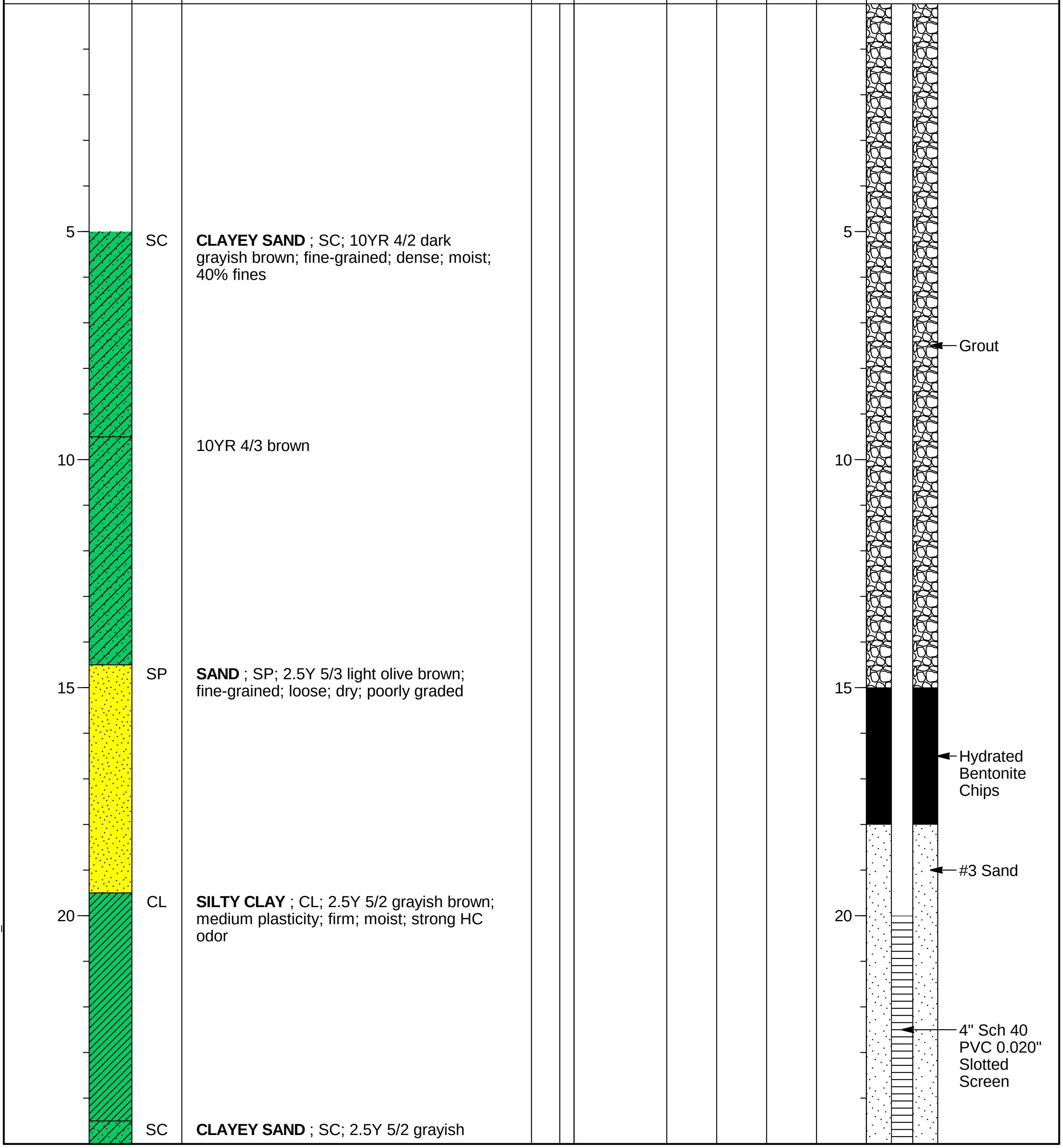
PROJECT: **I-10 at Tippecanoe**
LOCATION: **M&M Smog**
PROJECT NUMBER:

WELL / PROBEHOLE / BOREHOLE IDENTIFICATION: **SVE-3**
PAGE 1 OF 2

DRILLING: STARTED: **12/28/11** COMPLETED: **12/28/11**
INSTALLATION: STARTED: **12/28/11** COMPLETED: **12/28/11**
DRILLING COMPANY: **CalPac**
DRILLING EQUIPMENT: **B-61**
DRILLING METHOD: **HSA**
SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft):
EASTING (ft):
LAT:
LONG:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
WELL DEPTH (ft): **35**
STATIC DTW (ft): **Not Encountered**
BOREHOLE DEPTH (ft): **35.5**
WELL CASING DIA. (in): **4**
BOREHOLE DIA. (in): **10**
LOGGED BY: **ME**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Well Construction
5		SC	**CLAYEY SAND** ; SC; 10YR 4/2 dark grayish brown; fine-grained; dense; moist; 40% fines						5	
10			10YR 4/3 brown						10	
15		SP	**SAND** ; SP; 2.5Y 5/3 light olive brown; fine-grained; loose; dry; poorly graded						15	
20		CL	**SILTY CLAY** ; CL; 2.5Y 5/2 grayish brown; medium plasticity; firm; moist; strong HC odor						20	
		SC	**CLAYEY SAND** ; SC; 2.5Y 5/2 grayish							



PROJECT: **I-10 at Tippecanoe**
LOCATION: **M&M Smog**
PROJECT NUMBER:

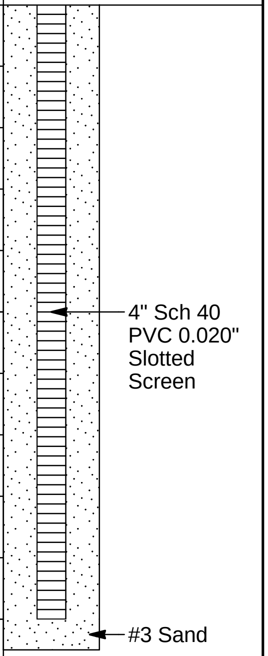
WELL / PROBEHOLE / BOREHOLE IDENTIFICATION: **SVE-3**
PAGE 2 OF 2

DRILLING: STARTED: **12/28/11** COMPLETED: **12/28/11**
INSTALLATION: STARTED: **12/28/11** COMPLETED: **12/28/11**
DRILLING COMPANY: **CalPac**
DRILLING EQUIPMENT: **B-61**
DRILLING METHOD: **HSA**
SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft):
EASTING (ft):
LAT:
LONG:
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
WELL DEPTH (ft): **35**
STATIC DTW (ft): **Not Encountered**
BOREHOLE DEPTH (ft): **35.5**
WELL CASING DIA. (in): **4**
BOREHOLE DIA. (in): **10**
LOGGED BY: **ME**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			brown; fine-grained; dense; moist; 30% fines						
30		SM	**SILTY SAND** ; SM; 2.5Y 4/1 dark gray; fine to medium-grained; firm; moist; 40% fines; strong old HC odor	☒	0810 SVE-3@ 30-30.5'	1.5	9 15 30	1350	30
35		CL	**CLAY** ; CL; 10YR 5/2 grayish brown; high plasticity; firm; moist; trace silt	☒	0820 SVE-3@ 35-35.5'	1.5	8 8 12	5.0	35
			Borehole terminated at 35.5 feet.						
40									40
45									45

Well Construction



PROJECT: **M&M Smog**
LOCATION: **Tippecanoe and Laurelwood, San Bernardino CA**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
VW-4 PAGE 1 OF 2

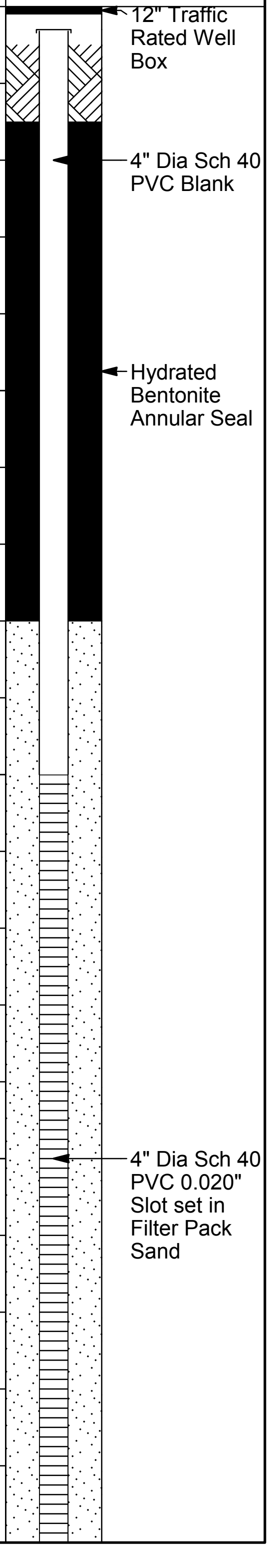
DRILLING:	STARTED **11/15/13**	COMPLETED: **11/15/13**	
INSTALLATION:	STARTED	COMPLETED:	

DRILLING COMPANY: **ABC Liovin**
DRILLING EQUIPMENT: **R-3**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING EQUIPMENT: **NA**

NORTHING (ft):	EASTING (ft):
LATITUDE:	LONGITUDE:
GROUND ELEV (ft):	TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered**	BOREHOLE DEPTH (ft): **30.5**
STATIC DTW (ft): **Not Encountered**	WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **4**	BOREHOLE DIAMETER (in): **10**
LOGGED BY: **HR**	CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			6" Concrete						
		SM	**SILTY SAND** ; SM; 10YR 3/4 dark yellowish brown; moist; no odor; 20-30% fines; light density	⧗			3 4 6		
5									5
		ML	**SANDY SILT** ; ML; 10YR 5/6 yellowish brown; moist; slight HC odor; 50% fine to medium grained sand; medium density	⧗			4 6 8		
10		SP	**POORLY GRADED SAND** ; SP; 10YR 6/3 pale brown; fine-grained; strong HC odor						10
				⧗			4 5 6		
15		ML	**SILT** ; ML; 10YR 5/4 yellowish brown; moist; slight HC odor; 5-10% fine grained sand						15
		SM	**SILTY SAND** ; SM; 10YR 4/3 dark yellowish brown; moist; strong HC odor; 40-50% fines	⧗			4 7 9		

Well Construction



PROJECT: **M&M Smog**
LOCATION: **Tippecanoe and Laurelwood, San Bernardino CA**
PROJECT NUMBER: **185802437**

WELL / PROBEHOLE / BOREHOLE NO:
VW-4 PAGE 2 OF 2

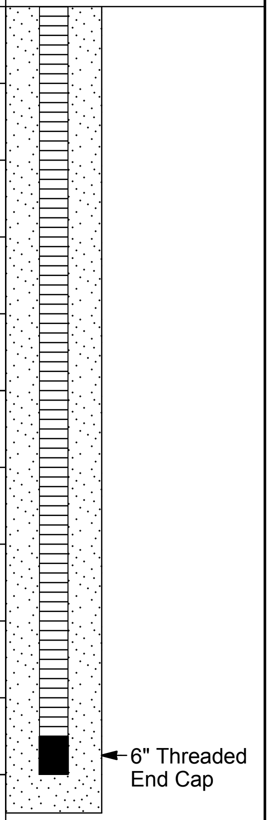
DRILLING: STARTED **11/15/13** COMPLETED: **11/15/13**
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: **ABC Liovin**
DRILLING EQUIPMENT: **R-3**
DRILLING METHOD: **Hollow Stem Auger**
SAMPLING EQUIPMENT: **NA**

NORTHING (ft):
LATITUDE:
GROUND ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
STATIC DTW (ft): **Not Encountered**
WELL CASING DIAMETER (in): **4**
LOGGED BY: **HR**

EASTING (ft):
LONGITUDE:
TOC ELEV (ft):
BOREHOLE DEPTH (ft): **30.5**
WELL DEPTH (ft): **---**
BOREHOLE DIAMETER (in): **10**
CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
		SM							
25			**...SAME AS ABOVE** ; 2.5Y 4/2 dark grayish brown	⧗			6 8 9		25
30			**...SAME AS ABOVE**	⧗			8 9 12		30
			Borehole terminated at 30.5 feet.						
35									35

Well Construction



APPENDIX C2.7

Equilon Enterprises / Shell
GeoTracker Case I.D. T0607100504

PROJECT NAME: **FORMER SHELL SERVICE STATION**		SITE LOCATION: **1973 TIPPECANOE AVENUE, SAN BERNARDINO, CALIFORNIA**	
DRILLING COMPANY: **BC2**	DRILL RIG: **CME-75**	DRILL CREW: **JUAN, DANIEL, ROBERT**	DATE DRILLED: **MAY 13, 2005**
DRILLING METHOD: **HOLLOW-STEM AUGER**	BORING DIAMETER (IN): **8**	TOTAL DEPTH OF BORING (FT): **41.0**	LOGGED BY: **TY TA**
SAMPLING METHOD: **SPLIT-SPOON**	HAMMER WEIGHT (LBS): **140**	HAMMER DROP (IN): **18**	REVIEWED BY: **K. ANDREWS**

DEPTH (FT)	SAMPLE LOCATION	SAMPLE ID	BLOWS PER 6 IN	PID (ppm)	GRAPHIC LOG	GW LEVEL	USCS SOIL GROUP	DESCRIPTION OF SUBSURFACE MATERIALS
0							SM	Concrete surface. SILTY SAND: olive brown (2.5Y 4/4); fine- to medium-grained; some silt; trace fine gravel; moist; dense; trace mica.
5	☐ ■	CB-1-d5.5	15/23/30	12.6				
10	☐ ■	CB-1-d10.5	8/11/17	30				Light olive brown (2.5Y 5/4); medium dense.
							CL	LEAN CLAY: brown (7.5YR 4/3); medium plasticity; low dry strength; no dilatancy; low toughness; moist; hard.
15	☐ ■	CB-1-d15.5	11/13/15	31				
							SP	POORLY GRADED SAND: olive gray (5Y 5/2); fine-grained; moist; medium dense.
20	☐ ■	CB-1-d20.5	9/13/17	181				
							SM	SILTY SAND: olive gray (5Y 5/2); fine-grained; moist; medium dense; some silt.
25	☐ ■	CB-1-d25.5	8/11/14	140				
							SW	WELL GRADED SAND with GRAVEL: dark gray (5Y 4/1); little fine gravel; moist; very dense.
30	☐ ■	CB-1-d30.5	12/28/50	36				
							CL	LEAN CLAY: brown (7.5YR 4/3); medium plasticity; low dry strength; no dilatancy; low toughness; moist; hard.
35	☐ ■	CB-1-d35.5	8/13/19	18				
							SM	SILTY SAND: light olive brown (2.5Y 5/4); fine-grained; wet; medium dense; trace mica.
40	☐ ■	CB-1-d40	10/16/24	17		∇		
								Boring terminated at 41 feet below ground surface. Groundwater observed at 40 feet below ground surface.

NOTES:

☐ = sample interval	∇ = groundwater first encountered	NM = not measured
☒ = no sample recovery	▼ = static groundwater	NA = not applicable
■ = laboratory sample	PID = photoionization detector	NR = not recorded
		ppm = parts per million

Kathleen M. Andrews

Kathleen M. Andrews, PG 6086, CHG 449

MILLER BROOKS
Environmental, Inc.

LOG OF BORING CB-1

PROJECT NUMBER 01-155-0003-09

PROJECT NAME: **FORMER SHELL SERVICE STATION**	SITE LOCATION: **1973 TIPPECANOE AVENUE, SAN BERNARDINO, CALIFORNIA**		
DRILLING COMPANY: **BC2**	DRILL RIG: **CME-75**	DRILL CREW: **JUAN, DANIEL, ROBERT**	DATE DRILLED: **MAY 13, 2005**
DRILLING METHOD: **HOLLOW-STEM AUGER**	BORING DIAMETER (IN): **8**	TOTAL DEPTH OF BORING (FT): **40.0**	LOGGED BY: **TY TA**
SAMPLING METHOD: **SPLIT-SPOON**	HAMMER WEIGHT (LBS): **140**	HAMMER DROP (IN): **18**	REVIEWED BY: **K. ANDREWS**

DEPTH (FT)	SAMPLE LOCATION	SAMPLE ID	BLOWS PER 6 IN	PID (ppm)	GRAPHIC LOG	GW LEVEL	USCS SOIL GROUP	DESCRIPTION OF SUBSURFACE MATERIALS
0							SM	Concrete surface. SILTY SAND: olive brown (2.5Y 4/4); fine-grained; moist; medium dense; some silt.
5	☐ ■	CB-2-d5.5	5/6/8	24				
10	☐ ■	CB-2-d10.5	6/8/12	30				
					▨		CL	LEAN CLAY: brown (7.5YR 4/3); medium plasticity; low dry strength; no dilatancy; low toughness; moist; firm.
15	☐ ■	CB-2-d15.5	7/9/11	29	▨			
							SP	POORLY GRADED SAND: brown (7.5YR 4/3); fine-grained; moist; medium dense.
20	☐ ■	CB-2-d20.5	6/8/9	250				
							SM	SILTY SAND: olive brown (2.5Y 4/4); fine-grained; moist; medium dense.
25	☐ ■	CB-2-d25.5	5/7/10	221				
							SW	WELL GRADED SAND with GRAVEL: olive brown (2.5Y 4/4); fine gravel; moist; dense.
30	☐ ■	CB-2-d30.5	17/26/40	50				
					▨		CL	LEAN CLAY: brown (7.5YR 4/3); medium plasticity; low dry strength; no dilatancy; low toughness; moist; firm.
35	☐ ■	CB-2-d35.5	6/9/13	26	▨			
							SP	POORLY GRADED SAND: olive brown (2.5YR 4/4); fine-grained; medium dense; trace mica.
40	☐ ■	CB-2-d40	8/12/17	11		▽		
								Boring terminated at 40 feet below ground surface. Groundwater observed at 40 feet below ground surface.

NOTES:

☐ = sample interval	▽ = groundwater first encountered	NM = not measured
☒ = no sample recovery	▼ = static groundwater	NA = not applicable
■ = laboratory sample	PID = photoionization detector	NR = not recorded
		ppm = parts per million

Kathleen M. Andrews

Kathleen M. Andrews, PG 6086, CHG 449

MILLER BROOKS Environmental, Inc.

LOG OF BORING CB-2

PROJECT NUMBER 01-155-0003-09

PROJECT NAME: FORMER SHELL SERVICE STATION	SITE LOCATION: 1973 TIPPECANOE AVENUE, SAN BERNARDINO, CALIFORNIA		
DRILLING COMPANY: BC2	DRILL RIG: CME-75	DRILL CREW: JUAN, DANIEL, ROBERT	DATE DRILLED: MAY 13, 2005
DRILLING METHOD: HOLLOW-STEM AUGER	BORING DIAMETER (IN): 8	TOTAL DEPTH OF BORING (FT): 40.0	LOGGED BY: TY TA
SAMPLING METHOD: SPLIT-SPOON	HAMMER WEIGHT (LBS): 140	HAMMER DROP (IN): 18	REVIEWED BY: K. ANDREWS

DEPTH (FT)	SAMPLE ID	BLOWS PER 6 IN	PID (ppm)	GW LEVEL	USCS SOIL GROUP	DESCRIPTION OF SUBSURFACE MATERIALS
0					SM	Concrete surface. SILTY SAND: olive brown (2.5Y 4/4); fine- to medium-grained; moist; medium dense; some silt.
5	CB-3-d5.5	4/5/17	45			
10	CB-3-d10.5	5/6/7	31			Fine-grained.
					CL	LEAN CLAY: brown (7.5YR 4/3); medium plasticity; low dry strength; no dilatancy; low toughness; moist; firm.
15	CB-3-d15.5	5/7/10	65			
					SP	POORLY GRADED SAND: olive gray (5Y 5/2); fine-grained; moist; medium dense.
20	CB-3-d20.5	7/9/12	68			
					SM	SILTY SAND: dark gray (5Y 4/1); fine-grained; moist; medium dense; trace mica; some silt.
25	CB-3-d25.5	6/9/11	41			
					SW	WELL GRADED SAND with GRAVEL: dark gray (5Y 4/1); little fine gravel; moist; medium dense.
30	CB-3-d30.5	13/17/27	52			
					CL	LEAN CLAY: brown (7.5YR 4/3); medium plasticity; low dry strength; no dilatancy; low toughness; moist; hard.
35	CB-3-d35.5	8/11/14	25			
					SP	POORLY GRADED SAND: olive brown (2.5YR 4/4); fine-grained; medium dense; trace mica.
40	CB-3-d40	7/10/14	18	∇		
						Boring terminated at 40 feet below ground surface. Groundwater observed at 40 feet below ground surface.

NOTES:

☐ = sample interval
☒ = no sample recovery
▬ = laboratory sample
∇ = groundwater first encountered
▼ = static groundwater
PID = photoionization detector
NM = not measured
NA = not applicable
NR = not recorded
ppm = parts per million

Kathleen M. Andrews

Kathleen M. Andrews, PG 6086, CHG 449

MILLER BROOKS Environmental, Inc.

LOG OF BORING CB-3

PROJECT NUMBER 01-155-0003-09

PAGE 1 OF 1

PROJECT NAME: FORMER SHELL SERVICE STATION	SITE LOCATION: 1973 TIPPECANOE AVENUE, SAN BERNARDINO, CALIFORNIA		
DRILLING COMPANY: BC2	DRILL RIG: CME-75	DRILL CREW: JUAN, DANIEL, ROBERT	DATE DRILLED: MAY 13, 2005
DRILLING METHOD: HOLLOW-STEM AUGER	BORING DIAMETER (IN): 8	TOTAL DEPTH OF BORING (FT): 41.5	LOGGED BY: TY TA
SAMPLING METHOD: SPLIT-SPOON	HAMMER WEIGHT (LBS): 140	HAMMER DROP (IN): 18	REVIEWED BY: K. ANDREWS

DEPTH (FT)	SAMPLE LOCATION	SAMPLE ID	BLOWS PER 6 IN	PID (ppm)	GRAPHIC LOG	GW LEVEL	USCS SOIL GROUP	DESCRIPTION OF SUBSURFACE MATERIALS
0							SM	Concrete surface. SILTY SAND: dark brown (7.5YR 3/2); fine-grained; moist; loose; some silt; trace mica.
5	■	CB-4-d5.5	4/6/8	21				
							SW	WELL GRADED SAND with GRAVEL: yellowish brown (10YR 5/4); little fine gravel; moist; medium dense.
10	■	CB-4-d10.5	9/11/15	25				
15	■	CB-4-d15.5	11/16/20	30				
20	■	CB-4-d20.5	12/16/23	51				
							SM	SILTY SAND: very dark gray (10YR 3/1); fine-grained; moist; dense; trace mica.
25	■	CB-4-d25.5	20/30/38	50				
30	■	CB-4-d30.5	16/23/30	17				
							SW	WELL GRADED SAND with GRAVEL: dark gray (10YR 4/1); fine gravel; moist; dense.
35	■	CB-4-d35.5	19/26/35	13				
40	■	CB-4-d40.5	15/19/25	15		∇		Medium dense.

Boring terminated at 41.5 feet below ground surface.
Groundwater observed at 40 feet below ground surface.

NOTES:

□ = sample interval
☒ = no sample recovery
■ = laboratory sample
∇ = groundwater first encountered
▼ = static groundwater
PID = photoionization detector
NM = not measured
NA = not applicable
NR = not recorded
ppm = parts per million

Kathleen M. Andrews

Kathleen M. Andrews, PG 6086, CHG 449

MILLER BROOKS
Environmental, Inc.

LOG OF BORING CB-4

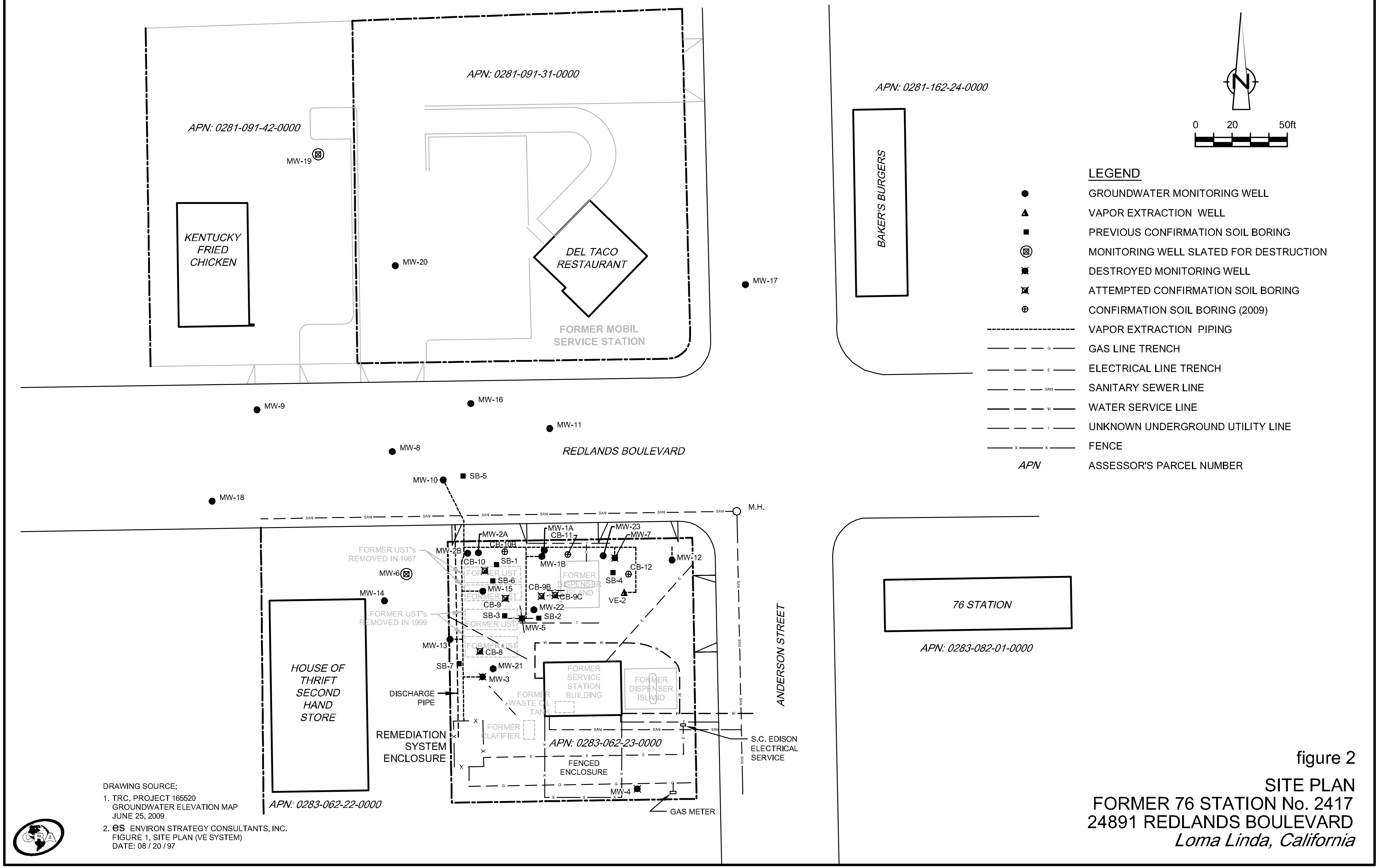
PROJECT NUMBER 01-155-0003-09

PAGE 1 OF 1

LOG OF BORINGS REVISED BORELBL09.GPJ MBE.GDT 5/27/05

APPENDIX C2.8

Unocal #2417
GeoTracker Case I.D. T0607100008



DRAWING SOURCE;
1. TRC, PROJECT 165520
GROUNDWATER ELEVATION MAP
JUNE 25, 2009
2. es ENVIRON STRATEGY CONSULTANTS, INC.
FIGURE 1, SITE PLAN (VE SYSTEM)
DATE: 08 / 20 / 97

figure 2

SITE PLAN
FORMER 76 STATION No. 2417
24891 REDLANDS BOULEVARD
Loma Linda, California

53972-95(007)GN-WA001 MAR 15/2010

Conestoa-Rovers & Associates, Inc.
175 Technology Dr. Suite 150
Irvine, CA 92618
Telephone: 949-648-5200
Fax: 949-648-5299

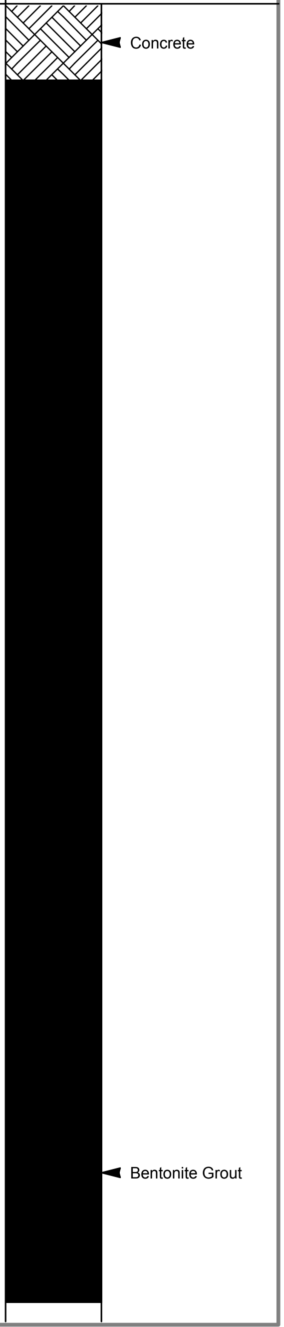
BORING / WELL LOG

CLIENT NAME	ConocoPhillips	**BORING/WELL NAME**	CB-10B
JOB/SITE NAME	Former 76 Station No. 2417	**DRILLING STARTED**	03-Dec-09
LOCATION	24891 Redlands Blvd. Loma Linda, California	**DRILLING COMPLETED**	09-Dec-09
PROJECT NUMBER	053972	**WELL DEVELOPMENT DATE (YIELD)**	NA
DRILLER	ABC Liovin Drilling	**GROUND SURFACE ELEVATION**	1063.00 ft above msl
DRILLING METHOD	Hollow-stem auger	**TOP OF CASING ELEVATION**	NA
BORING DIAMETER	8 Inch	**SCREENED INTERVALS**	NA
LOGGED BY	Tara Morton-Bernas	**DEPTH TO WATER (First Encountered)**	54.00 fbg ∇
REVIEWED BY	Jim Schneider PG 7914	**DEPTH TO WATER (Static)**	NA ▼

REMARKS Cleared to 8 fbg with air-knife assisted vacuum.

PID (ppm)	BLOW COUNTS	SAMPLE ID	DEPTH (fbg)	U.S.C.S.	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)
					Asphalt	0.3
			5	SP	ALLUVIUM: SAND - poorly graded, brown, moist; little gravel; little to no fines	
0	6 7 8	CB-10 -10.5-120809	10		@ 10': olive brown, trace silt	10.5
				ML	SILT with sand - olive brown, moist, stiff	
24.4	10 20 23	CB-10 -15.5-120809	15		@ 15': SILT - reddish-brown, moist, hard; few clay	
						18.0
38.3	15 18 22	CB-10 -20.5-120809	20	SP	SAND - poorly graded, brown, moist, medium dense; trace silt; fine sand	
						23.0
48.8	14 16 18	CB-10 -25.5-120809	25	ML	SILT - brown, moist, hard; little to some fine sand	
						28.0
7.4	17 18 25	CB-10 -30.5-120809	30		SAND - poorly graded, grey, moist, medium dense; fine to coarse sand	
	13		35			

WELL DIAGRAM



Continued Next Page

Conestoa-Rovers & Associates, Inc.
175 Technology Dr. Suite 150
Irvine, CA 92618
Telephone: 949-648-5200
Fax: 949-648-5299

BORING / WELL LOG

CLIENT NAME	ConocoPhillips	**BORING/WELL NAME**	CB-10B
JOB/SITE NAME	Former 76 Station No. 2417	**DRILLING STARTED**	03-Dec-09
LOCATION	24891 Redlands Blvd. Loma Linda, California	**DRILLING COMPLETED**	09-Dec-09

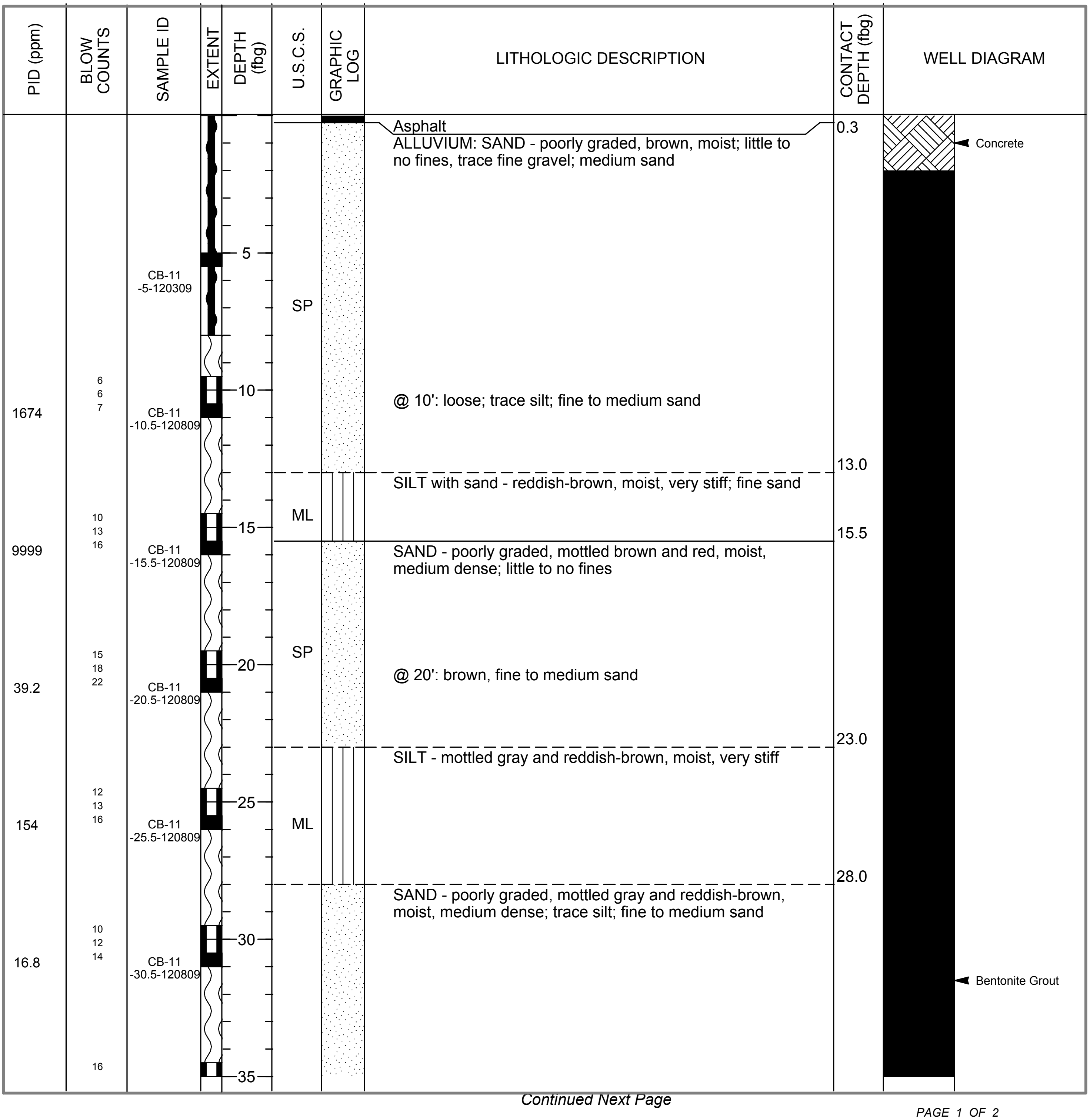
Continued from Previous Page

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
27.9	18 23	CB-10 -35.5-120809			SP		@ 35': mottled brown and olive gray; trace silt; fine sand		
8.9	15 18 22	CB-10 -40.5.5-120809		40			@ 40': brown		
35.9	4 20 14	CB-10 -45.5-120809		45			@ 45': mottled brown and olive gray		
52.2	10 12 14	CB-10 -50.5-120809		50			@ 50': trace silt		
							@ 54': brown, saturated; medium sand ∇		
41.2	16 18 20	CB-10 -55.5-120809		55					
54	13 14 15	CB-10 -60.5-120809		60			@ 60': dark brown; fine sand	61.0	Bottom of Boring @ 61 fbg

Conestoa-Rovers & Associates, Inc.
175 Technology Dr. Suite 150
Irvine, CA 92618
Telephone: 949-648-5200
Fax: 949-648-5299

BORING / WELL LOG

CLIENT NAME	ConocoPhillips	**BORING/WELL NAME**	CB-11
JOB/SITE NAME	Former 76 Station No. 2417	**DRILLING STARTED**	03-Dec-09
LOCATION	24891 Redlands Blvd. Loma Linda, California	**DRILLING COMPLETED**	08-Dec-09
PROJECT NUMBER	053972	**WELL DEVELOPMENT DATE (YIELD)**	NA
DRILLER	ABC Liovin Drilling	**GROUND SURFACE ELEVATION**	1063.00 ft above msl
DRILLING METHOD	Hollow-stem auger	**TOP OF CASING ELEVATION**	NA
BORING DIAMETER	8 Inch	**SCREENED INTERVALS**	NA
LOGGED BY	Tara Morton-Bernas	**DEPTH TO WATER (First Encountered)**	NA ▽
REVIEWED BY	Jim Schneider PG 7914	**DEPTH TO WATER (Static)**	NA ▼
REMARKS	Cleared to 8 fbg with air-knife assisted vacuum.		



PID (ppm)	BLOW COUNTS	SAMPLE ID	DEPTH (fbg)
		CB-11 -5-120309	5
1674	6 6 7	CB-11 -10.5-120809	10
9999	10 13 16	CB-11 -15.5-120809	15
39.2	15 18 22	CB-11 -20.5-120809	20
154	12 13 16	CB-11 -25.5-120809	25
16.8	10 12 14	CB-11 -30.5-120809	30
	16		35

U.S.C.S.	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)
	Asphalt	0.3
SP	ALLUVIUM: SAND - poorly graded, brown, moist; little to no fines, trace fine gravel; medium sand @ 10': loose; trace silt; fine to medium sand	13.0
ML	SILT with sand - reddish-brown, moist, very stiff; fine sand	15.5
SP	SAND - poorly graded, mottled brown and red, moist, medium dense; little to no fines @ 20': brown, fine to medium sand	23.0
ML	SILT - mottled gray and reddish-brown, moist, very stiff	28.0
	SAND - poorly graded, mottled gray and reddish-brown, moist, medium dense; trace silt; fine to medium sand	

Continued Next Page

BORING / WELL LOG

CLIENT NAME	ConocoPhillips	**BORING/WELL NAME**	CB-11
JOB/SITE NAME	Former 76 Station No. 2417	**DRILLING STARTED**	03-Dec-09
LOCATION	24891 Redlands Blvd. Loma Linda, California	**DRILLING COMPLETED**	08-Dec-09

Continued from Previous Page

PID (ppm)	BLOW COUNTS	SAMPLE ID	DEPTH (fbg)	U.S.C.S.	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
18.4	18 20	CB-11 -35.5-120809		SP	@ 35': dark brown		
17.5	13 14 15	CB-11 -40.5-120809	40				
23.4	6 6 12	CB-11 -45.5-120809	45		@ 45': mottled brown and black, loose, moist; fine sand; trace silt		
				ML	SILT with sand - mottled brown and black, moist, stiff; fine sand	48.0	
22.6	10 11 12	CB-11 -50.5-120809	50				
				SP	SAND - poorly graded, brown, moist, medium dense; fine sand	53.0	
18.4	11 13 13	CB-11 -55.5-120809	55				
17.7	12 13 14	CB-11 -60.5-120809	60			61.0	Bottom of Boring @ 61 fbg

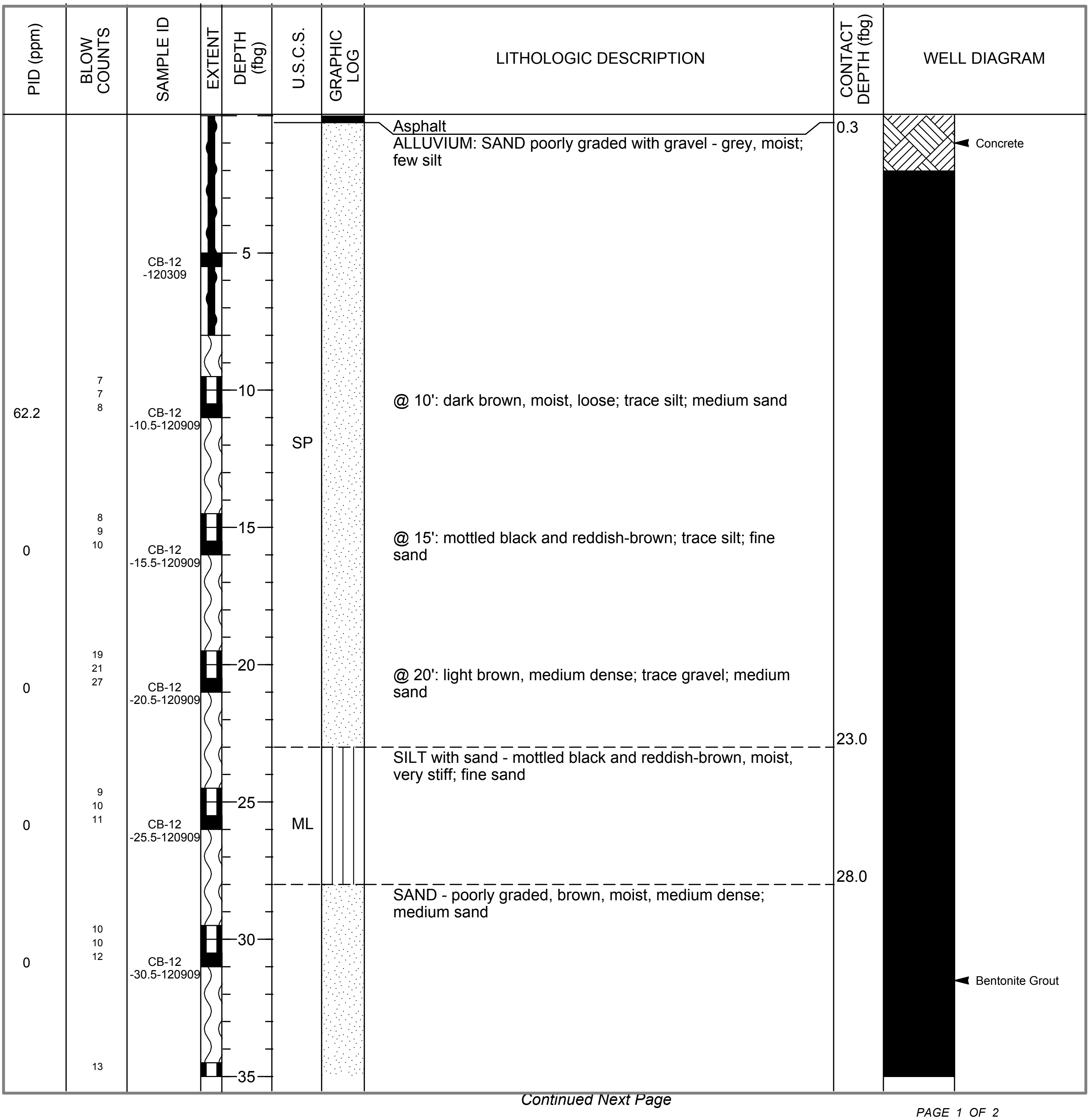
WELL LOG (PID) C:\DOCUME~1\CTOCZY~1\DESKTOP\GINTLO~1\053972\053972.GPJ DEFAULT.GDT 3/3/10

Conestoa-Rovers & Associates, Inc.
175 Technology Dr. Suite 150
Irvine, CA 92618
Telephone: 949-648-5200
Fax: 949-648-5299

BORING / WELL LOG

CLIENT NAME ConocoPhillips
JOB/SITE NAME Former 76 Station No. 2417
LOCATION 24891 Redlands Blvd. Loma Linda, California
PROJECT NUMBER 053972
DRILLER ABC Liovin Drilling
DRILLING METHOD Hollow-stem auger
BORING DIAMETER 8 Inch
LOGGED BY Tara Morton-Bernas
REVIEWED BY Jim Schneider PG 7914
REMARKS Cleared to 8 fbg with air-knife assisted vacuum.

BORING/WELL NAME CB-12
DRILLING STARTED 07-Dec-09
DRILLING COMPLETED 08-Dec-09
WELL DEVELOPMENT DATE (YIELD) NA
GROUND SURFACE ELEVATION 1062.50 ft above msl
TOP OF CASING ELEVATION NA
SCREENED INTERVALS NA
DEPTH TO WATER (First Encountered) NA ▽
DEPTH TO WATER (Static) NA ▼



PID (ppm)	BLOW COUNTS	SAMPLE ID	DEPTH (fbg)	U.S.C.S.	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
					Asphalt	0.3	Concrete
				SP	ALLUVIUM: SAND poorly graded with gravel - grey, moist; few silt		
		CB-12 -120309	5				
62.2	7 7 8	CB-12 -10.5-120909	10		@ 10': dark brown, moist, loose; trace silt; medium sand		
0	8 9 10	CB-12 -15.5-120909	15		@ 15': mottled black and reddish-brown; trace silt; fine sand		
0	19 21 27	CB-12 -20.5-120909	20		@ 20': light brown, medium dense; trace gravel; medium sand		
				ML	SILT with sand - mottled black and reddish-brown, moist, very stiff; fine sand	23.0	
0	9 10 11	CB-12 -25.5-120909	25				
					SAND - poorly graded, brown, moist, medium dense; medium sand	28.0	
0	10 10 12	CB-12 -30.5-120909	30				Bentonite Grout
	13		35				

Continued Next Page

Conestoa-Rovers & Associates, Inc.
175 Technology Dr. Suite 150
Irvine, CA 92618
Telephone: 949-648-5200
Fax: 949-648-5299

BORING / WELL LOG

CLIENT NAME	ConocoPhillips	**BORING/WELL NAME**	CB-12
JOB/SITE NAME	Former 76 Station No. 2417	**DRILLING STARTED**	07-Dec-09
LOCATION	24891 Redlands Blvd. Loma Linda, California	**DRILLING COMPLETED**	08-Dec-09

Continued from Previous Page

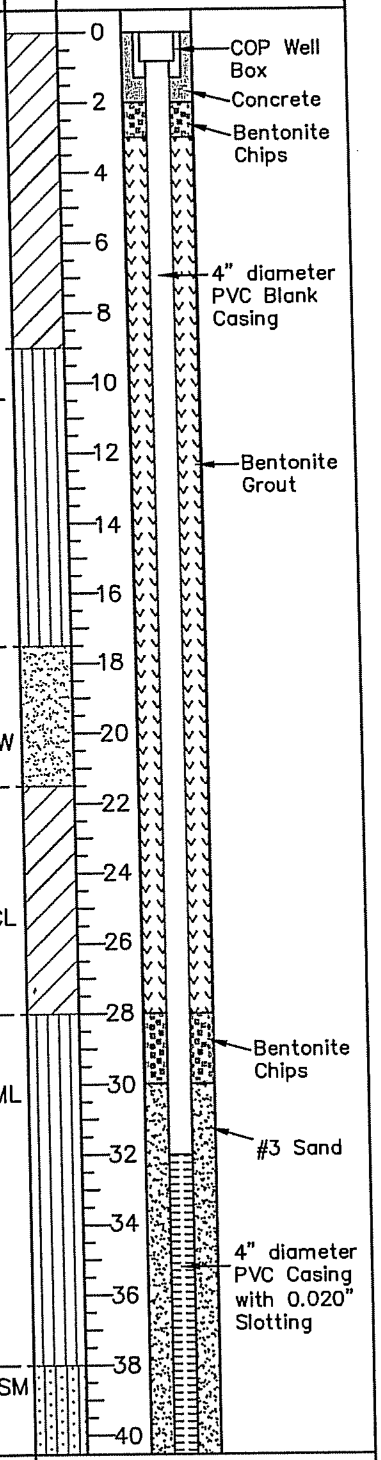
PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
0	15 18	CB-12 -35.5-120909			SP		@ 35': fine to medium sand; trace silt		
0	12 13 14	CB-12 -40.5-120909		40			@ 40': medium to coarse sand; some angular gravel @ 40.25': fine sand; few silt		
							SILT - mottled black and brown, moist, stiff; trace sand	43.0	
0	19 10 10	CB-12 -45.5-120909		45	ML				
0	18 19 21	CB-12 -50.5-120909		50					
							SAND - poorly graded, mottled black and brown, moist, medium dense; trace silt; fine to medium sand	53.0	
0	8 10 12	CB-12 -55.5-120909		55	SP				
0	17 19 21	CB-12 -60.5-120909		60				61.0	Bottom of Boring @ 61 fbg

PROJECT NO.: 150267.0000.0000
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

DATE DRILLED: May 16, 2007
LOGGED BY: E. Seikaly
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/ CME-85

DRILLING METHOD: 10" Hollow Stem Auger
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 53.5 feet DEPTH TO WATER: 49 feet

BLOWS PER 6 INCHES	PID (ppm)	DESCRIPTION	USCS
		Air knife and vacuum to 5 fbg. Surface material: 3" Asphalt, 3" Gravel.	
9/11/14	2.2	CLAY WITH SILT: dark grayish brown (10YR 4/2), stiff, moist.	CL
12/14/18	2.2	SILT WITH CLAY: brown (10YR 4/3), stiff, dry.	ML
8/14/19	33.4	Same as above; some sand.	
12/15/16	8.7	SAND: yellowish brown (10YR 5/4), medium dense, dry, fine- to medium-grained, well graded.	SW
11/16/19	51.4	SILTY CLAY: dark yellowish brown (10YR 3/4), very stiff, dry.	CL
10/12/18	4.6	SILT: light brown (7.5YR 6/4), very stiff, dry.	ML
12/16/19	3.3	Same as above; dark gray (7.5YR 4/1).	
			SM



LOG OF EXPLORATORY BORING

MW-21
PAGE 1 OF 2

PROJECT NO.: 150267.0000.0000
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

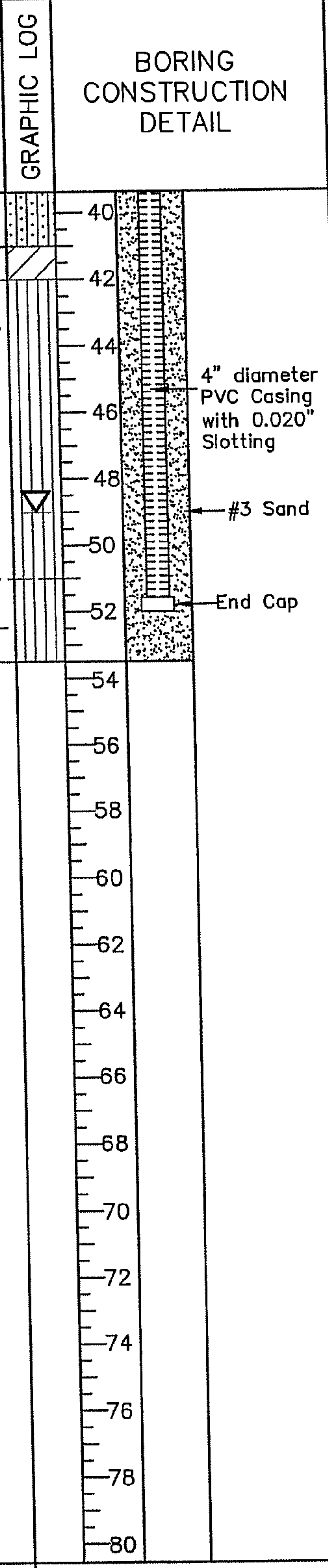
DATE DRILLED: May 16, 2007
LOGGED BY: E. Seikaly
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/ CME-85

DRILLING METHOD: 10" Hollow Stem Auger
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 53.5 feet DEPTH TO WATER: 49 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
17/25/35	3.3		40	SILTY SAND: dark gray (7.5YR 4/1), dense, moist, fine-grained sand, poorly graded.	SM
15/20/26	3.0		42	CLAY: grayish brown (10YR 5/2), hard, moist.	CL
13/28/33	10.7		43	CLAYEY SILT: dark yellowish brown (10YR 4/6), hard, moist.	ML
21/28/30	4.6		44	Same as above.	
15/18/25	3.0		52	SILT: grayish brown (10YR 5/2), very stiff, moist.	ML
			54	Bottom of Boring 53.5 fbg	

Aprroximate materials Used:

2.21 cu.ft. of Concrete
1.37 cu.ft. of Bentonite Chips
11.45 cu.ft. of Bentonite Grout
10 cu.ft. of #3 Sand



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LOG OF EXPLORATORY BORING

MW-21
PAGE 2 OF 2

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PROJECT NO.:	150267.0000.0000	DATE DRILLED:	May 16, 2007
LOCATION:	Former 76 Station 2417	LOGGED BY:	E. Seikaly
	24891 Redlands Boulevard	APPROVED BY:	J. Caruso, PG
	Loma Linda, California	DRILLING CO./RIG:	WDC/ CME-85

DRILLING METHOD: 10" Hollow Stem Auger

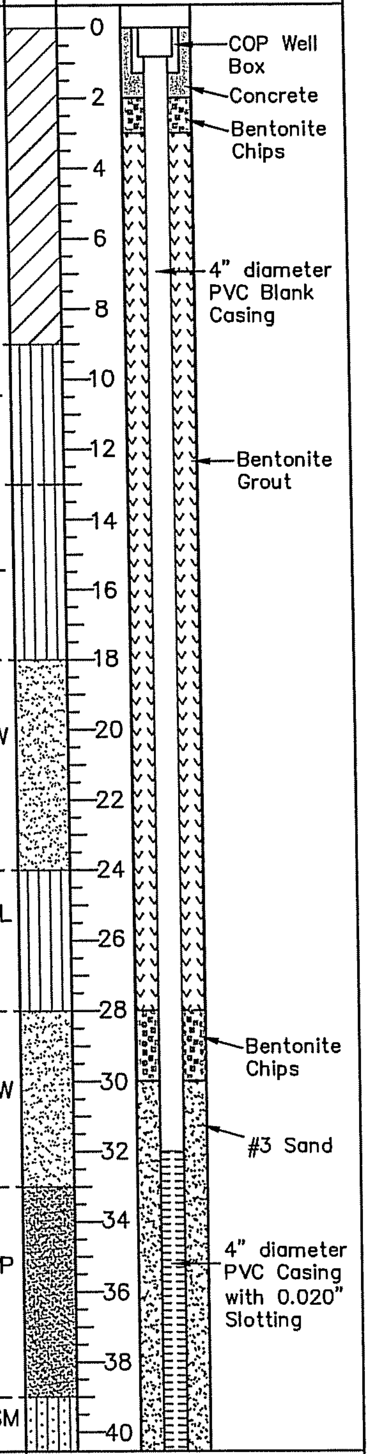
SAMPLER TYPE: CA Split Spoon Sampler

TOTAL DEPTH: 53.5 feet DEPTH TO WATER: 49 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Air knife and vacuum to 5 fbg. Surface material: 3" Asphalt.	
8/13/15	5.3		6	SILTY CLAY: dark yellowish brown (10YR 4/6), stiff, dry.	CL
10/15/18	8.2		10	SILT WITH CLAY: brown (10YR 4/3), stiff, dry, some sand.	ML
12/15/17	5.1		16	SANDY SILT: olive brown (2.5Y 4/4), very stiff, slightly moist, some gravel.	ML
35/ 50 for 6"	10.2		20	SAND WITH GRAVEL: light brown (2.5Y 3/4), very dense, slightly moist, medium- to coarse-grained sand, well graded.	SW
15/18/25	199		26	SANDY SILT: very dark gray (7.5YR 3/1), very stiff, slightly moist. [hydrocarbon odor and some staining]	ML
25/33/50	13.6		30	SAND: yellowish brown (10YR 5/4), dense, moist, fine- to coarse-grained sand, well graded, some silt.	SW
21/2/46	104		36	SAND: brown (10YR 4/3), dense, moist, fine-grained sand, poorly graded.	SP
			40		SM

GRAPHIC LOG

BORING CONSTRUCTION DETAIL



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LOG OF EXPLORATORY BORING

MW-22

PAGE 1 OF 2

PROJECT NO.: 150267.0000.0000
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

DATE DRILLED: May 16, 2007
LOGGED BY: E. Seikaly
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/ CME-85

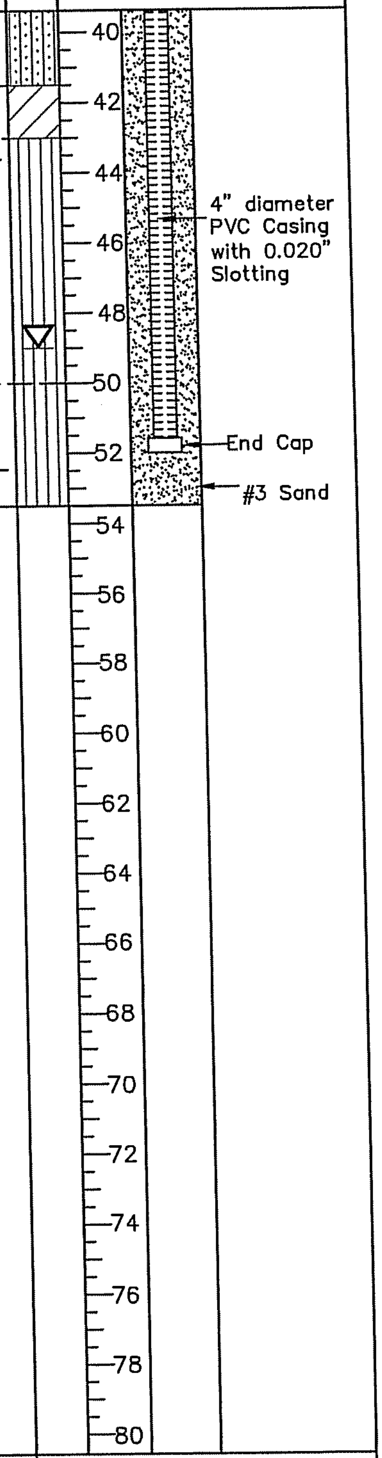
DRILLING METHOD: 10" Hollow Stem Auger
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 53.5 feet DEPTH TO WATER: 49 feet

BLOWS PER 6 INCHES	PID (ppm)	DEPTH (feet below grade)	DESCRIPTION	USCS
20/30/50	240	40	SILTY SAND: grayish brown (10YR 5/2), dense, dry, fine-grained sand, poorly graded.	SM
20/22/28	103	42	SILTY CLAY: dark yellowish brown (10YR 4/6), stiff, moist.	CL
10/27/33	137		CLAYEY SILT: yellowish brown (10YR 5/6), hard, moist.	ML
17/25/36	51.4	44	Same as above.	
		46		
		48		
		50		
16/18/23	374	52	SILT: grayish brown (10YR 5/2), very stiff, wet, some clay.	ML
		54	Bottom of Boring 53.5 fbg	

Aprroximate materials Used:

2.21 cu.ft. of Concrete
1.37 cu.ft. of Bentonite Chips
11.45 cu.ft. of Bentonite Grout
10 cu.ft. of #3 Sand

BORING CONSTRUCTION DETAIL



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LOG OF EXPLORATORY BORING

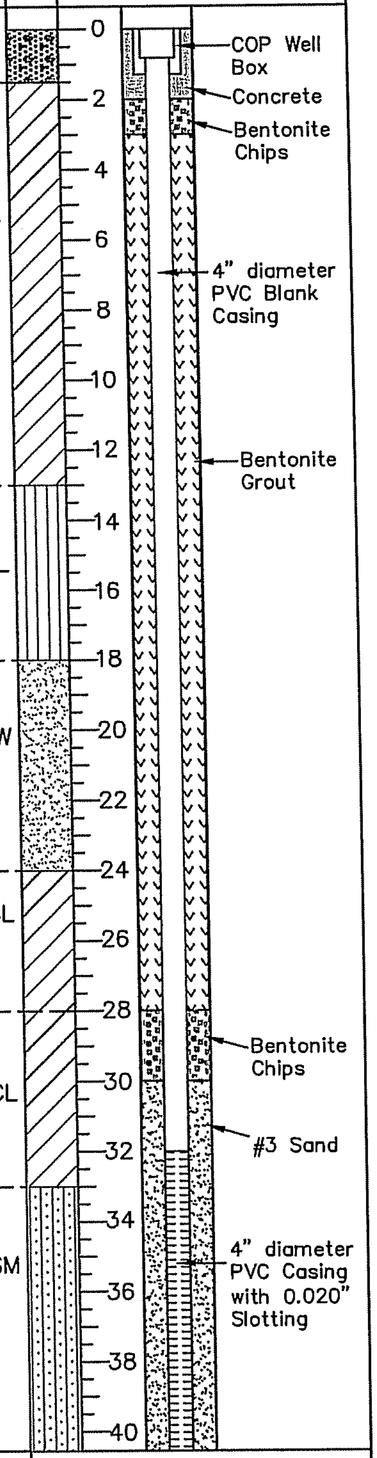
MW-22
PAGE 2 OF 2

PROJECT NO.: 150267.0000.0000
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

DATE DRILLED: May 16, 2007
LOGGED BY: E. Seikaly
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/ CME-85

DRILLING METHOD: 10" Hollow Stem Auger
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 53.5 feet DEPTH TO WATER: 49 feet

BLOWS PER 6 INCHES	PID (ppm)	DEPTH (feet below grade)	DESCRIPTION	USCS
		0	Air knife and vacuum to 5 fbg. Surface material: 3" Asphalt, 1.5' sand with gravel.	GP
7/10/25	2.4	6	CLAY WITH SILT: dark grayish brown (10YR 4/2), stiff, slightly moist.	CL
10/12/15	6.3	10	Same as above.	
13/15/21	31.2	16	SANDY SILT: olive brown (2.5Y 4/4), stiff, slightly moist.	ML
17/30	6.7	20	SAND WITH GRAVEL: light olive brown (2.5Y 5/4), dense, slightly moist, medium- to coarse-grained sand, well graded, trace silt.	SW
18/21/24	15.7	26	CLAY WITH SILT: dark grayish brown (10YR 4/2) very stiff, dry.	CL
11/16/19	6.6	30	SILTY CLAY: brown (7.5YR 4/3), stiff, dry.	CL
21/25/31	5.9	36	SILTY SAND: olive brown (2.5 4/4) dense, dry, fine-grained, poorly graded.	SM



TRC

LOG OF EXPLORATORY BORING

MW-23

PROJECT NO.: 150267.0000.0000
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

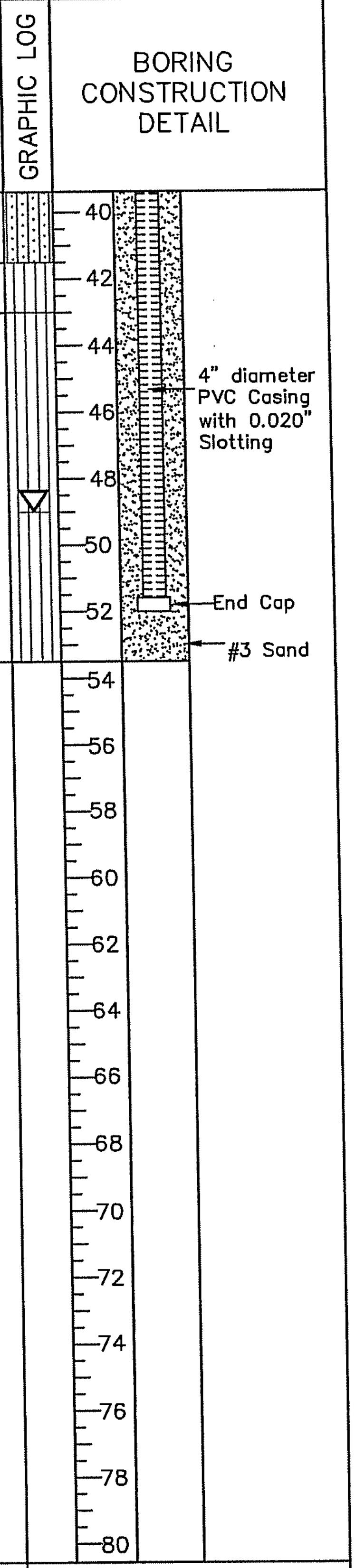
DATE DRILLED: May 16, 2007
LOGGED BY: E. Seikaly
APPROVED BY: J. Caruso, PG
DRILLING CO./RIG: WDC/ CME-85

DRILLING METHOD: 10" Hollow Stem Auger
SAMPLER TYPE: CA Split Spoon Sampler
TOTAL DEPTH: 53.5 feet DEPTH TO WATER: 49 feet

BLOWS PER 6 INCHES	PID (ppm)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
18/26/35	9.4		40	Same as above; moist.	SM
27/38/46	7.4		42	SANDY SILT: olive brown (2.5Y 4/4), hard, moist, some clay.	ML
35/39/43	6.7			CLAYEY SILT: olive brown (2.5Y 4/4), hard, moist.	ML
33/37/49	8.1		44	Same as above.	
			46		
			48		
			50		
28/35/37	11.1		52	Same as above; wet, some sand.	
			54	Bottom of Boring 53.5 fbg	

Aprroximate materials Used:

2.21 cu.ft. of Concrete
1.37 cu.ft. of Bentonite Chips
11.45 cu.ft. of Bentonite Grout
10 cu.ft. of #3 Sand



TRC

LOG OF EXPLORATORY BORING

MW-23
PAGE 2 OF 2

PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

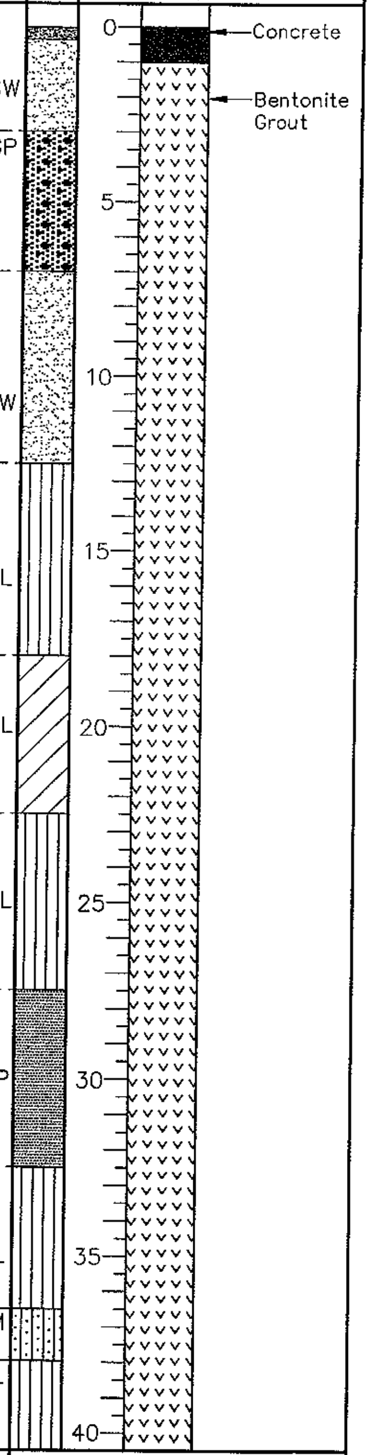
DATE DRILLED: June 7, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 41.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Air-Knifed to 5 feet. 4-inches of asphaltic concrete. FILL (SAND): dark yellowish brown (10YR 4/4), slightly moist, fine- to very coarse-grained, some fine gravel.	SW
				FILL (SANDY GRAVEL): dark yellowish brown (10YR 4/4), slightly moist, fine gravel.	GP
4/5/7		☒	5	No recovery.	
5/7/10	0.0		10	GRAVELLY SAND: very pale brown, medium dense, coarse-grained, well graded.	SW
5/7/8	3.9		15	SILT: brown, stiff, some sand, some clay.	ML
7/9/11	0.0		20	SILTY CLAY: dark brown, very stiff.	CL
9/10/12	5.1		25	CLAYEY SILT: dark brown, very stiff.	ML
10/12/13	0.0		30	SAND: grayish brown, medium dense, medium-grained, poorly graded.	SP
12/13/15	4.7		35	SILT: dark gray, very stiff, moist.	ML
12/12/14	1.7			SILTY SAND: dark brown, medium dense, fine-grained, poolry gradaed	SM
15/17/23	0.0			CLAYEY SILT: dark brown, hard, moist.	ML
			40		

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-1

PAGE 1 OF 2

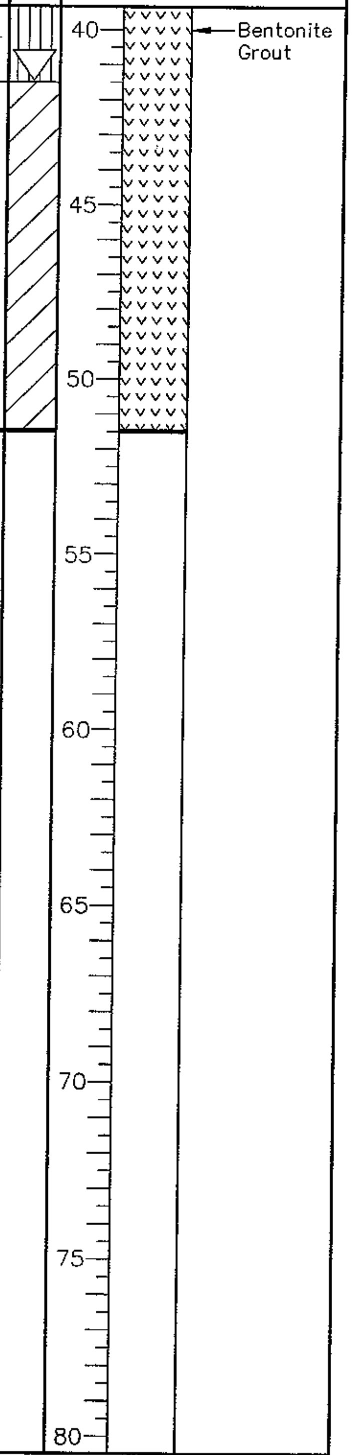
PROJECT NO.: 60-0626	DATE DRILLED: June 7, 2005
LOCATION: Former 76 Station 2417 24891 Redlands Boulevard Loma Linda, California	LOGGED BY: A. Helekar, PE
	APPROVED BY: A. Helekar, PE
	DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 41.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
15/19/21	0.0		40	Dark grayish brown, wet, no clay, some sand.	ML
14/15/20	0.0			CLAY: very dark grayish brown, hard, slightly moist.	CL
16/18/19	0.0		45	Brown.	
17/19/20	0.0		50	Slightly moist, some silt.	
				Bottom of boring at 51.5 feet below grade.	
			55		
			60		
			65		
			70		
			75		
			80		

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



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LOG OF EXPLORATORY BORING

SB-1

PROJECT NO.: 60-0626	DATE DRILLED: June 8, 2005
LOCATION: Former 76 Station 2417 24891 Redlands Boulevard Loma Linda, California	LOGGED BY: A. Helekar, PE
	APPROVED BY: A. Helekar, PE
	DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger

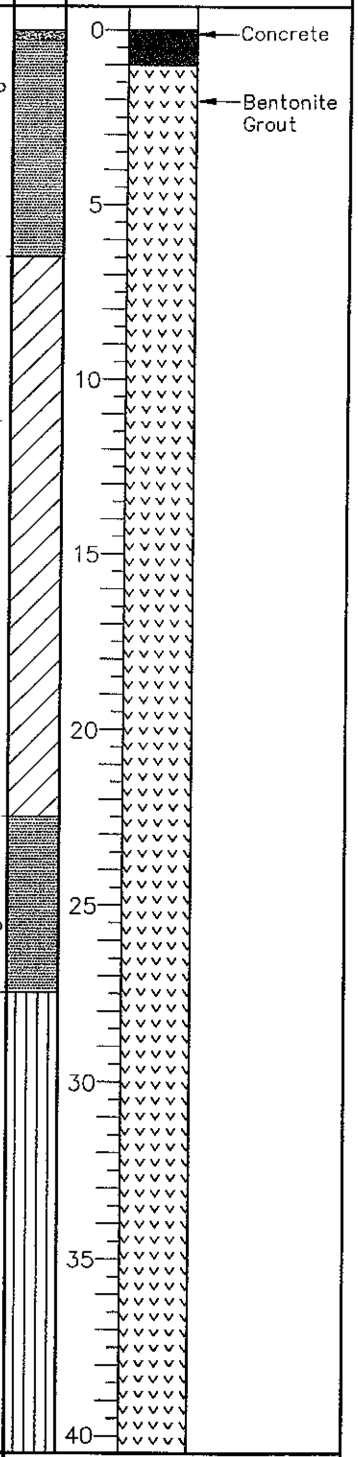
SAMPLER TYPE: California Modified Split Spoon

TOTAL DEPTH: 50 feet DEPTH TO WATER: 41 feet

BLOWS PER 6 INCHES	PID (ppmv)	DEPTH (feet below grade)	DESCRIPTION	USCS
		0	Air-Knifed to 9 feet. 3-inches of asphaltic concrete. SAND: olive brown (2.5Y 4/3), slightly moist, very fine- to fine-grained, slightly micaceous, trace silt.	SP
		5		
4/6/7	0.0	10	SILTY CLAY: dark yellowish brown, stiff.	CL
6/7/9	5.4	15	Very stiff.	
7/10/11	23.0	20		
30/50 for 6–inches	8.7	25	SAND: brownish yellow, very dense, fine-grained, medium-grained.	SP
10/11/13	21.6	30	CLAYEY SILT: dark yellowish brown, very stiff.	ML
11/13/15	43.5	35		
14/16/18	4.0		SILT: dark yellowish brown, hard, moist, with sand.	
15/17/ 19/22	1.8		SANDY SILT: dark yellowish brown, hard, moist.	
		40		

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-2

PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

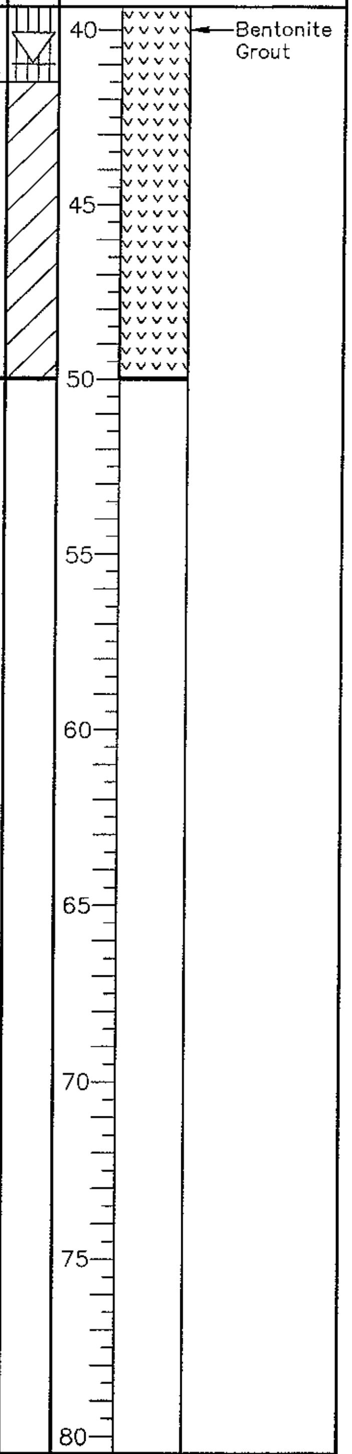
DATE DRILLED: June 8, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 50 feet DEPTH TO WATER: 41 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
17/19/23	1.7		40	CLAYEY SILT: wet.	ML
18/20/24	6.7			SANDY CLAY: dark yellowish brown, hard, moist.	CL
50 for 6-inches	0.0			SILTY CLAY: dark yellowish brown, slightly moist.	
			45		
			50	No recovery.	
				Bottom of boring at 50 feet below grade.	
			55		
			60		
			65		
			70		
			75		
			80		

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



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LOG OF EXPLORATORY BORING

SB-2

PAGE 2 OF 2

L:\Graphics\ProjectsByNumber\60-xxxx\60-0626\Boring Logs\60-626 Log SB-2.DWG Jun 17, 2005 - 8:22am lwinters

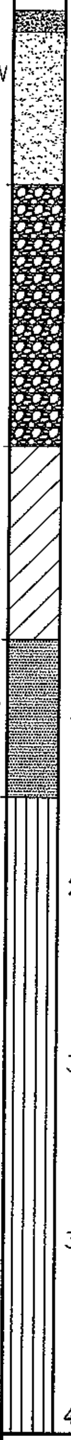
PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

DATE DRILLED: June 8, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

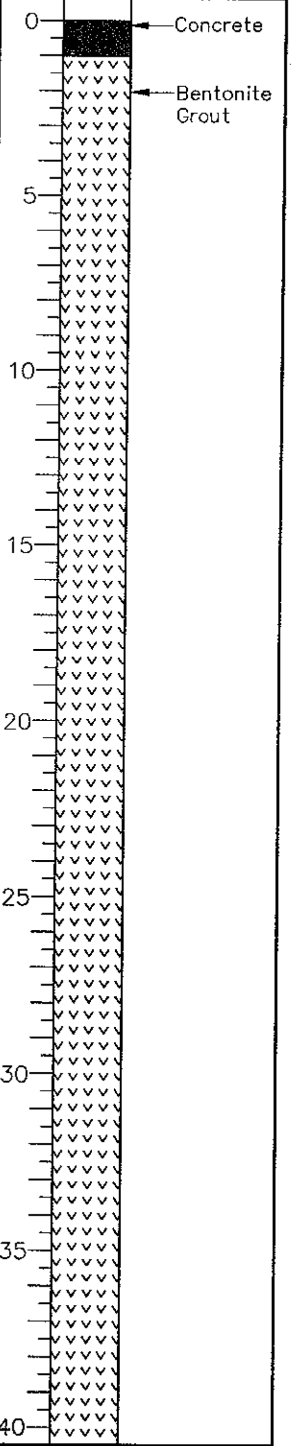
DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 41.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Air-Knifed to 5 feet. 7-inches of asphaltic concrete. SAND: yellowish brown (10YR 5/4), slightly moist, fine- to coarse-grained, some fine gravel.	SW
			5	PEA GRAVEL	
			10		
4/6/8	0.0		15	SILTY CLAY: dark yellowish brown, stiff.	CL
7/9/10	0.0	☒	20	SAND: yellowish brown, medium dense, fine-grained, poorly graded.	SP
7/9/11	23.2		25	CLAYEY SILT: dark yellowish brown, very stiff.	ML
8/10/12	17.3		30		
9/12/14	0.0		35	SILT: dark gray, very stiff, slightly moist.	
			40		

GRAPHIC LOG



BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-3

L:\Graphics\ProjectsByNumber\60-xxxx\60-0626\Boring Logs\60-626 Log SB-3.DWG Jun 16, 2005 - 2:31pm rhughes

PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

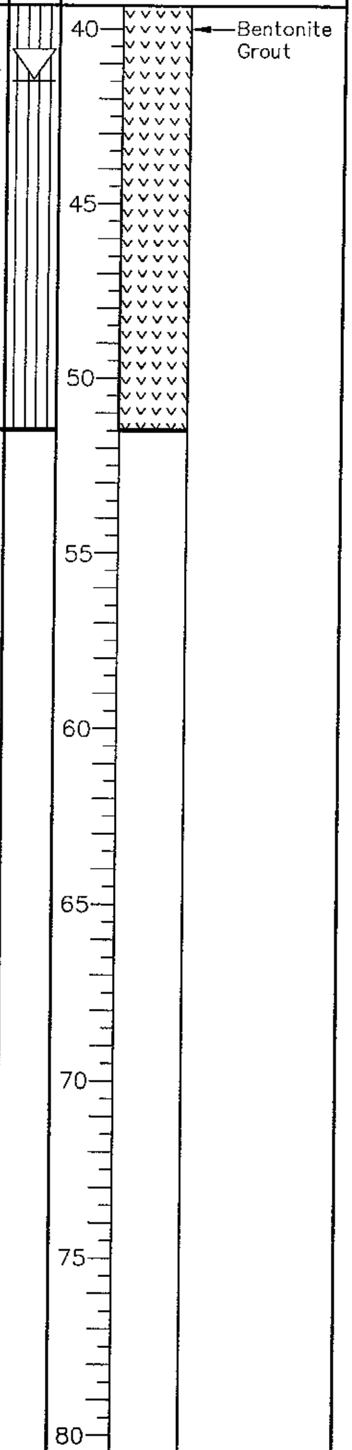
DATE DRILLED: June 8, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 41.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			40		
16/18/21	0.0			CLAYEY SILT: dark yellowish brown, hard, moist.	ML
13/16/18	0.0			SANDY SILT: dark yellowish brown, hard, wet.	
15/16/ 19/21	0.3			CLAYEY SILT: dark yellowish brown, hard, moist.	
			45		
17/19/21	0.0		50		
				Bottom of boring at 51.5 feet below grade.	
			55		
			60		
			65		
			70		
			75		
			80		

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-3

PAGE 2 OF 2

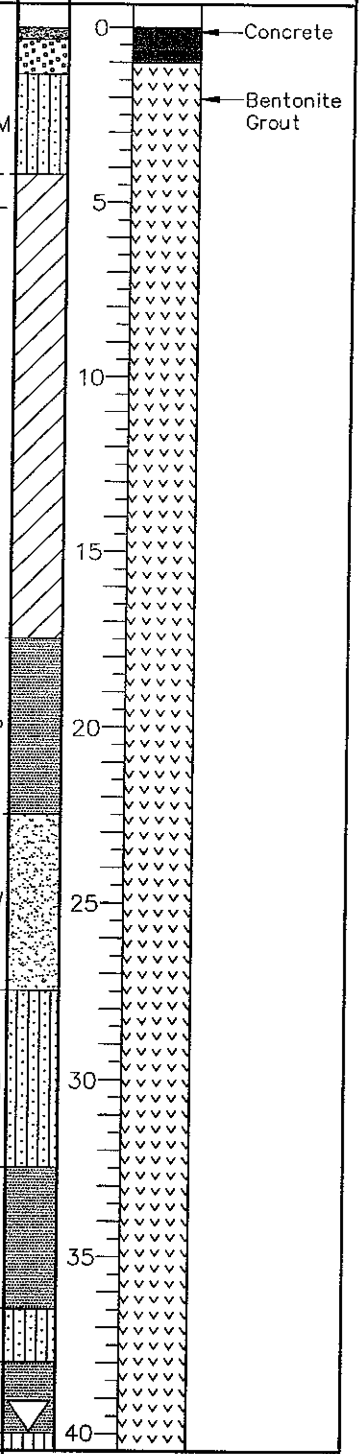
PROJECT NO.: 60-0626	DATE DRILLED: June 7, 2005
LOCATION: Former 76 Station 2417	LOGGED BY: A. Helekar, PE
24891 Redlands Boulevord	APPROVED BY: A. Helekar, PE
Loma Linda, California	DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 40 feet

BLOWS PER 6 INCHES	PID (ppmv)	DEPTH (feet below grade)	DESCRIPTION	USCS
		0	Air-Knifed to 5 feet. 3-inches of asphaltic concrete. 3-inches to 1.3 feet construction gravel. SILTY SAND: light brown (7.5YR 6/4), slightly moist, fine- to coarse-grained, construction debris (concrete).	SM
4/6/7	0.4	5	SILTY CLAY: very dark grayish brown, stiff.	CL
5/6/8	0.2	10	Dark grayish brown.	
4/5/7	0.4	15		
8/10/11	0.0	20	SAND: light olive brown, medium dense, medium-grained, poorly graded.	SP
10/15/17	0.0	25	GRAVELLY SAND: light olive brown, dense, slightly moist, coarse-grained, well graded.	SW
14/17/18	1.8	30	SILTY SAND: olive brown, dense, slightly moist, fine-grained, poorly graded.	SM
17/18/20	0.0	35	SAND: light olive brown, dense, slightly moist, fine-grained, poorly graded.	SP
10/40/50 for 6-inches	0.0		SILTY SAND: olive brown, very dense, wet, fine-grained, poorly graded.	SM
36/50 for 6-inches			GRAVELLY SAND: gray, very dense, wet, coarse-grained, medium graded.	SP
		40		ML

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-4

PAGE 1 OF 2

L:\Graphics\ProjectsByNumber\60-xxxx\60-0626\Boring Logs\60-626 Log SB-4.DWG Jun 17, 2005 - 8:15am lwinters

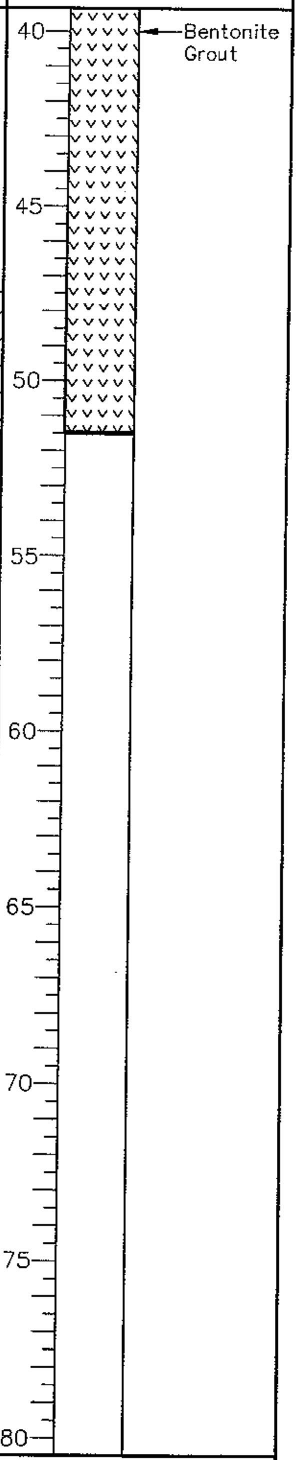
PROJECT NO.: 60-0626
LOCATION: Former 76 Stotion 2417
24891 Redlands Boulevard
Loma Linda, Californio

DATE DRILLED: June 7, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 40 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS	GRAPHIC LOG
38/40/50 for 6-inches	0.0		40	SANDY SILT: olive brown, hard, moist.	ML	
				CLAYEY SILT: olive brown, hard, moist.		
30/40/50 for 6-inches	0.0					
			45	SILT: with clay.		
36/38/40	0.0					
			50	CLAY: olive brown, hard, slightly moist.	CL	
17/21/34	0.0					
				Bottom of boring at 51.5 feet below grade.		
			55			
			60			
			65			
			70			
			75			
			80			

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-4

PAGE 2 OF 2

PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

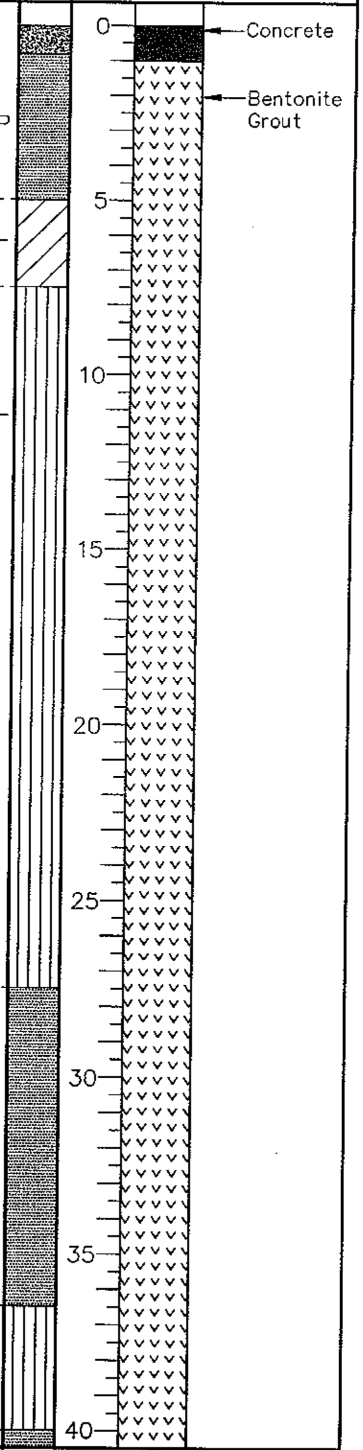
DATE DRILLED: June 8, 2005
LOGGED BY: A. Helekor, PE
APPROVED BY: A. Helekor, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 42.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	DEPTH (feet below grade)	DESCRIPTION	USCS
		0	Air-Knifed to 5 feet. 10-inches of asphaltic concrete.	
			SAND: yellowish brown (10YR 5/4), slightly moist, very fine- to coarse-grained, trace silt, trace fine gravel.	SP
4/5/7	10.0	5	SILTY CLAY: dark brown, stiff.	CL
6/7/10	2.9	10	CLAYEY SILT: dark brown, very stiff.	ML
6/7/8	2.6	15	Brown, with clay.	
6/8/9	1,949	20	SILT: dark brown, very stiff, with clay.	
7/9/11	32.5	25	CLAYEY SILT	
8/10/12	17.3	30	SAND: dark brown, medium dense, fine-grained, poorly graded.	SP
14/15/17	8.1	35		
15/16/20	7.4			
15/20/50 for 6-inches	1.6		SILT: dark brown, hard, slightly moist. Moist.	ML
		40		SP

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-5

PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

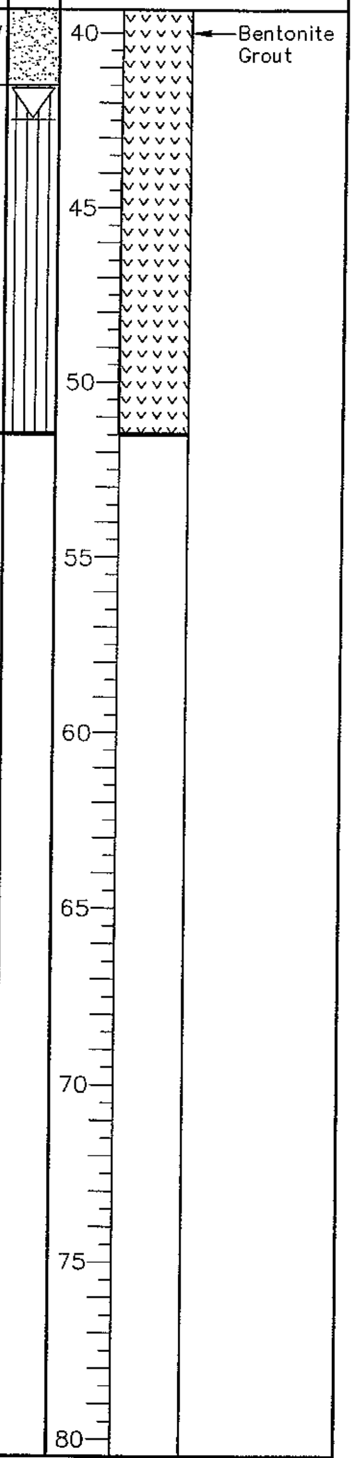
DATE DRILLED: June 8, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 42.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
27/50 for 6–inches	16.7		40	GRAVELLY SAND: dark gray, very dense, moist, coarse-grained, well graded.	SW
20/50 for 6–inches	19.0			SANDY SILT: dark brown, hard, wet.	ML
15/22/24	0.9		45	Moist, no sand.	
14/16/18	33.6		50	CLAYEY SILT: slightly moist.	
				Bottom of boring at 51.5 feet below grade.	
			55		
			60		
			65		
			70		
			75		
			80		

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-5

PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

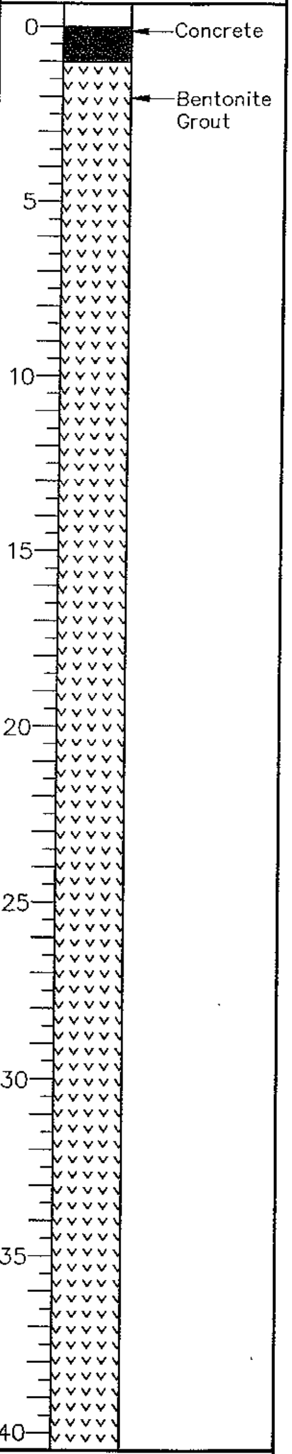
DATE DRILLED: June 7, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 41.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS
			0	Air-Knifed to 5 feet. 5-inches of asphaltic concrete. FILL (SAND): dark yellowish brown (10YR 4/4), slightly moist, fine- to very coarse-grained, with fine gravel.	SP
			4.5	FILL (SANDY GRAVEL): dark yellowish brown (10YR 4/4), slightly mosit, gravel is fine-grained, sand is fine- to coarse-grained.	GP
			7	PEA GRAVEL	
6/7/10	821	☐	25	SILT: dark grayish brown, very stiff.	ML
7/14/15	2.2	☐	30	SAND: dark grayish brown, medium dense, medium-grained, poorly graded.	SP
14/17/18	6.8	☐	35	SILTY SAND: dark gray, dense, moist.	SM
14/17/4	10.8	☒		Very dark grayish brown.	
17/19/ 20/22	0.0	☒	40	CLAYEY SILT: dark grayish brown, hard, moist.	ML
			40		SW

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-6

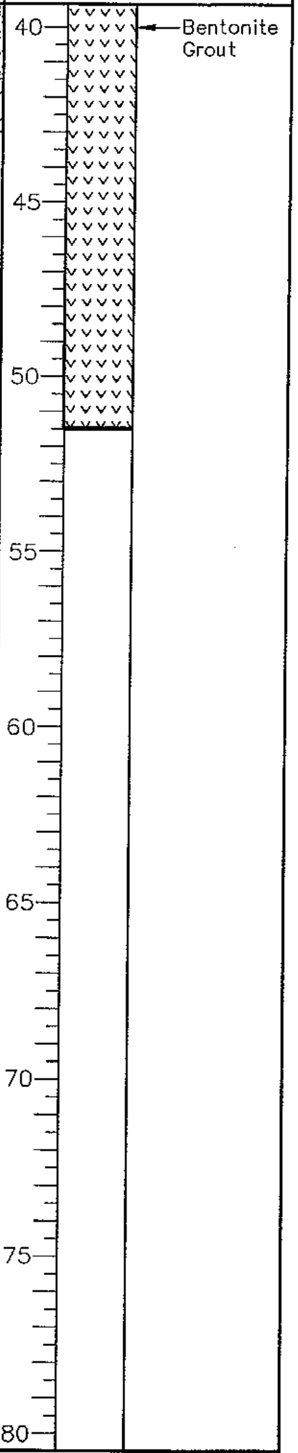
PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

DATE DRILLED: June 7, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 41.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	SAMPLE	DEPTH (feet below grade)	DESCRIPTION	USCS	GRAPHIC LOG
19/21/22	0.0		40	GRAVELLY SAND: dark gray, dense, wet, medium-grained, medium graded.	SW	▽
17/19/22	0.0			CLAY: dark grayish brown, hard, slightly moist, some silt.	CL	
15/17/ 19/22	0.0					
			45	CLAYEY SILT: dark grayish brown, hard, wet.	ML	
			50			
17/19/21	0.0					
				Bottom of boring at 51.5 feet below grade.		
			55			
			60			
			65			
			70			
			75			
			80			

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-6

PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

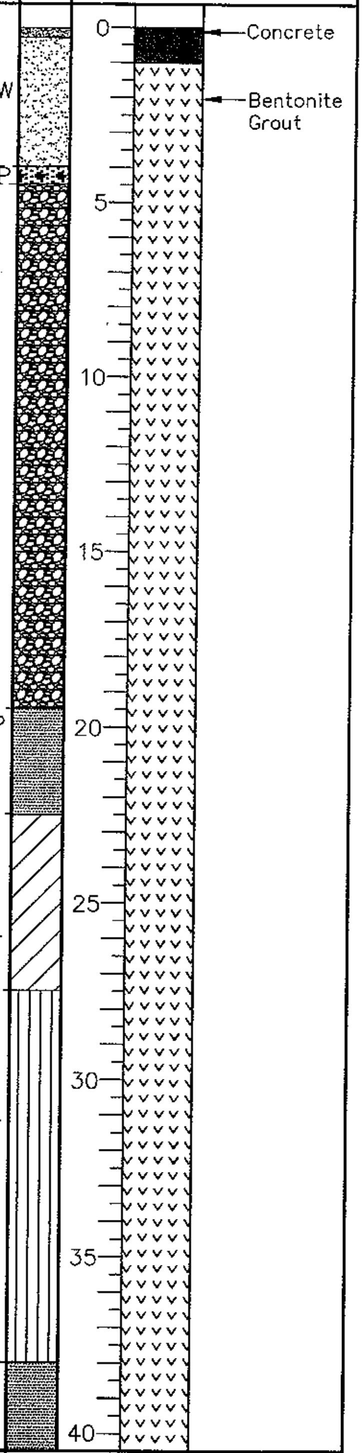
DATE DRILLED: June 8, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 41.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	DEPTH (feet below grade)	DESCRIPTION	USCS
		0	Air-Knifed to 5 feet. 3-inches of asphaltic concrete. SAND: dark yellowish brown (10YR 4/4), slightly moist, fine- to very coarse-grained, some fine gravel.	SW
			SANDY GRAVEL: dark yellowish brown (10YR 4/4), slightly mosit, gravel is fine-grained.	GP
		5	PEA GRAVEL	
10/11/14	0.0	20	SAND: yellowish brown, dense, fine-grained, poorly graded.	SP
10/14/17	0.0	25	SILTY CLAY: dark yellowish brown, hard.	CL
10/15/16	0.0	30	SILT: dark gray, medium hard.	ML
14/15/18	0.0	35	Slightly moist, trace clay.	
14/17/19	0.0		Moist, some clay.	
14/15/17/22	0.0	40	SAND: dark gray, dense, moist, fine-grained, poorly graded.	SP

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

LOG OF EXPLORATORY BORING

SB-7

PAGE 1 OF 2

L:\Graphics\ProjectsByNumber\60-xxxx\60-0626\Boring Logs\60-626 Log SB-7.DWG Jun 16, 2005 - 3:15pm rhughes

PROJECT NO.: 60-0626
LOCATION: Former 76 Station 2417
24891 Redlands Boulevard
Loma Linda, California

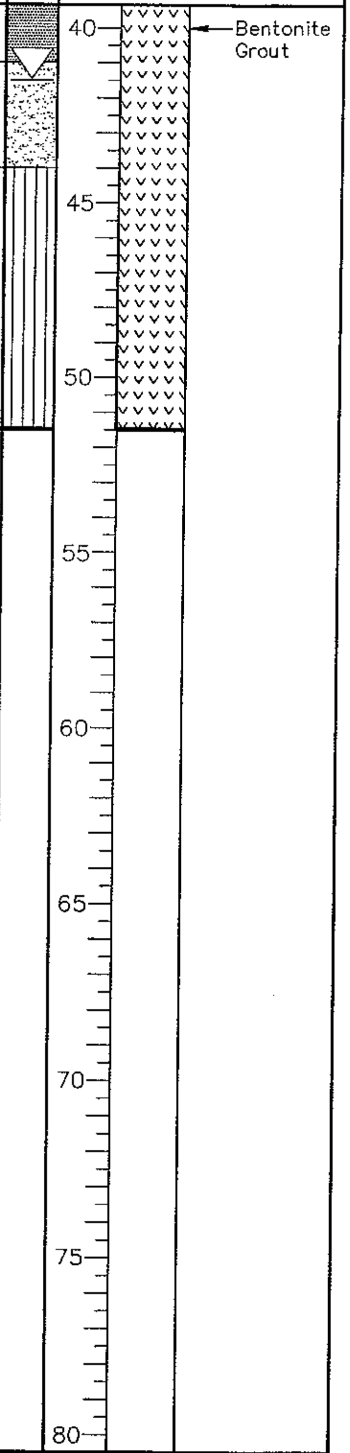
DATE DRILLED: June 8, 2005
LOGGED BY: A. Helekar, PE
APPROVED BY: A. Helekar, PE
DRILLING CO./RIG: Cascade

DRILLING METHOD: Hollow Stem Auger
SAMPLER TYPE: California Modified Split Spoon
TOTAL DEPTH: 51.5 feet DEPTH TO WATER: 41.5 feet

BLOWS PER 6 INCHES	PID (ppmv)	DEPTH (feet below grade)	DESCRIPTION	USCS
		40		SP
13/15/17	0.0			
13/17/19	0.0		GRAVELLY SAND: dark gray, dense, wet, coarse-grained, well graded.	SW
		45		
15/17/18	0.0		SILT: dark yellowish brown, hard, slightly moist, with clay.	ML
		50		
14/16/18	0.0		Moist.	
			Bottom of boring at 51.5 feet below grade.	
		55		
		60		
		65		
		70		
		75		
		80		

GRAPHIC LOG

BOREHOLE BACKFILL DETAIL



TRC

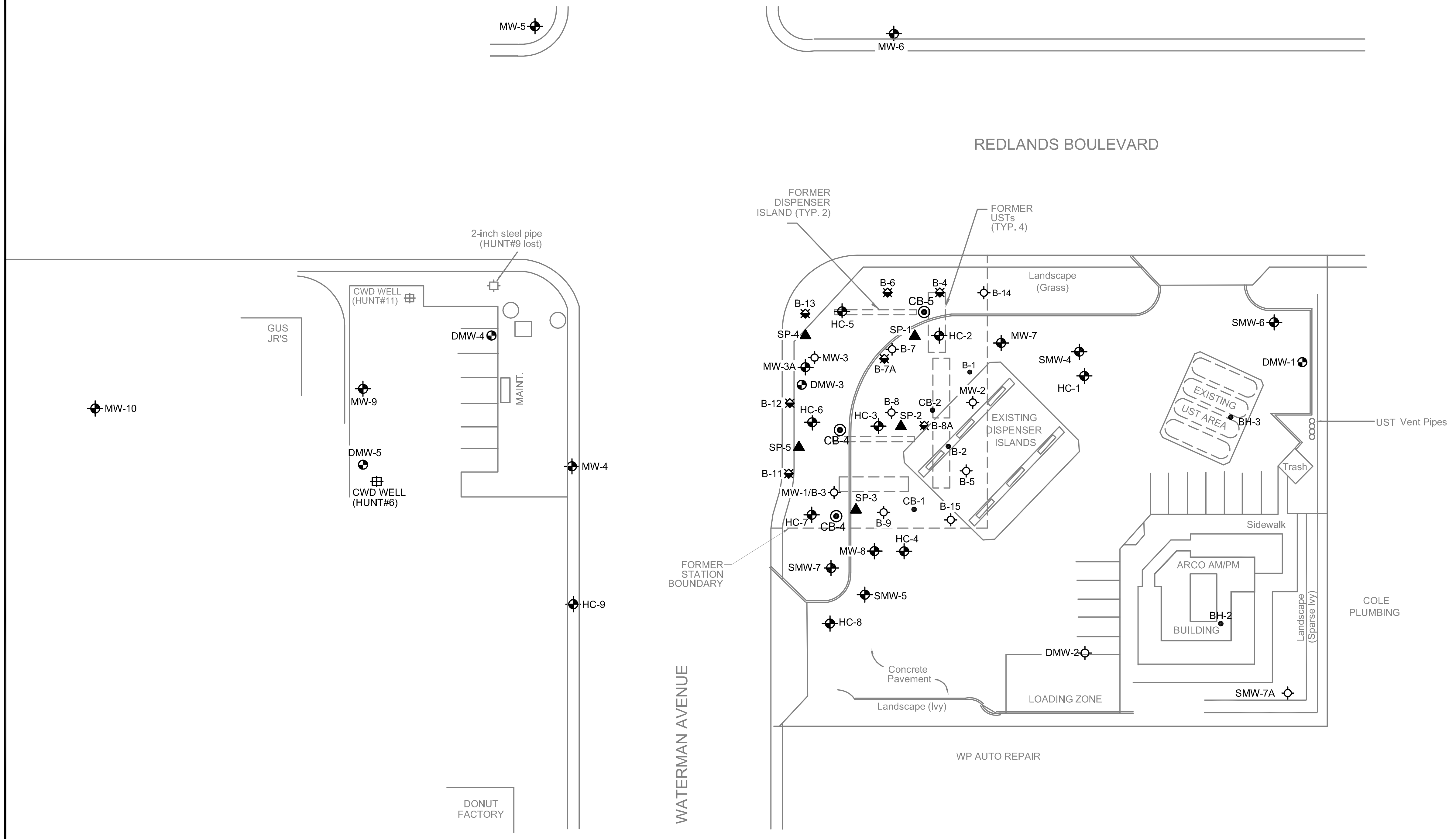
LOG OF EXPLORATORY BORING

SB-7

PAGE 2 OF 2

APPENDIX C2.9

ARCO #5214
GeoTracker Case I.D. T0607100180



LEGEND

— - - —	SITE PROPERTY LINE
SMW-7 ⌖	GROUNDWATER MONITORING WELL LOCATION (SHALLOW ZONE)
DMW-5 ◕	GROUNDWATER MONITORING WELL LOCATION (DEEP ZONE)
MW-3 ⌖	ABANDONED WELL LOCATION
SP-5 ▲	SPARGE WELL LOCATION
B-12 ✱	VADOSE ZONE WELL LOCATION
CB-2 •	SOIL BORING LOCATION
CB-5 ◉	CONFIRMATION SOIL BORING LOCATION
⊞	HUNT GROUNDWATER PRODUCTION WELL LOCATION

NOTES:

1. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

N

0 50 100

APPROXIMATE SCALE (FEET)

STRATUS
ENVIRONMENTAL, INC.

5412 BOLSA AVENUE, SUITE G
HUNTINGTON BEACH, CALIFORNIA
PHONE: (714) 230-2495

FOR:

ATLANTIC RICHFIELD COMPANY
ARCO FACILITY 5214
305 EAST REDLANDS BOULEVARD
SAN BERNARDINO, CALIFORNIA

SITE MAP

FIGURE: 2

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
1400-5214	R. ERDMAN	R. BAILEY	R. BAILEY	6/23/11

FILEPATH:T:\Projects\ARCO, BP\Other BP Sites\5214 D\CAD\CAD\2011\Q2\5214-Q2GW11.dwg | Layout Tab: Site Map2 | Drafter: rerdman

SOIL BORING LOG **Boring No.** CB-3 **Sheet 1 of 2**

Client ARCO 5214
Address 305 Redlands Blvd.
San Bernardino, CA
Project No. 1400-5214-01
Logged By: Steve Kalina

Date December 17, 2007
Driller JDK Drilling, Inc.
Drilling Foreman Troy
Method Limited Access HSA **hole diam.:** 8"
Depth of boring: 30 feet bgs
Backfill: Liquid grout
Depth to Water: 22 feet bgs ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Depth Scale	LITHO COLUMN	Descriptions of Materials and Conditions	PID (PPM)
					1			
					2			
					3		Cleared 0 - 5 feet with Air Knife	
					4			
		3			X			
		4			X 5	SM	SILTY SAND (SM), dark olive grey (5Y 3/2), 80% very fine to fine sand, some silt, trace medium sand, moderately sorted, loose, moist.	75.7
E	CB-3-5'	5	9:15	100%	X			
					6			
					7			
					8			
					9			
		4			X			
		6			X 10	SM	SILTY SAND (SM), olive grey (5Y 4/2), 50% very fine to fine sand, some silt, trace medium sand, moderately sorted, medium dense, damp.	3.4
E	CB-3-10'	9	9:20	100%	X			
					11			
					12			
					13			
					14			
		5			X			
		8			X 15	SM	SILTY SAND (SM), olive brown (2.5Y 4/4), 80% fine sand, some silt, moderately sorted, medium dense, damp.	10.4
E	CB-3-15'	13	9:25	100%	X			
					16			
					17			
					18			
					19			
		5			X			
		9			X 20			

E = Encore Soil Sample
X = Sample Interval

Comments:
Boring located in grass planter along Waterman Avenue midway between wells HC-7 and SP-3.

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. CB-3** **Sheet 2 of 2**

Client	ARCO 5214	**Date**	December 17, 2007
Address	305 Redlands Blvd.	**Driller**	JDK Drilling, Inc.
	San Bernardino, CA	**Drilling Foreman**	Troy
Project No.	1400-5214-01	**Method**	Limited Access HSA **hole diam.:** 8"
Logged By:	Steve Kalina	**Depth of boring:**	30 feet bgs
		Backfill:	Liquid grout
		Depth to Water:	22 feet bgs ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Depth Scale	LITHO COLUMN	Descriptions of Materials and Conditions	PID (PPM)
E	CB-3-20'	15	9:30	100%	X	SP	SAND (SP), dark grey (2.5Y 4/1), 80% fine to medium sand, some coarse sand, well sorted, medium dense, damp.	0.0
					21			
					22	▼		
					23			
					24			
		4			X			
		6			X 25	ML	SANDY SILT (ML), dark olive brown (5Y 3/2), 85% silt, some fine sand, trace medium sand, medium stiff, wet.	0.0
E	CB-3-25'	9	9:50	20%	X			
					26			
					27			
					28			
					29			
		8			X			
		12			X 30	ML	SANDY SILT (ML), dark olive brown (5Y 3/2), 70% silt, some fine sand, trace medium sand, stiff, moist.	0.0
E	CB-3-30'	17	10:00	100%	X			
					31			
					32			
					33			
					34			
					35			
					36			
					37			
					38			
					39			
					40			

E = Encore Soil Sample
X = Sample Interval

Comments:
Boring located in grass planter along Waterman Avenue midway between wells HC-7 and SP-3.

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. CB-4** **Sheet 1 of 2**

Client	ARCO 5214	**Date**	December 17, 2007
Address	305 Redlands Blvd.	**Driller**	JDK Drilling, Inc.
	San Bernardino, CA	**Drilling Foreman**	Troy
Project No.	1400-5214-01	**Method**	Limited Access HSA **hole diam.:** 8"
Logged By:	Steve Kalina	**Depth of boring:**	25 feet bgs
		Backfill:	Liquid grout
		Depth to Water:	22 feet bgs ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Depth Scale	LITHO COLUMN	Descriptions of Materials and Conditions	PID (PPM)
					1			
					2		Cleared 0 - 5 feet with Air Knife	
					3			
					4			
		5			X			
		8			X 5	SM	SILTY SAND (SM), dark olive grey (5Y 3/2), 80% very fine to fine sand, some silt, trace medium sand, moderately sorted, medium dense, moist.	20.5
E	CB-4-5'	9	8:15	100%	X			
					6			
					7			
					8			
					9			
		9			X			
		12			X 10	SM	SILTY SAND (SM), olive (5Y 4/3), 70% very fine to fine sand, some silt, trace medium sand, moderately sorted, dense, damp.	2.1
E	CB-4-10'	18	8:20	100%	X			
					11			
					12			
					13			
					14			
		8			X			
		12			X 15	ML	SANDY SILT (ML), olive brown (2.5Y 4/4), 80% silt, some fine sand, moderately sorted, medium dense, damp.	8.4
E	CB-4-15'	12	8:25	100%	X			
					16			
					17			
					18			
					19			
		7			X			
		11			X 20			

E = Encore Soil Sample
X = Sample Interval

Comments:
Boring located in grass planter along Waterman Avenue midway between wells HC-6 and HC-3.

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SOIL BORING LOG **Boring No. CB-4** **Sheet 2 of 2**

Client ARCO 5214
Address 305 Redlands Blvd.
San Bernardino, CA
Project No. 1400-5214-01
Logged By: Steve Kalina

Date December 17, 2007
Driller JDK Drilling, Inc.
Drilling Foreman Troy
Method Limited Access HSA **hole diam.:** 8"
Depth of boring: 25 feet bgs
Backfill: Liquid grout
Depth to Water: 22 feet bgs ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Depth Scale	LITHO COLUMN	Descriptions of Materials and Conditions	PID (PPM)
E	CB-4-20'	17	8:30	100%	X	SP	SAND (SP), dark grey (2.5Y 4/1), 90% fine to medium sand, little silt, trace coarse sand, well sorted, medium dense, moist.	0.0
					21			
					22	▼		
					23			
					24			
		4			X			
		6			X 25	SP	SAND (SP), dark grey (2.5Y 4/1), 90% fine to medium sand, little silt, trace coarse sand, well sorted, medium dense, wet.	0.0
E	CB-4-25'	9	9:50	20%	X			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
					34			
					35			
					36			
					37			
					38			
					39			
					40			

E = Encore Soil Sample
X = Sample Interval

Comments:
Boring located in grass planter along Waterman Avenue midway between wells HC-6 and HC-3.

STRATUS
ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No.** **CB-5** **Sheet 1 of 2**

Client ARCO 5214
Address 305 Redlands Blvd.
San Bernardino, CA
Project No. 1400-5214-01
Logged By: Steve Kalina

Date December 17, 2007
Driller JDK Drilling, Inc.
Drilling Foreman Troy
Method Limited Access HSA **hole diam.:** 8"
Depth of boring: 25 feet bgs
Backfill: Liquid grout
Depth to Water: 22 feet bgs ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Depth Scale	LITHO COLUMN	Descriptions of Materials and Conditions	PID (PPM)
					1			
					2			
					3		Cleared 0 - 5 feet with Air Knife	
					4			
		6			X			
		6			X 5	ML	SANDY SILT (ML), olive brown (2.5Y 4/4), 80% silt, some fine sand, moderately sorted, medium dense, damp.	0.0
E	CB-5-5'	7	10:45	100%	X			
					6			
					7			
					8			
					9			
		7			X			
		11			X 10	SM	SILTY SAND (SM), olive (5Y 4/3), 70% very fine to fine sand, some silt, trace medium sand, moderately sorted, medium dense, damp.	0.0
E	CB-5-10'	15	10:50	100%	X			
					11			
					12			
					13			
					14			
		8			X			
		10			X 15	ML	SANDY SILT (ML), olive brown (2.5Y 4/4), 80% silt, some very fine to fine sand, moderately sorted, medium dense, damp.	21.1
E	CB-5-15'	12	10:55	100%	X			
					16			
					17			
					18			
					19			
		8			X			
		9			X 20			

E = Encore Soil Sample
X = Sample Interval

Comments:
Boring located in grass planter along Redland Boulevard approximately 10 feet north of sparge well SP-1.

SOIL BORING LOG

Boring No. CB-5

Sheet 2 of 2

Client ARCO 5214

Address 305 Redlands Blvd.
San Bernardino, CA

Project No. 1400-5214-01

Logged By: Steve Kalina

Date December 17, 2007

Driller JDK Drilling, Inc.

Drilling Foreman Troy

Method Limited Access HSA **hole diam.:** 8"

Depth of boring: 25 feet bgs

Backfill: Liquid grout

Depth to Water: 22 feet bgs ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Depth Scale	LITHO COLUMN	Descriptions of Materials and Conditions	PID (PPM)
E	CB-5-20'	19	11:00	100%	X	SM	SILTY SAND (SM), dark olive grey (2.5Y 3/3), 70% fine to medium sand, some silt, trace coarse sand, moderately sorted, medium dense, moist.	0.0
					21			
					22	▼		
					23			
					24			
		6			X			
		9			X 25	SP	SAND (SP), dark grey (2.5Y 4/1), 90% fine to medium sand, little silt, trace coarse sand, well sorted, medium dense, wet.	0.0
E	CB-5-25'	11	11:05	100%	X			
					26			
					27			
					28			
					29			
		10			X			
		13			X 30	SP	SAND (SP), dark grey (2.5Y 4/1), 95% fine to medium sand, trace silt, well sorted, medium dense, wet.	0.0
E	CB-5-30'	16	11:10	100%	X			
					31			
					32			
					33			
					34			
					35			
					36			
					37			
					38			
					39			
					40			

E = Encore Soil Sample
X = Sample Interval

Comments:
Boring located in grass planter along Redland Boulevard approximately 10 feet north of sparge well SP-1.

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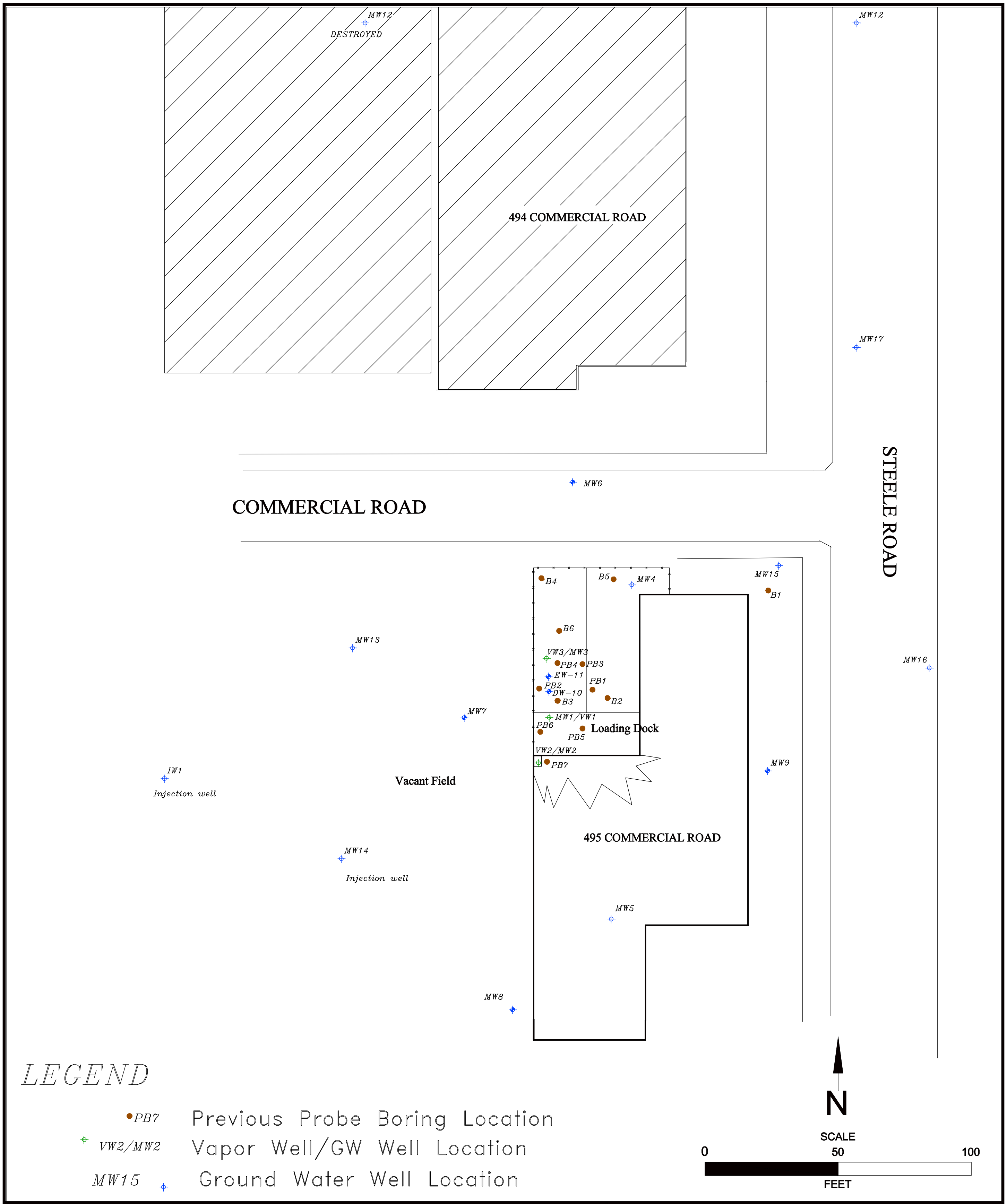
APPENDIX C2.10

Eric Realty Property
GeoTracker Case I.D. T10000001230



SITE PLAN

495 COMMERCIAL ROAD
SAN BERNARDINO, CALFORNIA

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www.advgeoenv.com

PROJECT NO. AGE-SC-11-1858	FILE:	FIGURE:
DATE: JULY 2013	DRAWN BY: MAC	1

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FIELD BORING LOG

Boring No.: **PB-1**
Total Depth: **15 Feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty Property**	Drilling Co.:	**EnviroProbe**
Site Location:	**San Bernardino**	Driller:	**Art**
Job No.:	**SB 607A7.930**	Rig Type:	**Geoprobe 5400**
Logged By:	**D. Becker**	Method of Drilling:	**Direct Push**
Project Manager:	**R. Loeffler**	Sampling Methods:	**Direct Push**
Dates Drilled:	**12/14/01**	Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▨	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, stiff, clay.	PB1-D5		0		
								Bentonite Grout
-10	⁙	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty, fine sand	PB1-D10		2		
-15	⁘	SP	SAND (POORLY GRADED): Pale yellowish brown (10YR 6/2), dry fine sand	PB1-D15		0		Termination

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FIELD BORING LOG

Boring No.: **PB-2**
Total Depth: **15 Feet**

PROJECT INFORMATION

Project:	**Eric Realty Property**
Site Location:	**San Bernardino**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**R. Loeffler**
Dates Drilled:	**12/14/01**

DRILLING INFORMATION

Drilling Co.:	**EnviroProbe**
Driller:	**Art**
Rig Type:	**Geoprobe 5400**
Method of Drilling:	**Direct Push**
Sampling Methods:	**Direct Push**
Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▨	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, stiff, clay.	PB2-D5		0		
								Bentonite Grout
-10	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty, fine sand. PCE odor	PB2-D10		220		
-15	░	SP	SAND (POORLY GRADED): Pale yellowish brown (10YR 6/2), dry, fine sand. PCE odor.	PB2-D15		240		Termination

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FIELD BORING LOG

Boring No.: **PB-2**
Total Depth: **15 Feet**

PROJECT INFORMATION

Project:	**Eric Realty Property**
Site Location:	**San Bernardino**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**R. Loeffler**
Dates Drilled:	**12/14/01**

DRILLING INFORMATION

Drilling Co.:	**EnviroProbe**
Driller:	**Art**
Rig Type:	**Geoprobe 5400**
Method of Drilling:	**Direct Push**
Sampling Methods:	**Direct Push**
Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▧	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, stiff, clay.	PB2-D5		0		
								Bentonite Grout
-10	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty, fine sand. PCE odor	PB2-D10		220		
-15	░	SP	SAND (POORLY GRADED): Pale yellowish brown (10YR 6/2), dry, fine sand. PCE odor.	PB2-D15		240		Termination

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FIELD BORING LOG

Boring No.:	**PB-3**
Total Depth:	**15 Feet**

PROJECT INFORMATION

Project:	**Eric Realty Property**
Site Location:	**San Bernardino**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**R. Loeffler**
Dates Drilled:	**12/14/01**

DRILLING INFORMATION

Drilling Co.:	**EnviroProbe**
Driller:	**Art**
Rig Type:	**Geoprobe 5400**
Method of Drilling:	**Direct Push**
Sampling Methods:	**Direct Push**
Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▨	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, stiff, clay.	PB3-D5		10		
								Bentonite Grout
-10	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty fine sand. Slight PCE odor.	PB3-D10		0		
-15	⁘	SP	SAND (POORLY GRADED): Pale yellowish brown (10YR 6/2), dry, fine sand.	PB3-D15		20		Termination

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FIELD BORING LOG

Boring No.:	**PB-4**
Total Depth:	**15 Feet**

PROJECT INFORMATION

Project:	**Eric Realty Property**
Site Location:	**San Bernardino**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**R. Loeffler**
Dates Drilled:	**12/14/01**

DRILLING INFORMATION

Drilling Co.:	**EnviroProbe**
Driller:	**Art**
Rig Type:	**Geoprobe 5400**
Method of Drilling:	**Direct Push**
Sampling Methods:	**Direct Push**
Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▨	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, stiff, clay.	PB3-D5		10		
								Bentonite Grout
-10	☷	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty fine sand. Slight PCE odor.	PB3-D10		0		
-15	⁘	SP	SAND (POORLY GRADED): Pale yellowish brown (10YR 6/2), dry, fine sand.	PB3-D15		20		Termination

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FIELD BORING LOG

Boring No.: **PB-5**
Total Depth: **15 Feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty Property**	Drilling Co.:	**EnviroProbe**
Site Location:	**San Bernardino**	Driller:	**Robert**
Job No.:	**SB 607A7.930**	Rig Type:	**Power Probe**
Logged By:	**D. Becker**	Method of Drilling:	**Direct Push**
Project Manager:	**R. Loeffler**	Sampling Methods:	**Direct Push**
Dates Drilled:	**12/14/01**	Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▨	SC	CLAYEY SAND: Moderate yellowish brown (10YR 5/4), dry, clayey, fine to medium sand (fill material).	PB5-D5		50		
								Bentonite Grout
-10	▧	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clay.	PB5-D10		0		
-15	░	SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), dry, fine sand.	PB5-D15		0		Termination

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FIELD BORING LOG

Boring No.: **PB-6**
Total Depth: **20 Feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty Property**	Drilling Co.:	**EnviroProbe**
Site Location:	**San Bernardino**	Driller:	**Robert**
Job No.:	**SB 607A7.930**	Rig Type:	**Power Probe**
Logged By:	**D. Becker**	Method of Drilling:	**Direct Push**
Project Manager:	**R. Loeffler**	Sampling Methods:	**Direct Push**
Dates Drilled:	**12/14/01**	Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▨	SC	CLAYEY SAND: Moderate yellowish brown (10YR 5/4), dry, clayey fine to medium sand. PCE odor.	PB6-D5		100		
-10	▨	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clay.	PB6-D10		50		
								Bentonite Grout
-15	░	SP	SAND (POORLY GRADED): Pale yellowish brown (10YR 6/2), dry, fine sand. PCE odor.	PB6-D15		100		
-20	▨	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp clay. PCE odor.	PB6-D20		110		Termination

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FIELD BORING LOG

Boring No.: **PB-6**
Total Depth: **20 Feet**

PROJECT INFORMATION

Project:	**Eric Realty Property**
Site Location:	**San Bernardino**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**R. Loeffler**
Dates Drilled:	**12/14/01**

DRILLING INFORMATION

Drilling Co.:	**EnviroProbe**
Driller:	**Robert**
Rig Type:	**Power Probe**
Method of Drilling:	**Direct Push**
Sampling Methods:	**Direct Push**
Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▨	SC	CLAYEY SAND: Moderate yellowish brown (10YR 5/4), dry, clayey fine to medium sand. PCE odor.	PB6-D5		100		
-10	▧	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clay.	PB6-D10		50		
								Bentonite Grout
-15	░	SP	SAND (POORLY GRADED): Pale yellowish brown (10YR 6/2), dry, fine sand. PCE odor.	PB6-D15		100		
-20	▧	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp clay. PCE odor.	PB6-D20		110		Termination

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FIELD BORING LOG

Boring No.: **PB-7**
Total Depth: **20 Feet**

PROJECT INFORMATION

Project:	**Eric Realty Property**
Site Location:	**San Bernardino**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**R. Loeffler**
Dates Drilled:	**12/14/01**

DRILLING INFORMATION

Drilling Co.:	**EnviroProbe**
Driller:	**Robert**
Rig Type:	**Power Probe**
Method of Drilling:	**Direct Push**
Sampling Methods:	**Direct Push**
Hammer Wt./Drop	

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								Concrete
-5	▨	SC	CLAYEY SAND: Moderate yellowish brown (10YR 5/4), dry, clayey fine to medium sand. PCE odor.	PB7-D5		180		
-10	▨	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clay. PCE odor.	PB7-D10		170		
								Bentonite Grout
-15	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), dry, silty fine sand. PCE odor.	PB7-D15		180		
-20	▨	CL	SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, sandy clay.	PB7-D20		80		Termination

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FIELD BORING LOG

Boring No.: **B8**
Total Depth: **50 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75 LAR**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**07-11-02**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								
	▥		SANDY SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), dry, sandy silt					
-5		ML		B8-D5	10/14/50	0		
	▥		SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), dry, silt					
-10		ML		B8-D10	32/50	0		
	░		SILTY SAND: Moderate yellowish brown (10YR 5/4), dry, silty fine sand					
-15		SM		B8-D15	18/22/32	0		
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), slightly damp, sandy, silty clay					
-20		CL		B8-D20	12/16/22	0		
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, sandy clay					
-25		CL		B8-D25	6/9/8	0		

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FIELD BORING LOG

Boring No.: **B8**
Total Depth: **50 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**07-11-02**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Steve**
Rig Type:	**CME 75 LAR**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-30	▨	CL	SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, sandy clay	B8-D30	17/18/21	0		
-35	░	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand	B8-D35	36/50	0		
-40	▨	SC	CLAYEY SAND: Moderate yellowish brown (10YR 5/4), damp, clayey fine sand	B8-D40	16/50	0		
-45	▨	CL	SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, sandy clay	B8-D45	16/19/25	0		
-50	▨	CL	SANDY CLAY: Moderate yellowish brown (10YR 5/4), wet, sandy clay	B8-D50	17/20/22	0		
-55								

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FIELD BORING LOG

Boring No.: **MW1/VW1**
Total Depth: **70 feet**

PROJECT INFORMATION	
Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**07-10-02**

DRILLING INFORMATION	
Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Steve**
Rig Type:	**CME 75 LAR**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-20								
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), slightly damp, sandy clay, less than 10% gravel					
-25		CL		MW1-D25	7/11/18	0		
	▤		SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty fine sand					
-30		SM		MW1-D30	7/8/9	0		
	▤		SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty, clayey fine sand					
-35		SC		MW1-D35	15/17/21	0		
			No Recovery - rock fragments in shoe					
-40					60	0		
	▥		CLAYEY SILT (LOW PLASTICITY): Dark yellowish brown (10YR 4/4), damp, clay and silt, less than 10% sand					
-45		CL		MW1-D45		0		
					8/11/14			
▼								

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FIELD BORING LOG

Boring No.: **MW1/VW1**
Total Depth: **70 feet**

PROJECT INFORMATION

Project: **Eric Realty**
Site Location: **495 East Commercial Rd.**
Job No.: **SB 607A7.930**
Logged By: **Diane Becker**
Project Manager: **Diane Becker**
Dates Drilled: **07-10-02**

DRILLING INFORMATION

Drilling Co.: **Cascade Drilling, Inc.**
Driller: **Steve**
Rig Type: **CME 75 LAR**
Method of Drilling: **10 in. Hollow Stem Auger**
Sampling Methods: **California Split Spoon**
Hammer Wt./Drop **140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-50	▨	CL	SANDY CLAY: Dark yellowish brown (10YR 4/4), damp, sandy clay	MW1-D50	9/16/17	0		
▽ -55	⁘	SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), moist, fine to medium sand	MW1-D55	15/27/28	0		
-60	▨	SC	CLAYEY SAND: Moderate yellowish brown (10YR 5/4), wet, clayey, fine to medium sand	MW1-D60	8/17/20	0		
-65	⁘		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), wet, fine sand, less than 10% silt					
-70	⁘		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), wet, fine sand, less than 10% silt					Termination

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FIELD BORING LOG

Boring No.:	**MW2/VW2**
Total Depth:	**70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75 LAR**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**07-10-02**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-20		SM		MW2-D20	8/10/12	0		
	▥		CLAYEY SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clayey silt, less than 10% fine sand					
-25		CL		MW2-D25	7/12/15	0		
	▨		SANDY CLAY: Dark yellowish brown (10YR 4/2), damp, silty, sandy clay					
-30		SC		MW2-D30	8/10/12	0		
	▤		SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand					
-35		SM		MW2-D35	22/50	0		
	▤		SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand					
-40		SM		MW2-D40	12/15/50	0		
	▥		CLAYEY SILT (LOW PLASTICITY): Dark yellowish brown (10YR 4/2), damp, clay					
-45		CL		MW2-D45	17/21/30	0		
▼								

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FIELD BORING LOG

Boring No.: **MW2/VW2**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75 LAR**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**07-10-02**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-50	▨	CL	CLAY (LOW PLASTICITY): Dark yellowish brown (10YR 4/4), moist clay, less than 10% sand	MW2-D50	6/11/12	0		
▽ -55	⁘	SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), moist, fine to medium sand	MW2-D55	7/15/19	0		
-60	▤	SM	SILTY SAND: Dark yellowish brown (10YR 5/4), damp, silty fine sand	MW2-D60	7/18/23	0		
-65	▤	SM	SILTY SAND: Dark yellowish brown (10YR 5/4), damp, silty fine sand	MW2-D65	12/14/18			
-70	⁘		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), moist, fine sand					Termination

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FIELD BORING LOG

Boring No.: **MW3/VW3**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75 LAR**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**07-11-02**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, silty clay					
-5		CL		MW3-D5	7/8/10	0		
	░		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), slightly damp, fine sand					
-10		SP		MW3-D10	12/14/16	0		
	▨		CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clay					
-15		CL		MW3-D15	6/9/9	0		
	▨		SANDY CLAY: Dark yellowish brown (10YR 4/2), damp, sandy clay					
-20		CL		MW3-D20	8/10/12	0		
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, silty clay					
-25		CL		MW3-D25	7/12/15	0		

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FIELD BORING LOG

Boring No.: **MW3/VW3**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75 LAR**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**07-11-02**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
			No recovery					
-30				MW3-D30		0		
	┄		SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand					
-35		SM		MW3-D35	22/50	0		
	▨		CLAYEY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand					
-40		SP		MW3-D40	12/15/50	0		
	⁘		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, silty fine sand					
-45		SM		MW3-D45	17/21/30	0		
	┄		SILTY SAND: Moderate yellowish brown (10YR 5/4), wet, silty fine sand					
-50		SM		MW3-D50	6/11/12	0		
	┄		SANDY SILT: Moderate yellowish brown (10YR 5/4), wet, sandy silt, less than 10% clay					
-55		SM		MW3-D55	7/15/19	0		

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FIELD BORING LOG

Boring No.: **MW3/VW3**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75 LAR**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**07-11-02**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-60	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), wet, silty fine sand		15/18/25			
-65	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), wet, silty fine sand		14/15/21			
-70	░	SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), wet, fine sand, less than 10% silt		17/19/23			Termination

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FIELD BORING LOG

Boring No.: **MW4**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75 LAR**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**07-12-02**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								
-5	▧	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), moist, clay	MW4-D5	4/6/7	0		
-10	▥	CL	CLAYEY SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clayey silt	MW4-D10	7/10/11	0		
-15	▧	CL	CLAY (LOW PLASTICITY): Dark yellowish brown (10YR 4/2), damp, clay	MW4-D15	5/6/8	0		
-20	▨	CL	SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, clayey, fine sand	MW4-D20	50	0		
-25	▨	SC	SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, sandy clay	MW4-D25	10/8/11	0		

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FIELD BORING LOG

Boring No.:	**MW4**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**07-12-02**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Steve**
Rig Type:	**CME 75 LAR**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-30		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, fine sand	MW4-D30	11/13/15	0		
-35		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, fine to medium sand	MW4-D35	50	0		
-40		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, fine to medium sand, less than 10% clay	MW4-D40	36/36	0		
-45		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, fine to medium sand	MW4-D45	15/50	0		
-50		SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), wet, silty, fine sand	MW4-D50	21/50	0		
-55		SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), wet, silty, fine sand	MW4-D55	21/23/29	0		

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FIELD BORING LOG

Boring No.:	**MW4**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**07-12-02**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Steve**
Rig Type:	**CME 75 LAR**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-60		SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), wet, silty fine sand		19/19/23			
-65		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), wet, fine sand		17/22/25			
-70		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), wet, fine sand		21/21/50			Termination

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FIELD BORING LOG

Boring No.: **MW5**
Total Depth: **70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**07-11-02**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Steve**
Rig Type:	**CME 75 LAR**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								
-5	▥	ML	SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), dry, silt	MW5-D5	22/50	0		
-10	▤	SM	SANDY SILT: Moderate yellowish brown (10YR 5/4), dry, sandy silt	MW5-D10	17/18/21	0		
-15	▧	SM	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), dry, silty sand	MW5-D15	8/9/11	0		
-20	░	SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), slightly damp, fine sand	MW5-D20	6/9/8	0		
-25	▨	CL	SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, sandy clay	MW5-D25	10/8/11	0		

FIELD BORING LOG

Boring No.:	**MW5**
Total Depth:	**70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75 LAR**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**07-11-02**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-30	▨	CL	SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, silty clay	MW5-D30	10/15/16	0		
-35	░	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand	MW5-D35	9/16/17	0		
-40	▨	CL	SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, sandy clay	MW5-D40	19/50	0		
-45	▨	SC	CLAYEY SAND: Moderate yellowish brown (10YR 5/4), damp, clayey fine sand	MW5-D45	7/11/18	0		
-50	░	SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), wet, fine sand	MW5-D50	16/18/25	0		
-55	░	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), wet, silty, fine sand	MW5-D55	17/18/23	0		

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FIELD BORING LOG

Boring No.: **MW5**
Total Depth: **70 feet**

PROJECT INFORMATION

Project: **Eric Realty**
Site Location: **495 East Commercial Rd.**
Job No.: **SB 607A7.930**
Logged By: **Diane Becker**
Project Manager: **Diane Becker**
Dates Drilled: **07-11-02**

DRILLING INFORMATION

Drilling Co.: **Cascade Drilling, Inc.**
Driller: **Steve**
Rig Type: **CME 75 LAR**
Method of Drilling: **10 in. Hollow Stem Auger**
Sampling Methods: **California Split Spoon**
Hammer Wt./Drop: **140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-60		SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), wet, silty fine sand		9/17/22			
-65		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), wet, fine sand		18/19/20			
-70		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), wet, fine sand		13/17/20			Termination

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FIELD BORING LOG

Boring No.: **MW6**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Shannon**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 95**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**02-06-03**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
0								
-5	▨	CL	SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, silty, sandy clay	MW6-D5	16/26/35	27.3		
-10	░	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty fine sand	MW6-D10	26/50	0		
-15	▧	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, sandy clay	MW6-D15	12/20/44	26.5		
-20	░	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty fine sand	MW6-D20	39/50	25.8		
-25	⋯	SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), slightly damp, fine to medium sand	MW6-D25	60 for 6"	0		
-30	▨	CL	SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, sandy, silty clay	MW6-D30	40/50	23.7		
-35	▥	SM	SANDY SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, sandy silt	MW6-D35	32/50	36.2		

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FIELD BORING LOG

Boring No.: **MW6**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Shannon**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 95**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**02-06-03**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppm	BORING COMPLETION	WELL DESC.
-40	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty, fine sand	MW6-D40	60 for 6"	8.9		
-45	▥	ML	CLAYEY SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), moist, clayey, sandy silt	MW6-D45	50 for 6"	24.1		
-50	▨	SC	CLAYEY SAND: Moderate yellowish brown (10YR 5/4), moist, clayey sand	MW6-D50	19/50	4.8		
-55	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), saturated, silty, fine sand	MW6-D55	30/50	0		
-60	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), saturated, silty fine sand	MW6-D60	30/50	0		
-65	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), saturated, silty fine sand	MW6-D65	60 for 6"	0		
-70	▤	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), saturated, silty, fine sand	MW6-D70	60 for 6"	0		Termination

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FIELD BORING LOG

Boring No.:	**MW7**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**02-05-03**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Shannon**
Rig Type:	**CME 95**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling

▼ Water level in completed well

-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, silty clay					
-5		CL		MW7-D5	6/8/31	186		
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), slightly damp, silty fine sand					
-10		CL		MW7-D10	29/50	288		
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, silty clay					
-15		CL		MW7-D15	31/50	>1,999		

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FIELD BORING LOG

Boring No.:	**MW7**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**02-05-03**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Shannon**
Rig Type:	**CME 95**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		CL		MW7-D25	15/30/50	1,714		
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), slightly damp, sandy clay					
-30		CL		MW7-D30	27/60	98.7		
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, silty clay					
-35		CL		MW7-D35	21/50	30.1		
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, silty clay					
-40		CL		MW7-D40	27/50	4.0		
-45								

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FIELD BORING LOG

Boring No.: **MW7**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Shannon**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 95**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**02-05-03**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
-55		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), saturated, fine sand	MW7-D55	25/28/40	0		
-60		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), saturated, fine sand	MW7-D60	21/50	0		
-65		SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), saturated, silty, clayey, fine sand	MW7-D65	34/50	0		
-70								

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FIELD BORING LOG

Boring No.: **MW8**
Total Depth: **70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**02-05-03**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Shannon**
Rig Type:	**CME 95**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling -
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
	▥		SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp silt					
-5		ML		MW8-D5	7/9/27	0		
	▥		SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp silt					
-10		ML		MW8-D10	32/50	3		
	▥		SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp silt					
-15		ML		MW8-D15	21/50	0		

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FIELD BORING LOG

Boring No.:	**MW8**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**02-05-03**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Shannon**
Rig Type:	**CME 95**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling -

▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		SC		MW8-D25	20/50	0		
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), slightly damp, sandy clay					
-30		CL		MW8-D30	60 for 6"	0		
	▥		SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp silt					
-35		ML		MW8-D35	35/50	0		
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, silty clay					
-40		CL		MW8-D40	60	0		
-50 -60								

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FIELD BORING LOG

Boring No.:	**MW8**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**02-05-03**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Shannon**
Rig Type:	**CME 95**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
	∵		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), saturated, fine sand					
-55		SP		MW8-D55	60 for 6"	0		
	∵ —		SILTY SAND: Moderate yellowish brown (10YR 5/4), saturated, silty, fine sand					
-60		SM		MW8-D60	60 for 6"	0		
	▨		CLAYEY SAND: Moderate yellowish brown (10YR 5/4), saturated, clayey, fine sand					
-65		SC		MW8-D65	60 for	0		
-70								

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FIELD BORING LOG

Boring No.: **MW9**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Shannon**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 95**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**02-06-03**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling -
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
			SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty, fine sand					
-5		SM		MW9-D5	17/26/50	0		
			SILTY SAND: Moderate yellowish brown (10YR 5/4), slightly damp, silty, fine sand					
-10		SM		MW9-D10	30/50	3.9		
			SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, clayey silt					
-15		ML		MW9-D15	16/37/50	0		

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PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Shannon**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 95**
Logged By:	**Diane Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**Diane Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**02-06-03**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling

▼ Water level in completed well

-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		SC		MW9-D25	20/50	7.6		
	⁘		SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), slightly damp, fine to coarse sand					
-30		SW		MW9-D30	70 for 6"	0		
	⁘		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), slightly damp, fine to medium sand					
-35		SP		MW9-D35	31/50	0		
	▥		SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), slightly damp, clayey, sandy silt					
-40		ML		MW9-D40	40/50	0		
-[illegible]								

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FIELD BORING LOG

Boring No.: **MW9**
Total Depth: **70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**Diane Becker**
Project Manager:	**Diane Becker**
Dates Drilled:	**02-06-03**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Shannon**
Rig Type:	**CME 95**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
-55		SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), saturated, silty, fine sand	MW9-D55	46/50	0		
-60		SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), saturated, silty, fine sand	MW9-D60	27/50	0		
-65		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), saturated, fine to coarse sand	MW9-D65	70 for	0		
-70								

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FIELD BORING LOG

Boring No.: **MW12**
Total Depth: **70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**D. Becker**
Dates Drilled:	**04-02-04**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Izzy**
Rig Type:	**CME 85**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
	▒		SILTY SAND: Dark yellowish brown (10YR 4/2), damp, silty, fine sand					
-5		SM		MW12-D5	13/15/17	0		
	▨		CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clay					
-10		CL		MW12-D10	10/14/18	0		
	▥		SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, silt					
-15		ML		MW12-D15	12/15/17	0		

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FIELD BORING LOG

Boring No.: **MW12**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Izzy**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 85**
Logged By:	**D. Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**04-02-04**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		SW		MW12-D25	14/16/16	0		
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, fine sandy clay					
-30		SC		MW12-D30	22/25/26	0		
	▥		CLAYEY SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clayey silt					
-35		ML		MW12-D35	20/23/24	0		
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, silty clay					
-40		CL		MW12-D40	20/24/27	0		
-60								

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FIELD BORING LOG

Boring No.: **MW12**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Izzy**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 85**
Logged By:	**D. Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**04-02-04**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
-55		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), wet, fine to coarse sand	MW12-D55	19/24/29	0		
-60		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), saturated, fine to coarse sand	MW12-D60	15/23/30	0		
-65		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), saturated, fine to coarse sand	MW12-D65	17/22/27	0		
-70								

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FIELD BORING LOG

Boring No.: **MW13**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Izzy**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 85**
Logged By:	**D. Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**04-01-04**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
			SANDY SILT: Moderate yellowish brown (10YR 5/4), dry, fine sandy silt					
-5		SM		MW13-D5	11/12/17	0		
			CLAYEY SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), dry, clayey silt					
-10		CL		MW13-D10	13/14/17	11.3		
			SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, fine sandy clay					
-15		ML		MW13-D15	15/17/21	7.3		

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FIELD BORING LOG

Boring No.:	**MW13**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**D. Becker**
Dates Drilled:	**04-01-04**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Izzy**
Rig Type:	**CME 85**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling

▼ Water level in completed well

-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		SC		MW13-D25	17/19/25	92.5		
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, fine sandy clay					
-30		SC		MW13-D30	18/23/23	237.1		
	▨		SANDY CLAY: Moderate yellowish brown (10YR 5/4), damp, silty, sandy clay					
-35		SP		MW13-D35	18/20/21	30.6		
	░		SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), damp, fine to medium sand					
-40		SW		MW13-D40	50 for	0		
[illegible]								

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FIELD BORING LOG

Boring No.:	**MW13**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**D. Becker**
Dates Drilled:	**04-01-04**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Izzy**
Rig Type:	**CME 85**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling

▼ Water level in completed well -

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
-55		SM	SANDY SILT: Moderate yellowish brown (10YR 5/4), moist, sandy silt	MW13-D55	22/50	0		
-60		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), saturated, clayey, fine to coarse sand	MW13-D60	20/24/28	0		
-65		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), saturated, clayey, fine to coarse sand	MW13-D65	35/50	0		
-70								

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FIELD BORING LOG

Boring No.:	**MW14**
Total Depth:	**70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Izzy**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 85**
Logged By:	**D. Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**04-01-04**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling

▼ Water level in completed well

-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
	▥		CLAYEY SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), dry, clayey silt					
-5		CL		MW14-D5	12/14/18	0		
	▥		SILT (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), dry, silt					
-10		ML		MW14-D10	15/16/17	11.3		
	▧		CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, clay					
-15		CL		MW14-D15	15/19/23	7.3		

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FIELD BORING LOG

Boring No.: **MW14**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Izzy**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 85**
Logged By:	**D. Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**04-01-04**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		SM		MW14-D25	19/22/25	92.5		
	▨		SANDY CLAY: Dark yellowish brown (10YR 4/2), damp, fine sandy clay					
-30		SC		MW14-D30	23/27/30	237.1		
	▨		SANDY CLAY: Dark yellowish brown (10YR 4/2), damp, fine sandy clay					
-35		SC		MW14-D35	19/23/27	30.6		
	▨		SILTY CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp, silty clay					
-40		CL		MW14-D40	20/23/24	0		
-50								

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FIELD BORING LOG

Boring No.: **MW14**
Total Depth: **70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Izzy**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 85**
Logged By:	**D. Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**04-01-04**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well -

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
-55		SM	SILTY SAND: Dark yellowish brown (10YR 4/2), wet, silty, fine to medium sand	MW14-D55	22/50	0		
-60		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), saturated, clayey, fine to coarse sand	MW14-D60	23/25/28	0		
-65		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), saturated, fine to coarse sand		35/50	0		
-70								

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FIELD BORING LOG

Boring No.:	**MW15**
Total Depth:	**70 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**Cascade Drilling, Inc.**
Site Location:	**495 East Commercial Rd.**	Driller:	**Izzy**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 85**
Logged By:	**D. Becker**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**04-02-04**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling -

▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
-5	▨	CL	CLAY (LOW PLASTICITY): Moderate yellowish brown (10YR 5/4), damp clay	MW15-D5	11/15/17	0		
-10	⁘	SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand	MW15-D10	10/12/14	0		
-15	⁘	SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, fine sand	MW15-D15	10/14/18	15 0		

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FIELD BORING LOG

Boring No.: **MW15**
Total Depth: **70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**D. Becker**
Dates Drilled:	**04-02-04**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Izzy**
Rig Type:	**CME 85**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		SC		MW15-D25	17/23/25	13.2		
	▨		SANDY CLAY: Dark yellowish brown (10YR 4/2), damp, fine sandy clay					
-30		SC		MW15-D30	20/24/28	0		
	░		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, silty, fine sand					
-35		SM		MW15-D35	21/23/30	0		
	░		SAND (POORLY GRADED): Dark yellowish brown (10YR 4/2), damp, fine to medium sand					
-40		SP		MW15-D40	16/22/26	16.2		
-[illegible]								

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FIELD BORING LOG

Boring No.:	**MW15**
Total Depth:	**70 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**D. Becker**
Project Manager:	**D. Becker**
Dates Drilled:	**04-02-04**

DRILLING INFORMATION

Drilling Co.:	**Cascade Drilling, Inc.**
Driller:	**Izzy**
Rig Type:	**CME 85**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling

▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
-55		SM	SILTY SAND: Dark yellowish brown (10YR 4/2), wet, silty, fine sand	MW15-D55	35/50	0		
-60		SW	SAND (WELL GRADED): Dark yellowish brown (10YR 4/2), saturated, fine to coarse sand	MW15-D60	24/26/27	0		
-65		SW	SAND (WELL GRADED): Moderate yellowish brown (10YR 5/4), saturated, fine to coarse sand		35/50	0		
-70								

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FIELD BORING LOG

Boring No.:	**MW16**
Total Depth:	**75 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**T. Smith**
Project Manager:	**D. Becker**
Dates Drilled:	**6-10-08**

DRILLING INFORMATION

Drilling Co.:	**JDK Drilling**
Driller:	**Steve**
Rig Type:	**CME 75**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
								Concrete
-5						0		
	⁘		SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, fine to medium sand					
-10		SP		MW16-D10	4/5/6	0		
	⁘		SILTY SAND: Dark yellowish brown (10YR 4/2), damp, silty fine sand					
-15 ▼		SM		MW16-D15	7/8/11	0		

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FIELD BORING LOG

Boring No.: **MW16**
Total Depth: **75 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**JDK Drilling**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75**
Logged By:	**T. Smith**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**6-10-08**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		SC		MW16-D25	7/10/12	0		Sch. 40 PVC Blank Casing
			SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand					
-30		SM		MW16-D30	9/12/14	0		
			SAND (POORLY GRADED): Dark yellowish orange (10YR 6/6), damp, fine to medium sand					
-35		SP		MW16-D35	12/17/23	0		
			SANDY SILT: Dark yellowish brown (10YR 4/2), damp, fine sandy silt					
-40		SM		MW16-D40	14/19/24	0		#3 Sand
-[illegible]	▼							

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FIELD BORING LOG

Boring No.: **MW16**
Total Depth: **75 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**JDK Drilling**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75**
Logged By:	**T. Smith**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**6-10-08**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling

▼ Water level in completed well

-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
-55		SM	SILTY SAND: Dark yellowish brown (10YR 4/2), damp, silty fine sand	MW16-D55	14/17/24	0		Sch. 40 PVC 0.20-inch Screen
-60		SM	SANDY SILT: Pale yellowish brown (10YR 6/2), damp, fine to medium sandy silt	MW16-D60	16/20/28	0		
-65 ▼		SM	SANDY SILT: Dark yellowish brown (10YR 4/2), damp, fine sandy silt	MW16-D65	18/26/35	0		
-70								

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FIELD BORING LOG

Boring No.: **MW16**
Total Depth: **75 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**JDK Drilling**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75**
Logged By:	**T. Smith**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**6-10-08**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.

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FIELD BORING LOG

Boring No.: **MW17**
Total Depth: **75 feet**

PROJECT INFORMATION

Project:	**Eric Realty**
Site Location:	**495 East Commercial Rd.**
Job No.:	**SB 607A7.930**
Logged By:	**T. Smith**
Project Manager:	**D. Becker**
Dates Drilled:	**6-10-08**

DRILLING INFORMATION

Drilling Co.:	**JDK Drilling**
Driller:	**Steve**
Rig Type:	**CME 75**
Method of Drilling:	**10 in. Hollow Stem Auger**
Sampling Methods:	**California Split Spoon**
Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well
-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
0								
								Concrete
-5						0		
	░		FINE SAND: Moderate yellowish brown (10YR 5/4), damp, fine sand					
-10		SW		MW17-D10	6/8/9	0		
	▨		SILTY CLAY (LOW PLASTICITY): Dark yellowish brown (10YR 4/2), moist, silty clay					
-15 -20 -25 ▼		CL		MW17-D15	7/8/10	0		

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FIELD BORING LOG

Boring No.: **MW17**
Total Depth: **75 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**JDK Drilling**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75**
Logged By:	**T. Smith**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**6-10-08**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
		SM		MW17-D25	8/12/14	0		
			SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand					
-30		SM		MW17-D30	10/12/18	0		Sch. 40 PVC Blank Casing
			SILTY SAND: Pale yellowish brown (10YR 6/2), damp, silty fine to coarse sand					
-35		SM		MW17-D35	13/17/24	0		
			SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine sand					
-40		SM		MW17-D40	13/19/22	0		
-[illegible]	▼							

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FIELD BORING LOG

Boring No.: **MW17**
Total Depth: **75 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**JDK Drilling**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75**
Logged By:	**T. Smith**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**6-10-08**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling
▼ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.
-55		SM	SILTY SAND: Moderate yellowish brown (10YR 5/4), damp, silty fine to medium sand	MW17-D55	18/25/31	0		0.20-inch Sch. 40 PVC Screen
-60		SM	SILTY SAND: Dark yellowish brown (10YR 4/2), damp, silty fine to medium sand	MW17-D60	18/26/29	0		
-65 ▼		SP	SAND (POORLY GRADED): Moderate yellowish brown (10YR 5/4), damp, fine to medium sand	MW17-D65	15/21/26	0		
-70								

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FIELD BORING LOG

Boring No.:	**MW17**
Total Depth:	**75 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
Project:	**Eric Realty**	Drilling Co.:	**JDK Drilling**
Site Location:	**495 East Commercial Rd.**	Driller:	**Steve**
Job No.:	**SB 607A7.930**	Rig Type:	**CME 75**
Logged By:	**T. Smith**	Method of Drilling:	**10 in. Hollow Stem Auger**
Project Manager:	**D. Becker**	Sampling Methods:	**California Split Spoon**
Dates Drilled:	**6-10-08**	Hammer Wt./Drop	**140 LB., 30 IN.**

NOTES:

▽ Water level during drilling

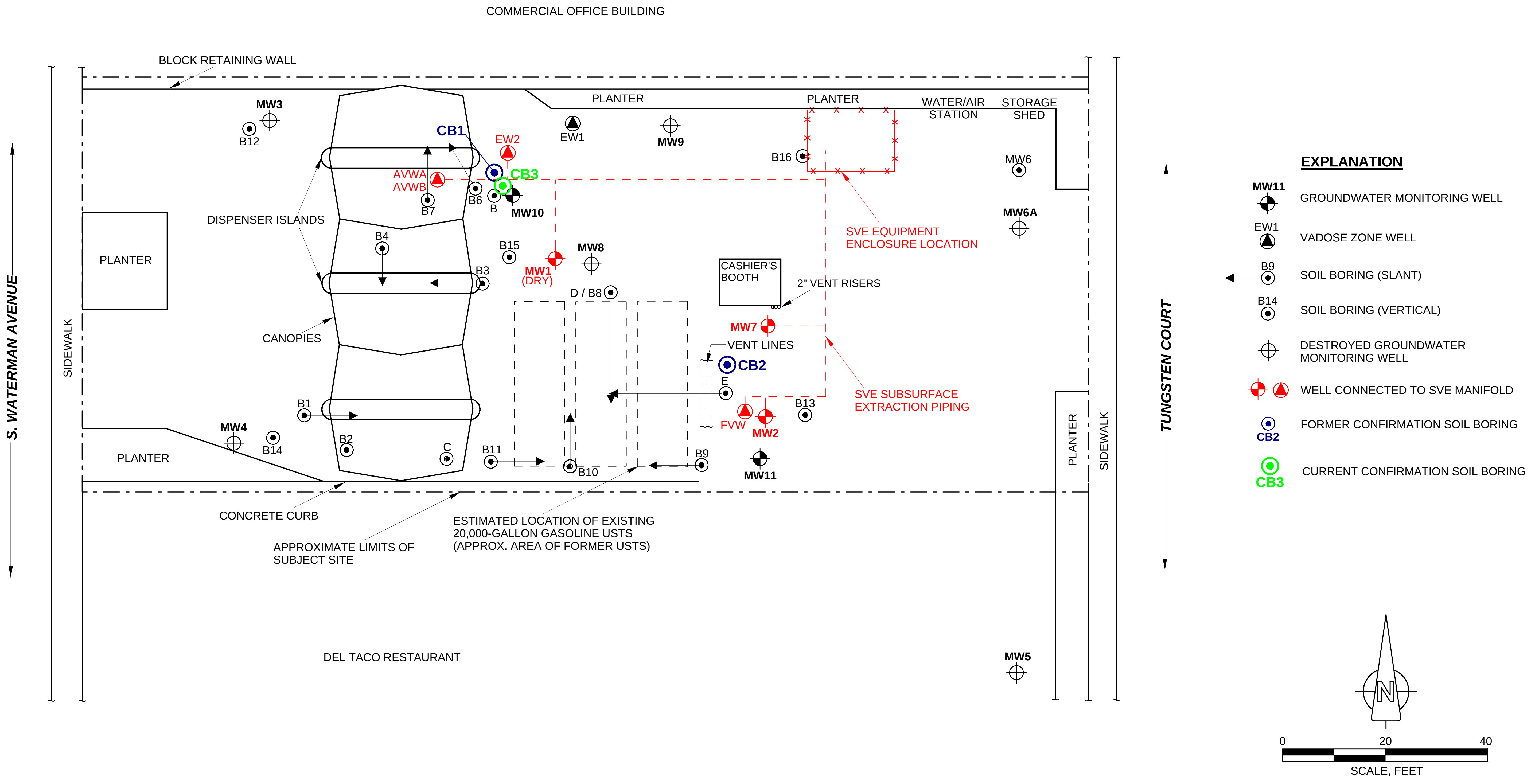
▼ Water level in completed well

-

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	SAMPLE NUMBER	Blows /6 in.	PID ppmv	BORING COMPLETION	WELL DESC.

APPENDIX C2.11

Food N Fuel
GeoTracker Case I.D. T0607100528



ALTA EM, INC.
EXPERT ENVIRONMENTAL SOLUTIONS

TITLE:
AREA OF INVESTIGATION

PROJECT:
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

DRAWN BY: D. KAWASAKI
CHECKED BY: R. HANSEN
PROJ. NO.: 01437-01
DATE: FEB 2012
FIGURE NO.: **2**

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LOG OF BORING A

(Page 1 of 3)

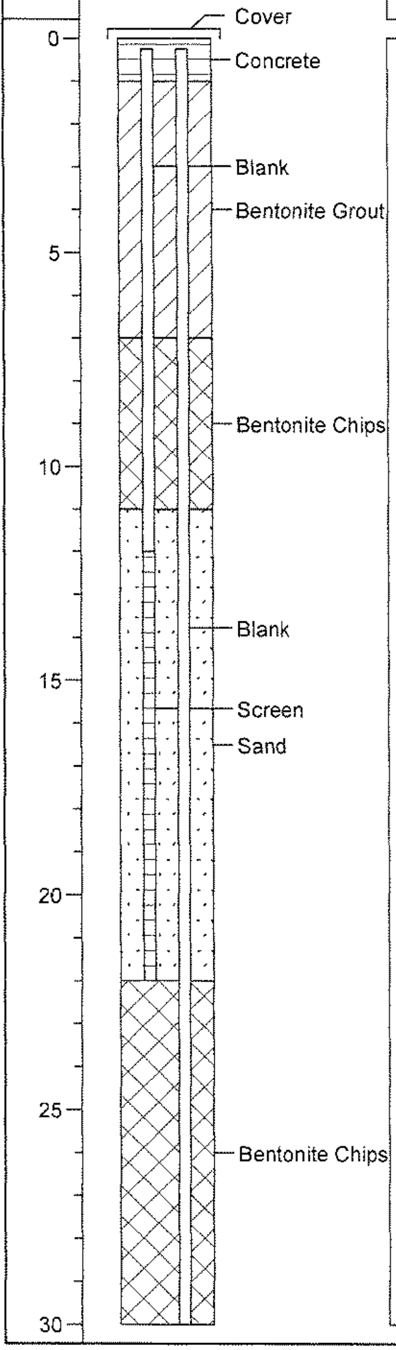
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 10/20 - 10/21/05 - DK	Casing	: 2" PVC
Hole Diameter	: 8"	Screen Interval	: AVWA: 12-22
Drilling Method	: Hollow-Stem Auger (LAR)	Screen Interval	: AVWB: 35-55
Sampling Method	: Standard Penetrometer	Sand Type	: #3 Monterey
Well Screen	: 0.020		

Well1: AVWA
Well2: AVWB
Elev.: N/A

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Concrete surface		Drilling with limited access rig.
3								Strong gasoline odor in cuttings @ 3'.
5	16	▨	A-5		SP	Moderate to dark yellowish-brown, damp, medium-dense, fine SAND; w/ minor silt	1,934	Strong gasoline odor in 5' sample.
10								No recovery at 10'.
11	24	▨	A-11		ML	Moderate to dark yellowish-brown, damp, very stiff, sandy SILT	939	Strong hydrocarbon odor in 11' sample.
15	21	▨	A-15		SM	Moderate yellowish-brown, damp, medium-dense, silty fine SAND	1,256	Strong hydrocarbon odor in 15' sample.
20	21	▨	A-20		ML	Dark yellowish-brown, damp, very stiff, sandy SILT; w/ minor clay	3,425	Strong gasoline odor in 20' sample.
25	18	▨	A-25		SM	Dark yellowish-brown, damp, medium-dense, silty fine SAND; w/ minor clay	3,825	Strong gasoline odor in 25' sample.

ALTA EM, INC.

LOG OF BORING A

(Page 2 of 3)

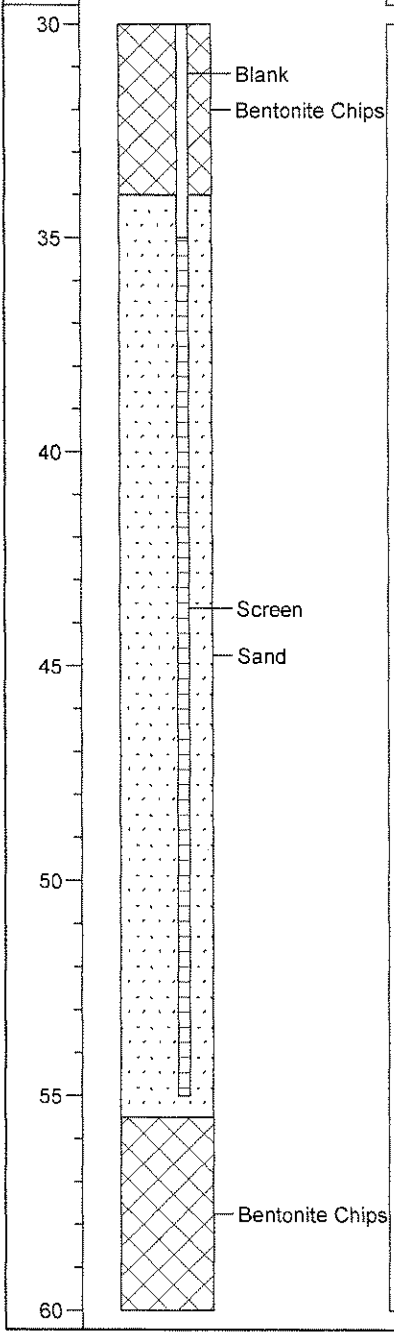
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 10/20 - 10/21/05 - DK
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger (LAR)
Sampling Method : Standard Penetrometer
Well Screen : 0.020
Casing : 2" PVC
Screen Interval : AVWA: 12-22
Screen Interval : AVWB: 35-55
Sand Type : #3 Monterey

Well1: AVWA
Well2: AVWB
Elev.: N/A

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ▤ Grab
- ▭ Other



Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
18	▨	A-30		ML	Dark yellowish-brown, damp, very stiff, SILT; w/ minor fine sand and clay	31.7	Faint to slight hydrocarbon odor in 30' sample.
38	▨	A-35		SM	Dark yellowish-brown, damp, dense, silty fine SAND; w/ trace medium sand	188	Slight hydrocarbon odor in 35' sample.
51	▨	A-40		SM	Dark yellowish-brown, damp, very dense, silty fine SAND	20.5	Faint hydrocarbon odor in 40' sample.
50	▨	A-45		SP	Dark yellowish-brown, damp, dense to very dense, fine SAND w/ minor silt	217	Slight hydrocarbon odor in 45' sample.
							Thin saturated zone at approximately 50'.
68	▨	A-50		SP	Dark yellowish-brown, saturated, dense, fine SAND	10.7	Faint hydrocarbon odor in 50' sample.
				SP	Dark yellowish-brown, moist, very dense, fine SAND		
75	▨	A-55		SP	Dark yellowish-brown, moist, very dense, fine SAND	301	Slight hydrocarbon odor in 55' sample.

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LOG OF BORING A

(Page 3 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

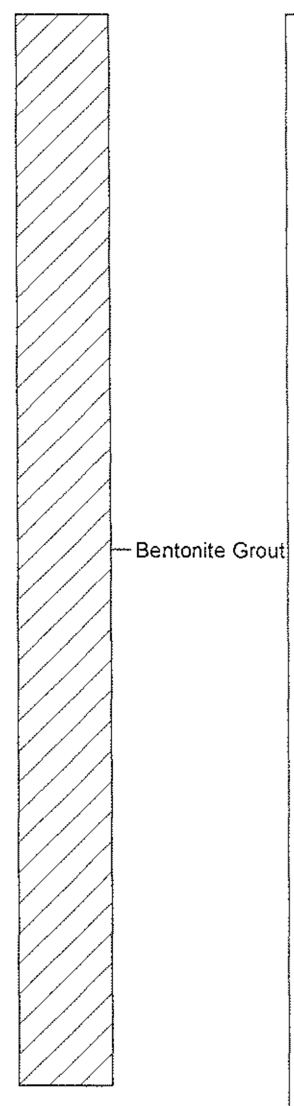
01437-01

Date/Logged by	: 10/20 - 10/21/05 - DK	Casing	: 2" PVC
Hole Diameter	: 8"	Screen Interval	: AVWA: 12-22
Drilling Method	: Hollow-Stem Auger (LAR)	Screen Interval	: AVWB: 35-55
Sampling Method	: Standard Penetrometer	Sand Type	: #3 Monterey
Well Screen	: 0.020		

Well1: AVWA
Well2: AVWB
Elev.: N/A

Sampler Type

- ☒ Split Spoon
- ▨ Standard Penetrometer
- ▤ Grab
- ▣ Other



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
60	80	▨	A-60		SP	Dark yellowish-brown, moist, very dense, fine SAND; w/ minor silt, coarse sand and gravel	143	Slight hydrocarbon odor in 60' sample.
65	50	▨	A-65		SP	Dark yellowish-brown, damp, dense to very dense, fine SAND; w/ trace coarse gravel	2.8	No odor in 65' sample.
								Tighter drilling
70	50	▨	A-70		CL	Dark yellowish-brown, damp, hard, silty CLAY; w/ trace fine sand	<1	No odor in 70' sample.
75	48	▨	A-75		ML	Dark yellowish-brown, damp, hard, clayey SILT	4.5	No odor in 75' sample.
80	49	▨	A-80		SP	Dark yellowish-brown, damp, dense, fine SAND; w/ minor silt	<1	No odor in 80' sample.
85	50	▨	A-85		ML	Grayish-olive, damp, hard, SILT; w/ minor clay and trace fine sand	<1	No odor in 85' sample.
90								

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LOG OF BORING B

(Page 1 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 11/02/05
Boring Depth : 60'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : Standard Penetrometer

Backfill Material : Bentonite Grout
Backfill Interval : 60' - 0'
Logged By : R. Stolberg

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
0			Concrete surface						
5	⁘	SM	Dark yellowish-brown, damp, medium-dense, silty fine SAND	▨	B-5	16	66		Slight hydrocarbon odor in 5' sample.
10	⁘	SM	Dark yellowish-brown, damp, medium-dense, silty fine SAND	▨	B-10	22	---		Slight hydrocarbon odor in 10' sample. Sample is 80% full.
15	⁘	SM	Dark yellowish-brown, damp, medium-dense, silty fine SAND	▨	B-15	29	533		Slight hydrocarbon odor in 15' sample.
20	‖	ML	Dark yellowish-brown, damp, very stiff, sandy SILT; w/ minor clay	▨	B-20	23	64		Slight hydrocarbon odor in 20' sample.
25	‖	ML	Dark yellowish-brown, damp, very stiff, sandy SILT	▨	B-25	25	11		Faint to slight hydrocarbon odor in 25' sample.
30									

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ALTA EM, INC.	**LOG OF BORING B** (Page 2 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 11/02/05
Boring Depth : 60'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : Standard Penetrometer

Backfill Material : Bentonite Grout
Backfill Interval : 60' - 0'
Logged By : R. Stolberg

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
30		ML	Dark yellowish-brown, damp, very stiff, sandy SILT	▨	B-30	27	6		No odor in 30' sample.
35		SP	Moderate yellowish-brown, damp, medium-dense, fine SAND	▨	B-35	27	15		Faint hydrocarbon odor in 35' sample.
40		SM	Moderate yellowish-brown, damp, dense, silty fine SAND	▨	B-40	31	2		No odor in 40' sample.
45		SP	Moderate yellowish-brown, damp, dense, fine SAND	▨	B-45	34	5		No odor in 45' sample.
50		ML	Moderate yellowish-brown, damp, moist, very stiff, SILT; w/ minor clay	▨	B-50	26	<1		No odor in 50' sample.
55		SP	Moderate yellowish-brown, damp, dense, fine SAND	▨	B-55	38	<1		No odor in 55' sample.
60									

ALTA EM, INC.	LOG OF BORING B (Page 3 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 11/02/05
Boring Depth : 60'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : Standard Penetrometer
Backfill Material : Bentonite Grout
Backfill Interval : 60' - 0'
Logged By : R. Stolberg

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
60		SP	Light yellowish-brown, damp, very dense, fine SAND	▨	B-60	50	<1		No odor in 60' sample.
65									
70									
75									
80									
85									
90									

07-16-2008 C:°OCUME~1\AEM2\MYDOCU~1\BORING~1\BORING~1\1437-01\B.BOR

ALTA EM, INC.	LOG OF BORING C (Page 1 of 3)
FOOD N' FUEL 2649 S. WATERMAN AVENUE SAN BERNARDINO, CALIFORNIA 01437-01	Date Drilled : 10/20/05 Boring Depth : 60' Hole Diameter : 8" Drilling Method : Hollow-Stem Auger (LAR) Sampling Method : Standard Penetrometer Backfill Material : Bentonite Grout Backfill Interval : 60' - 0' Logged By : R. Stolberg

Sampler Type

⊠ Split Spoon

▨ Standard Penetrometer

☰ Grab

▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
0			Concrete surface						Drilled with limited access rig.
5		SM	Olive green, damp, medium-dense, silty very fine SAND	▨	C-5	24	27		Faint to slight hydrocarbon odor in 5' sample.
10		SP	Dark yellowish-brown, damp, medium-dense, fine SAND; with minor silt	▨	C-10	29	12		Faint hydrocarbon odor in 10' sample.
15		SP	Moderate yellowish-brown, damp, medium dense to dense, fine SAND	▨	C-15	30	82		Slight hydrocarbon odor in 15' sample.
20		ML	Moderate yellowish-brown, damp, hard, sandy SILT; w/ minor clay	▨	C-20	36	84		Slight hydrocarbon odor in 20' sample.
25		ML	Moderate yellowish-brown, damp, hard, sandy SILT; w/ minor clay	▨	C-25	36	29		Faint hydrocarbon odor in 25' sample.
30									

ALTA EM, INC.

LOG OF BORING C

(Page 2 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 10/20/05
Boring Depth : 60'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger (LAR)
Sampling Method : Standard Penetrometer

Backfill Material : Bentonite Grout
Backfill Interval : 60' - 0'
Logged By : R. Stolberg

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
▤ Grab
▣ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
30		ML	Dark yellowish-brown, damp, very stiff to hard, sandy SILT; w/ some clay	▨	C-30	32	12		Faint hydrocarbon odor in 30' sample.
35		ML	Dark yellowish-brown, damp, hard, clayey SILT; w/ trace fine sand	▨	C-35	47	<1		No odor in 35' sample.
40		SP	Moderate yellowish-brown, damp, dense, fine SAND	▨	C-40	34	3		No odor in 40' sample.
45		SM	Moderate yellowish-brown, damp, medium dense, silty fine SAND; w/ minor clay	▨	C-45	24	<1		No odor in 45' sample.
50		SP	Moderate yellowish-brown, damp, very dense, fine SAND; w/ trace silt	▨	C-50	51	<1		No odor in 50' sample.
55		SP	Moderate yellowish-brown, damp, very dense, fine SAND; w/ trace silt	▨	C-55	75	<1		No odor in 55' sample.
60									

ALTA EM, INC.

LOG OF BORING C

(Page 3 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled	: 10/20/05	Backfill Material	: Bentonite Grout
Boring Depth	: 60'	Backfill Interval	: 60' - 0'
Hole Diameter	: 8"	Logged By	: R. Stolberg
Drilling Method	: Hollow-Stem Auger (LAR)		
Sampling Method	: Standard Penetrometer		

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
60	⁘	SP	Moderate yellowish-brown, damp, dense, fine SAND; w/ minor coarse sand	▨	C-60	50	<1		No odor in 60' sample.
65									
70									
75									
80									
85									
90									

ALTA EM, INC.	LOG OF BORING D (SLANT) (Page 1 of 3)
FOOD N' FUEL 2649 S. WATERMAN AVENUE SAN BERNARDINO, CALIFORNIA 01437-01	Date Drilled : 11/02/05 Boring Depth : 60' Hole Diameter : 8.0" Drilling Method : Hollow-Stem Auger Sampling Method : Standard Penetrometer Backfill Material : Bentonite Grout Backfill Interval : 60' - 0' Logged By : D. Kawasaki

Sampler Type
- ⊠ Split Spoon
- ▨ Standard Penetrometer
- ▤ Grab
- ▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
0			Concrete surface						Boring drilled at 21 degree angle from vertical.
5									
			Void from 0 to 16 feet (conductor casing)						Boring drilled through existing 10-inch diameter PVC conductor casing.
10									
15									
		SP	Dark grey, damp, coarse SAND; w/ minor gravel and fine sand	▨	D-18		15		Slight hydrocarbon odor in 18' sample.
20		SP	Dark yellowish-brown, damp, fine SAND	▨	D-20		38		Slight hydrocarbon odor in 20' sample.
		ML	Dark yellowish-brown, damp, sandy SILT	▨	D-23		5		No odor in 23' sample.
25		SM	Moderate yellowish-brown, moist to wet, silty fine SAND	▨	D-25		1		No odor in 25' sample.
30									

ALTA EM, INC.

LOG OF BORING D (SLANT)

(Page 2 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled	: 11/02/05	Backfill Material	: Bentonite Grout
Boring Depth	: 60'	Backfill Interval	: 60' - 0'
Hole Diameter	: 8.0"	Logged By	: D. Kawasaki
Drilling Method	: Hollow-Stem Auger		
Sampling Method	: Standard Penetrometer		

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
30		ML	Moderate yellowish-brown, moist, sandy SILT	▨	D-30		<1		No odor in 30' sample.
35		ML	Dark yellowish-brown, moist to wet, SILT; w/ minor clay and trace fine sand	▨	D-35		<1		No odor in 35' sample.
40		ML	Dark yellowish-brown, damp to moist, SILT; w/ minor clay and trace fine sand	▨	D-40		<1		No odor in 40' sample.
45		SM	Moderate to dark yellowish-brown, damp, silty fine SAND	▨	D-45		<1		No odor in 45' sample.
50		SM	Moderate yellowish-brown, damp, silty fine SAND	▨	D-50		<1		No odor in 50' sample.
55		SP	Light yellowish-brown, damp, fine SAND; w/ minor silt	▨	D-55		<1		No odor in 55' sample.
60									

ALTA EM, INC.

LOG OF BORING D (SLANT)

(Page 3 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled	: 11/02/05	Backfill Material	: Bentonite Grout
Boring Depth	: 60'	Backfill Interval	: 60' - 0'
Hole Diameter	: 8.0"	Logged By	: D. Kawasaki
Drilling Method	: Hollow-Stem Auger		
Sampling Method	: Standard Penetrometer		

Sampler Type

☒ Split Spoon
▨ Standard Penetrometer
▤ Grab
▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
60	⁘	SP	Dark yellowish-brown, damp, fine SAND; w/ minor silt	▨	D-60		<1		No odor in 60' sample.
65									
70									
75									
80									
85									
90									

ALTA EM, INC.	LOG OF BORING E (SLANT)
	(Page 1 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 11/2/05
Boring Depth : 60'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : Standard Penetrometer
Backfill Material : Bentonite Grout
Backfill Interval : 60' - 0'
Logged By : D. Kawasaki

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
▤ Grab
▣ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
0			Concrete surface						Drilled at 22 degree angle from vertical.
5		SP	Moderate yellowish-brown, damp, fine SAND; w/ minor silt	▤	---		---		No odor in 5' cuttings.
10		SP	Dark yellowish-brown, damp, fine SAND; w/ minor silt	▨	E-10		12		Faint hydrocarbon odor in 10' sample.
15		SP	Dark yellowish-brown, damp, fine SAND; w/ minor silt	▨	E-15		57		Slight hydrocarbon odor in 15' sample.
20		SP	Moderate yellowish-brown, damp, fine SAND; w/ some silt	▨	E-20		10		Faint hydrocarbon odor in 20' sample.
25		SM	Moderate yellowish-brown, damp, silty fine SAND	▨	E-25		22		Faint hydrocarbon odor in 25' sample.
30									

ALTA EM, INC.	LOG OF BORING E (SLANT) (Page 2 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 11/2/05
Boring Depth : 60'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : Standard Penetrometer
Backfill Material : Bentonite Grout
Backfill Interval : 60' - 0'
Logged By : D. Kawasaki

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
30		ML	Dark yellowish-brown, damp, sandy SILT	▨	E-30		<1		No odor in 30' sample.
35		ML	Dark yellowish-brown, damp, sandy SILT	▨	E-35		<1		No odor in 35' sample.
40		SP	Dark yellowish-brown, damp, fine SAND w/ minor silt and trace coarse sand	▨	E-40		<1		No odor in 40' sample.
45		SP	Moderate yellowish-brown, damp, fine SAND w/ trace gravel	▨	E-45		<1		No odor in 45' sample.
50		SP	Moderate yellowish-brown, damp, fine SAND; w/ trace gravel	▨	E-50		<1		No odor in 50' sample.
55		SP	Moderate yellowish-brown, damp, fine SAND; w/ minor silt	▨	E-55		2		No odor in 55' sample.
60									

ALTA EM, INC.

LOG OF BORING E (SLANT)

(Page 3 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 11/2/05
Boring Depth : 60'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : Standard Penetrometer

Backfill Material : Bentonite Grout
Backfill Interval : 60' - 0'
Logged By : D. Kawasaki

Sampler Type
- ⊠ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
60	⁘	SP	Dark yellowish-brown, damp, fine SAND	▨	E-60		<1		No odor in 60' sample.
65									
70									
75									
80									
85									
90									

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ALTA EM, INC.

LOG OF BORING CB1

(Page 1 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled	: 04/17/08	Backfill Material	: Bentonite Grout
Boring Depth	: 75'	Backfill Interval	: 75' - 0'
Hole Diameter	: 8"	Logged By	: D. Kawasaki
Drilling Method	: Hollow-Stem Auger		
Sampling Method	: 2" Split Spoon		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ▤ Grab
- ■ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
0			Concrete surface						
5		SM	Moderate yellowish-brown, damp to moist, medium dense, silty fine SAND	☒	CB1-5	21	240		Slight to moderate hydrocarbon odor in 5' sample.
10		SM	Dark yellowish-brown, moist, medium dense, silty fine SAND	☒	CB1-10	21	25		Faint hydrocarbon odor in 10' sample.
15		SM	Moderate yellowish-brown, damp to moist, medium dense, silty fine SAND	☒	CB1-15	25	95		Faint to slight hydrocarbon odor in 15' sample.
20		SP	Moderate yellowish-brown, damp, dense, fine to medium SAND; with trace coarse sand	☒	CB1-20	47	8		No odor in 20' sample.
25		ML	Dark yellowish-brown, damp to moist, hard, sandy SILT; with minor medium sand	☒	CB1-25	56	1		No odor in 25' sample.
30									

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ALTA EM, INC.

LOG OF BORING CB1

(Page 2 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled	: 04/17/08	Backfill Material	: Bentonite Grout
Boring Depth	: 75'	Backfill Interval	: 75' - 0'
Hole Diameter	: 8"	Logged By	: D. Kawasaki
Drilling Method	: Hollow-Stem Auger		
Sampling Method	: 2" Split Spoon		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
30		ML	Dark yellowish-brown, damp, very stiff, SILT; with minor fine sand	☒	CB1-30	47	3		No odor in 30' sample.
35		SP	Moderate yellowish-brown, damp, very dense, fine SAND	☒	CB1-35	56	1		No odor in 35' sample.
40		SM	Moderate yellowish-brown, damp, very dense, silty fine SAND	☒	CB1-40	52	1		No odor in 40' sample.
45		SM	Moderate yellowish-brown, damp, very dense, silty fine SAND	☒	CB1-45	63	1		No odor in 45' sample.
50		SP	Light yellowish-brown, damp, very dense, fine SAND	☒	CB1-50	60	<1		No odor in 50' sample.
55		SP	Light yellowish-brown, damp, very dense, fine to medium SAND; with trace coarse sand	☒	CB1-55	82	<1		No odor in 55' sample.
60									

ALTA EM, INC.

LOG OF BORING CB1

(Page 3 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 04/17/08
Boring Depth : 75'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : 2" Split Spoon

Backfill Material : Bentonite Grout
Backfill Interval : 75' - 0'
Logged By : D. Kawasaki

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
60		SP	Light yellowish-brown, damp to moist, dense to very dense, fine to medium SAND; with trace gravel	☒	CB1-60	50	<1		No odor in 60' sample.
65		SP	Light yellowish-brown, damp, fine SAND; with some medium to coarse SAND; and minor gravel	☒	CB1-65	85	<1		No odori n 65' sample.
70		ML	Moderate yellowish-brown, damp, hard, SILT; with minor clay	☒	CB1-70	87	<1		No odor in 70' sample.
75		ML	Moderate olive-brown, damp to moist, hard, SILT	☒	CB1-75	49	<1		No odor in 75' sample.
80									
85									
90									

ALTA EM, INC.

LOG OF BORING CB2

(Page 1 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 04/17/08
Boring Depth : 75'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : 2" Split Spoon

Backfill Material : Bentonite Grout
Backfill Interval : 75' - 0'
Logged By : D. Kawasaki

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
0			Concrete surface						
5		SP	Moderate yellowish-brown, damp, dense, fine SAND; with minor silt	☒	CB2-5	48	<1		No odor in 5' sample.
10		ML	Dark yellowish-brown, damp to moist, hard, SILT	☒	CB2-10	40	3		No odor in 10' sample.
15		SP	Moderate yellowish-brown, moist, dense, fine SAND	☒	CB2-15	39	5		No odor in 15' sample.
20		SP	Dark yellowish-brown, damp to moist, dense, fine SAND	☒	CB2-20	38	<1		No odor in 20' sample.
25		SM	Dark yellowish-brown, moist, dense, silty fine SAND; with some medium sand	☒	CB2-25	38	<1		No odor in 25' sample.
30									

ALTA EM, INC.

LOG OF BORING CB2

(Page 2 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 04/17/08
Boring Depth : 75'
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : 2" Split Spoon

Backfill Material : Bentonite Grout
Backfill Interval : 75' - 0'
Logged By : D. Kawasaki

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
▤ Grab
▣ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
30		ML	Dark yellowish-brown, moist, very stiff, SILT	☒	CB2-30	30	1		No odor in 30' sample.
35		ML	Dark yellowish-brown, moist, very stiff, SILT	☒	CB2-35	26	<1		No odor in 35' sample.
40		ML	Dark yellowish-brown, moist, very stiff, SILT; with minor fine sand	☒	CB2-40	28	<1		No odor in 40' sample.
45		SP	Dark yellowish-brown, moist, very dense, fine SAND; with minor silt	☒	CB2-45	54	<1		No odor in 45' sample.
50		SP	Dark yellowish-brown, moist, dense, fine SAND; with minor silt	☒	CB2-50	48	<1		No odor in 50' sample.
55		SP	Moderate yellowish-brown, damp to moist, very dense, fine SAND; with some medium sand, minor coarse sand and trace gravel	☒	CB2-55	58	<1		No odor in 55' sample.
60									

ALTA EM, INC.

LOG OF BORING CB2

(Page 3 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled	: 04/17/08	Backfill Material	: Bentonite Grout
Boring Depth	: 75'	Backfill Interval	: 75' - 0'
Hole Diameter	: 8"	Logged By	: D. Kawasaki
Drilling Method	: Hollow-Stem Auger		
Sampling Method	: 2" Split Spoon		

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
60		SP	Moderate yellowish-brown, damp to moist, very dense, fine SAND; with some medium sand, minor coarse sand and trace gravel	☒	CB2-60	79	<1		No odor in 60' sample. Driller reports gravelly zone at 60'. Much slower drilling.
		GP	Gravel						
65		SP	Moderate yellowish-brown, damp, very dense, fine SAND; with minor medium and coarse sand	☒	CB2-65	87	<1		No odori n 65' sample.
70		SP	Dark yellowish-brown, damp to moist, very dense, fine SAND; with some medium to coarse sand and gravel	☒	CB2-70	85	<1		No odor in 70' sample.
75		ML	Moderate olive-brown, moist, hard, SILT	☒	CB2-75	64	<1		No odor in 75' sample.
80									
85									
90									

ALTA EM, INC.

LOG OF BORING CB3

(Page 1 of 2)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 02/14/12
Boring Depth : 40'
Hole Diameter : 1.25"
Drilling Method : Direct Push (GeoProbe 6600)
Sampling Method : 1.0" Piston Sampler

Backfill Material : Bentonite Chips
Backfill Interval : 40' - 0'
Logged By : D. Kawasaki

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
0			6" Concrete Surface						
5		SM	Moderate yellowish-brown, damp, silty fine SAND	▪	CB3-5	---	<1		No odor in 5' sample.
10		SM	Moderate yellowish-brown, damp, silty fine SAND	▪	CB3-10	---	<1		No odor in 10' sample.
15		ML	Dark yellowish-brown, damp to moist, sandy SILT	▪	CB3-15	---	<1		No odor in 15' sample.
20		ML	Dark yellowish-brown, damp to moist sandy SILT	▪	CB3-20	---	<1		No odor in 20' sample.
25		SM	Moderate yellowish-brown, damp to moist, silty fine SAND	▪	CB3-25	---	<1		No odor in 25' sample.
30									

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ALTA EM, INC.

LOG OF BORING CB3

(Page 2 of 2)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 02/14/12
Boring Depth : 40'
Hole Diameter : 1.25"
Drilling Method : Direct Push (GeoProbe 6600)
Sampling Method : 1.0" Piston Sampler
Backfill Material : Bentonite Chips
Backfill Interval : 40' - 0'
Logged By : D. Kawasaki

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ■ ■ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
30		ML	Dark yellowish-brown, damp to moist, sandy SILT	■	CB3-30	---	<1		No odor in 30' sample.
35		SP	Dark yellowish-brown, damp to moist, fine SAND; with minor silt and medium to coarse sand	■	CB3-35	---	1		No odor in 35' sample.
40		SM	Dark yellowish-brown, damp to moist, silty fine SAND; with minor medium to coarse sand	■	CB3-40	---	<1		No odor in 40' sample.
45									
50									
55									
60									

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ALTA EM, INC.

LOG OF BORING FVW

(Page 1 of 2)

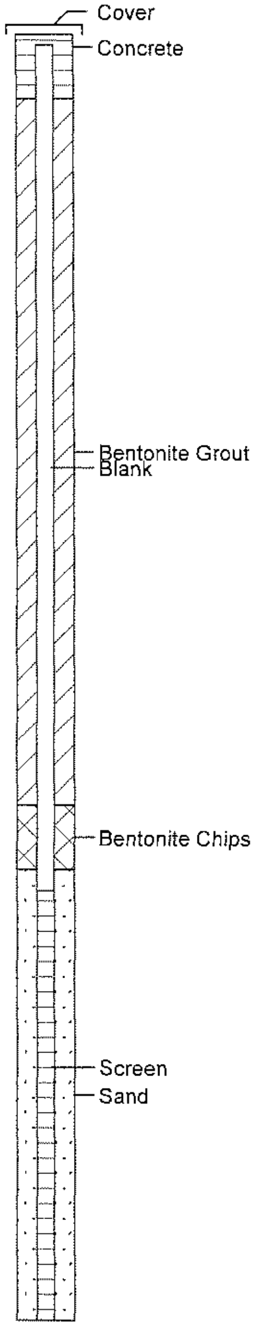
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 11/07/06 - D. Kawasaki	Casing	: 2" PVC
Hole Diameter	: 8"	Screen Interval	: 20' - 35'
Drilling Method	: Hollow-Stem Auger	Sand Type	: #3 Monterey Sand
Sampling Method	: N/A		
Well Screen	: 0.020" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ▤ Grab
- ▣ Other

Well: FVW
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Concrete: 6 Inches		
5	---	▤	---		SM	Cuttings at 5': Dark yellowish-brown, damp, silty fine SAND; with trace coarse sand	<1	No odor in 5' cuttings.
10	---	▤	---		SM	Cuttings at 10': Dark yellowish-brown, damp, silty fine SAND; with trace coarse sand and gravel	<1	No odor in 10' cuttings.
15	---	▤	---		SM	Cuttings at 15': Dark yellowish-brown, damp, silty fine SAND; with minor medium and trace coarse sand	24	Faint hydrocarbon odor in 15' cuttings.
20	---	▤	---		SM	Cuttings at 20': Dark yellowish-brown, damp to moist, silty fine SAND; with minor gravel	2,700	Strong gasoline odor in 20' cuttings.
25	---	▤	---		ML	Cuttings @ 25': Dark yellowish-brown, damp to moist, sandy SILT; with minor clay	500	Strong gasoline odor in 25' cuttings.
30								

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ALTA EM, INC.

LOG OF BORING FVW

(Page 2 of 2)

FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

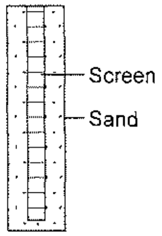
01437-01

Date/Logged by : 11/07/06 - D. Kawasaki
Hole Diameter : 8"
Drilling Method : Hollow-Stem Auger
Sampling Method : N/A
Well Screen : 0.020" Factory Slotted

Casing : 2" PVC
Screen Interval : 20' - 35'
Sand Type : #3 Monterey Sand

Sampler Type
⊠ Split Spoon
▨ Standard Penetrometer
▤ Grab
▣ Other

Well: FVW
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
30	---	▤	---		ML	Cuttings @ 30': Dark yellowish-brown, damp to moist, sandy SILT; with minor clay	110	Moderate gasoline odor in 30' cuttings.
35								
40								
45								
50								
55								
60								

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ALTA EM, INC.

LOG OF BORING MW1

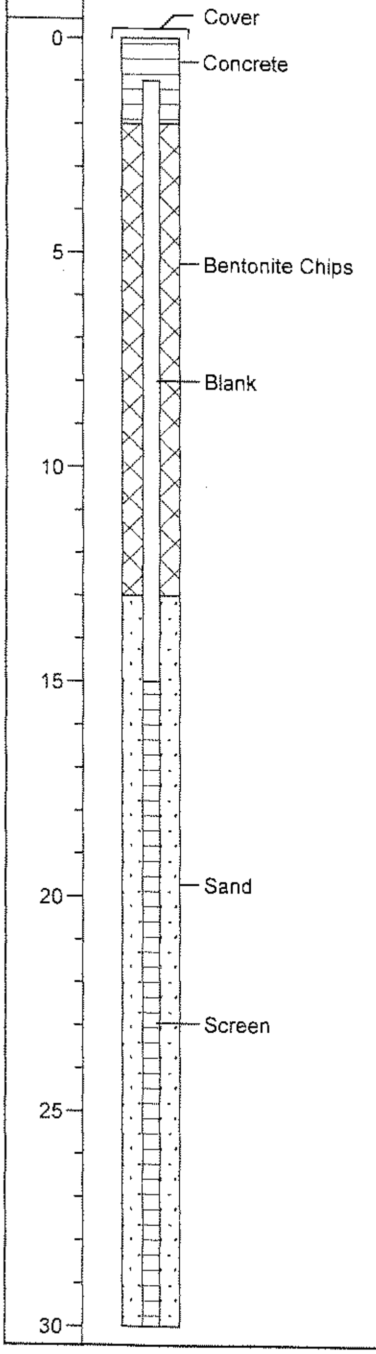
(Page 1 of 3)

FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 11/26/01 - R. Hansen
Hole Diameter : 11-inch
Drilling Method : Hollow-Stem
Sampling Method : 2.0" Split Spoon
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 15' - 80'
Sand Type : #2/12 Monterey Sand

Well: MW1
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Concrete: 7 Inches		
								Driller reports odor at 4' in post hole cuttings.
5	11	☒	MW1-5		SP	Olive-brown, damp, firm, very fine SAND; with some silt	N/R	No odor in 5' sample. OVM malfunctioning.
					SP	Light brown, damp, loose, fine sand; with trace medium sand		
10	12	☒	MW1-10		SP	Olive-brown, damp, medium-dense, fine SAND; with interbedded layers of fine to coarse sand	N/R	Slight petroleum hydrocarbon odor in 10' sample.
15	15	☒	MW1-15		ML	Brown, moist, stiff, clayey SILT; with minor fine sand	N/R	No odor in 15' sample.
20	15	☒	MW1-20		ML	Same as 15' sample; with interbedded layers of clayey fine SAND	N/R	No odor in 20' sample.
25	17	☒	MW1-25		CL	Brown, moist to wet, very stiff silty CLAY; with interbedded layers of sandy clay	N/R	No odor in 25' sample.
30								

ALTA EM, INC.

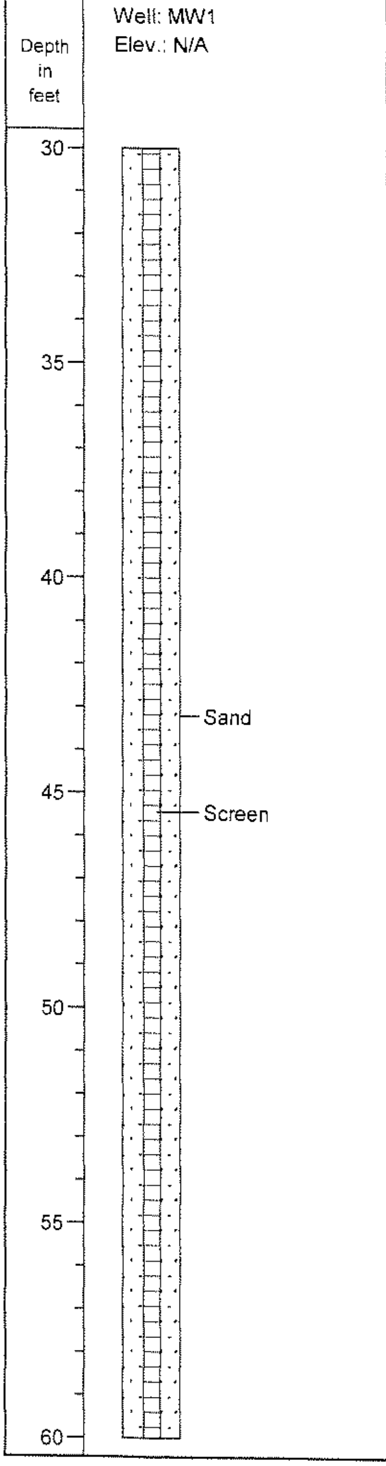
LOG OF BORING MW1

(Page 2 of 3)

FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 11/26/01 - R. Hansen	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11-inch	Screen Interval	: 15' - 80'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 2.0" Split Spoon		
Well Screen	: 0.010" Factory Slotted		



Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
17	☒	MW1-30		ML	Brown, damp to moist, very stiff, clayey SILT	N/R	No odor in 30' sample.
17	☒	MW1-35		ML	Same as 30' sample	N/R	No odor in 35' sample.
20	☒	MW1-40		ML	Brown, damp to moist, very stiff, SILT	N/R	No odor in 40' sample.
19	☒	MW1-45		SP	Brown, damp to moist, medium-dense, fine SAND; with minor silt	N/R	No odor in 45' sample.
22	☒	MW1-50		SM	Brown, wet, medium-dense, silty very fine SAND	N/R	No odor in 50' sample.
27	☒	MW1-55		SP	Light-brown, damp, medium-dense, fine SAND; no fines, trace medium sand	N/R	No odor in 55' sample.

ALTA EM, INC.

LOG OF BORING MW1

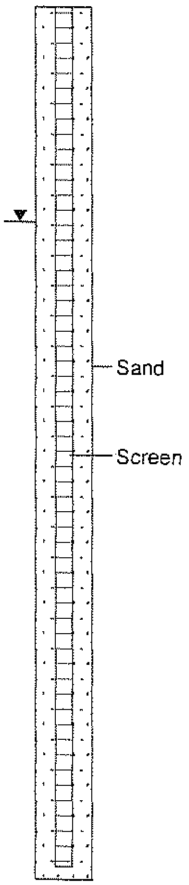
(Page 3 of 3)

FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 11/26/01 - R. Hansen
Hole Diameter : 11-inch
Drilling Method : Hollow-Stem
Sampling Method : 2.0" Split Spoon
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 15' - 80'
Sand Type : #2/12 Monterey Sand

Well: MW1
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
60	50 (1")	☒						No recovery at 60'
65	69 (10")	☒	MW1-65		SP	Grey-brown, saturated, very dense gravelly fine to medium SAND; gravel is fine to coarse and subangular	N/R	Gravel at 65'. No odor in 65' sample. A few inches of water on 65' sample. Groundwater encountered at approx 65'.
70	67 (8")	☒	MW1-70		SP	Brown, saturated, very dense silty gravelly fine SAND; mucky	N/R	Gravel at 70'. No odor in 70' sample.
75								8' of water on down-hole hammer.
80								
85								
90								

ALTA EM, INC.

LOG OF BORING MW2

(Page 1 of 3)

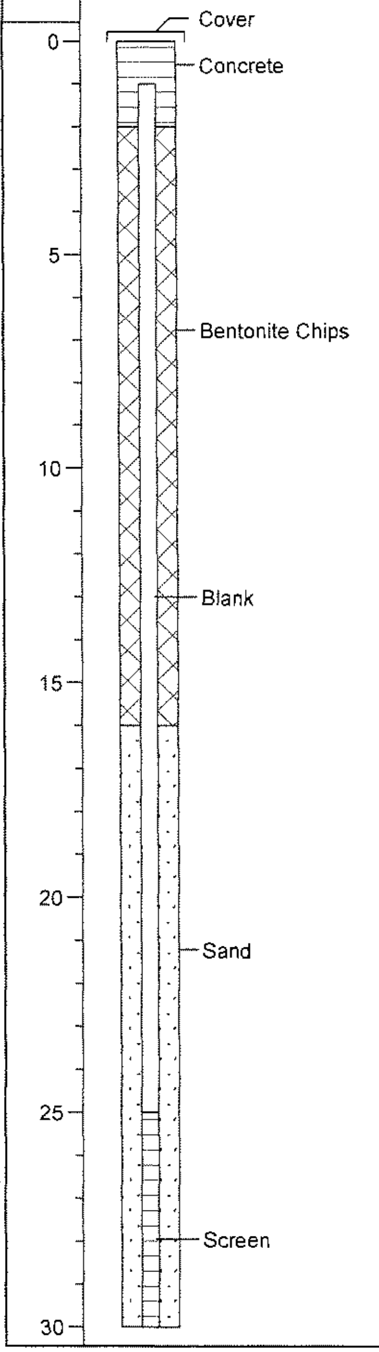
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 11/26 & 11/27 - D. Kawasaki
Hole Diameter : 11-inch
Drilling Method : Hollow-Stem
Sampling Method : 2.0" Split Spoon
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 25' - 75'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Well: MW2
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Concrete: 7 Inches		
5								
						Cuttings at 6': Brown, moist, stiff, silty fine SAND		No odor in 6' cuttings.
10	9	☒	MW2-10		SM	Brown, damp to moist, loose, silty fine SAND	<1	No odor in 10' sample.
15								
20	20	☒	MW2-20		SM	Brown, damp to moist, medium-dense, silty fine SAND	115	Slight aromatic odor in 20' sample.
25								
30								

ALTA EM, INC.

LOG OF BORING MW2

(Page 2 of 3)

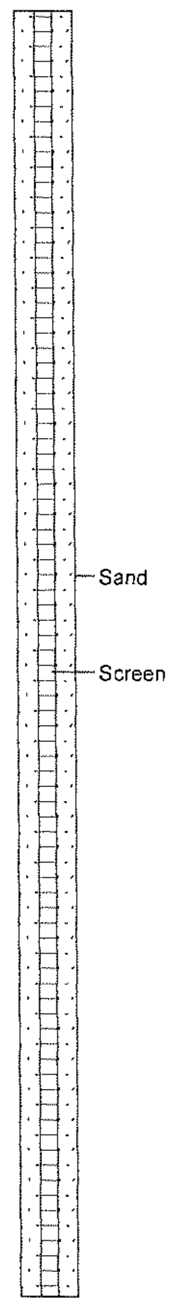
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 11/26 & 11/27 - D. Kawasaki
Hole Diameter : 11-inch
Drilling Method : Hollow-Stem
Sampling Method : 2.0" Split Spoon
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 25' - 75'
Sand Type : #2/12 Monterey Sand

Well: MW2
Elev.: N/A

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
30	20	☒	MW2-30	ML	Brown, damp to moist, very stiff, sandy SILT; with some clay	N/R	Slight aromatic odor in 30' sample. OVM malfunctioning.
35							
40	19	☒	MW2-40	SM	Brown, damp to moist, medium-dense, silty fine SAND; with trace medium sand	N/R	Slight aromatic odor in 40' sample.
45							
50	23	☒	MW2-50	ML	Brown, damp to moist, very stiff, sandy SILT; with some clay	N/R	No odor in 50' sample.
55							
60							

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ALTA EM, INC.

LOG OF BORING MW2

(Page 3 of 3)

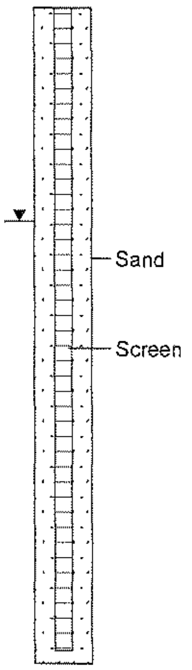
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 11/26 & 11/27 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11-inch	Screen Interval	: 25' - 75'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 2.0" Split Spoon		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
▤ Grab
▣ Other

Well: MW2
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
60	20	☒	MW2-60	SP	Light brown, damp to moist, medium dense, fine SAND; no fines	<1	No odor in 60' sample.
65	21	☒	MW2-65	SP	Light brown-grey, saturated, medium dense, medium SAND; with some gravel and minor silt	<1	No odor in 65' sample. Groundwater encountered at approx 65'.
70	62 (10")	☒	MW2-70	SP	Same as 65' sample	<1	3" rock at bottom of sampler. No odor in 70' sample.
							Much tighter drilling than in boring MW1 from 30' deep to bottom.
75							Drillers mistakenly brought sand up to 16' versus 23'.
80							
85							
90							

ALTA EM, INC.

LOG OF BORING MW3

(Page 1 of 3)

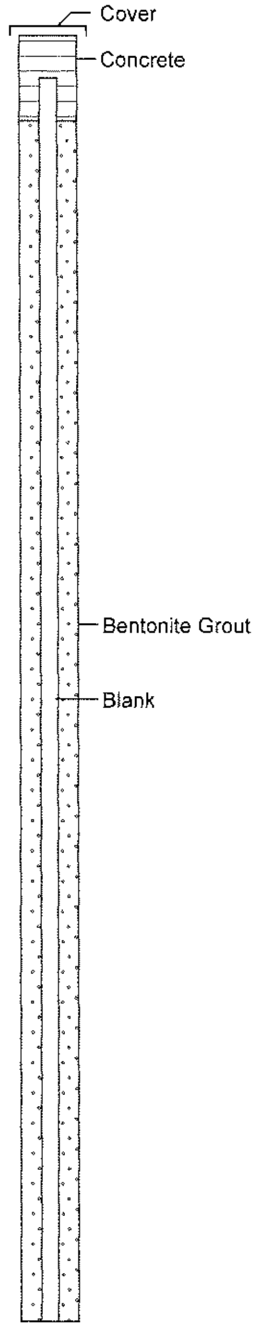
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 11/27/01 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11-inch	Screen Interval	: 50'-75'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 2.0" Split Spoon		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ⊠ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ■ Other

Well: MW3
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Concrete: 7 Inches		
5	10	⊠	MW3-5		SP	Brown, damp to moist, loose, fine SAND; with some silt	2	No odor in 5' sample.
10	11	⊠	MW3-10		SM	Brown, damp to moist, loose, silty fine SAND	1	No odor in 10' sample.
15	9	⊠	MW3-15		SP	Light brown, damp to moist, loose, fine SAND; with trace medium sand	10	No odor in 15' sample.
20	22	⊠	MW3-20		SP	Light brown, damp, loose, gravelly fine SAND, with trace medium sand	5	No odor in 20' sample.
25	16	⊠	MW3-25		CL	Dark brown, damp, stiff, silty CLAY	<1	No odor in 25' sample.
30								

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ALTA EM, INC.

LOG OF BORING MW3

(Page 2 of 3)

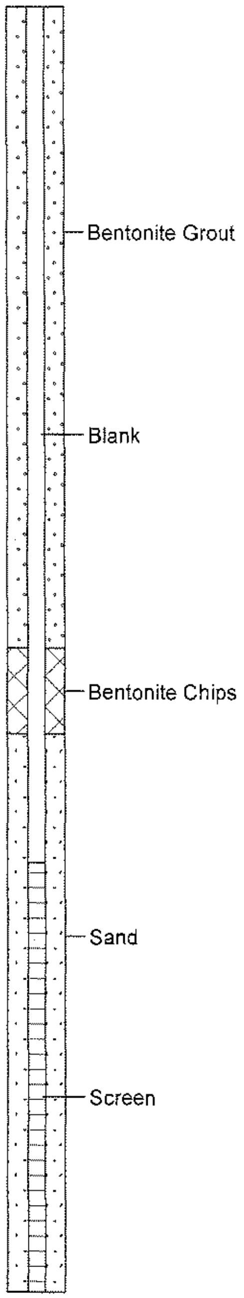
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 11/27/01 - D. Kawasaki
Hole Diameter : 11-inch
Drilling Method : Hollow-Stem
Sampling Method : 2.0" Split Spoon
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 50'-75'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
▤ Grab
▣ Other

Well: MW3
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
30	29	☒	MW3-30		CL	Dark brown, damp, very stiff, silty CLAY	<1	No odor in 30' sample.
35	19	☒	MW3-35		ML SP	Dark Brown, damp, stiff, clayey SILT Brown, damp, medium dense, fine SAND	<1	No odor in 35' sample.
40	29	☒	MW3-40		SP	Brown, damp, medium dense, fine SAND; with trace medium sand	<1	No odor in 40' sample.
45	27	☒	MW3-45		SM	Brown, damp, medium dense, silty fine SAND	<1	No odor in 45' sample.
50	19	☒	MW3-50		SP	Brown, damp, medium dense, fine SAND; with trace medium sand	<1	No odor in 50' sample.
55	30	☒	MW3-55		SP	Light brown, damp, dense, fine SAND; with trace medium sand	<1	No odor in 55' sample.
60								

ALTA EM, INC.

LOG OF BORING MW3

(Page 3 of 3)

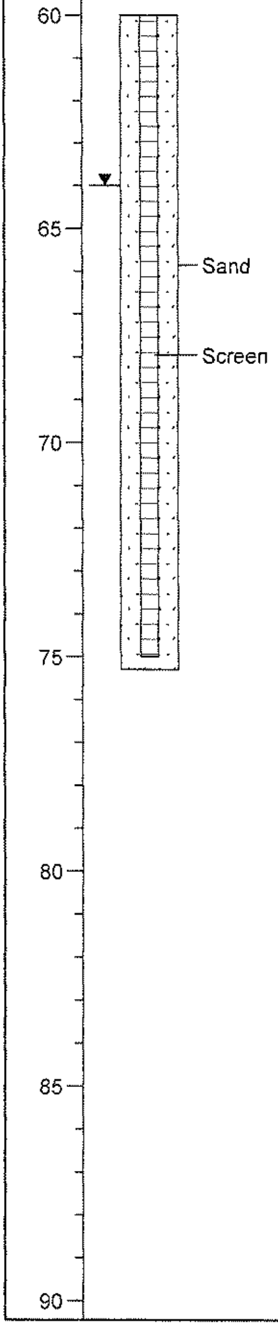
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 11/27/01 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11-inch	Screen Interval	: 50'-75'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 2.0" Split Spoon		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other

Well: MW3
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
60		☒					No recovery at 60'
61	32	☒	MW3-61	SM	Brown, damp, dense, silty SAND	<1	No odor in 61' sample.
65	19	☒	MW3-65	SM	Brown, damp to moist, medium dense, silty SAND; with trace medium sand	<1	No odor in 65' sample. Groundwater encountered at approx 64'.
							Hammer broke between 60' and 65'. Pulled out and drilled down again after hammer retrieval.

ALTA EM, INC.

LOG OF BORING MW4

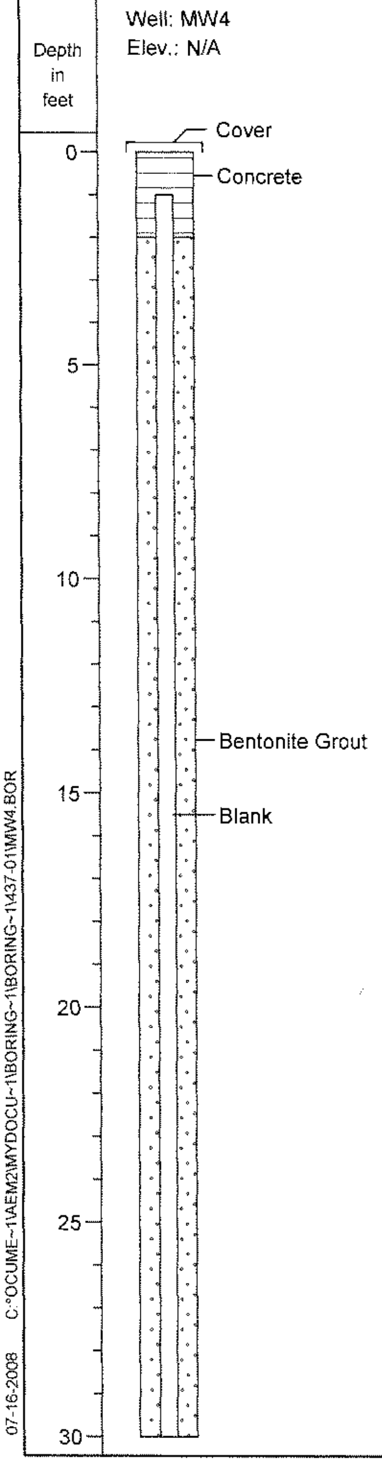
(Page 1 of 3)

FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 11/28/01 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11-inch	Screen Interval	: 50' - 75'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 2.0" Split Spoon		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ▤ Grab
- ▣ Other



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Concrete: 7 Inches		
10	12	☒	MW4-10		SP	Brown, damp to moist, medium dense, fine SAND; with some silt	<1	No odor in 10' sample.
20	10	☒	MW4-20		SP	Brown, damp, loose, fine SAND; with some silt	<1	No odor in 20' sample.

ALTA EM, INC.

LOG OF BORING MW4

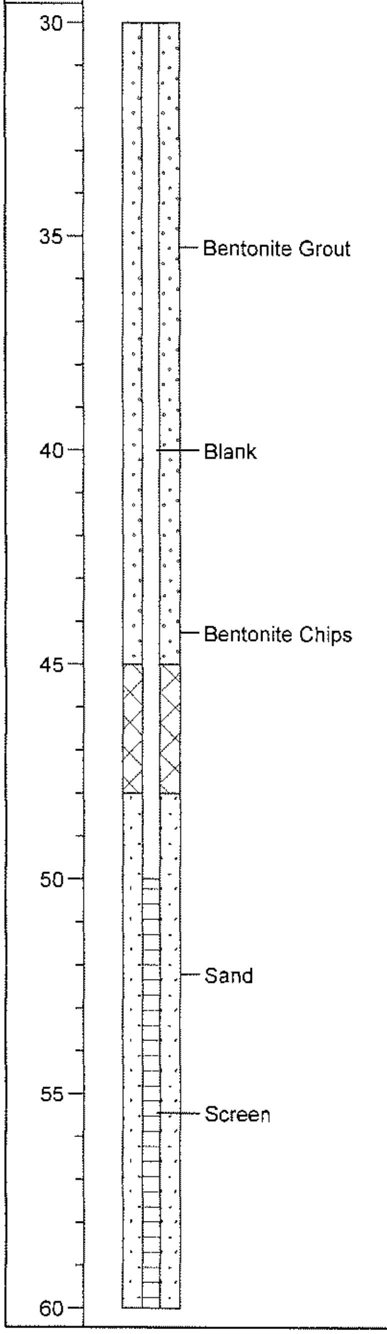
(Page 2 of 3)

FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 11/28/01 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11-inch	Screen Interval	: 50' - 75'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 2.0" Split Spoon		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
30	13	☒	MW4-30	ML	Brown, damp, moist, stiff, clayey SILT	<1	No odor in 30' sample.
40	14	☒	MW4-40	ML	Brown, damp to moist, stiff, SILT; with some clay	<1	No odor in 40' sample.
50	18	☒	MW4-50	SM	Brown, damp to moist, medium dense, silty fine SAND	<1	No odor in 50' sample.
55	20	☒	MW4-55	SP	Light brown, damp, medium dense, gravelly fine SAND; with trace medium sand	<1	No odor in 55' sample.

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ALTA EM, INC.

LOG OF BORING MW4

(Page 3 of 3)

FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

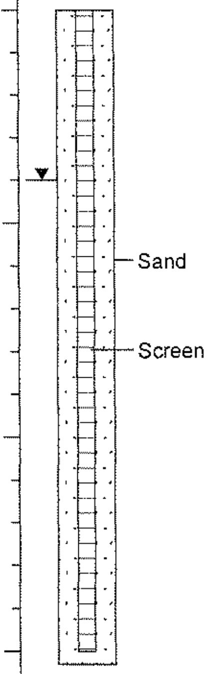
01437-01

Date/Logged by : 11/26/01 - D. Kawasaki
Hole Diameter : 11-inch
Drilling Method : Hollow-Stem
Sampling Method : 2.0" Split Spoon
Well Screen : 0.010" Factory Slotted

Casing : 4.0" Diameter PVC
Screen Interval : 50' - 75'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Well: MW4
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
60	21	☒	MW4-60	SP	Brown, damp, medium dense, gravelly fine SAND; with minor medium sand	4	No odor in 60' sample.
							Groundwater encountered at approx 64'.
65	18	☒	MW4-65	CL	Dark brown, moist to wet, very stiff, sandy CLAY; with trace medium sand	<1	No odor in 65' sample.
70	17	☒	MW4-70	CL	Dark brown, wet to saturated, very stiff, silty CLAY; with some fine sand	<1	No odor in 70' sample.
75	8	☒	MW4-75	ML	Dark brown, saturated, firm, sandy SILT	<1	No odor in 75' sample.
80							
85							
90							

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ALTA EM, INC.

LOG OF BORING MW5

(Page 1 of 4)

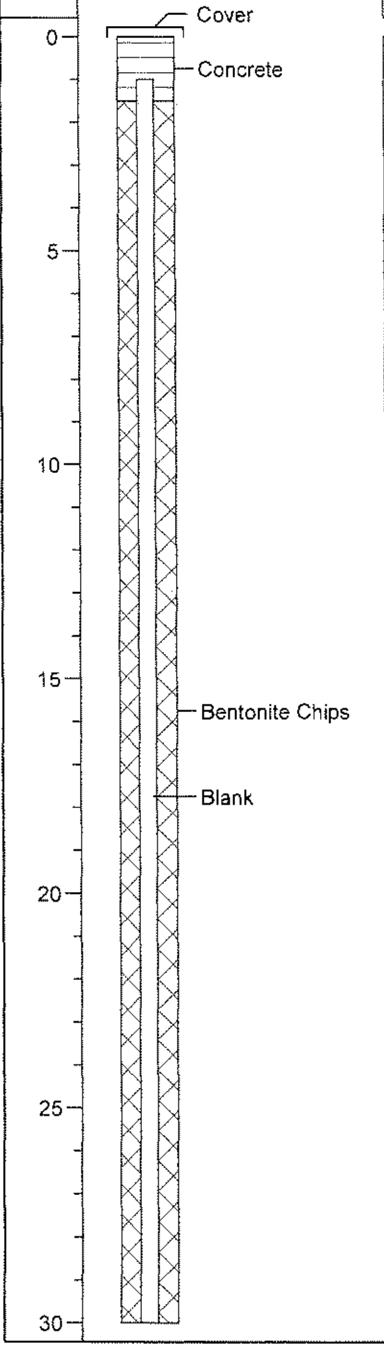
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 3/2/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Well: MW5
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Asphalt Surface		
5	27	▨	MW5-5		SM	Moderate yellowish brown, damp, medium dense, silty fine SAND	<1	No odor or discoloration in 5' sample.
10	43	▨	MW5-10		SP	Moderate yellowish brown, damp, dense, fine SAND; with minor silt	<1	No odor or discoloration in 10' sample.
15	64	▨	MW5-15		SM	Dark yellowish brown, damp, very dense, silty fine SAND	<1	No odor or discoloration in 15' sample.
20	38	▨	MW5-20		SM	Dark yellowish brown, damp, medium dense, silty fine SAND	<1	No odor or discoloration in 20' sample.
25	40	▨	MW5-25		SM	Dark yellowish brown, damp, dense, silty very fine SAND	<1	No odor or discoloration in 25' sample.

ALTA EM, INC.

LOG OF BORING MW5

(Page 2 of 4)

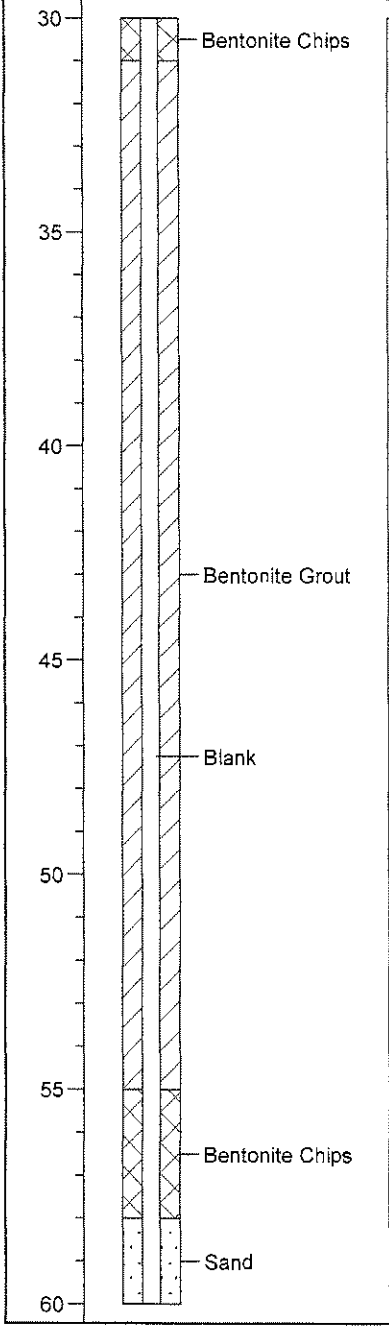
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 3/2/04 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other

Well: MW5
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
30	31	▨	MW5-30	ML	Dark yellowish brown, damp, very stiff, SILT; with minor fine sand	<1	No odor or discoloration in 30' sample.
35	58	▨	MW5-35	SP	Dark yellowish brown, damp, very dense, fine SAND	2	No odor or discoloration in 35' sample.
40	58	▨	MW5-40	SM	Dark yellowish brown, damp, very dense, silty fine SAND	2	No odor or discoloration in 40' sample.
45	56	▨	MW5-45	SP	Dark yellowish brown, damp, very dense, fine SAND; with minor silt	<1	No odor or discoloration in 45' sample.
50	36	▨	MW5-50	ML	Dark yellowish brown, damp, very stiff, sandy SILT	<1	No odor or discoloration in 50' sample.
55	50 (4")	▨	MW5-55	SP	Dark yellowish brown, damp, very dense, fine SAND	<1	No odor or discoloration in 55' sample.

ALTA EM, INC.

LOG OF BORING MW5

(Page 3 of 4)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

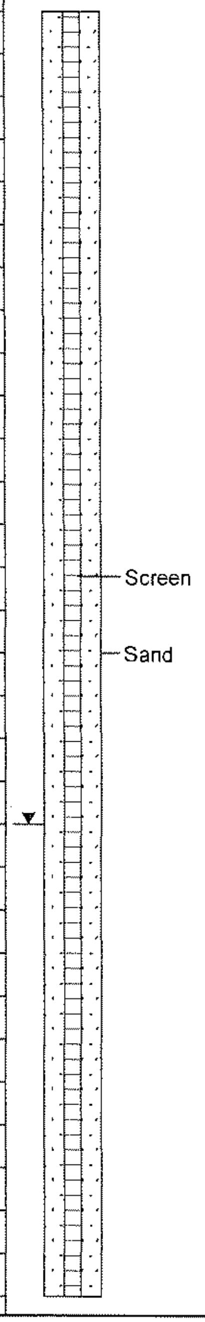
01437-01

Date/Logged by : 3/2/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted

Casing : 4.0" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
▤ Grab
▣ Other

Well: MW5
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
60	47	▨	MW5-60		SP	Moderate yellowish brown, damp, dense, very fine SAND; with minor silt	2	No odor or discoloration in 60' sample.
65	54	▨	MW5-65		SP	Moderate yellowish brown, damp, very dense, very fine SAND; with minor silt	2	No odor or discoloration in 65' sample.
70	84	▨	MW5-70		SP	Dark yellowish orange, damp, very dense, fine SAND; with minor silt and trace coarse sand	<1	No odor or discoloration in 70' sample.
75	51	▨	MW5-75		SP	Dark yellowish orange, moist to wet, very dense, fine SAND	<1	No odor or discoloration in 75' sample.
80	55	▨	MW5-80		SP	Dark yellowish brown, saturated, very dense, fine SAND; with trace gravel	<1	Groundwater at approxitmately 79'. No odor or discoloration in 80' sample.
85	63	▨	MW5-85		ML ML	Dark yellowish brown, saturated, hard, clayey SILT; with minor fine sand. Greyish olive, saturated, hard, SILT; with trace clay	<1	No odor or discoloration in 85' sample.
90								

ALTA EM, INC.

LOG OF BORING MW5

(Page 4 of 4)

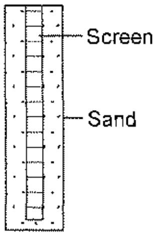
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 3/2/04 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Well: MW5
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
90	46	▨	MW5-90		SP	Dark yellowish brown, saturated, medium dense, medium to coarse SAND	<1	No odor or discoloration in 90' sample.
					CL	Greyish olive, saturated, hard, CLAY; with minor silt		
					CL	Greyish olive, saturated, hard, sandy CLAY; with minor fine sand		
95	50 (5")	▨	MW5-95		SM	Dark yellowish brown, saturated, very dense, silty fine SAND; with minor clay	<1	No odor or discoloration in 95' sample.
100								
105								
110								
115								
120								

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ALTA EM, INC.

LOG OF BORING MW6

(Page 1 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 3/3/04
Boring Depth : 68'
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer

Backfill Material : Bentonite Chips
Backfill Interval : 68' - 0'
Logged By : R. Hansen

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
0			Concrete: 6 inches						
5		SM	Brown, moist, medium dense, silty fine SAND, with interbedded silt layers	▨	MW6-5	32	<1		No odor or discoloration in 5' sample.
10		ML	Brown, moist, stiff, clayey SILT	▨	MW6-10	14	3		No odor or discoloration in 10' sample.
15		SP	Brown, damp, medium dense, fine SAND; with some silt	▨	MW6-15	29	<1		No odor or discoloration in 15' sample.
20		SM	Brown, damp, dense, silty fine SAND; with some coarse sand to fine gravel; with interbedded layers of clayey silt	▨	MW6-20	54	2		No odor or discoloration in 20' sample.
25		ML	Brown, damp, very stiff, SILT; with minor clay	▨	MW6-25	24	3		No odor or discoloration in 25' sample.
30									

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ALTA EM, INC.

LOG OF BORING MW6

(Page 2 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled : 3/3/04
Boring Depth : 68'
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer

Backfill Material : Bentonite Chips
Backfill Interval : 68' - 0'
Logged By : R. Hansen

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
30		ML	Brown, damp, very stiff, clayey SILT	▨	MW6-30	25	2		No odor or discoloration in 30' sample.
35		SP	Yellowish brown, damp, dense, very fine SAND	▨	MW6-35	41	<1		No odor or discoloration in 35' sample.
40		SP	Yellowish brown, damp, dense, fine SAND; no fines and trace medium sand	▨	MW6-40	57	14		No odor or discoloration in 40' sample.
45		SM	Brown, damp, very dense, silty fine SAND; with trace coarse sand and clay	▨	MW6-45	50 (5")	<1		No odor or discoloration in 45' sample.
50		SP	Light brown, damp, very dense, fine to medium SAND; with some angular fine gravel, no fines	▨	MW6-50	71	<1		No odor or discoloration in 50' sample.
55		SP	Light brown, damp, very dense, fine to medium SAND; with some angular fine gravel, no fines	▨	MW6-55	63	<1		No odor or discoloration in 55' sample.
60									

ALTA EM, INC.	# LOG OF BORING MW6 (Page 3 of 3)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date Drilled	: 3/3/04	Backfill Material	: Bentonite Chips
Boring Depth	: 68'	Backfill Interval	: 68' - 0'
Hole Diameter	: 11"	Logged By	: R. Hansen
Drilling Method	: Hollow-Stem		
Sampling Method	: 1.5" Standard Penetrometer		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Depth in feet	GRAPHIC	USCS	DESCRIPTION	Samples	Sample #	Blows/Ft	OVM	Lab Results (TPH)	REMARKS
60		SP	Grey brown, damp, very dense, gravelly fine sand; gravel is fine to coarse and subangular	▨	MW6-60	50 (4")	<1		No odor or dicoloration in 60' sample.
									Driller reports abundant gravel at ~60'.
65		SP	Grey brown, damp, very dense, gravelly fine sand; gravel is fine to coarse and subangular	▨	MW6-65	70 (5")	---		No odor or discoloration in 65' sample.
									Cannot advance past 68' due to coarse gravel and likely cobbles. Pulled out augers to check bit. Bit OK. Driller indicates that they cannot proceed in this hole. Moved to new location 12 feet away and began drilling MW6A.
70									
75									
80									
85									
90									

ALTA EM, INC.

LOG OF BORING MW6A

(Page 1 of 4)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

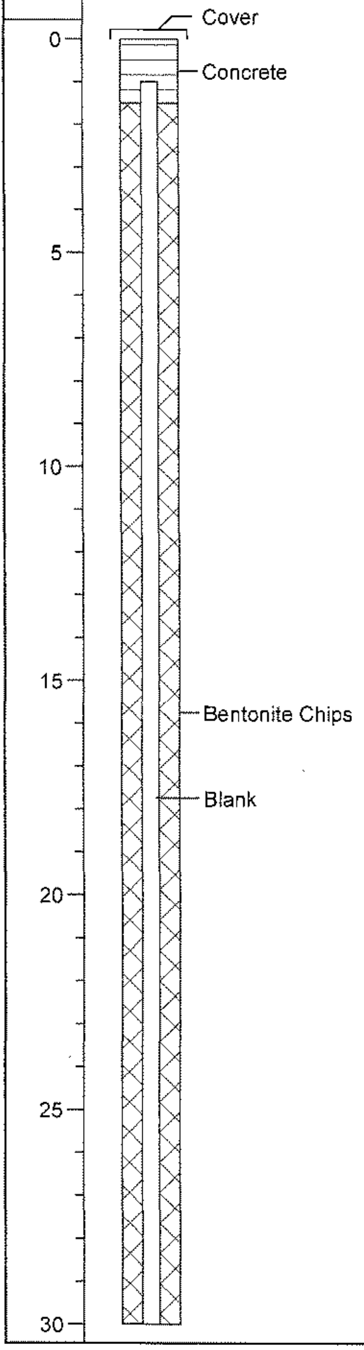
01437-01

Date/Logged by : 3/5/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Depth in feet

Well: MW6A
Elev.: N/A



Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
					Concrete: 6 inches		Began sampling at 70' feet. (See MW6 for soil data between 0' and 65')

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ALTA EM, INC.

LOG OF BORING MW6A

(Page 2 of 4)

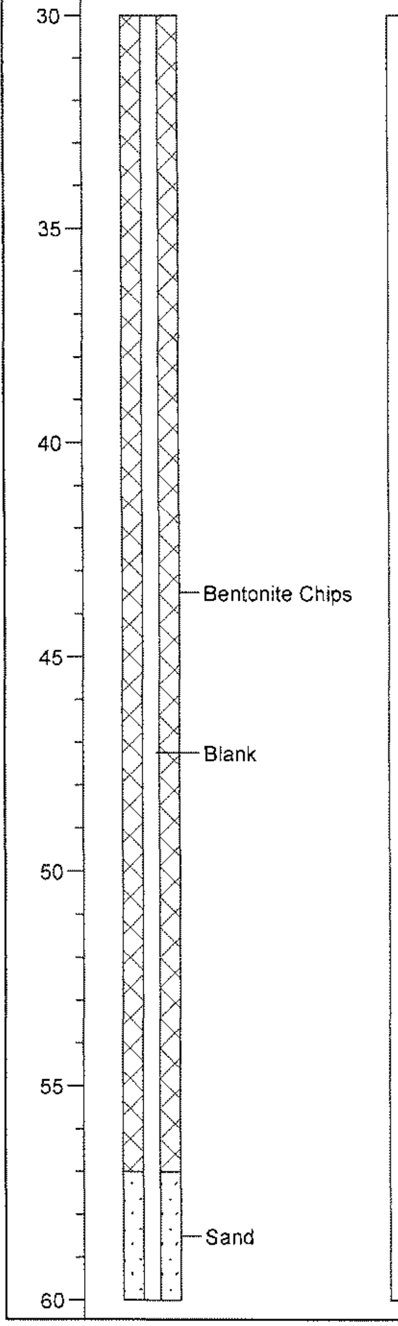
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 3/5/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Depth in feet	Well: MW6A Elev.: N/A	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS



ALTA EM, INC.

LOG OF BORING MW6A

(Page 3 of 4)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

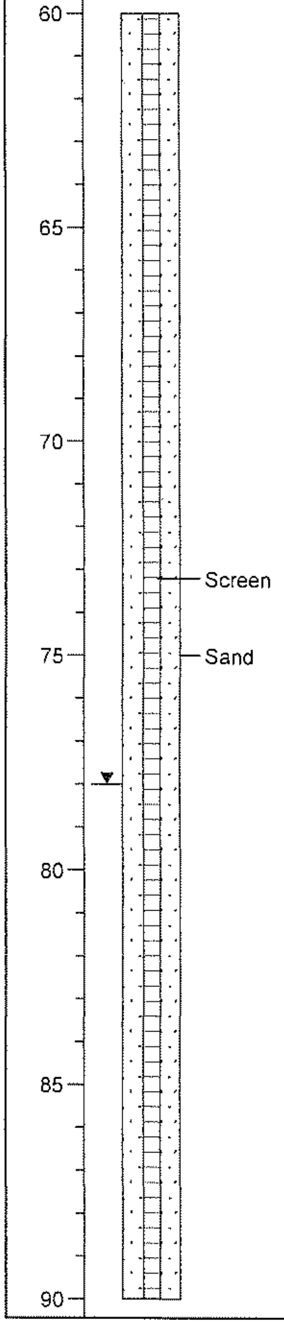
01437-01

Date/Logged by : 3/5/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted

Casing : 4.0" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Well: MW6A
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
70	50 (4")	▨	MW6A-70		ML	Greyish olive, damp to moist, hard, sandy SILT; with minor clay	<1	No odor or discoloration in 70' sample.
75	80	▨	MW6A-75		SP ML	Greyish olive, moist, very dense, fine SAND; with minor silt Greyish olive, moist, hard, SILT	<1	No odor or discoloration in 75' sample.
								Groundwater at approximately 78'.
80	54	▨	MW6A-80		SP	Moderate olive brown, saturated, very dense, fine SAND; with interbedded layers of sandy silt	<1	No odor or discoloration in 80' sample.
85	50	▨	MW6A-85		SM ML	Greyish olive, saturated, very dense, silty very fine SAND Greyish olive, saturated, hard, sandy clayey SILT	<1	No odor or discoloration in 85' sample.

ALTA EM, INC.

LOG OF BORING MW6A

(Page 4 of 4)

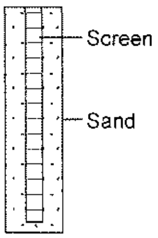
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 3/5/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
▤ Grab
▪ Other

Well: MW6A
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
90	62	▨	MW6A-90		ML	Greyish olive, saturated, very dense, silty very fine SAND	<1	No odor or discoloration in 90' sample.
95	90	▨	MW6A-95		SM	Greyish olive, saturated, very dense, silty fine SAND; with some clay	<1	No odor or discoloration in 95' sample.
100								
105								
110								
115								
120								

ALTA EM, INC.

LOG OF BORING MW7

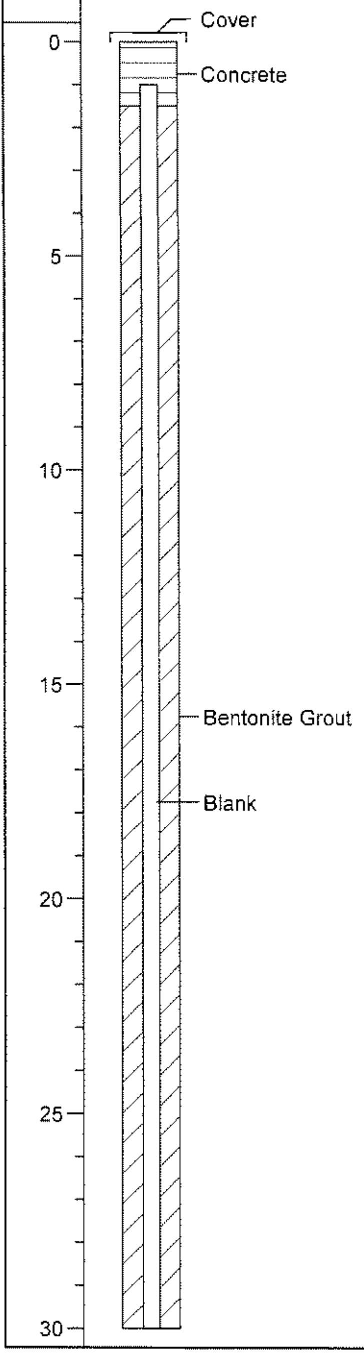
(Page 1 of 4)

FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 3/3/04 & 3/4/04 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 58' - 98'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Well: MW7
Elev.: N/A



Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Concrete: 6 inches		
5	34	▨	MW7-5		SP	Moderate yellowish brown, damp, medium dense, fine SAND; with minor silt	<1	No odor or discoloration in 5' sample.
10	22	▨	MW7-10		SM	Moderate yellowish brown, damp, medium dense, silty fine SAND	<1	No odor or discoloration in 10' sample.
15	17	▨	MW7-15		SM	Moderate yellowish brown, damp, medium dense, silty fine SAND	<1	No odor or discoloration in 15' sample.
20	22	▨	MW7-20		SP	Moderate yellowish brown, damp to moist, medium dense, fine SAND	<1	No odor or discoloration in 20' sample.
25	44	▨	MW7-25		SP	Dark yellowish brown, damp, medium dense, fine SAND; with trace silt	1	No odor or discoloration in 25' sample.
30								

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ALTA EM, INC.

LOG OF BORING MW7

(Page 2 of 4)

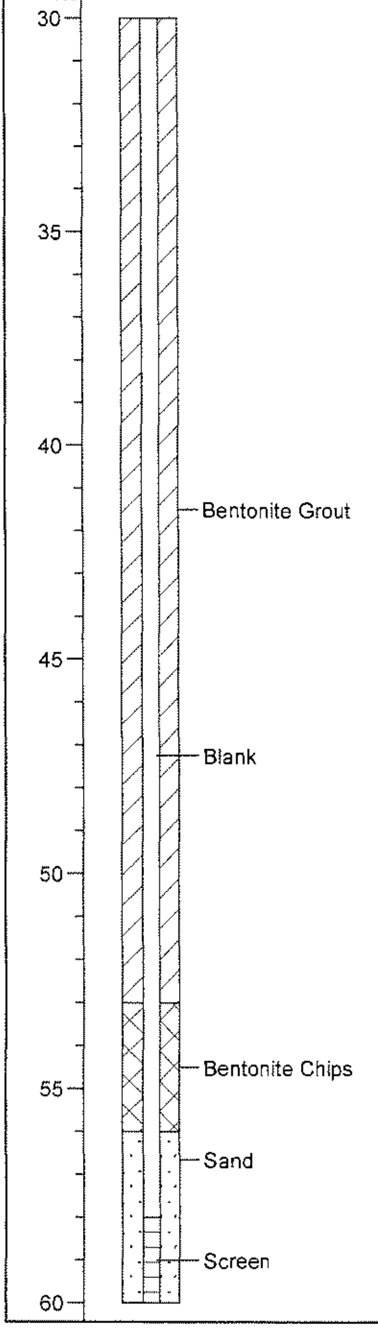
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 3/3/04 & 3/4/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4.0" Diameter PVC
Screen Interval : 58' - 98'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▪ Other

Well: MW7
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
30	26	▨	MW7-30		SP	Moderate yellowish brown, damp, medium dense, fine SAND	<1	No odor or discoloration in 30' sample.
35	44	▨	MW7-35		ML	Moderate yellowish brown, damp, hard, sandy SILT; with minor clay	<1	No odor or discoloration in 35' sample.
40	36	▨	MW7-40		ML	Moderate yellowish brown, damp, hard, sandy SILT; with minor clay	<1	No odor or discoloration in 40' sample.
45	50	▨	MW7-45		ML	Dark yellowish brown, damp to moist, hard, clayey SILT	<1	No odor or discoloration in 45' sample.
50	55	▨	MW7-50		SM	Dark yellowish brown, damp, very dense, silty fine SAND	<1	No odor or discoloration in 50' sample.
55	72	▨	MW7-55		SP	Dark yellowish orange, damp, very dense, fine SAND	<1	No odor or discoloration in 55' sample.

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ALTA EM, INC.

LOG OF BORING MW7

(Page 3 of 4)

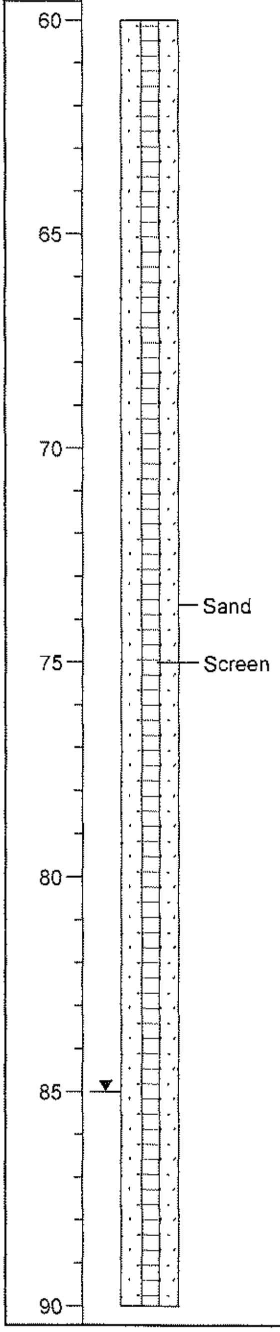
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 3/3/04 & 3/4/04 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 58' - 98'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ● Other

Well: MW7
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
60	50 (5")	▨	MW7-60	SP	Moderate yellowish brown, damp, very dense, fine SAND; with some gravel	<1	No odor or dicoloration in 60' sample.
65	50 (5")	▨	MW7-65	SP	Moderate yellowish brown, damp, very dense, fine SAND; with some coarse sand and gravel	<1	No odor or discoloration in 65' sample. Sample only 75% full.
							Rocky drilling. Driller reports same conditions as MW6. Rocks at 67'-72'. No sample recovery @ 70'.
75	50 (2")	▨	MW7-75	ML	Dark yellowish brown, damp, hard, sandy clayey SILT	30	Faint hydrocarbon odor and no discoloration in 75' sample.
80	50 (2")	▨	MW7-80	ML	Greyish olive, moist, hard, clayey SILT	<1	No odor or discoloration in 80' sample.
85	50 (3")	▨	MW7-85	SM	Greyish olive, damp to moist, very dense, silty fine SAND	57	Faint hydrocarbon odor and no discoloration in 85' sample. Soil at bottom of sampler wet to saturated. Groundwater at ~85', but appears to be rising.

ALTA EM, INC.

LOG OF BORING MW7

(Page 4 of 4)

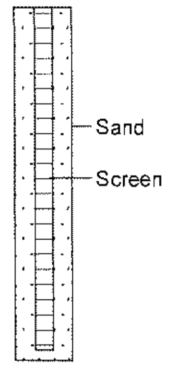
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 3/3/04 & 3/4/04 - D. Kawasaki	Casing	: 4.0" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 58' - 98'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Well: MW7
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
90	96	▨	MW7-90		SP	Greyish olive, saturated, very dense, fine SAND	15.6	No odor or discoloration in 90' sample.
					ML	Greyish olive, saturated, hard, clayey SILT; with minor fine sand		
95	50 (3")	▨	MW7-95		CL	Greyish olive, saturated, hard, silty CLAY	10	No odor or discoloraation in 95' sample.
100								
105								
110								
115								
120								

ALTA EM, INC.

LOG OF BORING MW8

(Page 1 of 4)

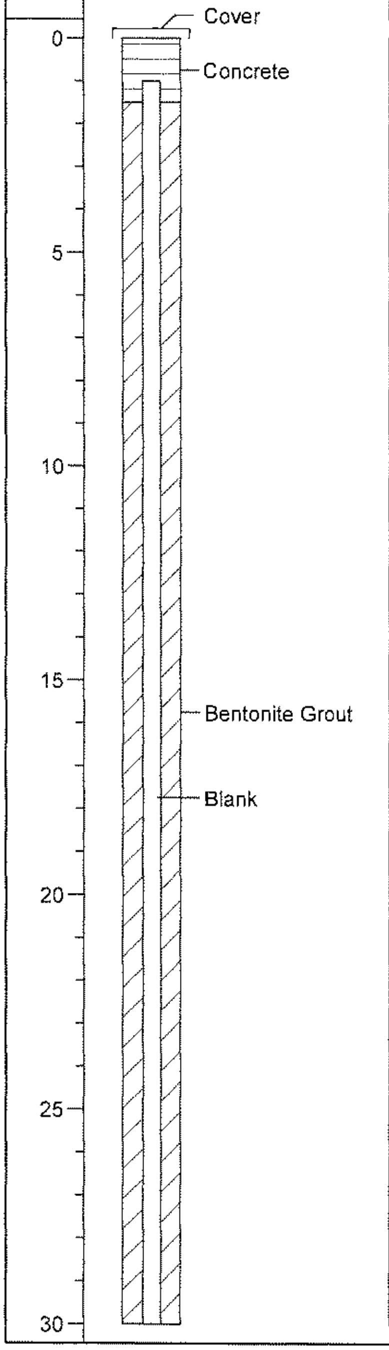
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 09/21/04 - D. Kawasaki	Casing	: 4" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ⊠ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other

Well: MW8
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						6" Concrete surface		
5	28	▨	MW8-5		SP	Moderate yellowish-brown, damp, medium-dense, fine SAND	2	No odor in 5' sample.
10	41	▨	MW8-10		SP	Moderate yellowish-brown, damp, dense, fine SAND	48	Faint hydrocarbon odor in 10' sample.
15	50	▨	MW8-15		SM	Moderate yellowish-brown, damp, very dense, silty fine SAND	3	No odor in 15' sample.
20	35	▨	MW8-20		SM	Moderate yellowish-brown, damp to moist, dense, clayey silty fine SAND	<1	No odor in 20' sample.
25	55	▨	MW8-25		SP	Moderate yellowish-brown, damp, very dense, fine SAND	<1	No odor in 25' sample.
30								

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ALTA EM, INC.

LOG OF BORING MW8

(Page 2 of 4)

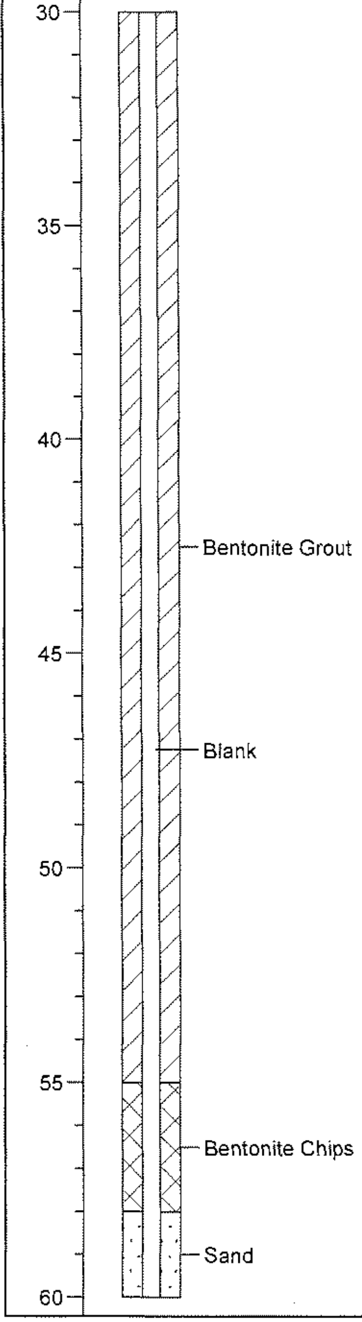
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 09/21/04 - D. Kawasaki	Casing	: 4" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▪ Other

Well: MW8
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
30	52	▨	MW8-30		SM	Moderate yellowish-brown, damp to moist, very dense, silty fine SAND; with minor clay	3	No odor in 30' sample.
35	75	▨	MW8-35		SP	Moderate yellowish-brown, damp to moist, very dense, fine SAND; with minor silt	<1	No odor in 35' sample.
40	80	▨	MW8-40		SM	Moderate yellowish-brown, damp to moist, very dense, silty fine SAND	<1	No odor in 40' sample.
45	75	▨	MW8-45		SP	Moderate yellowish-brown, damp to moist, very dense, fine SAND; with trace silt	<1	No odor in 45' sample.
50	75	▨	MW8-50		SP	Moderate yellowish-brown, moist, very dense, fine SAND; with minor silt	<1	No odor in 50' sample.
55	90	▨	MW8-55		SP	Light yellowish-brown, damp to moist, very dense, fine SAND	<1	No odor in 55' sample.
60								

ALTA EM, INC.

LOG OF BORING MW8

(Page 3 of 4)

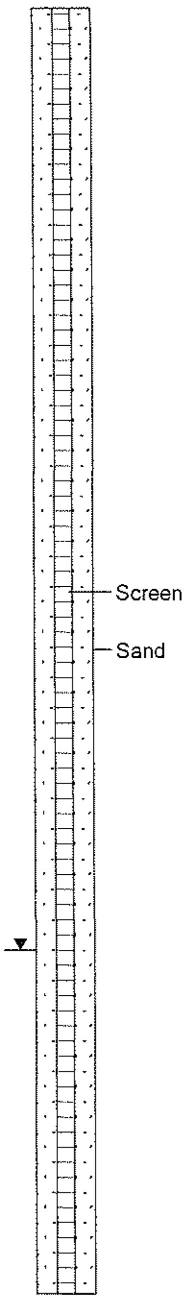
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 09/21/04 - D. Kawasaki	Casing	: 4" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Well: MW8
Elev.: N/A

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ▤ Grab
- ▪ Other



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
60	---	▨	---			---	No recovery @ 60'. Sampler lost down hole.
65	70 (6")	▨	MW8-65	SP	Light yellowish-brown, damp, very dense, fine SAND; with some gravel	<1	No odor in 65' sample.
							Rocks at 65' to 73'.
70	60 (3")	▨	MW8-70	SP	Moderate yellowish-brown, damp, very dense, fine SAND	<1	No odor in 70' sample.
75	70	▨	MW8-75	ML SP	Light yellowish-brown, moist, very dense, sandy SILT; with minor clay Light yellowish-brown, moist, very dense, fine SAND	<1	No odor in 75' sample.
80	75	▨	MW8-80	SM	Dark yellowish-orange, wet, very dense, silty fine SAND; with minor clay	<1	No odor in 80' sample.
							Groundwater at approximately 81'-83'.
85	80	▨	MW8-85	ML	Greyish-olive, saturated, hard, sandy SILT; with minor clay	<1	No odor in 85' sample.
90							

ALTA EM, INC.

LOG OF BORING MW8

(Page 4 of 4)

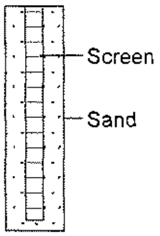
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 09/21/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Well: MW8
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
90	80	▨	MW8-90		SP	Greyish-olive, saturated, very dense, fine SAND	<1	No odor in 90' sample.
95	80	▨	MW8-95		SM	Greyish-olive, saturated, very dense, silty fine SAND	<1	No odor in 95' sample.
100								
105								
110								
115								
120								

ALTA EM, INC.

LOG OF BORING MW9

(Page 1 of 4)

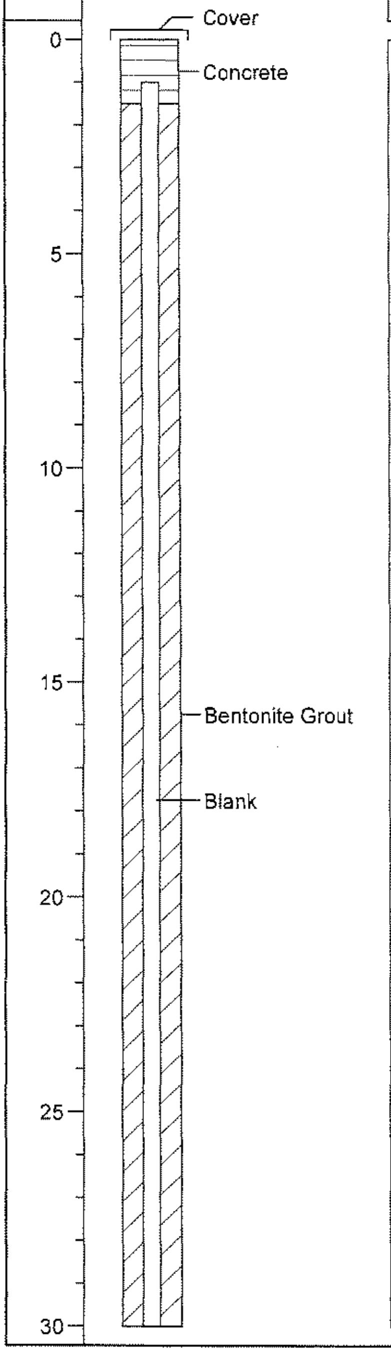
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 09/22/04 - D. Kawasaki	Casing	: 4" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other

Well: MW9
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
0					6" Concrete surface		
5	35	▨	MW9-5	SM	Moderate yellowish-brown, damp to moist, dense, silty fine SAND	<1	No odor in 5' sample.
10	38	▨	MW9-10	SM	Moderate yellowish-brown, moist, dense, silty fine SAND; with minor clay	<1	No odor in 10' sample.
15	35	▨	MW9-15	SM	Moderate yellowish-brown, moist, dense, silty fine SAND; with minor clay	<1	No odor in 15' sample.
20	42	▨	MW9-20	SP	Moderate yellowish-brown, damp to moist, dense, fine SAND; with trace medium sand	<1	No odor in 20' sample.
25	45	▨	MW9-25	SP ML	Moderate yellowish-brown, moist to wet, dense, fine SAND; with trace medium sand Moderate yellowish-brown, wet to saturated, dense, sandy SILT; with minor clay	<1	No odor in 25' sample.
30							

ALTA EM, INC.

LOG OF BORING MW9

(Page 2 of 4)

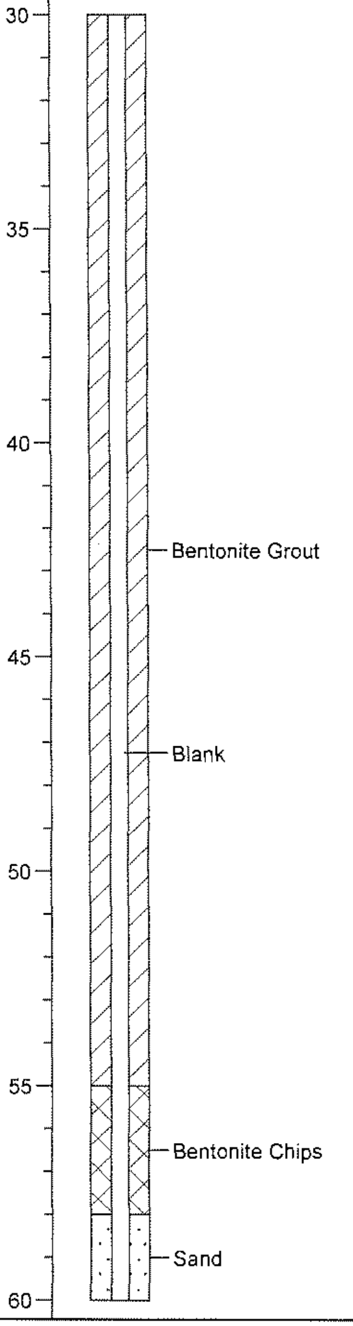
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 09/22/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other

Well: MW9
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
30	95	▨	MW9-30		ML	Dark yellowish-brown, moist, hard, clayey SILT	<1	No odor in 30' sample.
35	57	▨	MW9-35		SM	Dark yellowish-brown, moist, very dense, silty fine SAND	<1	No odor in 35' sample.
40	75	▨	MW9-40		CL	Moderate yellowish-brown, damp to moist, hard, silty CLAY	<1	No odor in 40' sample.
45	85	▨	MW9-45		SP	Moderate yellowish-brown, damp to moist, very dense, fine SAND; with some silt	<1	No odor in 45' sample.
50	75	▨	MW9-50		SM	Moderate yellowish-brown, damp to moist, very dense, silty fine SAND	<1	No odor in 50' sample.
					SP	Light yellowish-brown, damp to moist, very dense, fine SAND		
55	90	▨	MW9-55		SP	Moderate yellowish-brown, damp to moist, very dense, fine SAND	<1	No odor in 55' sample.

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LOG OF BORING MW9

(Page 3 of 4)

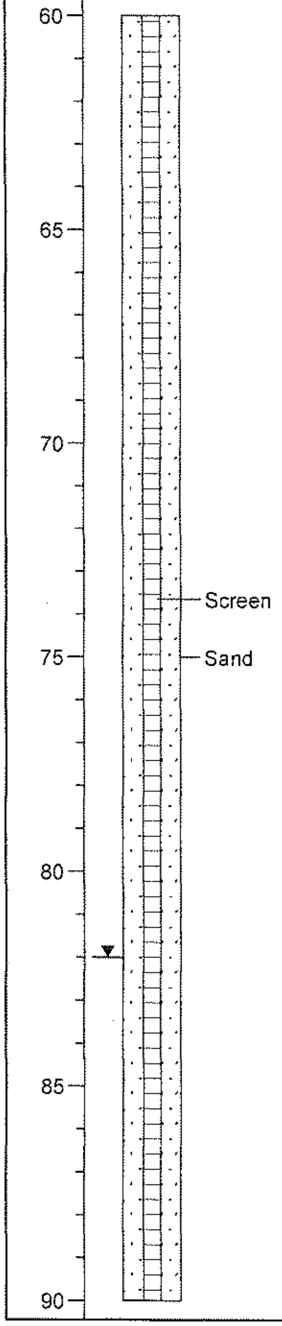
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 09/22/04 - D. Kawasaki	Casing	: 4" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Well: MW9
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
60	60 (3")	▨	MW9-65		SW	Light yellowish-brown, damp, very dense, gravelly fine SAND	<1	No odor in 60' sample. Sample 90% full.
65	48	▨	MW9-70		SM	Greyish-olive, damp to moist, dense, silty fine SAND	<1	No odor in 65' sample.
70	75	▨	MW9-75		SP	Greyish-olive, damp to moist, very dense, fine SAND	<1	No odor in 70' sample.
75	80	▨	MW9-75		ML	Greyish-olive, moist, hard, SILT	<1	No odor in 75' sample.
80	75	▨	MW9-80		ML	Greyish-olive, wet, hard, SILT	<1	No odor in 80' sample.
								Groundwater at approximately 81'-83'.
85	75	▨	MW9-85		ML	Greyish-olive, saturated, hard, sandy SILT	<1	No odor in 85' sample.

ALTA EM, INC.

LOG OF BORING MW9

(Page 4 of 4)

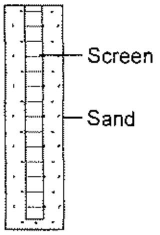
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 09/22/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other

Well: MW9
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
90	50 (6")	▨	MW9-90		SM	Moderate yellowish-brown, saturated, very dense, silty fine SAND	<1	No odor in 90' sample.
95	70 (6")	▨	MW9-95		SP	Moderate yellowish-brown, saturated, very dense, fine SAND	<1	No odor in 95' sample.
100								
105								
110								
115								
120								

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ALTA EM, INC.

LOG OF BORING MW10

(Page 1 of 4)

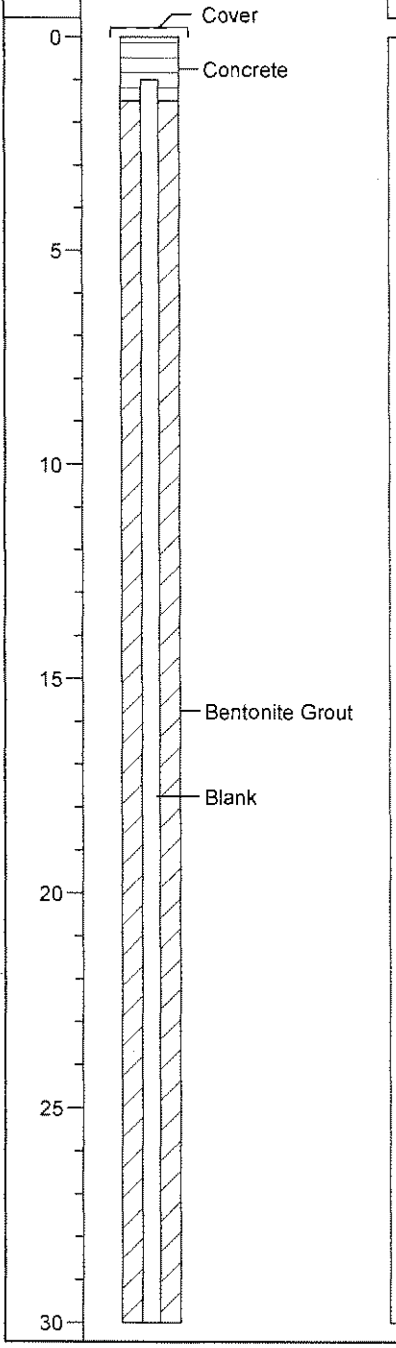
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 09/22 & 09/23/04 - D. Kawasaki	Casing	: 4" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▪ Other

Well: MW10
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						6" Concrete surface		Strong hydrocarbon odor in hand auger cuttings.
5	36	▨	MW10-5		SP	Dark yellowish-brown, damp to moist, dense, fine SAND; with minor silt	360	Moderate hydrocarbon odor in 5' sample.
10	45	▨	MW10-10		SP	Dark yellowish-brown, moist, dense, fine SAND	130	Slight hydrocarbon odor in 10' sample.
15	39	▨	MW10-15		SM	Dark yellowish-brown, moist, dense, silty fine SAND	1,200	Strong hydrocarbon odor in 15' sample.
20	32	▨	MW10-20		ML	Dark yellowish-brown, moist to wet, dense, sandy SILT	40	Slight hydrocarbon odor in 20' sample.
25	37	▨	MW10-25		SM	Dark yellowish-brown, moist, dense, silty fine SAND; with trace medium sand	480	Strong hydrocarbon odor in 25' sample.
30								

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ALTA EM, INC.

LOG OF BORING MW10

(Page 2 of 4)

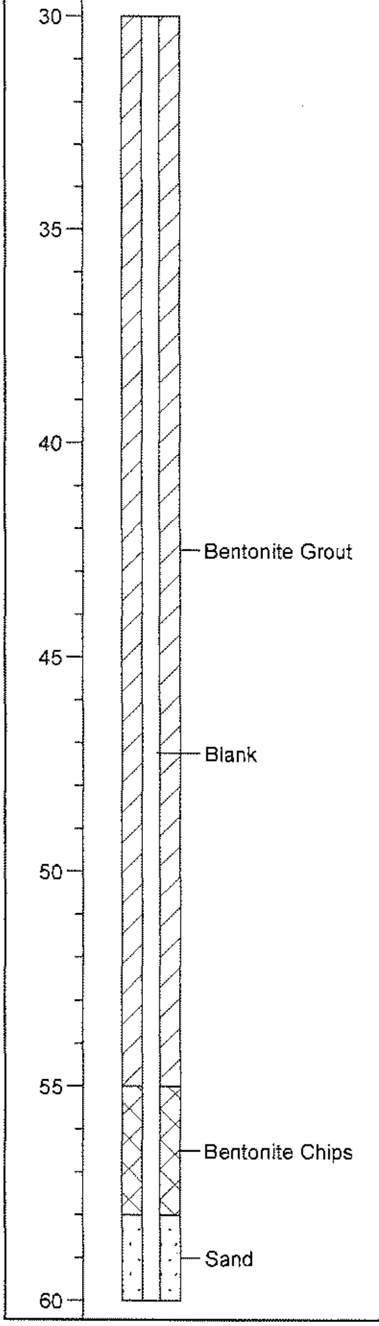
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 09/22 & 09/23/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▭ Other

Well: MW10
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
30	90	▨	MW10-30		SM	Moderate yellowish-brown, damp to moist, very dense, silty fine SAND	300	Moderate hydrocarbon odor in 30' sample.
35	70 (6")	▨	MW10-35		SM	Moderate yellowish-brown, damp to moist, very dense, silty fine SAND	---	Slight hydrcarbon odor in 35' sample. Sample 80% full.
40	50 (6")	▨	MW10-40		SM	Moderate yellowish-brown, moist, silty fine SAND; with minor clay	30	Faint hydrocarbon odor in 40' sample.
45	50 (6")	▨	MW10-45		SM	Moderate yellowish-brown, moist, very dense, silty fine SAND	23	Slight hydrocarbon odor in 45' sample.
50	83 (12")	▨	MW10-50		SP	Moderate yellowish-brown, moist, very dense, fine SAND	60	Slight hydrocarbon odor in 50' sample.
55	75 (9")	▨	MW10-55		SP	Light yellowish-brown, moist, very dense, fine SAND	8	No odor in 55' sample.
60								

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ALTA EM, INC.

LOG OF BORING MW10

(Page 3 of 4)

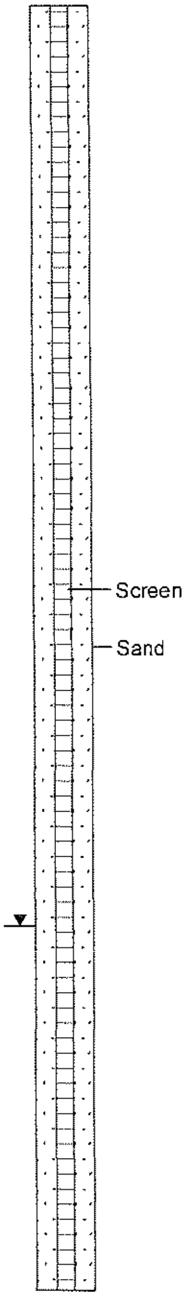
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 09/22 & 09/23/04 - D. Kawasaki	Casing	: 4" Diameter PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 95'
Drilling Method	: Hollow-Stem	Sand Type	: #2/12 Monterey Sand
Sampling Method	: 1.5" Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ☒ Split Spoon
- ▨ Standard Penetrometer
- ▤ Grab
- ▣ Other

Well: MW10
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
60	93 (10")	▨	MW10-65		SP	Moderate yellowish-brown, damp to moist, very dense, fine SAND; with minor silt	<1	No odor in 60' sample.
65	---	▨	---				---	No recovery @ 65'. Lost sampler down hole.
								Rocks @ 65' to 76'.
70	50 (4")	▨	MW10-75		SW	Light yellowish brown, dry to damp, very dense, gravelly fine SAND	<1	No odor in 70' sample. Sample 50% full.
75	---	▨	---				---	No recovery @ 75'. Rocks.
80	80 (8")	▨	MW10-80		SM	Greyish-olive, wet, very dense, silty fine SAND; with minor clay	<1	No odor in 80' sample.
								Groundwater at approximately 81'-82'.
85	75	▨	MW10-85		ML	Greyish-olive, saturated, very dense, sandy SILT; with minor clay	<1	No odor in 85' sample.
90								

ALTA EM, INC.

LOG OF BORING MW10

(Page 4 of 4)

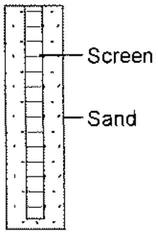
FOOD N' FUEL
2649 S. WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 09/22 & 09/23/04 - D. Kawasaki
Hole Diameter : 11"
Drilling Method : Hollow-Stem
Sampling Method : 1.5" Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4" Diameter PVC
Screen Interval : 60' - 95'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Well: MW10
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
90	80	▨	MW10-90		SP	Greyish-olive, saturated, very dense, fine SAND	<1	No odor in 90' sample.
95	95	▨	MW10-95		SP	Greyish-olive, saturated, very dense, fine SAND; with minor clay	<1	No odor in 95' sample.
100								
105								
110								
115								
120								

ALTA EM, INC.

LOG OF BORING MW11

(Page 1 of 4)

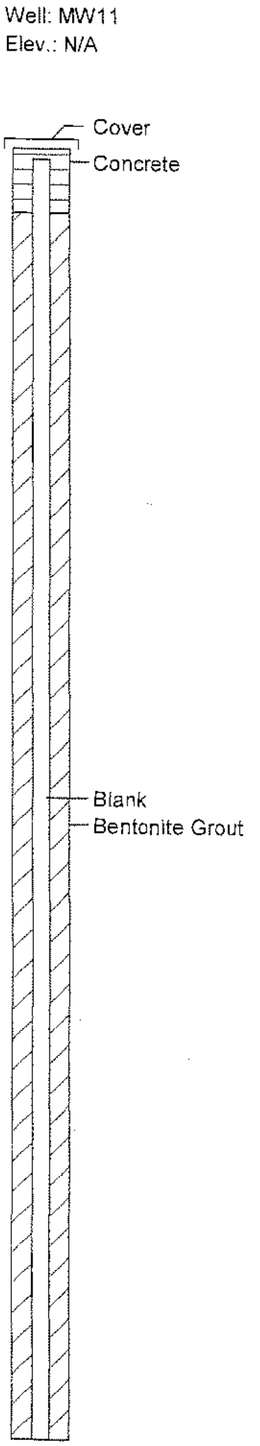
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 11/01/05 - R. Stolberg
Hole Diameter : 11"
Drilling Method : Hollow-Stem Auger
Sampling Method : Standard Penetrometer
Well Screen : 0.010" Factory Slotted

Casing : 4.0" PVC
Screen Interval : 60' - 100'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ 2" Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
0						Concrete: 7 Inches		
5	50	▨	MW11-5		SM	Dark yellowish-brown, damp, dense to very dense, silty fine SAND	<1	No odor in 5' sample.
10	50	▨	MW11-10		SM	Grayish olive, damp, dense to very dense, silty fine SAND; w/ trace course sand	82	Slight hydrocarbon odor in 10' sample.
15	34	▨	MW11-15		SP	Dark yellowish-brown, damp, dense, fine SAND; w/ minor silt	2,560	Strong gasoline odor in 15' sample.
20	33	▨	MW11-20		SP	Dark yellowish-brown, damp, dense, fine SAND; w/ minor silt	2,917	Strong gasoline odor in 20' sample.
25	23	▨	MW11-25		ML	Dark yellowish-brown, damp, very stiff, sandy SILT; w/ minor clay	198	Slight hydrocarbon odor in 25' sample.
30								

ALTA EM, INC.

LOG OF BORING MW11

(Page 2 of 4)

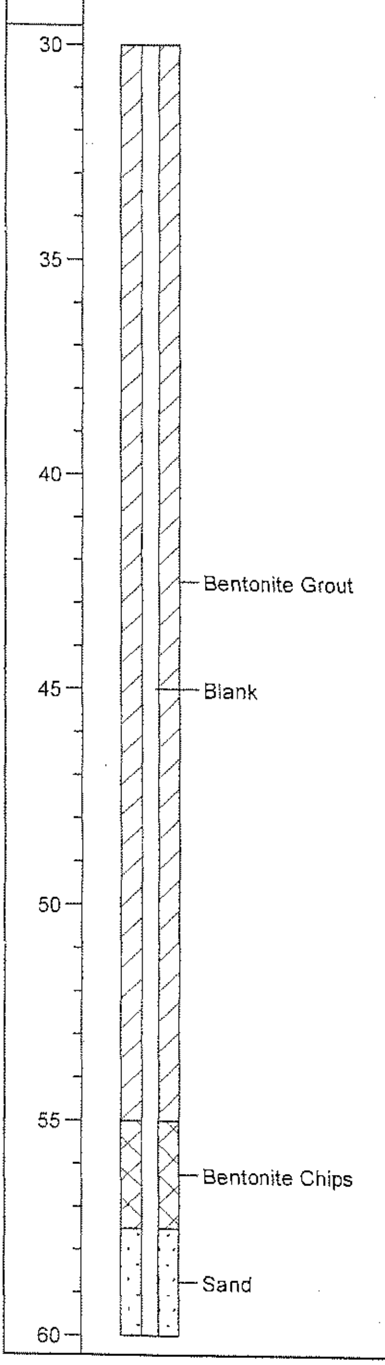
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by : 11/01/05 - R. Stolberg
Hole Diameter : 11"
Drilling Method : Hollow-Stem Auger
Sampling Method : Standard Penetrometer
Well Screen : 0.010" Factory Slotted
Casing : 4.0" PVC
Screen Interval : 60' - 100'
Sand Type : #2/12 Monterey Sand

Sampler Type
☒ 2" Split Spoon
▨ Standard Penetrometer
☰ Grab
▣ Other

Well: MW11
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	USCS	DESCRIPTION	OVM	REMARKS
30	23	▨	MW11-30	SM	Dark yellowish-brown, damp, medium-dense, silty fine SAND	43	Faint hydrocarbon odor in 30' sample.
35	29	▨	MW11-35	ML	Dark yellowish-brown, damp, Very stiff, sandy SILT	33	Faint hydrocarbon odor in 35' sample.
40	50	▨	MW11-40	SP	Dark yellowish-brown, damp, dense, fine SAND; w/ some medium sand and minor coarse sand	32	Faint hydrocarbon odor in 40' sample.
45	50	▨	MW11-45	ML	Dark yellowish-brown, damp, dense, sandy SILT; w/ minor clay	12	No odor in 45' sample.
50	50	▨	MW11-50	SM	Dark yellowish-brown, damp, dense to very dense, silty fine SAND	47	Faint hydrocarbon odor in 50' sample.
55	50	▨	MW11-55	ML	Dark yellowish-brown, damp, hard, sandy SILT	16	No odor in 55' sample.

ALTA EM, INC.

LOG OF BORING MW11

(Page 3 of 4)

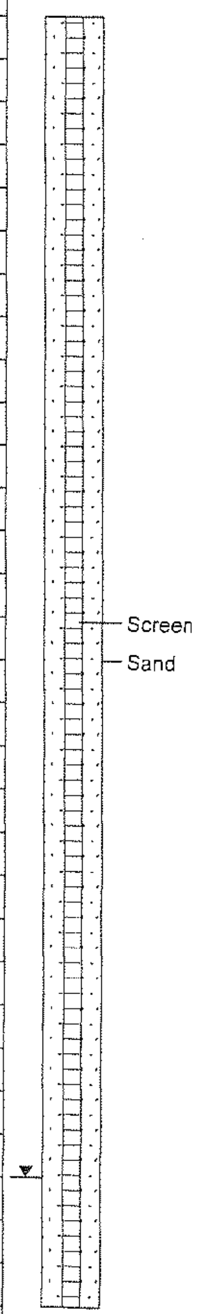
FOOD N' FUEL
2649 WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

01437-01

Date/Logged by	: 11/01/05 - R. Stolberg	Casing	: 4.0" PVC
Hole Diameter	: 11"	Screen Interval	: 60' - 100'
Drilling Method	: Hollow-Stem Auger	Sand Type	: #2/12 Monterey Sand
Sampling Method	: Standard Penetrometer		
Well Screen	: 0.010" Factory Slotted		

Sampler Type
- ⊠ 2" Split Spoon
- ▨ Standard Penetrometer
- ☰ Grab
- ▣ Other

Well: MW11
Elev.: N/A



Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
60	50	▨	MW11-60		SP	Moderate yellowish-brown, damp, dense to very dense, fine SAND; w/ minor coarse sand	---	Encountered rocks at 60 feet. No odor in 60' sample.
65	50	▨	MW11-65		SP	Moderate yellowish-brown, damp, dense to very dense, fine SAND; w/ minor coarse sand	4	No odor in 65' sample.
70	50	▨	MW11-70		ML	Dark yellowish-brown, damp-moist, hard, sandy SILT; w/ minor clay	---	Sample 50% full. No odor in 70' sample.
75	50	▨	MW11-75		ML	Grayish olive, damp, hard, clayey SILT	8	No odor in 75' sample.
80	50	▨	MW11-80		ML	Grayish olive, damp, hard, clayey SILT	2	No odor in 80' sample.
85	45	▨	MW11-85		ML	Grayish olive, moist-wet, hard, SILT; w/ minor clay	1	No odor in 85' sample.
								Groundwater encountered at ~87'.
90								

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ALTA EM, INC.

LOG OF BORING MW11

(Page 4 of 4)

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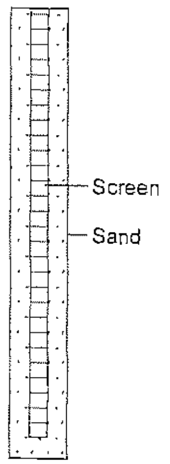

Depth in feet	Blows/Ft	Samples	Sample #	GRAPHIC	USCS	DESCRIPTION	OVM	REMARKS
90	50	▨	MW11-90		SM	Dark yellowish-brown, saturated, dense to very dense, silty fine SAND	<1	No odor in 90' sample.
95	46	▨	MW11-95		SM	Dark yellowish-brown, saturated, dense, silty fine SAND	<1	No odor in 95' sample.
100	50	▨	MW11-100		SM	Dark yellowish-brown, saturated, dense to very dense, silty fine SAND	<1	No odor in 100' sample.
105								
110								
115								
120								