

# GEOTECHNICAL REPORT

*for*

## STATE ROUTE 11 AND THE OTAY MESA EAST PORT OF ENTRY

SAN DIEGO COUNTY, CALIFORNIA  
DISTRICT 11-SD-ROUTE 11  
PM 0.0/2.8 EA 056310  
DISTRICT 11-SD-ROUTE 905  
PM R8.4/10.1

### TIER II ENVIRONMENTAL IMPACT REPORT/ ENVIRONMENTAL IMPACT STATEMENT



November 2010



**STATE ROUTE 11 AND THE OTAY MESA EAST PORT OF ENTRY**

**TIER II ENVIRONMENTAL IMPACT REPORT/  
ENVIRONMENTAL IMPACT STATEMENT**

**GEOTECHNICAL REPORT**

Preliminary Geotechnical Study (Phase I)

January 2008

Proposed State Route 11 Extension: Supplementary District Preliminary Geotechnical Report

October 7, 2009

**PRELIMINARY GEOTECHNICAL STUDY  
(PHASE I)**

**January 2008**



Geotechnical and Environmental Sciences Consultants

**PRELIMINARY GEOTECHNICAL STUDY  
CALTRANS/SR-11  
SAN DIEGO, CALIFORNIA**

**PREPARED FOR:**

Boyle Engineering  
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November 21, 2007  
Project No. 106033002

November 21, 2007  
Project No. 106033002

Mr. Kirk Bradbury  
Boyle Engineering  
7807 Convoy Court, Suite 200  
San Diego, California 92123

Subject: Preliminary Geotechnical Study  
Caltrans/SR-11  
San Diego, California

Dear Mr. Bradbury:

In accordance with Task Order No. 6 05-02-004, Ninyo & Moore has performed a Geotechnical Reconnaissance of the above-referenced site. The attached report presents our methodology, findings, opinions, and conclusions regarding the geologic and geotechnical conditions at the site.

We appreciate the opportunity to be of service to you on this project.

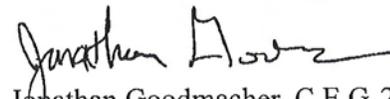
Respectfully submitted,  
**NINYO & MOORE**

  
Jeffrey T. Kent, P.E.  
Project Engineer



BTM/JTK/JG/kh

Distribution: (6) Addressee

  
Jonathan Goodmacher, C.E.G. 2136  
Manager/Principal Geologist



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## 1. INTRODUCTION

In general accordance with Task Order No. 6 05-02-004, Ninyo & Moore has prepared this preliminary geotechnical study for the evaluation of potential geologic and geotechnical concerns at the subject site. For this study, the subject site consists of the study area around the proposed freeway alignment alternatives (Figure 1).

The purpose of this study was to evaluate geologic and geotechnical conditions using available relevant data and to provide a preliminary geotechnical study report. Presented in this report are our findings pertaining to the indicated geotechnical conditions at the site. Subsurface exploration and laboratory testing of materials were not included in the scope of this limited evaluation.

The proposed project includes construction of the State Route 11 (SR-11) freeway from the SR-905/SR-125 junction to the proposed future Otay Mesa East Port of Entry (POE) at the international border with Mexico. A truck bypass road between the future POE and the existing Otay Mesa Commercial Vehicle Enforcement Facility may also be included in the scope of this transportation project. Interchanges are proposed for Enrico Fermi Road and future extensions of local roads. SR-11 would provide access to planned industrial and commercial development in the site vicinity. The scope of the SR-11 project also includes the POE location and facilities as they pertain to the environmental process. The POE itself would be designed and constructed by the United States General Services Administration (GSA).

## 2. SCOPE OF SERVICES

Ninyo & Moore's scope of services has included review of background materials of the site area. Specifically, we have performed the following tasks:

- Review of reasonably ascertainable geotechnical literature and mapping. Documents reviewed for our site evaluation are listed in the Selected References section of this report. Specifically reviewed were:
  - Historical and current topographic maps
  - Fault hazard maps
  - Landslide hazard maps
  - City of San Diego Seismic Safety Element maps
  - California seismic hazard maps compiled by Caltrans

- Geologic maps
  - Aerial photographs
  - Existing geologic reports
- Compilation and analysis of the data obtained.
  - Preparation of this report presenting our findings and conclusions.

### **3. SITE DESCRIPTION**

The site is considered to be the study area surrounding proposed areas of land acquisition and highway improvements associated with the SR-11 project. The site consists of approximately 475 hectares (1,173 acres) along the international border between the United States and Mexico, east of the community of Otay Mesa, within San Diego County, California (Figure 1). With the exception of one parcel of land utilized as a vehicle storage lot/automobile salvage yard, the majority of the site consists of undeveloped land. Equipment utilized by Otay Water District and San Diego Gas & Electric (SDG&E), such as power lines, water pipelines, and natural gas pipelines, constitute the infrastructure on the site. Currently, the U.S. Border Patrol uses the various unpaved roads that traverse the site to monitor border activities.

The site is bordered to the north by Otay Mesa Road, followed by graded land under construction, scattered residential properties, and an agricultural field used to cultivate alfalfa. The San Ysidro Mountains border the site to the east. The site is bordered to the south by the U.S.-Mexico border, marked by a series of security fences, followed by various residential, commercial, and industrial facilities in Mexico. A junkyard area, the Otay Mesa Inspection Facility, and multiple light industrial facilities border the site to the west (Figure 2).

### **4. GEOLOGY**

The following sections present our findings relative to regional geology, site geology, groundwater, faulting and seismicity, and mineral resources. Figure 2 is a geologic map of the site vicinity.

#### **4.1. Regional Geologic Setting**

The subject site is situated in the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb, 1990). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and meta-sedimentary rocks, and Cretaceous igneous rocks of the southern California batholith.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest. Several of these faults (Figure 3) are considered active faults. The Whittier-Elsinore, San Jacinto, and San Andreas faults are active fault systems located northeast of the site area and the Rose Canyon, Agua Blanca-Coronado Bank and San Clemente faults are active faults located west of the site area. Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement. Further discussion of faulting relative to the site is provided in the Faulting and Seismicity section of this report.

#### **4.2. Site Geology**

Based on our literature review, including published geologic maps, bedrock at the site consists of units of the Oligocene- to Miocene-age Otay Formation. As shown on Figure 4, the Otay Formation consists primarily of poorly indurated, massive, light-colored sandstone, siltstone, and claystone, interbedded with bentonite lenses. From reviewed reports and maps, the Otay Formation is known to contain highly expansive soils. The eastern portions of the site within the San Ysidro Mountains are underlain by Jurassic- and Cretaceous-age metavolcanic rocks, which consist of mildly metamorphosed volcanic, volcanoclastic, and sedimentary rocks. Based on pertinent geotechnical reports, formational materials are expected to be overlain by surficial soils of alluvium, colluvium, topsoil, and artificial fill. Alluvium occurs as deposits in the bottoms of the various drainages on the site. Colluvium is soil material eroded off slopes and deposited by gravity. It is typically poorly consolidated. Topsoil occurs as a relatively thin veneer of naturally occurring, organic-rich, soil on the formational materials. Fill soils may occur in the bottoms of the various

drainages due to previous farming of the land. From reviewed reports, each of these geologic units has been found to contain potentially corrosive soils.

#### **4.3. Groundwater**

According to the RWQCB Water Quality Control Plan for the San Diego Basin, the site is situated within the "Water Tanks" Hydrologic Subarea of the Tijuana Valley Hydrologic Area, within the Tijuana Hydrologic Unit. There are no existing beneficial uses of groundwater in this hydrologic area; however, potential beneficial uses have been designated for municipal, agricultural, and industrial supply purposes. The California Department of Water Resources (DWR) Water Data Library and USGS National Water Information System databases were consulted for groundwater information. Wells within or near the subject site were not found on these databases. Depth to groundwater was also not available on the State Water Resources Control Board (SWRCB) Geotracker website. A representative of the RWQCB was contacted regarding approximate depth to groundwater; however, a response was not received as of the date of this report. Based on regional topography, groundwater beneath the site is expected to flow in a west-southwest direction toward the Pacific Ocean. Groundwater levels can fluctuate due to, seasonal variations, irrigation, and other factors.

#### **4.4. Faulting and Seismicity**

Like elsewhere in California the project area is considered to be seismically active. The Rose Canyon Fault, the nearest known active fault, has been mapped approximately 13.3 miles west of the site. The Rose Canyon Fault is capable of generating an earthquake magnitude of 7.2 (United States Geological Survey/California Geological Survey [USGS/CGS], 2003).

In general, hazards associated with seismic activity include; strong ground motion, ground surface rupture, liquefaction, seismically induced settlement, and tsunamis. These hazards are discussed in the following sections.

#### **4.4.1. Strong Ground Motion and Ground Surface Rupture**

The significant seismic event with respect to the proposed improvements would be a maximum credible earthquake associated with the Rose Canyon fault. The Caltrans California Seismic Hazard Map (Mualchin, 1995a) indicates that the general site area has the potential for 0.3g peak ground acceleration. Therefore, based on the proximity to active and potentially active faults capable of producing large earthquakes, the subject site has the high potential for experiencing strong ground motion.

Based on our review of the referenced geologic maps and stereoscopic aerial photographs, as well as on our geologic field reconnaissance, the subject site is not underlain by known active or potentially active faults (i.e., faults that exhibit evidence of ground displacement in the last 11,000 years and 2,000,000 years, respectively). Therefore, ground surface rupture is not considered a hazard.

#### **4.4.2. Liquefaction and Seismically Induced Settlement**

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are susceptible to liquefaction. Some of the alluvial or colluvial soils in the on-site drainages and slopes may be liquefiable and/or subject to seismically induced settlement. In our opinion, formational materials on the site are not subject to liquefaction or seismically induced settlement.

#### **4.4.3. Tsunamis**

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. Based on the elevation and inland location of the site, the potential for damage due to tsunami is considered nil.

#### **4.5. Landsliding**

According to Tan (1995), the site is in an area designated as having a landslide susceptibility of 3-1. This indicates a low susceptibility to landslide hazards. No landslides or indications of deep-seated landsliding were noted on the site during our field exploration or our review of available geologic literature, topographic maps, and stereoscopic aerial photographs. Figure 5 is a map of the landslide hazards in the area.

#### **4.6. Mineral Resources**

Based on our review of referenced data, the proposed site is in an area where no significant mineral deposits are known to be present, nor are considered likely to exist.

### **5. FINDINGS**

Below are our preliminary findings regarding geologic and geotechnical conditions potentially affecting the proposed project.

- Based on our review of published geologic maps and aerial photographs, no faults or landslides have been mapped or were observed through aerial photograph review within the study area.
- The site has a potential for strong ground motions due to earthquakes on nearby active faults.
- Otay Formation soils in this area have been found to be highly expansive.
- Otay Formation, alluvial and colluvial soils in this area have been found to be potentially corrosive.
- Alluvial, colluvial and fill soils expected to be encountered will require mitigation and may be unsuitable for re-use as compacted fill.

### **6. RECOMMENDATIONS**

We recommend that a comprehensive geotechnical evaluation, including development-specific subsurface exploration and laboratory testing, be conducted prior to design and construction of any structures or improvements. The purpose of the subsurface evaluation would be to further evaluate the subsurface conditions in the area of the proposed structures or improvements and to

provide information pertaining to the engineering characteristics of earth materials at the site. From these data, recommendations for grading/earthwork, surface and subsurface drainage, foundations, pavement structural sections, sedimentation mitigation, and other pertinent geotechnical design considerations may be formulated.

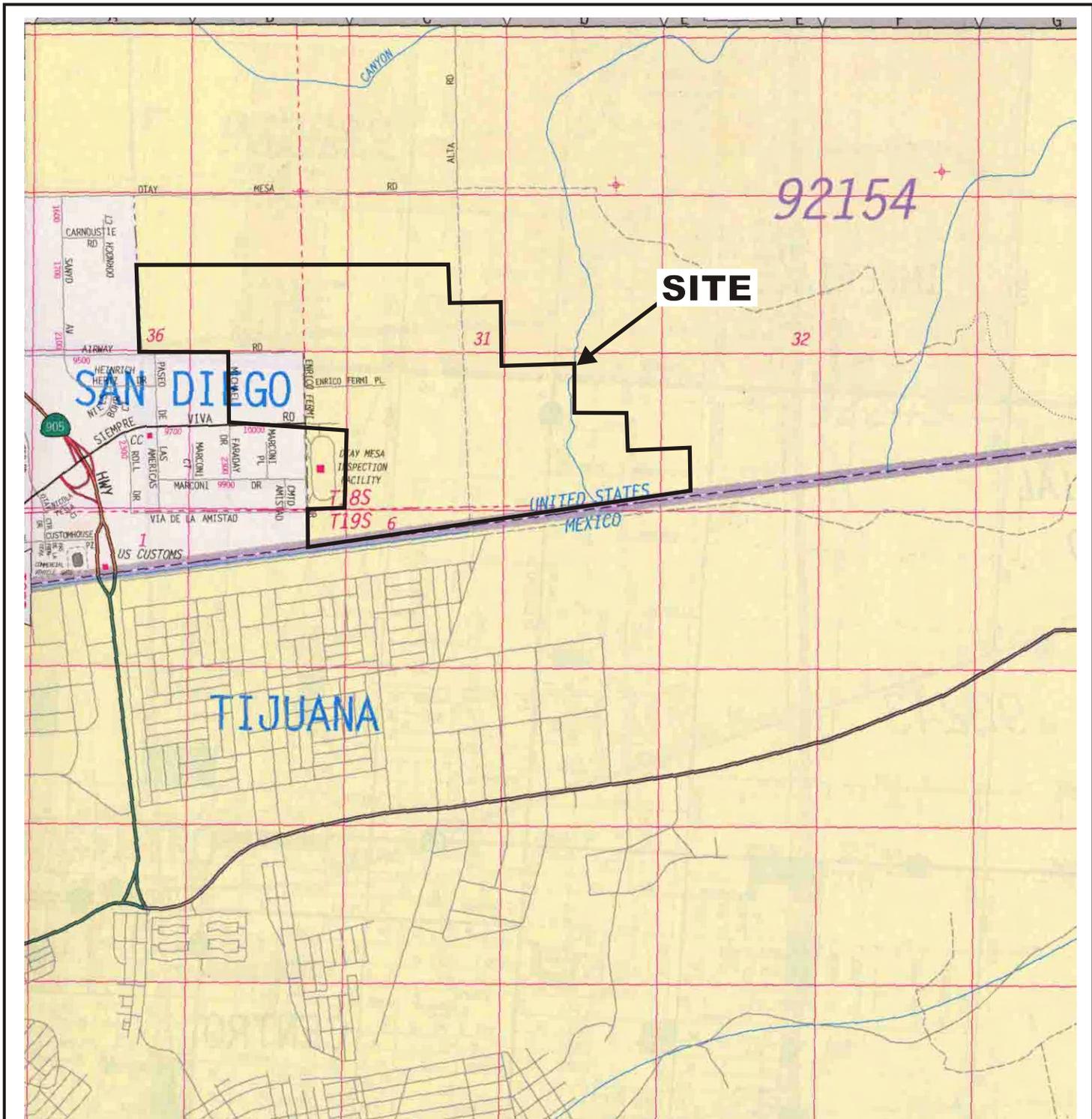
## **7. LIMITATIONS**

The geotechnical analyses presented in this report have been conducted in accordance with current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No warranty, implied or expressed, is made regarding the conclusions, recommendations, and professional opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered. Our preliminary conclusions and recommendations are based on an analysis of the observed conditions and the referenced background information. The purpose of this study was to evaluate geologic and geotechnical conditions within the site and to provide a Preliminary Geotechnical Study report.

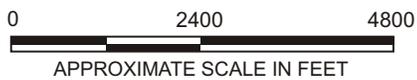
## 8. SELECTED REFERENCES

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- Weber, F. H., Jr., 1963, Geology and Mineral Resources of San Diego County, California: California Division of Mines and Geology County Report 3.

<b>AERIAL PHOTOGRAPHS</b>				
<b>Source</b>	<b>Date</b>	<b>Flight</b>	<b>Numbers</b>	<b>Scale</b>
USDA	3-31-53	AXN-3M	24 & 25	1:20,000



REFERENCE: 2005 THOMAS GUIDE FOR SAN DIEGO COUNTY, STREET GUIDE AND DIRECTORY.



NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

**Ninyo & Moore**

**SITE LOCATION MAP**

FIGURE

PROJECT NO.

DATE

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CALTRANS STATE ROUTE 11  
SAN DIEGO, CALIFORNIA

**1**

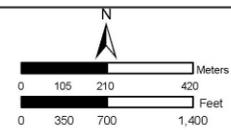
106033002 sim fig 1.cdr



SOURCE: LENSXA AERIAL IMAGE 2008 REFERENCE: NINYO AND MOORE, 2007, DRAFT HAZARDOUS MATERIAL AND HAZARDOUS WASTE INITIAL SITE ASSESSMENT CALTRANS/STATE ROUTE 11, SAN DIEGO, CALIFORNIA, DATED MARCH 16, 2007

LEGEND		LAND DESCRIPTION	
	ASSESSOR PARCEL BOUNDARY		UNDEVELOPED
	SITE BOUNDARY		LIGHT INDUSTRIAL
			PARTIALLY GRADED

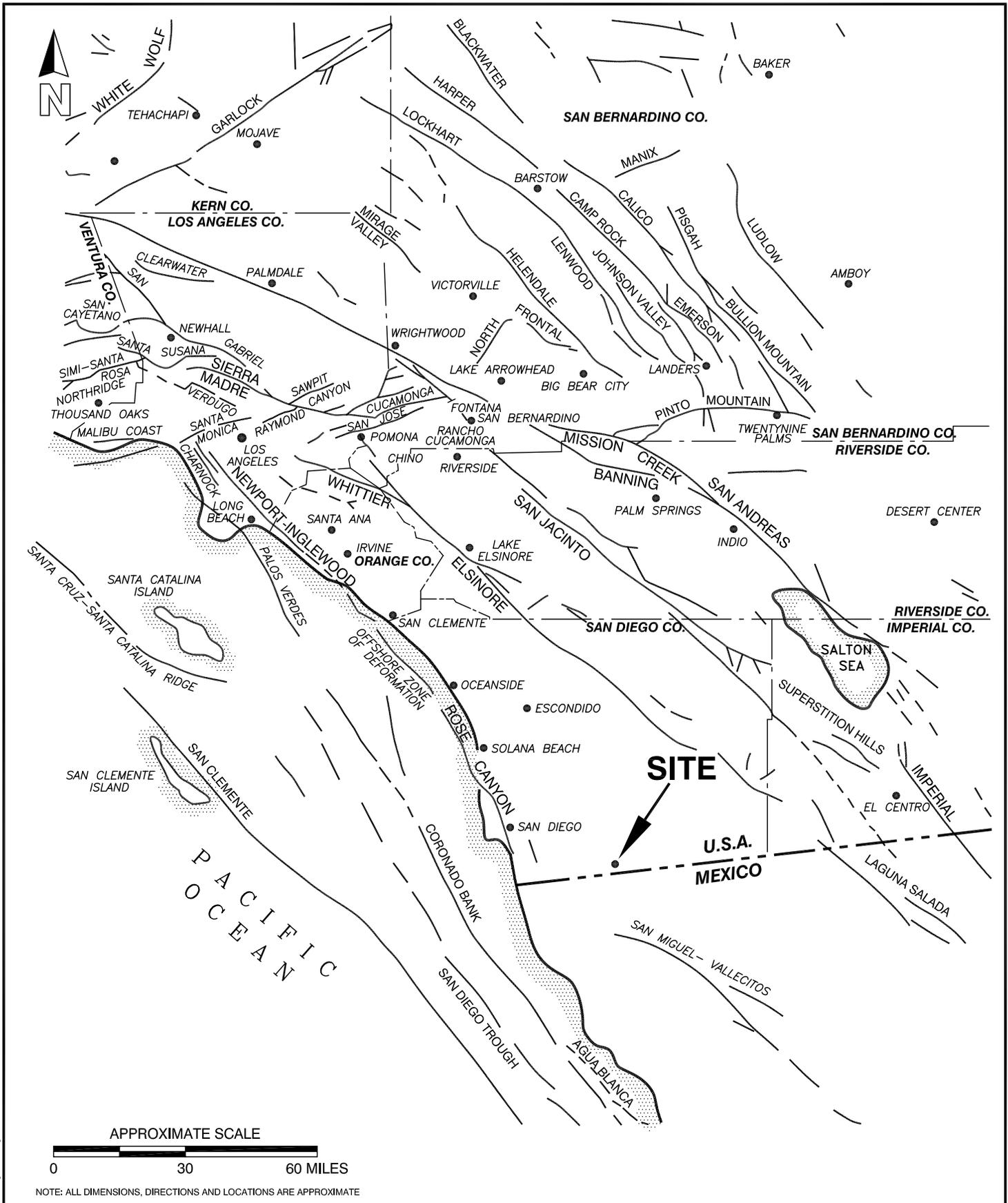
ALL DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE



<b>Ninjo &amp; Moore</b>	
PROJECT NO.	DATE
106033002	11/07

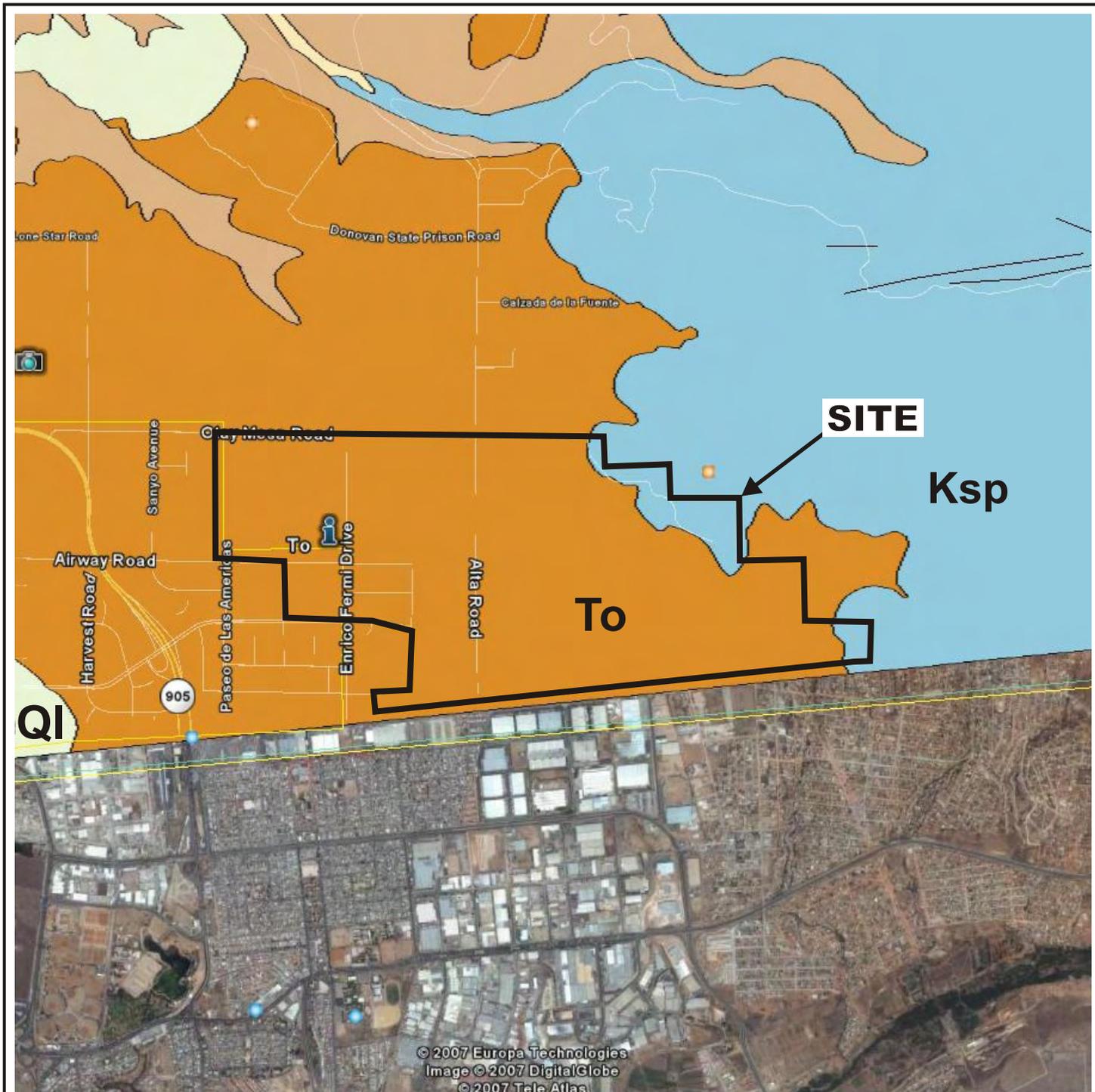
<b>SITE AND VICINITY MAP</b>
CALTRANS STATE ROUTE 11 SAN DIEGO, CALIFORNIA

FIGURE
<b>2</b>



106033002 Fault Fig 3.dwg

		<b>FAULT LOCATION MAP</b>  CALTRANS STATE ROUTE 11 SAN DIEGO, CALIFORNIA	FIGURE
			<b>3</b>
PROJECT NO.	DATE		
106033002	11/07		



LEGEND	
<b>QI</b>	LINDAVISTA FORMATION
<b>To</b>	OTAY FORMATION
<b>Ksp</b>	SANTIAGO PEAK VOLCANICS



NOT TO SCALE

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: GOOGLE EARTH, SAN DIEGO STATE DEPARTEMENT OF GEOLOGICAL SCIENCES, 2007.

**Ninyo & Moore**

**GEOLOGIC MAP**

FIGURE

PROJECT NO.

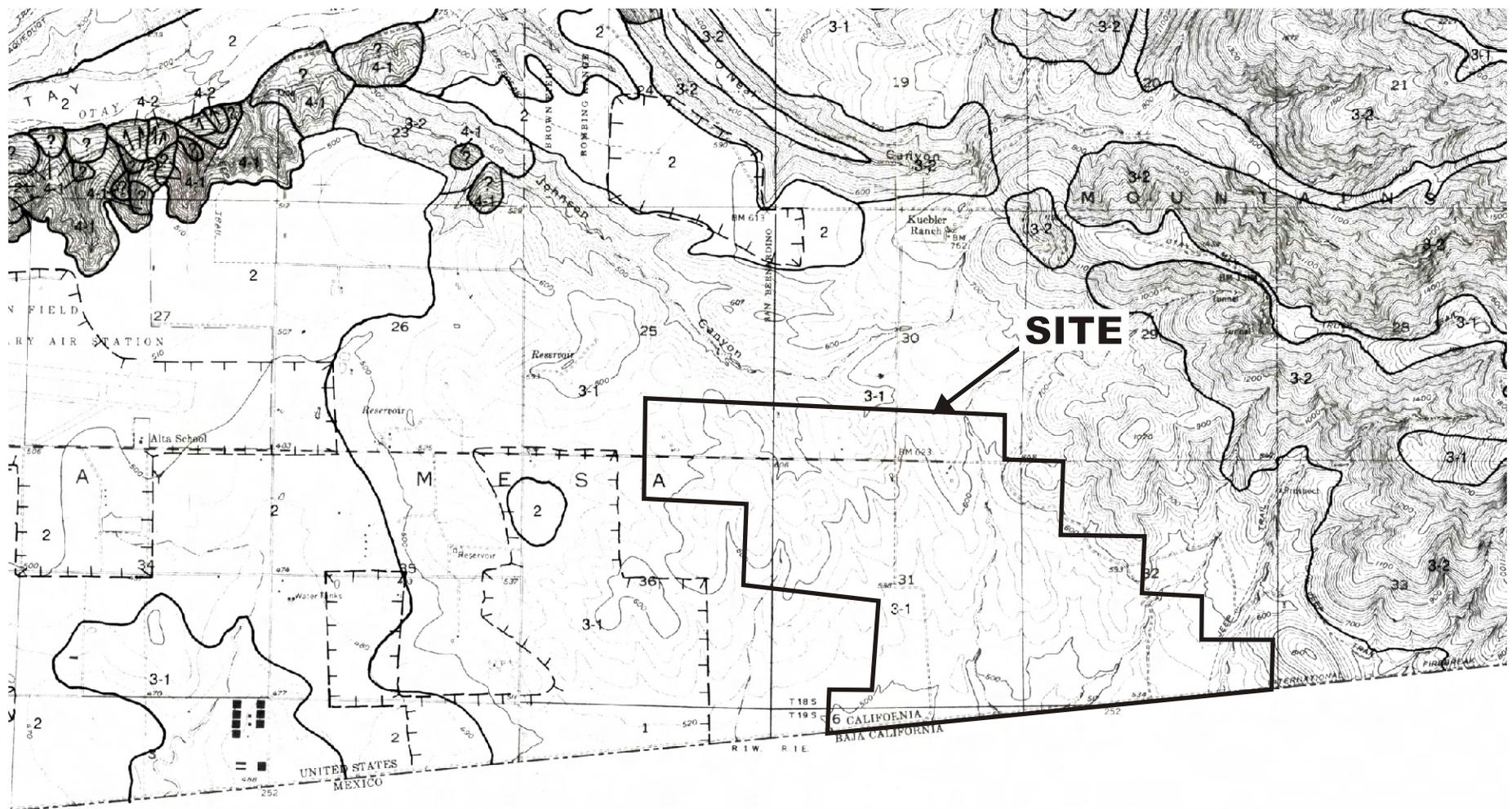
DATE

CALTRANS STATE ROUTE 11  
SAN DIEGO, CALIFORNIA

**4**

106033002

11/07



LEGEND	
	URBANIZED AREA BOUNDARY
	LANDSLIDE
	QUESTIONABLE LANDSLIDES

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.



<b>Ninyo &amp; Moore</b>		<b>LANDSLIDE HAZARDOUS MAP</b>	FIGURE
PROJECT NO.	DATE	CALTRANS STATE ROUTE 11 SAN DIEGO, CALIFORNIA	<b>5</b>
106033002	11/07		

**SUPPLEMENTARY DISTRICT  
PRELIMINARY GEOTECHNICAL  
REPORT**

**October 7, 2009**

# Memorandum

**To:** Nicola Bernard  
Office of Design  
District 11  
MS# 334

**Date:** October 7, 2009  
**File:** 11-SD-SR-11  
**EA** 11-056310  
**PM** 0.0 / 2.7

**From:** DEPARTMENT OF TRANSPORTATION  
DIVISION OF ENGINEERING SERVICES  
Geotechnical Services  
Office of Geotechnical Design – South 2

**Subject:** Proposed State Route 11 (SR-11) Extension: Supplementary District Preliminary Geotechnical Report

## Introduction

Pursuant to your request a Supplementary District Preliminary Geotechnical Report has been completed for the proposed SR-11 extension. For this report the investigation consisted of a site reconnaissance, review of the pertinent archived documents, exploratory drilling and test pit excavations, installation of piezometers, and the writing of this report. This report is intended to convey information relevant to the planning stage of the design of the SR-11 extension project. In addition, it is our understanding that the potential for geologic hazards such as faulting and seismicity, ground motion and ground rupture, liquefaction and seismically induced settlement, tsunamis, landsliding, and mineral resources at the project location have already been addressed in the preliminary geotechnical report prepared by Ninyo & Moore Consultants, dated November 21, 2007.

## Site Location

The project site is located along the border between the United States and Mexico, east of the community of Otay Mesa, in San Diego, California. To the west it is bounded by Enrico Fermi Drive, to the north by Otay Mesa Road, and to the south by the aforementioned border. The San Ysidro Mountains border the site to the east. For the project location reference is directed to Figure 1.

## Subsurface Exploration

During the subsurface exploration program for this project two relatively deep borings were drilled utilizing coring (wet rotary) method. Boring R-09-101 was drilled to the depth of 130 feet below existing ground level (to an elevation of 434.4 feet), and Boring R-09-102 was drilled to the depth of 50 feet below existing ground level (to an elevation of 441.5 feet). Boring Records for both borings are attached to this memorandum. Upon the completion of drilling, borings R-09-

101 and R-09-102 were developed into cluster piezometers; two piezometers per each boring were installed. For the piezometers reading data reference is directed to Table 1, in the Groundwater section of this report.

In addition to deep borings, four relatively shallow borings A-09-103, A-09-104, A-09-105, and A-09-106 were drilled utilizing augering (dry rotary) method. These borings were drilled to depths ranging from 26.5 feet to 36.5 feet below the ground level. Boring Records for these borings are attached to this report.

In order to assess the expansion potential of soils at the project location, a total of 14 test pits were excavated along the alignment of the proposed SR-11 extension. These test pits, O-09-107 through O-09-120, were excavated to an average depth of about three feet below ground surface. Soils from the bottoms of these excavations were field index-tested in order to classify them and to estimate their expansion potential. Results of field index tests are presented in Table 2 attached to this report. For the locations of all exploratory borings and test pits reference is directed to Figure 2. The Caltrans Office of Surveys surveyed all the borings and provided elevation data.

## **Site Geology**

The location of the proposed SR-11 extension is situated within the Peninsular Ranges Geomorphic Province of California. Based on the review of published geologic literature and maps, and our subsurface investigation program of 2009, the project area is generally underlain by the Oligocene to Miocene-age Otay Formation. The Santiago Peak Volcanics basement, in turn, underlies this formation. The Otay Formation is composed of poorly graded and poorly indurated sandstone and claystone. The claystone is composed almost exclusively of bentonite, therefore, creating a potential for the expansiveness of the Otay Formation soils (Kennedy, 1977). Bentonite is clay formed by the decomposition of volcanic ash, having the ability to absorb large quantities of water and to expand to several times its normal volume. In addition this soil has a very low intrinsic permeability (less than  $10^{-2}$  Darcy) that greatly restricts the movement of ground water, making it almost impermeable. Santiago Peak Volcanics basement consists of Jurassic to Cretaceous-age metavolcanic rocks consisting of mildly metamorphosed volcanic, volcanoclastic, and sedimentary rocks (Kennedy, 1977). In addition, the bottoms of the arroyos are filled with alluvial soils derived from local sources. A relatively thin mantle of topsoil consisting of slightly organic silty clayey sands overlies almost the entire site.

## **Subsurface Soil Conditions**

Several exploratory borings and test pits were drilled and excavated for this project. They revealed that about one to two feet thick mantle of topsoil covers almost the entire project site. Topsoil was found to consist of silty clayey sands with trace of organics. Native soils of the sedimentary origin belonging to the Otay Formation underlie this mantle. These soils were found to consist of sands and silty and clayey sands that locally were indurated thus were classified as sandstones and/or siltstones. Locally, layers/lenses of lean clays were found to exist within the aforementioned formation. The relative density of soils belonging to the Otay Formation, based

on SPT sampling (N-blow counts) was found to range from medium dense to very dense, with the average relative density being dense. Basement rocks belonging to the Santiago Peak Volcanics were found to underlie the Otay Formation. In Boring R-09-101 the interface between the Otay Formation and Santiago Peak Volcanics was logged at an elevation of 463.4 feet, and in Boring R-09-102 it was logged at an elevation of 459.5 feet. Santiago Peak Volcanics were found to consist of sedimentary rock, breccia, comprised of andesitic cobbles and gravels within a silty sand or sandy siltstone matrix.

In order to assess the expansion potential of the surficial soils of the Otay Formation, fourteen test pits were excavated along the SR-11 alignment. Field index tests were performed on soils encountered at about a depth of three feet in each test pit. The tests revealed that these soils consisted of lean clays, lean clays with sands, clayey sands, and sands with clays. They were found to exhibit plasticity ranging from low to high. Based on plasticity the expansion potential of these soils was estimated to range from low to high. For the subsurface soil description and estimated expansion potential at the location of test pits reference is directed to Table 2 attached to this report.

## Groundwater

No groundwater was encountered in all borings drilled during the exploration program for this project. Borings R-09-101 and R-09-102 were drilled utilizing drilling fluid. Therefore, water encountered in the piezometers is most likely a remnant of water-based drilling fluid slowly dissipating into the surrounding formation. This process will take time to complete.

Preliminary groundwater data obtained from the subsurface exploration program for this project (including the readings of piezometers) suggests that no groundwater exists within the Otay Formation. In Boring R-09-101 the interface of this sedimentary formation and underlying Santiago Peak Volcanics bedrock was logged to be at an elevation of 463.4 feet, and in Boring R-09-102 this interface was logged to be at an elevation of 459.5.0 feet. For the piezometers readings reference is directed to Table 1 below.

**Table 1, Groundwater Elevations (in feet) Observed in Piezometers R-09-101 and R-09-102**

Piezometer R-09-101		Piezometer R-09-102		Date of Sounding
Piezom-A	Piezom-B	Piezom-A	Piezom-B	
523.95	531.82	449.09	464.38	7/31/09
521.52	529.75	448.83	461.98	8/20/09
520.40	529.49	448.80	461.56	9/02/09
519.20	529.70	448.83	461.90	9/15/09
518.65	529.14	448.90	461.37	10/5/09

Based on preliminary results of our exploration program and available geologic literature it is very unlikely that significant ground water exists within the Otay Formation. However, our office will continue monitoring the piezometers, and any groundwater-related data that differs from the conclusions of this memorandum will be reported to your office. Perched groundwater could potentially be encountered at some locations within the Otay Formation, especially during the rainy season. Perched groundwater is unconfined ground water that is trapped by an underlying layer or lens of impermeable soil, usually clay.

No groundwater was noted within the Santiago Peak Volcanic bedrock, to the maximum depth of our exploratory borings. The maximum depth this formation was explored in Boring R-09-101 was 130.0 feet below ground level (elevation of 434.4 feet). In Boring R-09-102 the bedrock was explored to the depth of 50.0 feet below the ground level (elevation of 441.5 feet). At this time the existence of groundwater within the Santiago Peak Volcanics Formation has not been determined, as the piezometer readings have yet to stabilize and continue to trend downward. However, our office will continue monitoring piezometers installed in both borings, and any groundwater-related data that differs from the conclusions of this memorandum will be reported to your office.

## **Conclusions**

Soils encountered during our subsurface investigation consisted of a relatively thin (about one to two feet thick) layer of topsoil composed of silty and clayey sands and lean clays with sand and traces of organics. This topsoil layer was found to be underlain by the Otay Formation consisting of clayey and silty sands that with depth graded to siltstone and/or sandstone. Locally layers or lenses of lean clays were found to exist within this formation. The relative density of soils belonging to the Otay Mesa Formation, based on SPT sampling (N-blow counts), was found to range from medium dense to very dense, with the average value being dense. The Otay Formation was found to be underlain by the Santiago Peak Volcanics basement consisting of sedimentary breccia composed of andesitic gravels and cobbles within a silty sand matrix.

No groundwater was encountered during the subsurface investigation, and subsequent readings of piezometers installed during this investigation indicate that no significant groundwater is likely to exist within the Otay Formation. In addition, the existence of ground water within the bedrock basement has not yet been determined. However, the core samples gathered during exploratory drilling suggest that the Santiago Peak Volcanics basement has characteristics that are not conducive to the storage or transmission of groundwater.

Based on the results of the exploration program for this project it is expected that along the alignment of the proposed SR-11 extension certain cuts would expose expansive soils of the Otay Formation. It is estimated that about 30 percent of the length of the proposed SR-11 extension could be found to be underlain by medium to highly expansive soils. These soils could potentially be detrimental to the integrity of the pavement section of the freeway and to structures such as culverts and drainages. Their mitigation, based on laboratory testing, could involve removal and replacement of the top four to five feet of the subgrade section, and the removal and replacement

of the soils directly below proposed culverts and/or drainages. In addition, these expansive soils will be difficult to compact to the required degree of compaction.

Several large retaining structures are proposed for this project. They are proposed to be located at the west section of the subject project location. Based on our field exploration program, both standard Caltrans retaining walls and MSE (Mechanically Stabilized Embankment) wall designs could be utilized for these retaining structures. However, there is a potential for removal and replacement of unsuitable (expansive) soils that may be encountered under the foundations of the proposed structures.

Based on our review of published geologic maps, topographic maps, and aerial photographs, no man-made physical feature that would adversely affect the implementation of the SR-11 extension project was found to exist within this project limits.

If you have additional questions or require clarification please contact Jeff Tesar at (office) 858-467-2716 or (mobile) 858-945-0458.

Jeff Tesar, C.E.G.  
Engineering Geologist  
Office of Geotechnical Design – South-2

## **Attachements**

1. Figure 1, Project Location
2. Figure 2, Boring Locations
3. Boring Records
4. Table 2, Subsurface soil conditions and estimated expansion potential at the locations of Test Pits

cc: Abbas Abghari  
Brian Hinman  
OGDS2 Files

INDEX OF PLANS

SHEET NO.	DESCRIPTION
1	TITLE AND LOCATION MAP
2	DESCRIPTION
3	DESCRIPTION
4	DESCRIPTION
5	DESCRIPTION
6	DESCRIPTION
7	DESCRIPTION

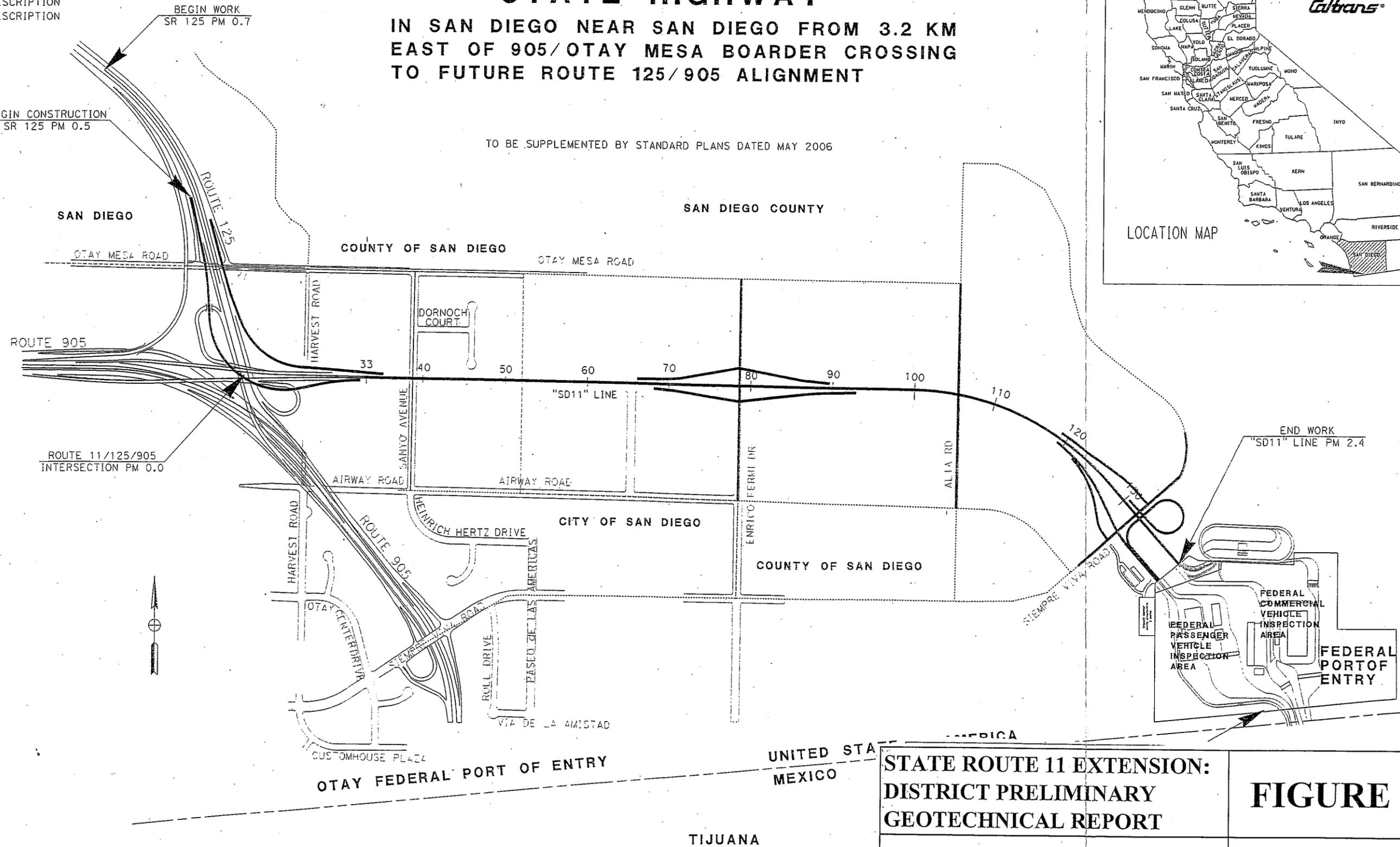
STATE OF CALIFORNIA  
**DEPARTMENT OF TRANSPORTATION**  
**PROJECT PLANS FOR CONSTRUCTION ON**  
**STATE HIGHWAY**

IN SAN DIEGO NEAR SAN DIEGO FROM 3.2 KM EAST OF 905/OTAY MESA BORDER CROSSING TO FUTURE ROUTE 125/905 ALIGNMENT

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	11	0.0 / 2.7	1	1

LOCATION MAP



PROJECT MANAGER  
M. BAZA

DESIGN ENGINEER  
F. BEHBOODY

STATE ROUTE 11 EXTENSION: DISTRICT PRELIMINARY GEOTECHNICAL REPORT	<b>FIGURE 1</b>
PROJECT LOCATION	
	EA 11-056310

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO CONTRACTORS."

# PRELIMINARY FOR DESIGN STUDY ONLY

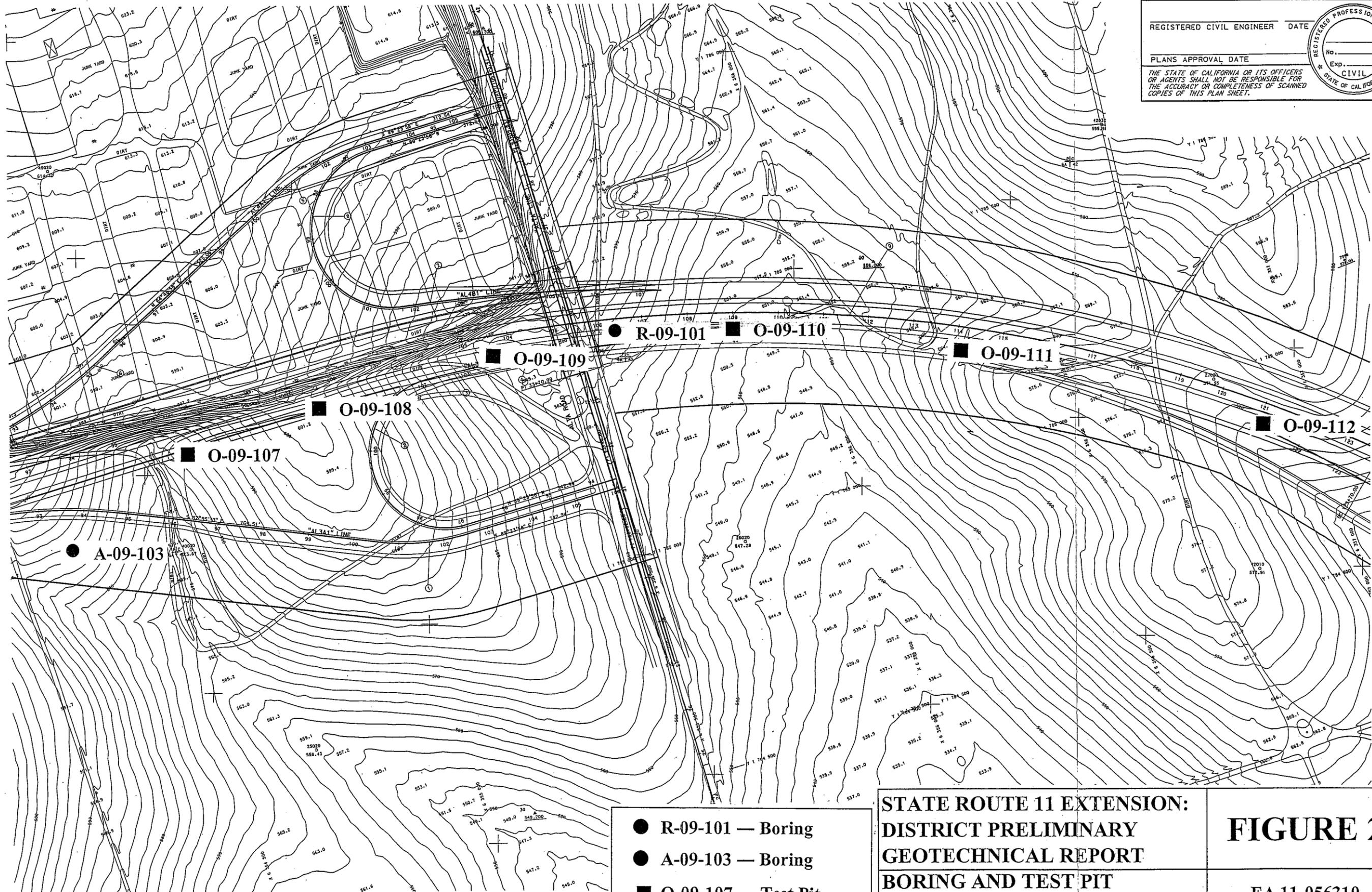
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11	0.0/2.7	3	5

REGISTERED CIVIL ENGINEER	DATE
PLANS APPROVAL DATE	

REGISTERED PROFESSIONAL ENGINEER  
 No. \_\_\_\_\_  
 Exp. \_\_\_\_\_  
 CIVIL  
 STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



- R-09-101 — Boring
- A-09-103 — Boring
- O-09-107 — Test Pit

**STATE ROUTE 11 EXTENSION:  
DISTRICT PRELIMINARY  
GEOTECHNICAL REPORT  
BORING AND TEST PIT  
LOCATIONS**

**FIGURE 2**  
  
EA 11-056310

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION  
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 DATE REVISOR

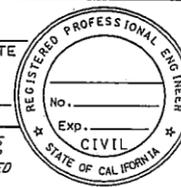
# PRELIMINARY FOR DESIGN STUDY ONLY

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11	0.0/2.7	4	5

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION  
**Caltrans** ENGINEERING SERVICES

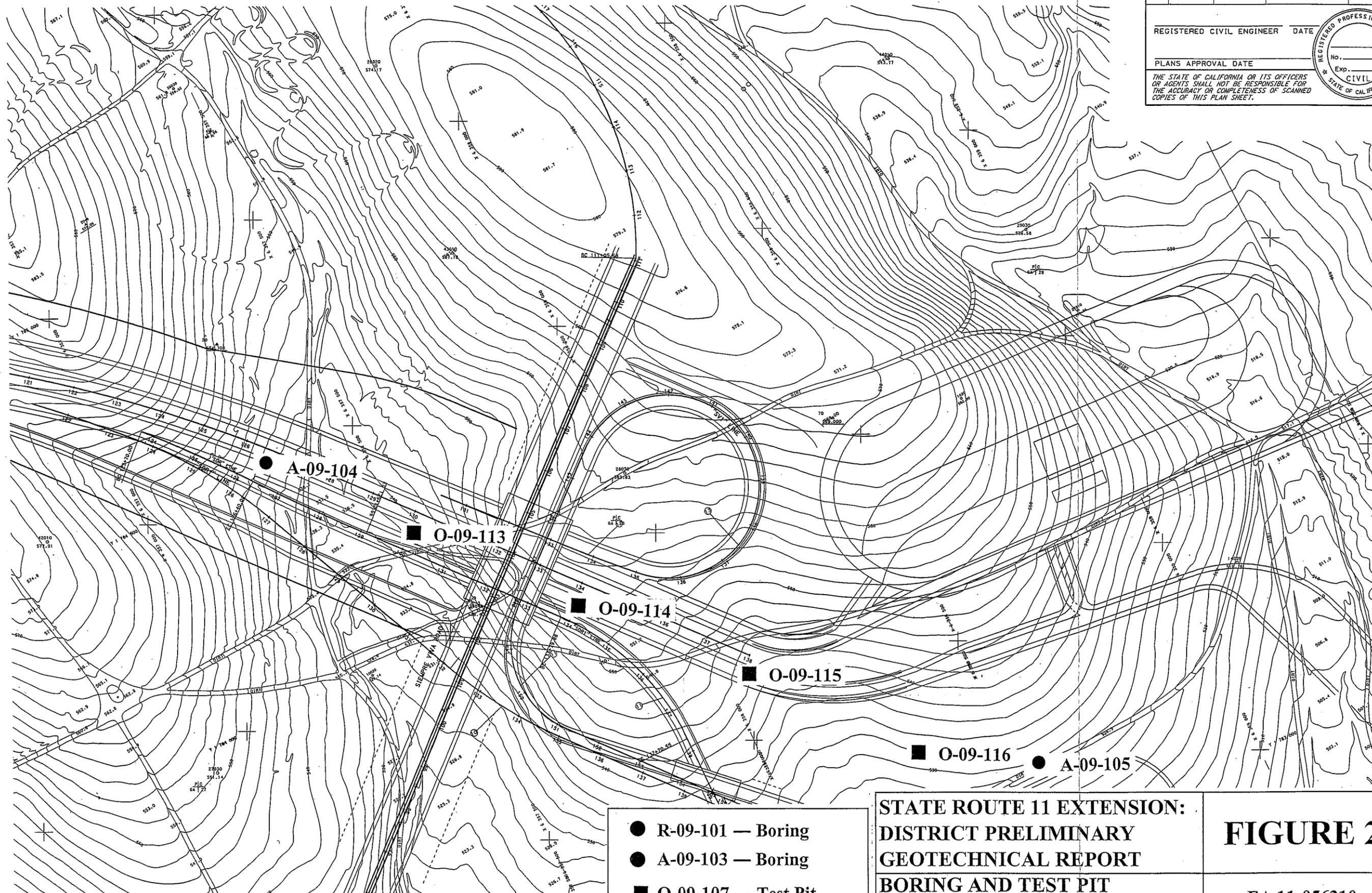
FUNCTIONAL SUPERVISOR

CALCULATED-DESIGNED BY

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REVISOR BY

DATE REVISED



- R-09-101 — Boring
- A-09-103 — Boring
- O-09-107 — Test Pit

**STATE ROUTE 11 EXTENSION:  
 DISTRICT PRELIMINARY  
 GEOTECHNICAL REPORT  
 BORING AND TEST PIT  
 LOCATIONS**

**FIGURE 2**

EA 11-056310

# PRELIMINARY FOR DESIGN STUDY ONLY

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11	0.0/2.7	5	5

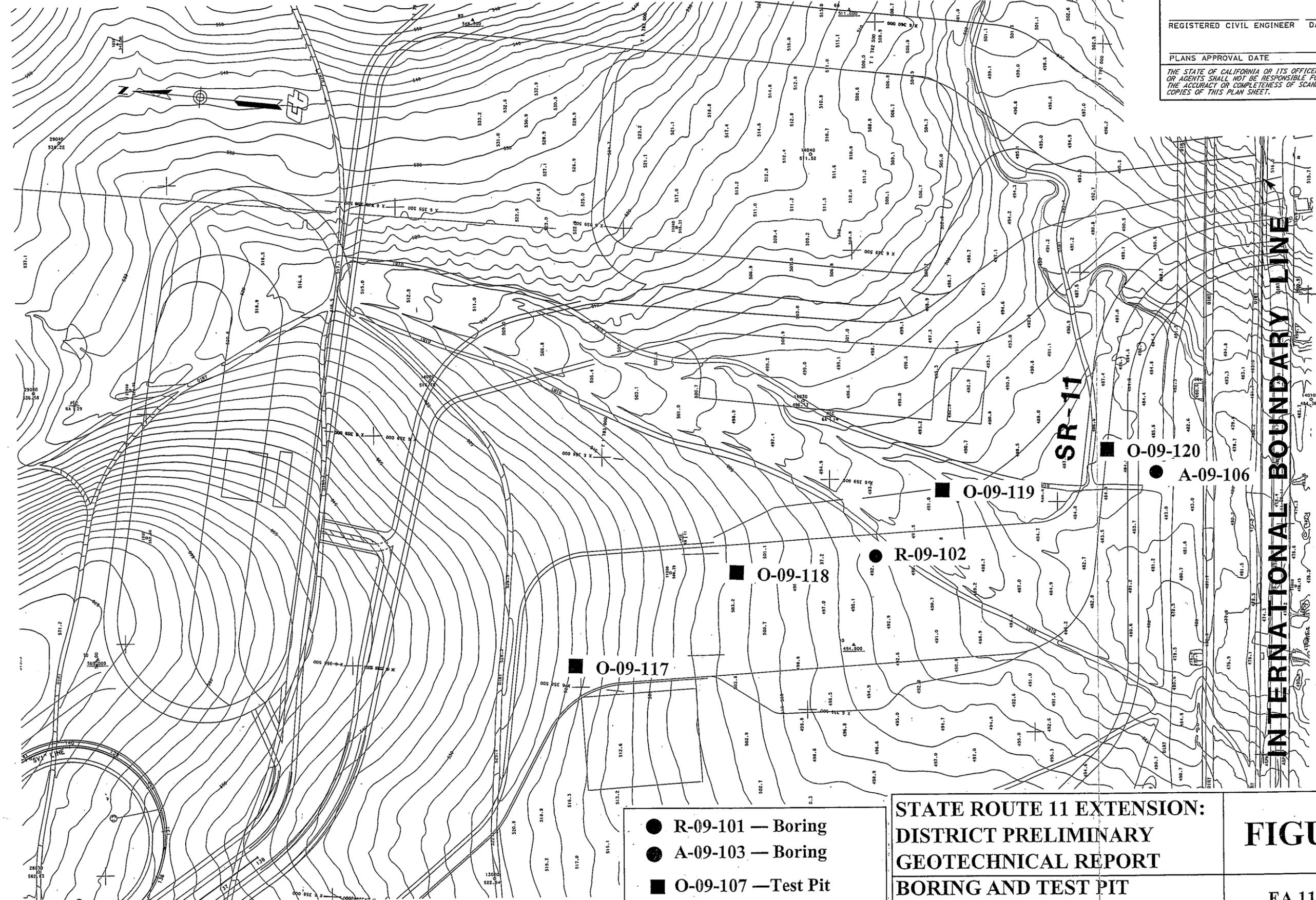
  

REGISTERED CIVIL ENGINEER	DATE
PLANS APPROVAL DATE	

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<b>Et-Gutrans</b> ENGINEERING SERVICES		CHECKED BY	DATE REVISED



- R-09-101 — Boring
- A-09-103 — Boring
- O-09-107 — Test Pit

**STATE ROUTE 11 EXTENSION:  
DISTRICT PRELIMINARY  
GEOTECHNICAL REPORT  
BORING AND TEST PIT  
LOCATIONS**

**FIGURE 2**  
EA 11-056310

**MEXICO**

**Table 2,** Subsurface soil conditions and estimated expansion potential at the locations of test pits.

<b>TEST PIT No.</b>	<b>TEST PIT ELEVATION (ft)</b>	<b>SOILS DESCRIPTION (at about a depth of 3 feet)</b>	<b>ESTIMATED EXPANSION POTENTIAL</b>
O-09-107	584.0	Lean CLAY (CL), dark brown, dry to moist, high plasticity	High
O-09-108	600.0	Lean CLAY with SAND (CL), brown, dry to moist, medium plastic	Medium
O-09-109	567.0	Lean CLAY with SAND (CL), brown, dry to moist, medium plastic	Medium
O-09-110	552.0	Clayey SAND (SC), brown, moist, low plasticity	Low
O-09-111	566.0	Clayey SAND (SC), brown, moist, low plasticity	Low
O-09-112	568.0	Lean CLAY with SAND (CL), brown, dry to moist, high plasticity	High
O-09-113	538.0	Lean CLAY with SAND (CL), brown, dry to moist, high plasticity	High
O-09-114	553.0	Poorly Graded SAND with CLAY (SP-SC), brown, moist, low plasticity	Low
O-09-115	542.0	Poorly Graded SAND with CLAY (SP-SC), brown, moist, low plasticity	Low
O-09-116	532.0	Clayey SAND (SC), gray, dry, low plasticity	Low
O-09-117	519.0	Clayey SAND (SC), gray, dry, low plasticity	Low
O-09-118	503.0	Clayey SAND (SC), gray, dry, low plasticity	Low
O-09-119	496.0	Clayey SAND (SC), brown, moist, low plasticity	Medium
O-09-120	481.0	Lean CLAY (CL), brown, moist, high plasticity	High

LOGGED BY JEFF TESAR	BEGIN DATE 07/15/09	COMPLETION DATE 07/20/09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 32°33' 48.440" N 116° 55' 05.277" W		HOLE ID: <b>R-09-101</b>
DRILLING CONTRACTOR CALTRANS DRILLING SERVICES			BOREHOLE LOCATION (Station, Offset, and Line)		SURFACE ELEVATION 564.37ft
DRILLING METHOD MUD ROTARY - CORING			DRILL RIG CS 2000		BOREHOLE DAIMETER 4.5 in
SAMPLER TYPE(S) AND SIZE(S) [ID] SPT (1.4), WIRELINE SAMPLER 4.5 "			SPT HAMMER TYPE AUTOMATIC		HAMMER EFFICIENCY (ER.) 84 %
BOREHOLE BACKFILL AND COMPLETION HOLE CUTTINGS AND ENVIROPLUG			GROUNDWATER READINGS	DURING DRILLING NOT INVESTIGATED	AFTER DRILLING (DATE) MONITORED
					TOTAL DEPTH OF BORING 130.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
564.4	1		Top Soil (Silty SAND)												
562.9	2		Poorly graded SAND (SP); Dense, gray, moist, fine grained, trace of coarse SAND, locally clayey. (Otay Formation).												
	3														
	4														
	5														
	6			S1	12		42								
					18										
					24										
	7														
	8														
555.4	9		Silty SAND (SM): Dense, gray, moist, fine grained sand, locally clayey.												
	10														
	11				S2	12		38							
					15										
					23										
	12														
	13														
	14														
	15														
	16			S3	8		36								
					17										
					21										
	17														
	18														
	19														
544.4	20														

(continued)



DEPARTMENT OF TRANSPORTATION  
DIVISION OF ENGINEERING SERVICES  
GEOTECHNICAL SERVICES

REPORT TITLE  
GEOTECHNICAL DESIGN REPORT FOR SR 11  
DISTRICT COUNTY  
11 SAN DIEGO  
PROJECT OR BRIDGE NAME  
SR-11  
BRIDGE NUMBER PREPARED BY DATE SHEET

HOLE ID: **R-09-101**  
ROUTE POSTMILE(KP) EA  
SR-11 0/4 11-056310



OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2

N/A

E. GALLETA

08/30/09

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
544.4	21	Sedimentary Rock (SANDY SILTSTONE): fine grained, thinly bedded, gray, moderately weathered, soft, slightly fractured. [Silty SAND (SM) dense, gray, moist, fine grained.]	X	4	15	43	88%	100%						
	22			21										
	23			22										
	24													
539.4	25	At Elev. 539.4 ft, very dense.	X	5	21	62	100%	86%						
	26	27												
	27	35												
	30	X	6	6	15	59	100%	86%						
	31			24										
	32			35										
	35	X	7	7	14	66	100%	100%						
	36			27										
	37			39										

(continued)



DEPARTMENT OF TRANSPORTATION  
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REPORT TITLE  
 GEOTECHNICAL DESIGN REPORT FOR SR 11  
 DISTRICT COUNTY  
 11 SAN DIEGO  
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 BRIDGE NUMBER N/A  
 PREPARED BY  
 E. GALLETA

HOLE ID: **R-09-101**  
 ROUTE POSTMILE(KP) EA  
 SR-11 0/4 11-056310  
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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
523.4	41		At Elev. 523.4 ft: brown, dense.	X	8	14 18 27	45								
	42							100%	80%						
	43														
	44														
519.4	45		At Elev. 519.4 ft: very dense.	X	9	13 24 36	60								
	46														
	47							100%	75%						
	48														
	49														
	50														
	51			X	10	25 30 42	72								
	52							60%	56%						
	53														
	54														
559.4	55		At Elev. 559.4 ft: dense.	X	11	17 18 30	48								
	56														
	57							100%	100%						
	58														
	59														
	60														

(continued)



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 SR-11 0/4

PREPARED BY  
 E. GALLETA

DATE  
 08/30/09

HOLE ID: **R-09-101**  
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 11-056310

SHEET  
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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
	61		Poorly graded SAND (SP): Very dense, gray, moist, fine to medium grained, locally silty.	X	12	14	59	66%	100%						
	62				22										
	63				37										
	64														
	65														
	66				X	13	19	60	86%						
	67														
	68														
	69														
494.4	70		At Elev. 494.4 ft: dense.	X	14	13	48	100%	100%						
	71					29									
	72					19									
	73														
	74														
489.4	75		Sedimentary Rock (SANDSTONE): fine to medium grained, thinly bedded, gray, moderately weathered, soft, slightly fractured. [Poorly graded SAND (SP), very dense, gray, moist, fine to coarse grained, traces of coarse sand.]					72%	100%						
	76														
	77														
	78														
	79														
	80														

(continued)



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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
	81				15	24 29 35	64								
	82							100%	100%						
	83														
	84														
	85														
	86														
	87							100%	100%						
	88														
	89														
474.4	90		Sedimentary Rock (SILTSTONE): thinly bedded, gray, moderately weathered, very soft, slightly fractured.		16	21 31 39	70								
	91														
	92								100%	100%					
	93														
	94														
	95														
	96														
	97														
	98							100%	100%						
	99														
	100														

(continued)



DEPARTMENT OF TRANSPORTATION  
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ROUTE POSTMILE(KP)  
 SR-11 0/4

PREPARED BY  
 E. GALLETA

DATE  
 08/30/09

HOLE ID: **R-09-101**  
 EA  
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SHEET  
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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (ksf)	Coring Run	Casing Depth	REMARKS	
464.4			Elev 464.4 ft: blowcount affected by gravel.			20										
463.4	101		Sedimentary Rock (BRECCIA): Gravels and cobbles within silty sand matrix, (often indurated or siliceous). Gravel content 40%, intensely weathered, moderately soft, moderately fractured.		17	20	Ref									
	102						*50		80%	75%						
	103															
	104															
	105															
	106															
	107															
	108								92%	59%						
	109															
	110					18	*50/4"	Ref								
	111								100%	60%						
	112															
	113															
	114								80%	75%						
	115															
	116															
	117															
	118								60%	33%						
	119															
	120															

(continued)



DEPARTMENT OF TRANSPORTATION  
 DIVISION OF ENGINEERING SERVICES  
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 OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2

REPORT TITLE  
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ROUTE  
 SR-11  
 PREPARED BY  
 E. GALLETA

DATE  
 08/30/09

HOLE ID: **R-09-101**  
 POSTMILE(KP) EA  
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SHEET  
 6 of 7

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
	121			X	19	*50/3"	Ref								
	122							60%	33%						
	123														
	124														
	125														
438.4	126		At Elev. 438.4 ft : more gravels and cobbles.												
	127							60%	50%						
	128														
	129														
434.4	130		Boring completed at the planned depth of 130 ft, Elev 434.4 ft Installed 2 piezometers: Piezo A to the depth of 130 ft Piezo B to the depth of 91.5 ft	X	20	*50/3"	Ref								
	131														
	132														
	133														
	134														
	135														
	136														
	137														
	138														
	139														
	140														



DEPARTMENT OF TRANSPORTATION  
 DIVISION OF ENGINEERING SERVICES  
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REPORT TITLE  
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 BRIDGE NUMBER N/A

ROUTE POSTMILE(KP)  
 SR-11 0/4

PREPARED BY DATE  
 E. GALLETÀ 08/30/09

HOLE ID: **R-09-101**  
 EA  
 11-056310

SHEET  
 7 of 7

LOGGED BY JEFF TESAR	BEGIN DATE 07/21/09	COMPLETION DATE 07/22/09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 32° 33' 17.903" N 116° 54' 26.481" W	HOLE ID: <b>R-09-102</b>
DRILLING CONTRACTOR CALTRANS DRILLING SERVICES			BOREHOLE LOCATION (Station, Offset, and Line)	SURFACE ELEVATION 491.48 ft
DRILLING METHOD MUD ROTARY - CORING			DRILL RIG CS 2000	BOREHOLE DAIMETER 4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT (1.4), WIRELINE SAMPLER 4.5"			SPT HAMMER TYPE AUTOMATIC	HAMMER EFFICIENCY (ER.) 84 %
BOREHOLE BACKFILL AND COMPLETION HOLE CUTTINGS AND ENVIROPLUG			GROUNDWATER READINGS	TOTAL DEPTH OF BORING 50.0 ft
			DURING DRILLING NOT INVESTIGATED	AFTER DRILLING (DATE) MONITORED

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
491.48 ft	1		Top Soil (Silty SAND)												
490.0	2		Poorly graded SAND with SILT (SP-SM); Dense, gray, moist, fine grained sand, locally clayey. (Otay Formation).												
	3														
	4														
486.5	5		Silty SAND (SM): Dense, gray, moist, fine grained sand.	1		10	34								
	6				14										
	7				20										
	8														
	9														
481.5	10		At Elev. 481.5 ft medium dense.	2		10	34								
	11				14										
	12				20										
	13														
	14														
476.5	15		Poorly graded SAND with SILT (SP-SM): Very dense, gray, moist, fine grained sand.	3		17	62								
	16				28										
	17				24										
	18														
	19														
	20														

Washed out during drilling: not intended to recover.

(continued)

	DEPARTMENT OF TRANSPORTATION	REPORT TITLE GEOTECHNICAL DESIGN REPORT FOR SR 11	HOLE ID: <b>R-09-102</b>
	DIVISION OF ENGINEERING SERVICES	DISTRICT COUNTY 11 SAN DIEGO	ROUTE POSTMILE(KP) SR-11 0/4
	GEOTECHNICAL SERVICES	PROJECT OR BRIDGE NAME SR-11	EA 11-056310
	OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2	BRIDGE NUMBER N/A	PREPARED BY DATE SHEET E. GALLETÀ 08/30/09 1 of 3

ELEVATION (ft)	DEPTH (ft)	Material Graphics	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
471.5	21		X 4	21 22 29		51	Not intended to recover samples.							
467.5	24	Sedimentary Rock (Gravelly SANDSTONE): thinly bedded, gray, moderately weathered, soft, slightly fractured. [Poorly graded Gravel with SILT and SAND/Poorly graded SAND with SILT and GRAVEL (GP-GM/SP-SM: Very dense, moist, gray, fine grained sand.)]	X 5	*42	Ref									
	25													
	26													
	27													
	28													
	29													
	30			X 6	50 *50/4"	Ref								
	31								75%	0%				
	32													
459.5	33		Sedimentary Rock (BRECCIA): Cobbles and gravels within silty sand/sandy siltstone matrix. Gray, intensely weathered, soft, moderately fractured. Cobbles ~ 30 %, gravels ~ 30 to 40 %.						100%	0%				
	34								100%	60%				
	35			X 7	*	Ref								
	36								100%	56%				
	37													
	38													
	39								100%	100%				
	40													

(continued)



DEPARTMENT OF TRANSPORTATION  
 DIVISION OF ENGINEERING SERVICES  
 GEOTECHNICAL SERVICES  
 OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2

REPORT TITLE  
 GEOTECHNICAL DESIGN REPORT FOR SR 11  
 DISTRICT COUNTY  
 11 SAN DIEGO  
 PROJECT OR BRIDGE NAME  
 SR-11  
 BRIDGE NUMBER  
 N/A

ROUTE  
 SR-11  
 PREPARED BY  
 E. GALLETA

DATE  
 08/30/09

HOLE ID: **R-09-102**  
 POSTMILE(KP) EA  
 0/4 11-056310  
 SHEET  
 2 of 3

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Coring Run	Casing Depth	REMARKS
	41							100%	50%						
	42							70%	0%						
	43														
	44							67%	50%						
	45			⊗	8	*50/3"	Ref								
	46							80%	0%						
	47														
	48														
	49							100%	17%						
441.5	50		Boring terminated at depth of 50 ft, elev 441.5 ft. due to expenditure of allotted drilling resources. Installed 2 piezometers: Piezo A to the depth of 50 ft. Piezo B to the depth of 31 ft.  * - blowcounts affected by gravels												
	51														
	52														
	53														
	54														
	55														
	56														
	57														
	58														
	59														
	60														



DEPARTMENT OF TRANSPORTATION  
 DIVISION OF ENGINEERING SERVICES  
 GEOTECHNICAL SERVICES  
 OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2

REPORT TITLE  
 GEOTECHNICAL DESIGN REPORT FOR SR 11  
 DISTRICT COUNTY  
 11 SAN DIEGO  
 PROJECT OR BRIDGE NAME  
 SR-11  
 BRIDGE NUMBER  
 N/A

ROUTE POSTMILE(KP)  
 SR-11 0/4  
 PREPARED BY  
 E. GALLETA  
 DATE  
 08/30/09  
 SHEET  
 3 of 3

HOLE ID: **R-09-102**

EA  
 11-056310

LOGGED BY J.TESAR	BEGIN DATE 07/15/09	COMPLETION DATE 07/15/09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 32° 33' 47.572" N 116° 55' 20.806" W	HOLE ID: <b>A-09-103</b>
DRILLING CONTRACTOR CALTRANS DRILLING SERVICES	BOREHOLE LOCATION (Station, Offset, and Line) 115 feet from CL (RT)		SURFACE ELEVATION 588.8 ft	
DRILLING METHOD AUGER	DRILL RIG CS 2000		BOREHOLE DAIMETER 6 in	
SAMPLER TYPE(S) AND SIZE(S) [ID] SPT (1.4)	SPT HAMMER TYPE AUTOMATIC		HAMMER EFFICIENCY (ER) 84 %	
BOREHOLE BACKFILL AND COMPLETION HOLE CUTTINGS AND ENVIROPLUG	GROUNDWATER DURING DRILLING READINGS		AFTER DRILLING (DATE) NOT ENCOUNTERED	
			TOTAL DEPTH OF BORING 31.5 ft	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Augering	Casing Depth	REMARKS
588.8	1		Top Soil (Clayey Sand)												
587.3	2		Well graded SAND with SILT (SW-SM): Very dense, light brown, moist, fine grained, locally clayey, few gravel. (Otay Formation)		1	17	68								
	3				30										
	4				38										
	5														
	6														
	7														
	8														
	9														
578.8	10		Silty SAND[SM]: Very dense, dark gray, moist, fine grained, exhibits mottled texture (Sedimentary).		2	17	101								
	11				40										
	12				61										
	13														
	14														
573.8	15		Poorly graded SAND [SP]: Very dense, light gray, moist, fine grained, locally silty and clayey.		3	21	98								
	16				77										
	17														
	18														
	19														
568.8	20														

(continued)



DEPARTMENT OF TRANSPORTATION  
DIVISION OF ENGINEERING SERVICES  
GEOTECHNICAL SERVICES  
OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2

REPORT TITLE  
HYDROGEOLOGIC REPORT FOR SR 11  
DISTRICT COUNTY  
11 SAN DIEGO  
PROJECT OR BRIDGE NAME  
SR-11  
BRIDGE NUMBER  
N/A

ROUTE  
SR-11  
PREPARED BY  
E. GALLETA  
DATE  
08/30/09

HOLE ID:  
**A-09-103**  
POSTMILE(KP)  
0/4  
EA  
11-056310  
SHEET  
1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Augering	Casing Depth	REMARKS
568.8	21	[Material Graphics]	Sedimentary Rock (Silty SANDSTONE): Fine grained, thinly bedded, gray, moderately weathered, soft, slightly fractured. [Silty SAND(SM): Dense, gray, moist, fine grained.]	X	4	24	69								
	26														
	43														
563.8	25	[Material Graphics]	Poorly graded SAND (SP): Very dense, gray, moist, fine grained, locally silty.	X	5	14	55								
	15														
	40														
561.3	28	[Material Graphics]	Well-graded SAND with SILT (SW-SM): Dense, light brown, moist, fine grained.												
557.3	31	[Material Graphics]	Boring completed at the planned depth of 31.5 ft., elev. 557.3 ft. No groundwater encountered.	X	6	10	31								
	17														
	32														
	33														
	34														
	35														
	36														
	37														
	38														
	39														
	40														

	DEPARTMENT OF TRANSPORTATION	REPORT TITLE	HOLE ID:	<b>A-09-103</b>
	DIVISION OF ENGINEERING SERVICES	HYDROGEOLOGIC REPORT FOR SR 11	DISTRICT	COUNTY
	GEOTECHNICAL SERVICES	11 SAN DIEGO	ROUTE	POSTMILE(KP)
	OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2	SR-11	SR-11	0/4
		BRIDGE NUMBER	PREPARED BY	DATE
		N/A	E. GALLETÀ	08/30/09
			SHEET	2 of 2

LOGGED BY J. TESAR	BEGIN DATE 07/15/09	COMPLETION DATE 07/15/09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 32° 33' 39.570" N 116° 54' 45.668" W	HOLE ID: <b>A-09-104</b>
DRILLING CONTRACTOR CALTRANS DRILLING SERVICES	BOREHOLE LOCATION (Station, Offset, and Line) 48 ft from Center Line (RT)		SURFACE ELEVATION 549.0 ft	
DRILLING METHOD AUGER	DRILL RIG CS 2000		BOREHOLE DAIAMETER 6 in	
SAMPLER TYPE(S) AND SIZE(S) [ID] SPT (1.4)	SPT HAMMER TYPE AUTOMATIC		HAMMER EFFICIENCY (ER) 84 %	
BOREHOLE BACKFILL AND COMPLETION HOLE CUTTINGS AND ENVIROPLUG	GROUNDWATER DURING DRILLING READINGS	AFTER DRILLING (DATE) NOT ENCOUNTERED	TOTAL DEPTH OF BORING 26.5 ft	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Augering	Casing Depth	REMARKS
549.0	1		Top soil (Clayey SAND)												
547.5	2		Silty, clayey SAND (SM/SC): Medium dense, light gray, moist, fine grained.		1	10 11 15	26								
540.0	9		Well-graded SAND with SILT (SW-SM): Dense, light gray, moist, fine grained.		2	8 18 18	36								
534.0	15		Poorly graded SAND (SP): Medium dense, light gray, moist, locally clayey.		3	7 8 14	22								
	20		(continued)												

 <p>DEPARTMENT OF TRANSPORTATION DIVISION OF ENGINEERING SERVICES GEOTECHNICAL SERVICES OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2</p>	REPORT TITLE HYDROGEOLOGIC REPORT FOR SR 11	HOLE ID: <b>A-09-104</b>
	DISTRICT COUNTY 11 SAN DIEGO	ROUTE POSTMILE(KP) SR-11 0/4
	PROJECT OR BRIDGE NAME SR-11	EA 11-056310
	BRIDGE NUMBER N/A	PREPARED BY DATE E. GALLETTA 08/30/09

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Augering	Casing Depth	REMARKS	
529.0	21	[Material Graphics: Poorly graded SAND (SP) with dots]	Poorly graded SAND (SP) , dense, gray,moist, fine grained, locally silty.	[Sample Location: 4]	4	11	40									
	18															
	22															
524.0	25	[Material Graphics: Very dense sand]	At Elev 524.0 ft grades to very dense.	[Sample Location: 5]	5	12	55									
	27															
	28															
522.5	27		Boring completed at planned depth of 26.5 ft, Elev 522.5 ft No groundwater encountered.													
	28															
	29															
	30															
	31															
	32															
	33															
	34															
	35															
	36															
	37															
	38															
	39															
	40															



DEPARTMENT OF TRANSPORTATION  
 DIVISION OF ENGINEERING SERVICES  
 GEOTECHNICAL SERVICES  
 OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2

REPORT TITLE  
 HYDROGEOLOGIC REPORT FOR SR 11  
 DISTRICT COUNTY  
 11 SAN DIEGO  
 PROJECT OR BRIDGE NAME  
 SR-11  
 BRIDGE NUMBER  
 N/A

ROUTE POSTMILE(KP)  
 SR-11 0/4  
 PREPARED BY  
 E. GALLETÀ  
 DATE  
 08/30/09

HOLE ID: **A-09-104**  
 EA  
 11-056310  
 SHEET  
 2 of 2

LOGGED BY J. TESAR	BEGIN DATE 07/14/09	COMPLETION DATE 07/14/09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 32° 33' 26.365" N 116° 54' 33.004" W	HOLE ID: <b>A-09-105</b>
DRILLING CONTRACTOR CALTRANS DRILLING SERVICES	BOREHOLE LOCATION (Station, Offset, and Line) 134 ft from Center Line (RT)		SURFACE ELEVATION 526.4 ft	
DRILLING METHOD AUGER	DRILL RIG CS 2000		BOREHOLE DAIMETER 6 in	
SAMPLER TYPE(S) AND SIZE(S) [ID] SPT (1.4)	SPT HAMMER TYPE AUTOMATIC		HAMMER EFFICIENCY (ER) 84 %	
BOREHOLE BACKFILL AND COMPLETION HOLE CUTTINGS AND ENVIROPLUG	GROUNDWATER DURING DRILLING READINGS		AFTER DRILLING (DATE) NOT ENCOUNTERED	
			TOTAL DEPTH OF BORING 31.0 ft	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Augering	Casing Depth	REMARKS
526.4	0		Top Soil (Lean CLAY).												
524.9	1														
	2		Well graded SAND with SILT (SW-SM): Medium dense, light gray, moist, fine grained sand. (Otay Formation)												
	3														
	4														
	5														
	6				1	8	23								
	7					9									
	8					14									
	9														
516.4	10		Poorly graded SAND (SP): Medium dense, light gray, moist, fine grained, slightly micaceous.			8									
	11				2	8	23								
	12					8									
	13					15									
	14														
	15														
	16				3	7	21								
	17					7									
	18					7									
	19					14									
	20														

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DEPARTMENT OF TRANSPORTATION  
DIVISION OF ENGINEERING SERVICES  
GEOTECHNICAL SERVICES  
OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2

REPORT TITLE  
HYDROGEOLOGIC REPORT FOR SR 11  
DISTRICT COUNTY  
11 SAN DIEGO  
PROJECT OR BRIDGE NAME  
SR-11  
BRIDGE NUMBER  
N/A

ROUTE  
SR-11  
PREPARED BY  
E. GALLETA  
DATE  
08/30/09

HOLE ID:  
**A-09-105**  
POSTMILE(KP)  
0/4  
EA  
11-056310  
SHEET  
1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Augering	Casing Depth	REMARKS
506.4	21	[Material Graphic: Silty Sand]	Silty SAND (SM): Dense, gray, moist, fine grained, exhibits mottled texture, (sedimentary).	[Sample Location: 4]	4	11	46								
	18														
	28														
501.4	25	[Material Graphic: Very Dense Sand]	At Elev. 501.4 ft grades to very dense.	[Sample Location: 5]	5	19	67								
	28														
	39														
495.7	30	[Material Graphic: Indurated Siltstone]	At Elev 495.7 ft silty sand indurated: siltstone.	[Sample Location: 6]	6	32	Ref								
495.4	31					81									
	31		Boring completed at the planned depth of 31 ft, Elev. 495.4 ft. No groundwater encountered.												
	32														
	33														
	34														
	35														
	36														
	37														
	38														
	39														
	40														

	DEPARTMENT OF TRANSPORTATION	REPORT TITLE	HOLE ID:	<b>A-09-105</b>
	DIVISION OF ENGINEERING SERVICES	HYDROGEOLOGIC REPORT FOR SR 11	DISTRICT	EA
	GEOTECHNICAL SERVICES	SAN DIEGO	COUNTY	11-056310
	OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2	SR-11	PROJECT OR BRIDGE NAME	
		BRIDGE NUMBER	PREPARED BY	DATE
	N/A	E. GALLETA	08/30/09	2 of 2

LOGGED BY J. TESAR	BEGIN DATE 07/14/09	COMPLETION DATE 07/14/09	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 32° 33' 12.418 N 116° 54' 23.793 W	HOLE ID: <b>A-09-106</b>
DRILLING CONTRACTOR CALTRANS DRILLING SERVICES	BOREHOLE LOCATION (Station, Offset, and Line) 184 ft from CL (RT)		SURFACE ELEVATION 483.6 ft	
DRILLING METHOD AUGER	DRILL RIG CS 2000		BOREHOLE DAIMETER 6 INCH	
SAMPLER TYPE(S) AND SIZE(S) [ID] SPT (1.4)	SPT HAMMER TYPE AUTOMATIC		HAMMER EFFICIENCY (ER) 84 %	
BOREHOLE BACKFILL AND COMPLETION HOLE CUTTINGS AND ENVIROPLUG	GROUNDWATER DURING DRILLING READINGS		AFTER DRILLING (DATE) NOT ENCOUNTERED	
			TOTAL DEPTH OF BORING 31.5 ft	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Augering	Casing Depth	REMARKS
483.6			Top Soil (Lean Clay with Sand and some organics).												
482.6	1		Lean CLAY with SAND (CL): Light brown, moist, coarse sand.												
	2														
481.1	3		Poorly graded SAND (SP), Very dense, light brown, moist, coarse grained, trace of andesitic gravel, (Otay Formation)												
	4														
	5														
	6														
	7														
	8														
	9														
	10														
	11														
	12														
	13														
	14														
	15														
	16														
	17														
	18														
	19														
	20														

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DEPARTMENT OF TRANSPORTATION  
DIVISION OF ENGINEERING SERVICES  
GEOTECHNICAL SERVICES  
OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2

REPORT TITLE  
HYDROGEOLOGIC REPORT FOR SR -11  
DISTRICT COUNTY  
11 SAN DIEGO  
PROJECT OR BRIDGE NAME  
SR-11  
BRIDGE NUMBER  
N/A

ROUTE  
SR-11

POSTMILE(KP)  
0/4

HOLE ID: **A-09-106**

EA  
11-056310

PREPARED BY  
E.GALLETA

DATE  
08/30/09

SHEET  
1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows Per 6 in	Blows Per 1.0 ft	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Augering	Casing Depth	REMARKS
	21	[Material Graphic: Poorly graded SAND (SP)]	Poorly graded SAND (SP): Very dense, light brown, moist, fine grained, slightly clayey.	[Sample Location: 4]	4	18	51								
	22					24									
	23					27									
461.1	24														
	25	[Material Graphic: Poorly graded SAND (SP)]	At Elev. 458.6 ft, dense.	[Sample Location: 5]	5	14	46								
	26					22									
	27					24									
458.6	28														
	29	[Material Graphic: Poorly graded SAND (SP)]	Poorly graded SAND (SP) dense, light brown, dry, coarse grained.	[Sample Location: 6]	6	14	44								
	30					19									
	31					25									
455.4	32														
	33		Boring completed at the planned depth of 31.5 ft, Elev. 452.1 ft. No groundwater encountered.												
	34														
	35														
	36														
	37														
	38														
	39														
	40														

	DEPARTMENT OF TRANSPORTATION	REPORT TITLE	HOLE ID:	<b>A-09-106</b>
	DIVISION OF ENGINEERING SERVICES	HYDROGEOLOGIC REPORT FOR SR -11	DISTRICT	0/4
	GEOTECHNICAL SERVICES	SAN DIEGO	COUNTY	EA
	OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2	SR-11	PROJECT OR BRIDGE NAME	11-056310
	BRIDGE NUMBER	PREPARED BY	DATE	SHEET
	N/A	E. GALLETA	08/30/09	2 of 2