INFORMATION HANDOUT

For Contract No. 04-1SS054
At 04-Ala-580-32.5

Identified by
Project ID 0400020871

MATERIALS INFORMATION

Foundation Recommendation Report for Distressed Slope Repair, July 18, 2013

Portions of Preliminary Site Investigation Report, October 2013

Underground Classification - Potentially Gassy With Special Conditions

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. MAJID MADANI
Acting Office Chief
Bridge Design-West

Attention: Gordon Danke
Isaias Yalan

Date: July 18, 2013

File: 04-ALA-580 PM 32.4/32.7
EA: 04-1SS050
E-Fis# 0400020871
150th Ave Off-Ramp

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Subject: Foundation Report for Distressed Slope Repair

This Foundation Report (FR) provides our geotechnical recommendations for repairing the distressed roadway section adjacent to the sliding slope located on the north end of the 150th Avenue off-ramp. The distressed roadway section is located near the intersection of Foothill Road and Fairmont Drive, City of San Leandro, Alameda County.

SCOPE OF WORK

We have performed a geotechnical investigation to determine the possible causes of the sliding slope, and developed a repair plan. The scope of work includes the following:

- Field reconnaissance to observe and document site conditions.
- Review geology open files and as-built reports of foundation recommendations.
- Subsurface exploration consisting of two vertical borings in April 2012.
- Installation of one Slope Inclinometer (SI) and one piezometer.
- Soil samples were collected and sent to the Trans Lab in Sacramento for analysis.
- Engineering analyses and foundation recommendations.

PROJECT DESCRIPTION

The project is located at the 150th Avenue off-ramp from westbound Route 580 in the City of San Leandro, Alameda County (Figure 1). The 150th Ave off-ramp is a single lane exit from Route 580, but widens to two lanes for the most of the length of the off-ramp. The off-ramp increases in elevation relative to westbound Route 580, with a maximum height of approximately 35 ft above Route 580. This section of Route 580 was constructed in the mid 1960's. An As-Built plan sheet for the projects indicates there was a Rock Slope Protection (RSP) repair constructed under a construction change order during the original construction. The RSP repair is located between westbound Route 580 and the end of the 150th Ave off-ramp. There has been constant creeping of the shoulder resulting in continuous maintenance repairs of the left lane of the off-ramp. It appears the slope is slowly creeping down towards Route 580.

There is an existing 60 inches diameter reinforced concrete pipe (RCP) running the length of the off-ramp. The pipe is located on the eastern side of the off-ramp, and the slide is located on the western side of the off ramp. The location of the 60 inches RCP didn't allow for the use of tie-backs for the soldier pile retaining wall. Please refer to utility plans for exact location of the 60 inches RCP line and other utilities.

The current project consists of constructing a retaining wall between the off-ramp and westbound Route 580.

FIELD INVESTIGATION AND TESTING PROGRAM

A subsurface investigation was conducted from April 2 to April 3, 2012. The sub-surface investigation consisted of two vertical soil borings RW-12-001 and RW-12-002. In-situ Standard Penetration Test (SPT) blow counts were recorded at every 5 foot interval to evaluate the consistency of the on-site soils. Soil samples were collected from the SPT sampler. Selected soil samples were transported to the Caltrans Geotechnical Laboratory in Sacramento for testing.

Soil boring RW-12-001 was drilled to a depth of 71.5 ft and a slope inclinometer (SI) was installed. Soil boring RW-12-002 was drilled to a depth of 51.5 ft, and a piezometer was installed. SI readings are located in Appendix B, and piezometer readings in Table 1.

Groundwater Conditions

Periodic groundwater readings were conduct in the piezometer located in soil boring RW-12-002. The groundwater readings are presented in Table 1.

Table 1- Periodic Groundwater Readings

Date	Depth to water level (ft)	Groundwater elevation (ft)
04/20/2012	16.8	53.4
05/10/2012	15.95	54.25
06/14/2012	16.2	54.0
08/16/2012	16.35	53.85
10/04/2012	16.65	53.55

Higher groundwater elevations can be anticipated depending on the amount of precipitation during the rainy season.

LABORATORY TESTING

Selected soil samples retrieved from the borings were tested to evaluate the properties pertinent to our analysis. The types of laboratory tests performed include the following: Laboratory test results are located in Appendix B. A copy of the Log-of-Test-Borings (LOTB) is located in Appendix A.

- Atterberg Limits (AASHTO T 89, AASHTO T 90).
- Moisture Content (AASHTO T 265, ASTM D 2216).
- Corrosion Content California Test Methods (CTM 643, CTM 442, CTM 417).
- Mechanical Analysis (ASTM D 422)

SITE GEOLOGY AND SUBSURFACE CONDITIONS

Climate

The climate of Alameda County is characterized by cool, wet winters and warm, dry summers. The San Francisco Bay borders the county on the west and controls temperatures throughout the year, minimizing extremes between the seasons. The eastern half of the county, separated from the western half by rolling coastal hills, is drier with greater temperature extremes. The average temperature for Hayward, near the project area, is 57° F, with a low of 47° F in January and a high of 65° F in September. Humidity in the region is generally low, with winter having the highest humidity and fall the lowest. Winds are generally out of the west and below 10 miles per hour. The strongest winds are associated with cold winter storms and westerly summer breezes drawn in by the warmer eastern interior. Rainfall is greatest during the winter with annual totals averaging 25 inches in Hayward. December and January (5.2 in and 5.1 in, respectively) are the wettest months, while July and August (0.01 inches and 0.04 inches, respectively) are the driest.

Topography & Drainage

The project area lies on the eastern edge of a broad, flat plain that slopes gently east to west toward the San Francisco Bay. This plain is bordered on the east by gently sloping northwest-trending foothills that separate the bay from the Coast Ranges and the Central Valley farther to the east. Route 580 follows roughly the toe of slope of the East Bay Hills through San Leandro and much of Oakland. The 150^{th} Ave off-ramp gently rises from an elevation of 65 ft at its origination and terminates at an elevation of approximately 77 ft at Foothill Blvd. Route 580 is depressed slightly as it approaches the Fairmont Drive OC and sits below the off-ramp at an elevation of approximately 35 ft at its deepest point relative to the off-ramp.

Drainage through the project area is roughly east to west toward Route 580. Water is collected within the depressed section of the freeway and pumped from a location at the west end of the Fairmont Drive OC.

Regional Geology

Located within the Coast Range geomorphic province of California, the geology of the region consists of northwest-trending ridges, gently sloping hills, intermountain valleys, and large, elongated depressions. The San Andreas Fault system, the most prominent geologic feature in the area, includes the San Andreas Fault as well as numerous splays, including the Hayward and Calaveras Faults, which together take up strain between the northward migrating Pacific plate and the southward (relatively) moving North American plate. The major faults within the system are predominantly right-lateral, strike-slip faults with some compressional component, and these act together to form the prominent ridges and valleys. The San Francisco Bay, a partially filled northwest-trending depression extending from the Santa Clara Valley in the south to the Petaluma Valley in the north, is a direct result of these fault interactions.

Cretaceous sedimentary rocks of the Great Valley Sequence and Jurassic, Cretaceous, and Tertiary sedimentary and metamorphic rocks of the Franciscan Group dominate the region. Great Valley Sequence rocks represent the filling of long, roughly north/south-trending marine basins which were present during the un-roofing of the Sierra Nevada to the east. Franciscan Group rocks are generally melange material created by the sub-duction of the Pacific plate beneath the North American plate. It consists of blocks of low to high-grade metamorphic rocks contained in a sheared shale matrix with minor unmetamorphosed clastic and chemical sedimentary blocks.

Site Geology

The project area sits just at the base of the East Bay Hills and is underlain by alluvium deposited as fans during the Pleistocene (Figure 2). The area around the Fairmont Drive OC is characterized by fine-grained sediments: silty and clayey sands with some clean sand lenses. Bedrock encountered during the drilling investigation for the Fairmont Drive OC was a weathered brown shale at approximately elevation 20 ft. Published geologic maps indicate bedrock in the area to be Jurassic Gabbro, slivers of which are found along the Hayward Fault and are remnants of the Coast Range Ophiolite (Graymer, *et al*, 1996). As-built plans of the project area show that much of depressed section of Route 580 consisted of unsuitable material that was excavated and replaced. This trapezoid of excavated material extended within the project limits and parts of the outer edge of the off-ramp is fill material.

Subsurface and Groundwater Conditions

Soil boring RW-12-001 was drilled to a depth of 71.5 ft and a slope inclinometer (SI) was installed. Soil boring RW-12-002 was drilled to a depth of 51.5 ft, and a piezometer was installed. SI readings are located in Appendix B.

The soil encountered during the subsurface investigation , as interpreted from boring RW-12-001 consists of a 35 ft layer of medium stiff to very stiff clay, which is underplayed by a 35 ft dense to very dense clayey gravelly sand layer.

The soil encountered during the subsurface investigation , as interpreted from boring RW-12-002 consists of a 20 ft layer of soft to medium stiff clay, which is underplayed by a 30 ft dense to very dense clayey gravelly sand layer.

Groundwater readings were conducted from April 2012 to October 2012 from the piezometer installed at boring RW-12-002. Depth to groundwater ranged from 15.95 ft to 16.8 ft, and groundwater elevation ranged from 53.4 ft to 54.25 ft.

<u>SCOUR EVALUATION</u>

According to the FEMA Flood Hazard Areas Map, the proposed retaining wall is outside of the flood hazard area (Appendix B). The proposed retaining wall is not susceptible to scour.

CORROSION EVALUATION

One sample was collected from boring RW-12-001 for corrosion testing. The test result indicated that the sample is not corrosive to foundation elements. Corrosion test result is located in Table 2.

Table 2-Corrosivity Test Result

Boring No.	Depth	Minimum Resistivity (ohm-cm)	pH	Chloride (ppm)	Sulfate (ppm)
RW-12-001	35-37 ft	1200	8.3	-	-

SEISMIC RECOMMENDATIONS

Faulting and Seismicity

The project site is located within a seismically active region dominated by the northwest trending San Andreas Fault. Several other faults that parallel the San Andreas make up the larger San Andreas Fault system and separate the Pacific Plate on the west from the North American Plate to the east. The San Andreas Fault system can be thought of as a diffuse plate boundary at which strain is spread across a wide region (Figure 3). There are larger, well-known faults within the system that tend to be the most active; however, there are other unnamed faults that are not mapped that may produce moderate earthquakes.

Table 3 summarizes the known active faults in the region that have the potential to produce large earthquakes. Data are from Caltrans 2007 Seismic Hazard Report. Maximum Credible Earthquakes are given in Mw (moment magnitude) and are a function of the length and width of a fault zone and not of recent or historical events.

Table 3-Maximum Credible Earthquakes

FAULT	Distance from project (miles)	Maximum Credible Earthquake	Peak Ground Acceleration
Hayward	0.2	7.3	0.57 g
Calaveras	8.8	7.4	0.25 g
San Andreas	18.2	7.9	0.2 g

Based on the data above, the Hayward Fault (Southern Hayward section, Fault No. 354) is the controlling fault for this project (Figure 4). The Hayward Fault is a right-lateral strike-slip fault that dips 90 degrees relative to horizontal.

Seismic Hazards

Potential seismic hazards in such an active region include primary surface rupture, a seismic fault creep, and the secondary effects due to strong ground shaking. The following describes the hazards that may be encountered during either surface rupture or ground shaking and possible mitigation procedures to use during design and/or construction.

Primary Seismic Hazards

Surface rupture and fault creep:

There are no active faults that cross the project limits, therefore, fault rupture and fault creep are not considered to pose hazard to the project.

Secondary Seismic Hazards

Ground shaking:

The potential for strong ground shaking in the project area during the life of the project is high and will affect both roadways and structures. Loose, saturated soils pose the greatest threat during episodes of strong shaking. The following lists possible hazards that may be caused by strong ground shaking and the probability of their occurrence within the project limits:

Densification and Settlement:

Densification of loose granular soils – The probability of densification of loose soils within the project limits is low to moderate. The project proposes constructing a soldier wall to mitigate on-going embankment settlement, and surrounding soils are considered stable.

Liquefaction:

Liquefaction potential, a phenomenon in which soils lose all shear strength and turn essentially to fluids, is considered low in the project area. Potentially liquefiable deposits are generally composed of clean sand with a high ratio of void space. Subsurface sampling indicated dense silty clay, silty sand, and hard silty clay. The subsurface conditions suggest a low potential for liquefaction.

AS-BUILT FOUNDATION DATA

An as-built construction detail sheet for the 150th Ave off ramp indicates a slide which was stabilized during the original construction of the Route 580 with boulder rip raps (Appendix C). That slide area is approximately at the begging of the proposed soldier pile wall. It is expected that boulders will be encountered during the soldier pile wall excavation. The general plan for the soldier pile wall shows the boulder rip rap. Boulders up to 1-ton should be expected to be encountered from station 11+50 to station 12+35 along the "B" line.

GEOTECHNICAL RECOMMENDATIONS

Wall Type and Construction Method

The most viable repair strategy for this location is to construct a soldier beam and lagging wall, because of its narrow footprint, and requirement to keep the off ramp open during construction. Considering the conditions of the roadway and the existing slope, a wall with an approximate length of 265-ft. would be required. Based on the preliminary general plan sheet, the wall begins at Station 11+50.00 and ends at Station 14+11.69 along the "B" line. The wall off-set is approximately 5 to 6-ft. from the "B" line.

The use of tie-backs for the soldier pile was investigated, but due to conflicts of the tie-backs and the 60 inches RCP line it was determined by Structures and Geotechnical Design that this was not a viable option. There is an existing 60 inches diameter RCP line running the length of the off-ramp. The pipe is located on the eastern side of the off-ramp, and the slide is located on the western side of the off ramp. It was determined by Caltrans Structure Design that the angle of the tie-backs needed to avoid intersecting the 60 inches RCP line would be so high that the tie-back would be ineffective. Geotechnical Design determined that the required grouting pressures for the tie-back installation could damage to the 60 inches RCP. Based on these issues with the 60 inches RCP line, it was determined that a soldier pile with tie-backs would not be a viable option.

Design Parameters

The soldier pile wall should be designed using the lateral earth pressure diagram, Figure 5.5.5.6-1 of Section 5, Retaining Walls, from the Bridge Design Specifications (August 2004). This figure is attached in Appendix A.

Based on the site conditions and proposed construction summarized above, we recommend the following requirements/criteria for the proposed soldier beam and lagging wall design:

- Assume a cantilever design height of 20-ft and a horizontal back slope from station 11+50 to station 13+50, and a cantilever design height of 15-ft and a horizontal back slope from station 13+50 to station 14+11.69 along the "B" line with 5 to 6-ft off-set.

- For soil material behind the wall (active zone) extending 0.15 H below the wall base, use the following soil parameters: internal friction angle, $\phi = 10°$, cohesion, c = 300 psf, and a soil total unit weight, $\gamma = 120$ lbs/ft^3. For zone 2 (20 to 32-ft), the zone below zone 1, use the following soil parameters: internal friction angle, $\phi = 20°$, cohesion, c = 350 psf, and a soil total unit weight, $\gamma = 120$ lbs/ft^3. For zone 3 (deeper than 32-ft), the zone below zone 2, use the following soil parameters: internal friction angle, $\phi = 32°$, cohesion, c = 100 psf, and a soil total unit weight, $\gamma = 120$ lbs/ft^3.Use an arching factor of 0.08*(friction angle noted above).

- Calculate passive pressure against the piles using the log spiral method with a friction angle, $\phi = 20°$, cohesion, c = 300 psf, and a unit weight γ of 120 lbs/ft.^{3}. For design purposes, use a minimum bench width from 5 to 40-ft. at the base of the retaining wall, followed by a 2(H): 1(V) slope.

- Because of the potential for high ground acceleration, the seismic stability of the wall should be checked. For seismic earth pressure against the wall/piles, use a triangular pressure distribution with depth for a maximum pressure of 38 H psf, where H is the full design height.

  The pile spacing and pile embedment below the slide plane shall be determined by the structural analyses of the wall assuming the above recommended soil parameters and earth pressures. We recommend that a minimum pile embedment of 25 ft below the slide depth to allow sufficient resistant in Zone 3 soil mentioned above.

Drainage

We recommend that non-woven Type B rock slope protection fabric be placed behind the vertical face of the wall lagging to limit the piping of fines. We also recommend installation of horizontal drains 15 feet on center along the base of the soldier pile wall. The horizontal drains will be installed 5 degree angle upward for a length of 20 ft. The horizontal drain should consist of 1.5 inch diameter slotted PVC pipe (0.020" slots). The horizontal drains are needed to reduce pore water pressure for the wall. If the finished grade in front of the wall is raised by the placement of fill, all horizontal drains outlets must be connected to an 8 inch PVC pipe anchored on wall face and extended outside of the fill with a minimum grade of 2.0%. The pipe outlet shall be discharge into a down drain pipe. Please consult with Central District Hydraulics Branch for details of the outlet requirements.

If surface runoff is directed toward the wall, we recommend installing a gutter above the wall. Please contact D-4 Hydraulic for the collection of water discharges and outlet.

CONSTRUCTION CONSIDERATIONS AND REQUIREMENTS

The following construction considerations and requirements should be included in the design and construction specifications for the proposed wall.

- Wall must be constructed in a top down method, and the bench cannot be cut until all piles have been installed. The soldier piles should be installed in accordance with Section 49-4 of the most current Caltrans Standard Specifications.

- Drilling and concrete placement for soldier pile construction shall be staggered. No two adjacent holes can be open at the same time. Drilled holes for soldier piles can't be left open overnight.

- The installation of the soldier piles must be completed prior to the placement of any temporary fill required for a construction bench behind the face of wall. No fill shall be placed on the slide area before all piles and lagging are in place.

- If constructed during the rainy season, suitable drainage measures shall be used and are the responsibility of the contractor.

- All temporary cuts shall conform to Cal-OSHA requirements in general, and shall be no steeper than 1V:1H.

- All earthwork shall be in accordance to Section 19 of the most current Caltrans Standard Specifications.

- Groundwater maybe encountered during the excavation of the wall, and temporary dewatering maybe required.

- During the drilling operation for the proposed soldier beam piles, we believe that some caving of the drilled holes will likely occur. Thus, use of temporary casing is required. Due to the groundwater elevations, the installation of soldier piles will require dewatering of the borehole before the concrete is placed. The current Caltrans practice for soldier beam pile construction does not allow the use of slurry. Therefore, the use of temporary casing and dewatering is required when groundwater is encountered during construction of the soldier beam pile.

- Since part of the existing rock slope protection ("boulder rip-rap") is to be removed for the construction of the wall, I have estimated a quantity of 350 cubic yards of 1 ton rock to be excavated.

- Any backfill placed behind the wall shall conform to the Structure Backfill requirements in Section 19 of the 2010 Caltrans Standard Specifications.

Any questions regarding the above recommendations should be directed to the attention of Mahmood Momenzadeh at (510) 286-5732 or David Nesbitt at (510) 622-0104 of the Office of Geotechnical Design-West.

c: OAlcantara MMomenzadeh, DNesbitt, TPokrywka, MGaffney, CRisden, Archive

DNesbitt/mm

References:

California State Department of Transportation Fault Database, 2007, http://www.dot.ca.gov/hq/esc/earthquake_engineering/SDC_site/

Graymer, R.W., Jones, D.L., Brabb, E.E., 1996, Preliminary geologic map emphasizing bedrock formations in Alameda County, California: A digital database, USGS Open File Report 96-252

Mualchin, L., 1996, Technical report to accompany the California seismic hazard map, California Department of Transportation, Engineering Service Center.

U.S. Geological Survey and California Geological Survey, 2006, Quaternary fault and fold database for the United States, 12/01/2008, from USGS web site: http//earthquakes.usgs.gov/regional/qfaults/

Welch, L.E., 1975, Soil Survey of Alameda County, California, western part, United States Department of Agriculture

DIVISION OF ENGINEERING SERVICES GEOTECHNICAL SERVICES GEOTECHNICAL DESIGN - WEST – BRANCH B	Caltrans	Location Map 04-ALA-580, 0400020871 — PM 32.4-32.7 July 2013 Figure 1

Preliminary geologic map emphasizing bedrock formations in Alameda County, California: A digital database by R.W. Graymer, D.L. Jones, and E.E. Brabb U.S. Geological Survey Open-File Report 96-252

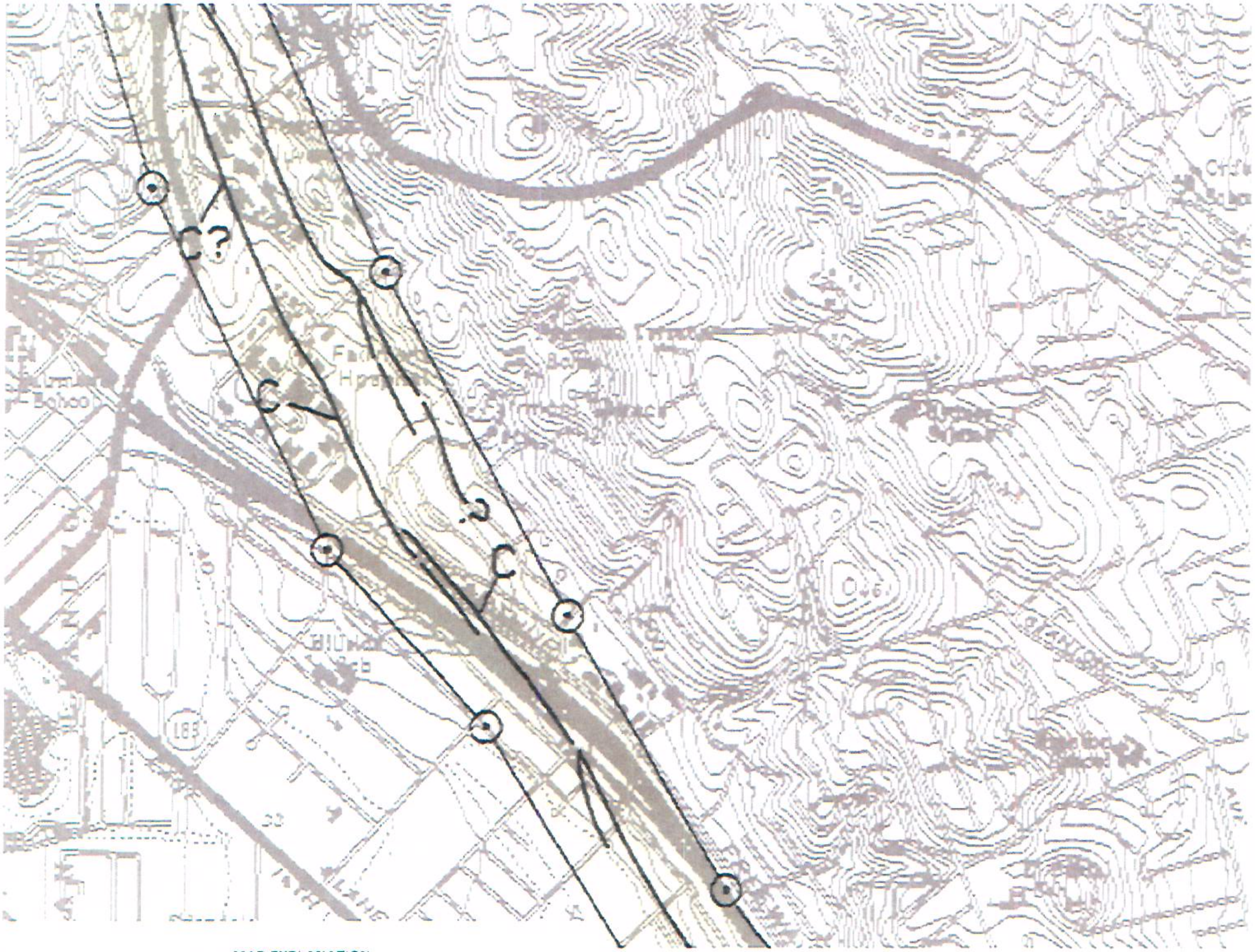
KEY

- Qu Undivided surficial deposits
- Jgb Gabbro

DIVISION OF ENGINEERING SERVICES GEOTECHNICAL SERVICES GEOTECHNICAL DESIGN - WEST - BRANCH B	Caltrans	**Site Geology Map** **04-ALA-580** **PM 32.4-32.7** **0400020871** **July 2013** **Figure 2**

U.S. Geological Survey and California Geological Survey, 2006, Quaternary fault and fold database for the United States, 12/01/2008, from USGS web site: http//earthquakes.usgs.gov/regional/qfaults/
Base map from Google Earth 2008

DIVISION OF ENGINEERING SERVICES GEOTECHNICAL SERVICES GEOTECHNICAL DESIGN - WEST – BRANCH B	Caltrans	Regional Fault Map 04-ALA-580 PM 32.4-32.7 0400020871 July 2013 Figure 3



CGS, Alquist-Priolo Earthquake Fault Zone Maps, Hayward Quadrangle, 1982
Scale No Scale

MAP EXPLANATION

Potentially Active Faults

Faults considered to have been active during Holocene time and to have a relatively high potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Special Studies Zone Boundaries

These are delineated as straight-line segments that connect encircled turning points so as to define special studies zone segments.

Seaward projection of zone boundary.

Caltrans

Alquist-Priolo Map

04-ALA-580
0400020871

PM 32.4-32.7
July 2013
Figure 4

APPENDIX A

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Ala	580			

M. Momenzadeh 4-9-13
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

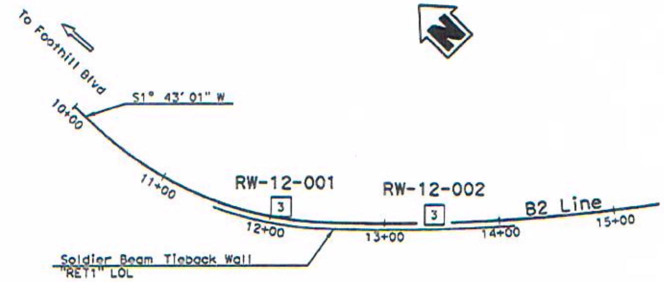
REGISTERED PROFESSIONAL ENGINEER — Mohmood Momenzadeh — No. GE2585 — Exp. 12-31-13 — Geotechnical — STATE OF CALIFORNIA

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, & Presentation Manual (2010 Edition).

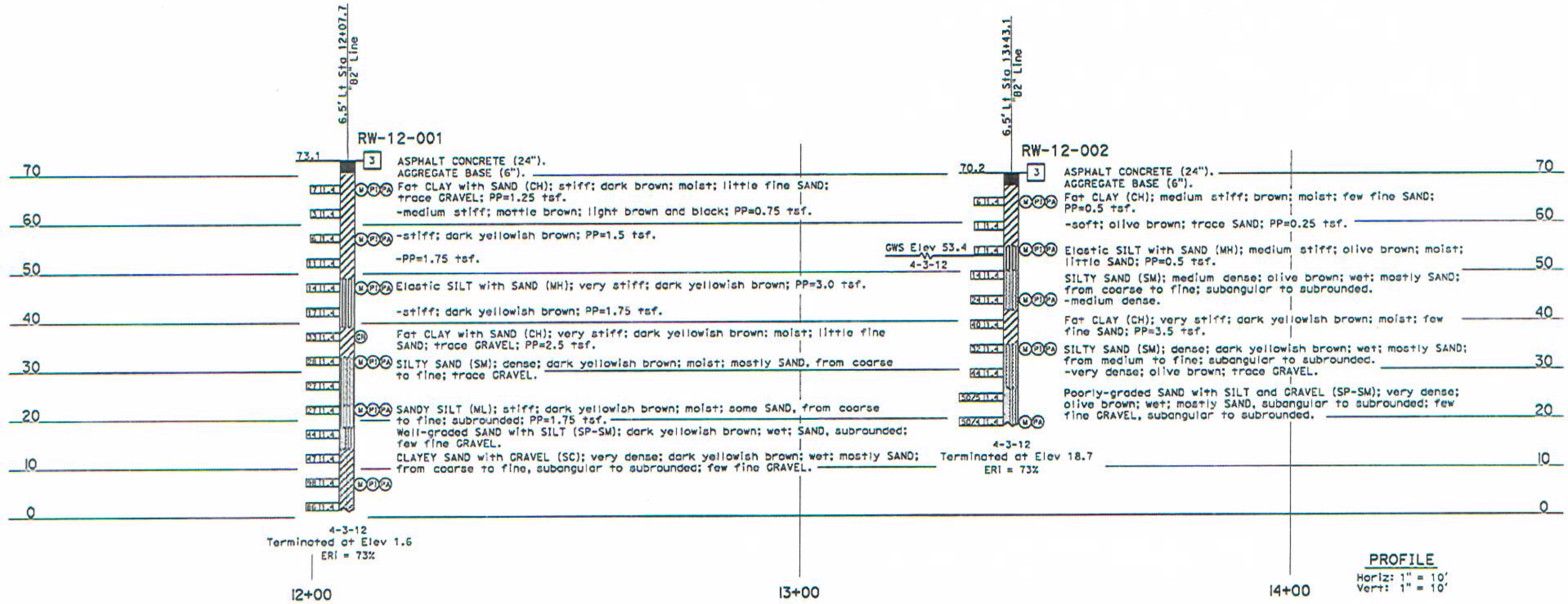
See 2010 Standard Plans A10F and A10G for Soil Legend, and A10H for Rock Legend.

BENCH MARK

AJ 200 PK/CT Shiner on-ramp
6' right B2 Line, station 19+67.9
N 2,083,855.94
E 6,093,197.20
Elev 66.08
NAVD88



PLAN
1" = 50'



PROFILE
Horiz: 1" = 10'
Vert: 1" = 10'

ENGINEERING SERVICES		MATERIALS AND GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	150TH AVENUE TIEBACK WALL
FUNCTIONAL SUPERVISOR	DRAWN BY: W. Tang 2/13	FIELD INVESTIGATION BY:		DESIGN BRANCH X	POST MILE 32.4/32.7	LOG OF TEST BORINGS
NAME: T. Pokrywka	CHECKED BY: J. Moore	D. Nesbitt				

GBS CIVIL LOG OF TEST BORINGS SHEET — ORIGINAL SCALE IN INCHES FOR REDUCED PLANS — UNIT: 3643 — PROJECT NUMBER & PHASE: 0400020871 — CONTRACT NO.: 04-155051 — DISREGARD PRINTS BEARING EARLIER REVISION DATES — X X

FILE => 150at-tieback.dgn

For temporary walls with vertical elements embedded in granular soil or rock and retaining cohesive soil, Figures 5.5.5.6-1 and 5.5.5.6-2 may be used to determine the lateral earth pressure distributions on the embedded portion of the vertical elements and Figure 5.5.5.6-4 may be used to determine the lateral earth pressure distribution due to the retained cohesive soil.

The lateral earth pressure distributions in Figures 5.5.5.6-1 thru 5.5.5.6-4 shown acting on the embedded portion of vertical wall elements shall be applied to the effective width, b', of discrete vertical wall elements. See Article 5.7.6 for effective widths of discrete vertical wall elements to be used.

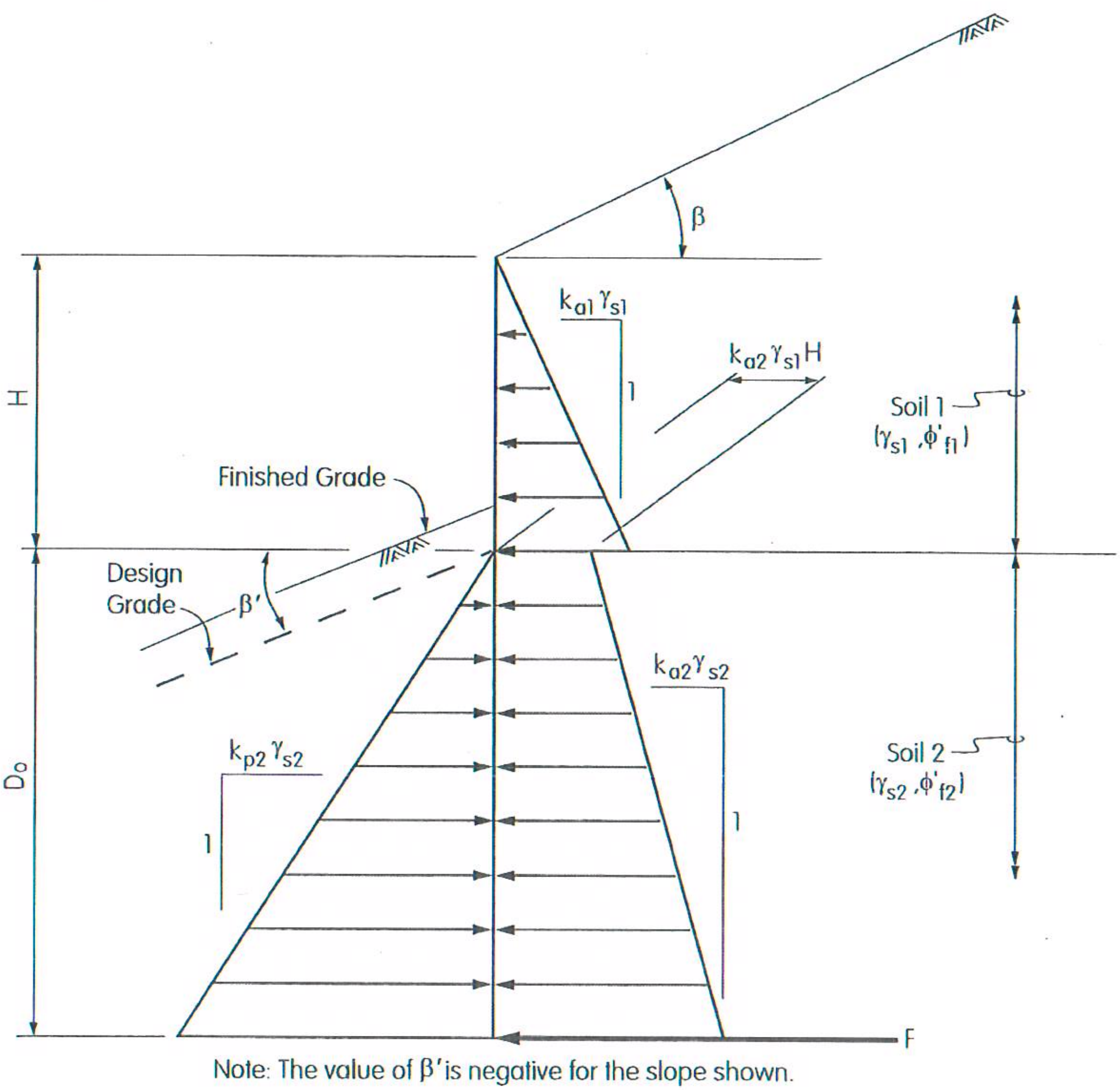
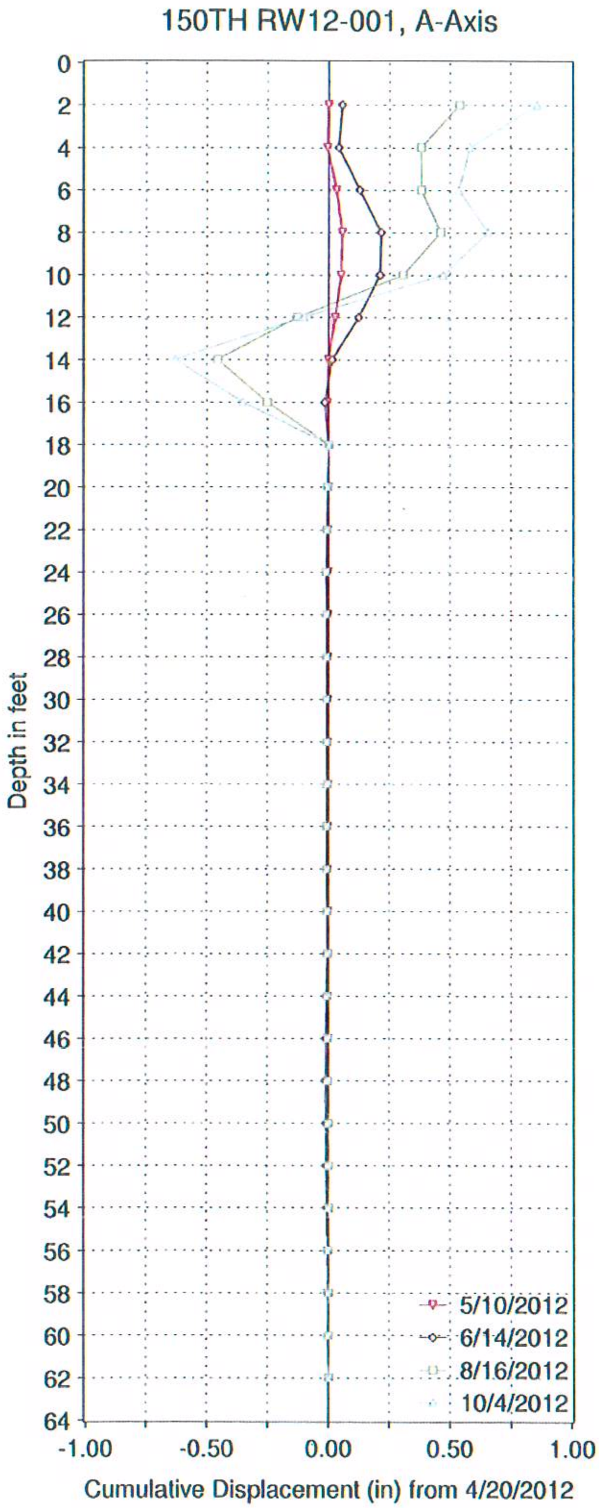
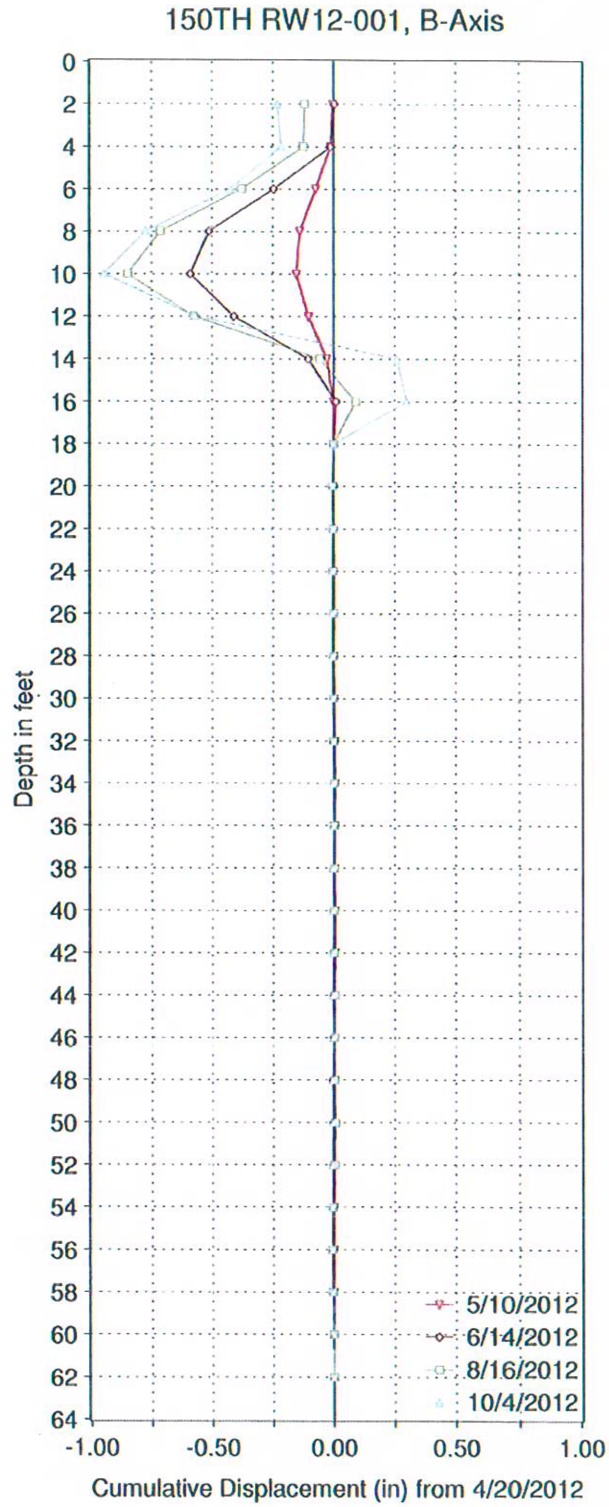


Figure 5.5.5.6-1 Simplified Lateral Earth Pressure Distributions for Permanent Non-gravity Cantilevered Walls with Vertical Wall Elements Embedded in Granular Soil and Retaining Granular Soil

APPENDIX B





150th @ Foothill

04-ALA-580-PM 32.5

CALIFORNIA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL LABORATORY

Caltrans

GL TRACKING NO : 12-031
Dist - EA: 04-1SS050
Report Date: June 22, 2012
Page: 1/1

CLASSIFICATION TEST SUMMARY

SAMPLE ID	% FINER THAN																	ATTERBERG LIMITS		AS RECEIVED		Gs
	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	5µ	1µ	LL	PI	γ_d (pcf)	%m	
RW-12-001_01						100	97	97	95	94	93	91	90	87	84	53	44	72	41		34.1	
RW-12-001_03									100	99	97	94	91	84	76	39	9	65	36		38.9	
RW-12-001_05								100	99	96	92	88	84	80	77	48	26	64	32		30.2	
RW-12-001_08								100	98	95	87	77	66	56	47	19	9	39	10		30.7	
RW-12-001_10						100	99	98	97	90	84	79	73	67	60	28	12	48	16		31.5	
RW-12-001_13						100	98	95	82	70	56	44	35	27	22	7	2	20	4		15.3	
RW-12-001_35-37'																						
RW-12-002_01									100	99	99	98	96	93	89	51	46	71	44		48.1	
RW-12-002_03									100	99	97	95	92	83	71	35	15	76	38		51.5	
RW-12-002_05						100	96	93	87	81	73	64	55	47	41	17	7	45	13		27.4	
RW-12-002_07							100	99	97	89	82	70	57	45	39	12	5	31	8		32.0	
RW-12-002_10						100	95	94	77	42	28	21	17	13	10	3	2		NP		11.9	

FEMA Flood Hazard Areas

Flood Hazard Areas

- Zone V- (100 yr. Flood Zone)
- Zone A- (100 yr. Flood Zone)
- Zone X500- (500 yr. Flood Zone or other concerns)
- Urbanized Area

Shaded to show topographical relief

Detailed FEMA Explanation

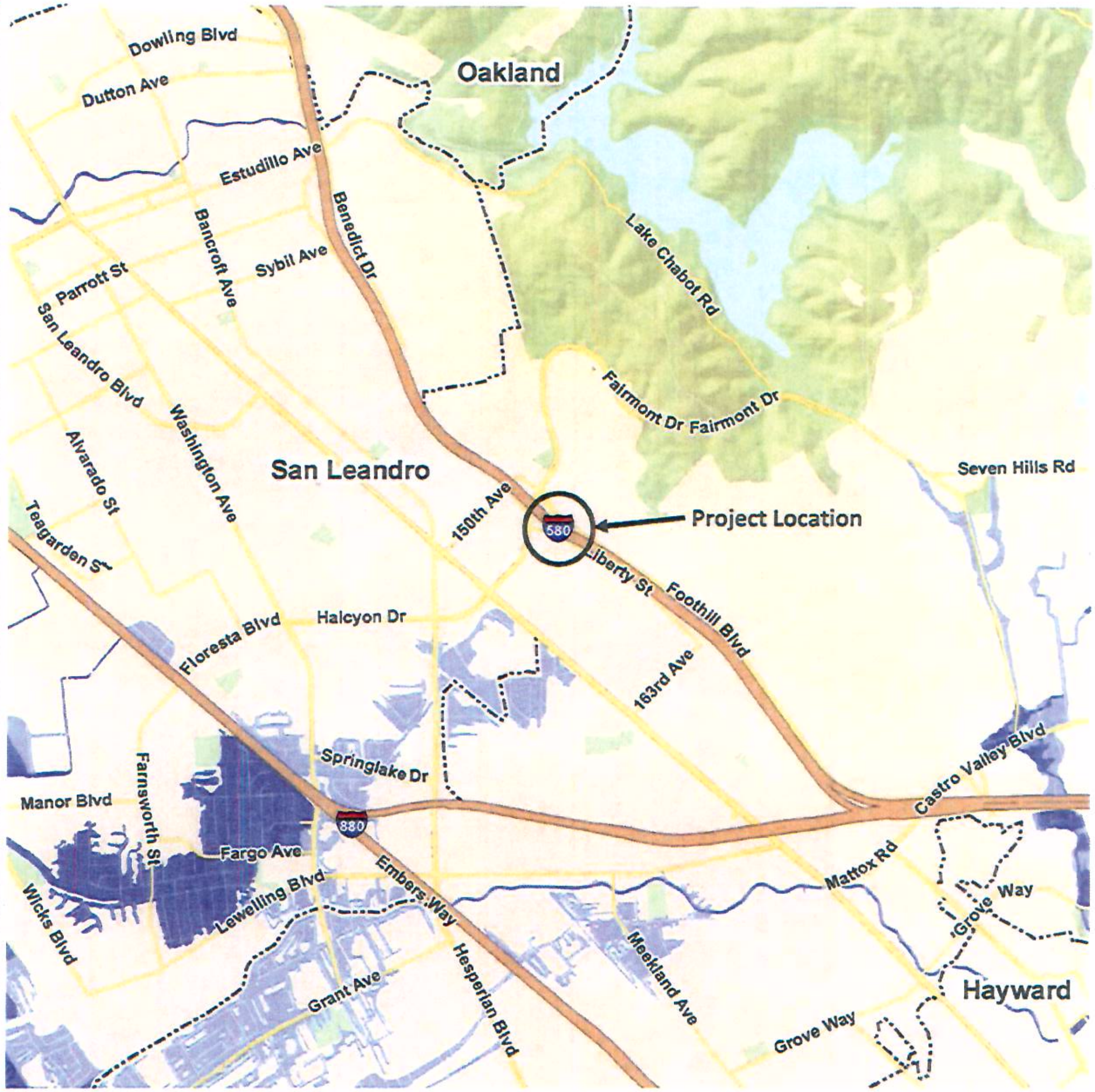
Flood Zone	Description
Zone V	This code identifies an area inundated by 1% annual chance flooding with velocity hazard (wave action).
Zone A	This code identifies an area inundated by 1% annual chance flooding.
Zone X500	This code identifies an area inundated by 0.2% annual chance flooding; an area inundated by 1% annual chance flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 1% annual chance flooding.

N

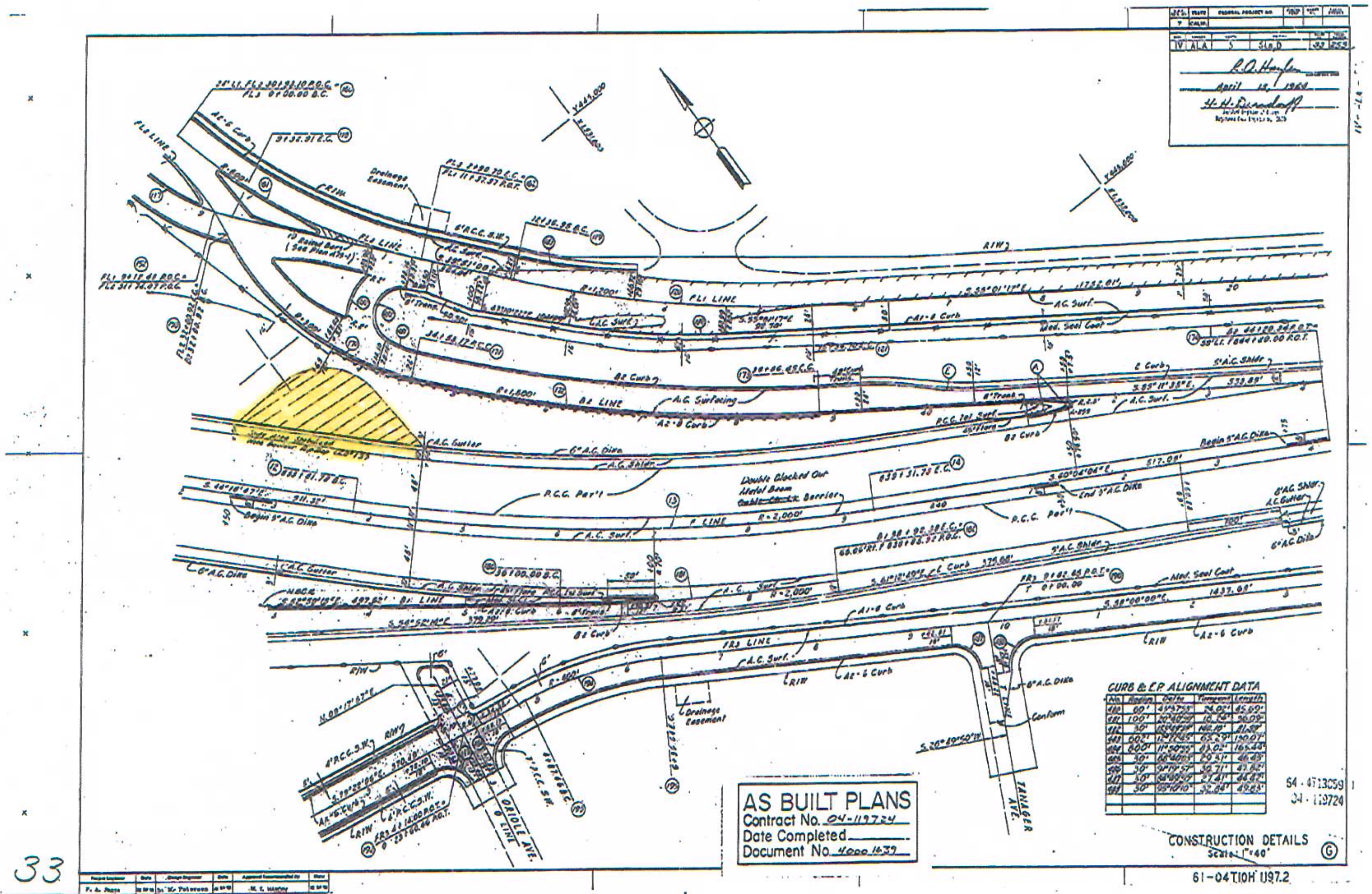
Scale: 1 inch = 0.55 miles

Sources:
Flood Zones - FEMA Q3 (2003) and DFIRM (2009)
Base Data - TeleAtlas (2008)
The product has been designed to support planning activities.
A more detailed version of this map is available at http://quake.abag.ca.gov

ABAG Geographic Information Systems

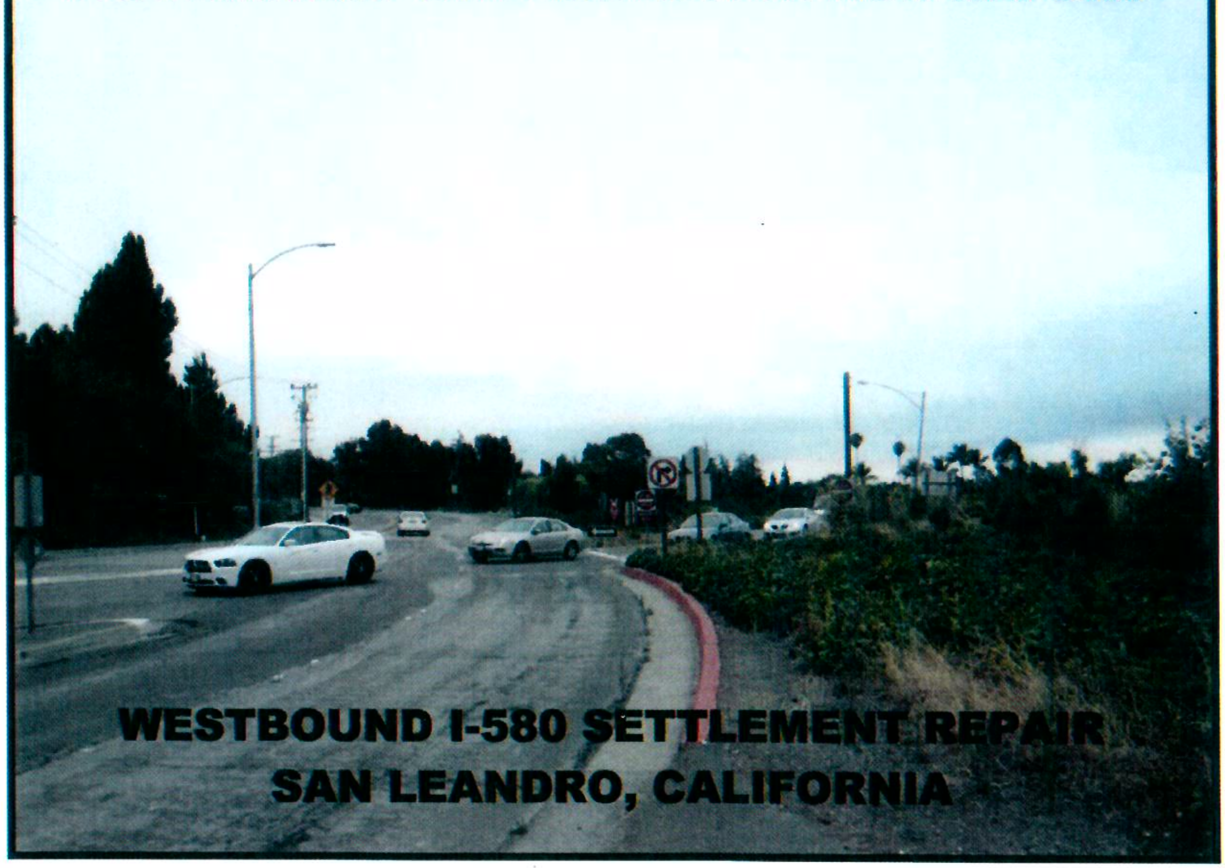


APPENDIX C



FL1 LINE
FL2 LINE
FR3 LINE
F LINE
B2 LINE
B1 LINE
Drainage Easement
Double Blocked Out Metal Beam Barrier
P.C.C. Pav't
TANAGER AVE.
ORIOLE AVE.
CURB & E.P. ALIGNMENT DATA
AS BUILT PLANS
Contract No. 04-119724
Date Completed
Document No. 4000 1439
CONSTRUCTION DETAILS
Scale: 1"=40'
61-04T10H U97.2
33

PRELIMINARY SITE INVESTIGATION REPORT



WESTBOUND I-580 SETTLEMENT REPAIR
SAN LEANDRO, CALIFORNIA

PREPARED FOR:
CALIFORNIA DEPARTMENT OF TRANSPORTATION
DISTRICT 4
OFFICE OF ENVIRONMENTAL ENGINEERING
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Caltrans

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GEOCON

GEOCON PROJECT NO. E8560-02-53
CALTRANS EA 04-1SS051
CALTRANS PROJECT # 04-0002-0871-1

OCTOBER 2013

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PRELIMINARY SITE INVESTIGATION REPORT

REPORT LIMITATIONS

This report has been prepared exclusively for the State of California Department of Transportation (Caltrans) District 4. The information contained herein is only valid as of the date of the report and will require an update to reflect additional information obtained.

This report is not a comprehensive site characterization and should not be construed as such. The findings as presented in this report are predicated on the results of the limited sampling and laboratory testing performed. In addition, the information obtained is not intended to address potential impacts related to sources other than those specified herein. Therefore, the report should be deemed conclusive with respect to only the information obtained. We make no warranty, express or implied, with respect to the content of this report or any subsequent reports, correspondence or consultation. Geocon strived to perform the services summarized herein in accordance with the local standard of care in the geographic region at the time the services were rendered.

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

GEOCON CONSULTANTS, INC.

Luann Beadle Senior Staff Scientist	Richard Day, CEG, CHG Senior Geologist

CALIFORNIA DEPARTMENT OF TRANSPORTATION – DISTRICT 4
OFFICE OF ENVIRONMENTAL ENGINEERING

Reviewed By:	Recommended By:	Approved By:
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PRELIMINARY SITE INVESTIGATION REPORT

1.0 INTRODUCTION

This Preliminary Site Investigation Report for an off-ramp settlement repair project along westbound (WB) Interstate 580 (I-580) in San Leandro, California was prepared by Geocon Consultants, Inc. under California Department of Transportation (Caltrans) Contract No. 04A3578 and Task Order No. 53 (TO-53), EA 04-1SS051.

1.1 Project Description and Proposed Improvements

The project proposes to repair the settlement and cracking of the pavement of the WB-580 off-ramp to Fairmont Drive/150th Avenue in the city of San Leandro, Alameda County, California. Proposed activities include the construction of a 264-foot-long by 20-foot-high soldier pile wall along the left side of the off-ramp, construct a concrete barrier on top of the wall with concrete barrier slabs, widen the shoulder of the off-ramp for a distance of 3 feet, repair the existing damaged roadway, replace the damaged metal beam guardrail, and upgrade other minor roadway appurtenances. Work will take place within Caltrans right-of-way. The project location is depicted on the attached Vicinity Map, Figure 1.

1.2 General Objectives

The purpose of the site investigation was to evaluate concentrations of California Assessment Manual 17 (CAM 17) metals, particularly aerially-deposited lead (ADL) and petroleum hydrocarbons in soil and petroleum hydrocarbons in groundwater.

The information obtained from this investigation will be used by Caltrans to evaluate soil and groundwater handling practices, worker health and safety, and soil and groundwater reuse and disposal options.

2.0 BACKGROUND

2.1 Hazardous Waste Determination Criteria

Regulatory criteria to classify a waste as California hazardous for handling and disposal purposes are contained in the CCR, Title 22, Division 4.5, Chapter 11, Article 3, §66261.24. Criteria to classify a waste as Resource, Conservation, and Recovery Act (RCRA) hazardous are contained in Chapter 40 of the Code of Federal Regulations (40 CFR), Section 261.

For waste containing metals, the waste is classified as California hazardous when: 1) the representative total metal content equals or exceeds the respective Total Threshold Limit Concentration (TTLC); or 2) the representative soluble metal content equals or exceeds the respective Soluble Threshold Limit Concentration (STLC) based on the standard Waste Extraction Test (WET). A waste has the potential of exceeding the STLC when the waste's total metal content is greater than or equal to ten times the respective STLC value since the WET uses a 1:10 dilution ratio. Hence, when a total metal is detected at a concentration greater than or equal to ten times the respective STLC, and assuming that 100 percent of the total metals are soluble, soluble metal analysis is required. A material is classified as RCRA hazardous, or Federal hazardous, when the representative soluble metal content equals or exceeds the Federal regulatory level based on the Toxicity Characteristic Leaching Procedure (TCLP).

The above regulatory criteria are based on chemical concentrations. Wastes may also be classified as hazardous based on other criteria such as ignitability and corrosivity; however, for the purposes of this investigation, toxicity (i.e., representative lead concentrations) is the primary factor considered for waste classification since waste generated during the construction activities would not likely warrant testing for ignitability or other criteria. Waste that is classified as either California hazardous or RCRA hazardous requires management as a hazardous waste.

2.2 DTSC Variance

The DTSC issued a statewide Variance effective July 1, 2009, regarding the management of ADL-impacted soils within Caltrans right-of-way. Under the Variance, soil that is classified as a non-RCRA hazardous waste, based primarily on ADL content, may be suitable for reuse within Caltrans right-of-way. ADL soil that is classified as a RCRA hazardous waste is not eligible for reuse under the Variance and must be disposed of as a RCRA hazardous waste (Caltrans Type Z-3).

ADL soil reused under the Variance must always be at least five feet above the highest groundwater elevation and, depending on lead concentrations, must be covered with at least one foot of non-hazardous soil or a pavement structure. The ADL soil may not be placed in areas where it might contact groundwater or surface water (such as streams and rivers), and must be buried in locations that are protected from erosion that may result from storm water run-on and run-off.

Review of the statewide Variance indicates the following conditions regarding the reuse and management of ADL-impacted soil as fill material for construction and maintenance operations. If ADL soil meets the Variance criteria but is not intended to be reused within Caltrans right-of-way, then the excavated soil must be disposed of as a California hazardous waste (Caltrans Type Z-2). A copy of the Variance is presented as Appendix A.

Caltrans Type Y-1: ADL soil exhibiting a total lead concentration less than or equal to 1,411 milligrams per kilogram (mg/kg), a DI-WET (WET using deionized water as extractant) lead concentration less than or equal to 1.5 milligrams per liter (mg/l), and a pH value greater than or equal to 5.5 may be reused within the same Caltrans corridor and must be covered with at least one foot of non-hazardous soil.

<u>Caltrans Type Y-2:</u> ADL soil exhibiting a total lead concentration less than or equal to 1,411 mg/kg, a DI-WET lead concentration less than or equal to 1.5 mg/l, and a pH value greater than 5 and less than 5.5 may be reused within the same Caltrans corridor and must be covered and protected from infiltration by a pavement structure.

ADL soil exhibiting a total lead concentration less than or equal to 1,411 mg/kg, a DI-WET lead concentration greater than 1.5 mg/l and less than or equal to 150 mg/l, and a pH value greater than 5 may be reused within the same Caltrans corridor and must be covered and protected from infiltration by a pavement structure.

ADL soil exhibiting a total lead concentration greater than 1,411 mg/kg and less than or equal to 3,397 mg/kg, a DI-WET lead concentration less than or equal to 150 mg/l, and a pH value greater than 5 may be reused within the same Caltrans corridor and must be covered and protected from infiltration by a pavement structure.

<u>Caltrans Type Z-2:</u> ADL soil exhibiting a total lead concentration greater than 3,397 mg/kg, a DI-WET lead concentration greater than 150 mg/l, or a pH value less than or equal to 5 is not eligible for reuse under the Variance and must be disposed of as a California hazardous waste.

<u>Caltrans Type Z-3:</u> ADL soil exhibiting a TCLP lead concentration greater than or equal to 5 mg/l is not eligible for reuse under the Variance and must be disposed of as a RCRA hazardous waste.

2.3 Environmental Screening Levels

The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) has prepared a technical report entitled *Screening For Environmental Concerns At Sites With Contaminated Soil and Groundwater, Interim Final* (updated May 2013), which presents Environmental Screening Levels (ESLs) for soil, groundwater, soil gas, and surface water, to assist in evaluating sites impacted by releases of hazardous chemicals. The ESLs are conservative values for more than 100 commonly detected contaminants which may be used to compare with environmental data collected at a site. "The ESLs are intended to help expedite the identification and evaluation of potential environmental concerns at sites where contamination has been identified. Data collected at a site can be directly compared to the ESLs, and the need for additional actions quickly determined" (RWQCB May 2013). ESLs are strictly risk assessment tools and "not intended to serve as a rule to determine if a waste is hazardous under the state or federal regulations (RWQCB May 2013)."

Residential and commercial/industrial land use ESLs are commonly used by contractors, soil trucking companies, and private and commercial land owners as default acceptance criteria to evaluate suitability of import soil material. The following ESL tables were used for this characterization:

- Table A. Shallow Soil (≤3m bgs), Groundwater is a Current or Potential Source of Drinking Water
- Table B. Shallow Soil (≤3m bgs), Groundwater is not a Current or Potential Source of Drinking Water
- Table K-3. Direct Exposure Soil Screening Levels, Construction/Trench Worker Exposure Scenario

The respective ESLs are listed at the end of Tables 3 to 5 for comparative purposes.

3.0 SCOPE OF SERVICES

The scope of services performed under TO-53, EA 04-1SS051 included the following:

3.1 Pre-field Activities

- Prepared the *Preliminary Site Investigation Workplan* and *Health and Safety Plan*, dated August 2013
- Retained the services of Penhall Company to perform concrete coring
- Retained the services of Advanced Technology Laboratories, Las Vegas (ATL-LV), a Caltrans-approved and California-certified analytical laboratory, to perform the chemical analyses of soil samples
- Notified Underground Service Alert (USA) at least 48 hours prior to field work

3.2 Field Activities

The field investigation was performed on August 14 and 22, 2013, by Geocon staff. The following field activities were performed during the sampling efforts:

- Advanced 9 soil borings at the project location using direct-push and hand auger drilling techniques. The borings were advanced to a maximum depth of 40 feet.
- Collected 8 soil samples for CAM 17 metals analysis
- Collected 30 soil samples for total lead analysis
- Collected 10 soil samples for TPHd/mo analysis
- Collected 6 soil samples for TPHg/BTEX/MTBE analyses

One groundwater sample was collected for TPHd/mo/g/BTEX/MTBE analyses.

The following QA/QC samples were collected:

- 2 trip blanks for TPHg analysis
- 2 equipment rinse blanks for total lead analysis

All samples were transported to California-certified environmental laboratories for analysis under standard chain-of-custody (COC) documentation.

4.0 INVESTIGATIVE METHODS

4.1 Sampling Procedures

Soil samples were collected from nine boring locations identified by the Caltrans TO Managers using hand-auger and direct-push sampling techniques. The groundwater sample was collected from Boring B2 using disposable polyethylene tubing fitted with a check-valve. Boring coordinates are presented on Table 1 and locations are shown on the Site Plan, Figure 2.

Soil samples collected using a hand-auger were placed in stainless steel tubes and sealed with Teflon tape and plastic lids prior to being stored in a chest cooled with ice.

Soil samples collected using a direct-push sample rig were obtained by hydraulically advancing a two-inch-diameter, four-foot-long stainless steel core-barrel sampler lined with an acetate sample tube into undisturbed soil. Soil samples were collected for laboratory analysis by cutting an approximately six-inch-long section of the acetate tube from the target sample depth, capping the ends with Teflon tape and plastic end caps.

The grab-groundwater sample was pumped from the tubing directly into the appropriate sample containers.

Sample containers were labeled, placed in a chest cooled with ice, and transported to a Caltrans-approved, certified environmental laboratory using standard COC documentation. Hand auger soil borings were back-filled to surface with soil cuttings; direct-push borings were backfilled to surface with neat cement.

Geocon provided QA/QC procedures during the field activities. These procedures included washing the sampling equipment with a Liqui-Nox® solution followed by a double rinse with deionized water. The equipment rinse blank was collected by pouring deionized water over the cleaned sampling equipment and collecting it into a sample container for laboratory analysis. Decontamination water was disposed of to the ground surface within Caltrans right-of-way in a manner not to create runoff, away from drain inlets or potential water bodies.

4.2 Laboratory Analyses

Laboratory analyses were performed by ATL-LV under regular turnaround-time (TAT). The laboratory reports and COC documentation are included in Appendix B.

The soil samples were analyzed as follows:

- 8 samples for CAM 17 metals according to EPA Test Methods 6010 ICAP and 7471.
- 30 samples for total lead according to EPA Test Method 6010 ICAP.
- 7 samples with a total chromium concentration equal to or exceeding 50 mg/kg (i.e., equal to or exceeding ten times the chromium STLC of 5.0 mg/l) were further analyzed for WET chromium.
- 9 samples with total lead concentrations equal to or exceeding 50 mg/kg (i.e., equal to or exceeding ten times the lead STLC of 5.0 mg/l) were further analyzed for WET lead
- 6 samples with WET lead concentrations exceeding 5.0 mg/l were further analyzed for DI-WET lead.
- 3 samples with total lead exceeding 100 mg/kg and WET lead exceeding 5.0 mg/l were further analyzed for TCLP lead.
- 10 samples for TPHd/mo according to EPA Test Method 8015.
- 6 samples for TPHg according to EPA Test Method 8015.
- 6 samples for BTEX/MTBE according to EPA Test Method 8260.

The groundwater sample was analyzed for TPHd/mo/g according to EPA Test Method 8015 and BTEX/MTBE according to Test Method 8260.

The QA/QC trip blank sample was analyzed for TPHg according to EPA Test Method 8015.

The QA/QC equipment rinse blank samples were analyzed for total lead using EPA Test Method 6010 ICAP.

4.3 Laboratory QA/QC

QA/QC procedures were performed for each method of analysis with specificity for each analyte listed in the test method's QA/QC. The laboratory QA/QC procedures included the following:

- One method blank for every ten samples, batch of samples or type of matrix, whichever was more frequent
- One sample analyzed in duplicate for every ten samples, batch of samples or type of matrix, whichever was more frequent
- One spiked sample for every ten samples, batch of samples or type of matrix; whichever was more frequent, with spike made at ten times the detection limit or at the analyte level

Prior to submitting the samples to the laboratories, the COC documentation was reviewed for accuracy and completeness.

5.0 INVESTIGATIVE RESULTS

5.1 Subsurface Conditions

In order to facilitate direct-push rig soil sampling, asphalt coring was performed at three locations (B1, B2, and B3) along the left shoulder of the Fairmont Drive/150th Avenue off-ramp. Asphalt was present at thicknesses of up to 2 feet. Observations during field activities indicated that aggregate base fill material was present to a depth of approximately 2 feet. Brown clay was present to 7.5 feet. Black clay grading to light tan olive clay with increasing moisture was present to a depth of 12 feet. Stiff to very stiff, hard, moist black clay was present to 30 feet.

Boring B1 was extended to a depth of 30 feet in an attempt to collect a groundwater sample. Groundwater was not encountered in Boring B1. Groundwater was present in Boring B2 at a depth of 18.5 feet; the boring was advanced to 40 feet to facilitate sample collection.

5.2 Laboratory Analytical Results

The analytical results are summarized in Tables 2 through 5 and are summarized below:

Soil Sample Results:

- The following metals were not detected above their respective laboratory reporting limits: antimony, beryllium, cadmium, silver, and thallium.
- Total lead was reported at concentrations ranging from <1.0 to 190 mg/kg.
- WET lead was reported at concentrations of 3.1 to 9.4 mg/l.
- DI-WET lead was not detected at or above the reporting limit of 0.25 mg/l.
- TCLP lead was not detected at or above the reporting limit of 0.25 mg/l.
- Total chromium was reported at concentrations ranging from 29 to 350 mg/kg.
- WET chromium was reported at concentrations ranging from <0.050 to 1.2 mg/l.
- Remaining CAM 17 metals were reported in the samples at total concentrations below ten times their respective STLCs.
- TPHd was reported at concentrations ranging from <1.0 to 25 mg/kg.
- TPHmo was reported at concentrations ranging from <1.0 to 76 mg/kg.
- TPHg was not detected at or above the reporting limit of 1.0 mg/kg.

- BTEX/MTBE were not detected at or above laboratory limits.

Groundwater Sample Results:

- TPHd was reported at a concentration of 0.067 mg/l.
- TPHmo was reported at a concentration of 0.088 mg/l.
- TPHg was not detected at or above the reporting limit of 0.050 mg/l.
- BTEX/MTBE were not detected at or above laboratory limits.

QA/QC Sample Results:

- Total lead was not detected at or above the laboratory reporting limit of 0.0050 mg/l in the equipment rinse blank samples.
- TPHg was not detected at or above the laboratory reporting limit of 0.050 mg/l in the trip blank sample.

5.3 Laboratory Quality Assurance/Quality Control

We reviewed the QA/QC results provided with the laboratory analytical reports. The data indicate non-detect results for the method blanks at or above reporting limits. The Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) were outside recovery criteria for several samples, possibly due to matrix interference; however, the associated laboratory control sample (LCS) recoveries were acceptable. The relative percent differences (RPD) for MS/MSD were outside of recovery limits for several analytes; however, the analytical batch was validated by the LCS. The relative percent difference (RDP) for nickel was outside of recovery criteria; however, the analytical batch was validated by the LCS. The RPD for one sample duplicate was outside criteria possibly due to non-homogeneity of the sample. Remaining samples and internal laboratory QA/QC samples showed acceptable recoveries and relative percent differences (RPDs). Based on this limited data review, no additional qualifications of the soil data are necessary, and the data are of sufficient quality for the purposes of this report.

5.4 Statistical Evaluation for Lead Detected in Soil Samples

Statistical methods were applied to the total lead data to evaluate: 1) the upper confidence limits (UCLs) of the arithmetic means of the total lead concentrations for each sampling depth; and 2) if an acceptable correlation between total and WET lead concentrations exists that would allow the prediction of WET lead concentrations based on calculated UCLs. The lead data for the Site were treated as a single sample population.

5.4.1 Calculating the UCLs for the Arithmetic Mean

The upper one-sided 90% and 95% UCLs of the arithmetic mean are defined as the values that, when calculated repeatedly for randomly drawn subsets of site data, equal or exceed the true mean 90% and 95% of the time, respectively. Statistical confidence limits are the classical tool for addressing uncertainties of a distribution mean. The UCLs of the arithmetic mean concentration are used as the mean concentrations because it is not possible to know the true mean due to the essentially infinite number of soil samples that could be collected from a site. The UCLs therefore account for uncertainties due to limited sampling data. As data become less limited at a site, uncertainties decrease, and the UCLs move closer to the true mean.

Non-parametric bootstrap techniques were used to calculate the UCLs. For those samples in which total lead was not detected, a value equal to one-half of the detection limit was used in the UCL calculation. The bootstrap test results are included in Appendix C. The following tables present the calculated UCLs and statistics for the Site.

Borings B1 to B9

SAMPLE INTERVAL (feet)	TOTAL LEAD 90% UCL (mg/kg)	TOTAL LEAD 95% UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	TOTAL LEAD MINIMUM (mg/kg)	TOTAL LEAD MAXIMUM (mg/kg)
0 to 0.5	93.0	100	66.8	0.5	190
1.0 to 1.5	49.6	53.9	34.9	2.5	88
2.5 to 3.0	49.4	54.7	29.1	0.5	140
5.0 to 5.5	NC	NC	3.43	2.5	5.7

NC – Not calculated due to insufficient data set

5.4.2 Correlation of Total and WET Lead

Total and corresponding WET lead concentrations are bivariate data with a linear structure. This linear structure should allow for the prediction of WET lead concentrations based on the maximum total lead concentrations presented in the tables above.

To estimate the degree of interrelation between total and corresponding WET lead values (x and y, respectively), the *correlation coefficient [r]* is used. The correlation coefficient is a ratio that ranges from +1 to −1. A *correlation coefficient* of +1 indicates a perfect direct relationship between two variables; a *correlation coefficient* of −1 indicates that one variable changes inversely with relation to the other. Between the two extremes is a spectrum of less-than-perfect relationships, including zero, which indicates the lack of any sort of linear relationship at all. The *correlation coefficient* was calculated for 7 (x, y) data points (i.e., soil samples analyzed for both total lead [x] and WET lead [y])

from the Site. To achieve an acceptable correlation, the total WET soluble lead data from samples B6-0 (110, 3.6) and B9-0 (190, 9.4) were excluded from the regression analysis. The excluded data have the highest squared residual WET soluble lead values (presented in Appendix C). Excluding these data points from the regression analysis yields an acceptable *coefficient of determination* (r^2) equaled 0.7741, which yields a corresponding *correlation coefficient* (r) of 0.8798.

For the *correlation coefficient* that indicates a linear relationship between total and WET lead concentrations, it is possible to compute the line of dependence or a best-fit line between the two variables. A least squares method was used to find the equation of a best-fit line (regression line) by forcing the y-intercept equal to zero since that is a known point. The equation of the regression line was determined to be $y = 0.0679(x)$, where x represents total lead concentrations and y represents predicted WET lead concentrations.

This equation was used to estimate the expected WET lead concentrations for the total lead UCLs for the data set (see Section 5.4.1). Regression analysis results and a scatter plot depicting the (x, y) data points along with the regression line are included in Appendix C. The predicted WET lead concentrations are summarized in Table 6.

6.0 CONCLUSIONS

6.1 Lead in Soil

The following table summarizes the predicted waste classification for excavated soil based on the calculated weighted averages of the total lead UCLs and predicted WET lead concentrations for data collected from the Site. For sample depths with insufficient data sets to allow complete statistical analyses, the maximum lead value was used in calculating averages. Weighted averages are calculated by using the total lead concentration for each 0.5-foot-depth interval as the value for the underlying 0.5-foot-depth interval (unless a sample was collected from the underlying depth interval). The total and WET lead calculations are summarized below and in Table 6.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification
0 to 1 ft	93	**6.3**	128	**Hazardous**
Underlying soil (1 to 5.5 ft)	*44.6*	*3.0*	*49.1*	*Non-hazardous*
0 to 2 ft	71.3	4.8	77.0	Non-Hazardous
Underlying soil (2 to 5.5 ft)	*43.2*	*2.9*	*47.7*	*Non-hazardous*
0 to 5 ft	*61.3*	*4.2*	*63.6*	Non-Hazardous
Underlying soil (5 to 5.5 ft)	*5.7*	*0.4*	*5.7*	*Non-hazardous*
0 to 5.5 ft	*53.4*	*3.6*	*58.3*	Non-Hazardous

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment and offsite disposal

Based on the data presented in the above table, soil excavated to a depth of 1.0 foot would be classified as a California hazardous waste since the 90% UCL-predicted WET lead concentration is greater than the lead STLC of 5.0 mg/l. Based on the reported DI-WET and pH results, soil excavated to a depth of 1.0 foot may be reused (as Caltrans Type Y-1) in accordance with the DTSC Variance by placing the excavated soil under clean fill or pavement. Based on the TCLP lead results, excavated soil would not be classified as a RCRA hazardous waste. Underlying soil would be classified as non-hazardous based on lead content. If excavations extend to 2.0 feet or deeper and the soil is managed as a whole, then excavated soil would be classified as non-hazardous.

6.2 Remaining CAM 17 Metals in Soil

Seven samples contained total chromium at concentrations of greater than 50 mg/kg (i.e., greater than ten times the STLC of 5 mg/l). The samples were further analyzed for WET chromium and the reported concentrations were below the STLC. Total chromium concentrations in remaining samples were below ten times the STLC. Accordingly, excavated soil would be classified as non-hazardous based on chromium content.

With the exceptions of chromium and lead, CAM 17 metals were reported in the samples at total concentrations below ten times their respective STLCs.

The CAM 17 metals concentrations in site soil were compared to ESLs. Arsenic, cobalt, and lead were reported at concentrations greater than one or more ESL values. Non-parametric bootstrap techniques were used to calculate the UCLs for arsenic, cobalt, and lead. The bootstrap test results are included in Appendix C. ESLs, UCLs, and published background concentrations for arsenic, cobalt, and lead are summarized in the table below:

Metal	Maximum	95% UCL	Shallow Soil Residential ESL	Shallow Soil Commercial/ Industrial ESL	Worker Direct Exposure ESL	PUBLISHED BACKGROUND MEAN[1]	PUBLISHED BACKGROUND RANGE [1]
Arsenic	22	8.65	0.39	0.96	10	3.5	0.6 to 11.0
Cobalt	27	23.5	23	80	49	14.9	2.7 to 46.9
Lead	190	43.4	80	320	320	23.9	12.4 to 97.1

Concentrations reported in mg/kg

[1] Kearney Foundation of Soil Science, March 1996

The 95% UCL arsenic concentration is greater than the residential and commercial land use ESLs; however, it is less than the construction exposure ESL and within the published background range. The SFRWQCB *November 2007 Update to Environmental Screening Levels (ESLs) Technical Document* states that ambient background concentrations of arsenic typically exceed risk-based screening levels. In such instances, it may be more appropriate to compare site data to regionally specific established background levels.

Based on the reported results for arsenic, offsite reuse or disposal of excavated soil may be restricted based on arsenic content, depending on proposed use.

The 95% UCL cobalt concentration is greater than the residential land use ESL; however, it is below the commercial land use ESL, the construction exposure ESL, and is within the published background range.

The 95% UCL lead concentration is less than the residential land use, commercial/industrial land use and construction exposure ESLs, and also within the published background range.

Metals results for soil samples are summarized in Tables 2 and 3.

6.3 Organics in Soil

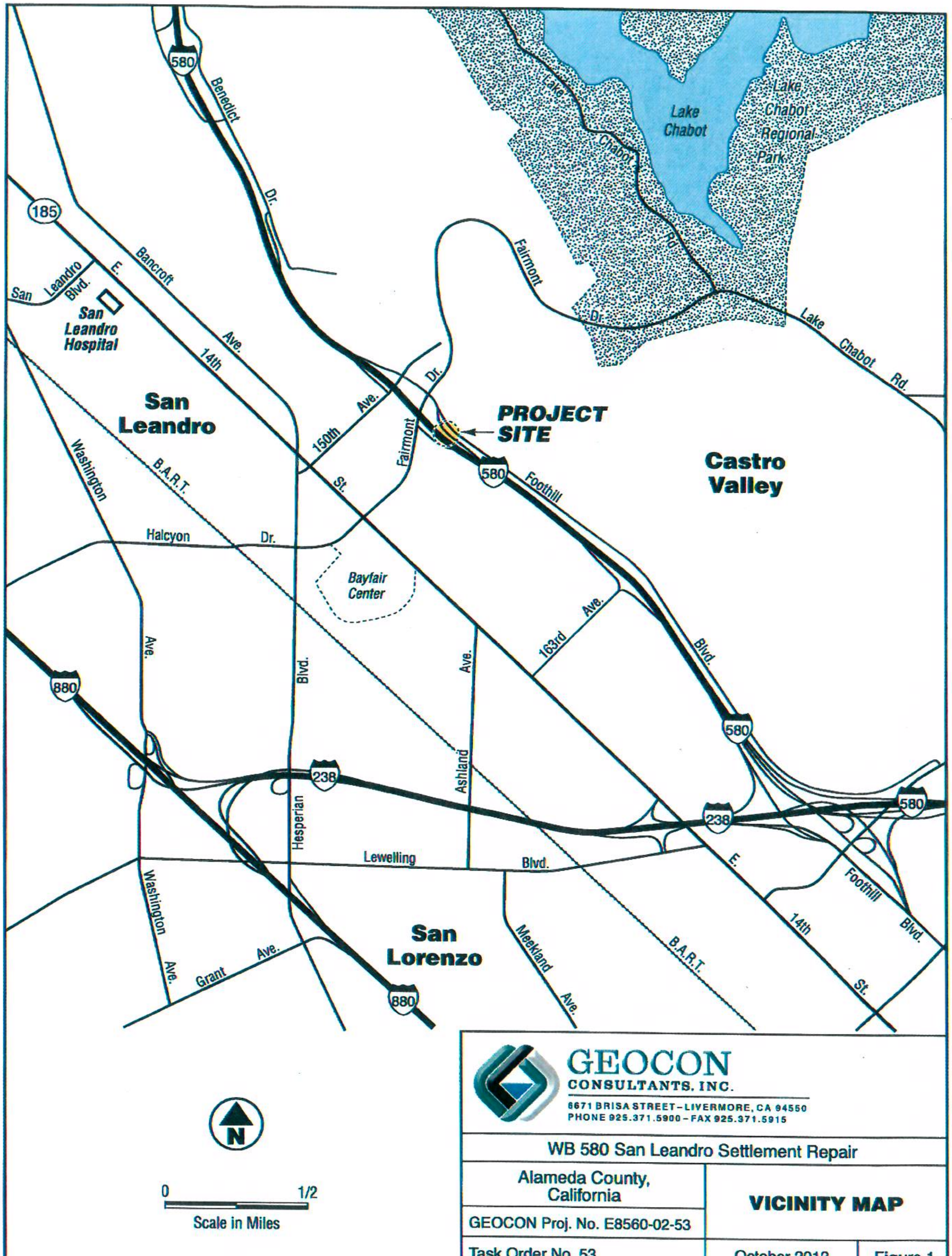
TPHg, BTEX, or MTBE were not detected at or above the laboratory reporting limits. TPHd/mo were reported in soil samples at concentrations of up to 25 and 76 mg/kg, respectively, below residential and commercial/industrial land use ESLs, and the construction exposure ESL (SFRWQCB, May 2013, Tables A and K-3). A summary of organic compound concentrations in site soil is presented in Table 4.

6.4 Organics in Groundwater

Groundwater samples were collected from Boring B2. TPHg, BTEX, or MTBE were not detected at or above the laboratory reporting limits. TPHd/mo were reported in samples at concentrations of 0.067 and 0.088 mg/l, respectively, below ESLs for groundwater as a current/potential source of drinking water, groundwater not as a current/potential source of drinking water, and surface water for freshwater, marine, or estuarine environments. (SFRWQCB, May 2013, Tables F-1a, F-1b, and F2a through F2c). A summary of organic compound concentrations for the groundwater sample is presented in Table 5.

6.5 Worker Protection

The contractor(s) should prepare a project-specific health and safety plan to prevent or minimize worker exposure to metals in soil. The plan should include protocols for environmental and personnel monitoring, requirements for personal protective equipment, and other health and safety protocols and procedures for the handling of soil.



GEOCON CONSULTANTS, INC.

6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

WB 580 San Leandro Settlement Repair

Alameda County, California	**VICINITY MAP**
GEOCON Proj. No. E8560-02-53	
Task Order No. 53	October 2013 — Figure 1

DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
MINING AND TUNNELING UNIT
2424 Arden Way, Suite 125
Sacramento, California 95825
doshM&Tsac@dir.ca.gov

Telephone (916) 574-2540
FAX (916) 574-2542

January 29, 2014

California Department of Transportation
111 Grand Avenue, 8th Floor
Oakland, CA 94623

Attention: Rifaat Nashed, Engineering Geologist

Subject: Underground Classification No. C052-001-14T
Classification: Potentially Gassy With Special Conditions
Project: 150th Avenue Soldier Pile Wall, San Leandro

The information provided to this office relative to the above project has been reviewed. On the basis of this analysis, an Underground Classification of "Potentially Gassy With Special Conditions" has been assigned to the tunnels identified on your submittal. Please retain the original Classification for your records and deliver a true and correct copy of the Classification to the tunnel contractor for posting at the job site.

When the contractor who will be performing the work is selected, please advise them to notify this office to schedule the mandated Pre-Job Conference with the Division prior to commencing any activity associated with boring of the tunnels. A Pre-Job Request Form is enclosed.

Should you have another bore under construction that is not required to have an Underground Classification (i.e.: less than 30 inches in diameter), please contact the Mining and Tunneling Unit prior to any employee entry of such a space.

If you have any questions on this subject, please contact this office at your earliest convenience.

Sincerely,

Douglas Patterson
Senior Engineer

enc: Classification
Pre-Job Request Form

cc: rifaat.nashed@dot.ca.gov
RBrockman@dir.ca.gov

State of California

Department of Industrial Relations

DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
MINING AND TUNNELING UNIT

Underground Classification

C052-001-14T	CALIFORNIA DEPARTMENT OF TRANSPORTATION
of	111 GRAND AVENUE, 8TH FLOOR; OAKLAND, CA 94623
at	150TH AVENUE SOLDIER PILE WALL
has been classified as	*** POTENTIALLY GASSY WITH SPECIAL CONDITIONS ***

as required by the California Labor Code § 7955.

The Division shall be notified if sufficient quantities of flammable gas or vapors have been encountered underground. Classifications are based on the California Labor Code Part 9, Tunnel Safety Orders and Mine Safety Orders.

SPECIAL CONDITIONS

1. **A Certified Gas Tester shall perform pre-entry and continuous monitoring of the underground environment to measure Oxygen and detect explosive, flammable, and toxic gasses whenever an employee is working in the underground environment.**
2. **Mechanical ventilation shall provide for continuous exhaust of fumes and air at any time an employee is working in the underground environment. The primary ventilation fans must be located outside of the underground environment and shall be reversible by a single switch near the fan location.**
3. **The Division shall be notified immediately if any Flammable Gas or Petroleum Vapor exceeds 5% of the Lower Explosive Limit.**
4. **All utilities that may be in conflict with the project shall be identified and physically located (potholed) prior to the start of project operations.**

The 44 shafts (50-foot-deep; 35 at 48-inch-diameter and 9 at 42-inch-diameter) alongside Route 580 at the 150th Avenue overcrossing in San Leandro, Alameda County

This classification shall be conspicuously posted at the place of employment.

Douglas Patterson, Senior Engineer

January 29, 2014

State of California
Department of Industrial Relations
Division of Occupational Safety & Health

REQUEST FOR PRE-JOB (TUNNEL)

ATTACH COPY OF CLASSIFICATION AND DIESEL PERMIT

Company Name: ______________________________

Phone ______________________ FAX: ______________________

DATE FAXED: ______________________________

PLEASE NOTE: THE BORING CONTRACTOR SHOULD SCHEDULE THE PREJOB AS FAR IN ADVANCE AS POSSIBLE - AT LEAST 3-4 DAYS IN ADVANCE. THE DIVISION REQUIRES THE JOB TO BE SET UP WHEN THE FIELD ENGINEER ARRIVES FOR THE PREJOB. THIS MEANS THAT THE BORE PIT HAS BEEN DUG AND PROPERLY GUARDED, THE CRANE IS IN PLACE AND READY TO LIFT, THE BORING MACHINE IS IN THE PIT AND READY TO GO, AND THE CREW IS READY TO BEGIN BORING THE TUNNEL. IF THERE IS A DELAY IN SETTING UP THE JOB, THE BORING CONTRACTOR SHOULD CONTACT THE DIVISION IMMEDIATELY.

PRE-JOB REQUEST DATE & TIME: ______________________________

ON-SITE SUPERVISOR & CELL NO.: ______________________________

CLASSIFICATION #: ______________ **DIESEL PERMIT #:** ______________

BORE DIAMETER AND LENGTH: ______________ (Diameter) ______________ (Length)

IS BORE ENTRY ANTICIPATED? **YES** **NO** (Circle One)

You MUST contact the Division if entry is planned, REGARDLESS of the bore diameter.

MANNER OF EXCAVATION: ______________________________

____

JOB-SITE LOCATION AND DIRECTIONS: ______________________________

____

____

GENERAL CONTRACTOR: ______________________________

SUBMITTED BY: ______________________________

REVIEWED BY: ______________ **DATE:** ______________

☐ *Mining & Tunneling Unit, District 1*
2424 Arden Way, Suite 125
Sacramento, California 95825-2400
*(916) 574-2540; **FAX: (916) 574-2542***

☐ *Mining & Tunneling Unit, District 2*
6150 Van Nuys Blvd., Suite 310
Van Nuys, California 91401-3333
*(818) 901-5420; **FAX: (818) 901-5579***

☐ *Mining & Tunneling Unit, District 3*
464 West Fourth Street, Suite 354
San Bernardino, California 92401-1442
*(909) 383-6782; **FAX: (909) 388-7132***