INFORMATION HANDOUT

For Contract No. 01-0B5704
At 01-Men-253-6.9

Identified by
Project ID 0112000139

MATERIALS INFORMATION

Foundation Report for Bridge No. 10E0031, dated September 12, 2014

State of California
Department of Transportation

California State Transportation Agency
CalSTA

Memorandum

Flex your power!
Be energy efficient!

To: RAMIN RASHEDI
Chief
Bridge Design Branch 11
Office of Bridge Design South 1
Structure Design
Division of Engineering Services - MS 9

Attention: Mark Okimura, PE

Date: September 12, 2014

File: 01-MEN-253-PM 6.89
Soldier Pile Tieback Wall
EA: 01-0B570
EFIS No. 0112000139

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES - MS 5

Subject: Foundation Report

Introduction

The Office of Geotechnical Design North (OGDN) is providing this Foundation Report (FR) for the subject storm damage repair project located on State Route (SR) 253 at Post Mile (PM) 6.89 in Mendocino County as shown in Figure 1 Site Vicinity Map in the Appendix.

The scope of work performed by OGDN includes reviews of available publications, performances of site reconnaissance and subsurface investigations, performances of engineering analyses and preparation of this report.

Project Background and Proposed Improvements

SR 253 is a two-lane asphalt concrete paved highway connecting SR 101 and SR 128. The route runs generally in an east-west direction in the project area. An intense storm event occurred on March 27, 2011 and a "slide-out" took place on the downslope to the south of the route, resulting in losses of the eastbound shoulder and portion of the eastbound travel lane.

OGDN previously investigated the "slide-out" and recommended a soldier pile tieback wall system to repair the damage in a memorandum titled "March Storm Damage Recommendation Located on MEN 253 PM 6.89" dated July 28, 2011. The damaged area was estimated to be about 230 feet long.

The proposed project will construct a soldier pile tieback wall to repair the "slide-out" and to restore the damaged roadway. To achieve the standard shoulder width, a soldier pile wall is added to the east of the soldier pile tieback wall, resulting in a final wall length of about 340 feet. The addition was made after our field investigation.

Field Investigations

Site Reconnaissance

OGDN performed site reconnaissance in March 2011 and November 2012. Upon our reconnaissance, the damaged travel lane had been temporarily repaired and traffic had been restored provisionally. Based on our observations, the arcuate head of the slide manifested into the pavement was near the center of the eastbound lane and was about 60 feet long. The first scarp on the downslope appeared to be an about 2 to 7 feet near vertical drop. Below the first scarp, the ground/slope extended near horizontally outward about 2 feet forming a benching area. Below the bench, a second scarp was about 5 feet high and appeared to be gentler than vertical. Below the second scarp, the slope appeared descending with a ratio of about 1:1 (H: V) or flatter.

The upslope to the north of SR 253 was a cut slope in the project area. The slope appeared to be about 1:1 (H:V), with some steeper inclinations in localized areas. Rock outcrop was observed on the slope. The rock appeared to be severely weathered and extensively fractured. Localized seepage was observed on the slope. Seeped water was collected by a drainage ditch located at the toe of the cut slope. The drainage ditch connects to a culvert located underneath SR 253 at PM 6.89. Water was transported through the culvert to a galvanized metal pipe and discharged into a natural drainage feature at the toe of the downslope to the south of the route. The discharging area was covered with "rip-rap" rock protection. No sign of distress was observed in the area immediately surrounding the "rip-rap."

Field Explorations

OGDN conducted a subsurface investigation at the site on February 14 and 15, 2012. Two soil test borings, RC-12-001 and RC-12-002, were performed to depths of 66 feet and 65 feet below the roadway surface, respectively. OGDN engineer, Kathryn Gallagher, was onsite and logged the borings. The borings were located within the "slide-out" area on the eastbound lane as shown in Figure 2 Boring Location Map in the Appendix. The borings were advanced using a Caltrans Acker drill rig with a self-casing wireline drilling method. Soil and rock samples were collected and visually classified onsite. Standard Penetration Tests (SPT) were performed at selected locations where materials appeared suitable. Upon completion of drilling, Slope Inclinometers (SI) were installed in the borings. The SI consisted of a 20-foot perforated PVC pipe at bottom and solid PVC pipes in upper section. The annular space between the SI and the borehole was backfilled with sand. The collected samples were transported to Caltrans core sample storage located at TransLab after field investigation was completed. Table 1 below summarizes of the borings of this subsurface investigation.

Sheets of Log of Test Boring (LOTB) for RC-12-001 and RC-12-002, including a location plan, is being prepared by Geotechnical Services, Office of Geotechnical Support, Branch D, Contracts, Graphics & Records. The LOTB will be provided upon completion to be incorporated into the project plans. Mrs. Irma Gamarra-Remmen of the branch may be contacted for the information of the LOTB.

Table 1 Subsurface Exploration Summary

Boring No.	Location		Boring Depth (ft)	Monitoring Device Installed	Date	
	Description	Approximate Station			Beginning	Completion
RC-12-001	In Slide Area	103+18 (A1 line)	66	SI	2/14/2012	2/15/2012
RC-12-002		102+53 (A1 line)	65		2/15/2012	2/16/2012

Laboratory Testing

Nine representative samples collected in the borings were selected for laboratory testing to aid in classification and characterization of subsurface materials. Tests performed included Unit Weight (ASTM D4767), Moisture Content by Mass (ASTM D2216), Particle-Size Analysis (ASTM D422), Liquid Limit (AASHTO T89), Plastic Limit and Plastic Index (AASHTO T90) and Corrosion. Results of the laboratory tests are provided in the Appendix.

Geology

The site is located in the northern portion of the Coast Range Geomorphic Province of California. This province is characterized by northwest-trending mountain ranges and intervening valleys, reflecting the northwest structural trend of regional bedrock. In the northern portion of the province, the bedrock consists of the Franciscan Complex, a diverse group of igneous, sedimentary, and metamorphic rocks of early Tertiary to Cretaceous age (approximately 38 to 100 million years old (Coastal Belt) up to Upper Jurassic to Cretaceous age (140 to 65 million years old). The Franciscan Complex is part of a northwest-trending belt of materials immediately adjacent to the eastern edge of the San Andreas fault system, which is located approximately 32 miles southwest of the site.

According to the Geologic Map of California, Olaf P. Jenkins Edition, Ukiah Sheet (CDMG 1992), the site is underlain by the Franciscan Complex rocks referred as Undivided Cretaceous Marine (K) deposits, which is locally overlain by younger Quaternary alluvial, colluvial, and landslide deposits. A Site Geology Map is provided in Figure 3 in the Appendix.

Seismicity

Based on Caltrans Methodology for Developing Design Response Spectrum for Use in Seismic

Design Recommendations (November 2012) and the subsurface condition discussed below, an average shear wave velocity (V_{S30}) of about 1200 feet per second was estimated for the upper 100 feet of the soil/rock at the project site.

Based on Caltrans ARS Online (2.2.06), the probabilistic response acceleration spectrum developed from the USGS 2008 Interactive Deaggregation (Beta) model controls at the site. The active faults potentially having seismic impact on the project site are Maacoma fault zone (North Section, Fault ID 66), San Andreas (North Coast) 2011 CFM (Fault ID 80) and San Andreas (Offshore) 2011 CFM (Fault ID 54). With the above estimated V_{S30}, a Peak Ground Acceleration (PGA) of 0.53g is estimated to be applicable at the site.

Potential of liquefaction is considered minimal at the site due to rock. No know fault is projected towards or passing directly through the project site. Therefore, potential for surface rupture due to fault movement is null.

Subsurface Conditions

The subsurface materials encountered in the borings consisted of asphalt materials, fills, colluvium, and rock. Below the asphalt pavement section, about 10 to 15 feet of fill materials were encountered. The fills contained clays, sands and gravels. SPT blow counts recorded in the fills ranged from 5 to 9 blows per foot (bpf) indicating that the fills were soft/loose to medium stiff/dense. Below the fills, about 20 to 25 feet of colluviums were encountered. The colluviums consisted of a mixture of sands, gravels and isolated cobbles and boulders. The colluviums were medium dense to very dense with recorded SPT blow counts ranging from 20 to over 57 bpf. Below the colluviums, rock was encountered. The rock was primarily sedimentary rock consisting of sandstone and mudstone. About 10 feet of the upper rock was extensively weathered and was intensely fractured or decomposed. A Generalized Subsurface Profile is provided in Figure 4 in the Appendix.

Groundwater

Due to the use of wireline drilling method, groundwater depth was not established during drilling. Groundwater depths were measured in the borings on February15 and 16, 2012. Table 2 below summarizes the measured groundwater depths.

Table 2 Groundwater Depth Summary

Boring No.	Groundwater Depth (ft)	Groundwater Elevation (ft)	Measuring Date
RC-12-001	14.9	279.1 +/-	2/16/2012
	20.0	274.0 +/-	2/22/2012
RC-12-002	11.9	276.1 +/-	2/22/2012

It should be noted that groundwater condition changes with local weather conditions and could rise significantly after a heavy rainfall. Based on our investigation and a slope stability analysis discussed below, a groundwater condition at a depth of about 20 feet below the roadway surface could possibly exist during and shortly after the rainfall event occurred in March 2011, which may have contributed and triggered the subject "slide-out". For design purposes, groundwater is considered at a depth of 20 feet below roadway surface.

Corrosion

One representative soil sample was collected from the site and was tested for corrosion evaluation. The test result is summarized in Table 3 below.

Table 3 Corrosion Test Result

Corrosion Lab#	Sample Type	Sample Depth (ft)	Minimum Resistivity (ohm-cm)	pH[1]	Chloride Content (ppm)	Sulfate Content (ppm)	Is Sample Corrosive
CR20130355	Soil	10	3704	6.44	n/a	n/a	No

1. CT643

The Department considers a site to be corrosive to foundation elements if one of more of the following conditions exist for the representative soil samples taken at the site: "*Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less.*"

Based on the test result, the site is considered to be non-corrosive to foundation elements.

Naturally Occurring Asbestos

Based on A General Location Guide for Ultromafic Rocks in California – Area More Likely to Contain Naturally Occurring Asbestos (CDMG, 2000), the site is not in areas that potentially contain naturally occurring asbestos.

Slope Stability Analyses

Slope stability analyses were performed to study the "slide-out" and the proposed soldier pile tieback wall using Slope/W (Geo-Slope International Ltd. 2007.) software and Spencer (1967) method. Two-dimensional models were developed to reproduce the insitu "slide-out" condition and to evaluate the proposed wall construction, respectively.

The "slide-out" was studied to back-analyze the insitu subsurface condition. No surcharge or seismic loading was considered to replicate the actual condition. Based on the study, the failure plane took place primarily in the colluviums extending about 200 feet longitudinally and about 90 feet transversally between its head and toe. Estimated engineering parameters for the subsurface materials are summarized in Table 4 below. Figure 5 in the Appendix shows the potential failure plane on the two dimensional Slope/W model.

Table 4 Estimated Engineering Parameters of Subsurface Materials

Approximate Depth[1] (ft)	Material Classification	Unit Weight (pcf)	Cohesion (psf)	Internal Friction Angle (°)
0 - 15	Fills	120	0	32
15 - 40	Colluvium	125	0	30
40 - 50	Weathered/ Decomposed Rock	130	0	33
> 50	Rock	150	0	40

With the above engineering parameters, the proposed soldier pile and tieback wall system was analyzed with a static surcharge load of 240 pounds per square foot and a seismic load consisting of a horizontal acceleration coefficient, k_h, equaling to one third of the PGA. A design wall height of 40 feet was considered such that the wall would be extended below the bottom of the colluvium. Based on our conversation with your office, 3 rows of tiebacks were considered with vertical spacing of 10 and 12 feet. Based on the analysis, Table 5 below summarizes the minimum bond and unbond lengths required for the tiebacks to satisfy global stability. A plot of the soldier pile tieback wall with the minimum satisfying factor of safety for global stability is shown in Figure 6 in the Appendix.

Table 5 Bond and Unbonded Lengths of Tiebacks

Tieback Location (from TOW)	Bond Length (ft)	Unbonded Length (ft)
1st Row	30	30
2nd Row	30	25
3rd Row	30	20

Design Recommendations

Based on the above study, without remediation, the colluviums may experience further downward movement resulting in additional "slide-out" with a trigger condition, such as a heavy storm similar to that occurred on March 2011. The proposed soldier pile tieback wall is suitable for use to remediate the current "slide-out" and to prevent future movement at the site.

Wall Lengths and Wall Heights

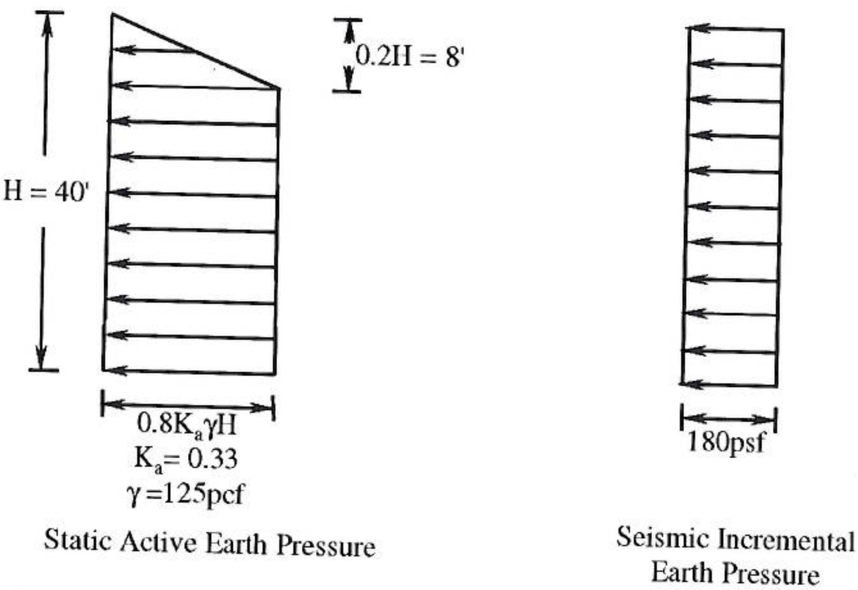
Based on the provided survey result, the General Plan, and our field investigations, a design wall length of about 250 feet, approximately from Station 101+55 to Station 104+03 is considered suitable for the soldier pile tieback wall at the site. Based on the General Plan, the soldier pile wall is about 90 feet long, approximately from station 104+03 to Station 104+90.

A design height of 40 feet from top of wall (TOW) to bottom of lagging is recommended for the soldier pile tieback wall such that the bottom of the lagging will be extended below the bottom of the colluvium. Based on the provided survey result and cross sections, the original ground in the area to receive the soldier pile wall is about 3 to 6 feet below the TOW. It is anticipate that minor excavation (less than 2 feet) will be required to remove the topsoil and loose surficial materials and to place the lagging. Therefore, for estimation purposes, the soldier pile wall may be considered as 8 feet high. At the ends of the walls, the bottoms of the walls maybe stepped to aid in construction. The recommended stepping ratio is 1.5:1 (H:V). In the area where the walls are joining together, the wall height will need to be transitioned from 40 feet (soldier pile tieback wall) to about 8 feet (soldier pile wall). A transitioning/stepping ratio of 1:1 may be used if 1.5:1 ratio cannot be realized due to site limitation. A plot showing the recommended design wall height and wall length is provided in Figure 7 in the Appendix.

Lateral Earth Pressure and Resistance for Soldier Pile Tieback Wall

Lateral earth pressure recommendations are based on Caltrans Bridge Design Specification, Section 5 Retaining Wall (August 2004), Caltrans Memo to Designer 5-12, Earth Retaining Structures Using Tiebacks (August 1990), AASHTO LRFD Bridge Design Specifications (4th Edition/2007) and California Amendments (2011) to AASHTO LRFD Bridge Design Specifications (4th Edition/2007).

The recommended static active lateral earth pressure and seismic incremental earth pressure distribution diagrams are provided below. The recommendations are based on a wall height of 40 feet, multiple rows of tiebacks, Caltrans standard structural backfill material, and a horizontal seismic acceleration coefficient, k_h, of 0.18g.



Active Earth Pressures Distributions (per linear foot) for Soldier Pile Tieback Wall

The above recommended earth pressures are nominal values, therefore no factor (load factor or resistance factor) is included. As the wall is designed free drained, hydrostatic pressure needs not to be considered.

Passive lateral resistance/earth pressure can be developed on the soldier piles embedded in the weathered rock and rock below the bottom of wall lagging. Table 6 below summarizes the passive lateral earth pressure coefficients recommended for the weathered rock and rock.

Table 6 Passive Resistance Recommendations for Soldier Pile Tieback Wall

Type of Rock	Unit Weight (pcf)	K_p
Weathered Rock	130	1.70
Rock below Weathered Rock	150	4.70

Lateral Earth Pressure and Resistance for Soldier Pile Wall

The subsurface condition in the area to receive the soldier pile wall was not investigated. The following recommendations in Table 7 are provided for the soldier pile wall based on the two borings discussed above and the existing topography observed during our site visits.

Table 7 Earth Pressure/Resistance Recommendations for Soldier Pile Wall

Type of Rock	Depth[1] (ft)	Unit Weight (pcf)	K_a	K_p
Fills/Soils	0 - 10	125	0.33	--
Weathered Rock	10 - 20	130	--	1.70
Rock	> 20	150	--	4.70

1. Depth is measured from current roadway surface (OG).

Soldier Piles

Typically the embedment depths of the soldier piles will be determined by the internal stability/lateral analysis to be performed by your office. To satisfy axial capacity demand and global stability requirement, we recommend that the soldier piles be extended through the weathered rock and embedded at minimum 5 feet into the competent rock below.

The following information is provided for estimate purposes. In the area to receive the soldier pile tieback wall, the competent rock encountered in the borings was at about 50 feet below the existing roadway (TOW). As such, the estimated pile tip would be at about 55 feet below TOW.

In the area to receive the soldier pile wall, subsurface information is not available. We assumed the weathered rock and the competent rock below might present at approximately 10 and 20 feet below the current roadway surface (OG). To satisfy axial capacity demand and global stability, we recommend that the soldier piles be extended to at minimum 5 feet into competent rock. As such a preliminary estimative pile tip would be at about 25 feet below OG. If more detailed pile tip information is desired, an additional field investigation should be performed. Such investigation may include drilling or seismic refraction testing.

We note that actual rock condition to be encountered during construction should be evaluated by the Engineer during construction. We recommend that pile length be set consistent throughout the entire length of the wall.

Lagging

If waler is not used in the proposed wall constructions, to prevent lagging from vertical movement/dropping along the soldier piles, we recommend that lagging be installed with some provision of structure support.

Tiebacks

We understand that 3 rows of tiebacks will be utilized. The top row is 10 feet below TOW, the second row is 12 feet below top row, and the bottom row is 12 feet below the second row. We recommend that tiebacks be designed and constructed in a way such that the entire bonded length is in competent bedrock below/behind the weathered rock. An ultimate bond stress of 8000 psf is recommended for the competent rock. The recommended unbonded lengths are provided in Table 8 below. Actual bonded length is typically determined by the Contractor. Minimum bonded length should be no less than 30 feet to satisfy global stability requirement.

Table 8 Minimum Unbonded Length of Tiebacks

Tieback Location	Minimum Unbonded Length (ft)
Top Row	30
Second Top Row	25
Bottom Tow	20

Structure Backfill Materials

Structure backfill should be in accordance with Caltrans Standard Specification 2010, Section 19-3 Structure Excavation and Backfill. We recommended that a minimum 2 feet of the standard structure backfill be placed behind the walls.

Drainage

We recommend that full drainage extending to the bottom of the lagging be installed with the walls. Drainage design and construction should be in accordance with Caltrans Standard Specification 2010, Section 68 Subsurface Drains.

Construction Consideration

All construction shall be in accordance with Caltrans Standard Specifications.

1. Excavation will be required for the proposed wall construction. Cobble, boulders, and rock were encountered at the site. Difficulty in excavation due to these materials should be anticipated. The slide debris including cobble and boulder sized rock fragments and the fragments of bedrock encountered in the borings may not represent the true size of the materials to be encountered during the construction. Excavation should be able to achieve by using conventional heavy excavation equipments. Blasting is not anticipated.

2. Temporary construction slope may be used during excavation. All regulations in connection to temporary construction slope should be followed. Contractor is responsible for design and construction of the temporary construction slope. Design and construction staging of the temporary slope shall be reviewed and approved by the Engineer prior to construction.

3. Soldier pile construction will require drilling through bedrock as well as the fills and colluvium consisting cobbles and boulders. Therefore difficult drilling due to these materials should be anticipated. Special equipments or methods, such as rock coring, maybe required. The depths of bedrock encountered in the borings and the associated estimation of bedrock profile may not represent the true profile of bedrock to be encountered during the construction.

4. Groundwater was measured at depths of about 11 to 20 feet and localized higher groundwater condition may exist depending on the local conditions. Groundwater will be encountered during the soldier pile construction and should be prepared. Temporary dewatering can be achieved by pump and sump. Contractor is responsible for design and construction of the temporary dewatering. Design and construction of dewatering should be reviewed and approved by the Engineer prior to construction.

5. Due to the loose nature of the fill materials, extensively fractured and decomposed nature of the rock, and presence of groundwater, potential caving of the drilled hole should be anticipated. Use of drill fluid and temporary casing may be needed. If used, temporary casing should be removed.

6. Due to the abovementioned material natures and history of ground movement at the site, the matrix of the subsurface materials can be very porous with significant voids. If encountered, loss of concrete and drill fluid, if used, will occur and should be prepared.

The discussions, analyses, and recommendations contained in report are based on specific project information regarding location, design, and construction that have been provided. If any changes are proposed during final project design and/or construction, OGDN should review the changes to determine if the discussions, analyses, and recommendations contained herein are still applicable.

If you have any questions, please call me at (916) 227-1057.

REGISTERED PROFESSIONAL ENGINEER
THOMAS NAXIN SONG
No. C 69325
Exp. 6/30/2016
CIVIL
STATE OF CALIFORNIA

Thomas Song, PE
Transportation Engineer – Civil
Geotechnical Design – North

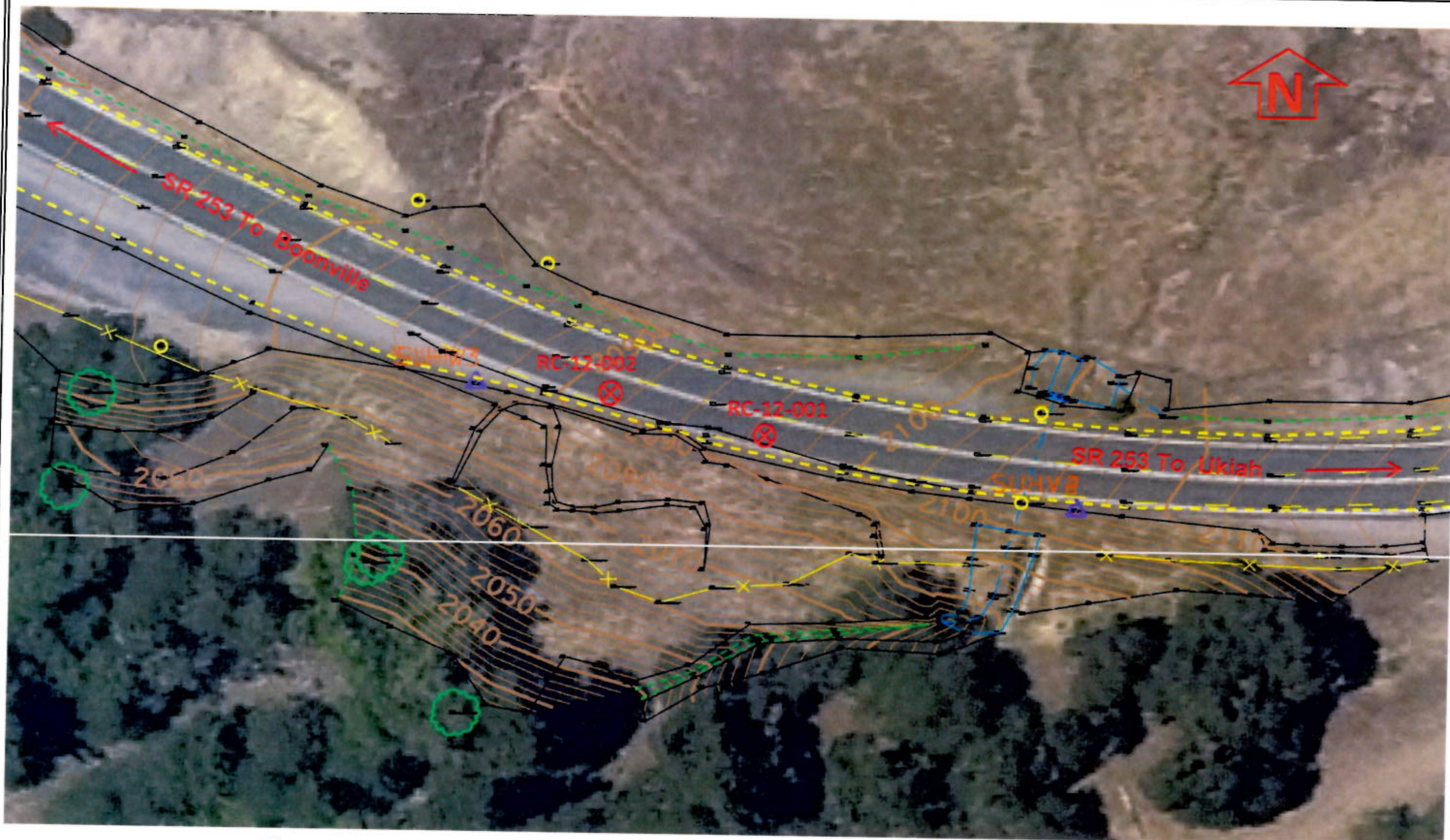
C: District Project Manager
Structure Construction R.E. Pending File
Structure Office Engineer
District Materials Engineer
Geotechnical Archive

Appendix

Not to Scale

EA/ EFIS No.	01-0B570 0112000139	**Site Vicinity Map** Foundation Report 01-MEN-253 PM 6.89
DATE:	8/29/2013	

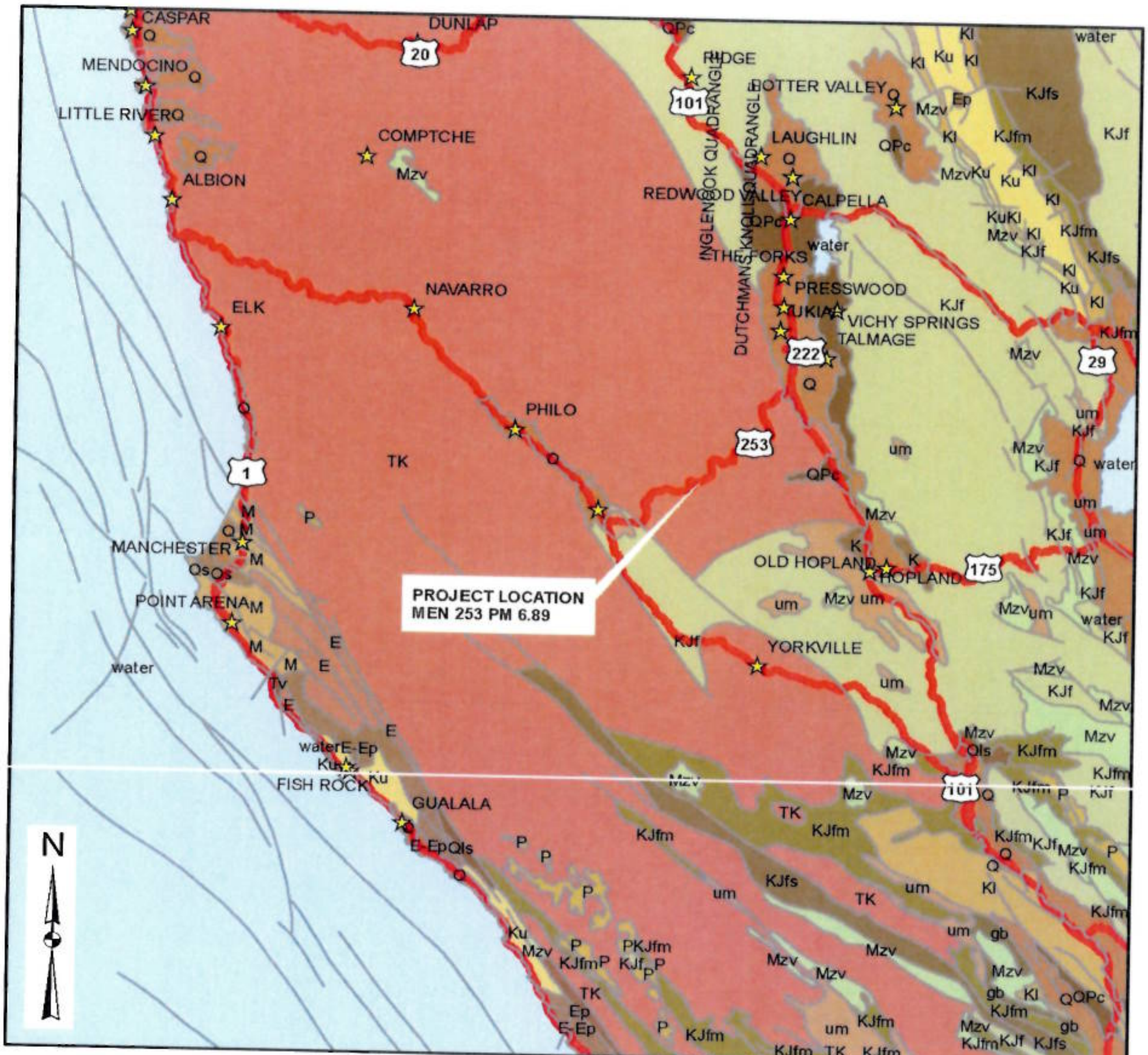
DEPARTMENT OF TRANSPORATION Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North (OGDN)	Figure 1



⊗ Approximate Boring Location

Not to Scale

Caltrans DEPARTMENT OF TRANSPORTATION Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North (OGDN)	EA: 01-0B570 0112000139 DATE: 6/25/2013	**Boring Location Map** Foundation Report 01-MEN-253-PM 6.89
	Department of Transportation, Division of Engineering Services Geotechnical Services - Office of Geotechnical Design North	Figure 2



Legend

Saucedo G.J. et. al. "GIS data for the geologic map of California", USGS, 2000
Digitized from the 1977 Geologic Map of California by C.W. Jennings

cageol_poly_dd_Project

ORIG_LABEL, ROCKTYPE1

- E, mudstone
- E-Ep, sandstone
- Ep, sandstone
- J, mudstone
- K, mudstone
- KJf, sandstone
- KJfm, melange
- KJfs, blueschist
- Kl, mudstone
- Ku, sandstone
- M, sandstone
- M?, sandstone
- Mzv, greenstone
- P, phyllite
- P, sandstone
- P, slate
- Q, alluvium
- QPc, sandstone
- Qls, landslide
- Qs, dune sand
- Qv, andesite
- TK, sandstone
- Tv, basalt
- Tv, dacite
- Tvp, rhyolite
- gb, gabbro
- um, serpentinite
- water, water

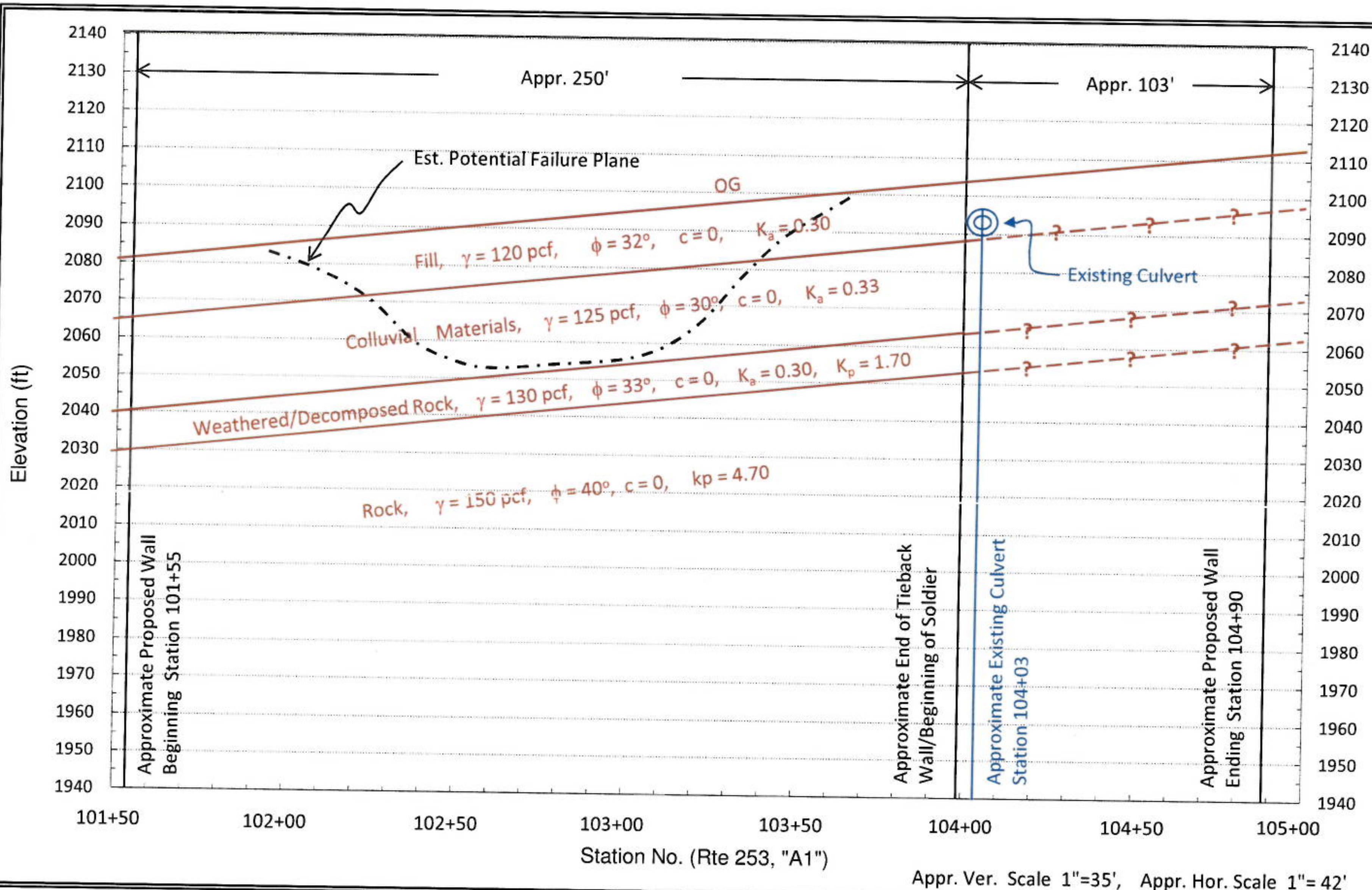
0 2.5 5 10 15 20 Miles

EA/ EFIS No.	01-0B570 0112000139	**Geology Map** Foundation Report 01-MEN-253-PM 6.89
DATE:	5/25/2013	

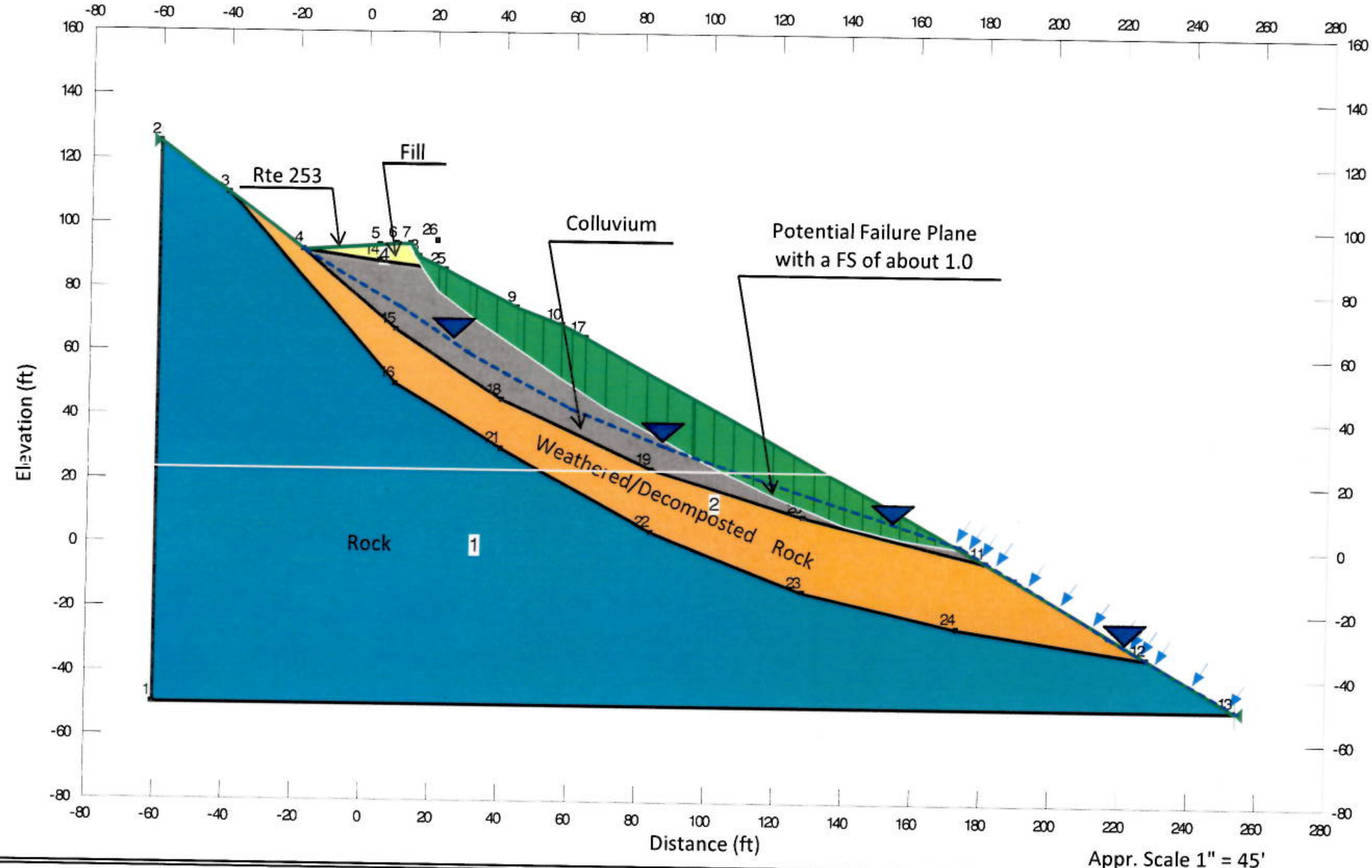
DEPARTMENT OF TRANSPORATION
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North (OGDN)

Figure
3

Caltrans



Caltrans — DEPARTMENT OF TRANSPORTATION Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North (OGDN)	EA/ EFIS: 01-0B570 0112000139 DATE: 10/2/2013	Generalized Subsurface Profile	
	MEN-253-PM 6.89 Foundation Report		Figure 4



Caltrans

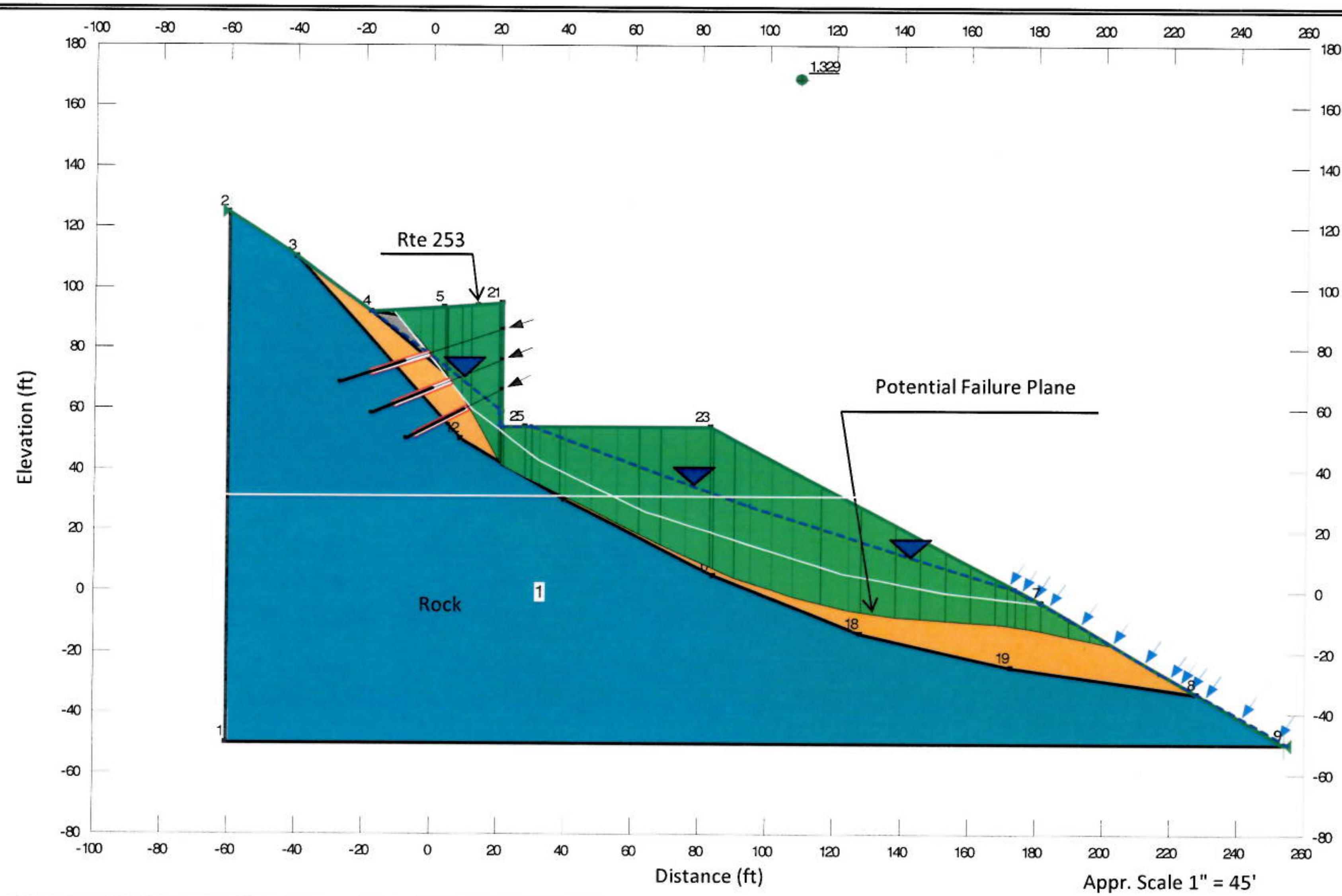
DEPARTMENT OF TRANSPORTATION
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North
(OGDN)

EA:	01-0B570 0112000139
DATE:	10/15/2013

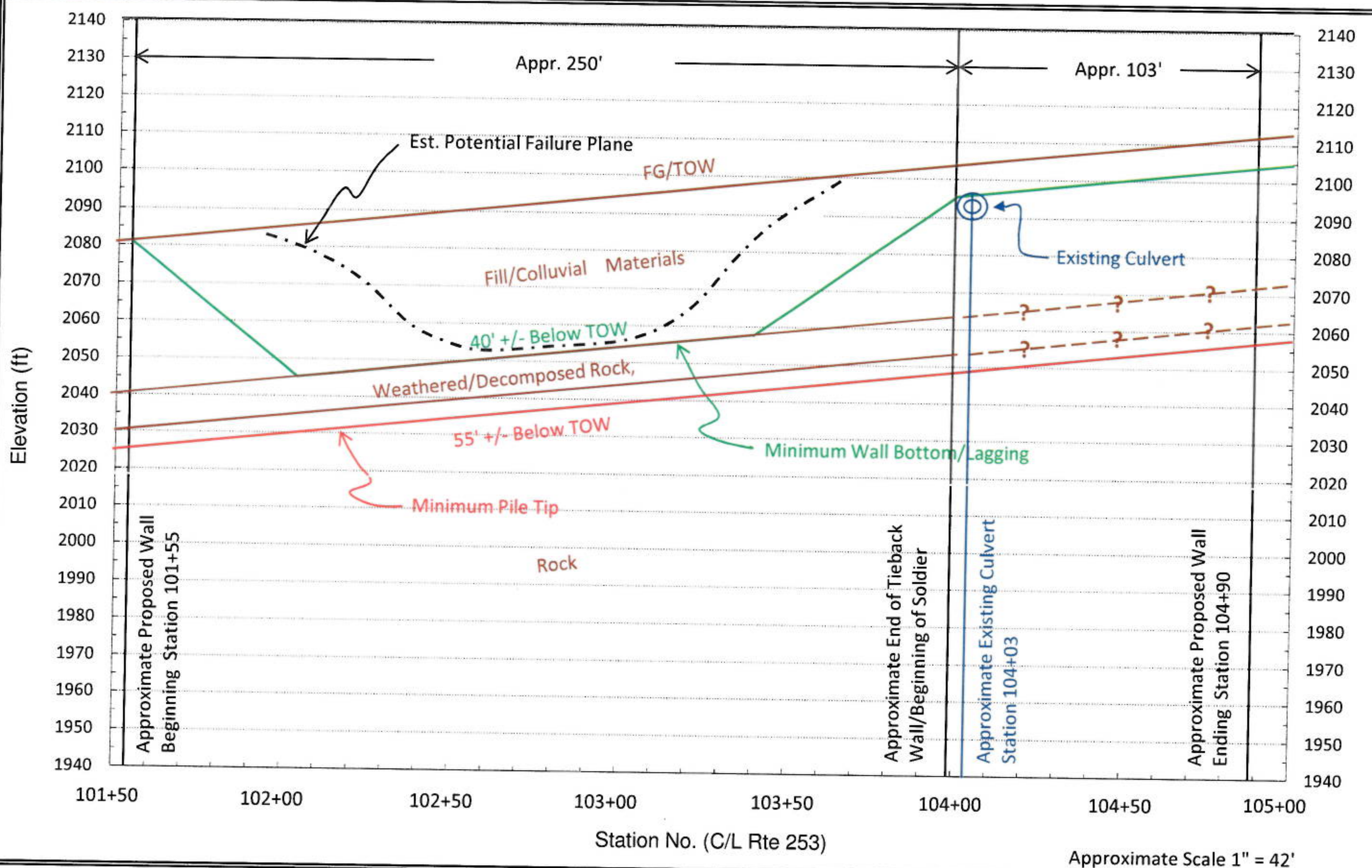
Potential Failure Surface
Insitu Sliding Condition

MEN-253-PM 6.89, Foundation Report

Figure 5



DEPARTMENT OF TRANSPORTATION Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North (OGDN)	EA:	01-0B570 0112000139	**Potential Failure Surface** **Insitu Sliding Condition**	
	DATE:	10/15/2013		
	MEN-253-PM 6.89, Foundation Report			Figure 6



DEPARTMENT OF TRANSPORTATION Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North (OGDN)	EA/ EFIS	01-0B570 0112000139	**Approximate Wall Profile (Wall Bottom & Pile Tip)**
	DATE:	10/2/2013	
	MEN-157-PM 6.89, Foundation Report		Figure 7

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION
MECHANICAL ANALYSIS
CALIFORNIA TEST METHOD NO. 203
MR-0211 (REV. 10/93)

59904

SAMPLE NUMBER	59904
JOB NUMBER	01-0B570

DISTRICT	COUNTY	ROUTE	POST MILE	STATION	
01	MEN	253	6.89		

FT. RT. / LT. LINE

1" 0.0 SIEVE ANALYSIS 100 100

SIEVE SIZE	MICRONS	GRAMS RETAINED	% RETAINED	% PASS	COMBINED GRADE
3/4"	19000	50	16	84	84
1/2"	12500	84	26	74	74
3/8"	9510	98	31	69	69
#4	4760	140	44	56	56
8	2380	11.8	14	86	48
16	1190	25.3	30	70	39
30	595	34.4	40	60	34
50	297	42.2	49	51	29
100	149	49.5	58	42	24
200	74	55.5	65	35	20
270	53				
PAN		85.6 318			

(-#4 = 177.4)

SAMPLE WEIGHTS

NET WET WEIGHT	88.7 88.2 GMS.
MOISTURE CONTENT	3.0% 3.0 %
NET DRY WEIGHT	86.1 85.6 GMS.

SOIL CLASSIFICATION

< 1.0 MICRON (Colloids)	4 %
< 5 MICRONS (Clay)	9 %
5 TO 74 MICRONS (Silt)	11 %
74 TO 4760 MICRONS (Sand)	36 %
> 4760 MICRONS (Gravel)	44 %
TEMP. HYDRO. BATH	70 °F

HYDROMETER ANALYSIS

PERIOD (Hours)	MICRONS	HYDRO. READING	COMPOSITE CORRECTION	CORRECT READING	% PASS	COMBINED GRADE
1	5	20	-6	14	16	9
6	2	—	—	—	—	—
24	1	12	-6	6	7	4

TESTED BY: EH
CALCULATED BY: EH
CHECKED BY: ML
DATE: 10-26-12

REMARKS:

SAMPLE RECEIVED 5-3-2012
% MOISTURE = 14%   5-0 FEET

PLASTIC LIMIT NOT DETERMINED — INSUFFICIENT SAMPLE

FM 93 1886 M

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION
MECHANICAL ANALYSIS
CALIFORNIA TEST METHOD NO. 203
MR-0211 (REV. 10/93)

59910

SAMPLE NUMBER 59910
JOB NUMBER 01-0B570

DISTRICT	COUNTY	ROUTE	POST MILE	STATION	RT. / LT.
01	MEN	253	6.89		FT. LINE

SIEVE ANALYSIS

SIEVE SIZE	MICRONS	GRAMS RETAINED	% RETAINED	% PASS	COMBINED GRADE
3/4"	19000	0	0	100	100
1/2"	12500	41	4	96	96
3/8"	9510	63	5	95	95
#4	4760	234	20	80	80
8	2380	6.6	8	92	74
16	1190	23.9	30	70	56
30	595	37.8	48	52	42
50	297	47.5	60	40	32
100	149	54.8	69	31	25
200	74	59.8	76	24	19
270	53				
PAN		79.2 1146			

-#4= 912

HYDROMETER ANALYSIS

PERIOD (Hours)	MICRONS	HYDRO. READING	COMPOSITE CORRECTION	CORRECT READING	% PASS	COMBINED GRADE
1	5	17	-6	11	14	11
6	2	—	—	—	—	—
24	1	10	-6	4	5	4

SAMPLE WEIGHTS

NET WET WEIGHT	102.1	83.6	GMS.
MOISTURE CONTENT	5.6	5.6	%
NET DRY WEIGHT	96.7	79.2	GMS.

SOIL CLASSIFICATION

< 1.0 MICRON (Colloids)	4	%
< 5 MICRONS (Clay)	11	%
5 TO 74 MICRONS (Silt)	8	%
74 TO 4760 MICRONS (Sand)	61	%
> 4760 MICRONS (Gravel)	20	%
TEMP. HYDRO. BATH	70	°F

TESTED BY: PH

CALCULATED BY: PH

CHECKED BY: ML

DATE: 10-26-12

REMARKS: SAMPLE RECEIVED 5-3-2012 - BAG & PLASTIC WRAP
% MOISTURE = 17%
UNIT WT. = 112 PCF

L.L. = 37 18'-0" FEET
P.L. = 24
P.I. = 13

FM 93 1686 M

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

MECHANICAL ANALYSIS
CALIFORNIA TEST METHOD NO. 203
MR-0211 (REV. 10/93)

59903

SAMPLE NUMBER 59903

JOB NUMBER 01-0B570

DISTRICT	COUNTY	ROUTE	POST MILE	STATION	
01	MEN	253	6.89	253-2-22.5	FT. RT. / LT. LINE

SIEVE ANALYSIS

SIEVE SIZE	MICRONS	GRAMS RETAINED		% RETAINED		% PASS		COMBINED GRADE
3/4"	19000		0		0		100	100
1/2"	12500		11		1		99	99
3/8"	9510		33		4		96	96
#4	4760		202		22		78	78
8	2380	6.4		7		93		73
16	1190	12.4		15		85		66
30	595	17.2		20		80		62
50	297	23.1		27		73		57
100	149	30.0		35		65		51
200	74	36.7		43		57		44
270	53							
PAN		85.5	922					

- #4 = 720

SAMPLE WEIGHTS

NET WET WEIGHT	100.7	89.3 GMS.
MOISTURE CONTENT	4.4	4.4 %
NET DRY WEIGHT	96.5	85.5 GMS.

SOIL CLASSIFICATION

< 1.0 MICRON (Colloids)	7 %
< 5 MICRONS (Clay)	20 %
5 TO 74 MICRONS (Silt)	24 %
74 TO 4760 MICRONS (Sand)	34 %
> 4760 MICRONS (Gravel)	22 %
TEMP. HYDRO. BATH	70 °F

HYDROMETER ANALYSIS

PERIOD (Hours)	MICRONS	HYDRO. READING	COMPOSITE CORRECTION	CORRECT READING	% PASS	COMBINED GRADE
1	5	28	-6	22	26	20
6	2	—	—	—	—	—
24	1	14	-6	8	9	7

TESTED BY: PH

CALCULATED BY: PH

CHECKED BY: M L.

DATE: 10-26-12

REMARKS. SAMPLE RECEIVED 5-3-2012 - BAG & PLASTIC WRAP
% MOISTURE = 15 %
UNIT WT. = 124 PCF

L.L. = 36 22.5 FEET
P.L. = 22
P.I. = 14

FM 93 1686 M

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

MECHANICAL ANALYSIS
CALIFORNIA TEST METHOD NO. 203

MR-0211 (REV. 10/93)

59905

SAMPLE NUMBER	59905
JOB NUMBER	01-0B570

DISTRICT	COUNTY	ROUTE	POST MILE	STATION	FT. RT. / LT.	LINE
01	MEN	253	6.89			

SIEVE ANALYSIS

SIEVE SIZE	MICRONS	GRAMS RETAINED	% RETAINED	% PASS	COMBINED GRADE
3/4"	19000	∅	0	100	100
1/2"	12500	12	1	99	99
3/8"	9510	14	1	99	99
#4	4760	59	6	94	94
8	2380	5.1	6	94	88
16	1190	13.3	16	84	79
30	595	19.5	23	77.	72
50	297	26.9	32	68	64
100	149	35.3	42	59	55
200	74	47.4	57	43	40
270	53				
PAN		83.6 988			

-#4 = 929

SAMPLE WEIGHTS

NET WET WEIGHT	102.1	87.1 GMS.
MOISTURE CONTENT	4.2	4.2 %
NET DRY WEIGHT	98.0	83.6 GMS.

SOIL CLASSIFICATION

< 1.0 MICRON (Colloids)	7 %
< 5 MICRONS (Clay)	19 %
5 TO 74 MICRONS (Silt)	21 %
74 TO 4760 MICRONS (Sand)	54 %
> 4760 MICRONS (Gravel)	6 %
TEMP. HYDRO. BATH	70 °F

HYDROMETER ANALYSIS

PERIOD (Hours)	MICRONS	HYDRO. READING	COMPOSITE CORRECTION	CORRECT READING	% PASS	COMBINED GRADE
1	5	23	-6	17.	20	19
6	2	—	—	—	—	—
24	1	12	-6	6	7	7

TESTED BY: DH

CALCULATED BY: DH

CHECKED BY: M.C

DATE: 10-26-12

REMARKS: SAMPLE RECEIVED 5-3-2012 - BAG & PLASTIC WRAP

% MOISTURE = 16%

UNIT WT. = 118 PCF

25.5 FEET

L.L. = 30

P.L. = 20

P.I. = 10

FM 93 1686 M

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

MECHANICAL ANALYSIS

CALIFORNIA TEST METHOD NO. 203

MR-0211 (REV. 10/93)

59907

SAMPLE NUMBER 59907

JOB NUMBER 01-0B570

DISTRICT 01 | COUNTY MEN | ROUTE 253 | POST MILE 6.89 | STATION

FT. RT. / LT. LINE

SIEVE ANALYSIS

SIEVE SIZE	MICRONS	GRAMS RETAINED	% RETAINED	% PASS	COMBINED GRADE
3/4"	19000	0	0	100	100
1/2"	12500	26	3	97	97
3/8"	9510	52	5	95	95
#4	4760	168	17	83	83
8	2380	9.3	12	88	73
16	1190	21.6	27	73	61
30	595	30.4	38	62	51
50	297	38.7	48	52	43
100	149	45.4	57	43	36
200	74	50.9	64	36	30
270	53				
PAN		80.1 975			

-#4 = 807

HYDROMETER ANALYSIS

PERIOD (Hours)	MICRONS	HYDRO. READING	COMPOSITE CORRECTION	CORRECT READING	% PASS	COMBINED GRADE
1	5	22	-6	16	20	17
6	2	-	-	-	-	-
24	1	12	-6	6	7	6

SAMPLE WEIGHTS

NET WET WEIGHT	101.2 83.6 GMS.
MOISTURE CONTENT	4.4 4.4 %
NET DRY WEIGHT	96.9 80.1 GMS.

SOIL CLASSIFICATION

< 1.0 MICRON (Colloids)	6 %
< 5 MICRONS (Clay)	17 %
5 TO 74 MICRONS (Silt)	13 %
74 TO 4760 MICRONS (Sand)	53 %
> 4760 MICRONS (Gravel)	17 %
TEMP. HYDRO. BATH	70 °F

TESTED BY: PH

CALCULATED BY: PH

CHECKED BY: ML

DATE: 10-24-12

REMARKS: SAMPLE RECEIVED 5-3-2012 - BAG ONLY - NO PLASTIC WRAP

% MOISTURE = 14 %

UNIT WT. = 114 PCF

L.L. = 36 30-0 FEET

P.L. = 22

P.I. = 14

FM 93 1686 M

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

MECHANICAL ANALYSIS
CALIFORNIA TEST METHOD NO. 203

MR-0211 (REV. 10/93)

59902

SAMPLE NUMBER 59902

JOB NUMBER 01-0B570

DISTRICT	COUNTY	ROUTE	POST MILE	STATION	FT. RT. LT.	LINE
01	MEN	253	6.89	Sample # 253-2-35		

SIEVE ANALYSIS

SIEVE SIZE	MICRONS	GRAMS RETAINED	% RETAINED	% PASS	COMBINED GRADE
3/4"	19000				
1/2"	12500	0	0		
3/8"	9510	3	0	100	100
#4	4760	39	4	96	96
8	2380	16.2	20	80	77
16	1190	29.9	36	64	61
30	595	41.6	50	50	48
50	297	50.6	61	39	37
100	149	57.2	69	31	30
200	74	61.6	75	25	24
270	53				
PAN		82.5 883			

-#4 = 844

HYDROMETER ANALYSIS

PERIOD (Hours)	MICRONS	HYDRO. READING	COMPOSITE CORRECTION	CORRECT READING	% PASS	COMBINED GRADE
1	5	16	-6	10	12	12
6	2	—	—	—	—	—
24	1	10	-6	4	5	5

SAMPLE WEIGHTS

NET WET WEIGHT	106.9	85.8	GMS.
MOISTURE CONTENT	4.0	4.0	%
NET DRY WEIGHT	102.8	82.5	GMS.

SOIL CLASSIFICATION

< 1.0 MICRON (Colloids)	5 %
< 5 MICRONS (Clay)	12 %
5 TO 74 MICRONS (Silt)	12 %
74 TO 4760 MICRONS (Sand)	72 %
> 4760 MICRONS (Gravel)	4 %
TEMP. HYDRO. BATH	70 °F

TESTED BY: DH

CALCULATED BY: DH

CHECKED BY: MC

DATE: 10-26-12

REMARKS: SAMPLE RECEIVED 5-3-2012 - BAG ONLY - NO PLASTIC WRAP

% MOISTURE = 12%

UNIT WT. = 120 PCF

35-0 FEET

L.L. = 30

P.L. = 20

P.I. = 10

FM 93 1686 M

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

MECHANICAL ANALYSIS
CALIFORNIA TEST METHOD NO. 203

MR-0211 (REV. 10/93)

59906

SAMPLE NUMBER: 59906
JOB NUMBER: 01-0B570

DISTRICT	COUNTY	ROUTE	POST MILE	STATION
01	MEN	253	6.89	

FT. RT. / LT. LINE

SIEVE ANALYSIS

SIEVE SIZE	MICRONS	GRAMS RETAINED	% RETAINED	% PASS	COMBINED GRADE
3/4"	19000				
1/2"	12500				
3/8"	9510	0	0	100	100
#4	4760	17	1	99	99
8	2380	4.8	6	94	93
16	1190	11.9	14	86	85
30	595	20.0	23	77	76
50	297	28.6	33?	67	66
100	149	36.8	42	58	57
200	74	49.2	50	50	50
270	53				
PAN		87.0 1495			

-#4: 1478

HYDROMETER ANALYSIS

PERIOD (Hours)	MICRONS	HYDRO. READING	COMPOSITE CORRECTION	CORRECT READING	% PASS	COMBINED GRADE
1	5	29	-6	23	26	26
6	2	—	—	—	—	—
24	1	17	-6	11	13	13

SAMPLE WEIGHTS

NET WET WEIGHT	102.2	89.6	GMS.
MOISTURE CONTENT	3.0	3.0	%
NET DRY WEIGHT	99.2	87.0	GMS.

SOIL CLASSIFICATION

< 1.0 MICRON (Colloids)	13 %
< 5 MICRONS (Clay)	26 %
5 TO 74 MICRONS (Silt)	24 %
74 TO 4760 MICRONS (Sand)	49 %
> 4760 MICRONS (Gravel)	1 %

TEMP. HYDRO. BATH: 70 °F

TESTED BY: BH

CALCULATED BY: DH

CHECKED BY: ML.

DATE: 10-26-12

REMARKS: SAMPLE RECEIVED 5-3-2012 - BAG & PLASTIC WRAP

% MOISTURE = 13%

UNIT WT. = 123 PCF

L.L. = 27 54-0 FEET

P.L. = 16

P.I. = 11

Results sent to: THOMAS SONG

Division of Engineering Services
Materials Engineering and Testing Services
Corrosion and Structural Concrete Field Investigation Branch

Report Date: 10/10/2013
Reported by Michael Mifkovic

CORROSION TEST SUMMARY REPORT - SOIL

EA **01-0B560**

EFIS: **0112000139**

Dist/Co/Rte/PM **01 / MEN /253/ / 6.89 PM**

CORROSION LAB #	TL101 #	BORE #	DEPTH (FT) START	END	MINIMUM RESISTIVITY[1] (ohm-cm)	pH[1]	CHLORIDE CONTENT[2] (ppm)	SULFATE CONTENT[3] (ppm)	IS SAMPLE CORROSIVE?
SOIL SAMPLE FROM: SOIL CUTTINGS									
CR20130355	C874536		0	10	3704	6.44			NO

This site is not corrosive to foundation elements (see note below).

Note: For Structural Elements, the Department considers a site corrosive if one or more of the following conditions exist: pH is 5.5 or less, chloride concentration is 500 ppm or greater, sulfate concentration is 2000 ppm or greater. Resistivity is not considered for Structural Elements. MSE backfill shall conform to the requirements of section 47-2.02C Structure Backfill in the 2010 Standard Specifications.

[1]CT 643, [2]CT 422, [3]CT 417

CR20130355 - CR20130355