



Appendix E – Preliminary Geotechnical Report

Draft Environmental Impact Report (SCH#2026010287) June 2026





Earth Mechanics, Inc.

Geotechnical & Earthquake Engineering

November 26, 2024

EMI Project No. 24-101

Biggs Cardosa Associates, Inc.
500 South Main Street, Suite 1200
Orange, CA 92868

Attention: Mr. Eric Pheifer, PE

Subject: **Preliminary Geotechnical Report
Euclid Avenue Bridge Replacement
Chino, San Bernardino County, California**

Dear Mr. Pheifer:

Attached is our Preliminary Geotechnical Report (PGR) for the proposed Euclid Avenue Bridge Replacement Project in the City of Chino, California. The recommendations and conclusions provided in this report are based on available subsurface soil information. These conclusions and recommendations are considered preliminary and should be verified in future by conducting additional site-specific geotechnical field investigations, laboratory testing, and engineering analyses.

Please submit this report to the City of Chino and any other participating agencies for their review. Responses to their review comments, as well as your comments, will be incorporated into the Geotechnical Report.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions, please do not hesitate to contact us.

Sincerely,

EARTH MECHANICS, INC.

Taylor Nguyen, EIT
Staff Engineer

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Principal Geologist



(Alahesh) A. Thurairajah, GE 3123
Project Manager



**PRELIMINARY GEOTECHNICAL REPORT
EUCLID AVENUE BRIDGE REPLACEMENT
CHINO, SAN BERNARDINO COUNTY, CALIFORNIA**

Prepared for:

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EMI Project No. 24-101

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1.0 INTRODUCTION

This Preliminary Geotechnical Report (PGR) has been prepared to provide the preliminary geotechnical information to assist the structural designers in the 65% design submittal for Euclid Avenue Bridge Replacement Project in the City of Chino. The preliminary recommendations provided in this report are based on subsurface information contained on Chino Creek Bridge (Widen) (Bridge No. 54-0426) as-built Log-of-Test-Borings (LOTB) sheet and Chino Creek Bridge (Replace) (Bridge No. 54-1248) as-built LOTB sheets, both of which are included in Appendix A. Additional site-specific geotechnical investigation will be performed for this bridge after approval of the encroachment permit, and final design recommendations will be provided in a Geotechnical Report after completion of the site-specific geotechnical field investigation.

2.0 PROJECT DESCRIPTION

The portion of Euclid Avenue in the City of Chino over Chino Creek and within the Prado Basin has been subject to flooding, road closures during storm events, and a number of traffic incidents. To mitigate these issues, the City of Chino is moving forward with a critical project to elevate and improve Euclid Avenue. The raised profile of Euclid Avenue will accommodate the free flow of stormwater at Chino Creek and within Prado Basin, making Euclid Avenue an “all-weather” facility. The project location is shown in Figure 1.

The Chino Creek Bridge (Bridge No. 54-0426) was originally built in 1950 and was widened in 1982. In 2006, the bridge was replaced by a two-span bridge (Bridge No. 54-1248). The existing bridge is approximately 144 feet long and 52 feet wide.

The project improvements include a new long bridge structure (Euclid Avenue Viaduct) to span the Prado Basin and Chino Creek, three Mechanically Stabilized Embankment (MSE) walls, one Caltrans Type 1 (Case 2) retaining wall, and new pavement structural sections.

The Euclid Avenue Viaduct is an 18-span, precast/prestressed concrete “wide flange” girder bridge supported on bent-type abutments, where a traditional multi-column bent supports the bridge vertical loads and a wrap-around MSE wall is used to retain the approach roadway embankment, and multiple column bents. The bridge deck will be approximately 2,493 feet long and at-least 76.5 feet wide. The retaining wall pertinent data is provided in Table 1.

Table 1. Retaining Wall Pertinent Data

Retaining Wall No.	Wall Type	Wall Location	Approximate Length (feet)	Maximum Design Height (feet)
1 (RW 1)	MSE	44.49' Rt. “Euclid Ave” 1001+81.39 to 34.23' Lt. “Euclid Ave” 1000+50.00	831	29.2
2 (RW 2)	MSE	20.75' Rt. “C” 600+78.97 to 7.75' Lt. “C” 600+52.31	1,426.2	36.7
3 (RW 3)	MSE	32.75' Lt. “Euclid Ave” 1034+32.44 to 43.75' Rt. “Euclid Ave” 1034+32.44	2,408	36.7

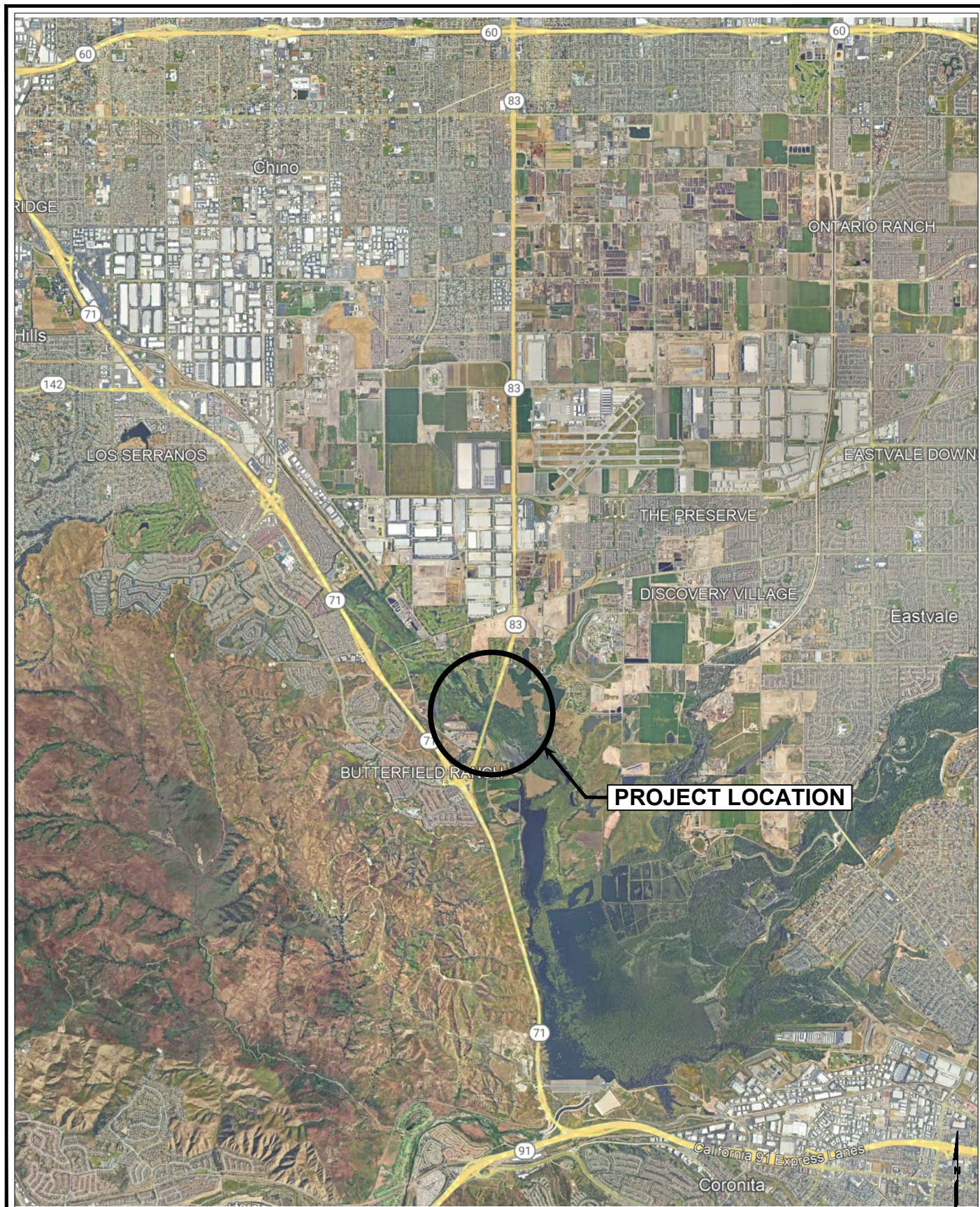


Retaining Wall No.	Wall Type	Wall Location	Approximate Length (feet)	Maximum Design Height (feet)
4 (RW 4)	Type 1 (Case 2)	17.81' Rt. "D" 303+67.75 to 17.81' Rt. "D" 308+41.08	473.3	20

3.0 GEOTECHNICAL INVESTIGATION

No site-specific field investigation was performed in preparation of this PGR. The conclusions and preliminary recommendations provided in this report are based on Chino Creek Bridge (Widen) (Bridge No. 54-0426) as-built LOTB sheet and Chino Creek Bridge (Replace) (Bridge No. 54-1248) as-built LOTB sheets. These as-built LOTB sheets are included in Appendix A. Site-specific field investigation consisting of soil borings and Standard Penetration Tests (SPTs) will be performed after approval of encroachment permits.





Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

EUCLID AVENUE BRIDGE REPLACEMENT

Project No. 24-101

Date: November 2024

SITE LOCATION MAP

Figure 1

4.0 GEOTECHNICAL CONDITIONS

4.1 Geology

4.1.1 Physiography

The site is located in the southwestern part of the Upper Santa Ana River (USAR) Valley which lies between the Transverse Ranges physiographic province to the north and the Peninsular Ranges physiographic province to the southwest. The Transverse Ranges comprise east-west trending mountains, such as the San Gabriel and San Bernardino Mountains, and intervening valleys whereas the Peninsular Ranges comprise northwest-southeast trending ranges. The USAR Valley is a relatively flat, gently south-southwesterly sloping plain composed of alluvial fan deposits derived from the San Gabriel Mountains on the north. These unconformably overlie crystalline basement rocks of the Peninsular Ranges type.

4.1.2 Stratigraphy

The project area is generally comprised of artificial fill (Af) overlying alluvial deposits (Qa and Qoa) underlain by bedrock (Tsc, Tscs, and Tsc). The alluvial sediments generally consist of sands with silt, clay, and gravel. These deposits are typical of late Quaternary-age sediments deposited in a river flood plain environment. Individual beds within these materials are typically poorly developed, lenticular, and discontinuous. The alluvial sediments are underlain by Miocene-age, predominantly marine sedimentary bedrock of the Sycamore Canyon Member of the Puente Formation (Dibblee and Ehrenspeck, 2001).

4.1.3 Geologic Structure

The geologic structure within the project area is characterized by Quaternary-age alluvial sediments deposited by the Santa Ana River, overlying moderately to steeply dipping Tertiary-age sedimentary rocks of the Sycamore Canyon member of the Puente Formation, underlain by Mesozoic-age basement rocks. The southeasterly trending Chino Fault is located approximately 0.9 miles to the southwest of the project (USGS, 2024; CGS, 2003). Other faults in the vicinity of the site include the Whittier-Elsinore fault (about 4 miles south of the site) and the Central Avenue fault (about 2.8 miles to the northwest).

The proposed bridge site is not within an Earthquake Fault Zone (EFZ) and does not cross any active fault traces (CGS, 2003). There are several active faults in the region that could produce significant ground shaking within the project alignment. The closest active faults to the project area, as mapped by the USGS (2024) include the Great Valley thrust fault system located approximately 29 miles southeast of the site, the Kern Canyon fault located 56 miles northeast of the site, and San Andreas fault zone located 56 miles southwest of the site. The San Andreas fault zone was identified as an Alquist-Priolo (AP) Earthquake Fault Zone by the Alquist-Priolo Earthquake Hazards Act of 1972, revised in 1994. The AP faults not only represent earthquake shaking hazards, but have a potential for surface ground rupture. The type and magnitude of the seismic hazard affecting the site are dependent on the distance and causative faults and the intensity and magnitude of the seismic event.

4.1.4 Geologic Hazards

Fault Rupture/Seismic Shaking. There are no known active surface faults within the project limits, so the potential for ground rupture is considered low. The nearest active or potentially active fault is located approximately 0.9 miles from the project site. As a result, ground shaking should be anticipated within the project area in the event of an earthquake.

Slope Stability. The bridge site is located in an alluvial plain that is generally flat. The risk associated with slope stability should be considered low.

Expansive Soils. Expansive soils swell or heave with increasing moisture content and shrink with decreasing moisture content. Montmorillonitic clays are most susceptible to expansion due to their layered crystalline structure. The site-specific geotechnical investigation should include sampling and testing of site soils for expansive soils.

Hydroconsolidation/Collapsible Soils. Hydroconsolidation occurs when soil layers collapse (settle) after water is added. Natural deposits susceptible to hydroconsolidation are typically aeolian, alluvial, or colluvial materials with high apparent dry strength. Alluvial deposits may be susceptible to collapse and excessive settlements if excessive moisture is introduced.

Since the alluvial deposits in the project area were generally deposited by water with repeated wetting that assisted in their compaction during deposition, they have a significantly lower potential for hydroconsolidation in comparison to aeolian deposits. Overall, the project site has a low to medium potential for subsidence due to hydroconsolidation. The site-specific geotechnical investigation should include in-situ sampling and testing of site soils to confirm the collapsible soil/hydroconsolidation potential.

Flooding. The proposed bridge site is located within Special Flood Hazard Zone AE; a regulatory floodway with base elevation of +556.5 feet according to the Federal Emergency Management Agency (FEMA, 2024).

Subsidence. Subsidence is the settlement of the ground surface caused by the compression of soil layers. The causes range from groundwater, oil and gas withdrawal, oxidation of organics, or the placement of additional fill over compressible layers. The extraction of fluids (water or petroleum) from sedimentary source rocks can cause the permanent collapse of the pore space previously occupied by the removed fluid. The compaction of subsurface sediment caused by fluid withdrawal can cause subsidence of the ground surface overlying a pumped reservoir. If the volume of water or petroleum removed is sufficiently great, the amount of resulting subsidence may be sufficient to damage nearby structures.

Since the site is not located in an area of where significant land subsidence is known to have occurred in the last 50 years as a result of land development, water resources development, groundwater pumping, or oil drilling, the risks associated with land subsidence is considered low.

4.2 Subsurface Conditions

According to the as-built LOTB sheet of Chino Creek Bridge (Widen) (Bridge No. 54-0426), included in Appendix A, one rotary-wash boring (B-1) was performed in April 1980. The top-of-hole elevation at the time of the investigation was +515.5 feet. The depth of the borehole was about 57 feet, which was advanced to about elevation +458 feet. According to the field investigation performed in 2003 for Chino Creek Bridge (Replace) (Bridge No. 54-1248), three rotary-wash borings (B-1 through B-3) were performed in January and February 2003. Top-of-hole elevations at the time of the investigation were +515 feet. The depths of the boreholes varied between 102 and 111 feet, and the deepest boring (B-3) was advanced to about elevation +387 feet.

The available subsurface information indicates that the project site is composed of fine-grained soils consisting of soft to medium stiff silt and clayey silt underlain by coarse-grained soils consisting of medium dense to very dense silty sand, clayey sand, sandy silt, sand, and sand with gravel. This alluvium is underlain by bedrock consisting of siltstone and sandstone. The idealized soil profile is presented in Table 2.

Table 2. Idealized Soil Profile

Approximate Elevation (feet)	Predominant Soil Type
+515 to +495	Soft to Medium Stiff Silt and Clayey Silt
+495 to +477	Medium Dense Silty Sand with Gravel, Clayey Sand, Sandy Silt
+477 to +460	Dense to Very Dense Sand and Sand with Gravel
+460 to +435	Siltstone
+435 to +387	Sandstone



5.0 GROUNDWATER

Based on the as-built LOTB sheets, groundwater was encountered around elevation +507 feet in the Chino Creek Bridge (Replace) as-built Boring B-3 and Chino Creek Bridge (Widen) as-built Boring B-1. The California Department of Water Resources Data Library was reviewed for additional groundwater reading in the vicinity of the project site. A groundwater well (Local Well No. CHINO-1207981) located within 1.5 miles north of the project site was identified. Groundwater measurements taken between 2010 and 2024 show groundwater elevations fluctuated between winter and summer months but ultimately showing an increasing trend from +530 feet to +546 feet. Groundwater elevations tend to increase in the winter months and decrease during the summer months. The ground surface elevation at this well is about +556 feet. Another groundwater well (Local Well No. CHINO-1207982) is located within 3.1 miles northeast of the proposed project site. Groundwater measurements taken between 2011 and 2024 show the groundwater elevation fluctuated between +529 feet and +539 feet, with groundwater elevations generally decreasing from 2011 to 2022 to the lowest groundwater elevation of +529 feet. The ground surface elevation at this well is about +575 feet. Another groundwater well (Local Well No. CHINO-1207983) is located within 2.2 miles southeast of the proposed project site. Groundwater measurements taken between 2011 and 2024 show the groundwater elevation fluctuated between +508 feet and +512 feet, with groundwater elevations decreasing during fall months. Ground surface elevation at this well is about +544 feet. Available groundwater data at the bridge location is summarized in Table 3.

Table 3. Summary of Available Groundwater Data

Groundwater Source	Boring No. or Local Well No.	Ground Surface El. (feet)	Groundwater Elevation (feet)	Date Measured
1980 As-built Boring (Chino Creek Bridge (Widen))	B-1	+515.5	+506.7	April 1980
2003 As-built Borings (Chino Creek Bridge (Replace))	B-1	+515.3	Not Measured	-
	B-2	+515.6	Not Measured	-
	B-3	+515.5	+506.5	January 2003
Groundwater Monitoring Well	CHINO-1207981	+555.6	+529.7 to +546.1	2010 to 2024
	CHINO-1207982	+574.6	+528.9 to +539.2	2011 to 2024
	CHINO-1207983	+544.1	+507.9 to +511.8	2011 to 2024

Groundwater depth affects liquefaction assessment and foundation design. Caltrans Geotechnical Manual on Liquefaction Evaluation (Caltrans, 2020) does not recommend using an abnormally higher groundwater elevation without a clear evidence for seasonal or long-term fluctuations. This is because using abnormally high groundwater level would result in costly and unnecessary overdesign. Therefore, a preliminary design groundwater table was placed at an elevation of +507 feet for preliminary liquefaction potential screening and foundation design. Groundwater elevation used for final design will be determined when additional site-specific field investigation is completed after approval of the encroachment permit.

6.0 AS-BUILT DATA

Based on a review of the as-built information for the existing bridge, the foundation information is summarized in Table 4.

Table 4. Summary of As-Built Foundation Data

Structure	Support	Foundation Type	Nominal Resistance (kips)	Specified Pile Tip Elevation (feet)
Bridge Replacement (2006)	Abutments 1 and 3	HP 10x57	180	+455.4 to +457.7
	Pier 2	Open-ended CISS 30x0.75	1,192	+435.7

7.0 SCOUR DATA

This bridge crosses over the unlined Chino Creek; therefore, scour potential is anticipated at the Bents 15 and 16 foundations. Per California Amendments to AASHTO LRFD Bridge Design Specifications – Eighth Edition (Caltrans, 2019c), the total scour depth should be used for the Service Limit State, full long-term scour depth (degradation scour plus contraction scour) and one-half the local scour depth should be used for the Strength Limit State, and full long-term scour depth should be used for the Extreme Event Limit State. A preliminary scour design depth of 17 feet was provided by Biggs Cardosa Associates (BCA), which was considered in estimation of preliminary pile lengths at Bents 15 and 16.

8.0 CORROSION EVALUATION

Available corrosion test results from Chino Creek Bridge (Replace) were reviewed, and the available test results are summarized in Table 5. However, only minimum resistivity and pH were tested and reported.

Table 5. Soil Corrosion Test Results

Boring No.	Sample Depth (feet)	Sample Elevation (feet)	USCS Soil Type	Minimum Resistivity (ohm-cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
B-1	0 to 28.1	+515.3 to +487.2	Clayey Sand (SC), Sandy Silt (ML), and Organic Soil (OL/OH)	1,050	7.3	-	-
B-1	30.7 to 52.4	+484.6 to +462.9	Clayey Sand (SC), Silt with Sand (ML), and Sandy Lean Clay with Gravel (CL)	2,500	8.2	-	-

Boring No.	Sample Depth (feet)	Sample Elevation (feet)	USCS Soil Type	Minimum Resistivity (ohm-cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
B-2	6 to 22.4	+509.5 to +493.1	Silty Sand (SM), Silt (ML), and Silt with Organics (ML-OL/OH)	1,350	8.1	-	-
B-2	30.9 to 47	+484.6 to +468.5	Silt (ML) and Poorly-graded Sand with Gravel (SP)	3,000	7.5	-	-

According to the Caltrans Corrosion Guidelines (Caltrans, 2021), soils are considered corrosive if the pH is 5.5 or less, or chloride content is 500 parts per million (ppm) or greater, or sulfate content is 1,500 ppm or greater. Since the chloride and sulfate content test results are not available, corrosion potential of on-site soils is not known. Based on EMI's experience, clay soils have a higher tendency to be corrosive, whereas gravels, sands and silts tend to be non-corrosive. Per the as-built LOTB sheet, the project site has predominantly sandy and silty soils. Therefore, site soils are anticipated to be non-corrosive. However, the corrosive nature of the project site will be evaluated during the final design phase using laboratory test results on site specific borings, and mitigation measures will be recommended if the site soils are found to be corrosive to concrete or bare metal.

9.0 SEISMIC INFORMATION

9.1 Ground Motion

The preliminary ARS curve was determined using the Caltrans ARS Online V3.1.0 (2024a), following the procedures described in Caltrans Seismic Design Criteria Version 2.0 (SDC 2.0) (2019b) and October 2019 Interim Revisions to SDC 2.0 (2019a), and the small-strain shear wave velocity for the upper 100 feet (V_{s30}). This V_{s30} was estimated from the information presented in the as-built LOTB sheets included in Appendix A and the SPT correlations provided in the Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations (Caltrans, 2012). The key parameters for determining the preliminary ARS curve are listed in Table 6.

Table 6. Key Parameters for Determining Preliminary ARS Curve

Site Coordinates	Latitude = 33.9403 degrees	Longitude = -117.6543 degrees
Shear Wave Velocity, V_{s30}	968 feet/sec (295 m/sec)	

The preliminary ARS curve is presented in Figure 2. The design magnitude (M) is 6.66, the preliminary Peak Ground Acceleration (PGA) is 0.68g, and the mean site-to-fault distance at 1.0 second period is 9 miles. Based on the subsurface information collected from the as-built LOTB sheets included in Appendix A and per Sections 6.1.2 and 6.1.3 of SDC 2.0 (2019b), the onsite soils are classified as “Class S2” soils.

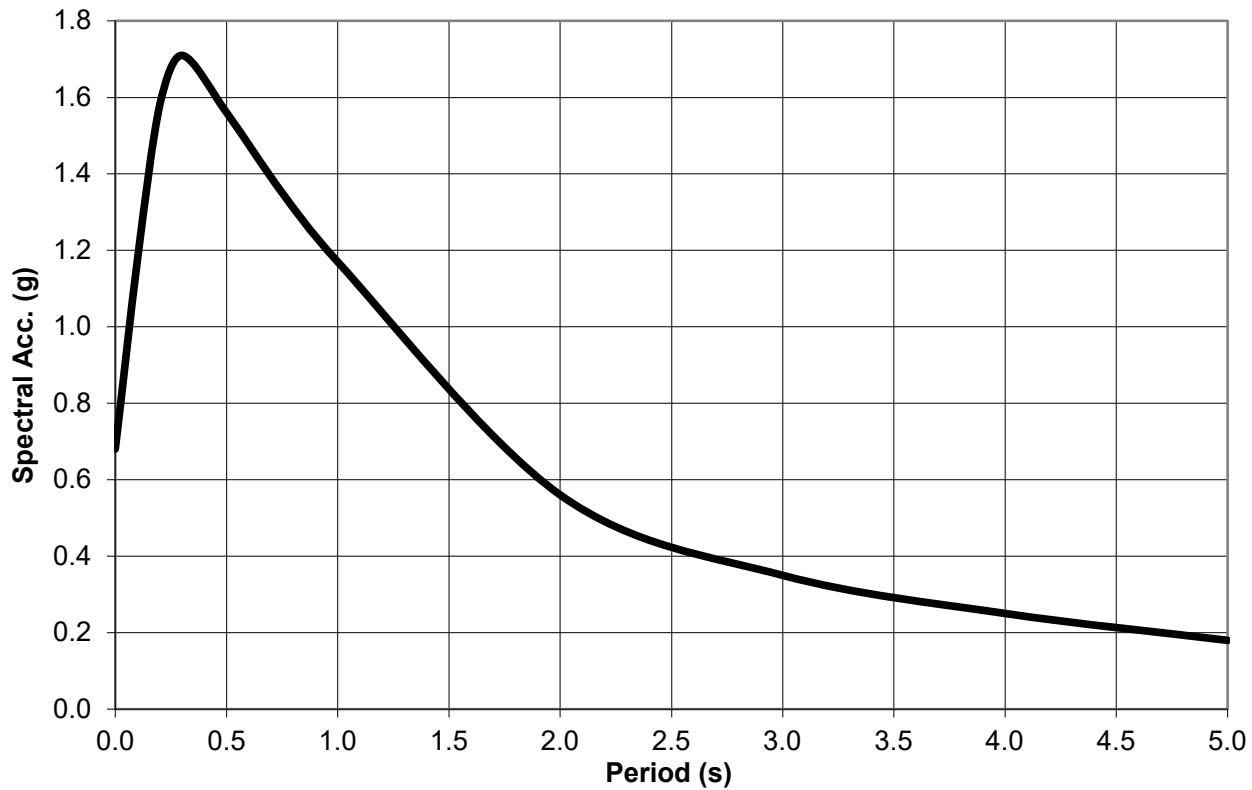
The preliminary ARS curve, the design magnitude, the preliminary PGA, the mean site-to-fault distance at 1.0 second period, and the site class will be updated following the field investigation.

9.2 Liquefaction Potential

The project site has not been evaluated for liquefaction hazard potential by the California Geological Survey (2001). Based on the preliminary liquefaction potential screening using a preliminary design groundwater elevation of +507 feet and SPT blowcounts and soil descriptions shown on the attached as-built LOTB sheets, liquefaction potential does exist at the project site. Potentially liquefiable soil pockets are anticipated between elevations +506 and +477 feet. This conclusion will be confirmed using additional site-specific soil borings and groundwater data to be obtained after approval of the encroachment permit.

9.3 Seismically-Induced Settlement

Since soil liquefaction potential does exist at the project site, seismically-induced settlement of onsite soils is anticipated. This conclusion will need to be confirmed using additional site-specific soil borings and groundwater data to be obtained after approval of the encroachment permit. If soil liquefaction and associated seismically-induced settlement is confirmed, then foundation design will incorporate the effects of seismically-induced settlement.



Preliminary ARS Curve

Latitude: 33.9384 Longitude: -117.6550

Shear Wave Velocity (V_{s30}) = 295 m/s

Design Magnitude (M) = 6.66

Peak Ground Acceleration (PGA) = 0.68g

5% Damping

Spectral Coordinates:

Period (sec)	Acc. (g)	Period (sec)	Acc. (g)
0.00	0.68	1.00	1.17
0.10	1.18	2.00	0.56
0.20	1.58	3.00	0.35
0.30	1.71	4.00	0.25
0.50	1.56	5.00	0.18
0.75	1.35		



Earth Mechanics, Inc.

Geotechnical and Earthquake Engineering

Project Number : 24-101

Date: Nov. 2024

EUCLID AVENUE BRIDGE REPLACEMENT

Preliminary Acceleration Response Spectrum

Figure 2

9.4 Seismic Slope Instability

Since liquefaction of the in-situ soils is anticipated, lateral spreading at the approaches will be accessed using the additional site-specific soil borings to be performed after approval of the encroachment permit.

9.5 Ground Rupture

No major faults traverse through the project site. The California Geologic Survey (2003) has not identified Earthquake Fault Zones through the site. Therefore, the risk of ground surface rupture and related hazards at the project site is expected to be low. According to Caltrans Memo To Designers 20-10 (Caltrans, 2013b), since the project site does not fall within an Earthquake Fault Zone or within 1,000 feet of an unzoned fault that is Holocene or younger in age, further fault studies will not be needed.



10.0 GEOTECHNICAL RECOMMENDATIONS

10.1 Bridge

Foundation Type: Due to the scour potential at the site, the near-surface site soils are not anticipated to have sufficient bearing resistance to support the proposed structure on spread footings, and deep foundations are recommended. Of the deep foundation alternatives, site soils are conducive to both driven and drilled piles. Based on the information provided by BCA, 78-inch diameter CIDH piles are proposed at all the supports.

Preliminary Pile Lengths: The proposed pile type and required nominal resistances provided by the bridge designers, and the estimated pile lengths for cost estimating purposes are presented in Table 7.

Table 7. Preliminary Foundation Design Recommendations for Euclid Avenue Bridge

Sup. No.	Pile Type	Cut-off El. (feet)	Nominal Resistance (kips)	Pile Length (feet)	Design Tip El. (feet)
Abut 1	78-inch CIDH (Type I Shaft)	+522.5	1,830	80	+442
Bent 2		+519.3	3,770	110	+409
Bent 3		+513.7	3,910	115	+398
Bent 4		+513.5	4,210	115	+398
Bent 5		+511.8	4,000	115	+396
Bent 6		+509.6	4,480	120	+389
Bent 7		+508.8	3,250	105	+403
Bent 8		+509.5	4,460	120	+389
Bent 9		+509.3	3,870	115	+394
Bent 10		+508.8	4,440	120	+388
Bent 11		+509.4	3,240	105	+404
Bent 12		+509.3	4,460	120	+389
Bent 13		+509.6	3,840	110	+399
Bent 14		+510.5	4,450	120	+390
Bent 15		+509.4	3,280	110	+399
Bent 16		+510.8	4,490	125	+385
Bent 17		+510.5	3,560	105	+405
Bent 18		+513.4	3,870	115	+398
Abut 19		+519.0	1,790	80	+439



Static Settlement and Settlement Period: Based on the information provided by BCA, up to 30 feet of fill is anticipated at the retaining walls at the approach embankments. The maximum ground settlement is expected to be about 3 inches at each abutment approach fill. The above settlement magnitude will be confirmed using upcoming site-specific soil borings and laboratory test results. It is our understanding that the abutment piles will be constructed prior to the MSE wall. Therefore, a settlement period is not required for pile construction. The final design calculations to determine the axial capacity of the abutment piles will incorporate the effects of static downdrag forces induced by soil settlement caused by subsequent construction of the MSE walls.

10.2 Retaining Walls

Three MSE walls and a Caltrans Standard Plan Type 1 (Case 2) wall were considered for the proposed walls. Based on the subsurface information collected from the as-built LOTB sheets included in Appendix A and bearing stress values provided in Caltrans BDA 3-8 (2013a), site soils are anticipated to have adequate bearing capacity to support the MSE walls at Retaining Wall No. 1 through Retaining Wall No. 3 provided a minimum of 3 feet of overexcavation and recompaction are performed below the wall base. Based on the bearing stress values provided in Caltrans Standard Plan Sheet for Type 1 (Case 2) retaining wall (Caltrans, 2024b), site soils are anticipated to have adequate bearing capacity to support Retaining Wall No. 4 provided a minimum of 3 feet of overexcavation and recompaction are performed below the footing.

11.0 ADDITIONAL FIELD WORK AND LABORATORY TESTING

The substructure width of the proposed bridge is less than 100 feet. AASHTO (2017) and California Amendments to AASHTO (2019c) recommend drilling a soil boring per support where substructure width is less than 100 feet. Therefore, we recommend an exploration program consisting of one soil boring at each support. For retaining walls, we recommend an exploration program consisting of one soil boring every 200 feet. The soil borings should extend at-least 20 feet below the specified tip elevation.

Samples recovered from the soil borings will be transported to the laboratory for testing. All the soil samples will be visually classified. Additional samples will be collected for moisture content/density tests, sieve analysis, #200 wash, Atterberg Limits, consolidation, corrosion, UU triaxial, and direct shear tests. Other laboratory tests may be required depending upon the nature of the soils encountered during the investigation.



12.0 REFERENCES

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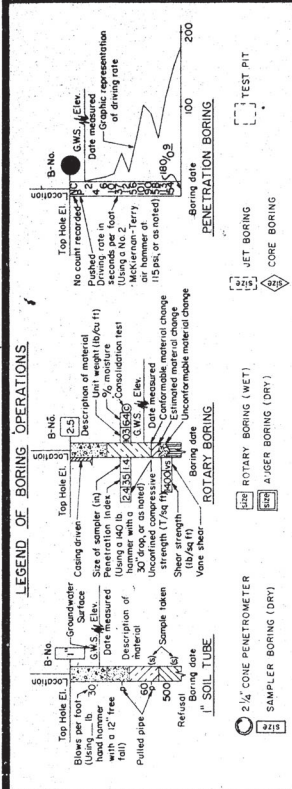
APPENDIX A

**AS-BUILT LOTB SHEETS, CHINO CREEK BRIDGE (WIDEN) (BRIDGE NO. 54-0426)
AND CHINO CREEK BRIDGE (REPLACE) (BRIDGE NO. 54-1248)**

CHINO CREEK BRIDGE (WIDEN) (BRIDGE NO. 54-0426)

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	BRIDGE NO.	TOTAL SHEETS
08	Sbd	83			

ENGINEERING GEOLOGIST
DATE APPROVED _____



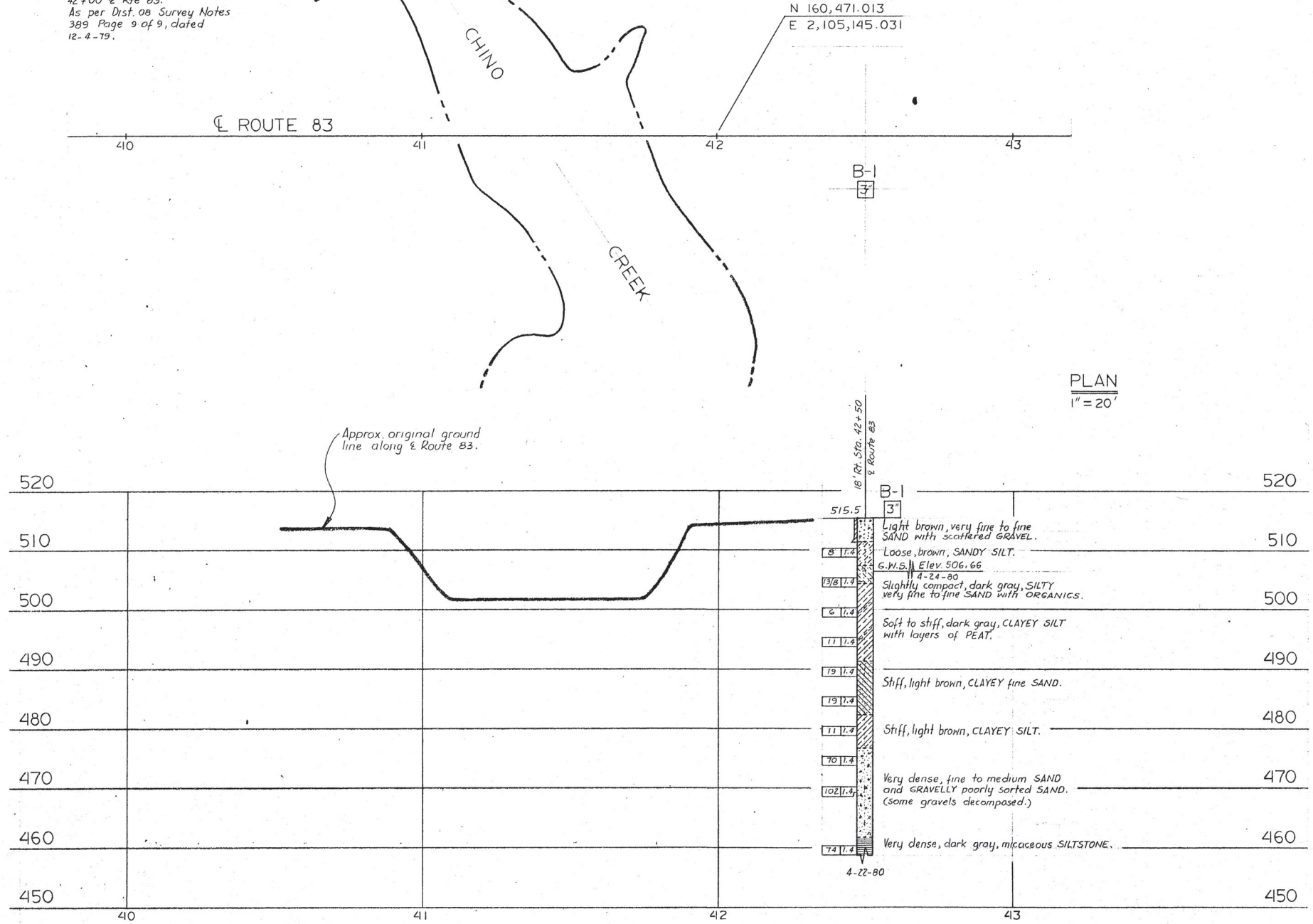
LEGEND OF EARTH MATERIALS	
	SILTY CLAY or CLAYEY SILT
	PEAT and/or ORGANIC MATTER
	FILL MATERIAL
	IGNEOUS ROCK
	SEDIMENTARY ROCK
	METAMORPHIC ROCK
	GRAVEL
	SAND
	SILT
	CLAY
	SILTY CLAY or CLAYEY SILT
	SANDY CLAY or CLAYEY SAND
	SILTY SAND

CONSISTENCY CLASSIFICATION FOR SOILS	
According to the Standard Penetration Test	
Penetration (Blows / Ft.)	Cohesive
0-5	Very soft
5-10	Soft
10-20	Stiff
20-35	Very stiff
35-70	Hard
70	Very hard
Granular	
Very loose	
Loose	
Slightly compact	
Compact	
Dense	
Very dense	

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

BENCH MARKS

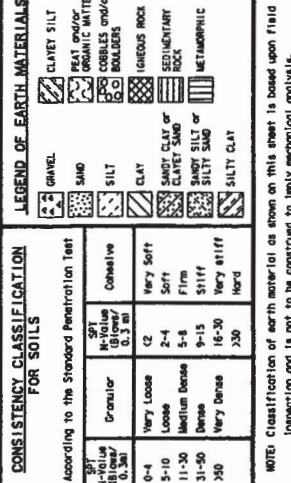
TBM #7 Elev. 516.05
Set boat nail 13.5 Rt. Sta.
42+00 & Rte 83.
As per Dist. 08 Survey Notes
389 Page 9 of 9, dated
12-4-79.



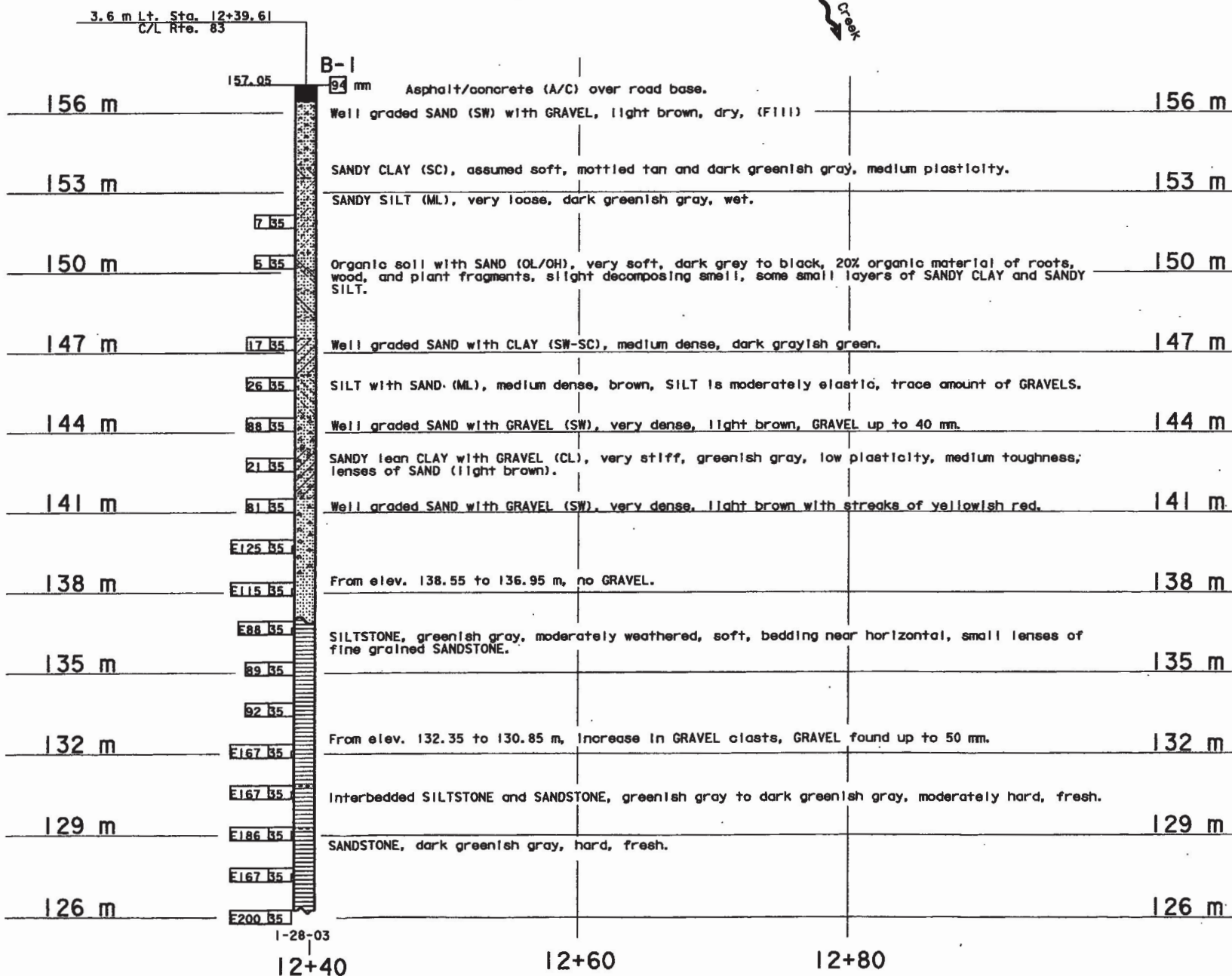
PROFILE
HORIZ. 1" = 20'
VERT. 1" = 10'

ENGINEERING GEOLOGY BRANCH		State of CALIFORNIA DEPARTMENT OF TRANSPORTATION		STRUCTURES - DESIGN		BRIDGE NO. 54-0426		CHINO CREEK BRIDGE (WIDEN)	
FIELD STUDY By W. C. CAIN, 4-22-80		Approval Recommended By [Signature]		PROJECT ENGINEER		REGISTERED CIVIL ENGINEER NO.		LOG OF TEST BORINGS	
DRAWN By VICTOR SESTOKAS, 5-19-80		Checked By W. C. CAIN, 5-20-80		CU 08201 WO 22201		Disregard prints bearing earlier revision dates		REVISION DATES (PRELIMINARY STAGE ONLY)	
SHEET 1 OF 1									

CHINO CREEK BRIDGE (REPLACE) (BRIDGE NO. 54-1248)



Fnd. Wood Lath in ground, 7.5 m Rt.
from intersection of center line of
Rte. 83 and Beginning of Bridge.



1. All Test borings were advanced using a 94 mm wireline drill system with "H4" drill rod to case the test boring.
2. All Test borings utilized a safety line hammer to advance the sampler using a 63.5 kg hammer with a 760 mm drop. Penetration Index values ("N" values) shown are the uncorrected blow counts.
3. Ground water was not measured in Borings B-1 and B-2.
4. Soil colors were determined by using Munsell Soil Color Charts (1994, Revised Edition). Rock colors were determined using GSA Rock Color Charts (1995, revised text).
5. The descriptions and classifications of rock and/or soil, including consistency and relative density descriptors, used by the field and/or office personnel for the exploration test holes shown on this sheet are based on the "Soil and Rock Logging Classification Manual (Field Guide)," Engineering Service Center, Office of Structural Foundations, August 1996.
6. E= Blow count for 0.3 m penetration extrapolated from blow count for less than 0.3 m penetration (due to change in material or hard driving).
7. Penetration Index Value reported "REF" means refusal.

HOR. 1:200
VER. 1:100

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO.	CHINO CREEK BRIDGE (REPLACE) LOG OF TEST BORINGS 1 OF 4
DRAWN BY	W. Tang 04/03		S. Sunding			54-1248	
CHECKED BY	S. Sunding					KILOMETER POST	
						1.45	

OGS GEOLOGIST LOG OF TEST BORINGS SHEET (METRIC) (REV. 3/02)

ORIGINAL SCALE IN MILLIMETERS
FOR REDUCED PLANS

CU 08
EA 449701

FILE => ching-ck, dan

DISREGARD PRINTS BEARING
EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

[illegible]

FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS" 1 OF 4



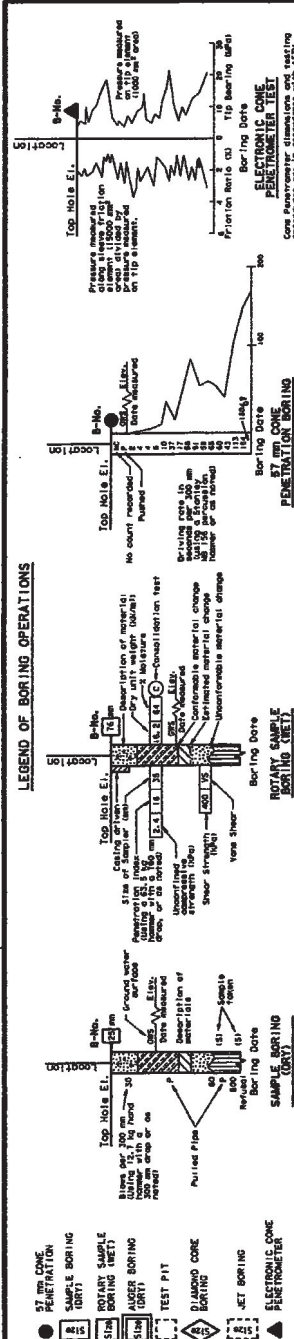
DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET TOTAL SHEETS
08	SBd	83		

REGISTERED GEOLOGIST 7-1-03

PLANS APPROVAL DATE

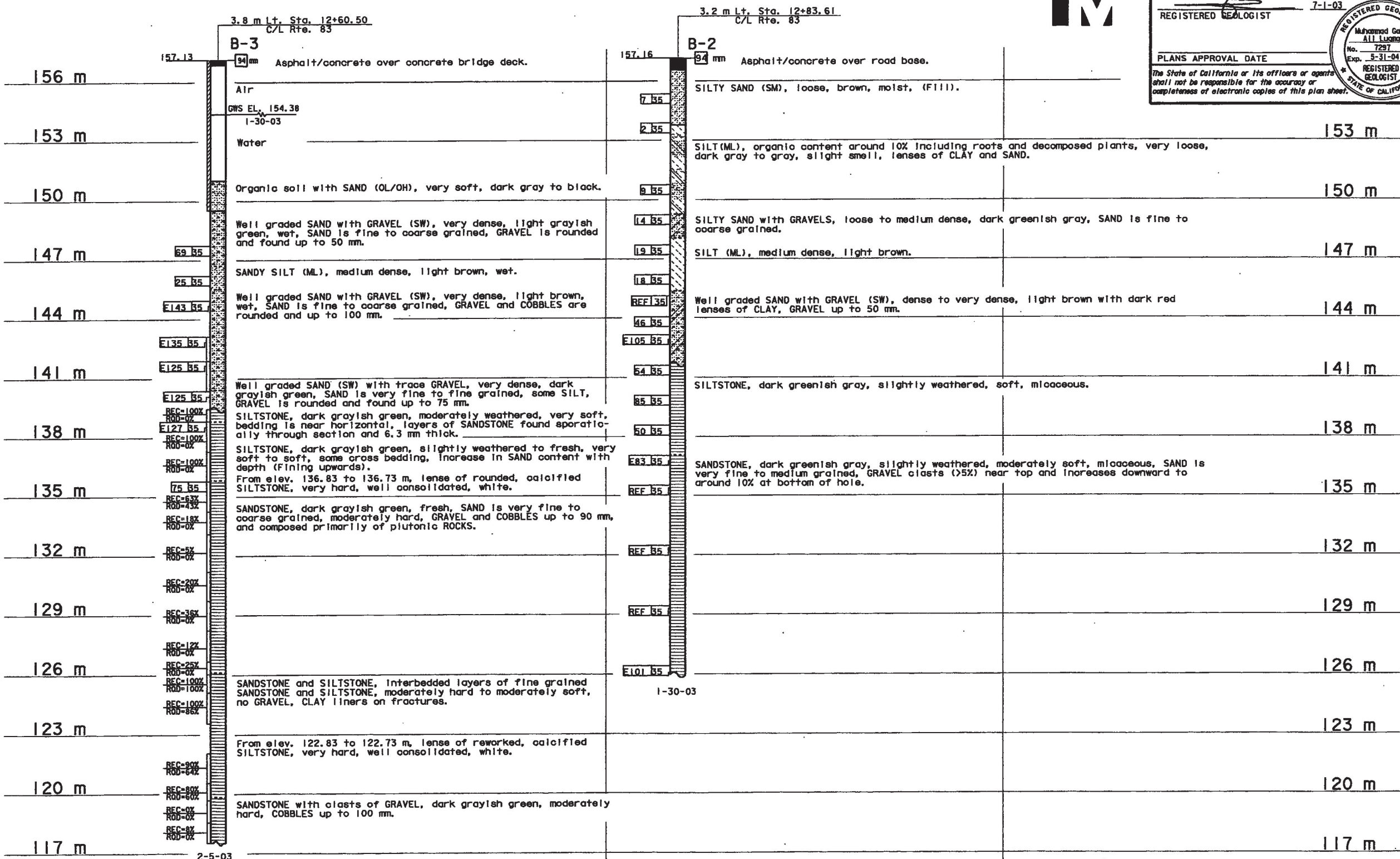
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED GEOLOGIST
Muhammad Gahr
No. 7297
Exp. 5-31-04
STATE OF CALIFORNIA



CONSISTENCY CLASSIFICATION FOR SOILS		LEGEND OF EARTH MATERIALS	
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	1-4	CLAY	CLAY
According to the Standard Penetration Test	SPT	CLAYEY SAND	CLAYEY SAND
	5-10	SAND	SAND
According to the Standard Penetration Test	SPT	GRAVEL	GRAVEL
	11-30	COBBLES	COBBLES
According to the Standard Penetration Test	SPT	CRACKED ROCK	CRACKED ROCK
	31-50	UNCRACKED ROCK	UNCRACKED ROCK
According to the Standard Penetration Test	SPT	SEDIMENTARY ROCK	SEDIMENTARY ROCK
	51-100	IGNEOUS ROCK	IGNEOUS ROCK
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	101-200	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	201-300	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	301-400	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	401-500	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	501-600	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	601-700	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	701-800	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	801-900	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	901-1000	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	1001-1100	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	1101-1200	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	1201-1300	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	1301-1400	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	1401-1500	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	1501-1600	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	1601-1700	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	1701-1800	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	1801-1900	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	1901-2000	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	2001-2100	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	2101-2200	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	2201-2300	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	2301-2400	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	2401-2500	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	2501-2600	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	2601-2700	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	2701-2800	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	2801-2900	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	2901-3000	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	3001-3100	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	3101-3200	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	3201-3300	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	3301-3400	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	3401-3500	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	3501-3600	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	3601-3700	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	3701-3800	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	3801-3900	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	3901-4000	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	4001-4100	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	4101-4200	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	4201-4300	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	4301-4400	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	4401-4500	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	4501-4600	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	4601-4700	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	4701-4800	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	4801-4900	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	4901-5000	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	5001-5100	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	5101-5200	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	5201-5300	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	5301-5400	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	5401-5500	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	5501-5600	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	5601-5700	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	5701-5800	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	5801-5900	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	5901-6000	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	6001-6100	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	6101-6200	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	6201-6300	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	6301-6400	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	6401-6500	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	6501-6600	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	6601-6700	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	6701-6800	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	6801-6900	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	6901-7000	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	7001-7100	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	7101-7200	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	7201-7300	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	7301-7400	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	7401-7500	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	7501-7600	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	7601-7700	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	7701-7800	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	7801-7900	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	7901-8000	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	8001-8100	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	8101-8200	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	8201-8300	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	8301-8400	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	8401-8500	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	8501-8600	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	8601-8700	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	8701-8800	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	8801-8900	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	8901-9000	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	9001-9100	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	9101-9200	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	9201-9300	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	9301-9400	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	9401-9500	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	9501-9600	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	9601-9700	SAND	SAND
According to the Standard Penetration Test	SPT	CLAYEY SILT	CLAYEY SILT
	9701-9800	CLAYEY SAND	CLAYEY SAND
According to the Standard Penetration Test	SPT	SANDY SILT	SANDY SILT
	9801-9900	SANDY SAND	SANDY SAND
According to the Standard Penetration Test	SPT	SILT	SILT
	9901-10000	SAND	SAND

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.



ENGINEERING SERVICES		GEOTECHNICAL SERVICES		FIELD INVESTIGATION BY:		STATE OF CALIFORNIA		DIVISION OF STRUCTURES		BRIDGE NO.		CHINO CREEK BRIDGE (REPLACE)	
DRAWN BY	W. Tang 04/03	CHECKED BY	S. Sunding	S. Sunding		DEPARTMENT OF TRANSPORTATION		STRUCTURE DESIGN		54-1248		LOG OF TEST BORINGS 2 OF 4	
						CU 08		DISCARD PRINTS BEARING		REVISION DATES (PRELIMINARY STAGE ONLY)		SHEET 08	
						EA 449701		EARLIER REVISION DATES		7-1-03		OF	