FOR CONTRACT NO.: 08-0H9304

INFORMATIONAL HANDOUT

GEOTECHNICAL DESIGN REPORT FOR SIGN STRUCTURES

LOG OF TEST BORINGS

AERIALLY DEPOSITED LEAD RECOMMENDATIONS

ROUTE: 08-SBD-10-25.3/29.3

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: RENEE SASSE - 08
Office Chief
Design A

Date: April 15, 2009

File: 08-SBd-10-PM 25.07
08-0H9301
OH Sign Structures.
Various Locations

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services - MS 5
Office of Geotechnical Design - South 2

Subject: Geotechnical Design Report for Sign Structures.

The Geotechnical Design Services-South 2 has completed a Geotechnical Design Report (GDR) for construction of four (4) proposed overhead signs, located on the westbound I-10, in the San Bernardino County. The project plans to install one-posted, tubular signs at four various locations in the project limit.

This report is based on site reconnaissance, literature search and a plan to drill four bored holes for the Log of Tests Boring (LOTB). The District provided structure plans, including typical cross-sections and layout sheets. The report discusses geotechnical aspects of the project and provides foundation recommendations. This GDR is in compliance of our Caltrans Procedure (DES/GS 01-2006) for Overhead Sign Foundation Report Guidelines.

References

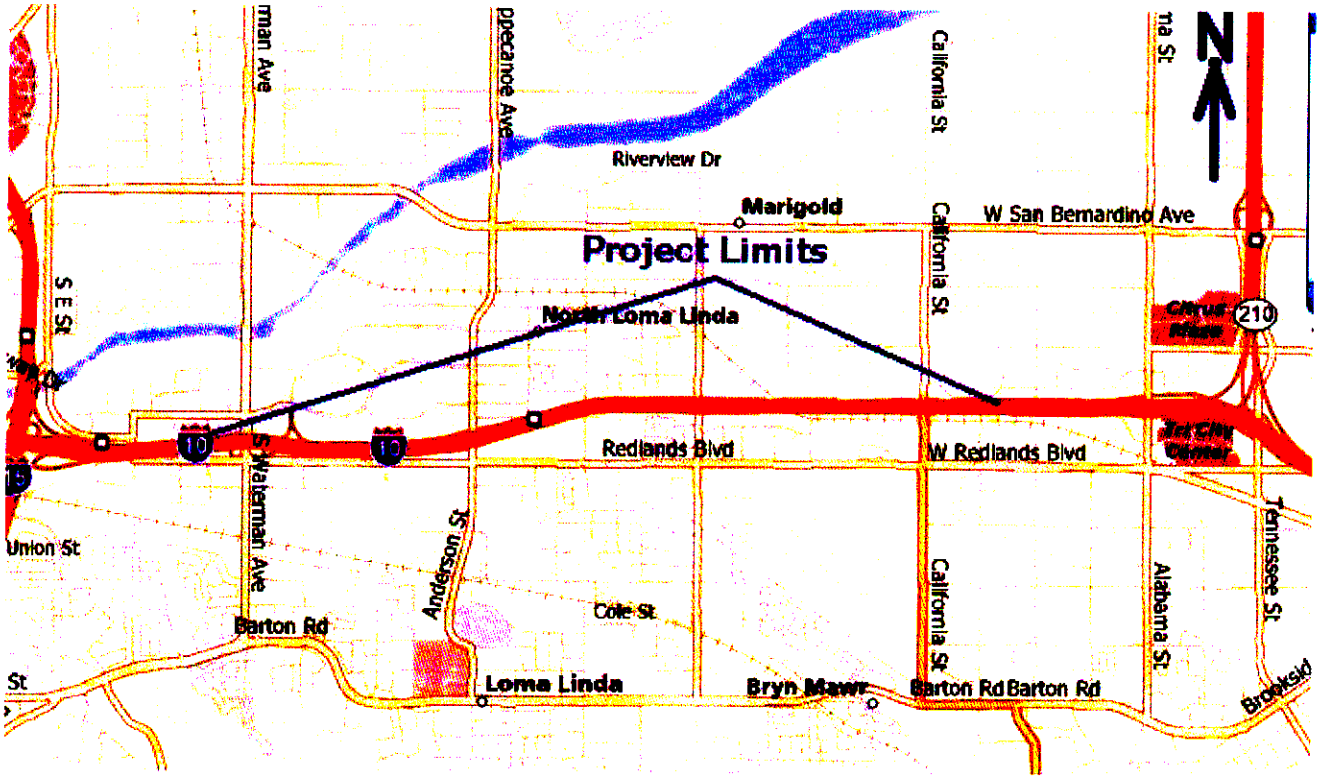
1. "Log Of Test Borings (LOTB) for Waterman Ave. U.C., Br. 54-0600," California Department of Transportation, Division of Highway, December 5, 1960.

2. "Log Of Test Borings (LOTB) for Richardson St. U.C., Br. 54-0597," California Department of Transportation, Division of Highway, December 5, 1960.

3. "Log Of Test Borings (LOTB) for Nevada St. U.C., Br. 54-0594," California Department of Transportation, Division of Highway, December 5, 1960.

4. "Final Seismic Design Recommendation for Ontario Mills Parkway U.C.," California Department of Transportation, Office of Geotechnical Design – South 2, February 12, 2006.

Project Description



Location Map

The District has planned to upgrade several sections of I-10 for improving traffic mobility and safety. The project is located between I-215 and I-210 near the City of Redlands. Within the scope of the project, four overhead sign structures will be installed along the westbound of I-10. All four newly proposed overhead signs will be one-posted and tubular type. Locations and dimensions of the sign structures are shown in the attachment and summarized as follows:

Sign Nos.	Station (English)	Width Across	Max. Post Height	Sign Type	Embank. Slope(H:V)	Remarks
1	198+00 WB	33.83 feet	28.70 feet	G85-11&W61C	3:1	Single Post
2	211+50 WB	34.27 feet	26.70 feet	G83-01&W61D	4:1	Single Post
3	309+60 WB	35.70 feet	31.11 feet	G83-01&W61D	2:1	Single Post
4	361+00 WB	35.83 feet	27.73 feet	G83-01&W61D	2:1	Single Post

Existing Conditions

The project site is mostly built on fill embankment in this section of I-10. The embankment slope of the roadway generally varies from 2:1 (H: V) to flat. The existing sign structures and the light poles have its post situated on or near the shoulder of embankment slope. According to our visual observation, most of the existing structures in this area have been performing well without any noted problem in the past.

Subsurface Investigation

Four (4) boreholes are planned to drill for soil samples along the dirt shoulder of westbound I-10. Each hole was situated within 20 feet of the newly proposed location for each of four overhead signs. Locations of the proposed boreholes are shown in the attachment. Hollow-stem auger with dry method will be used for this subsurface exploration. The proposed boring depth varies from 20 to 30 feet. Standard Penetration Tests will be taken at 5 feet interval. Bulk soil samples and undisturbed soil samples might be retrieved from the SPT tubes for primary laboratory tests.

However, as of time this report was being written, and due to the District's early schedule for the PS&E, our soil exploration program has not been conducted. Therefore, all the soil information and technical recommendations are based on our visual observations at the site and the previous LOTB performed in this area. Anyway, Log of Test Borings (LOTB) will be performed at a later date and furnished to your Office soon when completed by our Drafting Services Branch.

Subsurface Conditions

Based on our previously LOTB 's records (references) and visual observation on the field, the highway embankment consists mainly of artificial fill which includes coarse to fine sand and gravelly clayey SAND with some SILT. Preliminary information obtained from three referred locations show that the soil below embankment fill comprises of a top 5-10 feet, loose to medium dense, fine sand or sand with some silt, underlain by layers of medium dense and dense fine sand or gravelly sand with little silt.

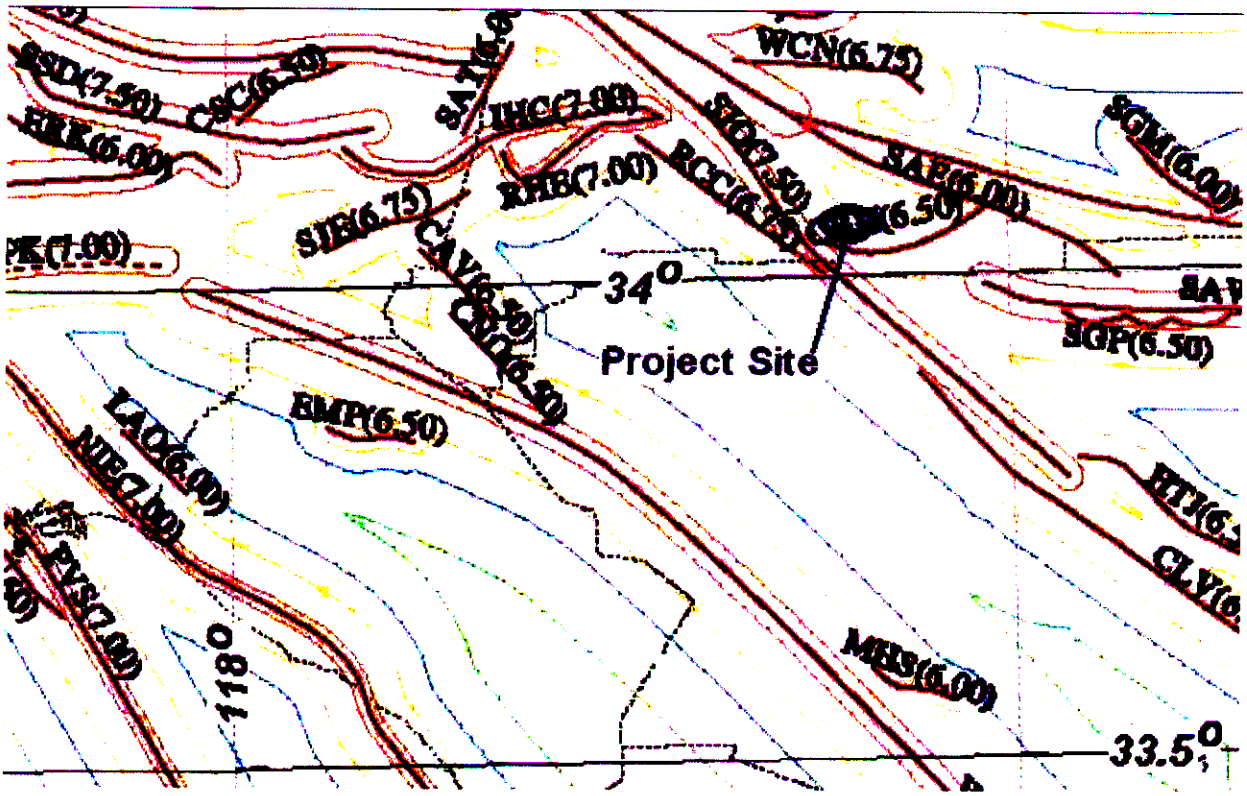
Water was not recorded on the previously LOTB in this area, except that one LOTB located near the Waterman Avenue UC. However, the water level was recorded at elevation 1009 feet in 1959, is still below the proposed tip elevation of the CIDH pile.

Seismic

The project site is located approximately 5.0 miles east of the Jacinto (SJO) fault and 1.0 mile north of the Crafton Hill (CRH) fault. Based on the Department's 1996 Seismic Hazard Map, Maximum Credible Earthquake (MCE) is 7.5. The mean Peak Bedrock Acceleration (PBA) is estimated as 0.5 g at this site. The area is not considered prone to surface rupture due to fault movement.

Liquefaction

No water observation recorded except area near the Waterman Avenue. As mentioned previously, the water level at elevation 1009 feet was reported in the 1959 LOTB is still below the bottom of the proposed CIDH pile. Therefore, liquefaction at this site would be considered insignificant to none.



Hazard Earthquake Map

Pile Foundation Information

According to information provided by the District and our Standard Plans (May 2006,) the pile data for CIDH are listed as follows:

Sign No.	Sheet No.	Locations	Sign Type	Post Type
1	S-1	198+00	G85-11&W61C	VII
2	S-2	211+50	G83-1&W61D	VII
3	S-7	309+70	G83-1&W61D	VIII
4	S-9	361+00	G83-1&W61D	VII

Post Type	Pedestal Size	Pile Diameter	Max. Pile Depth	Remarks
VII*	5.75 feet (1.753 m)	5.0 feet (1.524 m)	23.0 feet (7.0 m)	OK.
VIII*	5.75 feet (1.753 m)	5.0 feet (1.524 m)	25.0 feet (7.6 m)	OK.

* Typical Post Types: Source: 2006 Standard Plans, S-7, Page 316.

Corrosion

Pending to our soil samples collection. However, based on information obtained from our Lab's tests in the vicinity of this area indicates that soils within the project limits are not corrosive to buried metallic structures.

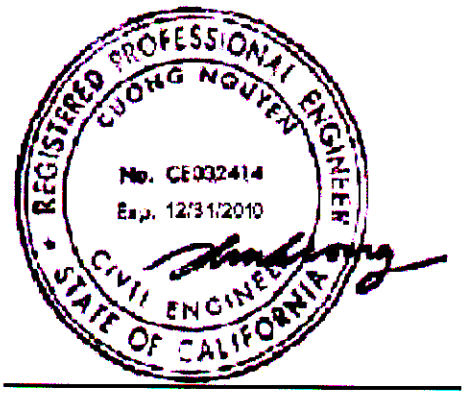
Conclusions and Recommendations

Based on the results of LOTB, SPT results and lab's tests from previously soil explorations, our conclusions and recommendations are as follows:

- Foundation materials are suitable for the proposed overhead signs using the Caltrans 2006 Standard Plans.
- Soil parameters are recommended for foundation design as: Density $\gamma = 120$ pcf, frictional angle $\phi = 30°$ and cohesion $C = 0$ psf.
- The existing embankment of the I-10 might contain a small amount of large-size rocks. Therefore, some difficulties on drilling for CIDH piles should be anticipated. In addition, due to possible pockets of loose sand, drilling for CIDH piles may encounter some locally caving problems.

If you have any question, please call Cuong Nguyen at (916) 227-4513 or ATSS 8-498-4513.

Prepared by: Date: April 15, 2009



CUONG NGUYEN, C.E. 32414
Associate Materials & Research Engineer
Branch C

cc: AAbghari
SWei
Project file

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	SBd	10			

REGISTERED CIVIL ENGINEER 9-15-09

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Quang Nguyen No. C38014 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

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.

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 4767)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 inches)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

ENGINEERING SERVICES

GEOTECHNICAL SERVICES

PREPARED BY: F. Nguyen 7/09

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH

BRIDGE NO. XX

POST MILE 25.3/29.2

OVERHEAD SIGNS

LOG OF TEST BORINGS 4 OF 4

08 LOTB SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 08 EA 0H9301

DIMENSIONS PRINTED BEHING ENGLISH REVISION DATES

REVISION DATES

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	SBd	10			

REGISTERED CIVIL ENGINEER 9-15-09

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — Cuong Nguyen — No. C38414 — Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

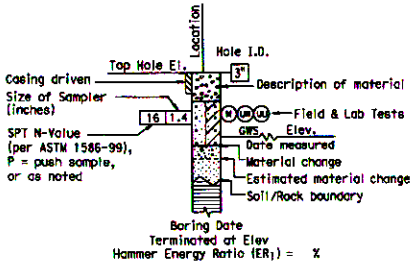
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
	A	Auger Boring
	R P	Rotary drilled boring Rotary percussion boring (air)
	R	Rotary drilled diamond core
	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
	O	Other

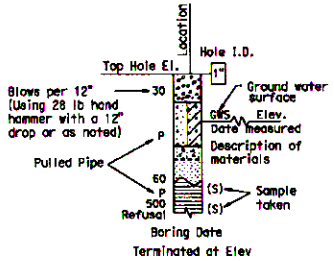
Note: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

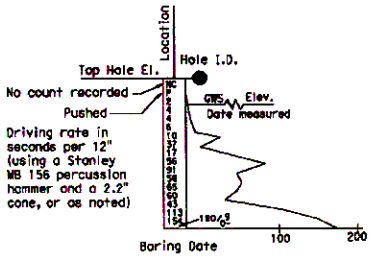
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



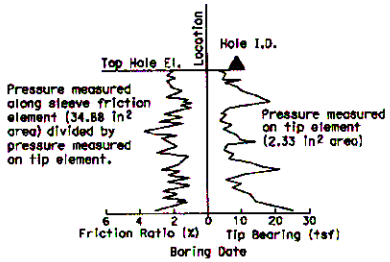
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. / POST MILE 25.3/29.2	OVERHEAD SIGNS LOG OF TEST BORINGS 3 OF 4
	PREPARED BY: F. Nguyen 7/09		CU 08 EA 0H9301	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES / SHEET / OF

08 LOTS SOIL LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
08	SBd	10			

REGISTERED CIVIL ENGINEER 9-15-09

PLANS APPROVAL DATE

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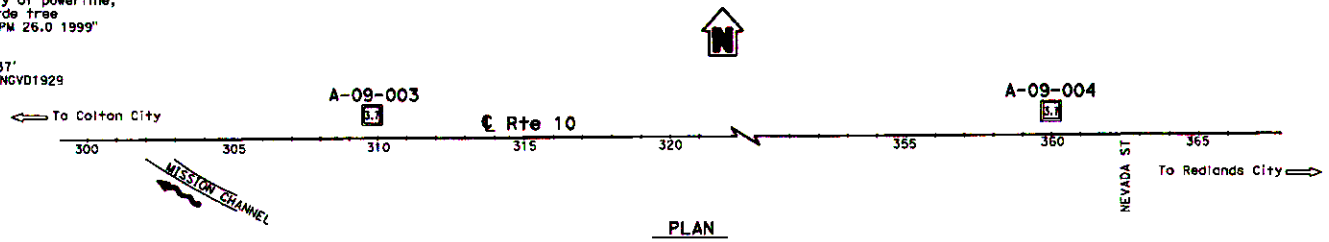
REGISTERED PROFESSIONAL ENGINEER Chang Nguyen No. C38414 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, & Presentation Manual (June 2007).

BENCH MARK

BM 260, SBD10 PM 26.0 1999
FD 2 1/4 " CDOT BCM
Up 0.2' in 12" Conc Cyl,
200' Wly 40" Euc tree,
3' Sly row, 138' Ely of powerline,
256' Ely of P. Verde tree
Stm'd "BM SBD-10-PM 26.0 1999"
N = 1846604.08
E = 6784247.47
Elevation = 1051.37'
Vertical Datum = NGVD1929



PLAN
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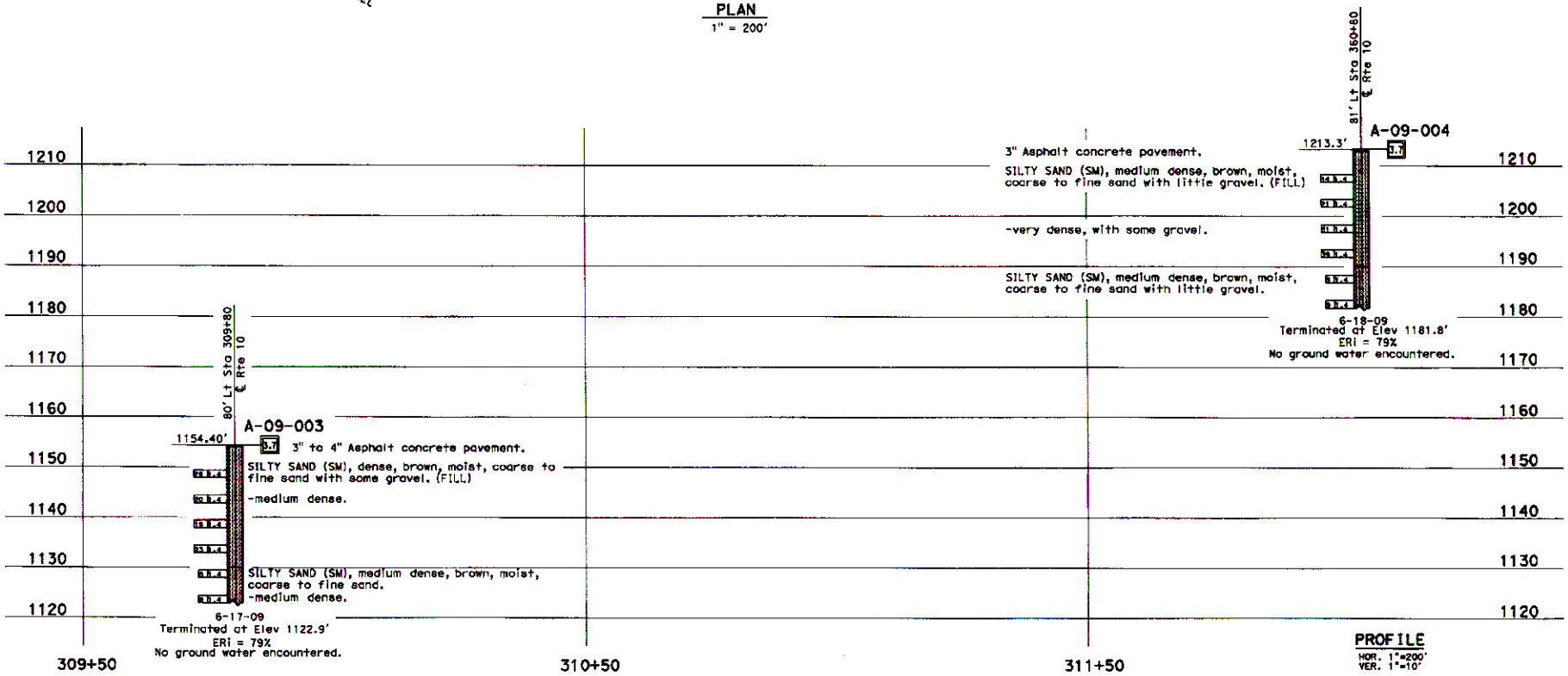

PROFILE
HOR. 1"=200'
VER. 1"=10'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. / POST MILES 25.3/29.2	OVERHEAD SIGNS LOG OF TEST BORINGS 2 OF 4
FUNCTIONAL SUPERVISOR NAME: Y. Wei	DRAWN BY: F. Nguyen 7/09 CHECKED BY: G. Purcell	FIELD INVESTIGATION BY: C. Nguyen	CU 08 EA 0H9301		

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STANDARD PRINTS BEARING EARLIER REVISION DATES 07-08 07-09 07-10 07-11

REVISION DATES SHEET OF

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	SBd	10			

REGISTERED CIVIL ENGINEER 9-15-09

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER Cuong Nguyen No. C38114 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, & Presentation Manual (June 2007).

BENCH MARK

BM 260, SBD10 PM 26.0 1999
FD 2 1/4 " CDOT BCM
up 0.2' in 12" Conc Cyl,
200' Wly 40" Euc tree,
3' Sly row, 138' Ely of powerline,
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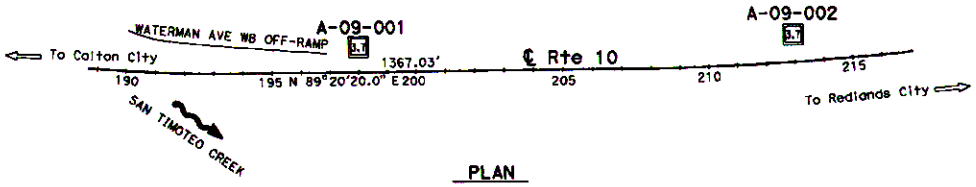
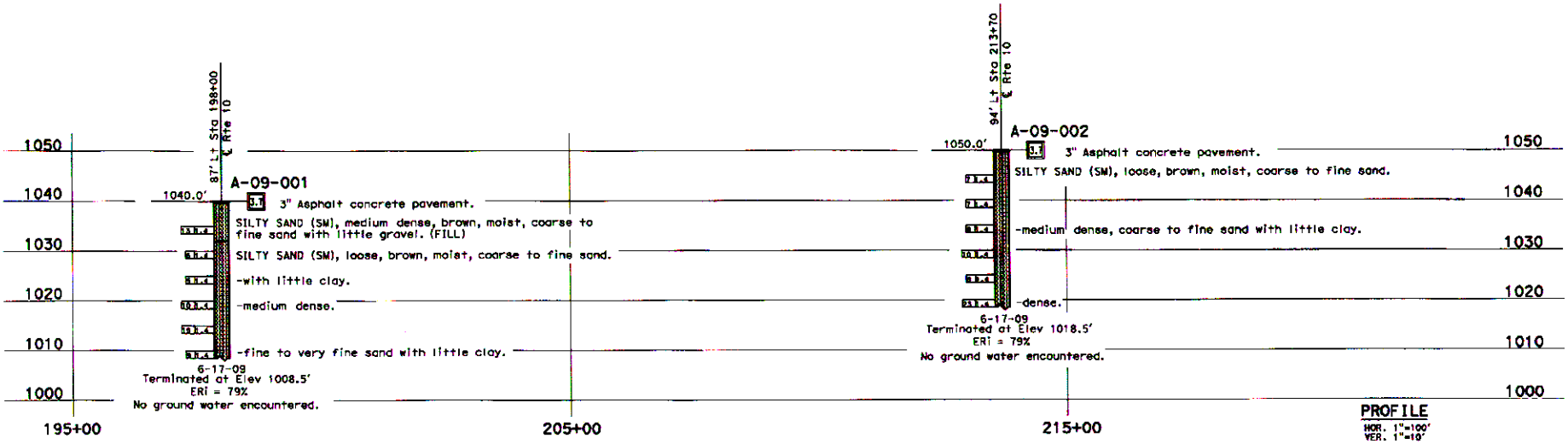
Elevation = 1051.37'
Vertical Datum = NGVD1929



PLAN
1" = 200'



PROFILE
HOR. 1"=100'
VER. 1"=10'

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH	BRIDGE NO. / POST MILES 25.3/29.2	OVERHEAD SIGNS LOG OF TEST BORINGS 1 OF 4
FUNCTIONAL SUPERVISOR NAME: Y. Wei	DRAWN BY: F. Nguyen 7/09 CHECKED BY: G. Pursell	FIELD INVESTIGATION BY: C. Nguyen	CU 08 EA 0H9301	DIMENSIONS PRINTS BEARING EARLIER REVISION DATES	REVISION DATES SHEET OF

DOS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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6.0 RECOMMENDATIONS

ADL is present at the site. Based on the findings and conclusions presented herein, the following is recommended:

1. A site-specific lead compliance plan should be developed to address health and safety of construction workers.

2. Excavated soil from the upper 1.5 feet bgs (ground surface to 1.5 feet bgs) may be reused onsite in accordance with Section 9.a.2 of Caltrans' Variance (Type Y-2) or disposed off site as a California hazardous waste.

3. Excavated soils below 1.5 feet may be reused onsite without restriction or released as surplus to the Contractor for disposition as non hazardous waste.