APPENDIX A.2

Previous Boring Logs

Final Geotechnical Summary Report
SR-710 Tunnel Technical Study
Los Angeles County, California

Prepared For:
California Department of Transportation
100 South Main Street
Los Angeles, CA 90012

Prepared By:
CH2M HILL
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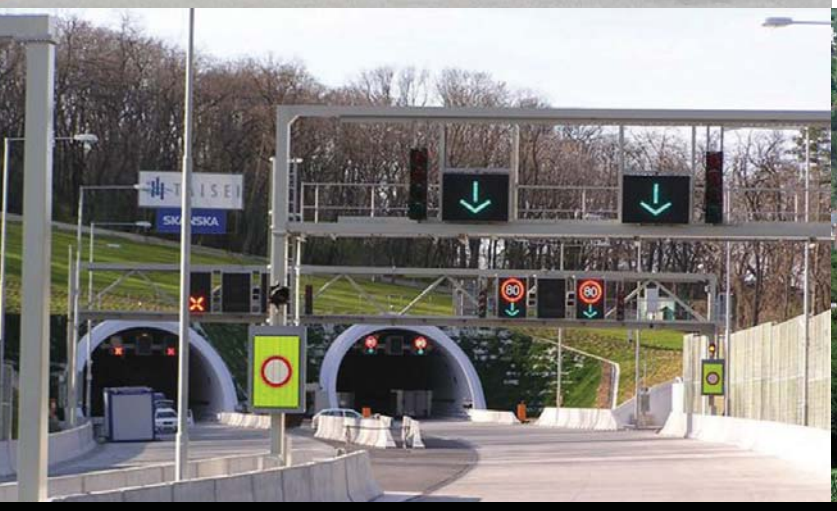
Santa Ana, CA 92707

April 2010

Volume I of V



CH2MHILL

GROUP SYMBOLS AND NAMES

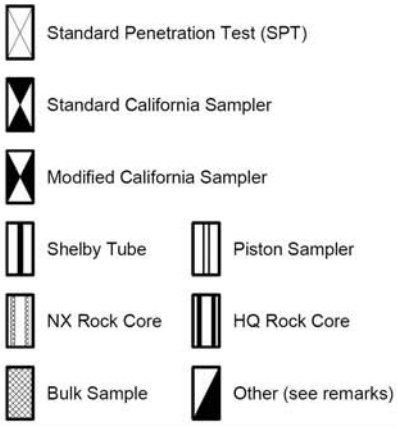
Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or 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 elastic 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 TESTS

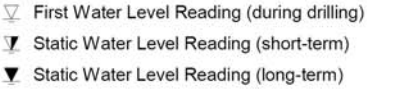
C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS



DRILLING METHOD SYMBOLS

WATER LEVEL SYMBOLS



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	D/D	07-187900

PROJECT OR BRIDGE NAME: SR-710 Tunnel Technical Study

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A			1 of 3

CONSISTENCY OF COHESIVE SOILS				
Descriptor	**Unconfined Compressive Strength (tsf)**	**Pocket Penetrometer (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS	
Descriptor	**SPT N_{60} - Value (blows / foot)**
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE	
Descriptor	**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	
Descriptor	**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%

SOIL PARTICLE SIZE		
Descriptor		**Size**
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS	
Descriptor	**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; it 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.

CEMENTATION	
Descriptor	**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.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (July 2007), Section 2, for tables of additional soil description components and discussion of soil description and identification.

ROCK GRAPHIC SYMBOLS

IGNEOUS ROCK

SEDIMENTARY ROCK

METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8 inches to 1 ft
Thinly bedded	1-1/4 to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

WEATHERING DESCRIPTORS FOR INTACT ROCK

	Diagnostic Features					
	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		
Descriptor	Body of Rock	Fracture Surfaces		Texture	Solutioning	General Characteristics
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull	Minor to complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened.
Decomposed	Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregated)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

Note: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

RELATIVE STRENGTH OF INTACT ROCK

Descriptor	Uniaxial Compressive Strength (psi)
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/6 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

CORE RECOVERY CALCULATION (%)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

RQD CALCULATION (%)

$$\frac{\Sigma \text{ Length of intact core pieces} > 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100$$

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft
Slightly Fractured	Lengths from 1 to 3 ft, few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft, with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE: **BORING RECORD LEGEND**

DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	D/D	07-187900

PROJECT OR BRIDGE NAME: SR-710 Tunnel Technical Study

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A			3 of 3

Addendum (including non-standard laboratory test designations) to 2010 SR 710 Tunnel Technical Study (CH2M HILL, 2010) Boring Record Legend

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 elastic 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 TESTS

C	Consolidation (ASTM D 2435-04)
CAI	Cerchar Abrasivity Index
CL	Collapse Potential (ASTM D 5333-03)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
EM	Elastic Model with Compressive Strength (ASTM D 7102)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
PTS	Petrographic Thin Section
R	R-Value (CTM 301 - 00)
SG	Specific Gravity (AASHTO T 100-06)
SD	Slake Durability Index (ASTH D 4645)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

CH2MHILL®

REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**L.A.**	**710**		**07-187900**

PROJECT OR BRIDGE NAME
SR 710 North Study

BRIDGE NUMBER	PREPARED BY	DATE	PLATE NO.
NA			

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
K. Barker	1-6-09	1-12-09	34° 4' 38" / 118° 9' 58" NAD83	R-09-Z1B8
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services			' Lt Sta Caltrans ROW @ Front St.	419.6 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wire-Line			CME 85	4 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT(1.4"),Punch Core(2.5"),Shelby(2.87"),HQ Core			CME Automatic, 140 lb., 30 inch drop	87%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Piezometer Installed on Completion			READINGS NM / 25.0 ft on 7-1-09	200.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	0		SILTY, CLAYEY SAND (SC-SM); medium dense; light olive brown; dry; fine SAND; little low to medium plasticity fines [RECENT ALLUVIUM].		D01			100						This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
417.63	2													
415.63	4													
	5		At EL. 414.6 ft, contains trace fine GRAVEL.		S02	5 5 17	22	100						Hand Auger 0'-5'
413.63	6													
	7		At EL. 412.6 ft, with olive yellow mottled with light gray.											
411.63	8													
409.63	10				O03			33						
407.63	12													
405.63	14													
	15		At EL. 404.6 ft, becomes black.		S04	3 4 5	9	100		23				PA
403.63	16		SANDY SILT (ML); stiff; dark grayish brown; dry; few GRAVEL; little coarse to fine SAND; mostly low plasticity fines.											
401.63	18													
399.63	20		SILTY SAND (SM); loose; dark yellowish brown; medium SAND.		O05			33						
397.63	22													
395.63	24													
	25													

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z1B8
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	T/T	07-07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.Barker			1 of 7

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	25		Lean CLAY (CL); soft; very dark grayish brown slightly mottled with rust staining; medium plasticity fines.		S06	p p 2		100		32				PI
393.63	26													
	27													
391.63	28													
	29													
389.63	30		SILTY SAND (SM); very dark grayish brown; fine SAND.		O07			33						
	31													
387.63	32													
	33													
385.63	34													
	35		Poorly graded SAND (SP); medium dense; grayish brown; coarse to medium SAND; weak cementation.		S08	5 7 13	20	100						
383.63	36													
	37													
381.63	38													
	39													
379.63	40		SILTY, CLAYEY SAND (SC-SM); medium dense; grayish brown; trace fine GRAVEL; mostly medium to fine SAND; some low plasticity fines.		O09			17						PA, DS
	41													
377.63	42		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, olive gray, intensely weathered, weak, soft, unfractured, with thin (1") clay lenses. **[PUENTE FORMATION]**							21	110			
	43													
375.63	44													
	45				S10	8 13 20	33	100						
373.63	46													
	47													
371.63	48													
	49													
369.63	50				O11		8	100				TV = 8		UW
	51													
367.63	52													
	53									22	109			
365.63	54													
	55													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z1B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.Barker			**2 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		At EL. 364.6 ft, contains pebble to cobble. *(continued)*.		S12	24 23 20	43	100							
363.63	56														
	57														
361.63	58														
	59														
359.63	60				O13			0							UW
	61														
357.63	62														
	63														
355.63	64														
	65				S14	6 14 18	32	100							
353.63	66														
	67		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, massive, medium dark gray to dark gray, moderately weathered, weak, soft, unfractured.												
351.63	68														
	69														
349.63	70				O15A			0							UW
	71														
347.63	72														
	73														
345.63	74														
	75				U15B			0							
343.63	76														
	77				S15C	12 29 50/5.5"		0							
341.63	78				C16			100	0						**See note at the end of the log regarding RQD.**
	79														
339.63	80				C17			97	47	26	97				PI, PA, UU
	81														
337.63	82														
	83														
335.63	84														
	85														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z1B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.Barker			**3 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		*(continued).*		S18	10 18 23	41	100							UW **See note at the end of the log regarding RQD.**
333.63	86														
	87				C19			0	0						
331.63	88														
	89		At EL. 330.6 ft, grades to greenish black.												
329.63	90		At EL. 329.6 ft, becomes slightly fractured, not healed, dipping 60 to 50°.		C20			100	100						
	91														
327.63	92														
	93														
325.63	94														
	95				C21			100	100						
323.63	96														
	97														
321.63	98														
	99														
319.63	100				C22			50	50						
	101		At EL. 318.6 ft, becomes unfractured.												
317.63	102														
	103														
315.63	104														
	105		At EL. 314.6 ft, becomes slightly fractured, not healed, dipping 50°.		C23			100	100						PI, PA, UU
313.63	106														
	107														
311.63	108														
	109									23	103				
309.63	110		At EL. 309.6 ft, becomes unfractured.		C24			83	83						
	111														
307.63	112														
	113														
305.63	114														
	115														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z1B8**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K.Barker**		DATE	SHEET **4 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	115				C25										**See note at the end of the log regarding RQD.**
303.63	116														
	117														
301.63	118														
	119														
299.63	120		At EL. 299.6 ft, becomes moderately soft.		C26			100	100	21 16	104				PI, PA, UU, CR
	121														
297.63	122														
	123														
295.63	124														
	125				C27			83	83						
293.63	126														
	127														
291.63	128														
	129														
289.63	130		At EL. 289.6 ft, becomes laminated.		C28			100	100						SD, EM
	131														
287.63	132														
	133														
285.63	134									23	100				
	135				C29			100	100						
283.63	136														
	137														
281.63	138		At EL. 281.6 ft, contains 6" lens of fresh, very strong, very hard.												
	139														
279.63	140				C30			100	0						
	141		At EL. 279.1 ft, becomes medium strong, very slightly fractured, bedding plane separation.												
277.63	142														
	143														
275.63	144														
	145														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z1B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.Barker			**5 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	145				C31			100	100						**See note at the end of the log regarding RQD.**
273.63	146														
	147														
271.63	148									22	105				PTS, SD, EM
	149														
269.63	150				C32			100	100						
	151														
267.63	152														
	153														
265.63	154														
	155				C33			100	100						UW, PI, CR
263.63	156														
	157														
261.63	158														
	159														
259.63	160		At EL. 259.6 ft, becomes soft.		C34			98	98	22	106				
	161														
257.63	162														
	163														
255.63	164														
	165				C35			95	95						
253.63	166														
	167														
251.63	168														
	169														
249.63	170		At EL. 249.6 ft, with few coarse sand.		C36			100	100						
	171														
247.63	172														
	173														
245.63	174														
	175														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z1B8**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K.Barker**		DATE	SHEET **6 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175				C37			100	100						SD, EM
243.63	176									22	102				**See note at the end of the log regarding RQD.**
	177		At EL. 243.1 ft, contains 3" lens of fresh, very strong, very hard.												
241.63	178														
	179														
239.63	180				C38			100	100						
	181														
237.63	182														
	183														
235.63	184														
	185		At EL. 235.1 ft, contains 6" lens of fresh, very strong, very hard.		C39			93	93						
233.63	186														
	187														
231.63	188														
	189														UU
229.63	190				C40			95	95	25	100				
	191														
227.63	192														
	193														
225.63	194														
	195				C41			100	100						SD, EM
223.63	196									22	102				
	197														
221.63	198														
	199														
219.63	200		Bottom of borehole at 200.0 ft bgs												
	201		Borehole was converted to piezometer at the completion of drilling.												
217.63	202		RQD values provided in the boring logs are based on intact core pieces obtained between two natural discontinuities. Majority of cores obtained in this boring are weak and does not meet the "sound core" definition provided in standard test method for RQD ASTM D 6032. These RQD values should not be used to evaluate the rock mass quality.												
	203														
215.63	204														
	205														

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z1B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.Barker			**7 of 7**

LOGGED BY / BEGIN DATE / COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
K. Lai, M Islam, K. Barker / 4-14-09	34° 5' 3" / 118° 9' 52" NAD83	R-09-Z2B5
DRILLING CONTRACTOR	**BOREHOLE LOCATION (Offset, Station, Line)**	**SURFACE ELEVATION**
Caltrans Drilling Services	' Lt Sta Edna St., w/o Dorchester Ave.	452.4 ft NAVD88
DRILLING METHOD	**DRILL RIG**	**BOREHOLE DIAMETER**
Rotary Wire-Line	CS 2000 (truck)	4 in
SAMPLER TYPE(S) AND SIZE(S) (ID)	**SPT HAMMER TYPE**	**HAMMER EFFICIENCY, ERi**
SPT(1.4"),Punch Core(2.5"),HQ Core	Diedrich Automatic, 140 lb., 30 inch drop	84%
BOREHOLE BACKFILL AND COMPLETION	**GROUNDWATER READINGS** DURING DRILLING / AFTER DRILLING (DATE)	**TOTAL DEPTH OF BORING**
Piezometer Installed on Completion	NM / 10.8 ft on 7-1-09	300.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT (4").												This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
	1		SILTY CLAY (CL-ML); soft to medium stiff; dark brown; moist; low plasticity fines; **[ALLUVIUM]**												
450.38	2														
	3														
448.38	4														
	5		SANDY SILT (ML); medium stiff; dark brown; moist; fine SAND; nonplastic fines.		S01	4 6 8	14					PP = 0.3			Hand Auger 0.3' - 5' VOC=12.1 ppm
446.38	6														
	7														
444.38	8		Lean CLAY with SAND (CL); stiff; dark brown; moist.												
	9														
442.38	10				S02	7 3 4	7			19					PI VOC=28.1 ppm
	11														
440.38	12														
	13		SILTY SAND (SM); dense; yellowish brown; moist; fine SAND.												
438.38	14														
	15				S03	13 16 16	32			17					
436.38	16														VOC=37.2 ppm
	17														
434.38	18														
	19														
432.38	20				S04	10 14 19	33								
	21		At EL. 431.4 ft, contains coarse to fine SAND.												VOC=6.3 ppm
430.38	22														
	23														
428.38	24														
	25														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z2B5
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	T/T	07-07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K. Barker, M. Islam			1 of 11

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	25													
426.38	26		SANDY SILT (ML); hard; light brown; moist; some fine SAND; mostly nonplastic to low plasticity fines; interbedded with silty sand (SM).		S05	10 11 11	22							VOC=8.8 ppm
	27													
424.38	28													
	29													
422.38	30				S06	7 11 8	19			27				PA
	31													VOC=8.5 ppm
420.38	32		SILTY SAND (SM); medium dense; yellowish brown; moist; medium to fine SAND; nonplastic fines.											
	33													
418.38	34													
	35				S07	3 6 8	14							
416.38	36													
	37													VOC=2.3 ppm
414.38	38													
	39													
412.38	40				S08	9 7 6	13							
	41													VOC=33.1 ppm
410.38	42													
	43		SANDY SILT (ML); stiff to very stiff; olive gray; moist; few fine GRAVEL; fine SAND; nonplastic to low plasticity fines.											
408.38	44													
	45				S09	4 8 10	18							
406.38	46													VOC=21.1 ppm
	47													
404.38	48		SILTY SAND (SM); medium dense; light brown; moist; little fine GRAVEL; fine SAND.											
	49													
402.38	50				S10	4 8 10	18			21				PA
	51		At EL. 401.4 ft, with trace fine GRAVEL; mostly fine SAND; some low plasticity fines.											VOC=5.6 ppm
400.38	52													
	53													
398.38	54													
	55													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker, M. Islam**		DATE	SHEET **2 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		At EL. 397.4 ft, grades to medium to fine SAND. SILTY SAND (SM) *(continued)*.		S11	20 20 14	34								
396.38	56														VOC=9.0 ppm
	57														
394.38	58		SILTY CLAY (CL-ML); stiff to very stiff; olive brown to olive gray; moist; low plasticity fines.												
	59														
392.38	60				S12	6 8 11	19								
	61														VOC=17.4 ppm
390.38	62														
	63														
388.38	64														
	65				S13	5 6 8	14								
386.38	66														VOC=4.2 ppm
	67														
384.38	68														
	69														
382.38	70				S14	7 9 15	24								
	71														VOC=9.5 ppm
380.38	72														
	73		Fat CLAY (CH); very stiff; olive gray; moist; medium to high plasticity fines.												
378.38	74														
	75				S15	5 9 11	20			21					PI
376.38	76														VOC=7.6 ppm
	77														
374.38	78		SILTY CLAY (CL-ML); stiff to very stiff; light brown; moist; low plasticity fines.												
	79														
372.38	80				S16	4 5 7	12								
	81														VOC=9.2 ppm
370.38	82														
	83														
368.38	84														
	85														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker, M. Islam**		DATE	SHEET **3 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		SILTY CLAY (CL-ML) *(continued)*.		S17	6 9 11	20			21					
366.38	86														VOC=10.8 ppm
	87														
364.38	88		Very stiff; olive gray; low to medium plasticity fines.												
	89														
362.38	90				S18	5 8 9	17								
	91														VOC=8.8 ppm
360.38	92														
	93														
358.38	94														
	95				S19	5 7 9	16								
356.38	96														VOC=11.4 ppm
	97														
354.38	98														
	99														
352.38	100				S20	6 9 13	22								
	101														VOC=12.4 ppm
350.38	102														
	103														
348.38	104														
	105		At EL. 347.4 ft, with few fine SAND.		O21					27	101	PP = 3.75			PI, PA, UU, C
346.38	106														
	107														
344.38	108		CLAYEY SAND (SC); medium dense; light brown; moist; fine SAND; nonplastic to low plasticity fines.												VOC=6.4 ppm
	109														
342.38	110				S22	4 6 8	14								
	111														VOC=4.6 ppm
340.38	112														
	113														
338.38	114		SANDY lean CLAY (CL); stiff; light brown to light gray; moist to wet; fine SAND; low plasticity fines.												
	115														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE **BORING RECORD**				HOLE ID **R-09-Z2B5**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker, M. Islam**		DATE	SHEET **4 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	115		SANDY lean CLAY (CL) *(continued)*.		S23	5 5 6	11					PP = 1.5		
336.38	116													VOC=11.5 ppm
	117													
334.38	118													
	119													
332.38	120		At EL. 332.4 ft, grades to very stiff.		S24	5 6 8	14					PP = 3.0		
	121													VOC=9.5 ppm
330.38	122													
	123		Fat CLAY (CH); very stiff; light brown to light gray; moist to wet.											
328.38	124													
	125				O25					28	95	PP = 2.0		PI, UU
326.38	126													
	127													
324.38	128													
	129		SANDY lean CLAY (CL); very stiff; light brown to light gray; moist to wet.											VOC=9.3 ppm
322.38	130				S26	10 12 15	27					PP = 4.0		
	131													VOC=10.7 ppm
320.38	132													
	133													
318.38	134													
	135		Very stiff to hard.		S27	12 18 25	43							
316.38	136													VOC=8.2 ppm
	137		SEDIMENTARY ROCK, (CLAYSTONE)/MUDSTONE, thinly bedded, moderate olive brown and olive gray, slightly weathered, extremely weak, very soft, unfractured, **[PUENTE FORMATION]**		C26			100	100					**See note at the end of log regarding RQD.**
314.38	138													
	139													
312.38	140		At EL. 312.4 ft, becomes laminated, soft.		C27			100	100					VOC=1.6 ppm
	141													
310.38	142													
	143													
308.38	144													
	145													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker, M. Islam**		DATE	SHEET **5 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	145		At EL. 307.4 ft, becomes slightly fractured, joint, not healed, dipping 30°. *(continued)*.		C28			90	90						VOC=2.8 ppm **See note at the end of log regarding RQD.**
306.38	146														
	147														VOC=1.1 ppm
304.38	148									40	80				PI, PA, UU
	149														
302.38	150		At EL. 302.4 ft, becomes unfractured.		C29			100	100						
	151														
300.38	152														
	153														
298.38	154														
	155		At EL. 297.9 ft, becomes soft to moderately soft. SEDIMENTARY ROCK, (CLAYSTONE)/MUDSTONE, massive, black, slightly weathered, weak, soft to moderately soft, unfractured.		C30			100	84						VOC=1.1 ppm
296.38	156														
	157														
294.38	158														VOC=2.7 ppm
	159														
292.38	160				C31			100	88						
	161														
290.38	162														
	163														VOC=1.9 ppm
288.38	164														
	165		At EL. 287.4 ft, becomes very slightly fractured, shear, dipping 45°.		C32			100	100						
286.38	166														VOC=2.6 ppm
	167														
284.38	168				C33			120	80						
	169														
282.38	170		At EL. 282.4 ft, becomes moderately soft, unfractured.		C34			100	100						VOC=1.7 ppm
	171														
280.38	172														
	173				C35			108	80						VOC=1.8 ppm
278.38	174														
	175														

(continued)

Department of Transportation
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker, M. Islam**		DATE	SHEET **6 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175		At EL. 277.4 ft, becomes very slightly fractured, joint, dipping 70°, few subhorizontal silty laminations. *(continued)*.		C36			100	20						VOC=1.7 ppm **See note at the end of log regarding RQD.**
276.38	176														
	177									23	101				PI, PA, UC
274.38	178														
	179														
272.38	180				C37			100	33						VOC=1.6 ppm
	181														
270.38	182														VOC=3.4 ppm
	183				C38			100	100						
268.38	184														
	185														VOC=2.9 ppm
266.38	186														
	187				C39			100	83						VOC=3.7 ppm
264.38	188									21	107				
	189														
262.38	190				C40			104	100						
	191														VOC=4.1 ppm
260.38	192														
	193														
258.38	194		At EL. 258.4 ft, contains about 50% siltstone, weakly subvertically laminated.		C41			100	75						VOC=20.0 ppm
	195														
256.38	196														
	197														
254.38	198														
	199		At EL. 253.4 ft, becomes unfractured.		C42			106	100						VOC=25.4 ppm
252.38	200														
	201														
250.38	202														
	203				C43			100	100						VOC=28.1 ppm SD, EM
248.38	204									22	105				
	205														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker, M. Islam**		DATE	SHEET **7 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205				C43			100	100						**See note at the end of log regarding RQD.**
246.38	206														
	207		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, black, slightly weathered, weak, moderately soft, unfractured, subvertical laminations.		C44			100	100						VOC=2.7 ppm
244.38	208														
	209														
242.38	210				C45			100	100						
	211														
240.38	212														VOC=17.3 ppm
	213				C46			100	100						VOC=25.0 ppm
238.38	214														
	215														
236.38	216														
	217														
234.38	218				C47			100	82	23	102				UU, CR VOC=3.2 ppm
	219														
232.38	220														
	221														
230.38	222														
	223		At EL. 229.4 ft, observed fine grained sand lenses.		C48			104	73						
228.38	224														VOC=16.5 ppm
	225														
226.38	226														
	227														
224.38	228		At EL. 224.4 ft, becomes dark greenish gray.		C49			100	75						VOC=4.6 ppm
	229														
222.38	230				C50			92	92						
	231														
220.38	232														PTS
	233				C51			94	40						VOC=29.0 ppm
218.38	234		At EL. 218.4 ft, becomes slightly fractured, shear, dipping 80°.												
	235														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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Division of Engineering Services
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K. Barker, M. Islam			**8 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235		*(continued).*		C51			94	40						**See note at the end of log regarding RQD.**
216.38	236														
	237		At EL. 215.8 ft, observed 2-3" gravel lens, fine, rounded and sub-angular.		C52			100	100						VOC=2.5 ppm
214.38	238														
	239														
212.38	240				C53			100	92						VOC=3.2 ppm
	241									21	109				SD, EM VOC=1.5 ppm
210.38	242														
	243														
208.38	244				C54			88	79						
	245														
206.38	246														
	247														
204.38	248		At EL. 204.4 ft, becomes extremely weak, very soft.		C55			42	10						VOC=4.1 ppm
	249														
202.38	250														
	251														
200.38	252		At EL. 200.9 ft, observed breccia lens, fine gravel, sub-rounded, black siltstone matrix.		C56			89	0						VOC=1.0 ppm
	253		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, massive, dark greenish gray, slightly weathered, extremely weak, very soft, unfractured.												
198.38	254														
	255				C57			30	0						VOC=5.1 ppm
196.38	256														
	257														
194.38	258														
	259														
192.38	260				C58			67	16						VOC=17.0 ppm
	261														
190.38	262														
	263														VOC=6.2 ppm
188.38	264		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dark gray, slightly weathered, weak,												
	265														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K. Barker, M. Islam			**9 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	265		moderately soft, unfractured. At EL. 187.4 ft, observed 1' lens of little coarse sand and trace fine gravel. *(continued)*.		C59			111	83	24	100				UU **See note at the end of log regarding RQD.**
186.38	266														
	267														
184.38	268		SEDIMENTARY ROCK, (CONGLOMERATE), coarse sand to cobble, dark gray, slightly weathered, extremely weak, very soft, unfractured, sand and clay matrix, clasts are very hard, sub-rounded and sub-angular, metamorphosed granitics, trace shell fragments, (possible shear zone).		C60			111	33						VOC=0.7 ppm
	269														
182.38	270														
	271														
180.38	272				C61			42	0						VOC=2.7 ppm
	273														
178.38	274														
	275		SEDIMENTARY ROCK, (CLAYSTONE)/MUDSTONE, massive, dark gray, slightly weathered, weak, moderately soft, with lenses of siltstone.		C62			100	40						VOC=1.0 ppm
176.38	276														
	277														
174.38	278														
	279		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, dark gray, slightly weathered, weak, hard, slightly fractured, joint dipping 45°. At EL. 172.4 ft, observed little coarse and fine gravels, sub-rounded, granitic.												
172.38	280				C63			90	0						VOC=14.5 ppm
	281														VOC=4.9 ppm
170.38	282														
	283		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated to very thinly bedded, dark gray, slightly weathered, weak, moderately soft, slightly fractured, locally very soft, with sandstone laminations.												
168.38	284														
	285				C64			135	40						
166.38	286														
	287														VOC=4.5 ppm
164.38	288														
	289				C65			107	50						VOC=3.0 ppm
162.38	290														
	291														
160.38	292									31	88				SD, EM
	293		At EL. 159.9 ft, observed 1' bed of little fine to coarse gravels, sub-angular.		C66			100	92						
158.38	294														
	295														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker, M. Islam**		DATE	SHEET **10 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	295				C67			120	80					VOC=1.7 ppm
156.38	296													**See note at the end of log regarding RQD.**
	297													
154.38	298				C68			100	80					VOC=2.7 ppm
	299													
152.38	300		Bottom of borehole at 300.0 ft bgs Borehole was converted to piezometer at the completion of drilling. RQD values provided in the boring logs are based on intact core pieces obtained between two natural discontinuities. Majority of cores obtained in this boring are weak and does not meet the "sound core" definition provided in standard test method for RQD ASTM D 6032. These RQD values should not be used to evaluate the rock mass quality.										VOC=1.6 ppm
	301													
150.38	302													
	303													
148.38	304													
	305													
146.38	306													
	307													
144.38	308													
	309													
142.38	310													
	311													
140.38	312													
	313													
138.38	314													
	315													
136.38	316													
	317													
134.38	318													
	319													
132.38	320													
	321													
130.38	322													
	323													
128.38	324													
	325													

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z2B5**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker, M. Islam**		DATE	SHEET **11 of 11**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Pratt/ T. Halda	1-13-09	1-22-09	1872415.7 ft / 6514868.4 ft NAD83	R-09-Z3B2
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans In-House			' Lt Sta S. Pasadena Ave & Calif. Blvd	781.4 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wire-Line			CS 2000 (truck)	3.7 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT(1.4"), Punch Core(2.5") & HQ Rock Coring			Diedrich Automatic, 140 lb., 30 inch drop	84%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Installed Piezometer for water monitoring			NM	144.4 ft on 7-1-09	275.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Woody debris, pine needles.		D01										This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
	1		SILTY SAND (SM); loose; strong brown; moist; fine SAND; nonplastic fines; (probable Recent ponded Alluvial deposit).												
779.40	2														
	3														
777.40	4		SANDY SILT (ML); very stiff; yellowish brown; moist; fine SAND; nonplastic fines.												
	5				S02	2 7 11	18								
775.40	6														VOC=0.2 PPM
	7				C03										
773.40	8														
	9														
771.40	10				O04										
	11		Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; yellowish brown to pale brown; moist; little fine to coarse GRAVEL; mostly coarse to fine SAND; few fines; dominantly hard (slightly weathered) to soft (intensely weathered) granitic rock fragments (older Quaternary Alluvium, Qoa).							10	129				UW, PI VOC=1.5 PPM
769.40	12														
	13														
767.40	14														
	15				S05	32 20 28	48			9					PA
765.40	16														VOC=0.5 PPM
	17														
763.40	18														
	19														
761.40	20				S06	19 27 25	52								
	21														VOC=0.6 PPM
759.40	22														
	23		COBBLES gravel, and sand, hard drilling.												
757.40	24														
	25														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z3B2
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	T/T	07-07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		1-26-09	1 of 10

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	25		SANDY SILT (ML); hard; yellowish brown; moist; nonplastic to low plasticity fines; FeO stained.		S07	12 11 17	28							
755.40	26													VOC=0.0.5 PPM
	27		Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; yellowish brown; moist; some fine to coarse GRAVEL; mostly fine to coarse SAND; subangular to subrounded hard (slightly weathered) to minor soft (intensely weathered) granitic and schist rock fragments.		C08									
753.40	28													
	29													
751.40	30				O09									
	31									9	132			VOC=2.3 PPM UW, PA
749.40	32													
	33													
747.40	34													
	35				S10	27 45 41	86							
745.40	36													VOC=2.1 PPM
	37													
743.40	38													
	39													
741.40	40				S11	13 13 30	43			15				
	41		SILT (ML); hard; yellowish brown; moist; nonplastic fines.											VOC=1.7 PPM
739.40	42		SILTY SAND (SM); very dense; yellowish brown; moist; nonplastic fines.		C12									
	43													VOC=3 PPM
	44		Well-graded SAND with SILT, GRAVEL, and COBBLES (SW-SM); very dense; yellowish brown; moist; about 1 to 5% COBBLES; little fine to coarse GRAVEL; mostly coarse to fine SAND; few fines; COBBLES consist of; up to 6 in. diameter subangular to subrounded hard to moderately hard (slightly weathered) granitic rock fragments.										
	45				S13	21 42 49	91							
735.40	46													VOC=0.8 PPM
	47				C14									VOC=1.9 PPM
733.40	48													
	49													
731.40	50				S15	60								VOC=2.4 PPM
	51				C16	88/0.2'		81						
729.40	52													
	53													VOC=1.1 PPM
727.40	54													
	55													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B2**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		**1-26-09**	**2 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Well-graded SAND with SILT, GRAVEL, and COBBLES (SW-SM) *(continued)*.		S17	31 50/0.5'				11					VOC=7.1 PPM PA
725.40	56							0							
	57														
723.40	58														
	59														
721.40	60				S18	48 48 44	92								VOC=4.2 PPM
	61														
719.40	62				C19			74							
	63														VOC=2.9 PPM
717.40	64		SILTY SAND (SM); hard; yellowish brown; moist; trace coarse to fine GRAVEL; mostly medium to fine SAND; some nonplastic fines; gradationally interbedded with silty sand.							18					PA
	65				S20	9 31 38	69								VOC=135 PPM
715.40	66														
	67		Well-graded SAND with GRAVEL and COBBLES (SW); very dense; yellowish brown; moist; about 10% COBBLES; about 15 to 25% fine to coarse GRAVEL; COBBLES consist of; up to 4 in. diameter subrounded hard (slightly weathered) granitic rock fragments.		C21			63							
713.40	68														VOC=0.8 PPM
	69														
711.40	70		SILTY SAND (SM); very dense; yellowish brown; moist; trace fine GRAVEL.		S22	30 50 50	100								VOC=2. PPM
	71														
709.40	72				C23			97		15					
	73		CLAYEY SAND (SC); dense to very dense; strong brown; moist; nonplastic fines; gradationally interbedded with silty sand, possible hardpan (paleosol).												VOC=1.4 PPM
707.40	74														
	75				S24	16 45 50	95								VOC=1.9 PPM
705.40	76		Well-graded SAND with GRAVEL (SW); very dense; yellowish brown to light yellowish brown; moist; about 0 to 10% fine to coarse GRAVEL; fine to coarse SAND; interbedded with up to 10% silty sand, subangular hard sheared granitic rock fragments.		C25			97							
	77														
703.40	78														VOC=2.3 PPM
	79														
701.40	80		Poorly graded SAND with GRAVEL (SP); very dense; yellowish brown to light yellowish brown; moist; little coarse to fine GRAVEL; mostly coarse to fine SAND; trace fines.		S26	24 48 41	89								VOC=6.1 PPM
	81														
699.40	82				C27			91		15					PA
	83														VOC=0.8 PPM
697.40	84														
	85														

(continued)

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REPORT TITLE: **BORING RECORD**
HOLE ID: **R-09-Z3B2**

DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	T/T	07-07-187900

PROJECT OR BRIDGE NAME: **SR-710 TUNNEL TECHNICAL STUDY**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
	J. Pratt, M. Islam	1-26-09	3 of 10

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		Poorly graded SAND with GRAVEL (SP) *(continued)*.		S28	50 70 50/0.4'									VOC=4.9 PPM
695.40	86														
	87		SILTY SAND (SM); very dense; strong brown to light yellowish brown; moist; trace fine GRAVEL; mostly coarse to fine SAND; interbedded with well graded sand and sandy silt, about 75% silty sand, about 20% well graded sand, crosslaminated.		C29			92							VOC=1.0PPM
693.40	88														
	89														
691.40	90				S30	27 35 22	57			15					PA VOC=2.3 PPM
	91														
689.40	92				C31			74							VOC=0.4 PPM
	93														
687.40	94														
	95		Well-graded SAND (SW); very dense; light yellowish brown; moist; trace fine to coarse GRAVEL; (up to 1 in. dia.) hard granitic rock fragments.		S32	42 26 75/0.4'									VOC=0.1 PPM
685.40	96														
	97				C33			100							
683.40	98		Well-graded SAND with GRAVEL (SW); very dense; light yellowish brown to yellowish brown; moist; about 5% COBBLES; coarse GRAVEL; up to 4 in. diameter subangular hard (slightly weathered) sheared quartz diorite rock fragments, little silt interbeds.												VOC0.0 PPM
	99														
681.40	100		SILTY SAND (SM); dense to very dense; strong brown to reddish brown; moist; trace GRAVEL; mostly coarse to fine SAND; little nonplastic to low plasticity fines; interbedded with about 20% well graded sand and 25% silt, intensely weathered soil and quartz diorite and schist rock fragments.		S34	24 25 35	60			17					PA VOC=1.9 PPM
	101														
679.40	102				C35			91							
	103														VOC=0.8 PPM
677.40	104														
	105				S36	11 15 20	35								VOC=1.8 PPM
675.40	106														
	107				C37			100		18					
673.40	108														VOC=0.4 PPM
	109														
671.40	110		SILTY SAND (SM); very dense; yellowish brown to reddish brown; moist; few fine GRAVEL; mostly coarse to fine SAND; some nonplastic to low plasticity fines; gradationally interbedded with clayey sand, subangular hard (slightly weathered) to soft (intensely weathered) quartz diorite and schist rock fragments, intensely weathered zone (paleosol).		S38	16 15 31	46								VOC=0.48 PPM
	111														
669.40	112				C39			100		12					PA VOC=0.1 PPM
	113														
667.40	114														
	115														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B2**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		**1-26-09**	**4 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	115		CLAYEY SAND (SC); dense to very dense; very stiff to hard; yellowish brown to reddish brown mottled; moist; nonplastic to low plasticity fines; to sandy lean clay, intensely weathered (paleosol or regolith).		S40	10 15 21	36								VOC=0.2 PPM
665.40	116														
	117				C41			69		14					PI
			CLAYEY SAND (SC); very dense; very stiff; light yellowish brown to yellowish red mottled; moist to wet; nonplastic to low plasticity fines; wet between EL 663.1 to 662.6 ft, minor weakly calcite cemented sand, intensely weathered soft (paleosol/regolith).												VOC=0.2 PPM
663.40	118														
	119														
661.40	120				S42	26 50/.2'						PP = 3.0 to 4.0			VOC=0.1 PPM
	121		METAMORPHIC ROCK, (GNEISS); medium-grained to aphanitic; thinly to moderately foliated (0.2 to 1.0 ft), foliations dip 20°, dark yellowish orange to light brown, decomposed to intensely weathered; very soft to soft; intensely fractured; joints dip from 60 to 80°, very thin slightly open fractures partly filled with clay and FeO (forms rubble), moderately thin totally silica healed fractures below EL +654.4 ft [fractures moderately rough; friable (Well graded SAND with CLAY (SW-SC), very dense). **[Wilson Quartz Diorite]**.		C43			100	0						
659.40	122														VOC=0.0 PPM
	123														
657.40	124														
	125				S44	60/.33'									
655.40	126				C45			51	0						
	127														
653.40	128														VOC=0.0 PPM
	129														
651.40	130				C46			0							
	131														
649.40	132														
	133		METAMORPHIC ROCK, (GNEISS); coarse-grained to very coarse-grained; generally foliated, pale yellowish brown to yellowish gray, intensely weathered, moderately soft to moderately hard, very intensely fractured, joints dip 55°, thin moderately open fractures partly healed with clay and FeO, some thin fractures (3 to 5 mm thick) moderately healed with silica or feldspar and dip 25 to 30°, and 55°; friable; estimated upper contact.											
647.40	134														
	135				C47			38	0						
645.40	136														
	137														
643.40	138														VOC=0.0 PPM
	139														
641.40	140				C48			42	0						
	141														
639.40	142														
	143														VOC=0.6 PPM
637.40	144														
	145														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B2**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		**1-26-09**	**5 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	145		*(continued).*		C49			70	10						UW, PL
635.40	146		METAMORPHIC ROCK, (GNEISS); medium-grained; generally foliated, pale yellowish brown to dark gray, intensely weathered, decomposed below EL 635.1 ft; moderately hard to hard; intensely fractured; below EL 635.1 ft, very soft (decomposed gneiss altered to clay with slickensides); rubble.							0	160				
	147														
633.40	148		METAMORPHIC ROCK, (GNEISS); generally foliated, light brownish gray to white, intensely weathered, moderately hard to hard, very intensely to intensely fractured, joints dip 60º, 75º, and 40 to 25º, very closely spaced fractures (7 mm spacing) below EL 633.4 ft; seams infilled with FeO and intensely weathered to decomposed mica (weathered to clay); fractures not healed.											VOC=0.4 PPM
	149														
631.40	150				C50			58	0						
	151		METAMORPHIC ROCK, (GNEISS);, light brownish gray to white, intensely weathered, moderately hard to hard, intensely to moderately fractured, joints dip 65 to 75º, closely to moderately spaced (0.4 to 0.1 ft), FeO and clay lined, not healed. Below EL 629.2 ft,, aphanitic to medium-grained, very intensely to intensely fractured, joints dip 25-30º and 65-75º (jointsets), very close to closely spaced (0.05 to 0.3 ft), subvertical joints not healed (FeO and clay infill); low angle joints moderately to totally healed with FeO and silica (0.5 to 10 mm thick).											
629.40	152														VOC=0.3 PPM
	153														
627.40	154														
	155				C51			56	16						
625.40	156		METAMORPHIC ROCK, (GNEISS); generally foliated, light gray to brownish gray, hard, intensely fractured, (decomposed seams); joints dip 80º, 50-55º, 65-25º, FeO and silica lined fractures are moderately healed to not healed; wet clay lined fractures (1 to 10 mm thick) not healed, slightly rough, slickensides on low angle shears, 5 to 30 mm fracture [spacing, lots rubble].											
	157														
623.40	158														VOC=1.1 PPM
	159														
621.40	160				C52			68	8						
	161														
619.40	162														
	163														VOC=0.5 PPM
617.40	164														
	165				C53			38	0						
615.40	166		METAMORPHIC ROCK, (GNEISS); intensely weathered, hard, very intensely to intensely fractured, fracture zone , forms rubble.												
	167		METAMORPHIC ROCK, (GNEISS); decomposed to intensely weathered, very soft to soft, possible veins/dike, seams weathered to clay (Well graded SAND with CLAY (SW-SC)).												
613.40	168														VOC=0.9 PPM
	169														
611.40	170				C54			48	0						UW, PL
	171		METAMORPHIC ROCK, (GNEISS); possibly thinly foliated (0.1 to 0.3 ft), yellowish gray, intensely weathered, hard, intensely fractured, continuous joints dip 60 to 70º and 25 to 40º, partly healed with silica and infilled with clay, slightly rough surfaces,.												
609.40	172									0	155				
	173														VOC=0.4 PPM
607.40	174														
	175														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B2**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		**1-26-09**	**6 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175		*(continued).*		C55			88	7						
605.40	176		METAMORPHIC ROCK, (SCHIST); fine- to medium-grained; intensely foliated (<3mm); intensely weathered to decomposed (possible altered mafic dike), dark gray, intensely weathered to decomposed (possible altered mafic dike); moderately hard; intensely to moderately fractured; fractures very closely spaced (10 to 15 mm), partly silica healed, remainder infilled with soft clay (not healed), [slightly to moderately open fractures (0.5 to 3 mm)].											
	177														
603.40	178														VOC=0.3 PPM
	179														
601.40	180		METAMORPHIC ROCK, (SCHIST); Chloritic, dark greenish gray, decomposed, very soft to soft, (decomposed to Lean CLAY (CL), medium plasticity, moist)).		C56			88	0						
	181		METAMORPHIC ROCK, (GNEISS); very thinly foliated, light gray to pale yellowish brown, intensely weathered to decomposed; mostly hard to some soft; very intensely to intensely fractured; soft clay lined fractures not healed (slightly open to moderately open, 0.5 to 2 mm), forms rubble (some Poorly graded GRAVEL with CLAY and SAND (GP-GC)).											
599.40	182														VOC=0.9 PPM
	183														
597.40	184		METAMORPHIC ROCK, (GNEISS);, medium light gray, intensely weathered, hard, intensely fractured, joint sets dip 80 to 70º, 60º, and 30º, fractures partly healed with silica and remainder infilled with soft clay (not healed, moderately open, 1 to 2 mm), slightly rough to smooth surfaces; rubble.											
	185				C57			85	10						
595.40	186														
	187		METAMORPHIC ROCK, (GNEISS);, fine-grained to medium-grained, medium light gray, intensely weathered to decomposed; hard to some very soft; very intensely to intensely fractured; joints dip 70º to 20º, very closely spaced (10 to 20 mm fracture spacing), siliceous & clay lined (1 to 2 mm), slightly rough to smooth surfaces [breaks down to rubble and coarse sand (some Poorly graded GRAVEL with SAND (GP))].											
593.40	188														
	189				C58			71	0						
591.40	190														
	191		METAMORPHIC ROCK, (GNEISS);, white to dark greenish gray, decomposed to intensely weathered; very soft to moderately soft; very intensely fractured; very closely spaced fractures (10 mm spacing) dip 70º, altered clay material is moist to wet (mostly Poorly graded GRAVEL with CLAY and SAND (GP-GC), moist to wet).											
589.40	192														
	193														
587.40	194		METAMORPHIC ROCK, (GNEISS); fine-grained to aphanitic; thinly to moderately foliated (0.2 to 0.4 ft), greenish gray to medium bluish gray, intensely to moderately weathered, hard, intensely fractured, fractures dip 20 to 30º, and 50º, closely spaced (0.2 to 0.3 ft), chlorite and slickensides on shear and fracture surfaces, fractures/shears partly calcite healed.		C59			80	0						
	195				C60			17	0						
585.40	196														
	197		METAMORPHIC ROCK, (GNEISS);, medium gray to white, mostly decomposed (80%) to intensely weathered; mostly very soft to little hard; intensely fractured; chloritic alteration, (mostly Poorly graded GRAVEL with CLAY and SAND (GP-GC); Pressure meter test (195-201 ft depth).											
583.40	198														
	199														
581.40	200														
	201				C61			93	0						
579.40	202		METAMORPHIC ROCK, (GNEISS);, medium-grained to fine-grained, medium gray to medium light gray, mostly moderately to intensely weathered (75%) with little thin (0.1 to 0.3 ft) decomposed intervals (25%); mostly hard to little very soft; intensely fractured, joints dip 75-70º, 50º & 25º, [closely spaced (0.1 to 0.3 ft), continuous, partly healed with silica, clay lined (not healed), slightly rough surfaces (little Poorly graded SAND with CLAY (SP-SC))].											
	203														VOC=0.9 PPM
577.40	204														
	205														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B2**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		**1-26-09**	**7 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205				C62			100	0						
575.40	206		METAMORPHIC ROCK, (GNEISS);, medium-grained, medium gray to medium light gray, mostly intensely weathered (70%) to some decomposed (30%); mostly moderately hard to some very soft; very intensely to intensely fractured; joints dip 70-80º, 50º, & 25 to 35º, very thin subvertical fractures very closely spaced (7 mm) [and totally silica healed, remaining lower angle joints are partly healed with silica and calcite and not healed with clay infill, slickensides plunge 20º on subvertical shears (some Lean CLAY with SAND (CL))].											
	207														
573.40	208														VOC=1.0 PPM
	209														
571.40	210				C63			86	0						
	211		METAMORPHIC ROCK, (GNEISS);, medium gray to medium dark gray, decomposed, very soft to soft, (Lean CLAY (CL), soft).												
569.40	212		METAMORPHIC ROCK, (GNEISS); medium-grained to fine-grained; very thinly to thinly foliated (dip 20º), medium gray to medium light gray, intensely to moderately weathered, moderately hard to hard, very intensely to intensely fractured, irregular discontinuous fractures dip 60 to 70º and 20º, fractures partly healed with chlorite and silica, slightly rough surfaces, 35% rubble.											VOC=0.8 PPM
	213														
567.40	214														
	215				C64			96	0						
565.40	216														
	217		METAMORPHIC ROCK, (GNEISS);, medium-grained, medium light gray to medium gray, mostly intensely to moderately weathered (80%) to little decomposed (20%); mostly moderately hard to little very soft; intensely fractured; joints dip 75º, 50º, and 25º, subvertical joints are very closely spaced (30 mm), low angle joints [are closely spaced (60 to 70 mm), continuous not healed fractures are lined with minor chlorite and rare calcite, moderately to slightly rough surfaces (little Lean CLAY (CL))].											VOC=0.5 PPM
563.40	218														
	219														
561.40	220				C65			100	0						
	221		METAMORPHIC ROCK, (GNEISS); medium-grained; foliated, medium gray, mostly moderately to intensely weathered (5% decomposed); mostly moderately hard to few soft; very intensely to intensely fractured; joints dip 70º and 20º, closely to very closely spaced (<0.1 to 0.2 ft) [subvertical very thin (0.5 mm thick) fractures moderately healed with silica, moderately rough surfaces]. Below EL 559.2 ft becomes, dark gray, (Pressuremeter test from 221.0 to 227.0 ft depth).		C66			76	0					
559.40	222														
	223														
557.40	224														
	225														
555.40	226				C67			100	0						
	227		METAMORPHIC ROCK, (GNEISS); medium-grained; foliated, medium light gray to medium gray, moderately to intensely weathered; moderately hard; very intensely to intensely fractured; joints dip 70 to 80º & 20-25º, continuous subvertical joints partly healed with silica and not healed with clay infill [slightly rough surfaces, 80% soft decomposed below EL 551.4 ft].		C68			77	20	3	156			UW, PTS, PL
553.40	228														
	229														VOC=0.8 PPM
551.40	230				C69			88	0						
	231														
549.40	232														
	233		IGNEOUS ROCK (QUARTZ DIORITE; medium-grained, medium light gray, moderately to slightly weathered, hard to very hard, intensely fractured, low angle moderately open joints lined with waxey chlorite, slickensides show 65º rake from horizontal in 50º dip shear planes; continuous joints dip 75º, 50º, and 20º, closely (40 mm) to very closely (10											VOC=0.8 PPM
547.40	234														
	235														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B2**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		**1-26-09**	**8 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235		mm) spaced, [moderate and low angle joints closely spaced, subvertical joints very closely spaced and moderately healed with very thin silica (0.5 to 1 mm thick)]. *(continued)*.		C70			94	22						
545.40	236														
	237		METAMORPHIC ROCK, (MARBLE) (partly replaced with QUARTZ DIORITE in patches); medium- to coarse-grained, light gray to medium light gray, moderately to intensely weathered; moderately hard; intensely fractured, low angle moderately open joints lined with waxey chlorite, high and low angle fractures moderately healed with calcite [fractures very closely spaced (20 to 25 mm), possible crinoidal debris in recrystalized mass].											
543.40	238														VOC=0.8 PPM
	239														
541.40	240				C71			83	15						
	241		At EL. 542.4 ft, becomes dark greenish gray, intensely fractured, joints dip 70º, 50 to 45º, and 20º, joints partly healed with calcite and chlorite infill to totally healed with calcite, 10% very soft decomposed interval altered to clay (few Lean CLAY (CL)).											
539.40	242														VOC=0.9 PPM
	243		METAMORPHIC ROCK, (MARBLE)(partly replaced with QUARTZ DIORITE in patches); medium-grained, dark greenish gray to light brownish gray, moderately to intensely weathered; moderately soft; intensely fractured, joints dip 80º , 50º, and 20º, partly to totally healed with calcite, moderately thin (1 to 2 mm) subvertical calcite veins very closely spaced (15 mm).		C72			92	0						
537.40	244														
	245														
535.40	246		METAMORPHIC ROCK, (MARBLE) (partly replaced with QUARTZ DIORITE in mixed patches and layers); medium- to coarse-grained, medium light gray to greenish gray, intensely to moderately weathered, moderately soft to moderately hard, intensely fractured, joints dip 75 to 60º, 50º, and 20º, joints partly to totally calcite healed (1 to 2 mm calcite veins), all continuous, some clay lined not healed open joints.											
	247				C73			50	0						
533.40	248														
	249		METAMORPHIC ROCK, (MARBLE);, medium-grained, greenish gray, intensely to moderately weathered, moderately hard, very intensely to intensely fractured, joints dip 20 to 30º and 60º, subvertical joints very closely spaced, low angle joints closely spaced, partly to totally calcite healed.		C74			80	0						
531.40	250				C75			80	0						
	251				C76			88	8						
529.40	252		IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, medium gray, intensely to moderately weathered, hard to very hard, intensely fractured, continuous joints dip 85 to 70º and 30º, very closely spaced subvertical joints partly healed with calcite and some infilled with clay and slightly open, low angle joints partly healed to totally healed with calcite (1 to 2 mm thick).											
	253														VOC=1.0 PPM
527.40	254														
	255				C77			80	7						
525.40	256														
	257														
523.40	258														VOC=0.9 PPM
	259		IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, medium gray, moderately to intensely weathered; hard; moderately to intensely fractured; continuous subvertical joints dip approximately 70º.											
521.40	260				C78			74	9						
	261														
519.40	262		IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, light olive gray to greenish gray, decomposed, very soft, (Lean CLAY (CL), stiff to hard clay (PP=1.0 to >4.5 tsf).											
	263														VOC=1.0 PPM
517.40	264														
	265														

(continued)

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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B2**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		**1-26-09**	**9 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	265		*(continued).*		C79			70	0						
515.40	266		IGNEOUS ROCK (DIORITE to QUARTZ DIORITE); medium- to coarse-grained, medium dark gray to medium light gray, intensely to moderately weathered, few (8%) decomposed intervals sometimes along fractures; moderately hard to hard (few zones very soft); intensely to moderately fractured, shear dipping 45° is waxey clay lined with slickensides showing 70° rake from horizontal on fracture plane, [slightly rough surface), joints dip 80 to 70°, 50°, and 20°, subvertical joints very closely spaced, low angle joints moderately to closely spaced, partly healed to not healed with calcite, clay lined (few Lean CLAY (CL) intervals)].											VOC=0.9 PPM
	267														
513.40	268														
	269				C80			90	0						
511.40	270														
	271														
509.40	272														
	273				C81			85	0						
507.40	274														
	275		Bottom of borehole at 275.0 ft bgs Borehole was converted to piezometer at the completion of drilling.												
505.40	276														
	277														
503.40	278														
	279														
501.40	280														
	281														
499.40	282														
	283														
497.40	284														
	285														
495.40	286														
	287														
493.40	288														
	289														
491.40	290														
	291														
489.40	292														
	293														
487.40	294														
	295														

CALTRANS BORING RECORD MET+ENG FIXED JOE - CALTRANS WITH REV Z3B2 Z3B5 Z3B7 ONLY SR-710TUNLS CT BORING LOGS11_23_09JPCOPY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B2**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	J. Pratt, M. Islam		**1-26-09**	**10 of 10**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Castle, B. Schell	2-4-09	2-13-09	34° 7' 52.6146" / 118° 9' 17.823" NAD83	R-09-Z3B3
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Cascade Drilling Inc.			' Lt Sta Bellefontaine St at St. John Ave	801.90 ft NAVD 88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Speed Star 30K	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Cal (2.4"), PQ core (3.2")			Automatic Hammer 140 lb. 30 inch drop	70%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Piezometer Installed on Completion			NM / 136.0 ft on 7-1-09	275.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		GRASS and LANDSCAPE (Fill).												This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007) except as noted in Appendix A1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
	1		SILTY SAND (SM); Loose, yellowish brown, medium to fine SAND [ALLUVIUM].												
799.90	2														
	3														
797.90	4														
	5														
795.90	6														
	7														
793.90	8														
	9														
791.90	10		Dense, yellowish brown mottled with brown, moist, fine SAND, micaceous, oxidized.		S1	9 12 15	27	100							
	11														
789.90	12														
	13														
787.90	14														
	15		Poorly graded SAND with GRAVEL (SP); dense, yellowish brown, moist, subangular GRAVEL, max. 3/4" dia.; coarse SAND, micaceous, granitic source.		D2	28 50/5		100							
785.90	16														
	17														
783.90	18														
	19														
781.90	20				S3	16 29 36	65	100							
	21														
779.90	22														
	23														
777.90	24														
	25														

(continued)

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Department of Transportation
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z3B3
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	D/D	07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	K.T		6-22-09	1 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		Poorly graded SAND with GRAVEL (SP) *(continued)*. Same as above. At EL. 775.99', becomes GRAVEL max. 2 1/4" dia.		D4	20 50/5		100							
775.99	26														
	27														
773.99	28														
	29														
771.99	30				S5	12 22 33	55	100							
	31														
769.99	32														
	33														
767.99	34														
	35				D6	50/6		100							
765.99	36														
	37														
763.99	38														
	39														
761.99	40		SILTY SAND (SM); very dense, yellowish brown and strong brown, moist, fine to very fine SAND, micaceous, oxidized.		S7	18 24 38	62	100							
	41														
759.99	42														
	43														
757.99	44														
	45		Assume Silty SAND as above.		D8	50/6		0							Note: Sampler Jammed with rock that fell into hole
755.99	46														
	47														
753.99	48														
	49														
751.99	50		No recovery.		D9	24 50/3		0							
	51														
749.99	52														
	53														
747.99	54														
	55														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B3**
DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.T		**6-22-09**	**2 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SILT (ML); yellowish brown, moist, nonplastic fines, finely micaceous.		S10	17 50/1		100							
745.99	56		GRAVELLY SILT (ML); medium stiff, dark yellowish brown, moist, about 50%, GRAVEL, max. 1" dia.; nonplastic fines, GRAVEL consists of diorite, subrounded to subangular, oxidized.												
	57														
743.99	58														
	59														
741.99	60		SILT (ML); yellowish brown, moist, finely micaceous.		D11	50/0.5		100							
	61		Poorly graded SAND with GRAVEL (SP); very dense, dark yellowish brown, moist, about 10% GRAVEL, max.1" dia.; coarse to fine SAND, GRAVEL consist of diorite, subangular, uncemented, unbedded.												
739.99	62														
	63														
737.99	64														
	65														
			SILTY SAND (SM); very dense, yellowish brown to brown, moist, trace fine GRAVEL, coarse to medium SAND.		S12	29 39 50/4		100							
735.99	66														
	67														
733.99	68														
	69														
731.99	70		SILTY CLAY (CL-ML); hard, brown to dark yellowish brown, moist, medium plasticity; 0.2" to 0.4" thick beds, horizontal bedding, oxidized, trace of organic material.		D13	19 50/5		100							
	71														
729.99	72		SILTY SAND (SM); dense, brown mottled with yellowish brown, moist, fine GRAVEL, coarse to fine SAND, about 20% nonplastic fines, dendritic manganese.												
	73														
727.99	74														
	75				S14	50/6		100							
725.99	76														
	77														
723.99	78														
	79														
721.99	80		SILTY SAND with GRAVEL (SM); very stiff, dark brown mottled with dark yellowish brown, about 10% fine GRAVEL, max. 1/2" dia; coarse to fine SAND, GRAVEL consist of diorite, subrounded to subangular, increase in fine towards bottom, unbedded, one 0.08"-thick vein.		D15	9 18 27	45	100							
	81														
719.99	82														
	83														
717.99	84														
	85														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B3**
DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.T		**6-22-09**	**3 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	85													
715.99	86		Well-graded SAND with GRAVEL (SW); very dense, yellowish brown, moist, about 30% subangular to subrounded GRAVEL, max. 1.5" dia.; coarse to fine SAND, gravel consist of diorite.		S16	50/6		100						
	87													
713.99	88													
	89													
711.99	90				D17	32	80	100				PP =		
	91		SILTY SAND (SM); very dense, brown to yellowish brown, moist, about 20% fine GRAVEL, medium to fine SAND, sharp contact 20° dip; gravel consist of igneous and metamorphic rocks, more oxidized, more rounded, grading down to bottom.			39						2.75		
709.99	92					41								
	93													
707.99	94													
	95													
705.99	96		Poorly graded SAND with SILT and GRAVEL (SP-SM); very dense, brown to yellowish brown, moist, fine GRAVEL, max. 1/4" dia.; coarse to fine SAND, 2" to 4" thick horizontal bedding.		S18	23	84	100						
	97					34								
703.99	98					50								
	99													
701.99	100				D19	10		100						
	101		SILTY SAND (SM); very dense, yellowish brown mottled with brown, moist, coarse to fine SAND, micaceous, oxidized.			50/5								
699.99	102													
	103													
697.99	104													
	105				S20	20		100						
695.99	106					50/6								
	107													
693.99	108													
	109													
691.99	110		At EL. 691', trace GRAVEL, max. 1/4" dia.		D21	20		100						
	111					50/6								
689.99	112													
	113													
687.99	114													
	115													

(continued)

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BORING RECORD				**R-09-Z3B3**
DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**LA**	**710**	**D/D**	**7-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.T		**6-22-09**	**4 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	115		No recovery.		S22	20 50/6		0							
685.99	116														
	117														
683.99	118														
	119														
681.99	120		Poorly graded SAND with GRAVEL (SP); very dense, yellowish brown, moist, coarse to fine subangular GRAVEL, max. 1.5" dia.; coarse to fine SAND, gravels consist of feldspar rich granitic rock.		S23	50/6		100							
	121														
679.99	122														
	123														
677.99	124														
	125		Well-graded GRAVEL (GW); very dense, gray to dark gray, moist, coarse to fine GRVEL; gravel consist of diorite and granite, slightly weahtered, hard, slightly fractured, 10% dark minerals, oxidized.		D24	50/5		100							
675.99	126														
	127				C1			55							
673.99	128											PP = 3			
	129		SILT (ML); very stiff, nonplastic, slightly micaceous.												
671.99	130		SILTY SAND (SM); medium dense, brown to dark yellowish brown, moist, fine SAND, about 5% low plasticity fines, very stiff, sharp contact.		C2			100				PP = 3			
	131														
669.99	132		Well-graded GRAVEL with SAND (GW); dense, brown to dark yellowish brown, moist, trace COBBLE; coarse GRAVEL; max. 2.5" dia.; coarse to fine SAND; about 5% low plasticity fines; gravel consist of diorite, gabbro and gneiss, hard to decomposed.												
	133				C3			55							
667.99	134		SILTY SAND (SM); dense to medium dense, dark yellow to brown, medium to fine SAND; about 20% nonplastic fines.												
	135														
665.99	136		Well-graded GRAVEL with SAND (GW); dense, multi colored, moist, trace BOULDER; about 20% COBBLES; coarse to fine SAND; nonplastic fines; cobbles consist of diorite, quartz diorite, gabbro, granite, gneiss rocks, hard to decomposed, rounded to subrounded.												
	137														Lost core at EL. 666.5' to 662'
663.99	138														
	139														
661.99	140				C4			58							Lost core
	141				C5			67							
659.99	142														
	143														
657.99	144				C6			22							Lost core
	145														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B3**
DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.T		**6-22-09**	**5 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	145		Well-graded GRAVEL with SAND (GW) *(continued)*.												
655.99	146				C7			42							Difficult to drill
	147				C8			27							
653.99	148														
	149														
651.99	150														
	151														
649.99	152		Poorly graded SAND with GRAVEL (SP); dense, reddish brown, moist, about 35% coarse to fine GRAVEL, max. 2.75" dia.; coarse SAND; gravel consist of igneous and metamorphic rocks, hard to decomposed, subrounded to rounded, horizontal bedding.		C9			75							most likely Pleistocene age soil horizon based on oxidation and density
	153														
647.99	154		At EL. 648', becomes yellowish brown, moist, wide variety of igneous and metamorphic rocks, hard to decomposed.		C10			100							
	155														
645.99	156		COBBLES with some well graded SAND with GRAVEL; medium desne to dense, brown and yellowish brown, moist, about 60% COBBLES, medium to coarse SAND; cobbles consist of igneous and metamorphic rocks, well rounded to subrounded, hard to decomposed.												
	157														
643.99	158														
	159				C11			0							
641.99	160														
	161														
639.99	162														
	163														
637.99	164				C12			50							
	165														
635.99	166														
	167														
633.99	168		Poorly graded SAND (SP); dense, yellowish brown, moist, coarse SAND.												
	169		SILT (ML); stiff, yellowish brown, moist, nonplastic, micaceous. no bedding.		C13			60							Lost core at top
631.99	170		Well-graded SAND with GRAVEL (SW); dense, yellowish brown, moist, little GRAVEL, max. 4" dia.; coarse SAND, gravel consist of igneous and metamorphic rocks.												
	171														
629.99	172														
	173														
627.99	174				C14			60							
	175														

(continued)

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BORING RECORD				**R-09-Z3B3**
DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.T		**6-22-09**	**6 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175														See note at end of log regarding RQD.
625.99	176				C14			60							
	177		Well-graded SAND with GRAVEL (SW) *(continued)*.												
623.99	178		At EL. 624.2', gabbro boulder, soft, crumbly.												
	179				C15			70							
621.99	180		COBBLES , BOULDERS, GRAVEL; multi colored, about 50% COBBLES, about 10% BOULDERS, about 30% GRAVEL, about 10% coarse SAND matrix, cobbles consist of igneous and metamorphic rocks, rounded to subrounded, hard to decomposed, some oxidized, some fresh.												
	181														
619.99	182														
	183														
617.99	184				C16			48							
	185														
615.99	186														
	187														
613.99	188														
	189				C17			92	0						
611.99	190		IGNEOUS and METAMORPHIC ROCKS (DIORITE, QUARTZ DIORITE, QUARTZ MONZONITE, foliated DIORITE, GNEISS); intersecting intrusive bodies and dikes; fine-grained to coarse-grained, light gray to bluish green, intensely weathered, soft, (FAULT GOUGE, intensely sheared and altered to SANDY CLAY; stiff, coarse to fine SAND, high plasticity fines) (WILSON QUARTZ DIORITE).												
	191														
609.99	192														
	193														
607.99	194				C18			67	0			PP = 3.5 to 4.5			
	195														
605.99	196														
	197				C19			87	0			PP = 4.5			
603.99	198														
	199														
601.99	200														
	201														
599.99	202														
	203														Lost core
597.99	204		At EL. 597.5', becomes FAULT GOUGE.		C20			79	0						
	205														

(continued)

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DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.T		**6-22-09**	**7 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205														
595.99	206				C20			79	0						See note at end of log regarding RQD.
	207														
593.99	208														
	209														
591.99	210														Lost core
	211		At EL. 593', sheared, altered igneous and metamorphic rocks in SANDY CLAY matrix, dark gray to bluish green, about 50% dark minerals, joints and shears dipping 35° to 45°, clay filling small scale fault, dipping 40°.		C21			75	0			PP = 4.5			
589.99	212														
	213														
587.99	214														
	215														
585.99	216														Lost core
	217														
583.99	218				C22			83	0						
	219														
581.99	220														
	221														
579.99	222				C23			40	0						
	223														
577.99	224														Lost core
	225														
575.99	226														
	227				C24			73	0						
573.99	228														
	229														
571.99	230														
	231				C25			58	0						
569.99	232		At EL. 569.5', hard zones; highly fractured and sheared igneous and metamorphic rocks, decomposed.												
	233														
567.99	234														
	235														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235														
565.99	236				C26			10	0						See note at end of log regarding RQD. Very poor recovery
	237														
563.99	238														
	239		At EL. 562', sheared DIORITE, soft, decomposed, oxidized, altered.												
561.99	240				C27			0	0						
	241														
559.99	242														
	243														
557.99	244				C28			50	58			PP = 4.5			
	245		At EL. 556.6', hard fragment of sheared diorite, max. 2.25" dia.												
555.99	246														
	247		At EL. 555', fault gouge zone with CLAYEY SAND; about 2% GRAVEL, about 64% coarse to fine SAND, about 34% nonplastic fines; gravel consists of igneous and metamorphic rocks, decomposed, intensely fractured and sheared.							13	125	PP = >4.5			PI
553.99	248				C29			100	100						Difficult to drill at EL. 554'
	249														
551.99	250		IGNEOUS and METAMORPHIC ROCKS (DIORITE): fine grained to coarse grained, gray, moderately weathered, hard, intensely fractured, abundant soft zones of sheared and altered rocks.												
	251														
549.99	252		At EL. 549.8', slickensides on fault surface, reddish brown, oxidation, clay filling, dipping 35°.												
	253		At EL. 548', minor scale fault dipping 30°.												
547.99	254				C30			98	45	4					CS & EM, UC
	255		At EL. 546', altered DIORITE, soft to moderately soft, fractured.												
545.99	256														
	257		At EL. 545', wavy fracture with oxidized clay filling, smooth polished surface, dipping 30°.												
543.99	258														
	259		At EL. 543', becomes healed fault, dipping 40°, abundant slickenside.												UC
541.99	260		At EL. 542.5', FAULT GOUGE, light gray, very soft, altered to sandy clay.												
	261		At EL. 540.5', recemented igneous rock, moderately hard, altered.												
539.99	262														
	263														
537.99	264				C31			100	0						
	265														

(continued)

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Department of Transportation
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B3**
DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.T		**6-22-09**	**9 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	265		*(continued).*		C31			100	0						See note at end of log regarding RQD.
535.99	266		At EL. 535.5', shattered zone, moderately hard, 1.25" wide.												
	267														
533.99	268														
	269		At EL. 533', calcite crystals, max. 1/4" dia.												
531.99	270														CS & EM, PTS
	271				C32			98	0			PP = 4.5			
529.99	272		IGNEOUS ROCK (altered DIORITE), coarse-grained, light gray, predominantly very soft, locally hard, intensely fractured, small scale faults, dipping 50° to 70°, recrystallization along fault plane, abundant FeO on joint and fault surfaces, hydrothermally altered, Plagioclase 40%,Hornblende 29%, Chlorite 8%, Quartz 8%, biotite 5%, K-feldspar 1%, Calcite 3%, weak directional fabric.											
	273														
527.99	274														
	275		At EL. 528', becomes intensely fractured.												
525.99	276		Bottom of borehole at 275.5 ft bgs Bottom of borehole is at elevation 526.5 ft. Borehole converted to piezometer at the completion of drilling.												
	277														
523.99	278														
	279														
521.99	280														
	281														
519.99	282														
	283														
517.99	284														
	285														
515.99	286														
	287														
513.99	288														
	289														
511.99	290														
	291														
509.99	292														
	293														
507.99	294														
	295														

CALTRANS BORING RECORD MET+ENG FIXED SR710_BORINGLOG_3_28_2010.GPJ CALTRANS LIBRARY.GLB 3/28/10

Department of Transportation
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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B3**
DIST.	COUNTY	ROUTE	POSTMILE	EA
7	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K.T		**6-22-09**	**10 of 10**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D. Jankly	3-2-09	3-6-09	34° 7' 58.7712" / 118° 8' 54.5316" NAD83	R-09-Z3B4
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Cascade Drilling Inc.			' Lt Sta (Fillmore St. e/o S. Raymond Ave.)	768.0 ft NAVD 88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Speedstar 30k	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT(1.4"), Cal (2.4"), PQ core (3.2")			Automatic Hammer 140 lb. 30 inch drop	70%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite and cement grout backfill			NM	N/A	276.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT 4" thick.												This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
	1		Road base material, 4" thick.												
			CLAYEY SAND with GRAVEL (SC); yellowish brown; moist [FILL].												
766.00	2				D01										
	3														
764.00	4														
	5														Hand Auger to 5'
762.00	6														
	7		SILTY SAND (SM); dense; light reddish brown; moist; coarse to fine SAND; low plasticity fines [OLDER ALLUVIUM].												
760.00	8														
	9														
758.00	10				S02	10 19 21	40	100							VOC = 2.5 ppm
	11														
756.00	12														
	13														
754.00	14														
	15		Medium dense; 2% fine GRAVEL, 60% coarse to fine SAND, 38% fines.		S03	9 16 19	35	67		17	107				PI, PA
752.00	16														
	17														
750.00	18														
	19														
748.00	20		Poorly graded SAND with GRAVEL (SP); very dense; light reddish brown; moist; fine GRAVEL; coarse to fine SAND; weak cementation.		S04	30 40 50/5"		71							VOC = 2.6 ppm
	21														
746.00	22														
	23														
744.00	24														
	25														

(continued)

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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z3B4
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	D/D	07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	D. Jankly		5-7-09	1 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		Poorly graded SAND with GRAVEL (SP) *(continued)*.		S05	50/4"		0							
742.00	26														
	27														
740.00	28														
	29														
738.00	30				S06	50/6"		0							
	31														
736.00	32														
	33														
734.00	34														
	35		SILT with SAND (ML); hard; brown; moist; little medium to fine SAND; mostly low plasticity fines.		S07	26 37 46	83	89							VOC = 2.0 ppm
732.00	36														
	37														
730.00	38														
	39														
728.00	40		At EL. 728.0 ft, becomes grayish brown with orange (FeO2) stained zones; 22% medium to fine SAND, 78% fines.		S08	18 43 50/3"		100		24	104				PI, PA
	41														
726.00	42														
	43														
724.00	44														
	45				S09	11 19 31	50	100							VOC = 1.7 ppm
722.00	46														
	47														
720.00	48														
	49														
718.00	50		SILTY SAND (SM); very dense; grayish brown with orange (FeO2) stained zones; moist; 8% coarse to fine GRAVEL, 50% coarse to fine SAND, 42% fines, micaceous.		S10	28 50/4"		100		16	118				PI, PA
	51														
716.00	52														
	53														
714.00	54														
	55														

(continued)

Department of Transportation
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REPORT TITLE **BORING RECORD**				HOLE ID **R-09-Z3B4**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **D/D**	EA **07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER **N/A**	PREPARED BY **D. Jankly**		DATE **5-7-09**	SHEET **2 of 10**

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		Poorly graded SAND with GRAVEL (SP); brown; moist; fine GRAVEL; coarse to fine SAND.		S11	50/5"		100							VOC = 2.2 ppm
712.00	56														
	57														
710.00	58														
	59														
708.00	60				S12	50/4"		0							
	61														
706.00	62														
	63														
704.00	64														
	65		SILTY SAND (SM); very dense; gray to orange brown; moist; 1% fine GRAVEL, 51% predominantly fine SAND, 48% low plasticity fines.		S13	39 42 43	85	100		24					PA VOC = 2.2 ppm
702.00	66														
	67														
700.00	68														
	69														
698.00	70				S14	50/4"		0							
	71														
696.00	72														
	73														
694.00	74														
	75				S15	19 50		75		21					VOC = 1.7 ppm
692.00	76														
	77														
690.00	78														
	79														
688.00	80				S16	26 50/1"		0							
	81														
686.00	82														
	83														
684.00	84														
	85														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**5-7-09**	**3 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		Poorly graded GRAVEL (GP); very dense; light brown and dark gray; moist; cobbles to 3" dia. derived from granite and gneiss (slightly weathered, subangular to subrounded).		S17	50/5"		0	0						
682.00	86				C18										
	87														
680.00	88														
	89														
678.00	90				C19			38	0						
	91														
676.00	92														
	93														
674.00	94		SILTY SAND (SM); brown; moist; 2% fine GRAVEL, 65% predominantly medium to fine SAND, 33% low plasticity fines.		C20			50	33	12					PA
	95		At EL. 673.0 ft, observed 2" thick, very dark brown silty clay to clayey silt bed, probable paleosol.												
672.00	96		Poorly graded SAND with GRAVEL (SP); brown; moist; few fine GRAVEL; medium to fine SAND; low plasticity fines.												
	97														
670.00	98														
	99														
668.00	100		SANDY SILT (ML); soft to medium stiff; brown; moist to wet; fine SAND; homogeneous, micaceous.		C21			20	0						
	101														
666.00	102														
	103														
664.00	104														
	105		Poorly graded GRAVEL (GP); light brown and dark gray; moist.		C22			80	60						
662.00	106		SILTY SAND (SM); brown; moist to wet; 1% fine GRAVEL, 55% predominantly fine SAND, 44% low plasticity fines, homogenous.							13					PA
	107														
660.00	108														
	109														VOC = 51.3 ppm
658.00	110				C23			54	30						
	111		Poorly graded GRAVEL with SAND (GP); light brown and dark gray; moist; coarse, subangular to subrounded GRAVEL; moderately to slightly weathered, moderately hard to hard, subangular to subrounded; clasts. Clasts composed of granite, diorite, and gneiss.												
656.00	112														
	113														
654.00	114														
	115														

(continued)

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Department of Transportation
Division of Engineering Services
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Office of Geotechnical Design - South 1

REPORT TITLE: **BORING RECORD**
HOLE ID: **R-09-Z3B4**

DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	D/D	07-187900

PROJECT OR BRIDGE NAME: **SR-710 TUNNEL TECHNICAL STUDY**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	D. Jankly	5-7-09	4 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	115		Poorly graded GRAVEL with SAND (GP) *(continued)*.		C24			30	0						
652.00	116														
	117														
650.00	118														
	119														
648.00	120				C25			16	0						
	121														
646.00	122														
	123														
644.00	124														
	125		At EL. 643.0 ft, observed 5-inch intersected granitic clast.		C26			40	0						
642.00	126														
	127		At EL. 641.4 ft, observed 5-inch intersected granitic clast.												
640.00	128														
	129														
638.00	130				C27			40	0						
	131														
636.00	132		At EL. 636.3 ft, observed 3-inch intersected granitic clast.												
	133														
634.00	134														
	135				C28			50	0						
632.00	136														
	137		At EL. 631.5 ft, observed 5-inch intersected granitic clast. At EL. 630.7 ft, observed 3-inch intersected granitic clast.												
630.00	138														
	139														
628.00	140				C29			0	0						
	141														
626.00	142														
	143														
624.00	144														
	145														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B4**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **D/D**	EA **07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER **N/A**	PREPARED BY **D. Jankly**		DATE **5-7-09**	SHEET **5 of 10**

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	145				C29			0	0						
622.00	146				C30			25	0						
	147														
620.00	148														
	149														
618.00	150				C31			20	0						
	151		At EL. 616.8 ft, observed 3-inch intersected granitic clast.												
616.00	152														
	153														
614.00	154														
	155		Poorly graded SAND with SILT (SP-SM); moist to wet; 9% fine GRAVEL, 84% coarse to fine SAND, 7% low plasticity fines.		C32			50	20	14					PA
612.00	156														VOC = 10.0 ppm
	157		SILTY SAND (SM); moist to wet; trace fine GRAVEL; medium to fine SAND; homogeneous.												
610.00	158		At EL. 610.4 ft, observed SAND with faint subhorizontal laminations.												
	159														
608.00	160		Poorly graded GRAVEL with SAND (GP); and COBBLES, to poorly graded SAND with GRAVEL and COBBLES, dark olive brown, moist to wet. Recovered predominately as gravel and cobble fragments with limited sandy matrix.		C33			6	0						
	161														
606.00	162														
	163														
604.00	164														
	165				C34			20	0						
602.00	166														
	167														
600.00	168														
	169														
598.00	170				C35			40	0						
	171														
596.00	172														
	173														
594.00	174														
	175														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**5-7-09**	**6 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175		Poorly graded GRAVEL with SAND (GP) *(continued)*.		C36			0	0						See note at end of log regarding RQD.
592.00	176														
	177														
590.00	178														
	179														
588.00	180				C37			0	0						
	181														
586.00	182														
	183														
584.00	184														
	185		Gravel, cobbles and rock fragments in coarse-grained sandy matrix. Clasts are subrounded to well rounded, granitic and metamorphic derived.		C38			40	0						
582.00	186														
	187														
580.00	188														
	189														
578.00	190				C39			40	0						
	191		At EL. 577.2 ft, observed 2 to 4-inch thick intersected diorite and granite clasts.												
576.00	192														
	193														
574.00	194														
	195				C40			37	0						
572.00	196														
	197														
570.00	198														
	199														
568.00	200		At EL. 568.0 ft, observed decomposed bedrock consisting of Silty Clay.		C41			94	40						VOC = 17.0 ppm
	201		IGNEOUS ROCK (DIORITE), fine-grained, massive, dark greenish gray mottled with white, intensely to moderately weathered, moderately hard, moderately fractured, some fractures with up to 1/8" thick, soft, moist silty lining. Fractures are undulatory and irregular, tight to slightly open, smooth to moderately rough, no reaction to HCL sol. Becomes locally foliated at depth. **[WILSON QUARTZ DIORITE]**											
566.00	202														
	203														VOC = 1.2 ppm
564.00	204		At EL. 567.0 ft, observed joint, dipping 90 to 70°, 0 to 1 mm aperture, smooth to moderately rough.												
	205														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/5/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**5-7-09**	**7 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205		At EL. 565.2 ft, observed joint, dipping 80°, 0 to 1 mm aperture, smooth to moderately rough.		C42			66	20						
562.00	206		At EL. 563.5 ft, observed intensely fractured zone, 3" thick.												
	207		*(continued)*. At EL. 562.9 ft, becomes moderately weathered. Locally intensely fractured zone, 1.6' thick.												
560.00	208		At EL. 561.2 ft, observed joint, dipping 40°, 1 to 3 mm aperture, smooth to moderately rough.												
	209		At EL. 561.1 ft, observed joint, dipping 70°, 1 to 3 mm aperture, smooth to moderately rough.												
558.00	210		At EL. 561.0 ft, becomes fine-grained to medium-grained, moderately soft.		C43			60	20						VOC = 76.6 ppm
	211		At EL. 560.5 ft, observed joint, dipping 50°, 1 to 3 mm aperture, smooth to moderately rough.												
556.00	212		At EL. 560.2 ft, observed joint, dipping 20°, 1 to 3 mm aperture, smooth to moderately rough.												
	213		At EL. 557.5 ft, observed shear, dipping 50 to 5°, undulatory, irregular shear, dusky red, paperthin clay lining, striated along strike, parallels faint foliations 4" above and 4" below.												
554.00	214		At EL. 557.3 ft, observed joint, dipping 30 to 0°, 2 mm aperture, rough, no infill.												
	215		At EL. 556.9 ft, observed shear, dipping 40°, tight, moderately rough, 1/8" thick clay lining.												
552.00	216		At EL. 556.3 ft, observed shear, dipping 45°, tight, moderately rough, 1/8" thick clay lining, intensely fractured below shear.		C44			86	52						
	217		At EL. 556.2 ft, becomes intensely to moderately weathered, soft, intensely fractured.												VOC = 1.7 ppm
550.00	218		At EL. 552.8 ft, observed joint, dipping 35°, 1 to 2 mm aperture, moderately rough.							1	162				UC
	219		At EL. 552.2 ft, observed shear/fault zone, dipping 30°, 3" thick, highly sheared zone with dusky red clay lining (medium plasticity), along sub parallel shears, polished and striated.												
548.00	220		At EL. 551.9 ft, becomes coarse-grained, moderately weathered, moderately soft, intensely fractured.		C45			100	60						
	221		At EL. 551.0 ft, becomes intensely to moderately fractured, joint, dipping 60 to 50°, 3 mm aperture, moderately rough.												PL, UC
546.00	222		At EL. 549.5 ft, observed faint clay lined discontinuity, possible shear, irregular and undulatory, dipping 70 degrees to vertical. Clay is greenish gray, soft, wet, low to medium plasticity. Very weak.												
	223		At EL. 547.0 ft, observed intensely fractured, joint, dipping 60°, smooth. Very weak.												
544.00	224		At EL. 546.0 ft, observed shear, dipping 60°, polished and striated.												
	225		At EL. 545.5 ft, observed shear, dipping 90 to 45°, tight, 1/16" to 1/8" thick dusky red clay lining, undulatory.		C46			73	27						VOC = 2.3 ppm
542.00	226		At EL. 545.2 ft, observed joint, dipping 70 to 60°, 1-2mm aperture, moderately rough.												
	227		At EL. 545.0 ft, becomes intensely to moderately weathered, soft.												
540.00	228		At EL. 544.0 ft, observed shear, dipping 90 to 60°, 1/8" thick dusky red clay lining, undulatory.												VOC = 4.7 ppm
	229		At EL. 543.5 ft, observed joint, dipping 65°.												
538.00	230		At EL. 541.5 ft, becomes moderately weathered, moderately hard.												
	231		At EL. 541.0 ft, observed joint, dipping 80 to 40°, 2-4mm aperture, moderately rough.		C47			100	30						
536.00	232		At EL. 540.5 ft, observed joint, dipping 70°, 2mm aperture, moderately rough.												
	233		At EL. 540.2 ft, observed joint, dipping 60°, 2mm aperture, moderately rough.												
534.00	234		At EL. 539.6 ft, observed joint, dipping 60°, 2mm aperture, moderately rough.												
	235		At EL. 537.5 ft, observed joint, dipping 70°, numerous subparallel joints within 2" thick fractured zone. 2-3mm aperture, slightly rough.												
			At EL. 536.4 ft, observed joint, dipping 60 to 0°, 1-2mm aperture, moderately rough.												
			At EL. 535.7 ft, observed fault, dipping 50°, paperthin clay lining, 1-2mm thick, smooth. Becomes fine grained, very dark gray, slightly weathered, hard, and												VOC = 10.5 ppm

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**5-7-09**	**8 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235		moderately to intensely fractured below fault. At EL. 534.5 ft, observed shear, dipping 70°, tight, paperthin clay lining.		C48			100	33						PTS
532.00	236		At EL. 534.0 ft, observed shear, dipping 40°, paperthin dusky red clay lining, striated roughly downdip. Vein dipping 70 degrees with 1/8" thick carbonate infill.												PL
	237		At EL. 533.2 ft, observed shear, dipping 25°, paperthin dusky red clay lining, striated roughly downdip.												VOC = 0.8 ppm
530.00	238		At EL. 533.0 ft, PTS - Quartz Diorite, Plutonic Rock with allotriomorphic-granular texture.		C49			100	0						
	239		At EL. 532.7 ft, becomes moderately to slightly weathered, hard, intensely to moderately fractured.												
528.00	240		At EL. 532.4 ft, observed fault, dipping 70°, 3/8" reverse offset, tight, striated roughly downdip, offsets 1/16" thick carbonate lined vein.												
	241		At EL. 532.1 ft, observed 1/4" thick vein with carbonate infill.												
526.00	242		At EL. 531.6 ft, observed shear, dipping 50 to 45°, two shears with paperthin dusky red clay lining. Unit is medium strong.												VOC = 5.7 ppm
	243		At EL. 530.9 ft, observed shear, dipping 70 to 25°, undulatory, dusky red clay lining, striated roughly parallel to strike.		C50			100	0						
524.00	244		At EL. 530.5 ft, observed shear, dipping 65 to 25°, three shears with paperthin, dusky red clay lining.												
	245		At EL. 529.6 ft, observed joint, dipping 90 to 80°, very intensely fractured, numerous joints with olive yellow staining.		C51			100	0						
522.00	246		At EL. 529.2 ft, becomes very intensely fractured. At EL. 528.3 ft, observed shear, dipping 75 to 65°, 3-4mm aperture with dusky red clay film, slightly to moderately rough.												
	247														VOC = 0.2 ppm
520.00	248		At EL. 527.3 ft, observed shear, dipping 70°, 2-3mm aperture, striated with paperthin dusky red clay lining. At EL. 526.7 ft, observed shear, dipping 60°, 2-3mm aperture, paperthin dusky red clay lining.		C52			83	33						
	249		At EL. 526.0 ft, observed shear, dipping 90 to 70°, 2-3mm aperture, paperthin dusky red clay lining.												PL
518.00	250		At EL. 525.2 ft, observed shear, dipping 90 to 80°, 4mm aperture, 1/8" thick dusky red clay lining.												CAI
	251		At EL. 523.5 ft, observed shear, dipping 40 to 20°, three shears and numerous fractures from 244.2 to 245 ft bgs, with yellowish red and dark red lining.												
516.00	252		At EL. 522.9 ft, contains joint, dipping 30°, moderately rough.												
	253		At EL. 522.0 ft, observed shear, dipping 50 to 40°, three shears from 245.8 to 246.5 ft bgs, clay lined. At EL. 521.5 ft, becomes soft to moderately soft from 246.5' to 247.5'.												VOC = 7.9 ppm
514.00	254		At EL. 520.5 ft, observed shear, dipping 65°, 2mm aperture, clay lined, striated downdip.												
	255		At EL. 520.0 ft, becomes fine-grained, dark greenish gray to light greenish gray, slightly weathered, hard, intensely to moderately fractured.		C53			75	0						
512.00	256		At EL. 519.5 ft, observed joint, dipping 30°, unit is weak.												
	257		At EL. 518.8 ft, observed joint, dipping 30 to 20°. At EL. 518.1 ft, observed shear, dipping 60 to 40°, 2mm aperture, dusky red clay lining.												VOC = 6.9 ppm
510.00	258		At EL. 516.8 ft, observed shear, dipping 30°, 2mm aperture, clay lined, moderately rough.												
	259		At EL. 515.0 ft, observed joint, dipping 90°, numerous carbonate lined joints up to 1/16" thick.		C54			83	20						
508.00	260		At EL. 511.0 ft, observed joint, dipping 60°, carbonate lined joint or shear, dusky red lining, tight 1/16" thick. At EL. 508.5 ft, observed foliation joint, dipping 40°, faint.												
	261		At EL. 508.4 ft, observed joint, dipping 60°, paperthin carbonate lining, tight.												
506.00	262		At EL. 507.8 ft, observed numerous carbonate lined joint faces, scattered dusky red lined joints and shears.		C55			100	25						
	263		At EL. 505.7 ft, observed shear/fault zone, dipping 45°, roughly 1' thick gouge zone with highly polished fault plane at 263', striated down dip. Gouge consists of light greenish gray bentonitic clay with abundant diorite gravel to 1/4" dia. Gouge is moist, stiff, highly plastic.												VOC = 6.8 ppm
504.00	264		At EL. 503.9 ft, becomes moderately fractured, shear,												
	265														

(continued)

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Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**5-7-09**	**9 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	265		dipping 40°, clay lined.		C55			100	25						
502.00	266		At EL. 503.7 ft, observed joint, dipping 90°, 2mm aperture.		C56			88	0						
	267		At EL. 503.5 ft, observed fault, dipping 65°, 1/4" thick, soft clay gouge, striated down dip. At EL. 502.9 ft, observed joint, dipping 60°, 2mm aperture, slightly to moderately rough.												
500.00	268		At EL. 502.5 ft, observed faint, undulatory, subhorizontal foliations.												VOC = 7.3 ppm
	269		At EL. 502.0 ft, observed intensely fractured, shear, dipping 60°, 2mm aperture, clay lined, striated downdip.												
498.00	270		At EL. 501.8 ft, observed joint, dipping 80°. At EL. 501.0 ft, becomes very intensely fractured, remnant dusky red lined shears.		C57			100	76						PL
	271		At EL. 499.2 ft, observed shear, dipping 50°, dusky red clay and carbonate infill.												
496.00	272		At EL. 497.5 ft, becomes moderately fractured, joint, dipping 50 to 20°, numerous joint to 272 ft bgs, generally 1 mm aperture, slightly to moderately rough. Weak.							1	90				UC
	273		At EL. 497.0 ft, observed foliation joint, dipping 40 to 30°, faint.												
494.00	274		At EL. 496.0 ft, observed shear, dipping 60°, tight, dusky red, 1/16" thick clay lined shear, truncates foliations.												VOC = 11.4 ppm
	275		At EL. 495.5 ft, observed shear, dipping 30°, tight, dusky red, 1/16" thick clay lined shear. Weak.												
492.00	276		At EL. 495.2 ft, becomes locally very intensely fractured..												
	277		At EL. 495.0 ft, observed foliation joint, dipping 40°, faint.												
490.00	278		At EL. 494.6 ft, observed joint, dipping 80°. At EL. 494.0 ft, observed shear, dipping 50°, very tight, dusky red, 1/16" thick clay lined shear, truncates foliations.												
	279		At EL. 493.5 ft, contains foliation joint, dipping 45°, faint foliation.												
488.00	280		At EL. 493.0 ft, observed shear, dipping 50°, tight, dusky red, 1/16" thick clay lined shear, truncates foliations above, massive below.												
	281		At EL. 492.7 ft, observed joint, dipping 50°.												
486.00	282		Bottom of borehole at 276.0 ft bgs Boring terminated at planned depth. Borehole converted to piezometer at the completion of drilling.												
	283														
484.00	284														
	285														
482.00	286														
	287														
480.00	288														
	289														
478.00	290														
	291														
476.00	292														
	293														
474.00	294														
	295														

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**5-7-09**	**10 of 10**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
M. Torsiello	2-17-09	3-11-09	34° 7' 31.5588" / 118° 8' 54.6144" NAD83	R-09-Z3B6
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Cascade Drilling Inc.			' Lt Sta (State St. e/o Railroad St. w/o SR-110)	750.0 ft NAVD 88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Ingersoll Rand A400	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT(1.4"), Cal (2.4"), PQ core (3.2")			Automatic Hammer 140 lb. 30 inch drop	75%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Piezometer Installed on Completion			NM	51.2 ft on07/01/09	326.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT 6" thick.												This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
	1		CONCRETE 6" thick.												
748.00	2		Poorly graded SAND (SP); very dark grayish brown; dry to moist; coarse to medium SAND; trace fines [OLDER ALLUVIUM].												
	3														
746.00	4														Hand Auger to 5'
	5		SILTY SAND (SM); medium dense; very dark brown; dry to moist; 4% fine GRAVEL, 61% predominantly fine SAND, 35% low plasticity fines.		S01	4 5 6	11	100		6					PA VOC = 0.0 ppm
744.00	6														
	7														
742.00	8														
	9														
740.00	10		SILTY SAND with GRAVEL (SM); very dense; very dark brown; 28% coarse to fine GRAVEL, 56% coarse to fine SAND, 16% low plasticity fines.		S02	17 38 50/1"		92		8	128				PA VOC = 0.0 ppm
	11		SEDIMENTARY ROCK, (SANDSTONE), decomposed (well-graded SAND (SW); very dense, light gray, moist, trace fine gravel, fine to coarse sand) **[TOPANGA FORMATION]**												
738.00	12														
	13														
736.00	14														
	15				S03	50/3"		17							VOC = 0.0 ppm
734.00	16														
	17														
732.00	18														
	19														
730.00	20		Gray.		S04	50/3"		17							VOC = 0.0 ppm
	21														
728.00	22														
	23														
726.00	24														
	25														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z3B6
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	D/D	07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	D. Jankly		7-13-09	1 of 12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	25		No Recovery. *(continued)*.		S05	50/2.5"		0						See note at end of log regarding RQD.
724.00	26													
	27													
722.00	28													
	29													
720.00	30		No Recovery.		S06	50/2.5"		0						
	31													
718.00	32													
	33													
716.00	34													
	35		No Recovery.		C07			0	0					
714.00	36													
	37													
712.00	38				C08			0	0					
	39													
710.00	40													
	41													
708.00	42													
	43		SEDIMENTARY ROCK, (CONGLOMERATE), granule to cobble, fine to coarse sand, light gray, moderately weathered, soft to moderately soft, majority of matrix washed out, predominantly granule to pebble sized clasts observed.		C09			5	0					
706.00	44													
	45													
704.00	46													
	47													
702.00	48		At EL. 702.0 ft, observed Isolated calcite-cementation, moderately hard zones recovered.		C10			5	0					
	49													
700.00	50													
	51													
698.00	52													
	53				C11			0	0					
696.00	54													
	55													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
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Geotechnical Services
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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**2 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55				C11			0	0						See note at end of log regarding RQD.
694.00	56														
	57														
692.00	58		At EL. 692.0 ft, becomes moderately to slightly weathered, soft to moderately hard. Matrix is fine to coarse grained sand. No visible structure. Granule to cobble sized clasts composed of hard to very hard intrusive rock (generally dioritic in nature), subangular to rounded.		C12			30	0						
	59														VOC = 0.0 ppm
690.00	60														
	61														
688.00	62														
	63				C13			7	0						
686.00	64														
	65														
684.00	66														
	67														
682.00	68		At EL. 682.0 ft, becomes slightly weathered.		C14			18	13						
	69														
680.00	70														
	71														
678.00	72														
	73														
676.00	74														
	75														
674.00	76														
	77														
672.00	78		At EL. 672.0 ft, becomes slightly weathered to fresh, clasts are hard.		C15			15	5						
	79														VOC = 0.0 ppm
670.00	80														
	81														
668.00	82														
	83														
666.00	84														
	85														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**3 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85				C15			15	5						See note at end of log regarding RQD.
664.00	86														
	87														
662.00	88		At EL. 662.0 ft, becomes medium gray.		C16			8	3						VOC = 0.0 ppm
	89														
660.00	90														
	91														
658.00	92														
	93														
656.00	94														
	95														
654.00	96														
	97														
652.00	98				C17			7	0						
	99														
650.00	100														
	101														
648.00	102														
	103														
646.00	104														
	105														
644.00	106														
	107														
642.00	108		At EL. 642.0 ft, with coarse grained sand matrix.		C18			13	0						VOC = 0.0 ppm
	109														
640.00	110														
	111														
638.00	112														
	113				C19			18	0						
636.00	114		At EL. 636.0 ft, observed intersected clasts up to 3".												
	115														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**4 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	115				C19			18	0						See note at end of log regarding RQD.
634.00	116														
	117														
632.00	118		At EL. 632' to 627' Pressuremeter test.												
	119														
630.00	120														
	121														
628.00	122														
	123				C20			0	0						
626.00	124														
	125														
624.00	126				C21			0	0						
	127														
622.00	128		At EL. 622' to 617' Pressuremeter test.												
	129														
620.00	130														
	131														
618.00	132														
	133		At EL. 617.0 ft, becomes greenish gray.		C22			20	8						
616.00	134		At EL. 616.4 ft, observed incipient joint, dipping 0°.												
	135														VOC = 0.0 ppm
614.00	136														
	137														
612.00	138														
	139														
610.00	140														
	141														
608.00	142														
	143		At EL. 607.0 ft, observed slightly weathered, soft, incipient joint, dipping 70°, very hard clasts up to 8" intersected.		C23			47	13						
606.00	144														
	145														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**5 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	145				C23			47	13						See note at end of log regarding RQD.
604.00	146														VOC = 0.0 ppm
	147														
602.00	148		At EL. 602.0 ft, becomes medium gray, slightly weathered to fresh, very soft to soft.		C24			27	0						
	149														VOC = 0.0 ppm
600.00	150														
	151														
598.00	152														
	153		At EL. 597.0 ft, observed very soft matrix, clasts are very hard. Intact sand matrix up to 7" thick observed.		C25			45	12						
596.00	154														
	155														VOC = 0.0 ppm
594.00	156														
	157														
592.00	158				C26			45	17						
	159														
590.00	160		At EL. 590.0 ft, observed intact coarse grained sand matrix up to 5.5" thick, moderately soft. Very hard diorite clasts up to 5" observed.												
	161														VOC = 0.0 ppm
588.00	162														
	163		At EL. 587.0 ft, becomes fresh, very soft, granule and pebble sized clasts within fine to medium grained sand matrix.												
586.00	164		At EL. 587' to 580' Pressuremeter test.												VOC = 0.0 ppm
	165														
584.00	166														
	167														
582.00	168														
	169														
580.00	170				C27			44	0						
	171														VOC = 0.0 ppm
578.00	172		At EL. 579.0 ft, observed roughly 6 inches of reddish brown aphanitic igneous rocks.												
	173				C28			67	7	11					PA
576.00	174		At EL. 577.0 ft, observed greenish gray, slightly weathered to fresh, hard granule, pebble and cobble sized clasts within fine to coarse grained very soft sand matrix.												VOC = 0.0 ppm
	175														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**6 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175		Very weak.		C28			67	7						See note at end of log regarding RQD. PL
574.00	176														
	177														
572.00	178		At EL. 572.0 ft, becomes light bluish gray to greenish gray, slightly weathered.		C29			30	12						
	179														VOC = 0.0 ppm
570.00	180														
	181														
568.00	182														
	183		At EL. 566.8 ft, observed joint, dipping 20°.		C30			100	0						
566.00	184		At EL. 566.0 ft, becomes slightly weathered to fresh, intensely fractured, with pebble sized clasts, white, very hard, subangular.												VOC = 0.0 ppm
	185		At EL. 565.5' to 557' Pressuremeter test.												
564.00	186														
	187														
562.00	188														
	189														
560.00	190		At EL. 560.0 ft, observed abundant pebbles between EL. 560' to 559'.												
	191		At EL. 559.0 ft, observed roughly 4" thick medium to coarse grained sandstone lens, greenish gray.												
558.00	192		At EL. 558.0 ft, observed some polished surfaces, possible gouge zone.												
	193		At EL. 557.0 ft, observed SANDSTONE bed, roughly 1' thick, medium-grained to granule, medium gray, slightly weathered, moderately fractured, bedding plane separation, dipping 30°, seven joints observed between EL. 557' to 555', dips range from 10 to 20 degrees.		C31			98	30						
556.00	194														
	195														
554.00	196		At EL. 556.0 ft, becomes intensely fractured. At EL. 554.5 ft, observed joint, dipping 60 to 20°, three joints observed between EL. 554.5' to 554'. PTS - Quartz Diorite clast: Plutonic rock with allotriomorphic-granular texture.												PTS CAI
	197		At EL. 554.0 ft, becomes poorly indurated conglomerate.												VOC = 0.0 ppm
552.00	198		At EL. 552.5 ft, observed incipient joint, dipping 60°, 1' thick coarse grained sandstone bed, easily friable.		C32			100	29						PL
	199		At EL. 552.0 ft, becomes massive, greenish gray, clasts up to 7" intersected. Very weak.												VOC = 0.0 ppm
550.00	200		At EL. 551.0 ft, observed three rough to moderately rough joints observed between EL. 551.3' to 550.7'.		C33			78	0						
	201		At EL. 550.0 ft, observed numerous joints observed between EL. 550' to 548', dipping 0 degrees.												
548.00	202		At EL. 548.2 ft, observed random fracture, dipping 50°.												VOC = 0.0 ppm
	203		At EL. 547.0 ft, observed shear, dipping 75°, clay lined, slickensided.		C34			90	72						
546.00	204		At EL. 546.9 ft, observed shear, dipping 75°.												
	205		At EL. 545.5 ft, observed shear, dipping 50°.												

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**7 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205		At EL. 545.0 ft, becomes very thickly bedded, moderately fractured, bedding joint, dipping 30°.		C34			90	72						See note at end of log regarding RQD.
544.00	206		At EL. 543.7 ft, observed random fracture, dipping 40°.												VOC = 0.0 ppm
	207		At EL. 543.3 ft, observed joint, dipping 40 to 30°, two joints observed.												
542.00	208		At EL. 542.5 ft, observed joint, dipping 20°.												
	209		At EL. 541.0 ft, observed bedding joint, dipping 35°, . Weak.							4	146				UC, PL
540.00	210		At EL. 540.0 ft, observed joint, dipping 0°.												
	211		At EL. 539.5 ft, observed incipient joint, dipping 0°. At EL. 539.3 ft, observed incipient joint, dipping 0°.												
538.00	212		At EL. 538.8 ft, observed joint, dipping 0°.												
	213				C35			98	87						
536.00	214		At EL. 536.5 ft, observed joint.												
	215		At EL. 535.9 ft, observed joint, dipping 0°. At EL. 535.6 ft, becomes very thinly bedded, bedding joint, dipping 45°.												VOC = 0.0 ppm
534.00	216		At EL. 535.5 ft, observed joint, dipping 0°. At EL. 535.0 ft, becomes very thickly bedded, slightly weathered, light gray, coarse angular sand matrix.												PL
	217		At EL. 534.5 ft, observed joint, dipping 0°, . Very weak. At EL. 534.0 ft, observed joint, dipping 0°.												
532.00	218		At EL. 533.8 ft, observed joint, dipping 0°. At EL. 533.5 ft, observed joint, dipping 0°, . Very weak. At EL. 533.0 ft, observed joint, dipping 0°.							2	149				UC
	219		At EL. 532.5 ft, observed joint, dipping 0°. At EL. 531.8 ft, observed joint, dipping 0°, Weak. At EL. 531.0 ft, observed 6" thick lens with medium grained sand matrix.												
530.00	220		At EL. 530.5 ft, observed joint, dipping 0°.												
	221		At EL. 529.0 ft, becomes very weak, moderately soft, bedding joint, dipping 40°.							3	142				UC, PL
528.00	222		At EL. 528.1 ft, observed joint, dipping 0°. At EL. 527.7 ft, observed joint, dipping 0°, . Very weak.												PL
	223		At EL. 527.2 ft, observed joint, dipping 0°. At EL. 527.0 ft, observed granule to cobble sized clasts.		C36			57	13						VOC = 0.0 ppm
526.00	224														
	225														
524.00	226				C37			67	32						VOC = 0.0 ppm
	227		At EL. 523.0 ft, observed bedding joint, dipping 35°, . Very weak to weak.							2	152				UC, PL
522.00	228		At EL. 522.0 ft, observed Sandstone lens, light gray, fine to coarse grained, friable.												
	229														
520.00	230		At EL. 520.5 ft, observed Sandstone lens, gray, fine to medium grained.		C38			83	83						VOC = 0.0 ppm
					C39			63	22						
	231		At EL. 519.5 ft, observed pebble to gravel sized clasts, subangular to angular, local slickensided surfaces.												VOC = 0.1 ppm
518.00	232				C40			19	0						VOC = 0.0 ppm
	233		SEDIMENTARY ROCK, (SANDSTONE), medium to coarse grained, angular, friable, possibly sheared.												
516.00	234														
	235														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**8 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235		*(continued).*		C40			19	0						See note at end of log regarding RQD.
514.00	236														
	237														
512.00	238														
	239														
510.00	240														
	241														
508.00	242		SEDIMENTARY ROCK, (CONGLOMERATE), slightly weathered to fresh, moderately hard, pebble sized clasts within well indurated sandstone matrix.		C41			100	0						VOC = 0.0 ppm
	243				C42			13	0						VOC = 0.0 ppm
506.00	244		At EL. 506.0 ft, observed random fracture, dipping 70°, dark gray slickensided surfaces.												
	245														
504.00	246														
	247														
502.00	248														
	249														
500.00	250														
	251														
498.00	252				C43			59	19						
	253		At EL. 497.5 ft, observed joint, dipping 65°, slickensided. At EL. 497.0 ft, observed calcite veins.												
496.00	254														PL VOC = 0.0 ppm
	255		At EL. 495.7 ft, observed joint, dipping 70°, slickensided. Weak.												
494.00	256														
	257				C44			50	32						
			At EL. 492.7 ft, observed joint, dipping 0°.							3					SD, PL
492.00	258		Weak to medium strong. At EL. 492.2: PTS - coarse grained arkosic conglomerate with grains cemented by calcite.												PTS UC
	259		At EL. 492.0 ft, observed Intersected 3" clast. At EL. 491.2 ft, observed joint, dipping 0°.							2	154				VOC = 0.0 ppm
490.00	260														
	261														
488.00	262				C45			0	0						
	263														
486.00	264														
	265														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**9 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	265		*(continued).*		C45			0	0						See note at end of log regarding RQD.
484.00	266														
	267		At EL. 483.0 ft, becomes slightly weathered, Clasts are 1/2" to 1" dia., diorite pebbles, very hard, some slickensided surfaces.		C46			32	10						
482.00	268		At EL. 482.0 ft, observed joint, dipping 70°, slickensided.												VOC = 0.0 ppm
	269		At EL. 481.9 ft, observed Intersected 6" clast.												
480.00	270														
	271														
478.00	272				C47			27	0						
	273		SEDIMENTARY ROCK, (SANDSTONE), dark bluish gray, moderately soft, fine to medium grained, subangular to angular, poorly cemented.												VOC = 0.0 ppm
476.00	274														
	275														
474.00	276														
	277		At EL. 473.0 ft, observed Sandstone as above with few diorite derived pebbles.		C48			38	0						
472.00	278		SEDIMENTARY ROCK, (CONGLOMERATE), pebble sized clasts within sand matrix.												VOC = 0.2 ppm
	279		At EL. 471.4 ft, observed bedding joint, dipping 35°.												
470.00	280														
	281														
468.00	282		At EL. 468.0 ft, observed joint, dipping 35°.		C49			45	19						
	283		At EL. 467.8 ft, observed joint, dipping 70°, Well cemented, fine grained matrix.												VOC = 0.0 ppm
466.00	284		At EL. 467.0 ft, observed decreased cementation, moderately soft.												PL
	285		At EL. 466.0 ft, observed Intersected 4" clast. Very weak.												
464.00	286														
	287		SEDIMENTARY ROCK, (SANDSTONE), soft, fine to medium grained, poorly cemented.		C50			20	0						
462.00	288		At EL. 462.3 ft, observed some angular to subangular pebbles.												VOC = 0.0 ppm
	289														
460.00	290														
	291														
458.00	292		At EL. 458.0 ft, becomes moderately soft, joint, dipping 75°, slickensided.		C51			15	0						VOC = 0.0 ppm
	293														
456.00	294														
	295														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**10 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	295				C51			15	0						See note at end of log regarding RQD.
454.00	296														
	297		**SHEAR ZONE AT El. 453' to El. 424'**		C52			46	24						
452.00	298		At EL. 452.8 ft, becomes massive, bluish gray, moderately to slightly weathered, extremely weak, very soft to soft, mostly fine to medium sand. Little fine to coarse, angular gravel. Little fines.												PL
	299									6					PA
450.00	300		At EL. 450.0 ft, observed sheared and friable bedrock.												VOC = 0.0 ppm
	301														
448.00	302														
	303				C53			100	87						VOC = 0.4 ppm
446.00	304		At EL. 446.3 ft, observed bedding joint, dipping 20°, Sandstone, white with black minerals, appears decomposed due to shearing.												
	305									12					PA
444.00	306		At EL. 444.0 ft, observed joint, dipping 77°, slickensided.												
	307														
442.00	308		At EL. 442.0 ft, observed joint, dipping 80°, Unit is friable, highly sheared, black gouge within joints.		C54			100	48						
	309		At EL. 441.0 ft, observed bedding joint, dipping 25°.												
440.00	310														
	311		At EL. 439.0 ft, observed bedding joint, dipping 25°, Unit is sheared, continuing from El. 453'.												
438.00	312		At EL. 438.0 ft, becomes very soft and friable, pebbles within sandstone are decomposed and easily friable, numerous slickensided surfaces.												VOC = 0.2 ppm
	313		At EL. 437.0 ft, becomes moderately to slightly weathered, soft, sandstone to siltstone, numerous near vertical slickensided surfaces 80 to 90 degree dip.		C55			100	72						
436.00	314		At EL. 435.5 ft, observed bedding joint, dipping 25°, Local 3/8" thick beds of sandstone and siltstone.												
	315		At EL. 434.8 ft, observed Possibly decomposed diorite, very dark gray. Numerous gray, clay lined slickensided surfaces which are friable.												
434.00	316														VOC = 0.6 ppm
	317		At EL. 433.0 ft, observed joint, dipping 40°, Likely continuation of shear zone from El. 453'.												
432.00	318		At EL. 432.8 ft, observed joint, dipping 10°.		C56			69	63						
	319		At EL. 432.5 ft, observed joint. At EL. 432.0 ft, observed Sandstone with some pebbles, gray to dark gray, friable, numerous slickensided surfaces.												
430.00	320		At EL. 431.0 ft, becomes moderately soft.												
	321		At EL. 429.0 ft, observed bedding joint, dipping 30°, Likely continuation of shear zone from El. 453'.												
428.00	322		At EL. 428.5 ft, becomes soft.												VOC = 0.9 ppm
	323														
426.00	324														
	325														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**7-13-09**	**11 of 12**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	325				C56			69	63						
424.00	326		Bottom of borehole at 326.0 ft bgs Borehole terminated at planned depth. Borehole converted to piezometer at the completion of drilling. RQD values provided on the boring logs are based on intact core pieces obtained between two natural discontinuities. The majority of core obtained from this boring is typically very weak to weak and does not meet the "sound core" definition provided in the standard test method for RQD (ASTM D 6032). These RQD values should not be used to evaluate rock mass quality.											
	327														
422.00	328														
	329														
420.00	330														
	331														
418.00	332														
	333														
416.00	334														
	335														
414.00	336														
	337														
412.00	338														
	339														
410.00	340														
	341														
408.00	342														
	343														
406.00	344														
	345														
404.00	346														
	347														
402.00	348														
	349														
400.00	350														
	351														
398.00	352														
	353														
396.00	354														
	355														

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B6**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **D/D**	EA **07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER **N/A**	PREPARED BY **D. Jankly**	DATE **7-13-09**	SHEET **12 of 12**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
M. Salisbury	**3-11-09**	**3-25-09**	**34° 6' 21.59" / 118° 9' 24.5" NAD83**	**R-09-Z3B8**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans In-House			**' Lt Sta Meridian Ave. n\o Oak St.**	**594.3 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wire-Line			**CME 85**	**4 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk,SPT (1.4"),Punch Core(2.5"),HQ Core			**CME Automatic, 140 lb., 30 inch drop**	**87%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Piezometer Installed on Completion			**NM** / **Well unaccessible**	**275.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	0		ASPHALT (6").											This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
	1		SANDY SILTY CLAY (CL-ML); soft to medium stiff; light brown; moist; some SAND; mostly nonplastic fines; weak cementation; **[ALLUVIUM]**		B1									
592.27	2													
	3													
590.27	4													
	5		SANDY SILTY CLAY (CL-ML); soft to medium stiff; strong brown; moist; some SAND; mostly nonplastic to low plasticity fines; weak to moderate cementation.		S2	3 4 4	8	100						Hand Auger from 0.5' - 5' VOC=16.8 ppm
588.27	6													
	7													
586.27	8													
	9													
584.27	10		SANDY SILTY CLAY (CL-ML); soft; strong brown; moist to wet; some SAND; mostly nonplastic to low plasticity fines; weak cementation.		C3			78		25				UW VOC=15.1 ppm
	11													
582.27	12													
	13													
580.27	14													
	15		SANDY SILT (ML); soft; light brown; moist; some fine SAND; mostly nonplastic to low plasticity fines; weak cementation.		S4	3 2 3	5	100						VOC=17.3 ppm
578.27	16													
	17													
576.27	18													
	19													
574.27	20		Fat CLAY (CH); soft; light brown; moist; few fine SAND; mostly nonplastic to low plasticity fines; weak cementation.		C5			78		23	104			UW, PI
	21		SANDY SILT (ML); medium stiff to stiff; light brown; moist; few fine SAND; mostly nonplastic to low plasticity fines; weak cementation.											
572.27	22													
	23													
570.27	24													
	25													

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	M.Salisbury			**1 of 11**

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method Casing Depth	Remarks
	25		SANDY SILT (ML); medium stiff to stiff; light brown; moist; few fine SAND; mostly nonplastic to low plasticity fines; weak cementation; Siltstone; moderately hard [BEDROCK].		S6	12 14 14	28	100						VOC=11.4 ppm
568.27	26													
	27		SEDIMENTARY ROCK, (MUDSTONE), thinly to moderately bedded, moderate olive brown, moderately weathered, soft, moderately fractured, **[TOPANGA FORMATION]**		C07			100	43					**See note at the end of log regarding RQD.**
566.27	28													
	29									25	96			UW, PI
564.27	30		Intensely to moderately fractured, random fracture (CL), with some fine sand.		C08			100	70					VOC=21.4 ppm
	31		Bedding plane separation dipping 35°.											
562.27	32		Bedding joint dipping 25°. Bedding joint dipping 15°.											
	33		Bedding joint dipping 52°. Bedding joint dipping 62°.											
560.27	34													
	35		Very thickly bedded, light brown to grayish orange, moderately soft to moderately hard, intensely fractured, with sand and clay, fine sand.		C09			100	20					VOC=15.2 ppm
558.27	36		Bedding joint (CL), dipping 45°.											
	37		Very thickly bedded, light brown mottled with greenish gray, moderately soft to moderately hard, intensely fractured.											
556.27	38													
	39													
554.27	40		SEDIMENTARY ROCK, (CLAYSTONE), thickly bedded, pale yellowish orange, moderately hard, intensely to moderately fractured, sandy, with silt, poorly graded, fine sand.		C10			100	40					VOC=16.3 ppm
	41													
552.27	42		SEDIMENTARY ROCK, (SILTSTONE), very thickly bedded to massive, pale yellowish orange, moderately hard, intensely to moderately fractured, with fine sand, poorly graded.											
	43		Very thickly bedded to massive, bedding plane separation dipping 42°.											
550.27	44		Bedding plane separation dipping 39°.											
	45		Olive gray, intensely to moderately fractured, with fine sand.		C11			100	32					VOC=17.4 ppm
548.27	46		Bedding plane separation dipping 35°.											
	47		Bedding plane separation dipping 32°.											
546.27	48		Bedding joint dipping 67°.											
	49		Bedding plane separation dipping 18°.											
			Bedding plane separation dipping 29°.											
544.27	50		Bedding joint (ML), dipping 45°.		C12			100	40					VOC=15.6 ppm
	51		SEDIMENTARY ROCK, (SANDSTONE), thickly bedded, moderate yellowish brown, moderately hard, intensely to moderately fractured, silty, fine sand.											
542.27	52		Bedding plane separation dipping 32°.											
	53		SEDIMENTARY ROCK, (SILTSTONE), thickly bedded, light brown, moderately hard, slightly fractured, with some fine sand.							22	102			UW, PI
			Random fracture (ML), dipping 90°.											
540.27	54		SEDIMENTARY ROCK, (CLAYSTONE), moderately to thickly bedded, moderate brown, moderately soft, slightly fractured, shear (CL), dipping 32°.											
	55													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **M.Salisbury**		DATE	SHEET **2 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SEDIMENTARY ROCK, (SILTSTONE), moderately bedded, moderate brown, moderately soft, slightly fractured, bedding plane separation dipping 31°.		C13			100	50						VOC=16.4 ppm **See note at the end of log regarding RQD.**
538.27	56		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, moderately soft, slightly fractured. Bedding plane separation dipping 31°. *(continued)*.												
536.27	58		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, very to extremely hard, slightly fractured.												
534.27	60		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, slightly fractured, shear (CL), dipping 25°.		C14			100	43						VOC=18.3 ppm
	61		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, very to extremely hard, slightly fractured.												
532.27	62		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, slightly fractured, shear (CL), dipping 40°.												
530.27	64		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, very to extremely hard, slightly fractured, bedding plane separation dipping 15°, laminated silty fine sand lens.												
	65		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, slightly fractured, shear (CL), dipping 25°.		C15			100	40						VOC=18.7 ppm
528.27	66		SEDIMENTARY ROCK, (SANDSTONE), thinly to moderately bedded, moderate yellowish brown, soft, slightly fractured, bedding plane separation dipping 22°, silty, medium sand.												
526.27	68		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, slightly fractured, shear (CL), dipping 25°. Thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured, shear (CL), dipping 25°.												
524.27	70		SEDIMENTARY ROCK, (SANDSTONE), thinly to moderately bedded, olive gray, moderately soft to moderately hard, very slightly fractured to unfractured, bedding plane separation dipping 22°, silty fine sand.		C16			90	20						VOC=24.6 ppm
522.27	72		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured. Bedding joint (CL), dipping 39°. Bedding joint (CL), dipping 39°.												
520.27	74		Thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured, shear dipping 25°.												
	75		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured.		C17			100	10						VOC=22.4 ppm
518.27	76		Shear dipping 30°.												
516.27	78		SEDIMENTARY ROCK, (CLAYSTONE), thinly to moderately bedded, moderate brown, soft, very slightly fractured to unfractured. Shear dipping 15°.												
	79		SEDIMENTARY ROCK, (SILTSTONE), thinly to moderately bedded, moderate brown, hard to very hard, very slightly fractured to unfractured. Moderately hard, shear (clay), dipping 19°.												
514.27	80		Thinly to moderately bedded, moderate brown, very hard, very slightly fractured to unfractured.		C18			100	42						VOC=14.1 ppm
	81		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, very hard, very slightly fractured to unfractured, dipping 28°, silty, fine sand.												
512.27	82		Moderate brown, shear (clay), dipping 25°.												
	83		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, very slightly fractured to unfractured.		C19			71	25						
510.27	84		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, very slightly fractured to unfractured, shear (clay), dipping 22°.												
	85														

(continued)

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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	M.Salisbury			**3 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, very slightly fractured to unfractured.		C20			93	67						VOC=17.0 ppm **See note at the end of log regarding RQD.**
508.27	86		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, very hard, very slightly fractured to unfractured.												
	87														
506.27	88		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, sandy, fine sand. Olive gray, dipping 35°. Moderate brown. *(continued)*. Very intensely to intensely fractured, dipping 15°.							13	117				UW
	89														
504.27	90				C21			92	0						VOC=16.4 ppm
	91		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, very intensely to intensely fractured, shear.												
502.27	92		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, very intensely to intensely fractured. Intensely to moderately fractured, trace fine sand. Dipping 15°.												
	93														
500.27	94		Moderate brown to light gray, sandy, find sand. Moderate brown, slightly fractured. Thinly bedded, light gray, dipping 10°. Moderate brown.												
	95				C22			100	0						VOC=24.1 ppm
498.27	96		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, soft to moderately soft, slightly fractured, dipping 25°.												
	97		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, soft to moderately soft, slightly fractured. Laminated to very thinly bedded, hard, dipping 25°. Moderately hard, shear (clay), dipping 25°.												
496.27	98														
	99		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, moderately hard, slightly fractured. Bedding joint dipping 25°, with some fine sand. Trace fine sand. With some fine sand.												
494.27	100				C23			100	0						VOC=21.0 ppm
	101		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, moderately hard, slightly fractured.												
492.27	102		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, moderately hard, intensely fractured.												
	103														
490.27	104		SEDIMENTARY ROCK, (SANDSTONE), laminated to very thinly bedded, moderate brown, very to extremely hard, intensely fractured, dipping 10°, silty, fine sand.		C24			100	89						
	105		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, very to extremely hard, slightly fractured, dipping 10°.												VOC=22.1ppm
488.27	106		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, very to extremely hard, slightly fractured.												
	107		Laminated to very thinly bedded, hard, bedding joint dipping 20°.		C25			100	50						
486.27	108		Intensely to moderately fractured. Joint (clay), dipping 48°.												
	109		Dipping 17°. Joint dipping 30°.												
484.27	110		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, moderately hard, intensely to moderately fractured. Joint dipping 30°.		C26			100	0						VOC=23.2 ppm
	111														
482.27	112		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, moderately hard, intensely to moderately fractured. Moderate brown mottled with light gray, hard, trace fine sand. Joint dipping 50°. Bedding joint dipping 25°. With fine sand.												
	113														
480.27	114														
	115				C27			93	18						

(continued)

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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Division of Engineering Services
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	M.Salisbury			**4 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	115		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.		C27			93	18						VOC=15.9 ppm **See note at the end of log regarding RQD.**
478.27	116		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured. Dipping 25°.							10	129				UW
	117				C28			100	22						
476.27	118		SEDIMENTARY ROCK, (SANDSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 24°.												
	119														
474.27	120		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 25°, excellent bedding contact.		C29			100	45						VOC=24.2 ppm
	121		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
472.27	122		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	123														
470.27	124		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 25°.												
	125		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.		C30			98	0						VOC=26.9 ppm
468.27	126		Dipping 18°, trace fine sand. Moderate brown to light gray, hard, intensely to moderately fractured.												
	127		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured, random fracture (moderately healed), dipping 90°.												
466.27	128														
	129		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.												
464.27	130		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured.		C31			100	20						VOC=23.5 ppm
	131														
462.27	132		SEDIMENTARY ROCK, (SILTSTONE), laminated to very thinly bedded, moderate brown, hard, intensely to moderately fractured. Laminated, moderate brown to light gray, sandy, fine sand.												
	133		Dipping 16°.												
460.27	134		Dipping 18°. Thinly bedded, moderate brown.												
	135		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.		C32			100	33						VOC=23.9 ppm
458.27	136		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, intensely to moderately fractured, dipping 18°, with fine sand.												
	137		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, intensely to moderately fractured.												
456.27	138														
	139		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, intensely to moderately fractured, dipping 28°, sandy.												
454.27	140		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, intensely to moderately fractured.		C33			77	64						UW, SD VOC=19.5ppm
	141		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, intensely to moderately fractured.							9					
452.27	142		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, intensely to moderately fractured.		C34			100	48						
	143														
450.27	144		SEDIMENTARY ROCK, (SILTSTONE), moderately bedded, moderate brown, hard, intensely to moderately fractured, with fine sand, grayish brown mudstone clasts.												
	145														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	M.Salisbury			**5 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	145		Dipping 22°. Bedding joint dipping 17°.												VOC=18.4 ppm
448.27	146		SEDIMENTARY ROCK, (SANDSTONE), laminated, olive gray, hard, moderately fractured, dipping 22°, silty, fine sand.		C35			100	58						**See note at the end of log regarding RQD.**
	147														
446.27	148		SEDIMENTARY ROCK, (SILTSTONE), moderately bedded, olive gray, hard, moderately fractured, dipping 25°. Moderate brown, dipping 28°.												
	149		Laminated, olive gray, dipping 17°, sandy. Moderate brown.												
444.27	150		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, moderately fractured.												
	151		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, moderately fractured.		C36			96	18						
442.27	152		SEDIMENTARY ROCK, (CLAYSTONE), laminated, moderate brown, hard, moderately fractured.												
	153		SEDIMENTARY ROCK, (SILTSTONE), laminated, moderate brown, hard, moderately fractured. Thinly bedded, light olive gray, dipping 28°.												
440.27	154		Moderately bedded, moderate brown, intensely fractured. *(continued)*. Dipping 25°.												
	155		Light olive gray, dipping 25°. Moderate brown.												VOC=20.7 ppm
438.27	156		Joint (clay, partially healed), dipping 48°. Bedding joint dipping 20°.		C37			100	21	8					UW, PL
	157		Thinly bedded, dipping 14°, sandy. Dipping 10°.												
436.27	158		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, intensely fractured. Dipping 39°.		C38			100	0						
	159		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, very intensely fractured, with fine sand.												
434.27	160		Dipping 29°.		C39			87	0						VOC=26.0.6ppm
	161		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, very intensely fractured, shear dipping 25°.												
432.27	162		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, very intensely fractured.												
	163		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, very intensely fractured, dipping 45°.												
430.27	164		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, very intensely fractured.												
	165		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, soft, very intensely fractured, dipping 28°.		C40			100	10						
428.27	166		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured, parallel to bedding (shale parting).												PL
	167		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, moderately fractured, joint dipping 45°.												
426.27	168		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												
	169		Dipping 23°.		C41			100	100						
424.27	170				C42			100	60						
	171														
422.27	172		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, moderately fractured, dipping 17 to 22°.												
	173														
420.27	174		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very weak, very hard, moderately fractured, bedding joint (silt, not healed), dipping 32°. Incipient fracture (not healed), dipping 60°.							7	137				UC EM
	175														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	M.Salisbury			**6 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175		Laminated to very thinly bedded, dipping 22°, sandy, fine sand. *(continued)*.		C43			100	32						**See note at the end of log regarding RQD.**
418.27	176														
	177		SEDIMENTARY ROCK, (CLAYSTONE), laminated to very thinly bedded, moderate brown, very hard, moderately fractured, dipping 15°.												
416.27	178		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, very hard, moderately fractured, joint (clay, partially healed), dipping 38°.												
	179		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, moderately fractured.												
414.27	180		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.		C44			95	35						
	181		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured. No sand.												
412.27	182		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured, bedding joint.												
	183														
410.27	184		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured, with fine sand.		C45			100	20						
	185		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
408.27	186		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
	187		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
406.27	188		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard, intensely fractured.												
	189		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely fractured, dipping 15°, silty, fine sand.		C46			100	75						
404.27	190		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely fractured, with fine sand.												
	191		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately soft to moderately hard, intensely fractured.		C47			100	50	11					SD, CR
402.27	192		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately soft to moderately hard, intensely fractured.												
	193		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately soft to moderately hard, intensely fractured, dipping 22°.		C48			100	32						EM
400.27	194		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately soft to moderately hard, intensely fractured.												UC
	195		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely fractured, dipping 17°, silty, fine sand.							8	131				
398.27	196		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely fractured.												
	197		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely fractured, dipping 21°.		C49			94	19						
396.27	198		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately soft, moderately fractured.												
	199		SEDIMENTARY ROCK, (SANDSTONE), laminated, olive gray, very weak, very hard, slightly fractured, dipping 25°, fine sand.												
394.27	200		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately soft, moderately fractured.		C50			67	50						
	201		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												
392.27	202														
	203														
390.27	204														
	205														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	M.Salisbury			**7 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, very hard, moderately fractured.		C51			100	42	8	133				SD, EM UC **See note at the end of log regarding RQD.**
388.27	206		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												
	207		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												
386.27	208		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, moderately fractured.												
	209		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, brownish gray, very hard, intensely fractured, fine sand.												
384.27	210		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, intensely fractured, dipping 17°.		C52			95	33						
	211		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, very hard, intensely fractured, dipping 20°, fine sand.												
382.27	212		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, very hard, intensely fractured.												
	213		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, very hard, intensely fractured, dipping 19°, fine sand.		C53			100	89						
380.27	214		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, weak, hard, intensely to moderately fractured.												
	215		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately hard, intensely to moderately fractured, dipping 19°.		C53			100	42						PTS
378.27	216		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	217		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.		C54			100	21						
376.27	218		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, intensely to moderately fractured, dipping 21°.		C55			100	50						
	219		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.		C55			100	75						
374.27	220		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, soft, intensely to moderately fractured.												
	221		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
372.27	222		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, hard, intensely to moderately fractured.												
	223		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.		C56			100	83						SD
370.27	224		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	225		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, with fine sand.							9					
368.27	226		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.		C56			100	100						
	227		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C56			100	83						
366.27	228		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
	229		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
364.27	230		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
	231		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
362.27	232		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C57			100	81						
	233		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured, sandy, fine sand.												
360.27	234														
	235														

(continued)

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C57			100	81						
358.27	236		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C58			100	92	6	135				UC **See note at the end of log regarding RQD.** EM
	237		Thinly bedded, moderate brown, moderately soft, moderately fractured, dipping 10°.												
356.27	238		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured.												
	239		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately soft, moderately fractured, dipping 10°.												
354.27	240		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately soft, moderately		C59			100	94						
	241		Olive gray, sandy, fine sand.												
352.27	242		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, moderately soft, moderately fractured, dipping 25°.												
	243		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured, fracture zone dipping 50°.												
350.27	244		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, moderately fractured.		C60			100	83						
	245		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, moderately fractured. Olive gray, hard, intensely fractured.		C60			100	56						
348.27	246		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely fractured.												
	247		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely fractured.												
346.27	248		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.		C61			100	0						
	249		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.												
344.27	250		SEDIMENTARY ROCK, (SANDSTONE), very thinly bedded, olive gray, moderately hard to hard, intensely fractured, dipping 22°, silty, fine sand.		C61			100	92						
	251														
342.27	252		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.		C62			100	90						
	253		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, moderately hard to hard, intensely fractured.												
340.27	254		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, medium strong, very hard, slightly fractured, bedding joint.												
	255		Hard, dipping 15°.												
338.27	256		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, slightly fractured,		C63			100	100	7	132				EM, UC
	257		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, slightly fractured. Dipping 10°.												
336.27	258		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, slightly fractured,												
	259		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, slightly fractured.												
334.27	260		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, slightly fractured,		C64			100	87						
	261		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, slightly fractured.												
332.27	262		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, slightly fractured. Dipping 20°. Dipping 15°.												
	263		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, very hard, slightly fractured.												
330.27	264		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, very hard, slightly fractured.												
	265														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	M.Salisbury			**9 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	265		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, weak, hard to very hard, intensely to moderately fractured. Dipping 8°. Incipient fracture (clay, partially healed), dipping 72°.		C65			100	81						PL **See note at the end of log regarding RQD.**
328.27	266														
	267		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured, dipping 22°, silty, fine sand.												
326.27	268		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured. Incipient fracture (not healed), dipping 90°. Sandy, fine sand.												
	269				C66			100	40						
324.27	270		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured, dipping 18°.												
	271		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured.												
322.27	272		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured, bedding joint dipping 18°.												
	273				C67			100	100						
320.27	274		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured, dipping 21°.												
	275		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard to very hard, intensely to moderately fractured. Dipping 20°.												
318.27	276		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, hard, intensely to moderately fractured, fine sand.												
	277		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured. Dipping 25°.												
316.27	278		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 22°.												
	279		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
314.27	280		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, dipping 20°.												
	281		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
312.27	282		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	283		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, with fine sand.												
310.27	284		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	285		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
308.27	286		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	287		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured, with fine sand.												
306.27	288		SEDIMENTARY ROCK, (CLAYSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
	289		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.												
304.27	290		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured. Incipient fracture (not healed), dipping 90°.												
	291		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured. Incipient fracture (not healed), dipping 90°.												
302.27	292		SEDIMENTARY ROCK, (SANDSTONE), thinly bedded, olive gray, hard, intensely to moderately fractured, dipping 22°.												
	293														
300.27	294														
	295														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	M.Salisbury			**10 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method Casing Depth	Remarks
	295		SEDIMENTARY ROCK, (SILTSTONE), thinly bedded, moderate brown, hard, intensely to moderately fractured.										
298.27	296		Bottom of borehole at 275.0 ft bgs Borehole was converted to piezometer at the completion of drilling.										
	297												
296.27	298		RQD values provided in the boring logs are based on intact core pieces obtained between two natural discontinuities. Majority of cores obtained in this boring are weak and does not meet the "sound core" definition provided in standard test method for RQD ASTM D 6032. These RQD values should not be used to evaluate the rock mass quality.										
	299												
294.27	300												
	301												
292.27	302												
	303												
290.27	304												
	305												
288.27	306												
	307												
286.27	308												
	309												
284.27	310												
	311												
282.27	312												
	313												
280.27	314												
	315												
278.27	316												
	317												
276.27	318												
	319												
274.27	320												
	321												
272.27	322												
	323												
270.27	324												
	325												

CALTRANS BORING RECORD MET+ENG FIXED MIKE - 12-7-09SR-710 CALTRANS BORING LOGS W REV Z2B2 Z3B8 Z3B9 Z3B10 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B8**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **M.Salisbury**		DATE	SHEET **11 of 11**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
K. Barker	1-13-09	1-21-09	34° 5' 52" / 118° 8' 47" NAD83	R-09-Z3B11
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services			' Lt Sta N. Palm Ave. s/o W. Alhambra Rd.	533.1 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wire-Line			CME 85	4 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk,SPT(1.4"),Punch Core(2.5"),HQ Core			CME Automatic, 140 lb., 30 inch drop	87%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Piezometer Installed on Completion			NM	158.0 ft on 7-1-09	275.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT (6").		D01			100							This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
531.11	2		SILTY, CLAYEY SAND (SC-SM); medium dense; very dark brown; dry; few fine GRAVEL; medium to fine SAND; **[ALLUVIUM]**												
529.11	4														
527.11	6		CLAYEY SAND (SC); medium dense; olive brown; moist; medium to fine SAND.		S02	8 14 15	29	100							Hand Auger from 0.5' - 5' VOC=2.4 ppm
525.11	8														
523.11	10														VOC=2.3 ppm
521.11	12		SILTY SAND (SM); medium dense; olive brown; moist; trace fine GRAVEL; mostly medium to fine SAND.		O03			17		13	113				UW, PA
519.11	14														
517.11	16				S04	6 13 13	26	100							VOC=2.4 ppm
515.11	18		At EL. 516.1 ft, observed 0.5' lens of (Poorly graded SAND) (SP); coarse SAND.												VOC=3.4 ppm
513.11	20														
511.11	22		At EL. 512.1 ft, contains few fine, subangular GRAVEL.		O05			33							UW, PI
509.11	24									11	107				
	25														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z3B11
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	T/T	07-07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K. Barker			1 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	25		At EL. 508.1 ft, with 0.5' to 1' interbeds of (SANDY SILT) (ML/SM); fine SAND. SILTY SAND (SM) *(continued)*.											VOC=1.7 ppm
507.11	26				S06	11 15 18	33	100						
	27													
505.11	28													
	29													
503.11	30													VOC=1.5 ppm
	31				O07			33						UW
501.11	32													
	33													
499.11	34									14	102			
	35													
497.11	36				S08	6 9 10	19	100						
	37													
495.11	38													
	39													
493.11	40													VOC=3.3 ppm
	41		Poorly graded SAND with SILT (SP-SM); medium dense; olive brown; moist; mostly medium to fine SAND.		O09			17						UW, PA
491.11	42													
	43													
489.11	44									22	98			
	45													
487.11	46				S10	7 7 9	16	100						
	47													
485.11	48													
	49													
483.11	50		SILTY SAND with GRAVEL (SM); medium dense; olive brown; moist; little fine GRAVEL; fine SAND.											VOC=3.1 ppm
	51				O10A			0						
481.11	52													No Recovery
	53													
479.11	54													
	55													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE: **BORING RECORD**
HOLE ID: **R-09-Z3B11**

DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	T/T	07-07-187900

PROJECT OR BRIDGE NAME: **SR-710 TUNNEL TECHNICAL STUDY**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
	K. Barker		2 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		SILTY SAND with GRAVEL (SM) *(continued)*.		O10A			0							
477.11	56		Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; olive brown; moist; fine GRAVEL; coarse to fine SAND; weak cementation.		S11	23 31 25	56	100							
	57														
475.11	58														VOC=1.1 ppm
	59														
473.11	60		At EL. 473.1 ft, contains 1' lens of trace coarse GRAVEL; moderate cementation.												
	61		At EL. 472.1 ft, becomes dense; little coarse to fine GRAVEL; mostly coarse to fine SAND; few low plasticity fines.		O12			33							UW, PA
471.11	62														
	63														VOC=8.1 ppm
469.11	64									10	138				
	65														
467.11	66				S13	22 19 27	46	100							
	67														
465.11	68		SANDY elastic SILT (MH); very stiff; olive brown; moist; some fine SAND; medium plasticity, low dry strength, low toughness fines.												
	69														
463.11	70		SILTY SAND (SM); dense; olive brown; moist; fine GRAVEL; mostly fine SAND; some low plasticity fines; weak cementation.												
	71				O14			17							UW, PA VOC=7.3 ppm
461.11	72														
	73														VOC=4.1 ppm
459.11	74		SANDY elastic SILT (MH); very stiff; olive brown; moist; some fine SAND; medium plasticity, low dry strength, low toughness fines.							21	101				
	75														
457.11	76				S15	11 12 14	26	100							
	77														
455.11	78														
	79														
453.11	80														
	81		Poorly graded SAND (SP); medium dense; olive brown; moist; medium to fine SAND; few fines.		O16			50		18	112				UW
451.11	82														
	83														VOC=1.4 ppm
449.11	84														
	85														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B11**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker**		DATE	SHEET **3 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	85		Poorly graded SAND (SP) *(continued)*.											
447.11	86		SANDY SILT (ML); very stiff; dark yellowish brown; moist; some fine SAND; mostly low to medium plasticity fines.		S17	28 14 14	28	100		17				PI
445.11	88													VOC=1.4 ppm
443.11	90													
	91				O18			17		20	101			UW, PA
441.11	92													VOC=1.4 ppm
439.11	94													
437.11	96				S19	12 17 18	35	100						
435.11	98													
433.11	100		CLAYEY SAND (SC); dense; dark yellowish brown; moist; trace fine GRAVEL; some fine SAND; medium plasticity, very high dry strength, high toughness fines.											VOC=2.1 ppm
	101				O20			67		10	101			UW, PI
431.11	102		SILTY SAND with GRAVEL (SM); dense to very dense; dark yellowish brown mottled with very pale brown and moderate yellowish brown; moist; some coarse to fine, subangular GRAVEL; weak cementation; gravels are granodiorite, fine to medium grained, dark yellowish brown, intensely weathered, hard.		C21			10						VOC=20.1 ppm
	103													VOC=2.5 ppm
429.11	104													
427.11	106				C22			10						VOC=2.5 ppm
425.11	108													
423.11	110													
	111		At EL. 422.1 ft, becomes about 10% COBBLES; about 20 to 30% GRAVEL.		C23			33						VOC=3.0 ppm
421.11	112													
419.11	114													
	115													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE **BORING RECORD**				HOLE ID **R-09-Z3B11**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **T/T**	EA **07-07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY **K. Barker**		DATE	SHEET **4 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	115		SILTY SAND with GRAVEL (SM) *(continued)*.		C23			33							
417.11	116		At EL. 417.1 ft, observed little coarse to fine GRAVEL; mostly coarse to fine SAND.		C24			67		12					PI, PA
	117														
415.11	118														
	119														
413.11	120														
	121				C25			100							PA
411.11	122		SILTY SAND (SM); dense; yellowish brown; moist; trace fine GRAVEL; mostly medium to fine SAND; little fines; weak cementation.												
	123														
409.11	124		At EL. 409.1 ft, contains trace fine, subangular GRAVEL.												VOC=1.9 ppm
	125									11					PA
407.11	126		At EL. 407.1 ft, observed no gravel.		C26			95							
	127														
405.11	128														
	129		SANDY lean CLAY (CL); stiff; yellowish brown; moist; trace fine GRAVEL; some medium to fine SAND; mostly medium plasticity fines.												
403.11	130														
	131				C27			20		26					PI, PA
401.11	132														
	133														
399.11	134														
	135		CLAYEY SAND (SC); dense to very dense; dark yellowish brown; moist; trace fine, subangular GRAVEL; coarse to medium SAND.												
397.11	136				C28			0							VOC=2.1 ppm
	137														
395.11	138														
	139														
393.11	140														
	141		Poorly graded SAND with SILT and GRAVEL (SP-SM); dense; dark yellowish brown mottled with yellowish brown and pale orange; moist; few coarse to fine, subangular GRAVEL; fine SAND; few fines.		C29			100							
391.11	142														VOC=2.0 ppm
	143														
389.11	144														
	145														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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Office of Geotechnical Design - South 1

REPORT TITLE: **BORING RECORD**
HOLE ID: **R-09-Z3B11**

DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	T/T	07-07-187900

PROJECT OR BRIDGE NAME: **SR-710 TUNNEL TECHNICAL STUDY**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
	K. Barker		5 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	145		At EL. 388.1 ft, contains trace fine GRAVEL. Poorly graded SAND with SILT and GRAVEL (SP-SM) *(continued)*.		C29			100						
387.11	146				C30			100						
	147													
385.11	148		At EL. 384.6 ft, observed 6" lens cobbles.											
	149													
383.11	150													
	151		Well-graded SAND with SILT (SW-SM); dense; dark yellowish brown mottled with yellowish brown and pale orange; moist; few fine GRAVEL; mostly medium to fine SAND.		C31			100		14				PA VOC=18.2 ppm
381.11	152		At EL. 380.6 ft, becomes some coarse to fine GRAVEL. At EL. 380.1 ft, becomes trace GRAVEL; coarse SAND. At EL. 379.1 ft, becomes about 10 to 15% coarse to fine GRAVEL.											
	153													
379.11	154													
	155		At EL. 378.1 ft, becomes trace GRAVEL.											
377.11	156		Poorly graded SAND with GRAVEL and COBBLES (SP); dense; dark yellowish brown; moist; about 20% COBBLES; coarse SAND; COBBLES consist of.		C32			60						VOC=20.1 ppm
	157													
375.11	158													
	159													
373.11	160		Elastic SILT (MH); very stiff; brown and dark yellowish brown; moist; medium plasticity fines.									PP = 2.5		
	161		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dark yellowish brown, intensely weathered, moderately soft to moderately hard, intensely fractured, shear (silt, moderately healed), dipping 20 to 45°, **[TOPANGA FORMATION]**		C33			100	35					VOC=0.4 ppm **See note at the end of log regarding RQD.**
371.11	162													
	163													
369.11	164		At EL. 369.6 ft, becomes soft to moderately soft.											
	165													
367.11	166				C34			100	40					VOC=13.4 ppm
	167													
365.11	168		At EL. 365.1 ft, becomes very intensely fractured, moderately healed.											
	169													
363.11	170													
	171				C35			100	80					
361.11	172		At EL. 361.1 ft, becomes slightly mottled with greenish gray, extremely weak, moderately soft, slightly fractured, shear, dipping 45°.							25	101			PI, PA, UU, CR
	173													
359.11	174													
	175		At EL. 358.6 ft, contains fine sandstone lenses.											

(continued)

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B11**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME: **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER	PREPARED BY: **K. Barker**		DATE	SHEET: **6 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	175		Poorly graded SAND with GRAVEL and COBBLES (SP) *(continued)*.		C35			100	80					VOC=8.4 ppm
357.11	176		Elastic SILT (MH) *(continued)*. *(continued)*.		C36			100	70					**See note at the end of log regarding RQD.** VOC=3.3 ppm
	177		At EL. 357.1 ft, becomes moderately to slightly fractured, dipping 90 to 20°.											
355.11	178		At EL. 355.1 ft, contains 6" fracture zone.											
	179													
353.11	180													
	181		At EL. 352.1 ft, contains 6" fracture zone.		C37			110	100					VOC=20.4 ppm
351.11	182		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, with fine sandstone lenses, massive, moderate yellowish brown mottled with olive gray, moderately weathered, soft to moderately soft, slightly fractured, fault (moderately healed), dipping 40°.											VOC=20.6 ppm
	183													
349.11	184		At EL. 349.6 ft, contains 4" fracture zone. SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, moderate yellowish brown, intensely weathered, extremely weak, moderately soft, moderately fractured, (carbonate), dipping 40°.							22	103			UC
	185													
347.11	186		At EL. 348.2 ft, contains 5" fracture zone. At EL. 347.1 ft, becomes moderately soft to moderately hard, incipient joint.		C38			80	70					
	187													VOC=1.8 ppm
345.11	188													
	189													
343.11	190													
	191		At EL. 342.8 ft, contains 6" shear/fault zone, dipping 55°. At EL. 342.1 ft, becomes soft to moderately soft, slightly fractured, partially healed, dipping 45°.		C39			100	95					UW
341.11	192													VOC=4.0 ppm
	193													
339.11	194		At EL. 339.1 ft, contains 4" lens hard.											
	195													
337.11	196				C40			100	95					
	197		At EL. 336.7 ft, contains 4" lens hard.											
335.11	198													
	199		At EL. 334.1 ft, becomes moderately hard, unfractured.											
333.11	200													
	201				C41			100	100					VOC=3.6 ppm
331.11	202		At EL. 331.3 ft, contains 2" lens hard. At EL. 331.1 ft, becomes dark brown.											VOC=2.7 ppm
	203													
329.11	204													
	205													

(continued)

Department of Transportation
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REPORT TITLE: **BORING RECORD**

HOLE ID: **R-09-Z3B11**

DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	T/T	07-07-187900

PROJECT OR BRIDGE NAME: **SR-710 TUNNEL TECHNICAL STUDY**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
	K. Barker		7 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205		*(continued).*		C41			100	100						**See note at the end of log regarding RQD.**
327.11	206		At EL. 327.1 ft, becomes slightly fractured, dipping 50 to 45°.		C42			100	100						VOC=1.0 ppm
	207														
325.11	208														
	209														
			At EL. 323.6 ft, contains lenses of fine sandstone, 1-3" thick. Unit is extremely weak.							21	112				
323.11	210		At EL. 323.1 ft, observed shear, dipping 45°.												PTS, SD, EM, UC
	211		At EL. 322.3 ft, observed shear/fault zone, dipping 50°.		C43			100	90						UW
321.11	212		At EL. 322.1 ft, contains 6" slightly weathered, hard, fracture zone, not healed. At EL. 321.6 ft, becomes moderately soft, slightly fractured, dipping 45°.												
	213		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, massive, dark reddish brown, intensely weathered, moderately soft, unfractured.												
319.11	214														
	215		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dark reddish brown, intensely weathered, moderately soft, slightly fractured.												
317.11	216				C44			100	100						UU
	217		At EL. 316.3 ft, becomes intensely weathered, moderately soft, moderately to slightly fractured, incipient fracture, dipping 60 to 30°, with lenses of fine sandstone.												VOC=0.9 ppm
315.11	218									22	101				PI, UC
	219		At EL. 314.3 ft, contains 2" slightly weathered, hard, fracture zone, not healed, Unit is extremely weak.												
313.11	220		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dusky yellowish brown and dark greenish gray, intensely weathered, moderately hard, very intensely to intensely fractured, (moderately healed), dipping 40 to 80°, swells when excavated.												
	221				C45			110	80						VOC=2.8 ppm
311.11	222														
	223														
309.11	224														
	225														
307.11	226		At EL. 307.1 ft, becomes totally healed, Unit is extremely weak.		C46			110	50						EM, UC
	227									15	119				VOC=4.2 ppm
305.11	228														
	229		At EL. 304.1 ft, becomes fresh, hard, intensely fractured, random fracture, totally healed, dipping 30°.												
303.11	230		At EL. 303.3 ft, becomes intensely weathered, moderately hard, very intensely fractured, incipient joint.												
	231		At EL. 302.1 ft, becomes intensely fractured, partially healed, with light gray sandstone lenses, 1-2" thick, 1' spacing.		C47			110	80						VOC=5.7 ppm
301.11	232														PTS
	233														
299.11	234														
	235														

(continued)

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Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B11**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K. Barker			**8 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235		At EL. 298.3 ft, contains 3" lens of fresh, very hard. *(continued)*.		C47			110	80						**See note at the end of log regarding RQD.**
297.11	236				C48			110	60						VOC=5.5 ppm
	237														
295.11	238														
	239														
293.11	240														
	241				C49			120	90						VOC=1.1 ppm
291.11	242														
	243		At EL. 290.8 ft, contains 6" fracture zone, not healed, dipping 45 to 30°. At EL. 290.3 ft, becomes moderately soft, intensely fractured, shear, moderately healed.												
289.11	244														
	245		Unit is extremely weak.												SD, EM, PI, UC
287.11	246				C50			110	80	13	124				VOC=2.5 ppm
	247														
285.11	248														
	249														
283.11	250		At EL. 283.1 ft, observed												
	251		At EL. 282.1 ft, becomes soft, unfractured.		C51			100	60						VOC=1.6, 3.8 ppm
281.11	252		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, massive, medium gray, intensely weathered, very soft.												
	253		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, thickly to very thickly bedded, dark greenish gray, intensely weathered, moderately soft, unfractured, incipient joint.												
279.11	254														
	255		At EL. 278.1 ft, contains 3" lens of fine-grained sandstone.												
277.11	256				C52			100	90						
	257														
275.11	258		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, massive, light gray, slightly weathered, hard, unfractured.												
	259				C53			100	100						UU, PI
273.11	260		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, dark greenish gray, intensely weathered, moderately soft.												
	261		SEDIMENTARY ROCK, (SANDSTONE), fine-grained, light gray, fresh, very hard.		C54			115	80						
271.11	262		SEDIMENTARY ROCK, (SILTSTONE)/MUDSTONE, laminated, dark greenish gray, intensely weathered, extremely weak, moderately soft, very intensely fractured, shear (totally healed), with fine-grained sandstone laminations.												
	263		At EL. 272.1 ft, contains 3" lens of fracture zone.												SD, EM, UC
269.11	264		At EL. 271.9 ft, becomes extremely weak, soft, slightly fractured, moderately healed, dipping 45 to 0°.							14	119				
	265														

(continued)

Department of Transportation
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B11**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K. Barker			**9 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	265		*(continued).*		C54			115	80						**See note at the end of log regarding RQD.**
267.11	266		At EL. 267.1 ft, becomes moderately soft, very intensely fractured, moderately healed, dipping 45°.		C55			120	75						
	267														
265.11	268														
	269														
263.11	270														
	271		At EL. 262.6 ft, becomes moderately hard.												
			At EL. 262.1 ft, becomes very intensely fractured, totally healed.		C56			138	100						
261.11	272														
	273														
259.11	274														
	275		Bottom of borehole at 275.0 ft bgs												
257.11	276		Borehole was converted to piezometer at the completion of drilling.												
	277		RQD values provided in the boring logs are based on intact core pieces obtained between two natural discontinuities. Majority of cores obtained in this boring are weak and does not meet the "sound core" definition provided in standard test method for RQD ASTM D 6032. These RQD values should not be used to evaluate the rock mass quality.												
255.11	278														
	279														
253.11	280														
	281														
251.11	282														
	283														
249.11	284														
	285														
247.11	286														
	287														
245.11	288														
	289														
243.11	290														
	291														
241.11	292														
	293														
239.11	294														
	295														

CALTRANS BORING RECORD MET+ENG FIXED KRIS - SR-710 CALTRANS BORING LOGS WITH REV Z1B4 Z1B8 Z2B3 Z2B4 Z2B4 Z2B5 AND Z3B11 ONLY.GPJ CALTRANS LIBRARY 040808.GLB 3/10/10

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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B11**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**T/T**	**07-07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	K. Barker			**10 of 10**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
R. Chavez	1-6-09	1-13-09	34° 5' 32.8014" / 118° 9' 34.1424" NAD83	R-09-Z3B12
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Cascade Drilling Inc.			' Lt Sta (Westmont Dr. s/o Sherwood Ave.)	501.0 ft NAVD 88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Ingersoll Rand A400	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT(1.4"), Cal (2.4"), PQ core (3.2")			Automatic Hammer 140 lb., 30 inch drop	75%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Piezometer Installed on Completion			NM / 12.8 ft on7/1/09	275.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT 6" thick.												This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
			Road base material, 6" thick.												
	1		SANDY lean CLAY (CL); dark yellowish brown to olive brown; moist; fine SAND; medium plasticity fines [OLDER ALLUVIUM].		D1										
499.00	2														
	3														
497.00	4														
	5														Hand Auger from 1' - 7.5'
495.00	6														
	7														
493.00	8														
	9														
491.00	10		Stiff; brown.		S2	3 3 4	7								VOC = 0.4 ppm
	11														
489.00	12														
	13		SILTY SAND (SM); very dense; light yellowish brown; moist; trace fine GRAVEL; medium to fine SAND; low plasticity fines.												
487.00	14														
	15				S3	29 26 41	67								VOC = 0.2 ppm
485.00	16														
	17														
483.00	18		SILT (ML); hard; light olive brown; moist; trace fine, rounded GRAVEL; nonplastic fines.												
	19														
481.00	20				S4	10 20 40	60								VOC = 0.3 ppm
	21														
479.00	22														
	23		SILTY SAND (SM); dense; light olive brown; moist; medium to fine SAND; trace mica.												
477.00	24														
	25														

(continued)

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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z3B12
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	D/D	07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	D. Jankly		3-16-09	1 of 10

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		SILTY SAND (SM) *(continued)*.		S5	15 22 29	51								See note at end of log regarding RQD. VOC = 0.2 ppm
475.00	26														
	27														
473.00	28		Elastic SILT (MH); very stiff; dark brown; moist; trace mica.												
	29														
471.00	30				S6	4 6 14	20								VOC = 0.2 ppm
	31														
469.00	32														
	33		SILT with SAND (ML); hard; dark brown; moist; fine SAND.												
467.00	34														
	35		25% fine SAND, 75% fines.		S7	7 14 28	42								VOC = 0.3 ppm Other lab tests = PI, PA
465.00	36														
	37														
463.00	38														
	39														
461.00	40		8" Silty Sand layer between 40' and 40.7'.		S8	14 15 19	34								VOC = 0.2 ppm
	41														
459.00	42														
	43		SILTY SAND (SM); very dense; olive brown; moist; fine SAND; micaceous.												
457.00	44														
	45		78% fine SAND, 22% low plasticity fines.		S9	18 34 41	75								VOC = 0.0 ppm Other Lab tests = PA
455.00	46														
	47														
453.00	48														
	49														
451.00	50		Light olive brown.		S10	12 21 28	49								VOC = 0.0 ppm
	51														
449.00	52														
	53														
447.00	54														
	55														

(continued)

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Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE: **BORING RECORD**

HOLE ID: **R-09-Z3B12**

DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**

PROJECT OR BRIDGE NAME: **SR-710 TUNNEL TECHNICAL STUDY**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	**D. Jankly**	**3-16-09**	**2 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	55		SILTY SAND (SM) *(continued)*.		S11	17 39 50/4"								See note at end of log regarding RQD.
445.00	56													
	57													
443.00	58		SILTY CLAY (CL-ML); very stiff; brown to reddish brown; moist; low to medium plasticity fines; trace mica.											
	59													
441.00	60		5" thick interbed of silt between 60.4' and 60.8'.		S12	6 9 15	24							VOC = 0.4 ppm
	61													
439.00	62													
	63		Poorly graded SAND (SP); dense; brown; moist; fine SAND.											
437.00	64													
	65				S13	16 24 29	53							VOC = 0.4 ppm
435.00	66													
	67													
433.00	68													
	69		SEDIMENTARY ROCK: (MUDSTONE/CLAYSTONE), massive, dark olive brown with white specs, intensely weathered, soft, unfractured. (lean CLAY with SAND, hard, moist, medium plasticity fines) **[FERNANDO or PUENTE FORMATION]**											Driller notes faster rod drop at 68.5'
431.00	70				S14	5 9 15	24							VOC = 1.2 ppm
	71													
429.00	72													
	73													
427.00	74													
	75		At EL. 426.0 ft, becomes yellowish brown, 1% fine GRAVEL, 16% coarse to fine SAND, 83% fines.		S15	12 20 36	56							VOC = 1.7 ppm Other lab tests = PI, PA
425.00	76													
	77													
423.00	78													
	79													
421.00	80				S16	8 14 20	34							VOC = 0.1 ppm
	81													
419.00	82		At EL. 419.5 ft, becomes light olive brown and, dark grayish brown, very soft, trace fine gravel, white carbonate stringers with weak reaction to diluted HCL.		C17			100	100					
	83				C18			100	100					
417.00	84		At EL. 417.0 ft, becomes dark grayish brown, sandy (fine grained).											
	85													

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B12**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**3-16-09**	**3 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		SEDIMENTARY ROCK, (CLAYSTONE), massive, light olive brown and, dark grayish brown, intensely weathered, very soft, trace fine gravel, trace sand, white carbonate stringers with weak reaction to diluted HCL. (lean CLAY with trace SAND, hard, moist, mostly low plastic fines). *(continued)*.		C18			100	100						See note at end of log regarding RQD.
415.00	86														
	87														
413.00	88		At EL. 413.5 ft, grades to thickly bedded, light olive brown and dark yellowish brown, medium plasticity with trace fine to coarse sand.		C19			100	100						VOC = 0.1 ppm
	89														
411.00	90		At EL. 411.5 ft, becomes sandy and gravelly 91.5'.												
	91														
409.00	92		At EL. 409.5 ft, becomes very dark gray, very thickly bedded.												
	93		At EL. 408.5 ft, becomes moderately weathered, soft.		C20			100	100						
407.00	94		At EL. 406.9 ft, observed approximately 0.4' thick bed with abundant siltstone fragments.												
	95														VOC = 0.2 ppm
405.00	96														
	97				C21			100	100						
403.00	98		At EL. 403.5 ft, becomes massive, dark grayish brown with trace angular gravel, no reaction to diluted HCL.												VOC = 0.2 ppm
	99														
401.00	100														VOC = 0.1 ppm
	101														PI, PA
399.00	102				C22			100	100						
	103		At EL. 398.5 ft, becomes oxidized, strong brown.												
397.00	104		At EL. 397.5 ft, becomes dark grayish brown and light olive gray, unfractured, low plasticity with trace fine gravel.												
	105														
395.00	106														
	107		At EL. 394.5 ft, becomes thickly bedded, with occasional olive brown, thin beds of coarse grained sandstone, unfractured.		C23			100	100						VOC = 0.1 ppm
393.00	108														
	109		At EL. 392.0 ft, observed bedding joint, dipping 30°, 2" thick coarse grained clayey sandstone bed with some well rounded gravel. Extremely weak.												PI, UU
391.00	110		At EL. 391.0 ft, observed 1" thick, fine to coarse grained, clayey sandstone interbed, dipping 20 to 30 degrees.												
	111		At EL. 390.0 ft, observed 1" thick, fine to coarse grained clayey sandstone bed.		C24			60	60						
389.00	112		At EL. 389.5 ft, becomes dark grayish brown, lacks sand and gravel, no reaction to diluted HCL.												VOC = 0.2 ppm
	113														
387.00	114		At EL. 387.5 ft, observed 2" thick sandstone bed, brown, fine grained with some gravel.												
	115														

(continued)

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DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**3-16-09**	**4 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	115				C24			60	60					See note at end of log regarding RQD.
385.00	116		At EL. 384.8 ft, becomes slightly weathered, very dark gray with scattered well rounded gravel, highly plastic, unfractured.		C25			100	100					VOC = 0.1 ppm
	117													
383.00	118													
	119													
381.00	120													
	121		At EL. 380.5 ft, becomes fresh.											VOC = 0.1 ppm
379.00	122				C26			100	100					
	123													
377.00	124													
	125													PI, PA
375.00	126		Extremely weak.		C27			100	100					UU VOC = 0 ppm
	127		At EL. 374.5 ft, becomes moderately weathered, olive brown, low plasticity, with few elongated gravel.											
373.00	128													
	129													
371.00	130													
	131		At EL. 370.0 ft, contains white calcareous gravel. Unit is massive.		C28			91	91					
369.00	132													
	133													
367.00	134													
	135													
365.00	136													
	137				C29			84	84					VOC = 0.0 ppm
363.00	138													
	139		SEDIMENTARY ROCK, (SILTSTONE), thickly bedded, pale olive mottled with white, moderately weathered, extremely weak, moderately soft, unfractured, mostly non plastic; moderate reaction to diluted HCL. **[PUENTE FORMATION]**												
361.00	140		At EL. 362.6 ft, observed bedding joint, dipping 30°, roughly 2" thick calcareous bed with strong reaction to HCL solution.											PA, UU
	141													
359.00	142		SEDIMENTARY ROCK, (SHALE) with interbedded SILTSTONE, DIATOMACEOUS SILTSTONE, and CALCAREOUS SILTSTONE, laminated to very thinly bedded, pale olive to olive gray, fresh, very slightly fractured, calcareous interbeds are white and hard. Bedding dipping 40 degrees.		C30			94	94					VOC = 0 ppm
	143													
357.00	144		At EL. 359.5 ft, observed joint, dipping 80°, tight.											
	145													

(continued)

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BORING RECORD				**R-09-Z3B12**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**3-16-09**	**5 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	145		SHALE with interbedded SILTSTONE, DIATOMACEOUS SILTSTONE, and CALCAREOUS SILTSTONE, laminated to very thinly bedded, pale olive to olive gray, fresh, very slightly fractured, calcareous interbeds are white and hard. *(continued)*.		C30			94	94					See note at end of log regarding RQD.
355.00	146													
	147				C31			96	72					VOC = 0.1 ppm
353.00	148		At EL. 354.7 ft, becomes soft with hard SHALE beds.											
	149													
351.00	150													
	151													
					C32			77	77					VOC = 0.2 ppm
349.00	152		At EL. 349.0 ft, becomes soft, unfractured, bedding joint, dipping 45°, breaks along bedding plane, slightly calcareous.											
	153													
347.00	154													
	155													VOC = 0.1 ppm
345.00	156													
	157		At EL. 344.4 ft, becomes very slightly fractured.		C33			91	91					
343.00	158		At EL. 343.0 ft, observed bedding joint, dipping 50°.											
	159													VOC = 0.0 ppm
341.00	160													
	161		At EL. 340.4 ft, observed joint, dipping 30°, tight, smooth.											
339.00	162		At EL. 339.9 ft, observed joint, dipping 40°, tight, smooth.		C34			100	100					
	163													
337.00	164		At EL. 337.4 ft, observed bedding joint, dipping 60°.											
	165		SEDIMENTARY ROCK, (SILTSTONE) and DIATOMACEOUS SILTSTONE, joint dipping 60°, tight, smooth.											CR
335.00	166		At EL. 335.0 ft, becomes soft to hard, with hard, interval with calcareous/dolomitic interbeds, unfractured.		C35			76	0					VOC = 0.0 ppm
	167													
333.00	168				C36			82	0					VOC = 0.0 ppm
	169													
331.00	170													
	171		At EL. 330.2 ft, becomes yellowish brown, oxidized, intensely weathered, soft, very intensely fractured (between 170.8' to 172'). Possible faulted zone.		C37			100	70					VOC = 0 ppm
329.00	172		At EL. 329.0 ft, observed bedding joint, dipping 60°, on hard, siliceous interbed.											
	173		At EL. 328.5 ft, becomes slightly fractured, joint, dipping 30°, moderately rough.											
327.00	174													
	175													

(continued)

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BORING RECORD				**R-09-Z3B12**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**3-16-09**	**6 of 10**

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	175		*(continued).*		C37			100	70					See note at end of log regarding RQD.
325.00	176		At EL. 325.9 ft, observed joint, dipping 70°, tight, iron oxide stained, slightly rough.		C38			92	92					VOC = 0 ppm
	177		SEDIMENTARY ROCK, (SHALE), very thinly to thinly bedded, olive gray and light gray, fresh, soft, very slightly fractured, oxidized bedding plane joints, no clay seams.											
323.00	178		At EL. 323.0 ft, observed bedding joint, dipping 60°.											
	179													
321.00	180		At EL. 321.7 ft, observed color change to very dark gray with gray banding. At EL. 321.0 ft, observed syndepositional erosional features to 180.2'.											
	181		At EL. 320.0 ft, becomes laminated to very thinly bedded, black, moderately fractured, low plasticity.		C39			50	0					VOC = 0 ppm
319.00	182													
	183		At EL. 318.0 ft, observed bedding joint, dipping 50°.											
317.00	184													
	185													
315.00	186		At EL. 315.2 ft, becomes black and light greenish gray, extremely weak, unfractured, unoxidized, with thin interbeds hard, siliceous material, weak reaction to diluted HCL.		C40			72	50					VOC = 1.1 ppm UC
	187													
313.00	188		At EL. 312.8 ft, observed bedding joint, dipping 70°.											
	189													
311.00	190													
	191		At EL. 310.2 ft, becomes moderately soft, well bedded. At EL. 309.5 ft, observed phosphatic nodule, strong brown.		C41			100	100					VOC = 0.4 ppm SD
309.00	192													
	193		At EL. 308.5 ft, observed bedding joint, dipping 60°, weak reaction to diluted HCL, breaks along bedding.											
307.00	194				C42			79	79					VOC = 1.3 ppm
	195													
305.00	196		At EL. 305.5 ft, observed bedding joint, dipping 60°, Scattered 1/8" thick phosphate nodules. At EL. 305.2 ft, becomes moderately soft to moderately hard, moderately fractured.		C43			83	61					VOC = 2.5 ppm
	197													
303.00	198		At EL. 302.9 ft, observed three joints dipping 10 degrees, tight, stepped.											
	199		At EL. 302.7 ft, observed bedding joint, dipping 60°.											
301.00	200				C44			100	100					VOC = 1.1 ppm
	201													
299.00	202		At EL. 299.3 ft, observed bedding joint, dipping 55°, fish scales present. Extremely weak.											UC
	203													
297.00	204		At EL. 297.0 ft, observed bedding joint, dipping 60°, weak reaction to diluted HCL, scattered 1/8" dia.		C45			100	100					VOC = 1.7 ppm
	205													

(continued)

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BORING RECORD				**R-09-Z3B12**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**3-16-09**	**7 of 10**

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205		phosphatic nodules.		C45			100	100						See note at end of log regarding RQD.
295.00	206		SHALE, laminated to very thinly bedded, black and light greenish gray, fresh, moderately soft to moderately hard, moderately to slightly fractured. *(continued)*.												
	207		At EL. 294.0 ft, observed bedding joint, dipping 60°.												
293.00	208														
	209				C46			100	100						VOC = 0.9 ppm
291.00	210		At EL. 291.5 ft, with scattered 1/8" dia. phosphate nodules.												
	211														
289.00	212														
	213		At EL. 288.6 ft, observed bedding joint, dipping 60°, on 1/2" thick CLAY seam, along bedding, highly plastic, smooth, tight.												VOC = 5.8 ppm
287.00	214				C47			61	61						UC
	215		At EL. 286.5 ft, observed bedding joint, dipping 60°, Very weak.												
285.00	216														
	217		At EL. 284.3 ft, observed bedding joint, dipping 60°.												
283.00	218		At EL. 283.2 ft, observed two joints dipping 30 and 40 degrees, tight, smooth.												
	219				C48			83	37						VOC = 38 ppm
281.00	220		At EL. 280.8 ft, observed bedding joint, dipping 60°.												
	221														
279.00	222				C49			52	52						VOC = 2.5 ppm
	223		At EL. 277.8 ft, observed bedding joint, dipping 60°.												
277.00	224														
	225				C50			80	0						
			At EL. 275.8 ft, becomes very slightly fractured to unfractured.		C51			89	62						VOC = 0.4 ppm
275.00	226		At EL. 275.2 ft, observed bedding joint, dipping 65°, tight, smooth.												
	227														
273.00	228		At EL. 272.7 ft, observed bedding joint, dipping 65°, tight, smooth.												
	229														CR
271.00	230		At EL. 271.0 ft, becomes olive gray to light olive gray.		C52			68	68						VOC = 3.4 ppm
	231														
269.00	232		At EL. 269.0 ft, observed 4" thick siliceous bed, hard, very intensely fractured, no reaction to HCL solution.												
	233		At EL. 268.3 ft, observed bedding joint, dipping 65°.												
267.00	234		At EL. 267.8 ft, observed joint, dipping 30°, tight, calcite lined, slightly rough.												
	235														

(continued)

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07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**3-16-09**	**8 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235		SHALE, laminated to very thinly bedded, olive gray and light gray, fresh, moderately soft to moderately hard, very slightly fractured to unfractured.		C53			68	68						VOC = 2.4 ppm See note at end of log regarding RQD.
265.00	236														
	237		At EL. 263.8 ft, observed bedding joint, dipping 60°.												
263.00	238														
	239		PTS - Fine-grained shale or siltstone, planar bedded at the millimeter scale..												PTS
261.00	240				C54			100	100						VOC = 2.2 ppm
	241														
259.00	242		At EL. 259.5 ft, observed bedding joint, dipping 60°.												
	243														SD
257.00	244		At EL. 257.0 ft, observed joint, dipping 90°, tight moderately rough, approximately 1' long.		C55			100	100						VOC = 0.4 ppm
	245		At EL. 256.3 ft, observed bedding joint, dipping 60°.												
255.00	246														
	247		At EL. 254.7 ft, observed bedding joint, dipping 60°.												
253.00	248				C56			76	60						VOC = 0.2 ppm
	249		At EL. 252.2 ft, observed bedding joint, dipping 60°, . Very weak.												UC
251.00	250														
	251		At EL. 250.0 ft, observed bedding joint, dipping 60°.												
249.00	252		At EL. 249.5 ft, observed shear/fault zone, 3" thick, highly plastic, clay infilling, intensely fractured, parallel to bedding.												
	253				C57			63	63						VOC = 0.0 ppm
247.00	254														
	255														
245.00	256														
	257				C58			56	56						
243.00	258		At EL. 243.2 ft, observed bedding joint, dipping 60°.												
	259				C59			100	100						VOC = 0.9 ppm
241.00	260		At EL. 241.2 ft, observed bedding joint, dipping 60°.												
	261		At EL. 240.5 ft, observed bedding joint, dipping 60°.												
239.00	262				C60			100	90						
	263														
237.00	264														
	265		At EL. 236.5 ft, observed bedding joint, dipping 60°.												

(continued)

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07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**3-16-09**	**9 of 10**

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method / Casing Depth	Remarks
	265		SHALE, laminated to very thinly bedded, olive gray and light gray, fresh, moderately soft to moderately hard, very slightly fractured to unfractured.		C60			100	90					See note at end of log regarding RQD.
235.00	266		At EL. 235.9 ft, observed bedding joint, dipping 60°.											
	267		At EL. 235.2 ft, observed fault, dipping 80°, 1/8" thick, soft clay lining, rough, 7" offset.		C61			98	98					VOC = 1.3 ppm
233.00	268		At EL. 233.0 ft, observed fine grained sandstone lamination, friable. Very weak.											UC
	269													
231.00	270													
	271													
229.00	272				C62			100	100					VOC = 0.5 ppm
	273													SD
227.00	274		At EL. 227.5 ft, observed bedding joint, dipping 70°.											
	275		At EL. 226.7 ft, observed joint, dipping 40°, tight, polished and striated with clay film.											
			Bottom of borehole at 275.0 ft bgs Borehole terminated at planned depth.											
225.00	276		Borehole converted to piezometer at the completion of drilling.											
	277													
223.00	278		RQD values provided on the boring logs are based on intact core pieces obtained between two natural discontinuities. The majority of core obtained from this boring is typically very weak to weak and does not meet the "sound core" definition provided in the standard test method for RQD (ASTM D 6032). These RQD values should not be used to evaluate rock mass quality.											
	279													
221.00	280													
	281													
219.00	282													
	283													
217.00	284													
	285													
215.00	286													
	287													
213.00	288													
	289													
211.00	290													
	291													
209.00	292													
	293													
207.00	294													
	295													

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z3B12**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**3-16-09**	**10 of 10**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
D. Jankly	3-10-09	3-16-09	34° 4' 51.5958" / 118° 9' 20.7936" NAD83	R-09-Z4B4
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Cascade Drilling Inc.			' Lt Sta (Westminster Ave. n/o W. Mission Rd.)	454.4 ft NAVD 88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Speedstar 30k	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT(1.4"), Cal (2.4"), PQ core (3.2")			Automatic Hammer 140 lb. 30 inch drop	70%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Piezometer Installed on Completion			NM	46.3 ft on7/1/09	277.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT 4" thick.												This Boring Record was prepared in accordance with the Caltrans Soil & Rock Logging, Classification and Presentation Manual (June, 2007), except as noted in Appendix A.1 of the Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California, dated April, 2010.
	1		Road base material, 6" thick.												
452.40	2		SILTY SAND (SM); reddish brown; dry to moist; few coarse to fine, subangular to subrounded GRAVEL; mostly coarse to fine SAND; some low plasticity fines [FILL].		D01										
	3														
450.40	4														
	5		SILTY SAND (SM); dense; light brown; moist; trace coarse to fine, subrounded GRAVEL; mostly coarse to fine SAND; some low plasticity fines [OLDER ALLUVIUM].												Hand Auger to 5'
448.40	6														
	7														
446.40	8														
	9														
444.40	10				S02	7 10 20	30	61							
	11														
442.40	12														
	13														
440.40	14		SANDY SILTY CLAY (CL-ML); very stiff; dark yellowish brown; moist; 31% medium to fine SAND, 69% fines.												
	15				S03	5 18 14	32	100		18	113				PI, PA
438.40	16														
	17														
436.40	18														
	19														
434.40	20		Hard.		S04	6 12 14	26	100							
	21														
432.40	22														
	23														
430.40	24														
	25														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
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REPORT TITLE				HOLE ID
BORING RECORD				R-09-Z4B4
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	LA	710	D/D	07-187900
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	D. Jankly		4-13-09	1 of 10

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	25		SANDY SILTY CLAY (CL-ML) *(continued)*. Hard.		S05	9 16 25	41	100		21	103				
428.40	26														
	27														
426.40	28														
	29														
424.40	30		Very stiff; brown.		S06	5 8 13	21	100							
	31														
422.40	32														
	33														
420.40	34														
	35		43% predominantly fine SAND, 57% fines.		S07	6 13 18	31	100		20	110				PI, PA
418.40	36														
	37														
416.40	38														
	39														
414.40	40				S08	10 18 29	47	72							
	41		Poorly graded SAND (SP); very dense; light yellowish brown; moist; coarse to fine SAND.												
412.40	42														
	43														
410.40	44														
	45				S09	50/3"		0							
408.40	46														
	47														
406.40	48														
	49														
404.40	50		SILTY SAND with GRAVEL (SM); very dense; dark yellowish brown; moist; 15% coarse to fine GRAVEL, 69% coarse to fine SAND, 16% low plasticity fines.		S10	33 30 24	54	78		12					PA
	51														
402.40	52														
	53														
400.40	54														
	55														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
Division of Engineering Services
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Office of Geotechnical Design - South 1

REPORT TITLE **BORING RECORD**				HOLE ID **R-09-Z4B4**
DIST. **07**	COUNTY **LA**	ROUTE **710**	POSTMILE **D/D**	EA **07-187900**
PROJECT OR BRIDGE NAME **SR-710 TUNNEL TECHNICAL STUDY**				
BRIDGE NUMBER **N/A**	PREPARED BY **D. Jankly**		DATE **4-13-09**	SHEET **2 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	55		At EL. 399.4 ft, with coarse GRAVEL.		S11	50/5"		40							
398.40	56		SILTY SAND with GRAVEL (SM) *(continued)*.												
	57														
396.40	58														
	59														
394.40	60		SILTY SAND (SM); very dense; reddish brown; moist; mostly coarse to fine SAND; little low plasticity fines.		S12	19 50/5"		80							
	61														
392.40	62														
	63														
390.40	64														
	65		1% fine GRAVEL (subangular), 61% predominantly fine SAND, 38% low plasticity fines.		S13	18 31 44	75	100							PA
388.40	66														
	67														
386.40	68														
	69														
384.40	70				S14	18 38 56	94	89							
	71														
382.40	72														
	73														
380.40	74														
	75		At EL. 379.4 ft, becomes mostly coarse to fine SAND; little low plasticity fines.		S15	50/6"		33							
378.40	76														
	77														
376.40	78														
	79														
374.40	80				S16	24 33 47	80	72							
	81														
372.40	82														
	83														
370.40	84		SEDIMENTARY ROCK, (CLAYSTONE), massive, strong brown, decomposed, soft, moist, oxidized, no reaction to diluted HCL. (fat CLAY (CH), moist, very												
	85														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

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Division of Engineering Services
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Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z4B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**4-13-09**	**3 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	85		stiff). **[FERNANDO FORMATION]** *(continued)*.		S17	13 19 23	42	100	100	28					See note at end of log regarding RQD. PI
368.40	86														
	87		SEDIMENTARY ROCK, (CLAYSTONE TO SILTSTONE), massive, light greenish gray and dark yellowish brown, moderately weathered, soft, unfractured, iron oxide staining.		C18										
366.40	88														
	89														
364.40	90				C19			100	100						
	91														
362.40	92														
	93		At EL. 361.9 ft, observed bedding joint, faint, subhorizontal.												
360.40	94		At EL. 360.5 ft, observed 7" thick Siltstone bed, strong brown with black stained remnant fractures, subhorizontal.												
	95														
358.40	96		At EL. 358.6 ft, observed shear, dipping 75°, polished, paperthin clay lining, faint shear surface extended from 95.8 feet to 96.5 feet.												
	97		At EL. 357.9 ft, observed faint subhorizontal bedding plane. Extremely weak.							27	95				PI, PA, CR, UU
356.40	98														
	99		At EL. 355.4 ft, observed bedding joint, dipping 20 to 10°, 3/8" to 1/2" thick Siltstone bed with iron oxide stained halo, undulatory.												
354.40	100				C20			100	100						
	101		At EL. 353.4 ft, observed bedding joint, dipping 10°.												
352.40	102														VOC = 32.6 ppm
	103		At EL. 351.4 ft, observed joint, dipping 60°, very faint, non-continuous, black lined joint.												
350.40	104		At EL. 350.4 ft, observed undulatory bedding, rolls over, dipping up to 20 degrees in opposite direction, soft sediment deformation present.												
	105		At EL. 349.4 ft, observed shear, dipping 25 to 20°, four shears observed between 105' to 106.5'. Shears are tight, up to 1/16" thick, black lined, truncate siltstone laminations.												
348.40	106														
	107		At EL. 347.9 ft, observed joint, dipping 30 to 25°, numerous black lined joints, iron oxide stained, some iron oxide stained Siltstone lenses.		C21			100	100						
346.40	108		At EL. 347.4 ft, becomes light brownish gray, very slightly fractured.												
	109		At EL. 346.4 ft, observed shear, dipping 60°, faintly polished shear, bedding is undulatory, subhorizontal.												VOC = 51.5 ppm
344.40	110		At EL. 345.3 ft, observed shear, dipping 40°, 1mm aperture, moderately rough.												
	111		At EL. 345.0 ft, observed bedding joint, dipping 10°, 3/8" thick iron oxide stained bed with abundant black staining.												
342.40	112		At EL. 344.4 ft, observed bedding joint, dipping 10 to 5°.		C22			78	78						
	113		At EL. 343.6 ft, observed bedding joint, dipping 25°, bedding is undulatory, locally folded, soft sediment deformation.												
340.40	114		At EL. 343.5 ft, observed shear, dipping 45°. At EL. 342.0 ft, observed bedding joint, dipping 40°, local faint laminations.												VOC = 49.2 ppm
	115		At EL. 341.8 ft, observed joint, dipping 70°, tight.												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z4B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**4-13-09**	**4 of 10**

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	115		At EL. 341.6 ft, observed bedding joint, dipping 45°, possible bedding on strong brown and light brown gray contact.		C22			78	78						See note at end of log regarding RQD.
338.40	116		At EL. 341.4 ft, becomes greenish black, contact between light greenish gray above and greenish black dipping 60 degree.												
	117		*(continued)*.												
336.40	118		At EL. 338.6 ft, observed shear, dipping 70 to 45°, two very faint shears.												
	119		At EL. 337.9 ft, observed joint, dipping 60 to 50°, aperture 2mm, moderately rough.												
334.40	120		At EL. 336.9 ft, observed bedding joint, dipping 25°, bedding on contact between strong brown and light brownish gray beds.		C23			100	80						
	121		At EL. 336.4 ft, observed joint, dipping 50°.												VOC = 25.6 ppm
332.40	122		At EL. 334.4 ft, grades to unoxidized. Unit is micaceous, no reaction to HCL solution.												
	123		At EL. 334.0 ft, observed bedding joint, dipping 40°, local iron oxide stained bed.		C24			100	100						
330.40	124		At EL. 333.8 ft, observed shear, dipping 70°.												
	125		At EL. 332.9 ft, observed irregular gradational contact from 121' to 122.1' dipping 65 degrees to vertical, greenish black above, light gray below.												VOC = 26.5 ppm
328.40	126		At EL. 332.1 ft, observed shear, dipping 70°, iron oxide stained below shear, light brownish gray above.												
	127		At EL. 331.5 ft, observed bedding joint, dipping 60°, 1" diameter concretionary nodule, beds folded around nodule.							20	102				PI, UC
326.40	128		SEDIMENTARY ROCK, (SILTSTONE), massive, greenish black to black, slightly weathered to fresh, moderately soft, unfractured, with scattered rip-up clasts, micaceous, unoxidized.												
	129		At EL. 329.9 ft, observed 8" thick strong brown zone. Very weak.												
324.40	130		At EL. 325.4 ft, observed scattered black rip-up clasts, randomly oriented, bedding unknown.												
	131				C25			100	100						
322.40	132														
	133		At EL. 321.4 ft, observed 1.5' thick zone with very faint black siltstone rip-up clasts and very faint laminations indicating possible subhorizontal bedding (<10 degrees).												VOC = 21.8 ppm
320.40	134														
	135		At EL. 319.4 ft, becomes fresh, micaceous.												
318.40	136														
	137		At EL. 317.9 ft, observed charcoal fragment, 1/8"x3/8".		C26			90	83						VOC = 31.7 ppm
316.40	138														
	139									18	102				UU
314.40	140		Very weak.												
	141														
312.40	142		At EL. 312.4 ft, observed shear, dipping 70°, polished, tight, faint clay lining.												
	143		At EL. 311.4 ft, observed shear, dipping 70°, tight shear with 1/16" clay lining, black.		C27			100	100						
310.40	144		At EL. 310.2 ft, contains black siltstone rip-up clasts.												
	145														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
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Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z4B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**4-13-09**	**5 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	145		SILTSTONE, massive, greenish black to black, fresh, moderately soft to moderately hard, unfractured, with scattered rip-up clasts, micaceous, unoxidized. *(continued)*.		C27			100	100						See note at end of log regarding RQD.
308.40	146		At EL. 307.9 ft, observed shear, dipping 65°, tight shear with 1/16" clay lining, faint.												VOC = 15.4 ppm
	147														
306.40	148		At EL. 306.9 ft, observed 2" thick soft zone, no visible shearing observed.												
	149														
304.40	150				C28			100	100	17					SD
	151		At EL. 303.4 ft, observed shear, dipping 70 to 50°, two shears, tight, very faint, 1/16" thick clay lining.												
302.40	152		At EL. 302.4 ft, observed shear, dipping 75 to 70°, tight, 1/16"-1/8" thick, fat clay lining.												
	153														
300.40	154														
	155		At EL. 299.9 ft, observed black siltstone rip-up clasts. At EL. 299.6 ft, observed shear, dipping 60°, Aperture 1mm, clay lined, moderately rough.												
298.40	156									17	105				UC
	157		Very weak.												
296.40	158				C29			100	100						
	159														
294.40	160														
	161														
292.40	162														VOC = 25.1 ppm
	163														
290.40	164														
	165														
288.40	166		At EL. 289.1 ft, observed abundant rip-up clasts, randomly oriented.												
	167		At EL. 287.9 ft, observed possible 10 degree bedding on numerous similarly oriented rip-up clasts.												
286.40	168				C30			95	95						
	169														
284.40	170		At EL. 285.2 ft, observed charcoal fleck 1/8"x3/8".												
	171														
282.40	172														
	173		At EL. 282.4 ft, observed fine, white lined nodules up to 1/8" thick and 3/8" long. Possible shells/shell fragments.												
280.40	174				C31			100	100						VOC = 15.1 ppm
	175														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z4B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**4-13-09**	**6 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	175		SILTSTONE, massive, greenish black to black, fresh, moderately soft to moderately hard, unfractured, with scattered rip-up clasts, micaceous, unoxidized.		C31			100	100						See note at end of log regarding RQD.
278.40	176		At EL. 278.9 ft, observed scattered charcoal flecks <1/8" diameter and scattered white lined nodules as El. 282.4 ft.												
	177														
276.40	178														
	179		At EL. 275.4 ft, observed 1/4" x 1-1/2" bluish gray, subhorizontal lens.												
274.40	180		At EL. 274.8 ft, observed 3/8" x 5" laminated lens dipping 50 degrees, non-continuous around core.		C32			100	100						
	181		At EL. 274.2 ft, observed 3/8" diameter concretionary nodule.		C33			100	100						
272.40	182		At EL. 273.4 ft, observed abundant rip-up clasts, randomly oriented, from 181' to 185'.												
	183														
270.40	184														
	185														VOC = 35.8 ppm PI
268.40	186														
	187														
266.40	188														
	189		At EL. 265.9 ft, observed white lined nodules as El. 282.4 ft.		C34			100	100						
264.40	190														
	191														VOC = 15.7 ppm
262.40	192														
	193														
260.40	194														
	195														
258.40	196				C35			100	100						
	197		At EL. 257.4 ft, observed faint white lens, 4" long x 1/8" thick, dipping 60 degrees, non-continuous around core.												
256.40	198														
	199									14	106				SD, UC
254.40	200		At EL. 254.9 ft, observed black siltstone rip-up clasts. Very weak.												
	201		PTS - Siltstone with red-brown iron oxide rich matrix (86%).												PTS VOC = 28.2 ppm
252.40	202		At EL. 253.7 ft, observed 1" long x 1/8" thick white nodule.												
	203		At EL. 252.4 ft, observed scattered charcoal flecks <1/8" diameter, from 201.3' to 205'.												
250.40	204		At EL. 251.9 ft, observed 1" x 3/4" stone in center of core, polished, rectangular.												
	205														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z4B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**4-13-09**	**7 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	205		SILTSTONE, massive, greenish black to black, fresh, moderately soft, unfractured, with scattered rip-up clasts, micaceous, unoxidized.		C36			100	100						See note at end of log regarding RQD.
248.40	206		At EL. 249.3 ft, observed possible bedding dip of 10 degrees, scarce charcoal flecks <1/8" dia.												
	207														
246.40	208														VOC = 48.4 ppm
	209		At EL. 245.9 ft, observed 1" x 1/2" lens of fine to medium grained silty sandstone, dipping 10 degrees.												
244.40	210				C37			100	100						
	211														
242.40	212		At EL. 242.2 ft, observed siltstone rip-up clasts.												
	213														VOC = 46.2 ppm
240.40	214														
	215		At EL. 239.6 ft, observed irregular lenses of bluish gray silt, subhorizontal.												
238.40	216		At EL. 239.4 ft, observed some fine white lined nodules as El. 282.4 ft.												
	217														
236.40	218				C38			100	100						
	219														
234.40	220														
	221		At EL. 234.2 ft, observed scarce siltstone rip-up clasts. Scattered charcoal flecks at 220.5 to 222.5'. Very weak.							20	101				CR, UU
232.40	222														
	223		At EL. 231.4 ft, observed 3/4" x 3/8" bluish gray rip-up clast, internally laminated, subhorizontal.												
230.40	224				C39			100	100						VOC = 22.2 ppm
	225														
228.40	226		At EL. 228.3 ft, observed siltstone rip-up clasts.												
	227														
226.40	228		At EL. 226.4 ft, observed white lined nodules as El. 282.4 ft, generally subhorizontally dipping.												
	229		At EL. 226.1 ft, observed 3/8" x 1/8" charcoal fleck.												
224.40	230		At EL. 224.8 ft, contains siltstone rip-up clasts.												
	231		At EL. 223.9 ft, observed faint, 3" x 3/8" sandy lens dipping 20 degrees, dips against faint 10 degree fabric in rock (possible bedding dipping 10 degrees).												
222.40	232		At EL. 223.4 ft, observed dark greenish gray, hard, 4" thick limestone bed, highly reactive to HCL solution, some very tight internal fractures with possible calcite lining. Upper contact dipping 20 degrees, lower contact is undulatory, subhorizontal.		C40			100	100						
	233														
220.40	234		At EL. 221.4 ft, observed bluish gray siltstone rip-up clast. Unit is very weak.							14					SD
	235														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z4B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**4-13-09**	**8 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	235		SILTSTONE, massive, greenish black to black, fresh, moderately soft to moderately hard, unfractured, with scattered rip-up clasts, micaceous, unoxidized.		C40			100	100						See note at end of log regarding RQD.
218.40	236		At EL. 218.1 ft, observed 1-1/2" x 3/8" charcoal/remnant wood fragment.												VOC = 43.2 ppm
	237		At EL. 216.9 ft, observed scattered charcoal flecks.												
216.40	238		At EL. 216.4 ft, observed faint siltstone fabric indicates possible subhorizontal bedding.												
	239														
214.40	240														
	241														
212.40	242				C41			100	100						
	243		At EL. 211.4 ft, observed possible subhorizontal bedding based on siltstone rip-up clast orientation.												
210.40	244														
	245				C42			97	97						VOC = 3.6 ppm
208.40	246		At EL. 208.9 ft, observed faint siltstone fabric, possible subhorizontal bedding.												
	247		At EL. 207.4 ft, observed shear, dipping 60°, tight, paperthin clay lining, polished.												
206.40	248		At EL. 206.4 ft, with scattered fine (<1/16" diameter) white flecks at 248' to 254'.												
	249														
204.40	250														VOC = 2.4 ppm
	251		At EL. 203.4 ft, observed scarce charcoal flecks up to 1/8" dia.												
202.40	252		At EL. 201.9 ft, observed siltstone rip-up clast.												
	253														
200.40	254		At EL. 200.4 ft, observed local fabric dipping 50 degrees, adjacent and parallel to 1/16" to 1/8" thick very fine sand lens, possible soft sediment deformation.												
	255				C43			100	100						
198.40	256		As 123.5' with trace fine sand. Siltstone fabric indicates subhorizontal bedding.												
	257		At EL. 197.9 ft, observed siltstone rip-up clasts.												
196.40	258		At EL. 197.4 ft, observed scattered charcoal flecks between 257' and 265'.												
	259														
194.40	260														VOC = 22.4 ppm
	261														
192.40	262														
	263									21	102				UU
190.40	264		Very weak.												
	265														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z4B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**4-13-09**	**9 of 10**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	265		SILTSTONE, massive, greenish black to black, fresh, moderately soft to moderately hard, unfractured, with scattered rip-up clasts, micaceous, unoxidized.		C44			100	100						See note at end of log regarding RQD.
188.40	266		At EL. 187.9 ft, observed 1/8" - 1/4" thick bluish gray silt lens.												
	267														
186.40	268		At EL. 185.6 ft, observed bedding joint, dipping 5 to 0°, 1" thick section with bluish gray, very fine sand lenses, subhorizontal.												
	269														
184.40	270		At EL. 183.4 ft, observed shear, dipping 70°, polished, faint clay lining.												
	271														
182.40	272				C45			100	100						
	273		At EL. 181.1 ft, observed siltstone rip-up clast and bluish gray very fine sand lens.												
180.40	274														VOC = 18.3 ppm
	275														
178.40	276		At EL. 178.9 ft, observed shear, dipping 65°, very tight, 1/16" thick clay lining.												
	277		Bottom of borehole at 277.0 ft bgs Borehole terminated at planned depth.												
176.40	278		Borehole converted to piezometer at the completion of drilling.												
	279														
174.40	280		RQD values provided on the boring logs are based on intact core pieces obtained between two natural discontinuities. The majority of core obtained from this boring is typically very weak to weak and does not meet the "sound core" definition provided in the standard test method for RQD (ASTM D 6032). These RQD values should not be used to evaluate rock mass quality.												
	281														
172.40	282														
	283														
170.40	284														
	285														
168.40	286														
	287														
166.40	288														
	289														
164.40	290														
	291														
162.40	292														
	293														
160.40	294														
	295														

CALTRANS BORING RECORD MET+ENG FIXED SR-710 CH2M HILL BORINGS.GPJ CALTRANS LIBRARY 040808.GLB 3/11/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South 1

REPORT TITLE				HOLE ID
BORING RECORD				**R-09-Z4B4**
DIST.	COUNTY	ROUTE	POSTMILE	EA
07	**LA**	**710**	**D/D**	**07-187900**
PROJECT OR BRIDGE NAME				
SR-710 TUNNEL TECHNICAL STUDY				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**D. Jankly**		**4-13-09**	**10 of 10**

Caltrans LOTB

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
07	LA	134, 210, 710	Var	141	142

R.C. Wilhelms
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST · R.C. WILHELMS · No. 560 · Exp. 5-31-99 · CERTIFIED ENGINEERING GEOLOGIST · STATE OF CALIFORNIA

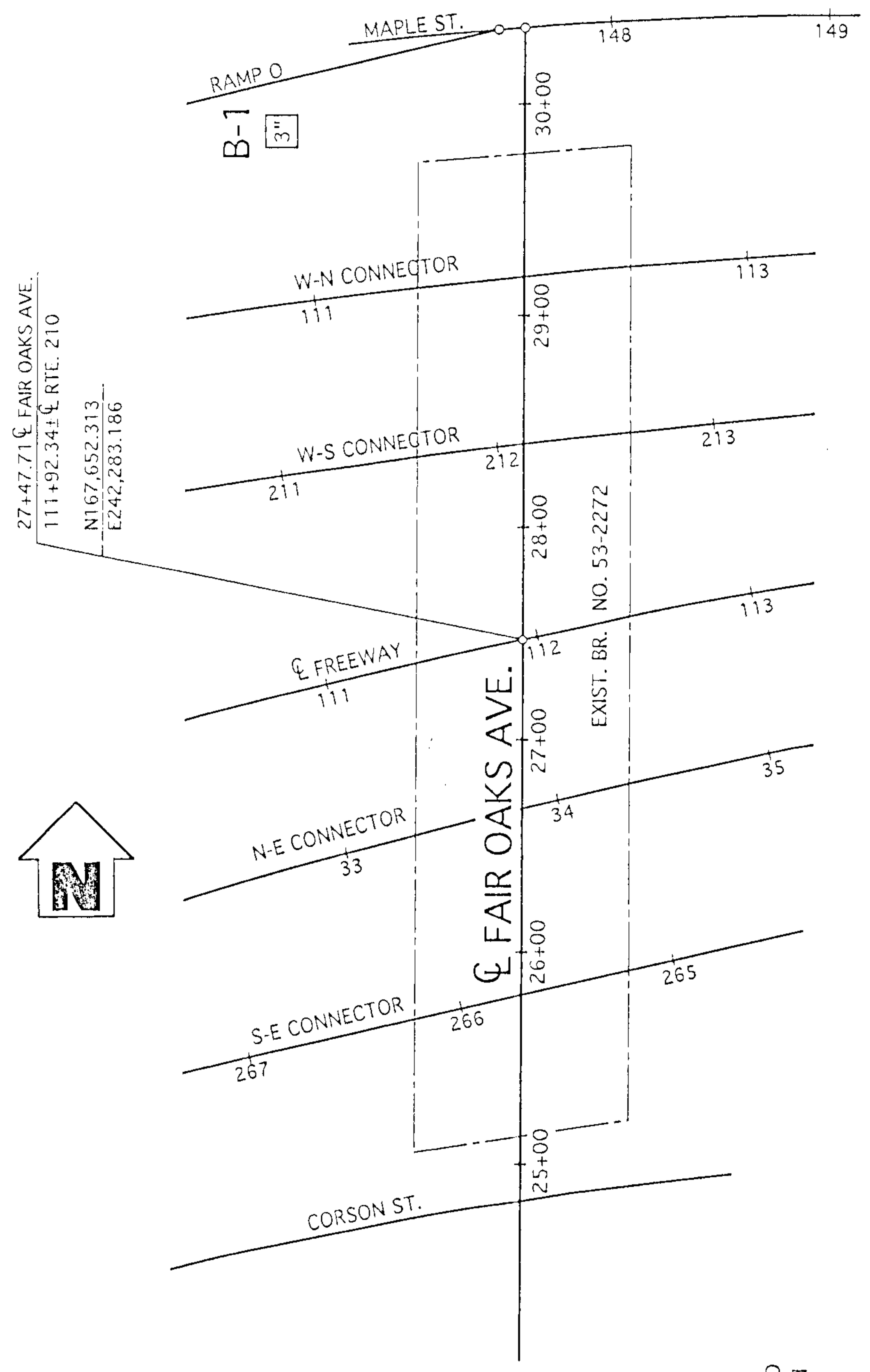
11-11-96
PLANS APPROVAL DATE

NO AS BUILT CHANGES

AS BUILT

CORRECTIONS BY M. JASMINSKI
CONTRACT NO. 07-170904
DATE 6/10/98

PLAN
1" = 60'



BENCH MARK

TBM Elev. 881.16 ±
FD. PAVING NOTCH AT NORTH END OF BRIDGE ON STA. 29+76.72± CENTERLINE FAIR OAKS AVENUE ACCORDING TO GENERAL PLAN (RECEIVED 12-8-94).

NOTES:

1. REC = % ROCK RECOVERY
2. RQD = % ROCK QUALITY DESIGNATION
3. NO GROUND WATER ENCOUNTERED DURING FIELD INVESTIGATION.

PROFILE
Hor. 1" = 20'
Ver. 1" = 10'

B-1
114' Lt. Sta. 29+87
℄ Fair Oaks Ave.
882.0

Boring B-1 log (descriptions, top to bottom):

- Compact, olive brown and olive gray, SILTY fine to medium SAND with minor GRAVEL and occasional COBBLES; slight cohesion; dry.
- Dense to very dense, light brown, SILTY medium SAND with scattered GRAVEL and COBBLES; slightly moist.
- Dense, brown, SILTY fine to medium SAND with minor GRAVEL; slightly moist.
- Very dense, light brown, medium to coarse SAND with scattered GRAVEL and less than 10% fines; slightly moist.
- Very dense, brown, SILTY to CLAYEY fine SAND; moist.
- Very dense, light brown to light gray, GRAVELLY coarse SAND with sparse COBBLES.
- Very dense, light brown, slightly SILTY coarse SAND with scattered GRAVEL.
- Dense, brown SILT; moist.
- Very dense, light brown, slightly SILTY coarse SAND with scattered GRAVEL.
- Very dense, light brown, coarse SAND with scattered GRAVEL and occasional COBBLES; a 0.5' SILTY fine SAND bed encountered at 130.0' depth; moist.
- Very dense, light brown and gray, SANDY GRAVEL with scattered COBBLES.
- Very dense, varicolored COBBLES and BOULDERS. Hardness of the rock fragments range from extremely hard to moderately soft; the weathering varies from intensely to moderately weathered (in moderately soft pieces) to slightly weathered (in extremely to very hard pieces).
- Estimated very dense, light brown, coarse GRAVELLY SAND with interbeds of brown, SILTY SAND with scattered GRAVEL and occasional COBBLES.
- Estimated very dense, brown, SILTY fine SAND with interbeds of medium to coarse SAND, CLAYEY coarse SAND, minor GRAVEL and COBBLES; moist.
- Varicolored, cemented angular pieces of decomposed GRANITIC and moderately soft META IGNEOUS and META SEDIMENTARY rocks. The size of the rock fragments range from 2" to 10". The cementation medium appears to be CLAY.
- Light brown, SILTY medium to coarse SAND with minor GRAVEL and decomposed COBBLES; moist.
- Olive brown and brown, SILTY fine SAND with interbeds of brown SILT and reddish brown CLAYEY SAND; moist.
- Gray, SANDY GRAVEL with minor very hard COBBLES.
- Reddish brown with patchy gray, SILTY fine to medium SAND with interbeds of CLAY, speckled SILT and minor GRAVEL; high oxidation; moist.
- Gray, SANDY coarse GRAVEL.

Penetration values (blows/ft): 26, 28, 53, 32, 26, 41, 51, 58, >70, >70, 58, 39, 62, >70, >70, >70, >70, >70, >70, >70, 58, >70, >70, >70, >70

Rock core: REC=40% RQD=0%; REC=10% RQD=0%; REC=60%; REC=15%; REC=60%; REC=80%; REC=40%; REC=30%; REC=40%; REC=50%; REC=40%; REC=60%; REC=50%; REC=70%; REC=75%; REC=70%

2-9-95

Elevations: 880, 870, 860, 850, 840, 830, 820, 810, 800, 790, 780, 770, 760, 750, 740, 730, 720, 710, 700, 690, 680, 670, 660, 650, 640, 630

Stations: 29+00, 30+00, 31+00

CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

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.

LEGEND OF EARTH MATERIALS

GRAVEL · SAND · SILT · CLAY · SANDY CLAY or CLAYEY SAND · SANDY SILT or SILTY SAND · SILTY CLAY · CLAYEY SILT · PEAT and/or ORGANIC MATTER · FILL MATERIAL · IGNEOUS ROCK · SEDIMENTARY ROCK · METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

2½" CONE PENETROMETER · SAMPLE BORING (DRY) · ROTARY SAMPLE BORING (WET) · AUGER BORING (DRY) · TEST PIT · DIAMOND CORE BORING · JET BORING · ELECTRONIC CONE PENETROMETER

SAMPLE BORING (DRY) · ROTARY SAMPLE BORING (WET) · 2½" CONE PENETRATION BORING · ELECTRONIC CONE PENETROMETER TEST

Cone Penetrometer dimensions and testing procedures are in accordance with ASTM Standard D 3441-79, or as noted.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	OFFICE OF ENGINEERING GEOLOGY	FIELD INVESTIGATION BY: F. GERAMI / J. PRATT	State of CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN 14
DRAWN BY Irma Gamarra 2/95				
CHECKED BY				

BRIDGE NO. 53-2272
POST MILE R 25.29

EARTHQUAKE RETROFIT PROJECT SR-156

FAIR OAKS AVENUE OVERCROSSING

LOG OF TEST BORINGS 1 OF 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 07262
EA 170901

DISREGARD PRINTS BEARING EARLIER REVISION DATES
3-30-95
REVISION DATES (PRELIMINARY STAGE ONLY)
SHEET 7 OF 8

TL 6051 REV 2/92

CALTRANS BORING RECORDS

Table 1
Selected Well Data For The Study Area And Vicinity

Well No.	Year Drilled	Elev. - Top of Well	Elev. - Bottom of Well	Total Depth	Elev. - Base of Alluvium	Thickness of Alluvium	Material at Bottom of Well
C-23a	1907	764	665	99	756	08	Granitic Rock
C-23d	1931	570	435	135	462	108	Granitic Rock
C-23f	1938	643	177	466	446	197	Granitic Rock
C-24a	1931	758	563	195	628	130	Tertiary Rock
C-25a	1916	756	577	180	625	131	Tertiary Rock
C-25b	1927	757	582	175	605	152	Granitic Rock
C-25d	1899	802	-508	1310	502?	300?	Granitic Rock
C-26	1901	756	588	168	588	168	Granitic Rock?
C-27	1911	753	494	259	550	203	Granitic Rock?
C-28	1904	750	456	254	505	245	Granitic Rock?
C-29	1924	754	506	248	508	246	Granite
C-30	1904	756	500	256	500	256	Granitic Rock?
C-30a	1898	746	636	110	---	---	Alluvium?
C-30b	1898	747	649	98	---	---	Alluvium?
C-30e	1910	753	468	285	478	275	Granitic Rock?
C-30L	1891	755	625	130	---	---	Alluvium?
C-30m	1903	756	226	530	498	258	Granitic Rock?
C-30n	1926	758	512	246	525	233	"Decomposed Granite Dyke"
C-31a	1925	772	582	190	589	183	Granite

Table 1. Selected Well Data For The Study Area And Vicinity (contd)

Well No.	Year Drilled	Elev. - Top of Well	Elev. - Bottom of Well	Total Depth	Elev. - Base of Alluvium	Thickness of Alluvium	Material at Bottom of Well
C-31c	1928	763	584	179	560	170	"Granite bed-rock"
C-31e	1931	758	548	210	548	210	Granitic Rock?
C-31f	1931	794	442	352	464	330	Granitic Rock?
C-34b	1908	732	572	160	612?	120?	Tertiary Rock?
C-56	1920	715	478	237	533?	182?	Tertiary Rock?
C-56a	1906	715	505	210	533?	182?	Tertiary Rock?
C-56b	1912	722	521	201	531?	191?	Tertiary Rock?
56c	1914	710	505	205	519	191?	Tertiary Rock?
C-56f	1905	746	491	255	492	254	Tertiary Rock?
C-57a	1931	701	- 33	734	391	343?	Decomposed Granite?
C-58	1922	714	229	485	231	483	Tertiray Rock?
C-63	1904	666	306	360	318	348	Tertiary Rock?
C-64b	1911	633	423	210	448	185	"Decomposed Granite"
C-65	1922	602	174	428	174	383	Tertiary Rock?
C-106	1907	754	447	307	454	300	Tertiary Rock?
C-108a	1924	690	490	200	516	174	Tertiray Rock?
C-111	1934	776	161	615	---	---	Alluvium
C-119c	1900?	614	153	461	---	---	Alluvium
C-131	1921	752	452	300	460?	292?	Tertiary Rock?

Table 1. Selected Well Data For The Study Area And Vicinity (contd)

Well No.	Year Drilled	Elev. - Top of Well	Elev. - Bottom of Well	Total Depth	Elev. - Base of Alluvium	Thickness of Alluvium	Material at Bottom of Well
C-202	1923	561	56	505	---	---	Alluvium
C-202a	1921	620	116	504	358	262	"Blue Granite"
C-202c	1921	681	459	222	---	---	Tertiary Rock
C-206	1923	534	- 27	561	---	---	Alluvium

Table 2. Exploratory Test Hole Data, 1973 Seismic Study

Boring No.	Elev. - Top of Boring	Elev. - Bottom of Boring	Total Depth	Elev. - Base of Alluvium	Thickness of Alluvium	Remarks
ES-1	722	371	351	605	117	Below 137 ft, gray-black claystone with white sandstone fragments: interpreted as fault gouge.
ES-2	743	439	304	626	117	Drilled 187 ft of highly deformed siltstone, sandstone and claystone: interpreted as belonging to the Topanga Formation.
ES-3	698	394	304	457	241	Encountered buff colored decomposed granitics which gradually became bluish-gray with depth: interpreted as basement complex rocks.

Hole No. ES-1
Page 2 of 5
07204 - 044811

DRILL LOG

LA-07 So. Pasadena Monterey Road to Columbia
102 ft. E. of Meridian
Location 36 S. R. 11 W. Ft., Right, Left Ground Elev. 725 Depth 351
3' W. of R-4 (10-1-71)

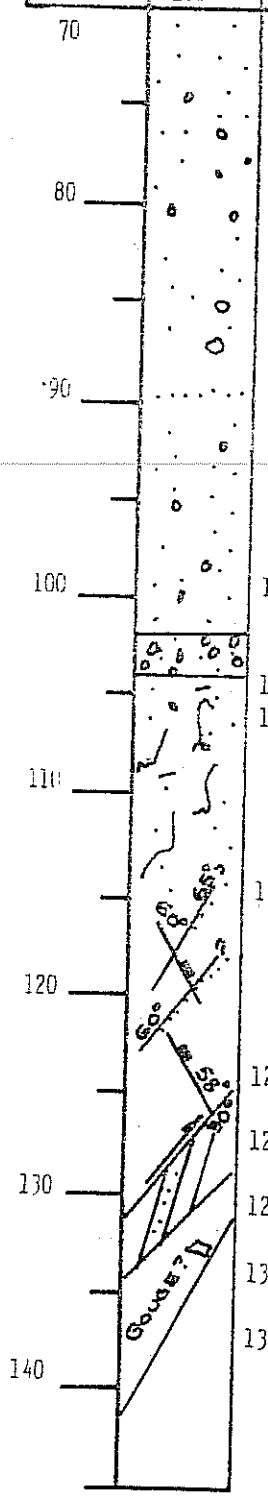
Logged by Al Parmer Type of Drill Core Groundwater Depth 30' Date Completed 6/26/73
perched (?)

DEPTH	LOG	DESCRIPTION AND REMARKS
0		Rock bit w/ air to 25'
		0'-4' Alluvium - granitic outwash soil, sandy w/ pebbles.
		4'-5' Gravel - granular to pea gravel, loose, sandy, angular to rounded, few chips of granodiorite pebbles.
10		
		5'-17' Sand w/ few gravely lenses. Sand is ora-brn., med. gr. w/ silty matrix 20-30% and 10%± granules and pebbles. Few gray-green siltstone lenses. Qtz. feldspar predom., ferro-mag. 5%, brn mica 1/2%.
20		Below 12' sand is v. coarse, pebbly (30%), poorly sorted.
		17-17.3 Gravel, pebble size, sandy, loose.
		17.3-25.5 Sand - med. to v. coarse gr. and pebbly. Silty matrix. Below 20', less pebbles in coarse gr. sand. Grading to med. gr. below 22' w/ random pebbles.
30		25.5-27.5 Sand - fine gr., silty, soft, med. brn., no visible bedding.
		27.5-102 Sand - med. gr., w/ random pebbles & cobbles (cored 6" pebble) blocking recovery. Poorly sorted, silty to coarse gr. w/ lenses of silty, v.f. SS to pebble lenses in 35'-40' run (20% rec.)
40		Color is Lt. grayish brn. except for v.f. SS @ 50-68' and 74-75'. Larger cuttings incl. qtz., gray and pink feldspar, meta. rocks.
50		Recovered 10" between 50'-55' of slightly plastic, clayey and silty v.f. to fine gr. SS. Some granule size qtz., etc.
60		Same matl. w/ sand (60'-63') ranging from silty, v.f. gr. to coarse gr. Possible bedding nearly horiz. Only 1 foot of recovery.
		Down-hole T.V. camera showed occasional pebbles. No visible bedding seen before water became too cloudy.
70		

DRILL LOG

7-LA-07 So. Pasadena Monterey Road to Columbia
102 ft. E. ℄ Meridian
ion 360 ft. N. Rte. 11 Ft., Right, Left Ground Elev. 725 Depth 351
3' W. of R-4 (10-1-71)

Logged by Al Parmer Type of Drill Core Groundwater Depth 30' Date Completed 6/28/73
perched (?)



DESCRIPTION AND REMARKS

Core recovery inc. w/change to Christenson NX

Very coarse gr. silty and pebbly sandstone. Very soft pebbles hard to very soft, wea. granitic and metamorphic detritus. Orthoclase of 10%.

Horiz. thin layer of black grains near 90'.

102-104± Possible gravel lense-mod. consol. as core barrel cut five pebbles in place before blocking. No incr. in bit noise. Cobble size prob. occur in lense. Mod. water loss.

104± -117.4 Lost most of sample through possible fault material.

104-117.4 SS and distributed silty matl., v. coarse gr., pebbly but w/incr yellow-brn color from both yellow silt and yellow rock detritus. Orthoclase from pebble cuttings.

117.4-127.0 Poss. fault zone. Good recovery of "squeezed" matl. plastic claystone & siltstone, mottled med. blue-gray to olive-brn. & orange-brn w/ v.f. to med. gr. SS interbeds. Slickensided joints, low to high angle-65°. 6" bed (?) of hard. med. gr. SS, olive-brn 119.4-120.0',120.0-120.4 highly slickensided claystone. Micaceous SS (120'). Granite (?) pebble 121.7'.

122.5-124.8 Hard SS fragments (2" dia), not bedded, in irreg. sh. 60° dip at 126.0 appears to be bedded. Core is predom siltstone.

127.0-127.5 Zone of granite pebbles and granular size sandstone. White pebbles in olive brn. matrix.

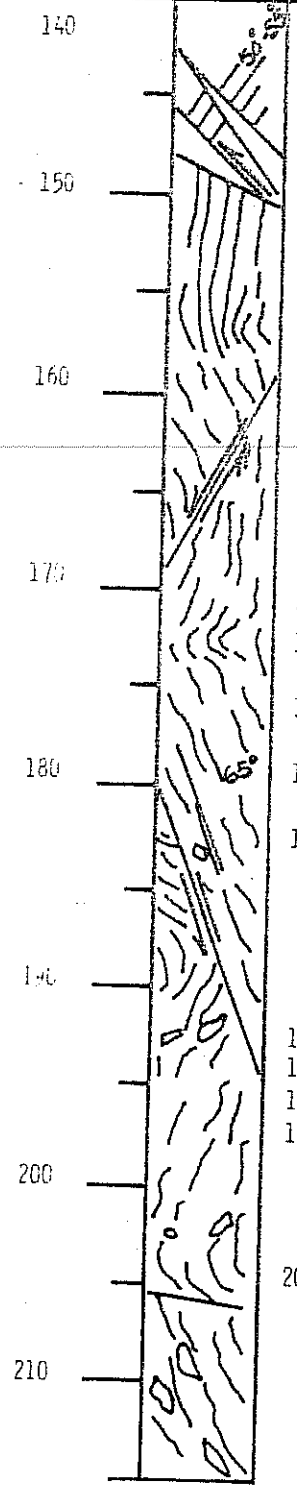
128.0-131.8 Tight fault @ 128.0 W/50° dip - truncates bedding 70°-75° dip. Lt. gray SS blue-gray & orange-brn siltstone below fault.

131.8-136.6 Fault zone. Frags. of SS, granitic pebbles in slickensided claystone. Yellow-brown to olive-brown plastic.

136.6- Black claystone W/slicks at 60° @ 137.0. Broken SS frags. (Lt. gray) to 142'. SS is calc., very hard.

DRILL LOG

A-67 So. Pasadena Monterey Road to Columbia
102 ft. E. ℄ Meridian
Location 360 ft. N. Rte. 11 Ft., Right, Left Ground Elev. Depth 351
.3' W. of R-4 (10-1-71)
Logged by Al Parmer Type of Drill Core Groundwater Depth 30' Date Completed 6/28/73
perched (?)



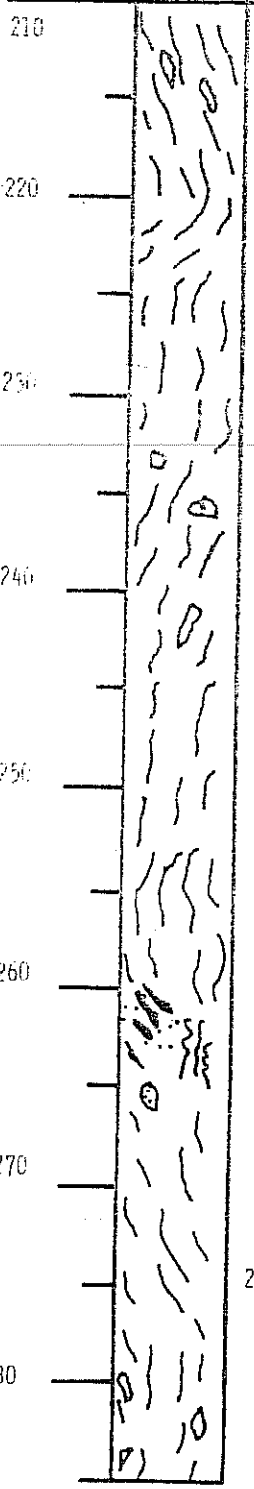
DESCRIPTION AND REMARKS

Same matl. w/bedding visible below 142' - dips 50°-55°
Core is predom. dark grayish black claystone and/or siltstone, slightly plastic, possible carbonaceous, w/Lt. to med. gray, hard, limey, micaceous fine gr. SS. Bed of hard SS 1-1/2" thick @ 145'. SS @ 145.2 dips 45° and cut on skew by shear dipping°45°. Slickensided joint 55° at 146'. 147' - Sh/ss dip 57° SS(dry) is dark gray to grayish black w/ lt. gray blebs, silty, v.f. gr., mica., very hard, limey.
148' - fault cuts interbedded ss& sh. dips 70°. SS frags in sh 148-148.5.
149.5 - SS bed dips 82°. Fault on skew dips 25°.
150 - dips up to 85°.
151 - 152 Good exposure in core of sh. w/ lt. gray SS, dip 78°.
152.5 Apparent fault - broken SS.
152.5-153.0 SS - Lt. gray, hard, limey, 60' dips, shows 2 healed offsets.
153-154 Broken zone w/high angle joints.
154-155 High angle dips appear to be warped. 70° dip @ 155'.
156-157 Folded bedding. Direction of high angle dip reverses in core
158-159.3 Bedding overturns - 70° dip @ 158 to (reversed) 70°, 85°, then 65° @ 159.3 Predom. dark grayish black silstone w/ med. gray limey SS laminations 1/16 to 1/4" thick to 160.6. Slicks in bl. sh - 80°-85°.
160.6-164± Sandstone, med. gray w/coglified (?) coatings. Limey joint 75°. Appar. X-bedding. Fine to med. gr. Some horiz. slicks. on shaley, high angle shear.
164±-172.2 Interbedded carb. sh. & silstone w/ some thin SS beds and zones of crushed SS. Bedding nearly vertical, warped. Sharp warp at 171 ft. Drag fold?
172.2-178.0 SS -Lt. to med. gray, med. to coarse gr., limey, w/ lenticular zones of squeezed, irregular shale partings. 65° dip.
178.0-192.7 Warped sh&ss. Shale is slickensided, irreg. SS is partly broken and displaced. Moist, plastic gouge (?) black clay (2") @ 183' SS/SH contact nearly vert 183.2 - 184.1. SS fragments 184.1-184.4, 185.3-185.4.
Sheared bedding dips 30°, shear 72° @ 186.6'. Low dips 10-30°, 185-186'
188.3-188.8' 60° dip; @ 189.0-189.5, 55° dip w/ab 90° change in bedding strike.
191.0-192.7 Core w/40% SS is chaotic jumble of platy SS frags. in shale.
192.7-195.5 Shale (claystone), as above except bedding vert., irreg. SS. partings.
195.5-198.0 Shale, as above, bedding obscured.
198.0-198.7 Shale, dark grayish black W/SS partings, 65° dips.
198.7-206.7 Core distinct by high degree of broken, rehealed beds of shale claystone, siltstone and SS. Dip 60° @ 202.5' on broken bedding.
Betw. 203.5 and 205.0, dip reverses almost 180°. 65° dip @ 205'.
Betw. 205.5 and 206.7, dips horiz. to 10° in shattered, displaced beds.
206.7-218.0 Shale W/SS fragments. Irregular bedding W/dips steep where intact.

DRILL LOG

"A-07 So. Pasadena Monterey Road to Columbia
102 ft. E. of Meridian
Location 360 ft. N. Rte. 11 Ft., Right, Left Ground Elev. 725 Depth 351
3' W. of R-4 (10-1-71)

Logged by Al Parmer Type of Drill Core Groundwater Depth 30' perched (?) Date Completed 6/28/73



DEPTH	LOG	DESCRIPTION AND REMARKS
210		Same matl. as above.
		Poss. dip 70° @ 215.0'
		Irreg. dips up to 90° 217-218'
220		223.0-223.9 Core shows 30° & 35° dips but in opp. dir.
		Drag folding or faulting (?)
		225.0-227 Poss. vert. dips in part.
		218.0-278 Core drys to hard, tough claystone. Scattered SS. frags.
230		No visible reliable bedding. Claystone is dark, to med. gray, broken, out of place.
		Pyrite in SS & claystone.
		Dip 70° (?) @ 235'
		Dip 60-65° (?) @ 247
		Core is primarily a rehealed section of fault gouge-breccia w/bedding indistinct or destroyed.
240		Pyrite in SS @ 243.8
250		251.5-256± Core is so near black, appears to contain lignite or oil-stain.
		No detectable smell. Pyrite
		256-258 Wapred zones 60° - near vertical.
260		260-261.5 Crushed SS & Sh.
		261 Good sample of SS/Sh breccia recemented, with later cycles of crushing and rehealing.
		263-264 Apparent vertical dip in claystone
		265.5-267 Apparent vertical dip in claystone
270		Photographed boxes 25 thru 30 B & W & color.
		273.5- Slicks in claystone.
		276 Poss. 65° dip.
		278-351 Core consists largely of SS breccia in steeply dipping claystone.
		278 - Iridescent reflections in secondary chalcopyrite (?) in SS.
		Core sections are firm and strong when dry.
280		278.5-279.5 Vertical dip.

Hole No. ES-1
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DRILL LOG

27 So. Pasadena Monierey Road to Columbia
107 ft. E. ℄ Meridian
Location 360 ft. N. Rte. 11 Ft., Right, Left Ground Elev. 725 Depth 351
W. of R-4 (10-1-71)

Logged by Al Parmer Type of Drill Core Groundwater Depth 30' Date Completed 6/28/73
perched (?)

DEPTH	LOG	DESCRIPTION AND REMARKS
280		Core continues as rehealed fault zone w/at least 2 cycles of squeezing, crushing and rehealing. Approx. 20-30% of matl. is SS fragments that range from v.f. gr. to med. and coarse gr., calc. Some SS has bl. shaley partings, some w/o partings. calcite vein in frag. @ 288.4'.
290		Core lacks any sec. veins - as late stage fracture fillings. 289.3 - Joint in SS-60' - has diagonal (strike-slip) lineations. 297 - Coring cut a SS frag 7" long.
300		301 - SS frag. - crushed and recemented - 5" long. Core is dark, brownish to grayish blac w/up to to 40% SS fragments. 302 - Possible dip 70°. 303 - 311.0 - 30%-40% crushed SS (up to 6" pieces). Few open cracks.
310		311.4 Open fractures in SS piece. No clay or other filling.
		315.8 SS fragments, fine gr. abut. med. gr. few calcite frags.
320		322.5-324.0 Claystone is softer, poss. moare recent gouge. Poss. 78-90° dip @ 323.
330		332-335 Vertically sheared SS.
340		Core betw. 346-351 - Rehealed fractured SS & SH beds w/numerous offsets.
350		351.0 - Bottom of hole.

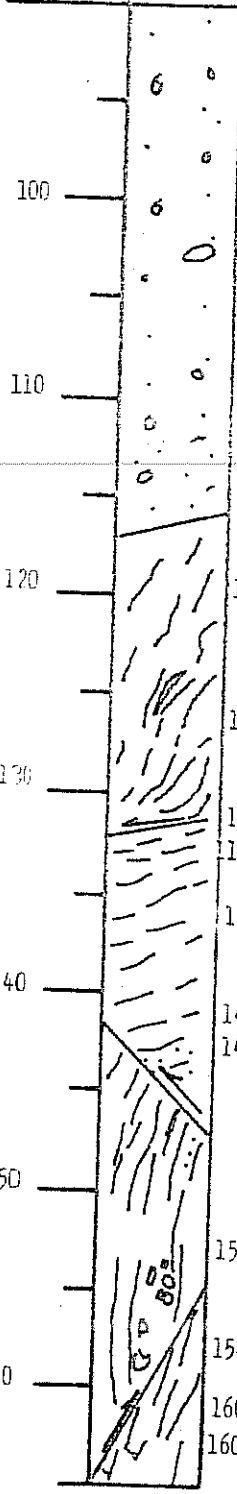
Hole No. ES-2
Page 1 of
07204 - 044811

DRILL LOG

7-LA-07 So. Pasadena. 117' W. of ℄ Fremont, 210' N. of ℄ Buena Vista

cation _____ Ft., Right, Left _____ Ground Elev. 745 Depth 304

Logged by A. L. Parmer Type of Drill Core Groundwater Depth _____ Date Completed 7/18/73



DESCRIPTION AND REMARKS

Hole was drilled w/ rock bit to 120' except for core runs at 50-55', 75-80, 100-105'. No recovery except for cobble in 100-105' run. Material to 117' prob. pebbly sand.

120-125 Tertiary sed. rock, siltstone, SS & claystone, irreg. bedded. med. firm weathered, mottled blue-gray to yell-brn, olive-brn. w/ orange streaks. Poss. dip @ 121' at 65°. Core breaks on cross-joints, 50° to 65° dip w/ slick surfaces. Soft wea.SS & plastic clay 121-125'.

125-129.8 SS is ora-brn to lt. gray-brn, fine to med. gr., non calc. Poss. lignite (not bedded) @ 125'. Same matl., less wea. Bedding dip & strike change within 1/2 foot. Dip @ 125.3 is 47°, @ 125.9 65° w/ est. 70°-80° change in strike bearing. 126.5'-127' strike change ab. 80°.

129.8-130.0 from olive clay st. to silty SS bed w/ poss. lignite.

130.0-131.8 Warped, broken beds - vert. to 40° SS around blue gray claystone

131.8-144± SS - soft, massive, 25° dip (?) speckled gray & med. brn., silty to coarse gr. w/qtz., some granule-size.

144.2- Laminated zone of thin interbeds of clayst. siltstone & SS. Distinctive colors - Lt gray SS, orange SS, olive to dark brn., some carbonaceous mtl. low dips (12°). Bedding warped, squeezed (?) in zones @ 132-133'.

142.2- Probable fault w/ soft SS above, steep dips below

Same laminated matl. as above but dips 65°, healed offset bedding. Slick break 145-143.7 @ 70°., matl. is predom. micaceous siltstone (145-

dips ab. 80' @ 149. Broken, offset beds

dip 70° @ 152-153

155-158.2 SS - as above, massive beds. Mod. weak; silty, fine to med. gr., speckled lt. gray to med. brn., olive siltstone & srange partings - 80° dips, Bedding is broken, rehealed 157.5-158.2 - bedding plant fault?

158.2-160.0± Laminated siltstone and SS as above. Rehealed fault 50° dip @ 159.8' Dip 90° 159.8-160.0'.

160.0 Prob. a major fault: Rehealed breccia (160.0-160.6) on bedding 65° dip.

160.0-163.0 Sudden change to unweathered matl. Interbedded dark grayish black siltstone shiny w/ mica(?), carbonaceous, and dark gr. SS, fine gr. Also claystone.

Hole No. ES-2

Page 2 of 3

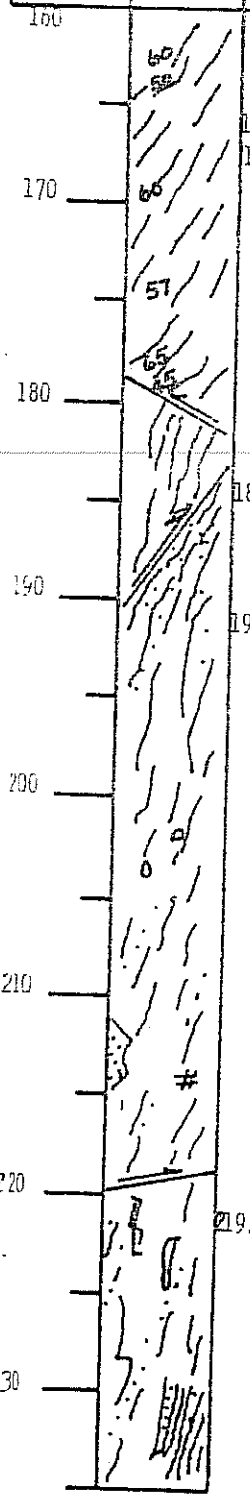
07204 - 044811

DRILL LOG

7-LA-07 So. Pasadena. 117' W. of ℄ Fremont, 210' N. of ℄ Buena Vista

Location _____ Ft., Right, Left _____ Ground Elev. 745 Depth 304

Logged by _____ Type of Drill Core Groundwater Depth _____ Date Completed 7/18/73



DESCRIPTION AND REMARKS

SS is Lt. gray partings as in ES-1 w/ incr. calcareous cement (w/ inev. freshness) many small fault offsets (avg. 1/4"). Some coaly fragments (?) 161' carbonaceous clayst. breaks on shiny surfaces 60° @ 162, 50° @ 163

163.0-164.8 SS - v. coarse gr., soft, speckled gray & black. Base is 30-40° contact.

164.8-185.0 Interbedded SS, siltstone & claystone. Fine gr. matl. is carbon., nearly black. First hard, limey. SS. 166.2-166.5'. Soft, v.c. SS(166.5-167.8'). Same as above SS @ 163-164.8. 60° dip at 169.5' & 172' core is not nearly as firm and competent as in ES-1 claystone. Core predominately micaceous siltstone (173-180') w/ lesser amounts of SS & claystone. Dark grayish-black. Dips - 57° @ 174.5', 45° @ 175.5, 30° @ 177', poss. 25° @ 178', 65° ? @ 178.5', 45° @ 179.5'.

Bedding is warped, offset by minor faults 180-180.3. Dips 30° to 65° 180-181, then steepen to 75°-80°. Core at 183.5' has tiny vert. to flat fault offsets, 1/8 to 1/4", normal & reverse types. SS is slightly calc., soft.

185-194.5 SS - predom. w/ partings of bl. carbonaceous siltst. & clayst. Top SS 185-186' is v.c. gr., silty and w/ granules. Mod. gray w/ bl. gr., all SS sl. calc. Bedding steep, irreg. due to squeezing and small folds & faults. Dip 55° on faulted contact @ 187±. Dip @ 191' is 78-80°, SS is predom. silty, med. gr. & med. to dark gray.

194.5-219.8 Interbedded SS & sh., same char. as above. Dips 60-80°, warped, fault offsets. Many small (1/8"-1/4") chunks of lignite 201'-203'. Bedding shows stronger displacements and more breakage below 194'.

At 214.8-215.0 SS - hard, calc., med. gr. Lt. gray

Dips of 80° at 219.5' overlie fault w/ 30° dip

219.8-245 SS and sandy siltstone. Steep bedding cut by rehealed faults w/ fault dips about 45°. SS is silty, f.g., hard above 224.5', med. to dark gray. Grades into sandy siltstone. Bedding remnants nearly vertical. Core broke up (weak?) 224.5-227.0. Vertical, offset bedding (228-235) in thin beds alternating between lt. gr., v.f. SS; dark gray, silty, med. gr. SS; dark grayish & brownish black sandy siltstone; and claystone. Core varies from hard to soft.

Hole No. ES-2

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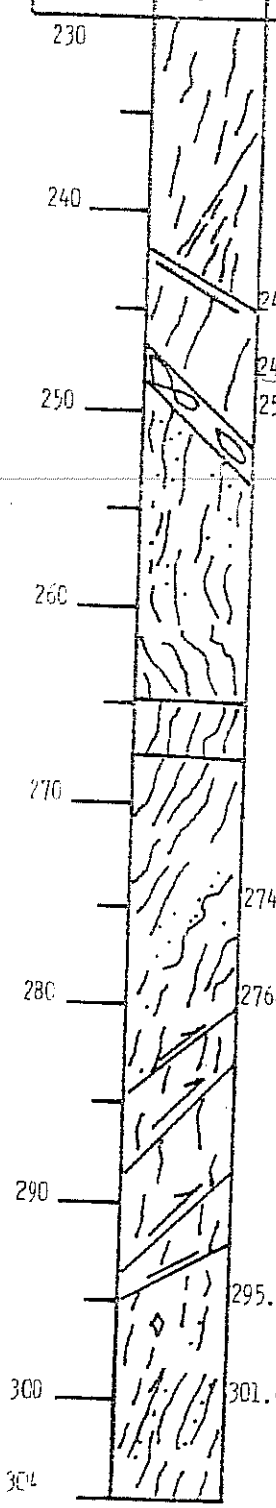
07204 - 0-4611

DRILL LOG

'7-LA-07 So. Pasadena. 117' W. of ℄ Fremont, 210' N. of ℄ Buena Vista

Location _____ Ft., Right, Left ____ Ground Elev. 745 Depth 304

Logged by _____ Type of Drill Core Groundwater Depth _____ Date Completed 7/18/73



DESCRIPTION AND REMARKS

241.0-241.3 Shattered claystone. All matl. is uniformly fresh appearing, no sec. alteration
242.5-244.0 60° dip truncates 80° dip which in turn is cut by 30° fault (?). Dips ab. 70° below fault. Prob. drag folding.

245.0-249.0 Darker than above siltstone & SS. Siltstone is sandy, nearly black. SS is med. to dark gray, fine to med. gr. Dips 60° to 90°.

249.0-250.4 Fault zone (?) Distorted dark claystone w/ disoriented SS beds. Major break.

250.4-274.2 Next core run has nearly vertical SS & Siltstone beds w/ only slight warping and breaking. Also claystone, carbon. frags. Core is dark grayish bl. w/ streaks of Lt. to med. gray SS.

Slight twist in strike 259-259.8 w/ dip change 90° to 75°. Core is predom. SS (260-264) weak to mod. firm. At least 3 zones of bedding displacement. Irreg. dips.
264.8- small fault offset is horiz.
267.5- small fault offset is nearly horiz.

At 271.5- 60° dip in warped SS/ siltstone. Warped contacts to 274' w/ SS broken or squeezed.

274.2-276 SS, soft, dark gray, silty, fine to med. gr., speckled gray and black grains. Dip 60°. Bedding may be overturned due to eroded (?) structures.

276-295.1 Predom. siltstone, w/ lt. gray SS partings. Dips 80°± (277-278)
Between 280-289, thin beds of siltstone & SS are squeezed w/ many minor fault offsets.
Core is firm.

Below 289 dip is ab. 90° w/ small faults ab. 45° dips at 290.6' and 291.1'. Fault w/ 30° dip at 293'.

295.1-301.4 Bedding is less distinct w/ white blebs of SS & small, black bleds of carbonaceous matl.
296.3-298.3 Recemented SS fragments. Dip at 298.3 - 45°

301.4-304.0 Steeply dipping, thin bedded matl. as above. Sandy siltstone (predom.) is dark, grayish black, SS is Lt. to dark gray, silty fine to clean, med. gr.

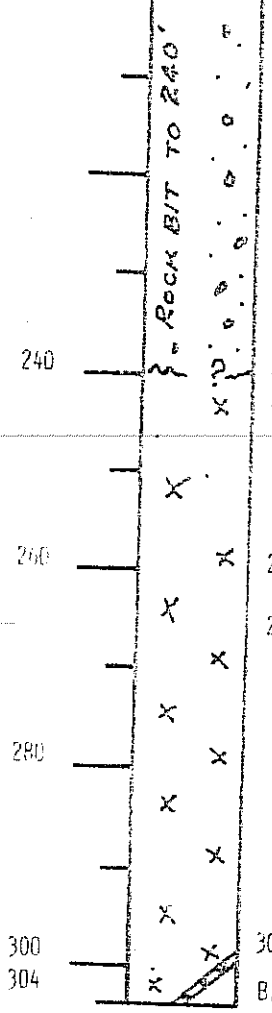
Hole No. ES-3
Page 1 of 1
07204 - 044811

DRILL LOG

Rte 7/11 Interchange, 175' N. ℄ Magnolia, 200' W. ℄ Fairview

Location 50 Ft., Left ℄ Ground Elev. 700 Depth 304.0

Logged by Al Parmer Type of Drill Core Groundwater Depth Date Completed



DESCRIPTION AND REMARKS	
0-240±	Pebbly sand. No obvious change in character. Same clay seams. Material is granitic outwash of pebbles, sand & silt. Rock bit cuttings and washed. Orthoclase fragments are prominent in cuttings.
240-244	Cutting change - weathered granodiorite, primarily reduced to clay minerals.
244-259	Granodiorite - coarse gr. core had bluish shade and probably is same as "blue rock" noted in water well C23f, located 2 blocks south at depth of 254 feet In lab, core is grayish brown. About 60% Lt. gray, 30% yellow and green, 10% greenish black. Core is soft and weak. Uniform grain size. Very little quartz or mica.
256.1-257±	Hard, fresh granodiorite. Light gray w/est. 30% ferro-magnesium minerals. Probably blocked off in run. More weathered to [illegible].
259-303.4	Granodiorite - dark bluish gray, coarse grained. Soft, highly weathered. Slow coring time (up to 7 min/ft) although granodiorite continues to be mushy. Rock bit to 299'. Core is very clayey granodiorite (299-304).
303.4-304.0	Quarte vein w/mica @ 303.4'-303.5' purplish gray zone w/45° contact w/Lt. gray
B.H.	clayey rock. Possible fault gouge.

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

TECHNICAL DATA REPORT FOR THE PROPOSED 710 FREEWAY TUNNELS FEASIBILITY

TASK 3.1 - SOIL BORING PROGRAM

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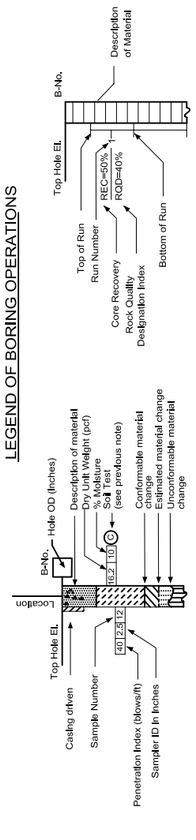
March 20, 2006

EMI Project No. 05-109

LEGEND OF BORING OPERATIONS



WEATHERING DESCRIPTORS

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

Descriptors	Diagnostic features: Chemical weathering-Discoloration and/or oxidation		Mechanical weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and solutioning		General characteristics (strength, excavation, etc.) §
Descriptive term	Body of rock	Fracture surfaces †		Texture	Solutioning	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck. Almost always rock excavation except for naturaly weak or weakly cemented rocks such as siltstones or shales.
Slightly weathered to fresh o						
Slightly weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened. With few exceptions, such as siltstones or shales, classified as rock excavation.
Moderately to slightly weathered o						
Moderately weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer rings when crystalline rocks are struck. Body of rock is slightly weakened. Depending on fracturing, usually is rock excavation except in naturally weak rocks such as siltstones or shales.
Intensely to moderately weathered o						
Intensely weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semi-arid conditions granitics are disaggregated.	Texture altered by chemical disintegra-tion (hy-dration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened. Usually common excavation.
Very intensely weathered						
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Always common excavation. Resistant minerals such as quartz may be present as "stringers" or "dikes."

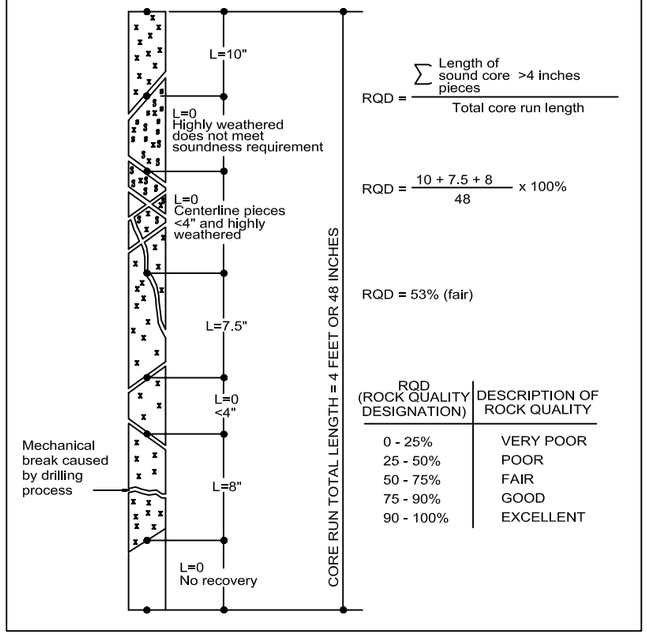
Note: This chart and its horizontal categories are more readily applied to rocks with feldspars and mafic minerals. Weathering in various sedimentary rocks, particularly limestones and poorly indurated sediments, will not always fit the categories established. This chart and weathering categories may have to be modified for particular site conditions or alteration such as hydrothermal effects; however, the basic framework and similar descriptors are to be used.

o Combination descriptors are permissible where equal distribution of both weathereing characteristics are present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, dual descriptors should not be used where significant, identifiable zones can be delineated. When given as a range, only two adjacent terms may be combined. "Decomposed to slightly weathered," or "moderately weathered to fresh" are not acceptable.

† Does not include directional weathering along shears or faults and their associated features. For example, a shear zone that carried weathering to great depths into a fresh rock mass would not require the rock mass to be classified as weathered.

§ These are generalizations and should not be used as diagnostic features for weathering or excavation classification. These characteristics vary to a large extent based on naturally weak materials or cementation and type of excavation.

RQD LOGGING



FRACTURE DENSITY

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

FRACTURE DENSITY - Based on the spacing of all natural fractures in an exposure or core recovery lengths in boreholes; excludes mechanical breaks, shears, and shear zones; however, shear-distributed zones (fracturing outside the shear) are included. Descriptors for fracture density apply to all rock exposures such as tunnel walls, dozer trenches, outcrops, or foundation cut slopes and inverts, as well as boreholes. Descriptive criteria presented below are based on borehole cores where lengths are measured along the core axis, for other exposures the criteria is distance measured between fractures (size of blocks).

UNFRACTURED: No fractures.

VERY SLIGHTLY FRACTURED: Core recovered mostly in lengths greater than 3 ft.

SLIGHTLY TO VERY SLIGHTLY FRACTURED *

SLIGHTLY FRACTURED:Core recovered mostly in lengths from 1 to 3 ft. with few scattered lengths less than 1 ft or greater than 3 ft.

MODERATELY TO SLIGHTLY FRACTURED *

MODERATELY FRACTURED: Core recovered mostly in 0.3 to 1.0 ft lengths with most lengths about 0.6 ft.

INTENSELY TO MODERATELY FRACTURED *

INTENSELY FRACTURED: Lengths average from 0.1 to 0.3 ft with scattered fragmented intervals. Core recovered mostly in lengths less than 0.3 ft.

VERY INTENSELY TO INTENSELY FRACTURED *

VERY INTENSELY FRACTURED: Core recovered mostly as chips and fragments with a few scattered short core lengths.

* Combinations of fracture densities (e.g. Very intensely to intensely fractured, or Moderately to slightly fractured) are used where equal distribution of both fracture density characteristics are presently over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions.

ROCK HARDNESS/STRENGTH DESCRIPTORS

Descriptor	Criteria
Extremely hard	Core, fragment, or exposure cannot be scratched with knife or sharp pick; can only be chipped with repeated heavy hammer blows.
Very hard	Cannot be scratched with knife on sharp pick. Core on fragment breaks with repeated heavy hammer blows.
Hard	Can be scratched with knife or sharp pick with difficulty (heavy pressure). Heavy hammer blow required to break specimen.
Moderately hard	Can be scratched with knife or sharp pick with light or moderate pressure. Core or fragment breaks with moderate hammer blow.
Moderately soft	Can be grooved 1/16 inch deep by knife or sharp pick with moderate or heavy pressure. Core or fragment breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily by knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very soft	Can be readily indented, grooved or gouged with fingernail, or carved with a knife. Breaks with light manual pressure.

Any bedrock unit softer than "very soft" is to be described using ASTM D-2488 consistency descriptors.

Note: Although "sharp pick" is included in these definitions, descriptions of ability to be scratched, grooved or gouged by a knife is the preferred criteria.

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

BEDDING, FOLIATION, OR FLOW TEXTURE DESCRIPTORS

Descriptors	Thickness / Spacing
Massive	Greater than 10 ft
Very thickly (bedded, foliated, or banded)	3 to 10 ft
Thickly	1 to 3 ft
Moderately	0.3 to 1 ft
Thinly	0.1 to 0.3 ft
Very thinly	0.03 (3/8 in) to 0.1 ft
Laminated (intensely foliated or banded)	Less than 0.03 ft (3/8 in)

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test (ASTM D-1586)

SPT N-value (blows/ft)	Granular	SPT N-value (blows/ft)	Cohesive
0 - 4	Very Loose	< 2	Very Soft
5 - 10	Loose	2 - 4	Soft
11 - 30	Medium Dense	5 - 8	Firm
31 - 50	Dense	9 - 15	Stiff
> 50	Very Dense	16 - 30	Very Stiff
		> 31	Hard

Note: Visual classification of earth materials are based on field inspection and are confirmed or revised with laboratory test results as necessary.

LEGEND OF EARTH MATERIALS (USCS) BASED ON ASTM D2487, D2488

FILL MATERIAL; POORLY-GRADED SAND (SP); WELL-GRADED SAND (SW); CLAY (CL or CH); SILTY SAND (SM) or SANDY SILT; SILT (ML or MH); CLAYEY SAND (SC) or SANDY LEAN CLAY; PEAT, and/or ORGANIC MATTER; COBBLES/BOULDERS; WELL-GRADED GRAVEL (GW); IGNEOUS ROCK; POORLY-GRADED GRAVEL (GP); SEDIMENTARY ROCK; SILTY GRAVEL (GM); METAMORPHIC ROCK; CLAYEY GRAVEL (GC)

TYPE OF BORINGS

2 1/2" CONE PENETRATION; ELECTRONIC CONE PENETROMETER; AUGER BORING (DRY); TEST FIT; DIAMOND CORE BORING; ROTARY WASH; SOIL TUBE

IN-SITU, LAB & FIELD TEST DESIGNATIONS

ATTERBERG LIMITS (AL); CHEMICAL ANALYSIS (CA); CONSOLIDATION (CN); DIRECT SHEAR (DS); MAX. DRY DENSITY (MD); HYDROMETER (HA); SIEVE ANALYSIS (SA); SAND EQUIVALENT (SE); SLAKE DURABILITY (SL); UNCONFINED COMPRESSION (UC); UNCONSOLIDATED UNDRAINED TRIAXIAL (TX); WASH #200 (W)

Notes:

1. All elevations refer to datum shown on USGS quadrangle maps for Pasadena and Los Angeles.
2. Discontinuities inclinations are measured with respect to the horizontal.
3. Color designation and numbers are from the Munsell color charts for soils.
4. Laboratory test data are provided in Appendix C of Technical Memorandum for Route 710 Tunnel Feasibility in Cities of Pasadena, South Pasadena, and Alhambra (Earth Mechanics, Inc 2006).
5. Core photos are provided in Appendix B of Technical Memorandum for Route 710 Tunnel Feasibility in Cities of Pasadena, South Pasadena, and Alhambra (Earth Mechanics, Inc 2006).

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DESIGNED BY	G. J. GUNARANJAN	DATE	03-13-06
LAYOUT BY	G. J. GUNARANJAN	DATE	03-13-06
CHECKED BY	M. KAPUSKAR	DATE	03-14-06
APPROVED BY		DATE	

REGISTERED PROFESSIONAL ENGINEER — MIKE KAPUSKAR — NO. GE2564 — EXP. 12/31/06 — GEOTECHNICAL — STATE OF CALIFORNIA

ROUTE 710 TUNNEL FEASIBILITY

LOG OF TEST OF BORINGS NO. 2

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test (ASTM D-1586)

SPT N-value (blows/ft)	Granular	SPT N-value (blows/ft)	Cohesive
0 - 4	Very Loose	< 2	Very Soft
5 - 10	Loose	2 - 4	Soft
11 - 30	Medium Dense	5 - 8	Firm
31 - 50	Dense	9 - 15	Stiff
> 50	Very Dense	16 - 30	Very Stiff
		> 31	Hard

LEGEND OF EARTH MATERIALS (USCS)

BASED ON ASTM D2487, D2488

- FILL MATERIAL
- CLAY (CL or CH)
- SILT (ML or MH)
- PEAT and/or ORGANIC MATTER
- WELL-GRADED GRAVEL (GW)
- POORLY-GRADED GRAVEL (GP)
- SILTY GRAVEL (GM)
- CLAYEY GRAVEL (GC)
- POORLY-GRADED SAND (SP)
- WELL-GRADED SAND (SW)
- SILTY SAND (SM) or SANDY SILT
- CLAYEY SAND (SC) or SANDY LEAN CLAY
- COBBLES/BOULDERS
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

Note: Visual classification of earth materials are based on field inspection and are confirmed or revised with laboratory test results as necessary.

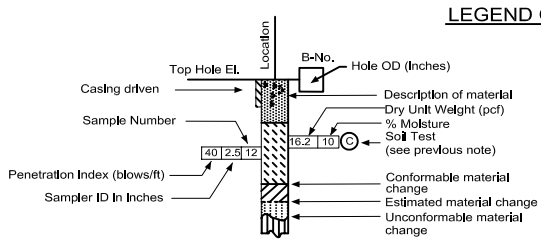
TYPE OF BORINGS

- 2 1/4" CONE PENETRATION
- ROTARY WASH
- ELECTRONIC CONE PENETROMETER
- AUGER BORING (DRY)
- TEST PIT
- DIAMOND CORE BORING
- SOIL TUBE

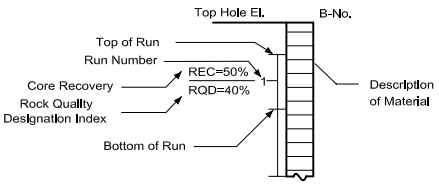
IN-SITU, LAB & FIELD TEST DESIGNATIONS

- (AL) ATTERBERG LIMITS
- (CA) CHEMICAL ANALYSIS
- (CN) CONSOLIDATION
- (DS) DIRECT SHEAR
- (MD) MAX. DRY DENSITY
- (HM) HYDROMETER
- (SA) SIEVE ANALYSIS
- (SE) SAND EQUIVALENT
- (SL) SLAKE DURABILITY
- (UC) UNCONFINED COMPRESSION
- (UU) UNCONSOLIDATED UNDRAINED TRIAXIAL
- (W) WASH #200

LEGEND OF BORING OPERATIONS



ROTARY(R) SAMPLE BORING (WET)



CORED BORING (WET)

EMI-1

N 34° 5' 10.1"
E 118° 9' 26.2"

06-1 TOP OF BOREHOLE, Date: 19 Jan 06, Time: 9 AM

0 El. ±455 ft

Asphalt concrete with silt, sand, and gravel base

10

39 2.5 1 — 120 14 — POORLY GRADED SAND with SILT (SP-SM): medium dense, orange-brown, slightly moist, fine- to coarse-grained sand, trace of subangular pebbles, nonplastic, slightly micaceous

20

29 1.4 2 — - 20 — SILTY SAND (SM): medium dense, orange-brown, slightly moist, very fine-grained sand, trace of coarse-grained sand and subangular pebble, nonplastic, slightly micaceous

30

44 2.5 3 — 123 34 — POORLY GRADED SAND with SILT (SP-SM): medium dense, orange-brown, slightly moist, fine-grained poorly-graded subrounded sand, nonplastic, slightly micaceous

40

50/5" 1.4 4 — - 32 — POORLY GRADED GRAVEL with SAND (GP): very dense, brown, slightly moist, weathered to highly weathered, well-rounded granite gravels from pea-size to 1" diameter, nonplastic

50

50/5" 2.5 5 — 126 24 — POORLY GRADED SAND (SP): very dense, dark brown to gray, slightly moist, disintergrates to very coarse-grained sand, angular pea gravel, nonplastic

60

62 1.4 6 — - 31 (W) — POORLY GRADED SAND with SILT (SP-SM): very dense, orange-brown, slightly moist, fine- to medium-grained sand, trace of pea gravel and rounded gravel to 1/2" diameter, trace of coarse feldspar and quartz sand, nonplastic, slightly micaceous

70

50/5" 2.5 7A — 128 20 / - 20 — POORLY GRADED SAND (SP): very dense, brown, slightly moist, coarse-grained subrounded to subangular sand, trace of granite pea gravel, nonplastic

80

33 1.4 8 — - 18 — SILTY SAND with SILT (SM): dense, brown, slightly moist, very fine- to medium-grained sand, trace of subrounded to sunangular pea gravel, predominantly quartz, feldspar, and micas, slightly plastic clay

90

50/3" 2.5 9A — 124 23 / - 25 — POORLY GRADED SAND (SP): very dense, pinkish-brown, very moist, medium- to coarse-grained angular to subangular arkosic sand, gravels to 1/4" diameter, nonplastic, slightly micaceous, stream alluvium

100

36 1.4 10 — - 27 — CLAYEY SAND with GRAVEL (SC): dense, dark yellowish-brown, moist, fine- to coarse-grained subangular sand, trace of granite pea gravel, trace of rounded gravel to 1/4" diameter, slightly plastic clay, gravels comprise light-colored & dark brown shale and granitic-dioritic rocks

110

PENETRATION DEPTH (ft)

110

80 2.5 11A — 144 10 (AL) (DS) / - 10 (UC) / - 10 — CLAYEY SAND with SILT (SC) (FERNANDO FORMATION): very dense, dark grayish-brown (10YR 4/2), linear gray and brown at upper part, moist, fine- to very fine-grained well-sorted sand, suggestive of decomposed bedrock with pedogenic soil, medium plasticity clay

dark brown, subangular to subrounded pea gravels, trace of siliceous shale fragments

120

34 1.4 12 — - 10 (DS) — dense, strong brown to gray with mottled orange-brown (7.5YR 5/8 to 10YR 6/1), very moist, fine- to very fine-grained sand, trace of coarse-grained sand and mica, trace of 1/8" siliceous shale fragments

97/10" 2.5 13C — 146 15 (AL) / - 15 (UC) / - 15 — LEAN CLAY (CL): hard, dark yellowish-brown (10YR 4/4), moist, medium plasticity clay with few silt, sparkly appearance

130

45 1.4 14 — - 15 — dark yellowish-brown (10YR 4/4) with mottled brown, orange, gray, and dark gray with a trace of reddish-brown, medium to high plasticity clay with very little silt

73 2.5 15A — 150 15 (AL) (DS) (UC) — medium to high plasticity clay with little silt

140

45 1.4 16 — - 15 (CA) — dark yellowish-brown (10YR 4/6) with mottled orange-brown and yellowish-brown, trace of fine-grained sand, medium to high plasticity clay

Date: 20 Jan 06, Time: 4:29 PM

Hole was bailed dry @ 5:15 PM on 19 Jan 06

REC=100% RQD=N/A (1) — @142': LEAN CLAY (CL): very stiff, dark yellowish-brown (10YR 4/6 - 6/6) with minor gray, reddish-brown, and orange-brown mottling, moist, trace of silt and fine-grained sand, medium plasticity clay, trace of hard pieces of oxidized claystone (additional 6" recovered)

REC=100% RQD=N/A (2)

150

REC=40% RQD=N/A (3) — moderate weathered, soft, massive, unfractured

REC=100% RQD=N/A (4) — @154': dark yellowish-brown (10YR 4/6) with mottled orange-brown, light gray, and red, few rounded chert pea gravel, trace of silt and mica (additional 3". recovered)

REC=94% RQD=N/A (5) — @158': bedding dips 25°

160

REC=75% RQD=52% (6) — (SL) LEAN CLAY TO CLAYSTONE, light gray mottled with yellowish-brown, decomposed, very soft, nonindurated, thin horizontal bedding, moist, moderately plastic dark yellowish-brown clay with very fine-grained sand

@161': bedding dips 20°

@162': bedding dips 45 - 60°

CLAYSTONE, grayish-brown with light gray and dark gray beds, moderately weathered, soft to moderately soft, thinly bedded

REC=100% RQD=100% (7) — @166.1': bedding dips 35 - 50° (additional 10" recovered)

@167.1': bedding dips 50°, oxidation along bedding planes

170

REC=100% RQD=100% (8) — @170.1': LEAN CLAY TO CLAYSTONE, light gray to gray weathering to strong brown along bedding planes, moderately weathered, very soft, thinly bedded @ 25 - 30°, moist, plastic clay with trace of fine-grained sand (additional 3" recovered)

REC=100% RQD=100% (9) — @173.6': CLAYSTONE, light gray to gray weathering to dark yellowish-brown (10YR 4/6), intensely weathered, soft, poorly indurated, thinly bedded @ 50 - 55° dip, slightly fractured, widely spaced (additional 6" recovered)

@175.6': bedding dips 45°

REC=79% RQD=77% (10) — @178.1': light gray to gray weathering to brown, thinly bedded @ 65°, "sparkly" surface on fresh fracture

180

REC=100% RQD=96% (11) — light gray to gray (7.5YR 6/0) weathering to reddish-yellow (5YR 6/8)along bedding planes, moderately weathered, very soft, laminated bedding @ 25 - 60°, very slightly fractured, extremely widely spaced, clean, breaks easily under manual pressure

@181.6': bedding dips 30°

REC=88% RQD=78% (12) — @186.1': gray (2.5YR 5/0) weathering to yellowish-brown, laminated bedding dips 60 - 70°, breaks easily with handling

@188': dark gray (2.5Y 4/0), fresh claystone

190

REC=100% RQD=100% (13) — @190.1': dark gray, fresh, very soft, laminated bedding @ 45°, very slightly fractured, very widely spaced, clean, "sparkly" surface on fresh freactures (additional 3" recovered)

REC=25% RQD=25% (14) — @192.6': slightly weathered, massive bedded dipping 20 - 25°, poorly indurated, unfractured, extremely widely spaced, not clean, parting @ 20 - 25°

REC=19% RQD=19% (15) (UC) (SL)

200

REC=100% RQD=100% (16) — @200.6': fresh to slightly weathered, very thinly bedded dipping 30°, very slightly fractured, (additional 28" recovered)

@201.1': BOTTOM OF HOLE, Date: 21 Jan 06

PENETRATION DEPTH (ft)

Notes:

1. Borehole diameter was $3\frac{7}{8}$" between 0 to 140' depth and 5" between 140' to bottom of hole.
2. SPT sampler used was 2" OD and 1.4" ID. California Modified Sampler used was 3" OD and 2.5 " ID.
3. An automatic trip hammer system using 140 lb weight and 30" drop was used to obtain blowcounts.
4. $2\frac{3}{8}$" diameter core was obtained using dual-barrel Geobarrel 101mm coring system (2.5" ID, $3\frac{10}{16}$" OD) from 140' depth to bottom of hole.
5. Groundwater level was measured at 66' depth on 20 Jan 06 after waiting time of 14 hours.

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G. J. GUNARANJAN	03-13-06
LAYOUT BY	DATE
G. J. GUNARANJAN	03-13-06
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M. KAPUSKAR	03-14-06
APPROVED BY	DATE

REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA — GEOTECHNICAL
MIKE KAPUSKAR
No. GE2564
EXP. 12/31/06

ROUTE 710 TUNNEL FEASIBILITY

LOG OF TEST OF BORINGS NO. 3

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test (ASTM D-1586)

SPT N-value (blows/ft)	Granular	SPT N-value (blows/ft)	Cohesive
0 - 4	Very Loose	< 2	Very Soft
5 - 10	Loose	2 - 4	Soft
11 - 30	Medium Dense	5 - 8	Firm
31 - 50	Dense	9 - 15	Stiff
> 50	Very Dense	16 - 30	Very Stiff
		> 31	Hard

LEGEND OF EARTH MATERIALS (USCS)

BASED ON ASTM D2487, D2488

- FILL MATERIAL
- CLAY (CL or CH)
- SILT (ML or MH)
- PEAT and/or ORGANIC MATTER
- WELL-GRADED GRAVEL (GW)
- POORLY-GRADED GRAVEL (GP)
- SILTY GRAVEL (GM)
- CLAYEY GRAVEL (GC)
- POORLY-GRADED SAND (SP)
- WELL-GRADED SAND (SW)
- SILTY SAND (SM) or SANDY SILT
- CLAYEY SAND (SC) or SANDY LEAN CLAY
- COBBLES/BOULDERS
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

Note: Visual classification of earth materials are based on field inspection and are confirmed or revised with laboratory test results as necessary.

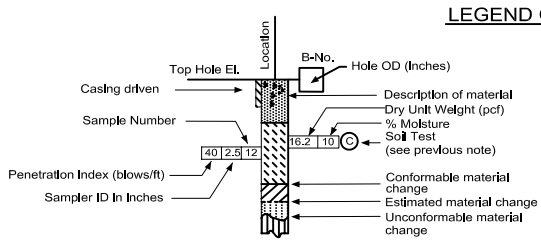
TYPE OF BORINGS

- 2 1/4" CONE PENETRATION
- ROTARY WASH
- ELECTRONIC CONE PENETROMETER
- AUGER BORING (DRY)
- TEST PIT
- DIAMOND CORE BORING
- SOIL TUBE

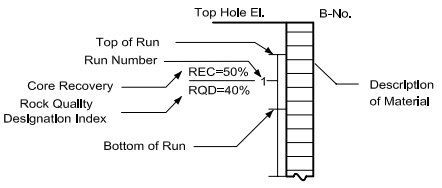
IN-SITU, LAB & FIELD TEST DESIGNATIONS

- AL ATTERBERG LIMITS
- CA CHEMICAL ANALYSIS
- CN CONSOLIDATION
- DS DIRECT SHEAR
- MD MAX. DRY DENSITY
- HM HYDROMETER
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SL SLAKE DURABILITY
- UC UNCONFINED COMPRESSION
- UU UNCONSOLIDATED UNDRAINED TRIAXIAL
- W WASH #200

LEGEND OF BORING OPERATIONS



ROTARY(R) SAMPLE BORING (WET)



CORED BORING (WET)

EMI-2

N 34° 6' 54.4"
E 118° 9' 58"

06-2 TOP OF BOREHOLE, Date: 26 Jan 06, Time: 8 AM

0 El. ±650 ft — Asphalt concrete and base

10 — 23 | 1.4 | 1 — - | 14 — POORLY GRADED SAND with SILT (SP-SM): medium dense, dark brown to brown (7.5YR 4/4), dry, fine- to medium-grained sand, occasional rounded pebbles up to 1/4 " diameter, nonplastic

20 — 39 | 2.5 | 2B — 130 | 20 / 130 | 20 — POORLY GRADED SAND (SP): medium dense, strong brown (7.5YR 4/6), slightly moist, fine- to medium-grained sand, nonplastic, slightly micaceous

30 — 44 | 1.4 | 3A — - | 34 / - | 35 — dense, dark yellowish-brown (10YR 4/4), fine-grained sand, trace of rounded gravel to 1/4" diameter
POORLY GRADED SAND with CLAY (SP-SC): dense, dark yellowish-brown (10YR 4/4), slightly moist, rounded-granitic gravels to 1/2 " diameter, nonplastic, micaceous

40 — 46 | 2.5 | 4A — 130 | 32 / 130 | 32 — medium dense, moist, fine-grained subrounded-sand, trace of rounded granitic gravels to 1/2 " diameter, slightly plastic clay, micaceous

50 — 50/4" | 1.4 | 5A — - | 24 / - | 25 / - | - — POORLY GRADED SAND (SP): very dense, dark brown to brown (7.5YR 4/4), moist, medium- to coarse-grained subangular sand, trace of pea gravel, nonplastic
POORLY GRADED SAND with SILT (SP-SM): very dense, dark brown to brown (7.5YR 4/4), moist, fine-grained sand, nonplastic, micaceous, rig chatter and abundant cobbles between 54' to 60' depth

60 — 50/5" | 2.5 | 6 — 135 | 31 — POORLY GRADED SAND (SP): very dense, dark yellowish-brown (10YR 4/4), very moist, fine- to coarse-grained subangular to subrounded sand, subrounded pea gravel, nonplastic, micaceous, abundant rig chatter from 67' to 70' depth

70 — 97/9" | 1.4 | 7 — - | 17 — POORLY GRADED SAND with CLAY and GRAVEL (SP-SC): very dense, dark yellowish-brown (10YR 4/4), moist, medium- to coarse-grained angular sand, abundant angular to subangular pea gravel, clay-rich layers up to 1" thickness, micaceous

80 — 81/10" | 2.5 | 8A — 135 | 18 (DS) / 135 | 18 — SILTY SAND (SM): very dense, yellowish-red (10YR 4/4) to yellowish-brown (10YR 4/4), moist, fine- to very fine-grained well-sorted sand, nonplastic, slightly micaceous
moderate rig chatter from 84' to 88' depth

90 — 45 | 1.4 | 9A — (W) - | 27 (SA) / - | 27 — dense, dark yellowish-brown (10YR 5/4)
LEAN CLAY with SAND (CL) (MONTEREY FORMATION): hard, strong brown (10YR 5/6) with minor yellowish-brown mottling, moist, medium plasticity clay, some shearing

100 — 50/3" | 2.5 | 10 — 135 | 18 (UC) — interbedded claystone and siltstone, gray (10YR 6/1) and yellowish-brown to dark yellowish-brown (10YR 5/6 - 4/6). (probably weathered Monterey formation)

110 — 88/10" | 1.4 | 11 — - | 27 — strong brown (7.5YR 5/8) with thin light gray interbeds, trace of fine- to medium-grained sand. Likely very weathered bedrock with faint bedding dipping 45°

PENETRATION DEPTH (ft)

110 (CA) (AL) Date: 27 Jan 06, Time: 8.46 AM

REC=100% RQD=17% 1 — @112': SANDSTONE/SILTSTONE/SHALE, mottled light gray with gray, intensely weathered, soft to very soft, laminated to very thinly bedded @ 50°, moderately fractured, moderately spaced, moderate shearing along bedding planes, calcite veins. Likely Monterey formation
@113.5': joints @ 40°, smooth

REC=100% RQD=17% 2 — @115': SANDSTONE/SILTSTONE/CLAYSTONE, light gray to yellowish-brown, intensely weathered, soft to moderately soft, laminated to very thinly bedded @ 65°, intensely fractured, very closely spaced, smooth to moderately rough, crumbles and disintegrates upon handling. calcite veins and lenses.

REC=0% RQD=N/A 3 — @116 - 117': used tricone bit to advance 1' through very hard interval

REC=100% RQD=0% 4 — @118.5': yellowish-brown with gray to light gray and very dark brown to black interbeds, intensely weathered, soft to moderately soft with some hard interbeds, bedded @ 30°, very stiff yellowish-brown high plasticity wet clay with sand

120 — SANDSTONE/SHALE/CLAY, gray to yellowish-brown, moderately to intensely weathered, moderately hard to very soft, very thinly bedded, zones up to 1.1' thick of highly sheared sandstone and shale in clay matrix

REC=50% RQD=8% 5 — @120.5': soft, sheared shale/clay section
@121': SANDSTONE (TOPANGA FORMATION), grayish-brown to gray, moderately hard, coarse- to medium-grained, moderately sorted

REC=83% RQD=56% 6 — @122.5': highly sheared stiff clay matrix with broken shale inclusions
moderately weathered, moderately hard, joint @ 45°, intensely fractured and recemented, encountered numerous calcite stringers @ all orientations
@126.5': joint @ 40°

130 REC=88% RQD=35% 7 — SANDSTONE and BRECCIA, olive gray, moderately weathered, moderately hard, well indurated, fine- to very fine-grained, bedded @ 45 - 50°, slightly fractured, moderately to widely spaced, thin, smooth to stepped. Likely Topanga formation
@127.5': joint @ 35°, smooth
@128': joint @ 15°, stepped, siliceous coating
@129': joint @ 25°, smooth, numerous calcite stringers and rehealed fractures at all orientations

REC=98% RQD=0% 8 — @134.5': moderately to highly weathered, soft, fine- to very fine-grained, highly sheared, partially recemented, disintegrates with handling, composed of mostly granitic material

@137.5': intensely weathered, very soft, sheared and recemented, crumbles with handling, very stiff clay matrix

140 REC=88% RQD=13% 9 — @138.5': joint @ 45°
@139': CONGLOMERATE, gray weathering to yellowish-brown, moderately weathered, hard, rounded, granitic clasts to 1.5" diameter, joints @ 45°, clean, slightly rough to smooth
@140': intensely weathered, sheared and recemented sandstone
VOLCANIC, brown to yellowish-brown, intensely weathered, soft, fine- to medium-grained, intensely fractured, closely spaced, smooth to moderately rough, manually friable, crumbles upon handling

REC=98% RQD=60% 10 — @143.5': moderately to intensely weathered, soft to moderately soft
(UC) @144': olive gray weathering to brown and reddish-brown, slightly to moderately weathered, hard, fine- to medium-grained, abundant calcite stringers
(UC) @ 147': gray, fine-grained, very hard rock (run drilled very slowly)
joint @ 65°, smooth

150 REC=100% RQD=72% 11 — @150': joint @ 63°, healed, filled with calcite

DIORITE / GRANODIORITE (Basement Rock), brown to yellowish-brown, moderately to intensely weathered, moderately hard, phaneritic, grain size up to 0.13", poorly indurated

REC=98% RQD=55% 12 — @153.5': joint @ 85°, smooth, oxidized
@155.5': joint @ 35°, polished to smooth

(UC) moderately weathered, moderately soft to soft, phaneritic, heavily oxidized joint surfaces, slightly to moderately fractured, numerous healed fractures

160 REC=100% RQD=40% 13 — @158.5': joint @ 55°, moderately rough
@159': joint @ 65°, smooth
@159.8': joint @ 62°, clay filling
@160.3': joint @ 60°
@160.5': joint @ 30°, oxidized
@161': joint @ 5°, smooth
brown to yellowish-brown, moderately to intensely weathered, soft, poorly indurated, phaneritic, numerous rehealed joints, breaks easily with handling

REC=98% RQD=N/A 14 — @163': joint @ 85°, slightly rough
@164.1': joint @ 50°, rough, no filling
@164.6': joint @ 50°, rough, no filling
@166.1': very soft, intensely fractured, appears to be partially sheared and recemented

170 REC=100% RQD=78% 15 — @168.1': joint @ 50°, slightly rough
@168.6': joint @ 50°, smooth, mafic inclusion 8" diameter @ 169' depth
@169.6': horizontal mechanical break, rough
@171.1': joint @ 48°, smooth with striations
light yellowish-brown to very pale-brown, moderately to intensely weathered

REC=100% RQD=53% 16 — @172.8': joint @ 75°, slightly to moderately rough
@173.3': joint @ 40°, rehealed
@173.6': joint @ 55°, moderately rough
@174.3': rehealed joint @ 46°, ½ " wide
@174.6': mechanical break @ 33°

(UC) @175.1': rehealed joint @ 58°, ½ " wide
@176.6': subparallel mechanical breaks

180 REC=100% RQD=19% 17 — brownish-yellow to yellowish-brown (10YR 6/6 to 10YR 5/6), intensely weathered, friable, angular to subangular coarse-grained sand, moderately fractured, oxidized joint surfaces, moderately spaced, slightly rough, some potential mafic clasts,
@177.8': joint @ 59°, moderately rough, slight foliation or striations

REC=95% RQD=65% 18 — @178.3': joint @ 55°, moderately rough
@178.6': joint @ 55°, rough
@179.1': very soft, numerous incipient fractures generally oriented @ 55 to 65°, potential foliation and joint @ 63°
moderately to intensely weathered, soft, partially healed fractures @ 60 to 90°

REC=100% RQD=37% 19 — @183.6': mafic inclusion up to 5"

190 — intensely weathered, very soft, nonindurated, alteration of feldspars (additional 2" recovered)
@187.1': joint @ 10°, clay filled, 1/8 " thick
@187.6': very soft, intensely fractured zone, 2" wide, possible mechanical fractures

REC=98% RQD=72% 20 — @189.1': dark, mafic-rich band @ 45°, 3/4 " wide,
@189.6': fracture @ 65°, slightly rough
@189.8': fracture @ 60°, rough, oxidation on surfaces
@190.1': horizontal mechanical break, rough

intensely weathered, soft, moderately fractured, alteration of feldspar to clay, rock appears to be foliated, horizontal foliation

(UC) REC=72% RQD=N/A 21 — @193.1': mechanical break @ 20°
@193.8': joint @ 75°, moderately rough, thin clay coating
@194.6': mechanical break, stepped

200 — brownish-yellow to yellowish-brown (10YR 6/6 to 10YR 5/6), intensely weathered, soft, moderately fractured, moderately spaced, alteration of feldspars and biotite, friable
@197.6': joint @ 46°, rough, oxidized
@197.8': joint @ 25°, polished
@198.3': joint @ 30°, polished with striations
@198.6': foliation @ 48°
@199.1': very soft, intensely weathered zone, 2½ " wide
@201.1': BOTTOM OF HOLE, Date: 31 Jan 06, Time: 11.18 AM

PENETRATION DEPTH (ft)

Notes:

1. Borehole diameter was $3\frac{7}{8}$" between 0 to 110' depth, 5" between 110 to 120' depth, and 3" between 120' to bottom of hole.
2. SPT sampler used was 2" OD and 1.4" ID. California Modified Sampler used was 3" OD and 2.5 " ID.
3. An automatic trip hammer system using 140 lb weight and 30" drop was used to obtain blowcounts.
4. $2\frac{3}{8}$" diameter core was obtained using dual-barrel Geobarrel 101mm coring system (2.5" ID, $3\frac{10}{16}$" OD) from 110' to 120' depth and 1.77" diameter core was obtained using dual-barrel NQ coring system (1.969" ID and $2\frac{14}{16}$" OD) from 120' depth to bottom of hole.
5. Groundwater level was measured at 82' depth on 27 Jan 06 after waiting time of 14.5 hours.

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G. J. GUNARANJAN	03-13-06
LAYOUT BY	DATE
G. J. GUNARANJAN	03-13-06
CHECKED BY	DATE
M. KAPUSKAR	03-14-06
APPROVED BY	DATE

REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA — GEOTECHNICAL — MIKE KAPUSKAR — GE2564 — EXP. 12/31/06

ROUTE 710 TUNNEL FEASIBILITY

LOG OF TEST OF BORINGS NO. 4

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test (ASTM D-1586)

SPT N-value (blows/ft)	Granular	SPT N-value (blows/ft)	Cohesive
0 - 4	Very Loose	< 2	Very Soft
5 - 10	Loose	2 - 4	Soft
11 - 30	Medium Dense	5 - 8	Firm
31 - 50	Dense	9 - 15	Stiff
> 50	Very Dense	16 - 30	Very Stiff
		> 31	Hard

LEGEND OF EARTH MATERIALS (USCS)

BASED ON ASTM D2487, D2488

- FILL MATERIAL
- CLAY (CL or CH)
- SILT (ML or MH)
- PEAT and/or ORGANIC MATTER
- WELL-GRADED GRAVEL (GW)
- POORLY-GRADED GRAVEL (GP)
- SILTY GRAVEL (GM)
- CLAYEY GRAVEL (GC)
- POORLY-GRADED SAND (SP)
- WELL-GRADED SAND (SW)
- SILTY SAND (SM) or SANDY SILT
- CLAYEY SAND (SC) or SANDY LEAN CLAY
- COBBLES/BOULDERS
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

Note: Visual classification of earth materials are based on field inspection and are confirmed or revised with laboratory test results as necessary.

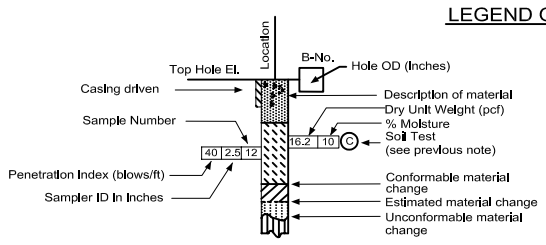
TYPE OF BORINGS

- 2 1/4" CONE PENETRATION
- ROTARY WASH
- ELECTRONIC CONE PENETROMETER
- AUGER BORING (DRY)
- TEST PIT
- DIAMOND CORE BORING
- SOIL TUBE

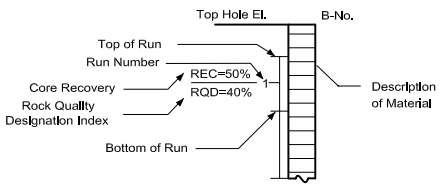
IN-SITU, LAB & FIELD TEST DESIGNATIONS

- AL ATTERBERG LIMITS
- CA CHEMICAL ANALYSIS
- CN CONSOLIDATION
- DS DIRECT SHEAR
- MD MAX. DRY DENSITY
- HM HYDROMETER
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SL SLAKE DURABILITY
- UC UNCONFINED COMPRESSION
- ULU UNCONSOLIDATED UNDRAINED TRIAXIAL
- W WASH #200

LEGEND OF BORING OPERATIONS



ROTARY(R) SAMPLE BORING (WET)



CORED BORING (WET)

EMI-3

N 34° 7' 44.5"
E 118° 9' 17.9"

06-3

TOP OF BOREHOLE: Date 23 Jan 06, Time: 8 AM

El. ± 790 ft

0 Alluvium

10 | 72 | 1.4 | 1 | - | 14 | SILTY SAND (SM): very dense, strong brown (7.5YR 8/4), dry, fine- to very fine-grained sand, subangular granite gravels 1/4 to 1/8" diameter, nonplastic

20 | 82 | 2.5 | 2 | 130 | 20 | POORLY GRADED SAND (SP): very dense, very pale-brown (10YR 7/4), dry, medium- to coarse-grained subangular sand, trace of subangular granite gravels 1/4 to 1/8" diameter, nonplastic

30 | 79 | 1.4 | 3B | - | 14 | POORLY GRADED GRAVEL with SAND (GP): very dense, light yellowish-brown (10YR 6/4), dry, medium- to coarse-grained subangular sand, subangular to angular granite gravels 1/8 to 11/2" diameter, trace of silt, nonplastic

40 | 50/4" | 2.5 | 4 | 130 | 20 | DS | WELL GRADED SAND with GRAVEL (SW): medium dense, light yellowish-brown (10YR 6/4), dry, medium- to coarse-grained subangular poorly sorted sand, subangular granitic gravels to 1/2" diameter, nonplastic

50 | 27 | 1.4 | 5A | - | 14 | W | WELL GRADED CLAYEY SAND (SC) (DECOMPOSED TOPANGA FORMATION): medium dense, strong brown (7.5YR 4/6), moist, coarse-grained angular to subangular sand, trace of pea gravel, nonplastic

60 | 50/4" | 2.5 | 6 | 130 | 20 | CA | POORLY GRADED SAND (SP): very dense, pale-brown (10YR 6/5), moist, coarse-grained sand, nonplastic, micaceous, some dark minerals, alteration of feldspars to clay
- | 14 | CA

70 | 50/1" | 1.4 | 7 | - | 14 | SA | SANDSTONE & CONGLOMERATE, very pale brown (10YR 8/3), moist, highly weathered to decomposed phaneritic rock, trace of dark minerals, alteration of feldspar and clay

50/1" | 8 | - | 18 | SA | black, moist, highly weathered, very soft, friable, coarse-grained to 1/8" diameter, partially altered feldspars
REC=11% RQD=0% 1

Date: 25 Jan 06, Time: 2.57 PM

@76.5': SANDSTONE (TOPANGA FORMATION), moderately weathered, moderately hard to hard, rounded, very well-indurated, likely only clasts contained within soft sandstone matrix that washed away during drilling. Recovered material not necessarily representative of formation

80 REC=60% RQD=8% 2

highly fractured

@80.5': light gray weathering to yellowish-brown (2.5Y 8/0 - 10YR 5/8), moderately weathered, hard, coarse-grained sand, very poorly sorted, angular, massively bedded @ 25°, intensely fractured, few granitic

REC=58% RQD=20% 3 UC cobbles at least 4" diameter, moderately indurated

@85.5': yellowish-brown, slightly to moderately weathered, moderately soft, coarse-grained sand, very poorly sorted, angular, massively bedded, intensely fractured, granitic cobbles up to 3.5" diameter, moderately indurated

90 REC=30% RQD=10% 4

@90.5': light gray to yellowish-brown, moderately soft, subangular to subrounded clasts, very poorly sorted, massively bedded, moderately fractured, granodiorite clast 2.875 " length, moderately indurated

moderately hard, massively bedded, very intensely fractured, very closely spaced, clean, stepped, contains both granitic and volcanic rocks up to 1.5" diameter

REC=27% RQD=0% 5

@94': potential joint @ 65°, slightly rough, granitic cobbles 3.5" diameter, likely soft matrix washed away

100 REC=40% RQD=0% 6

@99': light gray to yellowish-brown, moderately soft, subangular to subrounded coarse-grained sand, massively bedded, moderately fractured, granodiorite clast 2" length, moderately indurated

@99.5': intensely fractured core and clasts removed from matrix up to 2" diameter

moderately hard, angular clasts up to 2" diameter, granodiorite boulder, weathered joint @ 50°, thin filling

REC=60% RQD=20% 7

@104': intensely fractured volcanic and granitic clasts and pieces of core up to 2.5" diameter

@106.5': moderately hard, intensely fractured, closely spaced fractures, subangular granitic clast up to 1.5" diameter, moderately indurated

110

@109': slightly to moderately weathered, hard, very closely spaced fractures, some very thin coatings of clay, intensely fractured quartz diorite boulders, all core pieces reduced to less than 3" size by drilling

PENETRATION DEPTH (ft)

110

REC=40% RQD=0% 8

@114': gray, slightly weathered, hard, massively bedded, intensely fractured, closely spaced, clean, granitic cobbles at least 4" diameter, well indurated

REC=47% RQD=0% 9

hard to soft, very closely spaced, granodiorite boulders at least 12" diameter, poorly to well indurated

120

@119.5': intensely fractured, less than 3" spacing, reduced to gravel from drilling

REC=60% RQD=13% 10

@120.5': very soft, friable, easily reduced to soil with handling

REC=0% RQD=0% 11

@128.5': gray to dark gray, very soft, consists of hard angular to subangular clasts, largest piece of core is 2" length, volcanic, granodiorite, and minor quartzite clasts between ½ to 1½" diameter, poorly indurated

130

REC=20% RQD=0% 12

light gray to gray, slightly weathered, hard to very hard granodiorite clasts, angular to subangular very poorly sorted coarse-grained sand, well indurated, well cemented

REC=7% RQD=0% 13

@139': gray, hard, intensely fractured granodiorite boulder, largest piece of core 2" long, few volcanic clasts and sandstone fragments, poorly indurated

140

REC=40% RQD=8% 14

moderately hard, very poorly sorted coarse-grained sand, massively bedded, clean, rounded granitic clasts up to 2" diameter, well indurated

REC=17% RQD=0% 15

very poorly sorted angular to subrounded coarse-grained sand, very intensely fractured, very closely spaced joints, clean, subrounded granitic clasts up to 1" diameter, drill-rounded volcanic clasts between ½ to 1" diameter, moderately indurated

150

REC=20% RQD=0% 16

@154': slightly to moderately weathered, soft to moderately soft, very poorly sorted coarse-grained sandstone, subrounded to subangular volcanic & granitic clasts, poorly indurated, some fracture surfaces coated with calcite

REC=30% RQD=0% 17

moderately weathered, subrounded to angular volcanic & granitic clasts between 1 to 2" diameter, granodiorite boulder at least 5" diameter

160

REC=20% RQD=0% 18

@164.6': slightly weathered, soft, poorly to moderately sorted coarse-grained sandstone, thinly to moderately bedded @ 50°, intensely fractured, closely spaced fractures, clean, slightly rough to rough, notably few clasts and boulders, poorly indurated

REC=68% RQD=0% 19

UC @169.1': gray to light gray, very poorly sorted coarse-grained sandstone, thinly bedded @ 50°, 1/2 to 1/8" thick isolated silystone/claystone beds, moderately fractured

170

REC=43% RQD=7% 20

@174.6': dark gray, very thinly bedded @ 45°, polished to rough fracture, polished joint @ 45°, core is fragmented into pieces, largest piece 2"

REC=53% RQD=7% 21

@179.1': gray to dark gray, very soft, rough to moderately rough fracture, granitic cobble up to 3" diameter, nonindurated, crumbles under light manual pressure

180 REC=61% RQD=0% 22

gray, fresh, hard, very poorly sorted subangular to subrounded coarse-grained sand, massive bedded, moderately fractured, clean, rough to stepped fractures, very well indurated

REC=46% RQD=0% 23

slightly weathered, moderately soft, very poorly sorted coarse sandstone, rough fracture, moderately indurated

REC=50% RQD=0% 24

REC=37% RQD=0% 25

@188.1': gray to dark gray, slightly weathered, very soft, very intensely fractured, nonindurated, majority granitic clasts with some volcanic clasts, all core pieces less than 2"

190

REC=28% RQD=0% 26

gray, hard cobbles & pebbles, very thin calcite coating, granitic material

REC=25% RQD=0% 27

moderately sorted, subrounded, medium- to coarse-grained silty sand

poorly sorted medium- to coarse-grained sand, massive bedded, very intensely fractured, angular to subrounded clasts, core reduced to gravels less than 2.5" diameter

REC=25% RQD=0% 28

@198.1': moderately soft, very poorly sorted coarse-grained sand, thinly to moderately bedded @ 50°, moderately fractured, closely spaced, smooth to polished fractures, nonindurated, granitic cobble/boulder at least 4" diameter, subrounded volcanic clasts ~ 2" diameter

REC=96% RQD=17% 29

200

moderately hard, very poorly sorted, angular, coarse-grained sand, thinly to moderately bedded @ 60°, very thin filling, moderately indurated

REC=90% RQD=24% 30 UC

@200.1': dark gray, soft, poorly sorted, medium- to coarse-grained sand

@201.3': possible bedding @ 60°

@202.1': joint @ 70°, polished with striation

@202.3': joint @ 55°, polished with striation

@203.1': hard granodiorite cobble to 6" diameter

@204.1': BOTTOM OF HOLE,
Date: 25 Jan 06, Time: 12.58 PM

PENETRATION DEPTH (ft)

Notes:

1. Borehole diameter was $3\frac{7}{8}$" between 0 to 75' depth and 3" between 75' to bottom of hole.
2. SPT sampler used was 2" O.D. and 1.4" I.D. California Modified Sampler used was 3" O.D. and 2.5 " I.D.
3. An automatic trip hammer system using 140 lb weight and 30" drop was used to obtain blowcounts.
4. 1.77" diameter core was obtained using dual-barrel NQ coring system (1.969" ID and $2\frac{14}{16}$" OD) from 75' depth to bottom of hole.

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LAYOUT BY G. J. GUNARANJAN	DATE 03-13-06		
CHECKED BY M. KAPUSKAR	DATE 03-14-06		
APPROVED BY	DATE		

REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA GEOTECHNICAL
MIKE KAPUSKAR
GE2564
EXP. 12/31/06

ROUTE 710 TUNNEL FEASIBILITY

LOG OF TEST OF BORINGS NO. 5

PHASE II GEOTECHNICAL FEASIBILITY OF THE PROPOSED INTERSTATE 710 FREEWAY EXTENSION THROUGH THE MONTEREY HILLS LOS ANGELES COUNTY, CALIFORNIA CONTRACT NO. 07A0406, TASK ORDER NO. 2

PREPARED FOR:
Robert Bein, William Frost & Associates
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PREPARED BY:
Ninyo & Moore Geotechnical and Environmental Sciences Consultants
9272 Jeronimo Road, Suite 123A
Irvine, California 92618

March 25, 1999
Project No. 201769-01

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory excavations. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Spoon

Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test spoon sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The spoon was driven into the ground 12 to 18 inches with a 140-pound hammer free-falling from a height of 30 inches in general accordance with ASTM D 1586-84. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the spoon, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer or the kelly bar of the drill rig in general accordance with ASTM D 3550-84. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer or bar, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

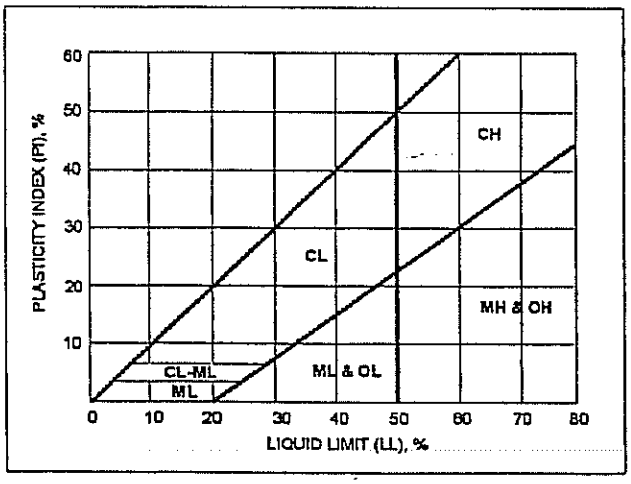
U.S.C.S. METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (More than 1/2 of soil >No. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction <No. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than 1/2 of soil <No. 200 sieve size)	SILTS & CLAYS Liquid Limit <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS Liquid Limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

CLASSIFICATION CHART (Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No.4	76.2 to 4.76
Coarse	3" to 3/4"	76.2 to 19.1
Fine	3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.074
Coarse	No. 4 to No. 10	4.76 to 2.00
Medium	No. 10 to No. 40	2.00 to 0.420
Fine	No. 40 to No. 200	0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

GRAIN SIZE CHART



PLASTICITY CHART

Ninyo & Moore

U.S.C.S. METHOD OF SOIL CLASSIFICATION

DATE DRILLED _____ BORING NO. SAMPLE

GROUND ELEVATION _____ SHEET 1 OF 1

METHOD OF DRILLING _____

DRIVE WEIGHT _____ DROP _____

SAMPLED BY _____ LOGGED BY _____ REVIEWED BY _____

DEPTH (feet)	SAMPLES (Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							Auger (A)
							Solid line denotes formation change.
							Modified split-barrel drive sampler (C)
							No recovery with modified Split-Barrel Drive Sampler (B)
							Dutch cone test (D)
5			♀				Seepage
							Rock Cores (E)
			▽				Groundwater encountered during drilling.
			▼				Groundwater measured after drilling.
							Piston (I)
							Dashed line denotes lithologic change
10							Standard Penetration Test (P)
							No recovery with a standard penetration test (T)
							Shelby tube sample (R)
		XX/XX					Distance pushed in inches/Length of sample recovered in inches.
							No recovery with Shelby tube sampler (X)
15							Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Sheared Bedding Surface
20							The total depth line is a solid line that is drawn at the level of the last entry.

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BORING LOG

EXPLANATION OF BORING LOG

PROJECT NO.	DATE	FIGURE
SAMPLE	Rev.3/95	

DATE DRILLED 2/3/99 BORING NO. NM-B1

GROUND ELEVATION 594' ±(MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" diameter hollow stem auger (Al Roy Drilling)

DRIVE WEIGHT 140 lbs. DROP 30 inches

SAMPLED BY BDF LOGGED BY BDF REVIEWED BY CAP

DEPTH (feet)	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						CL	ASPHALT CONCRETE: Approximately 3 inches thick. ALLUVIUM: Brown, damp, loose, sandy CLAY.
		15	16.6	78.8			
5		8					Firm; trace gravel; root hairs.
							Moist.
		76	18.4	102.4			Hard; angular rock fragments up to approximately 1/4 inch in diameter.
15		31					Reddish brown.

Ninyo & Moore

BORING LOG

Interstate 710 Extension
Los Angeles County, California

PROJECT NO.	DATE	FIGURE
201769-01	3/99	A-1

DATE DRILLED 2/3/99 BORING NO. NM-B1

GROUND ELEVATION 594' ±(MSL) SHEET 2 OF 3

METHOD OF DRILLING 8" diameter hollow stem auger (Al Roy Drilling)

DRIVE WEIGHT 140 lbs. DROP 30 inches

SAMPLED BY BDF LOGGED BY BDF REVIEWED BY CAP

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20			48	22.7	100.6		CL	ALLUVIUM: (Continued) Reddish brown, moist, hard, sandy CLAY; few gravel; angular and rounded rock fragments up to approximately 1/4 inch in diameter.
25			24					Variable moisture; very stiff. Gradually increasing moisture; fewer rock fragments.
30			35	20.5	105.5			Irregular pockets of finer grained material with higher moisture.
35			21					Light brown.
								TOPANGA FORMATION: Light brown, moist, weakly cemented, sandy SILTSTONE; intensely weathered.

Ninyo & Moore

BORING LOG

Interstate 710 Extension
Los Angeles County, California

PROJECT NO.	DATE	FIGURE
201769-01	3/99	A-2

DATE DRILLED 2/3/99 BORING NO. NM-B1

GROUND ELEVATION 594' ±(MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" diameter hollow stem auger (Al Roy Drilling)

DRIVE WEIGHT 140 lbs. DROP 30 inches

SAMPLED BY BDF LOGGED BY BDF REVIEWED BY CAP

DEPTH (feet)	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		58	23.2	101.2			TOPANGA FORMATION: (Continued) Light brown, moist, weakly cemented, sandy SILTSTONE; intensely weathered; iron oxide stains; manganese stains. Light reddish brown; weakly indurated; clayey SILTSTONE; iron oxide stains along fractures of variable orientation.
45		26	▽				@ 45.0': Groundwater encountered during drilling.
		60	27.4	98.7			
55							Total Depth = 51.5 feet. Groundwater encountered during drilling at approximately 45 feet. Backfilled and patched on 2/3/99.

Ninyo & Moore

BORING LOG

Interstate 710 Extension
Los Angeles County, California

PROJECT NO.	DATE	FIGURE
201769-01	3/99	A-3

DATE DRILLED 2/4/99 BORING NO. NM-B2

GROUND ELEVATION 676' ±(MSL) SHEET 1 OF 2

METHOD OF DRILLING 30" diameter bucket auger (Al Roy Drilling)

DRIVE WEIGHT See end of log DROP 12 inches

SAMPLED BY SMJ LOGGED BY SMJ REVIEWED BY CAP

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 4 to 5 inches thick.
						GP	AGGREGATE BASE: Gray, moist, dense, sandy GRAVEL; approximately 3 inches thick.
						ML	FILL: Orange-brown, moist, stiff, clayey SILT; angular rock fragments up to approximately 4 inches in diameter.
							TOPANGA FORMATION: Orange-brown, moist, weakly to moderately indurated, clayey SILTSTONE to silty CLAYSTONE; highly fractured and jointed; weathered; extensive iron oxide staining; beds up to approximately 4 inches thick; blocky weathering.
							@ 3.0': (B:N89°W/28°N).
5		10	20.2	101.5			@ 4.0': Interbeds of dark greenish gray, moist, moderately indurated, siltstone; micaceous; beds range from approximately 1/6 inch to 4 inches thick; (B:N90°W/31°N).
							@ 4.9': (B:N89°E/35°N).
							@ 5.1': (J:N56°W/54°S).
							@ 6.4': (B:N74°E/30°N) (J:N71°E/60°S).
							@ 8.5': (J:N55°W/75°N).
							@ 9.0': Clay seam; dark gray; micaceous; soft; approximately 1/32 to 1/16 inch thick; slickensides; (CS:N85°E/35°N).
10		11	22.1	97.0			@ 10.5'-13.6': Micaceous silt between bedding surfaces; soft; dark gray.
							@ 10.6': Gypsum vein; approximately 1/4 inch thick.
							@ 10.9': (B:N90°W/36°N).
							@ 13.6': Less weathered; well indurated.
							@ 13.8': (B:N70°W/35°N); Clay seam; approximately 1/32 inch thick along bedding.
15		19/10"	19.2	97.9			@ 14.5': (J:N52°W/50°S) (B:N68°W/35°N); siliceous beds of siltstone approximately 1/8 inch thick.
							@ 14.7': (J:N20°E/69°W); gypsum vein approximately 1/16 inch thick; (GV:N60°W/65°S).
							@ 15.6': (B:N80°W/35°N) (J:N75°W/52°S).
			▽				@ 20.0': Groundwater measured after drilling and downhole logging.

Ninyo & Moore

BORING LOG

Interstate 710 Extension
Los Angeles County, California

PROJECT NO.	DATE	FIGURE
201769-01	3/99	A-4

DATE DRILLED 2/4/99 BORING NO. NM-B2

GROUND ELEVATION 676' ±(MSL) SHEET 2 OF 2

METHOD OF DRILLING 30" diameter bucket auger (Al Roy Drilling)

DRIVE WEIGHT See end of log DROP 12 inches

SAMPLED BY SMJ LOGGED BY SMJ REVIEWED BY CAP

DEPTH (feet)	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		9	20.2	98.0			TOPANGA FORMATION: (Continued) Orange-brown, moist, moderately to well indurated, clayey SILTSTONE; highly fractured and jointed; extensive iron oxide staining; beds up to approximately 4 inches thick.
			♀				@ 24.0': Heavy seepage.
25		18	24.4	100.3			
							Total Depth = 26.0 feet. Seepage encountered at approximately 24 feet. Downhole logged to approximately 18 feet. Groundwater measured after downhole logging at 20 feet. Backfilled on 2/4/99. Drive Weights: 0-30': 3,350 lbs.
35							

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BORING LOG

Interstate 710 Extension
Los Angeles County, California

PROJECT NO.	DATE	FIGURE
201769-01	3/99	A-5

DATE DRILLED 2/10/99 BORING NO. NM-B4

GROUND ELEVATION 545' ±(MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" diameter hollow stem auger (A & R Drilling)

DRIVE WEIGHT 140 lbs. DROP 30 inches

SAMPLED BY BDF LOGGED BY BDF REVIEWED BY CAP

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						GM	ASPHALT CONCRETE: Approximately 4 inches thick.
						CL	AGGREGATE BASE: Gray, damp, dense, sandy GRAVEL with silt; approximately 4 inches thick.
							ALLUVIUM: Brown, damp, very stiff, sandy CLAY; trace gravel.
		39	18.3	74.3			
5		35	19.1	70.7			Few gravel.
							Moist.
10		58	20.1	91.5			Hard; pinhole voids.
						SC	Light brown, moist, medium dense, clayey SAND; few gravel.
15		43	12.9	111.4			
						SP-SM	Light brown, moist, medium dense, poorly graded SAND with silt.
		68/11"	7.1	116.8			

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BORING LOG

Interstate 710 Extension
Los Angeles County, California

PROJECT NO.	DATE	FIGURE
201769-01	3/99	A-10

DATE DRILLED 2/10/99 BORING NO. NM-B4

GROUND ELEVATION 545' ±(MSL) SHEET 2 OF 3

METHOD OF DRILLING 8" diameter hollow stem auger (A & R Drilling)

DRIVE WEIGHT 140 lbs. DROP 30 inches

SAMPLED BY BDF LOGGED BY BDF REVIEWED BY CAP

DEPTH (feet)	SAMPLE (Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20						SP-SM	ALLUVIUM: (Continued) Light brown, moist, medium dense, poorly graded SAND with silt.
						SC	Light brown, moist, medium dense, clayey SAND.
		105	8.4	103.4		SM	Light brown, moist, dense, silty SAND; gravel up to approximately 2 inches in diameter.
25						SC	Light brown, moist, medium dense to dense, clayey SAND.
		88/11"	6.9	109.4		SW-SM	Reddish brown, moist, dense, well graded SAND with silt; gravel up to approximately 2 inches in diameter.
			▽				@ 33.0': Groundwater encountered during drilling.
		58/6"	15.3	111.1			Saturated.
35						CL	Reddish brown, saturated, hard, silty CLAY.
		71	23.5	102.4			

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BORING LOG

Interstate 710 Extension
Los Angeles County, California

PROJECT NO.	DATE	FIGURE
201769-01	3/99	A-11

DATE DRILLED 2/10/99 BORING NO. NM-B4

GROUND ELEVATION 545' ±(MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" diameter hollow stem auger (A & R Drilling)

DRIVE WEIGHT 140 lbs. DROP 30 inches

SAMPLED BY BDF LOGGED BY BDF REVIEWED BY CAP

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40						CL	ALLUVIUM: (Continued) Reddish brown, saturated, hard, silty CLAY; grades to light yellowish brown.
45		42	28.4	95.0			TOPANGA FORMATION: Light yellowish brown, saturated, moderately indurated, clayey SILTSTONE; highly fractured; oxidized along fractures.
50		110	20.7	103.0			Thin bedded siltstone and claystone dipping approximately 5-10°; thicker beds of fine-grained sandstone.
55							Total Depth = 50.5 feet. Groundwater encountered during drilling at approximately 33 feet. Backfilled with bentonite slurry and patched on 2/10/99.

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BORING LOG

Interstate 710 Extension
Los Angeles County, California

PROJECT NO.	DATE	FIGURE
201769-01	3/99	A-12