

FOR CONTRACT NO.: 07-4S7604

INFORMATION HANDOUT

MATERIALS INFORMATION

GEOTECHNICAL DESIGN RECOMMENDATION

ROUTE: 07-LA-105-R3.5

FOR CONTRACT NO. 07-4S7604

INFORMATION HANDOUT

MATERIALS INFORMATION

GEOTECHNICAL DESIGN REPORT

07-LA-105-PM R3.5



Pratheep
 Piratheepan /D07/Caltrans/CA
 Gov
 05/06/2008 09:59 AM

To robert_doria@dot.ca.gov@DOT
 cc Shiva Karimi/HQ/Caltrans/CAGov@DOT, Gustavo
 Ortega/D07/Caltrans/CAGov@DOT
 bcc
 Subject Geotechnical Recommendation - 07-4S7601 LA-105-PM 3.5
 Settled Pvmt @ Imperial Hwy OC 53-2655

History: This message has been forwarded.

Bob:

Per our meeting on May 05, 2008, the proposed remedial measure at the subject site shall include overexcavation (removal) of 5 feet of material beneath the approach slab. It is recommended to place a non-woven-needle-formed filter/separator subgrade fabric at the bottom of the excavation. Then two-foot of class 2 aggregate base shall be placed and then again fabric. Backfilling shall conform Section 19 of the Standard Specification (no less than 95% relative compaction).

The bottom of excavation should be observed and probed by a representative of OGDS-1 or equivalent geotechnical quality control representative to verify that the soils are firm before fill placement. If soft or loose soils are observed at the bottom of excavation, the soft/loose materials shall be further removed to an additional 3 feet and controlled low strength material (slurry cement backfill) shall be placed in the 3 feet of additional excavation.

If you have any question, please contact us.

5-19-09: Kirsten OK's ABCS,
 Pratheep concurs.

Thanks,

Pratheep Piratheepan, P.E.
 Transportation Engineer
 Office of Geotechnical Design South - 1
 Geotechnical Services, Branch D
 100 South Main Street, 11th Floor
 Los Angeles, CA 90012

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Memorandum

*Flex your power!
Be energy efficient!*

To: MR. HAMID SAADATNEJADI
Senior Transportation Engineer
District 07 Office of Maintenance Engineering

Date: March 6, 2008
File: 07-LA-105-PM 3.36
EA 07 4S7601

Abutment 5 Approach Slab Repair,
Imperial Highway Overcrossing
Br. No. 53-2655

Attention: Robert Doria

From: **DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design - South 1
Branch D**

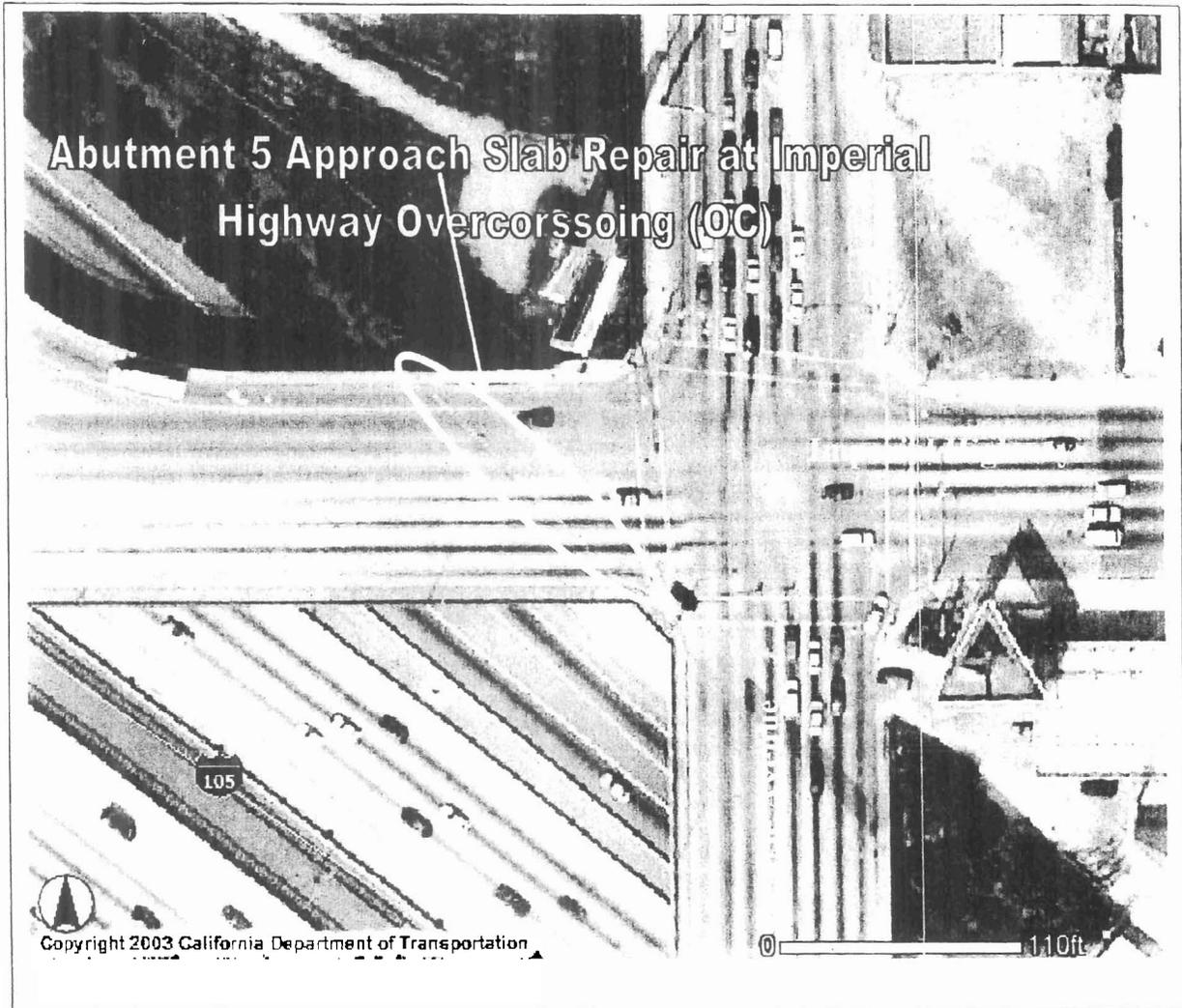
Subject: Geotechnical Recommendations for Abutment 5 Approach Slab Repair at Imperial Highway Overcrossing (OC) over State Route 105 (SR-105)

As requested by your office in an email dated July 25, 2007, the office of Geotechnical Design South 1 (OGDS1), Branch D has conducted a full investigation and prepared geotechnical recommendations for repairing the Abutment 5 Approach Slab at Imperial Highway Overcrossing (OC) over SR-105 in the County of Los Angeles. The purpose of our geotechnical investigation is to evaluate site subsurface conditions and to provide recommendations for approach slab rehabilitation. Conclusions and recommendations presented in this report are based on site reconnaissance, geotechnical investigation and a review of information from current and previous explorations.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The Imperial Highway Overcrossing (OC) - Bridge Number 53-2655 is located at post mile 3.36 on State Route 105 (SR-105) in the County of Los Angeles. The Imperial Highway OC was constructed in 1993. At the location of the bridge, SR-105 roadway was constructed by excavating the original ground. The Abutment 5 (left side) approach slab was constructed on top of fill material which was placed on top of the 2 (H):1 (V) side slopes of the SR-105 original ground excavation. The Abutment 5 (left side) approach slab pavement has been experiencing mostly vertical and minor lateral deformation caused by differential settlement between bridge deck and approach slab. The location of the project site relative to streets and landmarks is shown on the Vicinity Map, Figure 1.

OGDS1 understands that District 07 Office of Maintenance Engineering initiated the proposed rehabilitation project to determine the factors causing vertical deformation of the slab and to repair the approach slab.



GEOTECHNICAL INVESTIGATION

Our field exploration program consisted of drilling one (1) exploratory rotary sample boring and three (3) Cone Penetration Test (CPT) soundings on November 27 and 28, 2007. Sampling of the material for laboratory testing was also made. Placement of OGDS1's exploratory borings was constrained to westbound lanes due to conflict with numerous underground utility lines.

The rotary sample boring was drilled to a depth of 37.5 feet below the existing roadway surface at an elevation of about +70.0 feet MSL (Mean Sea Level, NGVD29 datum). The CPT soundings were advanced to depths ranging from 21.1 feet to 26.2 feet below the existing roadway surface. The Boring and CPT records and CPT interpretation results are attached to this report. The Log of Test Borings is being prepared and will be forwarded when completed for inclusion in the contract plans.

The subsurface conditions at the project site are interpreted from the sampling and lab test results obtained from the current field investigation, site construction history, and As Built Plans. Based on the available boring and CPT data, the interpreted subsurface materials beneath the site generally consist of fill to an approximate depth of 21 ft overlying native alluvium. The bridge approach fill consists of loose to medium dense silty sand, clayey sand, and sand with silt. The native alluvium generally consists of interlayered medium dense silty sand and sandy silt to the maximum recently drilled depth of 37.5 ft.

LOCAL GEOLOGY

The area is underlain by artificial fill placed during the construction of the freeway. This artificial fill lies over a thick section of quaternary deposits, typically consisting of sands, gravels, silt and cobbles with some clay.

GROUND WATER

No groundwater was encountered in the boring R-07-101 drilled to an elevation +32.8 ft MSL (i.e., a depth of 37.5 ft below Imperial Highway roadway grade) during our investigation. Groundwater was encountered between elevations +14.1 to +18.6 ft MSL during Caltrans investigation in 1987 for the Imperial Highway OC. This corresponds to depth of about 51.7 ft to 56.2 ft below the Imperial Highway roadway grade. Based on the groundwater levels encountered, groundwater is not considered to be a problem for approach slab re-construction/repair activities.

LABORATORY TEST RESULTS

Representative soil samples were obtained from Boring R-07-101 drilled at the subject site and submitted to the laboratory after completion of the fieldwork. Tests performed include sieve analysis, Atterberg limits, consolidation, compaction test, and corrosivity tests. The

test results are presented in Table No. 1 through No. 3 below. The results of sieve analysis and consolidation tests are attached to this report.

Caltrans considers a site to be corrosive if soil and/or water samples contain more than 500 PPM of chlorides, or more than 2000 PPM of sulfates, or has a pH of 5.5 or less. As shown in Table No. 3, the corrosivity test results indicate that the soil at the site is non-corrosive (Caltrans Corrosion Guidelines, 2003).

**Table No. 1
 Compaction Test Results**

Boring No.	Sample Depth (ft)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
R-07-101	4 - 36	129.0	9.5

**Table No. 2
 Atterberg Limits Test Results**

Boring No.	Sample Depth (ft)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)
R-07-101	11.3 – 11.7	14	24	10
R-07-101	11.7 – 12.0	-	-	NP*
R-07-101	12.0 – 12.3	-	-	NP*

* NP – Non-Plastic

**Table No. 3
 Corrosion Test Results**

Boring No.	Sample Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Sulfate * Content (PPM)	Chloride* Content (PPM)
R-07-101	3.2 – 3.5	7.82	3,300	-	-
R-07-101	4 - 36	8.02	3,800	-	-

* Caltrans does not test soil and water samples for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm.

GEOTECHNICAL OBSERVATION AND EVALUATION

The coring operation performed prior to field exploration indicated that the structural section of the Imperial Hwy lanes consists of a Portland Cement Concrete (PCC) pavement underlain by cement-treated base (CTB) materials. The thickness of PCC layer observed in the boring and CPTs ranged from about 14 in. to 16 in. whereas the thickness of the CTB ranged from 9 in. to 14 in. It was observed that water sprayed at the cutting bit during the coring operation was rapidly drained inside the CPT hole CPT-07-103. Poorly compacted base or poor quality concrete-treated base (too much gravel) or a small void area below the slab might have caused the rapid draining.

The modified California samplers were pushed with moderate pressure to collect relatively undisturbed samples in the upper 15 ft. Efforts to retrieve a modified California sample between 6 to 7.5 ft depth failed as the soil fell out of the sampler. The sandy soil encountered at 6 to 7.5 ft depth appeared to be loosely compacted and with less silt content.

The continuous soil profile data obtained from the three CPT soundings were further processed and evaluated to obtain the relative densities of the near surface soils. Based on OGDS1's evaluation, about 1½ to 2½ ft of well-compacted (Relative densities, D_r , above 65%) gravelly sandy soil layer was observed immediately below the PCC slab on all three CPT soundings. A poorly compacted (Relative densities, D_r , about 35% to 50%) 5 to 6 ft sandy soil layer underlies the well-compacted layer. Existing soil compaction is less than the required 95% relative compaction for Structure Backfill shown in the Caltrans Standard Specifications (2006).

GEOTECHNICAL RECOMMENDATIONS

Based on the results of this investigation, it is our opinion that poor compaction of the upper part of the fill resulted in settlement of the approach slab at this location. In order to provide a uniform bearing material and avoid additional settlement we recommend three alternative remedial measures:

1. Remedial measure shall include overexcavation (removal) of 8 feet of material beneath the approach slab. It is recommended to place a non-woven-needle-formed filter/separator subgrade fabric at the bottom of the excavation. Then two-foot of class

- 2 aggregate base shall be placed and then again fabric. Backfilling shall conform Section 19 of the Standard Specification (no less than 95% relative compaction).
2. A grouting program
 3. A combination of the above two

OGDS1 recommends that a geotechnical engineer or certified engineering geologist should be present to observe the soil conditions encountered during slab removal, to evaluate the applicability of the recommendations presented in this report with respect to the soil conditions encountered, and to recommend appropriate changes in design or construction if conditions differ from those described herein.

District 7 Materials Unit should be contacted for the PCC pavement structural section design.

Mr. HAMID SAADATNEJADI
March 6, 2008
Page 7

Abutment 5 Approach Slab
Imperial Highway OC, Br. No. 53-2655
07-4S7601

If you have any questions or comments, please call Pratheep Piratheepan at (213) 620-2363 or Shiva Karimi at (213) 620-2146.

Prepared by:

Date:

Supervised by:

Date: 03/06/08


Pratheep Piratheepan, P.E.
Transportation Engineer
Office of Geotechnical Design South
Branch D




Shiva Karimi, Ph.D., P.E., C.E., Chief
Office of Geotechnical Design South 1
Branch D



Attachments: Caltrans Boring and CPT Records and CPT Interpretations (11 sheets)
Sieve Analysis Test Result (3 sheets)
Consolidation Test Result (1 sheet)

CC: RE Pending File

Specs & Estimates (D07)
Specs Div. (D07)

District 07 Proj. Mgmt
District 07 Materials – Kirsten Stahl
OGDS1- Sac. File
GS- Corporate
OGDS1- LA File

GROUP SYMBOLS AND NAMES			
Graphic / Symbol	Group Names	Graphic / Symbol	Group Names
	GW Well-graded GRAVEL		CL Lean CLAY
	Well-graded GRAVEL with SAND		Lean CLAY with SAND
	GP Poorly graded GRAVEL		Lean CLAY with GRAVEL
	Poorly graded GRAVEL with SAND		SANDY lean CLAY
	GW-GM Well-graded GRAVEL with SILT		SILTY CLAY
	Well-graded GRAVEL with SILT and SAND		SILTY CLAY with SAND
	GW-GC Well-graded GRAVEL with CLAY (or SILTY CLAY)		SILTY CLAY with GRAVEL
	Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		SANDY SILTY CLAY
	GP-GM Poorly graded GRAVEL with SILT		SANDY SILTY CLAY with GRAVEL
	Poorly graded GRAVEL with SILT and SAND		GRAVELLY SILTY CLAY with SAND
	GP-GC Poorly graded GRAVEL with CLAY (or SILTY CLAY)		SILT
	Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		SILT with SAND
	GM SILTY GRAVEL		SILT with GRAVEL
	SILTY GRAVEL with SAND		SANDY SILT
	GC CLAYEY GRAVEL		SANDY SILT with GRAVEL
	CLAYEY GRAVEL with SAND		GRAVELLY SILT
	GC-GM SILTY, CLAYEY GRAVEL		GRAVELLY SILT with SAND
	SILTY, CLAYEY GRAVEL with SAND		ORGANIC lean CLAY
	SW Well-graded SAND		ORGANIC lean CLAY with SAND
	Well-graded SAND with GRAVEL		ORGANIC lean CLAY with GRAVEL
	SP Poorly graded SAND		SANDY ORGANIC lean CLAY
	Poorly graded SAND with GRAVEL		GRAVELLY ORGANIC lean CLAY
	SW-SM Well-graded SAND with SILT		GRAVELLY ORGANIC lean CLAY with SAND
	Well-graded SAND with SILT and GRAVEL		ORGANIC SILT
	SW-SC Well-graded SAND with CLAY (or SILTY CLAY)		ORGANIC SILT with SAND
	Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		ORGANIC SILT with GRAVEL
	SP-SM Poorly graded SAND with SILT		SANDY ORGANIC SILT
	Poorly graded SAND with SILT and GRAVEL		SANDY ORGANIC SILT with GRAVEL
	SP-SC Poorly graded SAND with CLAY (or SILTY CLAY)		SANDY ORGANIC SILT with GRAVEL
	Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		GRAVELLY ORGANIC SILT
	SM SILTY SAND		GRAVELLY ORGANIC SILT with SAND
	SILTY SAND with GRAVEL		Fat CLAY
	SC CLAYEY SAND		Fat CLAY with SAND
	CLAYEY SAND with GRAVEL		Fat CLAY with GRAVEL
	SC-SM SILTY, CLAYEY SAND		SANDY fat CLAY
	SILTY, CLAYEY SAND with GRAVEL		SANDY fat CLAY with GRAVEL
	PT PEAT		GRAVELLY fat CLAY
	COBBLES COBBLES and BOULDERS BOULDERS		GRAVELLY fat CLAY 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	
	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)



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

REPORT TITLE				
BORING RECORD LEGEND				
DIST. 07	COUNTY LA	ROUTE 105	POSTMILE 3.43.4	EA 07-4S7601
PROJECT OR BRIDGE NAME Imperial Highway Overcrossing (OC) @ Interstate 105				
BRIDGE NUMBER 53-2657	PREPARED BY	DATE	SHEET 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.



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

REPORT TITLE

BORING RECORD LEGEND

DIST. 07	COUNTY LA	ROUTE 105	POSTMILE 3.4/3.4	EA 07-4S7601
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PROJECT OR BRIDGE NAME
Imperial Highway Overcrossing (OC) @ Interstate 105

BRIDGE NUMBER 53-2657	PREPARED BY	DATE	SHEET 2 of 3
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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						
Descriptor	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		General Characteristics
	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.
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 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. 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 (%)
$\frac{\sum \text{Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}}$

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

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



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - South
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REPORT TITLE				
BORING RECORD LEGEND				
DIST. 07	COUNTY LA	ROUTE 105	POSTMILE 3.4/3.4	EA 07-4S7601
PROJECT OR BRIDGE NAME Imperial Highway Overcrossing (OC) @ Interstate 105				
BRIDGE NUMBER 53-2657	PREPARED BY	DATE	SHEET 3 of 3	

LOGGED BY PP	BEGIN DATE 11-27-07	COMPLETION DATE 11-27-07	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID R-07-101
DRILLING CONTRACTOR Caltrans in-house			BOREHOLE LOCATION (Station, Offset, Line) Sta ~18+51 Offset ~42L Imp. Hwy. Center line	SURFACE ELEVATION 70.25 ft
DRILLING METHOD Rotary Wire-Line			DRILL RIG CME-85	BOREHOLE DIAMETER 4.5 in.
SAMPLER TYPE(S) AND SIZE(S) (ID) Punch core, Mod. California, SPT			SPT HAMMER TYPE Automatic, 140 lb, 30-in.	HAMMER EFFICIENCY, ERI 87%
BOREHOLE BACKFILL AND COMPLETION Bentonite chips			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS Not encountered.	TOTAL DEPTH OF BORING 37.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per Foot	Recovery (%)	RCD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	1		PORTLAND CEMENT CONCRETE (PCC) SLAB = 16"												
	2		AGGREGATE BASE = 14"												
68.25	3		FILL: SILTY SAND with GRAVEL loose to medium dense; yellowish brown; moist; about 7 to 28% fine to coarse GRAVEL; about 53 to 63% fine to coarse SAND; about 18 to 30% no to low plasticity fines; weak cementation. At 5 ft, grades with no gravel	01	P*			100		5	114				CP, PA
66.25	4			02				100		7	120				PA
64.25	6		Poorly graded SAND with SILT (SP-SM); loose to medium dense; dark brown; moist; about 90% fine to medium SAND. At 7.5 ft, contains roots, signs of fill	03	P*			0							Sample fell off.
62.25	8			04				100							P* - Mod. Cal samples were pushed with moderate pressure to collect undisturbed sample.
60.25	10		SILTY SAND (SM); medium dense; brown; moist; about 0 to 1% fine GRAVEL; about 63% fine to coarse SAND; about 36% fines. CLAYEY SAND (SC); medium dense; yellowish brown; moist; about 53% fine to medium SAND; about 47% low plasticity fines. SILTY SAND (SM); medium dense; yellowish brown; moist; about 87% fine to medium SAND; about 13% no plasticity fines. At 16 ft, grades to grayish brown.	05	P*			100							PA
58.25	12			06				86		21	102				PA C, PA, PI
56.25	14		At 17.5 ft, grades micaceous	07		5	18	100		19					PA
54.25	16			08			8								
52.25	18		ALLUVIUM: SILTY SAND (SM); medium dense; yellowish brown; moist; about 78% fine to medium SAND; about 22% no plasticity fines. At 26 ft, grades to very moist	09		7	19	100		10					PA
50.25	20			10			8								
48.25	22			11		8	20	100		26					PA
46.25	24			12			8								
44.25	26					8									
42.25	28					8									
	30														

(continued)

CALTRANS BORING RECORD 052007 07-45760 GPJ CT SACTO 053107 GDT 2/29/08



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

REPORT TITLE BORING RECORD				HOLE ID R-07-101	
DIST 07	COUNTY LA	ROUTE 105	POSTMILE 3.4/3.4	EA 07-457601	
PROJECT OR BRIDGE NAME Imperial Highway Overcrossing (OC) @ Interstate 105					
BRIDGE NUMBER 53-2657		PREPARED BY PP		DATE 2-20-08	SHEET 1 of 2

CAL TRANS BORING RECORD 052007 07.4S760.GPJ CT SACTO 053107.GDT 2/29/08

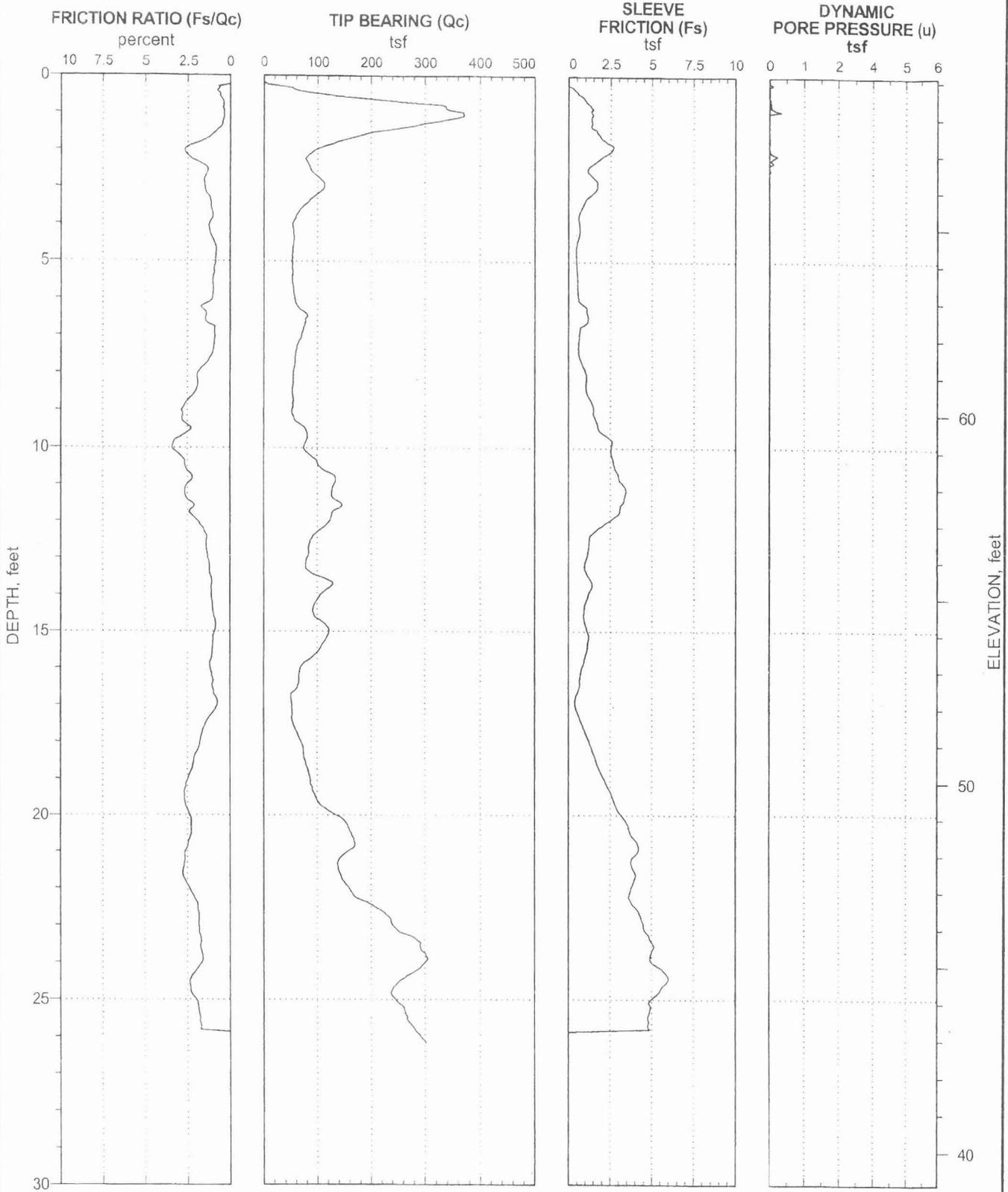
ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per Foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
30	30		SANDY SILT (ML); medium dense; yellowish brown; moist; about 40% fine to medium SAND; about 60% low plasticity fines.		12			86							
31	31				13	8	24	100		15				PA	
38.25	32					10									
	33					14			86						
36.25	34														
34.25	36				15	8	18	100		18				PA	
	37					9									
	37.5		Bottom of Borehole at 37.5 ft. Boring completed to total depth of 37.5 ft on 11/26/07.												
32.25	38														
	39														
30.25	40														
	41														
28.25	42														
	43														
26.25	44														
	45														
24.25	46														
	47														
22.25	48														
	49														
20.25	50														
	51														
18.25	52														
	53														
16.25	54														
	55														
14.25	56														
	57														
12.25	58														
	59														
10.25	60														
	61														
8.25	62														
	63														
6.25	64														
	65														
	66														



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

REPORT TITLE BORING RECORD				HOLE ID R-07-101	
DIST. 07	COUNTY LA	ROUTE 105	POSTMILE 3.4/3.4	EA 07-4S7601	
PROJECT OR BRIDGE NAME Imperial Highway Overcrossing (OC) @ Interstate 105					
BRIDGE NUMBER 53-2657		PREPARED BY PP		DATE 2-20-08	SHEET 2 of 2

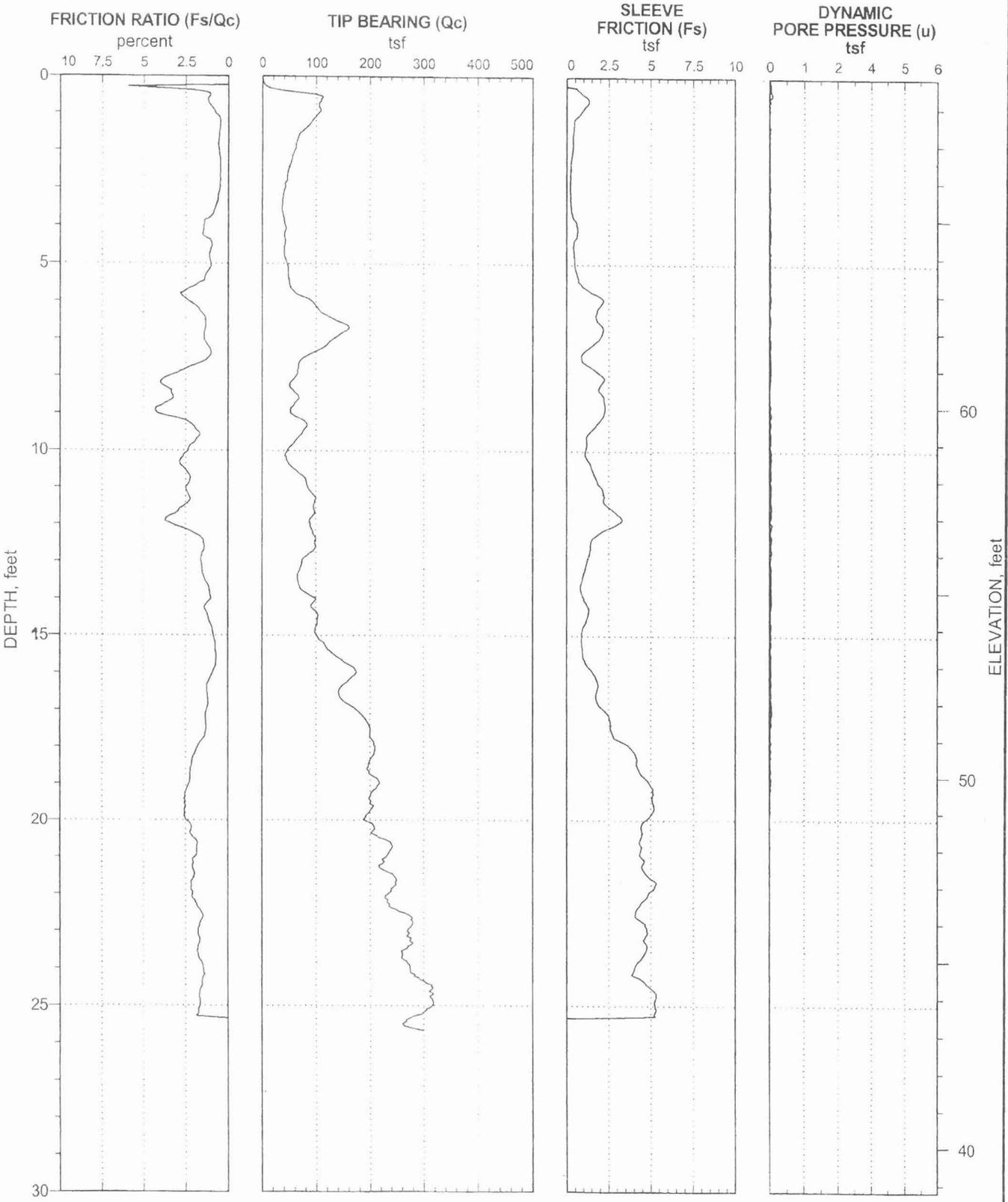
CALTRANS CPT RECORD 052007 07-4S760.GPJ CT SACTO 053107.GDT 2/29/08



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

REPORT TITLE BORING RECORD				HOLE ID CPT-07-102	
DIST. 07	COUNTY LA	ROUTE 105	POSTMILE 3.4/3.4	EA 07-4S7601	
PROJECT OR BRIDGE NAME Imperial Highway Overcrossing (OC) @ Interstate 105					
BRIDGE NUMBER 53-2657		PREPARED BY PP		DATE 2-20-08	SHEET 1 of 1

CALTRANS CPT RECORD 052007 07-4S760.GPJ CT SACTO 053107 GDT 2/29/08



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

REPORT TITLE BORING RECORD				HOLE ID CPT-07-103
DIST. 07	COUNTY LA	ROUTE 105	POSTMILE 3.4/3.4	EA 07-4S7601
PROJECT OR BRIDGE NAME Imperial Highway Overcrossing (OC) @ Interstate 105				
BRIDGE NUMBER 53-2657	PREPARED BY PP	DATE 2-20-08	SHEET 1 of 1	

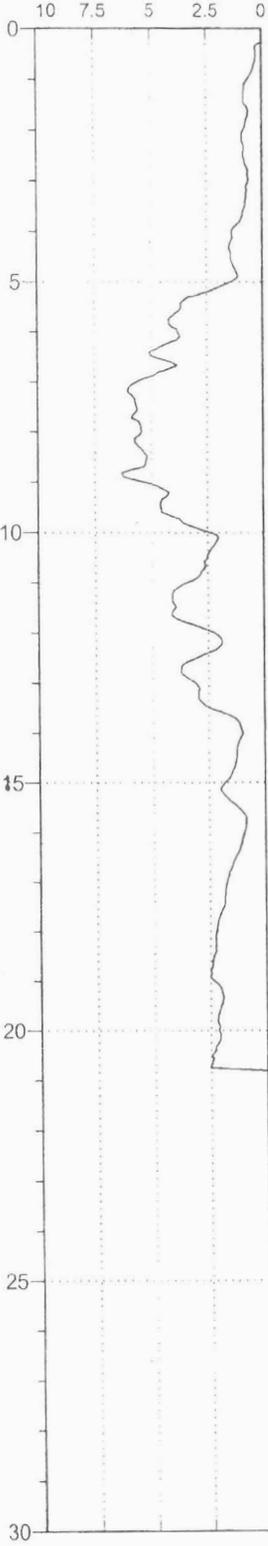
CALTRANS CPT RECORD 052007 07-4S760.GPJ CT SACTO 053107.GDT 2/29/08

DEPTH, feet

ELEVATION, feet

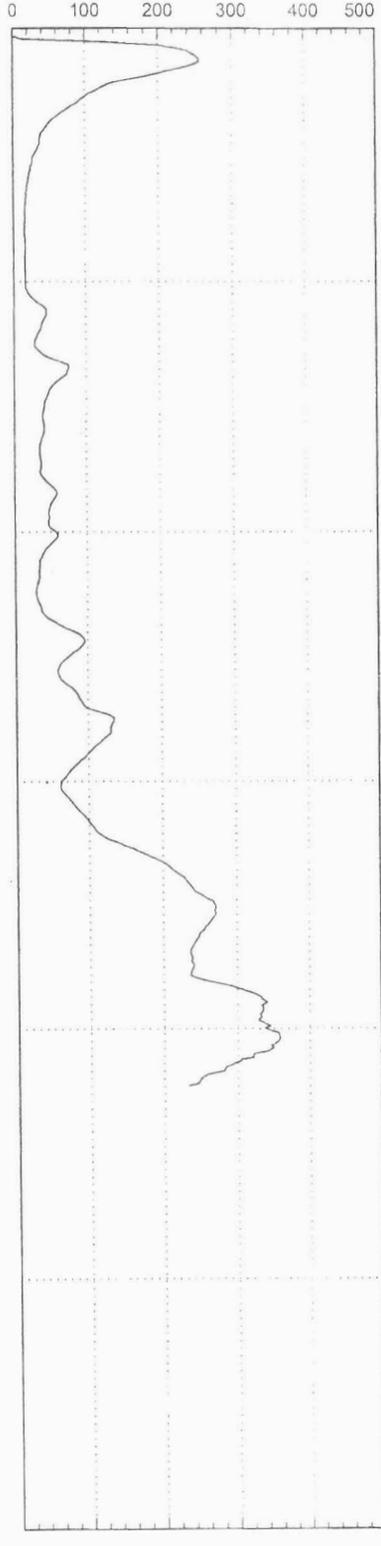
FRICITION RATIO (Fs/Qc)

percent



TIP BEARING (Qc)

tsf



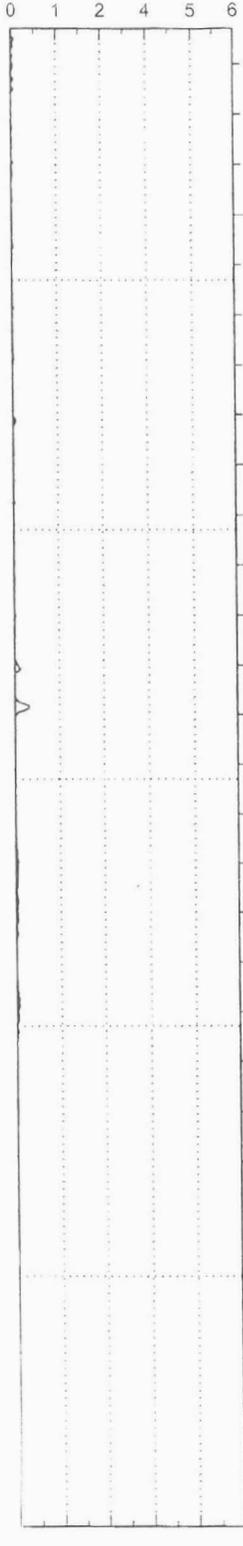
SLEEVE FRICTION (Fs)

tsf



DYNAMIC PORE PRESSURE (u)

tsf



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

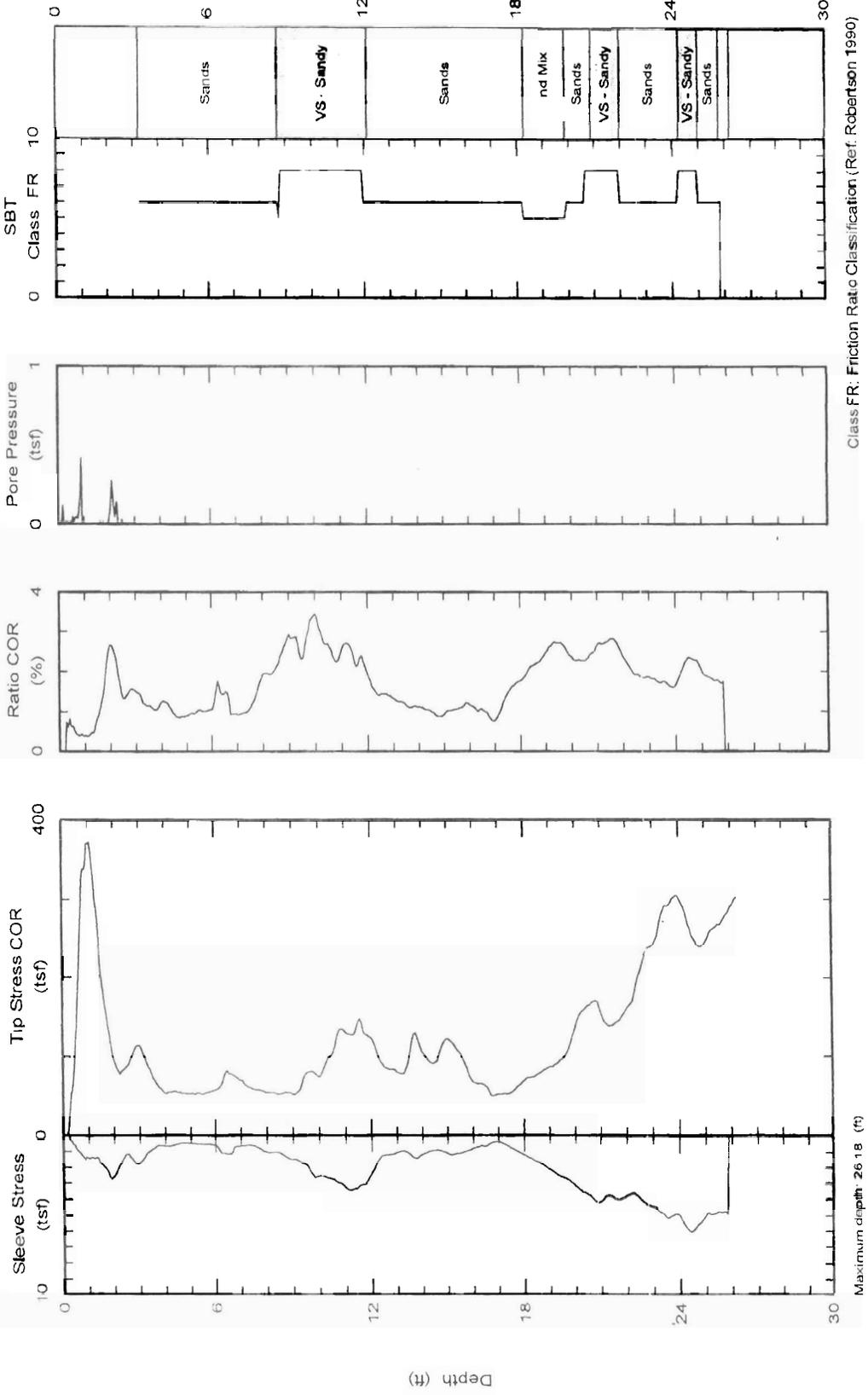
REPORT TITLE BORING RECORD				HOLE ID CPT-07-104	
DIST 07	COUNTY LA	ROUTE 105	POSTMILE 3.4/3.4	EA 07-4S7601	
PROJECT OR BRIDGE NAME Imperial Highway Overcrossing (OC) @ Interstate 105					
BRIDGE NUMBER 53-2657		PREPARED BY PP		DATE 2-20-08	SHEET 1 of 1



Division of Engineer Service
Geotechnical Service
5900 Folsom Blvd. Sac., CA 95819
www.dot.ca.gov

Lat: 0
Lon: 0
Elevation: 0
Customer: Pratheep Piratheepan
Job Site: 07-LA-105-3.36

Date: 27/Nov/2007
Test ID: 127701-2
Project: 07-4s7600



Class FR: Friction Ratio Classification (Ref: Robertson 1990)



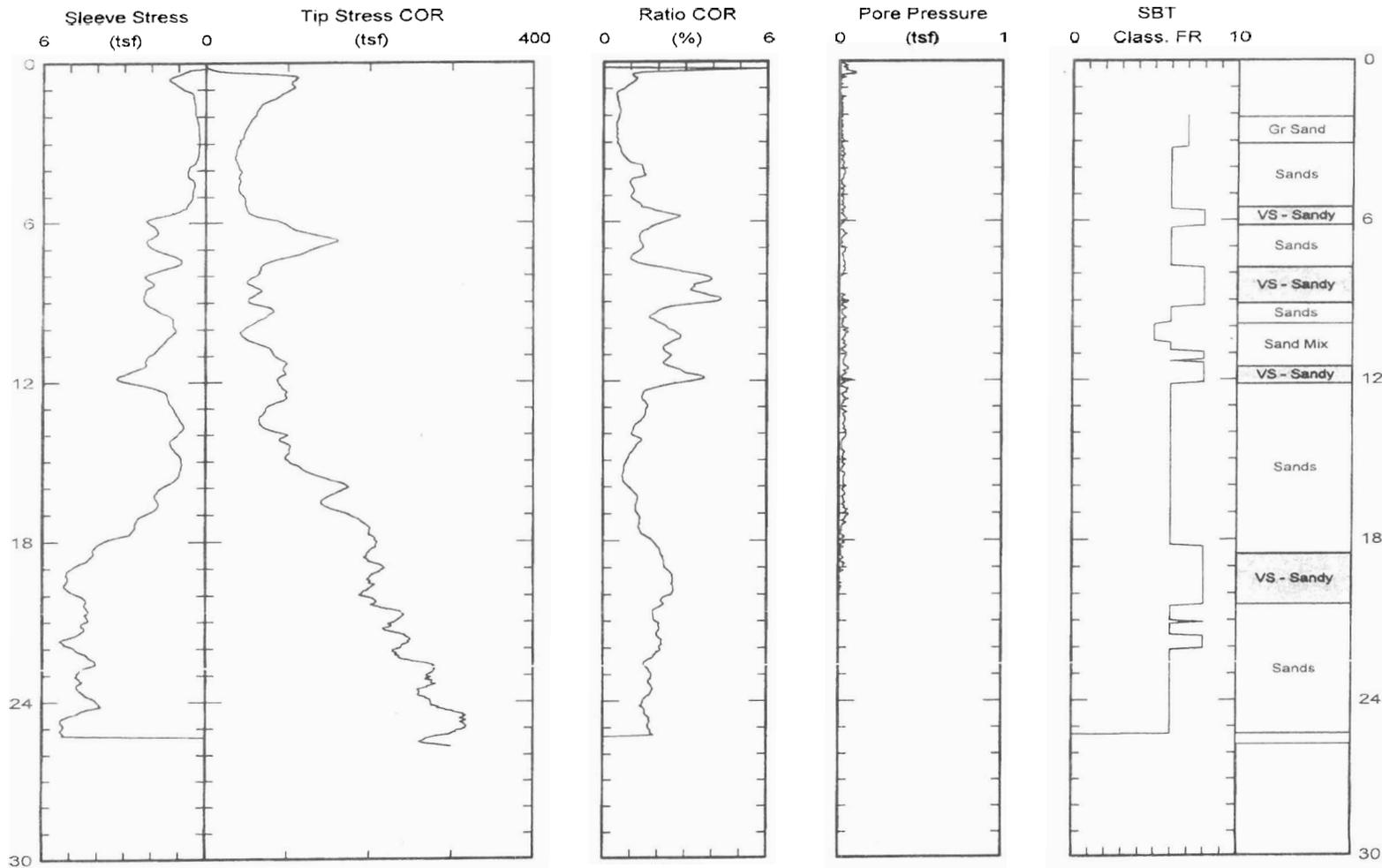
Division of Engineer Service
 Geotechnical Service
 5900 Folsom Blvd. Sac., CA 95819
 www.dot.ca.gov



Lat: 0
 Lon: 0
 Elevation: 0

Date: 28/Nov/2007
 Test ID: 127702-3
 Project: 07-4s7600

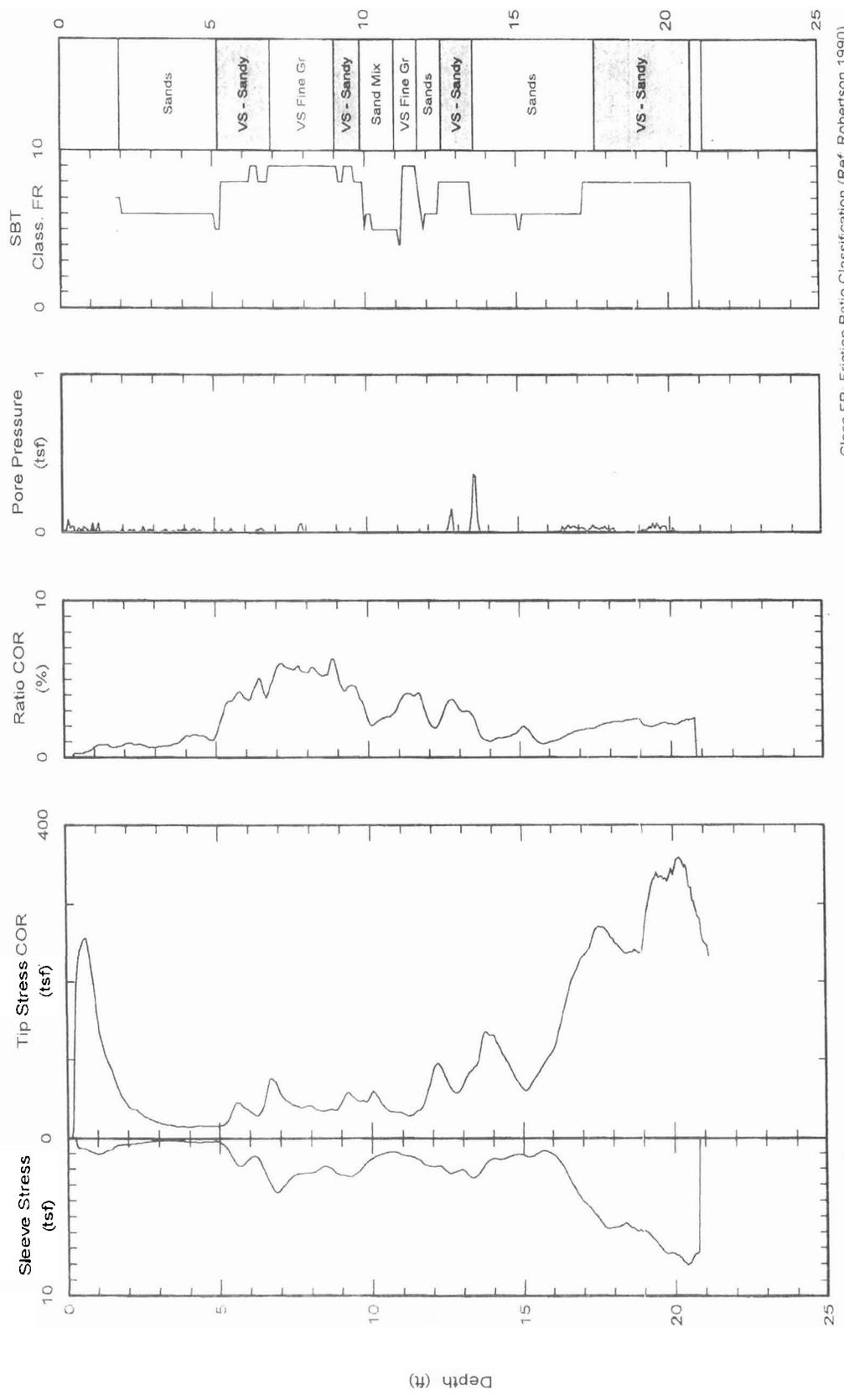
Customer: Pratheep Piratheepan
 Job Site: 07-LA-105-3.36



Maximum depth: 25.67 (ft)

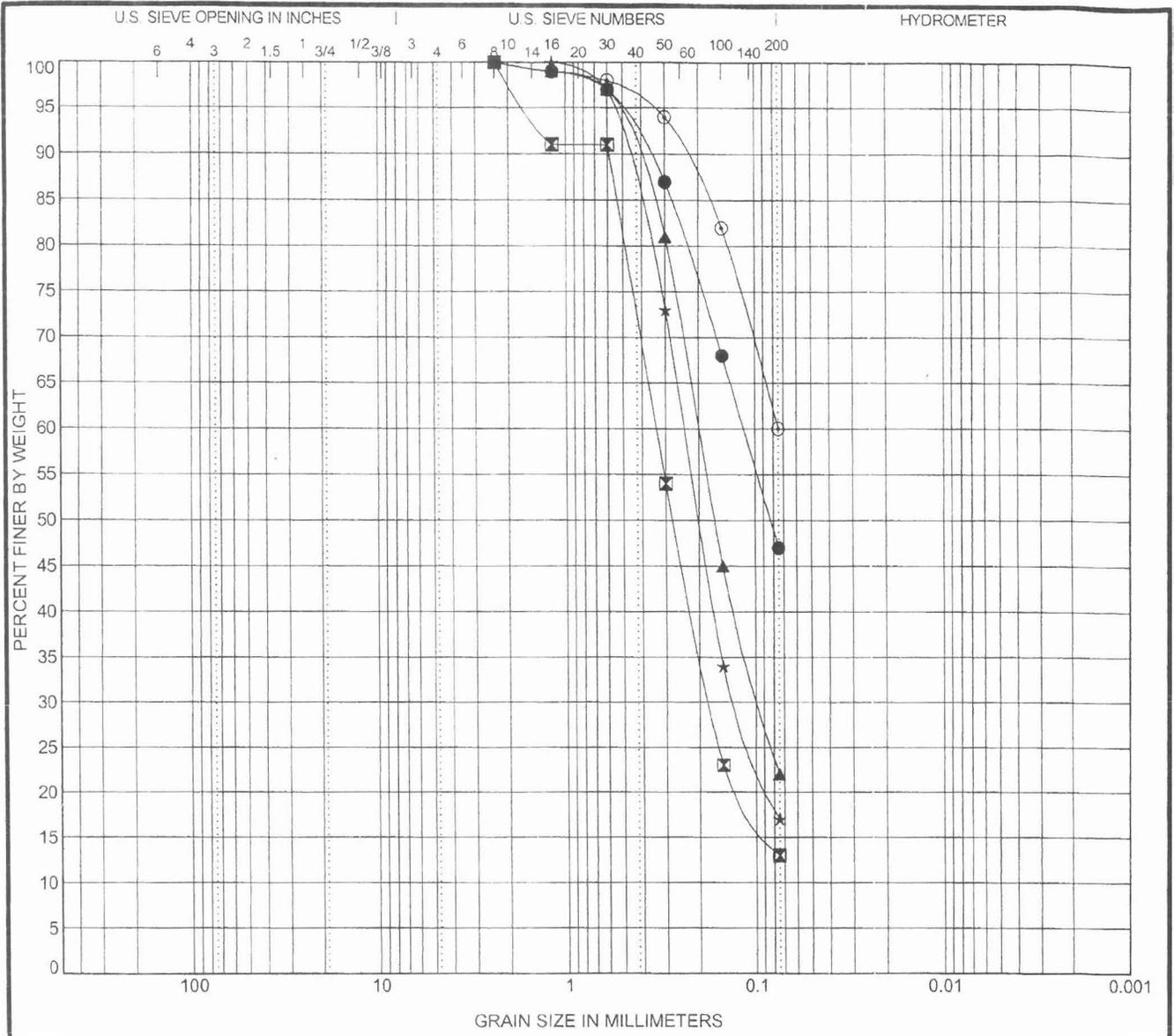
Class FR: Friction Ratio Classification (Ref. Robertson 1990)

 Division of Engineer Service Geotechnical Service 5900 Folsom Blvd. Sac., CA 95819 www.dot.ca.gov	Lat: 0 Lon: 0 Elevation: 0 Customer: Pratheep Piratheepan Job Site: 07-LA-105-3.36	Date: 28/Nov/2007 Test ID: 128701-4 Project: 07-4s7600
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Class FR: Friction Ratio Classification (Ref. Robertson 1990)

Maximum depth: 21.14 (ft)



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

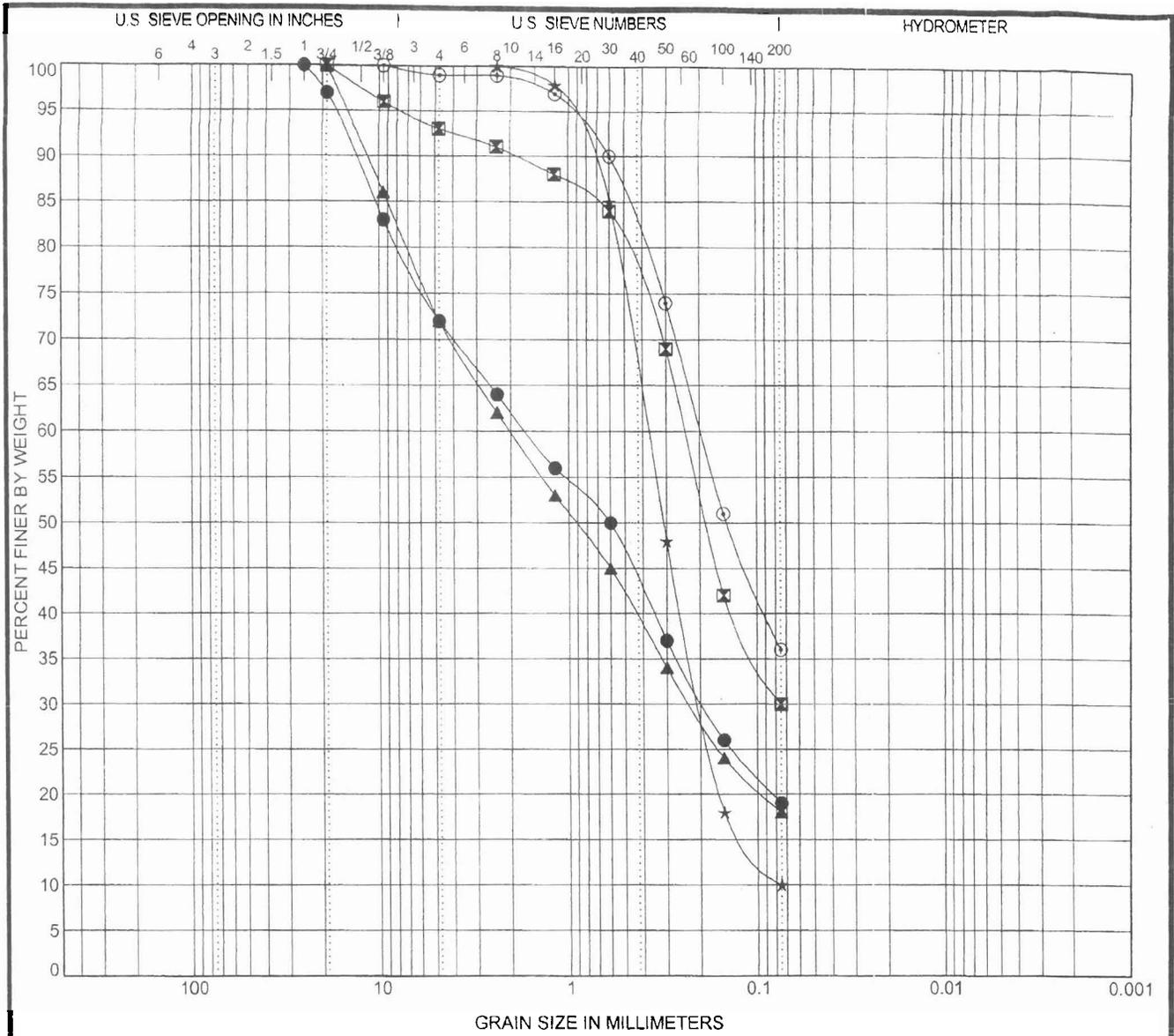
Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● R-07-101 12.0	CLAYEY SAND	24	14	10		
⊠ R-07-101 16.0	Well-grade SAND with SILT	NP	NP	NP		
▲ R-07-101 21.0	SILTY SAND	NP	NP	NP		
★ R-07-101 26.0	SILTY SAND	NP	NP	NP		
⊙ R-07-101 31.0	SANDY SILT	NP	NP	NP		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● R-07-101 12.0	2.36	0.115			0.0	53.0		47.0
⊠ R-07-101 16.0	2.36	0.336	0.175		0.0	87.0		13.0
▲ R-07-101 21.0	2.36	0.2	0.095		0.0	78.0		22.0
★ R-07-101 26.0	1.18	0.238	0.127		0.0	83.0		17.0
⊙ R-07-101 31.0	2.36	0.075			0.0	40.0		60.0

GRAIN SIZE DISTRIBUTION

Project Name:
 Location:
 Number:

US EM GRAIN SIZE 07-45760.BPJ CT SACTO 053107.GDT 2/29/08



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

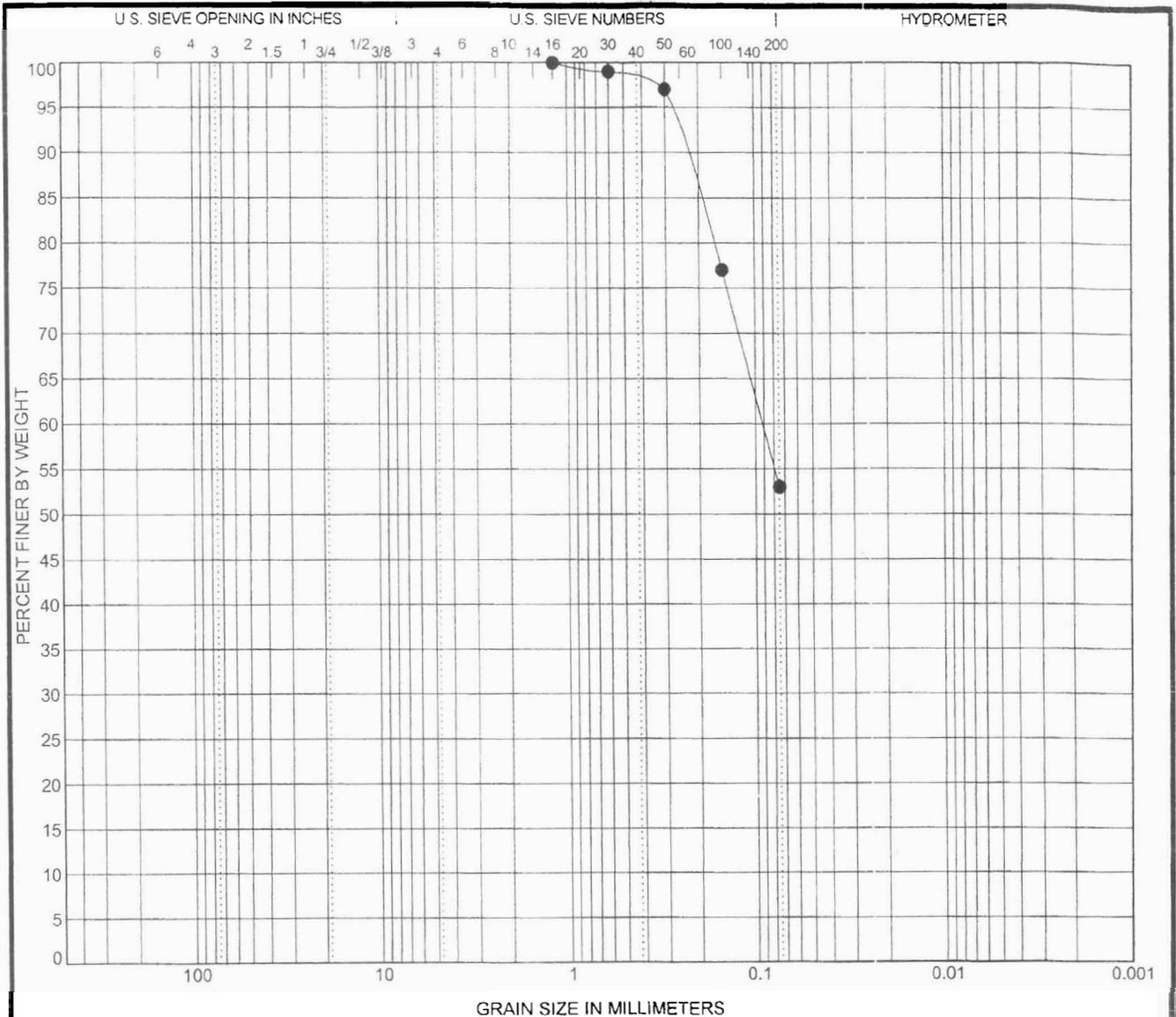
Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● R-07-101 2.8	SILTY SAND with GRAVEL	NP	NP	NP		
⊠ R-07-101 3.2	SILTY SAND	NP	NP	NP		
▲ R-07-101 3.5	SILTY SAND with GRAVEL	NP	NP	NP		
★ R-07-101 11.3	Poorly Graded SAND with SILT (SP-SM)	NP	NP	NP	1.39	5.01
⊙ R-07-101 11.7	SILTY SAND	NP	NP	NP		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● R-07-101 2.8	25	1.669	0.193		28.0	53.0		19.0
⊠ R-07-101 3.2	19	0.238	0.075		7.0	63.0		30.0
▲ R-07-101 3.5	19	2.023	0.227		28.0	54.0		18.0
★ R-07-101 11.3	2.36	0.376	0.198	0.075	0.0	90.0		10.0
⊙ R-07-101 11.7	9.5	0.197			1.0	63.0		36.0

GRAIN SIZE DISTRIBUTION

Project Name:
 Location:
 Number:

US EM GRAIN SIZE 07-45760.GPJ CT SACTO 053107.GDT 2/29/08



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
R-07-101 36.0	SANDY SILT	NP	NP	NP		

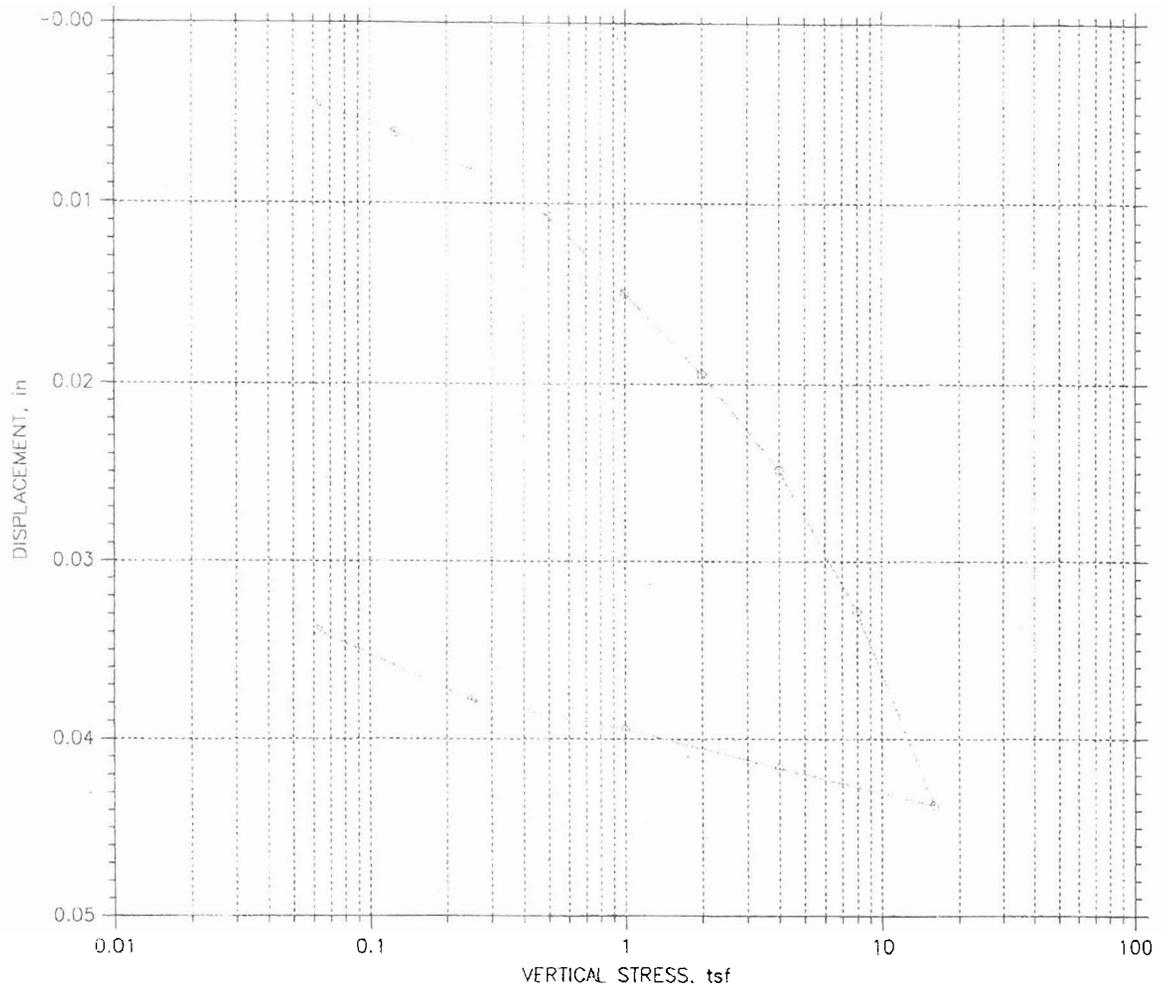
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
R-07-101 36.0	1.18	0.092			0.0	47.0	53.0	

GRAIN SIZE DISTRIBUTION

Project Name:
 Location:
 Number:

JSEFM GRAIN SIZE 07-45760.OPJ T SACTO 053107.GDT 2/29/08

CONSOLIDATION TEST DATA SUMMARY REPORT



				Before Test	After Test
Overburden Pressure: 8.854e-312 tsf		Water Content, %		21.18	18.66
Preconsolidation Pressure: 3.612e-311 tsf		Dry Unit Weight, pcf		102.2	107.1
Compression Index: 2.75859e-313		Saturation, %			
Diameter: 1.94 in		Height: 0.75 in		Void Ratio	0.66
LL: 0	PL: 0	PI: 0	GS: 2.72		0.59

Project: Sett Appr Slab @Imp Hwy@Location: 07-LA-105-3.36		Project No.: 07-4S7601
Boring No.: R-07-01		Tested By: KS
Sample No.: 5-1		Checked By: GL# 08-007
Test No.: 07075-G1		Test Date: 12/26/07
Sample Type: 2" BRASS		Depth: 12.0-12.3'
Description: WET, DENSE, BROWN MEDIUM SAND		Elevation: Br# 55-2655
Remarks:		