This is to be used for all "INFORMATION HANDOUT" cover sheets. Edit as appropriate.

FOR CONTRACT NO: 12-0F96C1
PROJECT ID: 1200020278

INFORMATION HANDOUT

WATER QUALITY

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

BOARD ORDER NO. 99-06-DWQ
NPDES PERMIT NO. CAS CAS000003
BOARD ORDER NO. 2009-0009-DWQ
NPDES PERMIT NO. CAS CAS000002
BOARD ORDER NO. R9-2008-002
NPDES PERMIT NO. CAS CAG919002

PERMITS

U.S. FISH AND WILDLIFE SERVICE INFORMAL SECTION 7
CONSULTATION PERMIT NO. FWS-OR-09B0458-11I0399

AGREEMENTS

NONE

ENCROACHMENT PERMITS

NONE

MATERIALS INFORMATION

FINAL STRURCTURE FOUNDATION REPORT - Non-Standard Retaining Walls, with Addendums.

FINAL STRUCTURE FOUNDATION REPORT - Proposed Tieback Walls (RW Nos. 315L and 316R), with Addendums.

REVISED FINAL STRUCTURE FOUNDATION REPORT - Avenida Vaquero Undercrossing (Widen) Bridge No. 55-0223

FINAL GEOTECHNICAL DESIGN REPORT with Addendum.

FINAL AERIALLY DEPOSITED LEAD REPORT

FINAL MATERIALS REPORT, with Addendum.

MAJOR ANNUAL EVENTS: Dana Point, San Clemente and San Juan Capistrano

ROUTE: 12-Ora-5-3.7/6.2

DEPARTMENT OF TRANSPORTATION
3347 MICHELSON DRIVE, SUITE 100
IRVINE, CA 92612
PHONE (949) 724-2189
FAX (949) 724-2519

Flex your power!
Be energy efficient!

March 30, 2012

Mr. David Gibson
Executive Officer
California Regional Water Quality Control Board
San Diego Region
9174 SKY PARK COURT, SUITE 100,
SAN DIEGO, CA, 92123-4340
ATTN: Whitney Ghoram

Subject: Update to List of project as required by– General Waste Discharge Requirements for Discharges to surface Waters within the San Diego Region Except for San Diego Bay Order No. R9-2008-0002 (NPDES CAG919002) for all projects scheduled in 2012-2013 year

CIWQS Place No. 750987:WGhoram
WDID No. 9 00000 2047

Dear Ms. Ghoram,

The California Department of Transportation (Department) is submitting an update to the list of projects required each year in the Department's enrollment letter.

If you have any questions regarding this letter, please contact me at (949) 724-2189.

Sincerely,

Grace Pina-Garrett, Branch Chief
District 12 NPDES Stormwater Unit

EA	Project Location					Project Description[1], [2]	Water Bodies Within or Adjacent to Project Limits[3]	Dredge and Fill Activities (Y/N/ NA)[4]
	Co	Route	Begin PM	End PM	Regional Board			
0A070	ORA	5	16.5	16.7	San Diego	Reconstruct undercrossing at La Paz Rd and widen SB off-ramp	Oso Creek	N
"0E070"	ORA	5	15.1	16.4	San Diego	Widen freeway and overhead	Oso Creek	N
0F060	ORA	5	5.6	6.6	San Diego	Widen S/B off-ramp and bridge OC @ Camino De Estrella	San Juan Creek	N
0F960	ORA	5	3.3	8.7	San Diego	Construct HOV Lanes	Segunda Deshecha, Prima Deshecha, San Juan Creek	Y
0G200	ORA	5	12.8	13.1	San Diego	Reconstruct I-5/Avery Parkway IC	Oso Creek	N
0G930	ORA	5	5.1	5.4	San Diego	Construct two sound walls (1,805 LF)	Prima Deshecha, San Juan Creek	N
0G940	ORA	5	1.2	1.7	San Diego	Construct two sound walls (660 LF)	Segunda Deshecha channel	N
0H021	ORA	5	16.5	16.7	San Diego	Modify ramp/IC	Aliso Creek	N

0H232	ORA	5	6.1	0	San Diego	Install CMS at various freeway IC	Prima Deshecha, Segunda Deshecha	N
0H860	ORA	5	13.7	13.7	San Diego	Modify ramps/ICs	Oso Creek	N
0L280	ORA	5	8.8	0	San Diego	Widening of San Juan Creek Rd.	San Juan Creek	N
0G013	ORA	73	15	23	San Diego	SJH NB widening. adds a fourth NB lane	Sand Canyon Channel, San Diego Creek	Y
0H440	ORA	73	10	24.5	San Diego	Stormwater mitigation and slope stability	Aliso Creek, Laguna Canyon Channel, Sand Canyon Channel, San Diego Creek	N
"04322"	ORA	74	13.3	16.6	San Diego	Plant establishment/ environmental mitigation	San Juan Creek	N
"08692"	ORA	74	1	1.9	San Diego	Widen from 2 lanes to 4 lanes	San Juan Creek	Y
0E310	ORA	74	0	1.6	San Diego	Reconstruct IC at SR-74	San Juan Creek	Y
0M550	ORA	73	10.62	10.97	San Diego	Retaining Wall	Oso Creek	N

Disturbed Land Area (acres)	Treatment Control Status Type, Quantity[5]	Anticipated Project Delivery Schedule		Construction Period		
		PA&ED Date	PS&E Date	Start Date	End Date	
> 1.0 Acres	C	7/1/2015	9/29/2017	8/11/2018	8/11/2021	
> 1.0 Acres	BS	7/25/2005	8/1/2007	7/29/2008	5/1/2012	currently stopped
2.6 Acres	C	1/29/2008	8/1/2010	5/1/2011	5/1/2013	
> 1.0 Acres	C	7/1/2011	7/1/2013	7/1/2014	7/1/2018	
> 1.0 Acres	C	7/1/2012	10/1/2014	9/1/2015	9/1/2018	
> 1.0 Acres	E	12/15/2004	3/11/2009	10/1/2010	12/1/2012	
> 1.0 Acres	E	8/5/2004	1/22/2009	10/1/2010	4/1/2012	
> 1.0 Acres	E	4/2/2008		7/1/2010	7/1/2011	

> 1.0 Acres	E	8/29/2007	3/1/2010	1/1/2011	3/1/2012
> 1.0 Acres	E	7/2/2008		11/1/2010	11/1/2011
> 1.0 Acres	E	12/1/2010		10/1/2012	10/1/2013
35 Acres	C	7/2/2008	7/1/2008	10/1/2008	2/1/2010
> 1.0 Acres	E	2/1/2009	9/1/2011	10/1/2012	10/1/2016
< 1.0 Acres	E	2/14/2006	6/1/2009	5/1/2010	2/1/2016
> 1.0 Acres	BS	11/30/2009	5/1/2012	2/1/2013	2/1/2015
> 1.0 Acres	BS	6/1/2009	12/1/2011	9/1/2012	11/1/2014
< 1.0 Acres	E	3/1/2012	4/1/2012	7/1/2012	10/1/2012

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road, Suite 101
Carlsbad, California 92011

In Reply Refer To:
FWS-OR-09B0458-11I0399

JUN 23 2011

Mr. Chris Flynn
Senior Environmental Planner
California Department of Transportation
District 12
3347 Michelson Drive, Suite 100
Irvine, California 92612-1692

Attention: Kedest Ketsela, Associate Environmental Planner

Subject: Informal Section 7 Consultation for the I-5 HOV Lane Extension Project between Avenida Pico and San Juan Creek Road, Orange County, California

Dear Mr. Flynn:

This is in response to your letter dated May 9, 2011, requesting our concurrence with your determination that the subject project is not likely to adversely affect the federally endangered least Bell's vireo (*Vireo bellii pusillus*, "vireo") and the federally threatened coastal California gnatcatcher (*Polioptila californica californica*, "gnatcatcher") and its designated critical habitat in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*). The California Department of Transportation (Caltrans) has assumed the Federal Highway Administration's responsibilities under the Act for this consultation in accordance with Sections 6004 and 6005 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) 2005, as described in the National Environmental Policy Act Delegation Pilot Program Memorandum of Understanding between Federal Highway Administration and Caltrans (effective July 1, 2007) and codified in Renewed 23 U.S.C. 326 and 23 U.S.C. 327.

The Orange County Transportation Authority, in cooperation with Caltrans, the City of Dana Point, the City of San Clemente, and the City of San Juan Capistrano, is proposing to widen Interstate 5 (I-5) between Avenida Pico and San Juan Creek Road. The proposed project will add one high-occupancy vehicle (HOV) lane in each direction on I-5 throughout the project limits, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. The project limits on I-5 extend from 0.4 mile (mi) south of the Avenida Pico Undercrossing (Post Mile [PM] 3.0) to 0.1 mi south of the San Juan Creek Road Undercrossing (PM 8.7). While the Natural Environmental Study for the proposed project includes several alternatives, consultation has been requested for Alternative 4b. Alternative 4b differs from the other alternatives in that the Avenida Pico Overcrossing structure will be reconfigured with a

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northbound loop on-ramp and realigned northbound off-ramp. In addition, no buffer will be included between the HOV lanes and general travel lanes instead of the 4 foot (ft) buffer proposed under Alternatives 2 and 3.

We have reviewed the information provided to us, including *I-5 HOV Lane Extension Project Natural Environmental Study I-5 Between Avenida Pico and San Juan Creek Road 12-ORA-05 (PM 3.0/8.7)* (Caltrans 2010). The gnatcatcher and vireo are known to occur in the vicinity of the project. Gnatcatchers were observed within most of the coastal sage scrub (CSS) within the I-5 right-of-way in the vicinity of the project. Up to seven pairs of gnatcatchers were observed during the surveys (LSA Associates, Inc. 2010a). However, the project will not result in any direct permanent impacts to gnatcatchers or their critical habitat. Project Alternative 4b will result in the permanent loss of 0.4 acre (ac) of unoccupied CSS and temporary impacts to 0.32 ac of unoccupied CSS. A small portion of the temporary impact area, totaling 0.018 ac of ornamentals and disturbed CSS, is located within Unit 6 of designated gnatcatcher critical habitat. The function of Unit 6 is to support a stable population of gnatcatchers and to provide connectivity between populations to the south in San Diego County and farther north in Orange County.

Vireos were observed at three locations in the vicinity of the project during focused surveys conducted in 2010 (LSA Associates, Inc. 2010b). Project Alternative 4b will result in the permanent loss of 0.07 ac of unoccupied degraded riparian scrub habitat that is located approximately 0.25 mi away from the vireo occupied areas.

The following measures have been incorporated into the project design to avoid and minimize impacts to the gnatcatcher and vireo:

1. A biologist ("Project Biologist") approved by the Carlsbad Fish and Wildlife Office (CFWO) will be on site during: a) initial clearing and grubbing; and b) weekly during project construction within 61 meters (200 ft) of offsite gnatcatcher and vireo habitat to ensure compliance with all conservation measures. The Project Biologist will be familiar with gnatcatchers, vireos, and their habitat and will have experience monitoring these species. Caltrans will submit the biologist's name, address, telephone number, and work schedule on the project to the CFWO prior to initiating project impacts. The biologist will be provided with a copy of this consultation.

2. Under the supervision of the Project Biologist, the limits of project impacts (including construction staging areas and access routes) will be clearly delineated with bright orange plastic fencing, stakes, flags, or markers that will be installed in a manner that does not impact habitats to be avoided and such that they are clearly visible to personnel on foot and operating heavy equipment. If work occurs beyond the fenced or demarcated limits of impact, all work will cease until the problem has been remedied to the satisfaction of the CFWO. Temporary construction fencing and markers will be removed upon project completion.

3. The clearing and grubbing of native habitats for the project will be conducted between September 1 and February 14 to avoid the gnatcatcher and vireo breeding season (or sooner

than September 1 if the Project Biologist demonstrates to the satisfaction of the CFWO that all nesting is complete). If vegetation clearing must be conducted during the breeding season, Caltrans will re-initiate consultation with the CFWO to address unanticipated effects to these species.

4. The Project Biologist will submit a final report to the CFWO within 120 days of project completion including photographs of impact areas and adjacent habitat, documentation that authorized impacts were not exceeded, and documentation that general compliance with all conservation measures was achieved. The report will specify numbers, locations, and sex of gnatcatchers and vireos (if observed), observed gnatcatcher and vireo behavior (especially in relation to project activities), and remedial measures employed to avoid and minimize impacts to gnatcatchers and vireos. Raw field notes should be available upon request by the CFWO.

5. An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will receive a training/awareness program prior to working on the proposed project. They will be advised of the potential impact to the listed species and the potential penalties for taking such species. At a minimum, the program will include the following topics: occurrence of the listed and sensitive species in the area (including photographs), their general ecology, sensitivity of the species to human activities, legal protection afforded these species, penalties for violations of Federal and State laws, reporting requirements, and project features designed to reduce the impacts to these species and promote continued successful occupation of the project area.

6. Caltrans will ensure that the following conditions will be implemented with regard to project landscaping:

    a. Caltrans will ensure that project landscaping does not include exotic plant species listed on the California Invasive Plant Council's (Cal-IPC) “Invasive Plant Inventory” list. A copy of the complete list can be obtained from Cal-IPC’s web site at http://www.cal-ipc.org.

    b. If invasive weed species are already growing within the project area, special care will be taken during transport, use, and disposal of soils containing invasive weed seeds to ensure that invasive weeds are not spread into new areas by the project. All heavy equipment will be washed and cleaned of debris prior to entering a new area to minimize the spread of invasive weeds. Eradication strategies will be implemented should an invasion of nonnative plant species occur.

    c. The 0.32 ac CSS temporary impact area will be revegetated with native coastal sage scrub species. The proposed seed palette will be provided to the CFWO for review and approval prior to application in the field. A 3-year plant establishment period is proposed that will include exotic species removal and reapplication of seed as necessary.

7. Caltrans will ensure that the following conditions will be implemented during project construction.

a. The project site will be kept as clean of debris as possible. All food-related trash items will be enclosed in sealed containers and regularly removed from the site.

b. Pets of project personnel will not be allowed on the project site.

c. Impacts from fugitive dust will be avoided and minimized through watering and other appropriate measures.

d. Cut and fill will be balanced within the project or the construction contractor will identify the source or disposal location. All spoils and material disposal will be disposed of properly.

e. Appropriate erosion and siltation controls will be installed prior to the onset of vegetation clearing and be maintained in good repair until the completion of project construction. Erosion and sediment control devices used for the proposed project, including fiber rolls and bonded fiber matrix, will be made from biodegradable materials such as jute, with no plastic mesh, to avoid creating a wildlife entanglement hazard.

f. All equipment maintenance, staging, and dispensing of fuel, oil, coolant, or any other such activities will be restricted to designated disturbed/developed areas. These designated areas will be located in such a manner as to prevent run-off from entering existing native vegetation areas.

g. Should construction occur within or adjacent to CSS or riparian habitats during the February 15 to August 31 gnatcatcher and vireo nesting season, all construction equipment, fixed or mobile, will be equipped with properly operating and maintained mufflers to reduce construction noise.

h. All pile driving for the project that will occur near habitats that support gnatcatchers and vireos will be conducted between September 1 and February 14 to avoid the gnatcatcher and vireo breeding season (or sooner than September 1 if the Project Biologist demonstrates to the satisfaction of the CFWO that all nesting is complete) and to minimize construction noise impacts to nesting gnatcatchers and vireos.

i. If nighttime construction is necessary, all project lighting (e.g., staging areas, equipment storage sites, roadway) will be selectively placed and directed onto the roadway or construction site and away from sensitive habitats. Light glare shields will be used to reduce the extent of illumination into sensitive habitats.

Temporary indirect impacts may occur to gnatcatcher and vireo as a result of noise, night lighting, introduction of invasive species, dust, erosion, sedimentation, and human encroachment resulting from the project. Noise and vibrations associated with the use of heavy equipment during construction of the proposed project has the potential to disrupt vireo and gnatcatcher nesting and foraging behaviors in adjacent habitat by masking intraspecific communication and startling birds

(e.g., see Dooling and Popper 2007 for a discussion of observed effects of highway noise on birds). Gnatcatchers and vireos that nest and forage in habitats adjacent to the existing I-5 freeway are subjected to existing noise and vibration and continue to use the habitat. Once construction is complete, project operations are anticipated to result no change in noise levels (LSA Associates, Inc. 2010c). In addition, measures (listed above) have been incorporated into the project to reduce the effects of construction noise on essential vireo and gnatcatcher behaviors (breeding, feeding, sheltering) to the level of insignificance. For the purposes of section 7 consultation, an insignificant effect is one that is sufficiently small that a person would not be able to meaningfully measure, detect, or evaluate it.

Construction and operational lighting has the potential to affect gnatcatchers and vireos. Light that alters natural light patterns in ecosystems can lead to increased predation, disorientation, and disruption of inter-specific interactions (Longcore and Rich 2004). Measures (listed above) will be implemented by Caltrans to reduce the impacts of lighting on gnatcatcher and vireo behavior in the adjacent habitat to the level of insignificance. The project has also incorporated measures (listed above) to prevent the introduction and spread of invasive species, and to minimize construction dust, erosion, sedimentation, and human encroachment into the adjacent habitat. I-5 is an existing facility, so with the proposed measures, any increase in habitat degradation associated with these factors is likely to be insignificant.

The primary constituent elements of designated gnatcatcher critical habitat consist of CSS and other vegetation communities necessary to support core gnatcatcher populations and provide connectivity within populations. The temporary impacts to 0.018 ac of unoccupied ornamentals and disturbed CSS on the edge of Unit 6 of designated gnatcatcher critical habitat will not affect the function of the unit to support a stable population of gnatcatchers and to provide connectivity between populations to the south in San Diego County and farther north in Orange County. With the incorporation of the above measures, the proposed project impacts on the primary constituent elements in Unit 6 of gnatcatcher critical habitat are considered to be insignificant.

Because the above measures have been incorporated into the project, we concur with your determination that the proposed project is not likely to adversely affect the vireo and gnatcatcher and its designated critical habitat. We base our concurrence on the following reasons: 1) no direct permanent or temporary impacts to vireo and gnatcatcher occupied habitat will occur; 2) the permanent loss of 0.4 ac unoccupied CSS and 0.07 ac unoccupied riparian scrub and the temporary loss of 0.32 ac of unoccupied CSS, including 0.018 ac of disturbed CSS and ornamentals within gnatcatcher critical habitat, is not anticipated to significantly interfere with essential gnatcatcher and vireo breeding, feeding, or sheltering behaviors; 3) construction activities will be modified to limit noise, night lighting, introduction of invasive species, dust, erosion, sedimentation, and human encroachment disturbance to gnatcatchers and vireos as described in the measures above to ensure that gnatcatcher and vireo breeding, feeding and sheltering activities in the adjacent habitat are not substantially disrupted. In addition, the project's temporary impact areas will be restored, which will support the survival and recovery of these species.

Therefore, the interagency consultation requirements of section 7 of the Act have been satisfied. Although our concurrence ends informal consultation, obligations under section 7 of the Act will be

reconsidered if new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered or this action is subsequently modified in a manner that was not considered in this assessment.

This document does not authorize take under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. §§ 703-712). In order to avoid violation of the MBTA, Caltrans will avoid take of active nests through implementation of the following measures:

- In order to avoid impacts to nesting birds, any native or exotic vegetation removal, tree trimming activities, or bridge demolition will occur outside of the nesting season. The nesting season is from February 15 to August 31. In the event that vegetation clearing is necessary during the nesting season, a qualified biologist will conduct a preconstruction survey to identify the locations of nests. Should nesting birds be found, an exclusionary buffer will be established by the biologist. This buffer will be clearly marked in the field by construction personnel under the guidance of the biologist, and construction or clearing will not be conducted in this zone until the biologist determines that the young have fledged or the nest is no longer active.

- To prevent project effects to bridge- and crevice-nesting birds (i.e., swifts and swallows), all work on existing bridges with potential habitat that is conducted between February 15 and October 31 will include the removal of all bird nests prior to construction under the guidance and observation of a qualified biologist. Removal will occur prior to February 1 of that year, before the swallow colony returns to the nesting site. Removal of swallow nests that are under construction must be repeated as frequently as necessary to prevent nest completion or until a nest exclusion device is installed (such as netting or a similar mechanism that keeps birds from building nests). Nest removal and exclusion device installation will be monitored by a qualified biologist. Such exclusion efforts must be continued to keep the structures free of swallows until September or the completion of construction. All nest exclusion techniques will be coordinated between the Caltrans District Biologist and the resource agencies.

Thank you for your coordination on this project. If you have any questions regarding this letter, please contact Sally Brown of my staff at (760) 431-9440, extension 278.

Sincerely,

for Karen A. Goebel
Assistant Field Supervisor

Literature Cited:

California Department of Transportation (Caltrans). 2010. I-5 HOV Lane Extension Project Natural Environmental Study I-5 Between Avenida Pico and San Juan Creek Road 12-ORA-05 (PM 3.0/8.7). 90+pp.

Dooling, R. J. and A. N. Popper. 2007. The effects of highway noise on birds. Prepared by Environmental BioAcoustics LLC for the California Department of Transportation, Sacramento, California. 74 pp.

Longcore, T. and C. Rich. 2004. Ecological light pollution. Front Ecological Environment 2(4):191-198.

LSA Associates, Inc. 2010a. Coastal California Gnatcatcher Winter Survey Results: Interstate-5 High Occupancy Vehicle (HOV) Lane Extension Project, October 2009–January 2010. 3+pp.

LSA Associates, Inc. 2010b. Least Bell's Vireo Survey Results: Interstate 5 High-Occupancy Vehicle Lane Extension Project, April–July 2010. 3+pp.

LSA Associates, Inc. 2010c. Noise Study Report I-5 HOV Lane Addition Project.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road, Suite 101
Carlsbad, California 92011

In Reply Refer To:
FWS-OR-09B0458-13I0136

JAN 23 2013

Mr. Chris Flynn
Senior Environmental Planner
California Department of Transportation
District 12
3347 Michelson Drive, Suite 100
Irvine, California 92612-1692

Attention: Ms. Kedest Ketsela, Associate Environmental Planner

Subject: Informal Section 7 Consultation for the I-5 HOV Lane Extension Project between Avenida Pico and San Juan Creek Road, Orange County, California

Dear Mr. Flynn:

This is in response to your email dated October 10, 2012, requesting that our informal consultation (FWS-OR-09B0458-11I0399) for the I-5 HOV Lane Extension Project between Avenida Pico and San Juan Creek Road be amended to address modifications to the project that will result in effects to the federally threatened coastal California gnatcatcher (*Polioptila californica californica,* gnatcatcher) that were not addressed in the original informal section 7 consultation. The California Department of Transportation (Caltrans) has assumed the Federal Highway Administration's responsibilities under the Act for this consultation in accordance with Sections 6004 and 6005 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) 2005, as described in the National Environmental Policy Act Delegation Pilot Program Memorandum of Understanding between Federal Highway Administration and Caltrans (effective July 1, 2007) and codified in Renewed 23 U.S.C. 326 and 23 U.S.C. 327.

The Orange County Transportation Authority, in cooperation with Caltrans, City of Dana Point, City of San Clemente, and City of San Juan Capistrano, is proposing to widen Interstate 5 (I-5) between Avenida Pico and San Juan Creek Road. The proposed project will add one high-occupancy vehicle (HOV) lane in each direction on I-5 throughout the project limits, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. The project limits on I-5 extend from 0.4 mile south of the Avenida Pico Undercrossing (Post Mile [PM] 3.0) to 0.1 mile south of the San Juan Creek Road Undercrossing (PM 8.7).

Changes to the project design plans have occurred to accommodate the reconstruction of an embankment to build retaining walls. This will increase temporary impacts to unoccupied coastal sage scrub habitat by 0.075 acre, which will increase the total temporary impacts to coastal sage scrub for the project from 0.32 acre to approximately 0.4 acre. The gnatcatcher is known to occur within habitat adjacent to this new impact area.

The following amended conservation measure is proposed to avoid and minimize potential impacts to the gnatcatcher. Changes from the original informal section 7 consultation are indicated with the underlined text.

6. Caltrans will ensure that the following conditions will be implemented with regard to project landscaping:

   a. Caltrans will ensure that project landscaping does not include exotic plant species listed on the California Invasive Plant Council's (Cal-IPC) "Invasive Plant Inventory" list. A copy of the complete list can be obtained from Cal-IPC's web site at http://www.cal-ipc.org.

   b. If invasive weed species are already growing within the project area, special care will be taken during transport, use, and disposal of soils containing invasive weed seeds to ensure that invasive weeds are not spread into new areas by the project. All heavy equipment will be washed and cleaned of debris prior to entering a new area to minimize the spread of invasive weeds. Eradication strategies will be implemented should an invasion of nonnative plant species occur.

   c. The 0.4 acre CSS temporary impact area will be revegetated with native coastal sage scrub species. The proposed seed palette will be provided to the CFWO for review and approval prior to application in the field. A 3-year plant establishment period is proposed that will include exotic species removal and reapplication of seed as necessary.

We have determined that the above modification will not change the conclusion of our June 23, 2011, informal section 7 consultation. This slight increase in the temporary impacts for the project is not anticipated to significantly interfere with essential gnatcatcher breeding, feeding, or sheltering behaviors. In addition, the project's temporary impact areas will be restored, which will support the survival and recovery of the species. Therefore, the interagency consultation requirements of section 7 of the Act have been satisfied. With the exception of the conservation measures amended above, all conservation measures will be implemented as written in the informal section 7 consultation (FWS-OR-09B0458-11I0399) previously issued for the proposed action. By copy of this letter, we are formalizing this change to the June 23, 2011, informal section 7 consultation. If you have any questions regarding this amendment, please contact Sally Brown of this office at 760-431-9440, extension 278.

Sincerely,

for Karen A. Goebel
Assistant Field Supervisor

FINAL STRUCTURE FOUNDATION REPORT

Non-Standard Retaining Walls
Interstate 5 HOV Widening, Segment 2
Orange County, California
12-Ora-5, PM 3.7/6.2
Caltrans Project No. 1200020278
(EA No. 12-0F96C01)
EMI Project No. 11-136
Date: September 21, 2012

EARTH MECHANICS, INC.

Geotechnical and Earthquake Engineering

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

September 21, 2012

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Final Structure Foundation Report for Non-Standard Retaining Walls***
Retaining Wall Nos. 218R, 240R, 274R, 275L, 280R, 287L, 297L,
302R and 330R
Interstate 5 HOV Widening, Segment 2
Cities of San Clemente and Dana Point, Orange County, California
12-Ora-5, PM 3.7/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C1)

Dear Mr. Montes:

Attached is our Final Structure Foundation Report for the non-standard retaining walls that are proposed for the Interstate 5 HOV Widening, Segment 2 Project. This report presents the findings and conclusions of our geotechnical investigation, and provides design and construction recommendations for the proposed non-standard retaining walls.

A Structure Foundation Report for the non-standard retaining walls, dated April 27, 2012, was submitted to Caltrans for review. The Caltrans Office of Geotechnical Design South 1 (OGDS-1) reviewed the report and provided their comments in a spreadsheet dated August 13, 2012. EMI prepared responses to the OGDS-1 review comments, which were reviewed and concurred with by the OGDS-1 reviewer. Responses to Caltrans comments have been incorporated into this Final GDR. Caltrans approval email along with review comments and EMI responses are provided in Appendix D.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions please call us.

Sincerely,

EARTH MECHANICS, INC.

REGISTERED PROFESSIONAL ENGINEER
GNANAPRAGASAM J. GUNARANJAN
No. GE2970
Exp: 12-31-13
GEOTECHNICAL
STATE OF CALIFORNIA

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

REGISTERED PROFESSIONAL ENGINEER
ANDREW V. KORKOS
NO. 2357
EXP. 3/31/14
GEOTECHNICAL
STATE OF CALIFORNIA

Andrew Korkos, GE 2357
Principal Engineer

CERTIFIED ENGINEERING GEOLOGIST
WENDY A. DRUMMOND
CEG No. 2049
EXP. 8/31/2013
STATE OF CALIFORNIA

Wendy A. Drummond, CEG 2049
Senior Geologist

GJG/gjg,avk,wad

17800 Newhope Street, Suite B, Fountain Valley, California 92708 Tel: (714) 751-3826 Fax: (714) 751-3928

FINAL STRUCTURE FOUNDATION REPORT

NON-STANDARD RETAINING WALLS
RETAINING WALL NOS. 218R, 240R, 274R, 275L, 280R, 287L, 297L, 302R, AND 330R
INTERSTATE 5 HOV WIDENING, SEGMENT 2
CITIES OF SAN CLEMENTE AND DANA POINT, ORANGE COUNTY, CALIFORNIA
12-ORA-5, PM 3.7/6.2
CALTRANS PROJECT NO. 1200020278 (EA NO. 12-0F96C01)

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EMI Project No. 11-136

September 21, 2012

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1.0 INTRODUCTION

1.1 Purpose and Scope of Work

This Foundation Report presents the findings and conclusions of a geotechnical investigation conducted by Earth Mechanics, Inc. (EMI) for the proposed non-standard retaining walls that are part of the Interstate 5 (I-5) HOV Widening, Segment 2 Project. The proposed walls are located along the I-5 mainline in the Cities of San Clemente and Dana Point in Orange County, California. The report presents the finding and conclusions from our investigation, and presents results of our foundation evaluation and provides design and construction recommendations to assist AECOM in preparing the project plans, specifications, and cost estimates for the project.

The geotechnical services provided for this project included the following tasks:

- Perform field exploration consisting of drilling, sampling and logging twenty-two (22) exploratory borings and six (6) Cone Penetration Test (CPT) soundings.
- Perform laboratory testing of selected representative soil/bedrock samples.
- Develop soil and bedrock parameters to be used for the design of the proposed walls.
- Perform geotechnical engineering analysis to develop foundation design and construction recommendations.
- Prepare this report presenting our findings, conclusions, and recommendations.

1.2 Project Description

The Orange County Transportation Authority (OCTA), in cooperation with the California Department of Transportation (Caltrans), and the Cities of Dana Point, San Clemente, and San Juan Capistrano, is proposing to widen the I-5 mainline between Avenida Pico and San Juan Creek Road. The project will add one HOV lane in each direction of the I-5 freeway, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. This report applies only to Segment 2 of the overall project; the limits of Segment 2 extend along the mainline from about 1,600 feet southeast of Avenida Vista Hermosa to about 2,400 feet northwest of Camino de Estrella. The location of the project is shown on Figure 1.

To accommodate the two additional HOV lanes, the I-5 mainline will be widened in both the northbound (NB) and southbound (SB) directions of the freeway. Major improvements proposed in Segment 2 include widening the Avenida Vaquero Undercrossing (UC), ramp improvements at the Avenida Vista Hermosa and Camino de Estrella interchanges, several earth retaining walls, sound walls, and new pavement. Ancillary improvements include overhead sign structures, utility lines, drainage structures, lighting, landscaping, and roadway striping.

This foundation report pertains to the proposed non-standard retaining walls only. In addition to this foundation report, a Geotechnical Design Report (GDR) has been prepared to address the Caltrans Standard sound walls and design and construction of roadway embankments and cut slopes (EMI, 2012a).

INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Earth Mechanics, Inc.
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SITE LOCATION MAP

Figure 1

Project No. 11-136

Date: 03-19-12

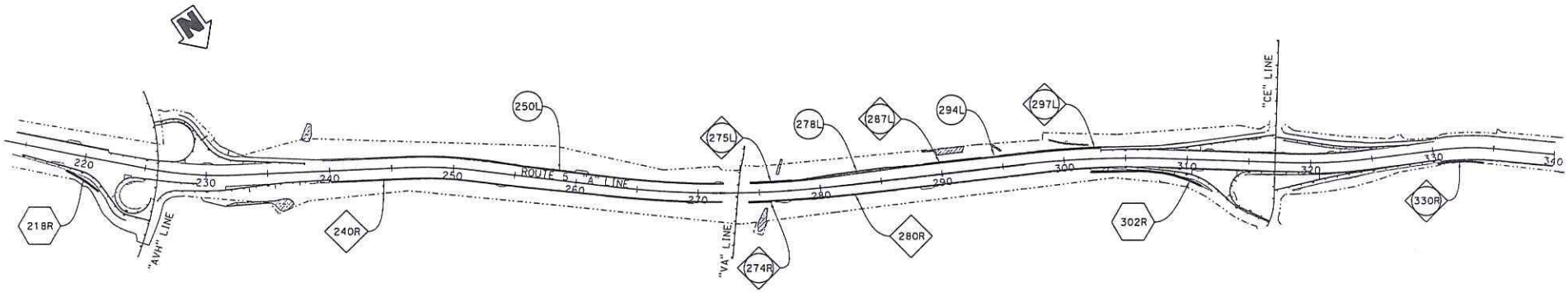
1.3 Proposed Retaining Walls

A total of nine non-standard retaining walls are proposed for the project and are addressed in the report. General information for each retaining wall is presented in Table 1. The wall locations are presented in Figure 2.

Table 1. Non-Standard Retaining Walls General Information

Wall No.	Wall Type	Approx. Begin Wall Station	Approx. End Wall Station	Wall Length (feet)	Wall Height (feet)	Bottom of Footing Elevation (feet)	Retained Ground Condition
218R	Type 7 (Case 2)	218+75.07 ("AVH-1" Line)	222+21.75 ("AVH-1" Line)	311.00	10 to 18	+182.25 to +188.43	2H:1V Slope
240R	Type 1 (Case 2)	240+09.00 ("A" Line)	247+31.96 ("A" Line)	720.00	10 to 18	+146.75 to +164.18	2H:1V Slope
274R	Type 1SWB	274+06.45 ("A" Line)	275+97.68 ("A" Line)	193.33	8 to 16	+114.90 to +121.61	Level
275L	Type 1SWB	274+23.80 ("A" Line)	277+71.63 ("A" Line)	344.00	6 to 14	+112.15 to +120.87	Level
280R	Type 1 (Case 2)	280+50.00 ("A" Line)	286+25.88 ("A" Line)	576.00	10 to 20	+131.75 to +143.00	2H:1V Slope
287L	Type 1SWB	288+56.00 ("A" Line)	293+36.00 ("A" Line)	480.00	8 to 18	+141.39 to +156.37	Level
297L (1)	Type 1SWB	297+84.78 ("A" Line)	303+02.26 ("A" Line)	524.00	6 to 12	+170.30 to +188.06	Level
302R	Type 7 (Case 2)	302+15.00 ("A" Line)	305+51.00 ("A" Line)	336.00	10 to 22	+184.12 to +191.31	2H:1V Slope
	Type 1 (Case 2)	305+51.00 ("A" Line)	309+84.95 ("CE-3" Line)	408.00	8 to 12	+190.73 to +196.06	
	Type 7 (Case 2)	309+84.95 ("CE-3" Line)	311+52.95 ("CE-3" Line)	168.00	14 to 18	+195.81 to +201.56	
330R	Type 7SW	330+25.00 ("A" Line)	334+25.85 ("A" Line)	380.00	8 to 14	+186.96 to +203.33	Level

Note: 1. Last 48 feet of RW 297L is a Sound Wall on Barrier Type 736S.



WALL LOCATION KEY MAP
1" = 400'

LEGEND:

- 218R — Retaining Wall
- 275L — Sound Wall on Retaining Wall
- 240R — Retaining Wall, see "ROAD PLANS"
- 250L — Sound Wall, see "ROAD PLANS"

Note:
(1) Foundation recommendations for Sound Wall 250L, 278L, and 294L are included in the GDR (EMI, 2012a).

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	I-5 HOV WIDENING PROJECT, SEGMENT 2	Retaining Walls Key Map
	Project No. 11-136 / Date: 09-11-12	Figure 2

2.0 GEOTECHNICAL FIELD INVESTIGATION AND LABORATORY TESTING

2.1 Existing Information

The Log-of-Test-Boring (LOTB) sheets, included with the as-built plans, for the existing bridges (Avenida Vista Hermosa UC, Avenida Vaquero UC, and Camino de Estrella OC) were reviewed by EMI. Most existing borings are located some distance away from the proposed walls and therefore were not used for the foundation analysis.

2.2 Site-Specific Field Exploration

A site-specific geotechnical field investigation was conducted between September 26 and November 7, 2011. A total of fifty-seven (57) exploratory boreholes were drilled and nine (9) Cone Penetration Test (CPT) soundings were performed under the supervision of EM I for Segment 2. Of these fifty-seven (57) boreholes and nine (9) CPT soundings, twenty-two (22) boreholes and six (6) CPT soundings were drilled to assess the subsurface conditions at the locations of the proposed retaining walls. The boreholes and CPT soundings were conducted in the vicinity of the retaining wall alignments along the NB and SB outside shoulders of the I-5 mainline and along inside and outside shoulders of ramps.

EMI borehole and CPT information, including Borehole/CPT number, northing, easting, station, offset, ground surface elevation, exploration depth, and groundwater elevation, are summarized in Table 2. The locations of the boreholes and CPT soundings are shown on Figure 3 through Figure 15 and on the LOTB sheets provided in Appendix A.

Table 2. Exploratory Borehole/CPT Information

Borehole or CPT Number	Easting	Northing	Station (A-Line)	Offset (feet)	GSE (feet)	GWE (feet)	Depth (feet)	Method	Figure No.
A-11-202	6,141,102	2,107,839	216+91	143.2 RT	+186.6	NE	31.5	HSA	3
A-11-203	6,140,877	2,108,123	220+52	180.9 RT	+194.0	NE	31.5	HSA	5
A-11-211	6,139,067	2,109,357	242+18	69.9 RT	+159.8	NE	31.5	HSA	6
A-11-212	6,138,769	2,109,535	245+65	63.1 RT	+167.6	NE	30.8	HSA	7
A-11-214	6,138,347	2,109,669	249+87	67.5 LT	+180.2	NE	51.5	HSA	7
CPT-11-215	6,137,929	2,110,034	255+38	65.0 LT	+180.5	NM	60.6	CPT	7
A-11-216	6,137,682	2,110,250	258+66	65.1 LT	+172.3	NE	51.5	HSA	8
A-11-221	6,136,532	2,111,317	274+30	62.3 RT	+130.5	NE	91.5	HSA	9
A-11-222	6,136,446	2,111,223	274+52	63.5 LT	+127.9	+73.9	90.3	HSA	9
CPT-11-222	6,136,441	2,111,226	274+57	63.7 LT	+127.8	NM	99.6	CPT	9
CPT-11-223	6,136,131	2,111,411	278+22	64.7 LT	+129.9	NM	70.0	CPT	9

Notes: 1. Easting/Northing coordinates and Stations/offsets were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevations (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Encountered During Drilling (approximate);
NE = Groundwater Table Not Encountered; NM = Groundwater Not Measured.
4. HSA = Hollow-stem Auger Boring; CPT = Cone Penetration Test Sounding.

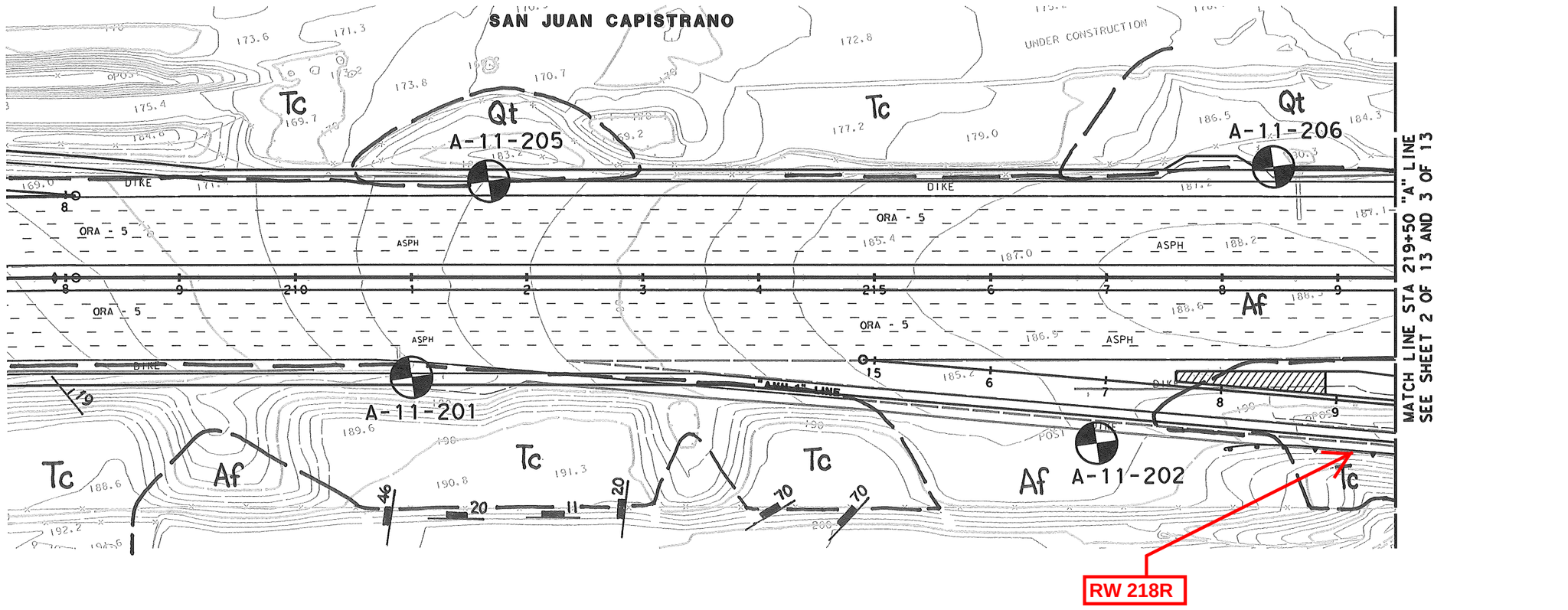
Table 2. Exploratory Borehole/CPT Information (Continued)

Borehole or CPT Number	Easting	Northing	Station (A-Line)	Offset (feet)	GSE (feet)	GWE (feet)	Depth (feet)	Method	Figure No.
A-11-224	6,136,364	2,111,437	276+34	76.1 RT	+130.4	NE	51.5	HSA	9
A-11-226	6,135,930	2,111,668	281+21	64.7 RT	+139.1	+113.4	50.8	HSA	9
A-11-228	6,135,303	2,111,845	287+59	72.8 LT	+153.5	NE	37.0	HSA	10
CPT-11-229	6,134,993	2,112,018	291+13	65.2 LT	+161.9	NM	77.9	CPT	10
A-11-230	6,134,671	2,112,187	294+77	65.8 LT	+172.3	+126.8	50.0	HSA	10
A-11-232	6,134,393	2,112,320	297+83	79.7 LT	+182.5	NE	50.4	HSA	11
A-11-233	6,133,981	2,112,548	302+49	91.1 LT	+193.7	NE	51.5	HSA	11
CPT-11-234	6,133,976	2,112,743	303+58	71.1 RT	+193.1	NM	37.7	CPT	11
A-11-235	6,133,663	2,112,993	307+62	99.5 RT	+198.5	+179.7	51.5	HSA	11
CPT-11-236	6,133,416	2,113,273	311+29	177.6 RT	+208.5	NM	20.0	CPT	13
A-11-253	6,131,811	2,114,191	329+58	96.0 RT	+206.0	+183.0	51.5	HSA	13
A-11-254	6,131,567	2,114,354	332+62	120.3 RT	+201.4	+183.8	50.5	HSA	15
A-11-260	6,140,910	2,108,148	220+47	221.3 RT	+208.2	NE	30.4	SS	5
A-11-261	6,138,920	2,109,492	244+14	106.5 RT	+178.8	NE	31.1	SS	6
A-11-262	6,134,034	2,112,767	303+22	122.2 RT	+208.8	NE	36.5	HSA	11
A-11-263	6,133,504	2,113,253	310+46	214.1 RT	+230.0	NE	36.5	HSA	13
A-11-264	6,135,616	2,111,832	284+76	61.8 RT	+146.4	NE	50.5	HSA	10

Notes: 1. Easting/Northing coordinates and Stations/offsets were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevation (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Encountered During Drilling (approximate);
NE = Groundwater Not Encountered; NM = Groundwater Not Measured.
4. HSA = Hollow-stem Auger Boring; SS = Solid-stem Auger; CPT = Cone Penetration Test Sounding.

2.2.1 Exploratory Boreholes

Boreholes were conducted for the purpose of collecting samples of subsurface earth materials and logging subsurface conditions where improvements are proposed. A total of twenty-two (22) boreholes were drilled near the proposed non-standard retaining walls. The boreholes were excavated to depths of approximately 30.4 to 91.5 feet below the existing ground surface using a truck-mounted drilling rig equipped with 8-inch diameter hollow-stem augers. Subsurface earth materials and conditions were logged and samples of subsurface materials were collected for laboratory testing. Large bulk samples of near-surface soils were logged and collected. Smaller soil/bedrock samples were collected from borings generally at 5-foot vertical intervals by means of split-spoon drive samplers; the Standard Penetration Test (SPT) sampler and the Modified California Drive (MCD) sampler were used to collect small disturbed and relatively undisturbed samples, respectively. The SPT sampler (1.4-inch ID) and MCD sampler (2.5-inch ID) were driven a total depth of 18 inches or until refusal, using a 140-pound automatic hammer falling 30 inches. The blowcounts for the last 12 inches of penetration were recorded on the LOTB sheets. The MCD is a split-barrel sampler with a tapered cutting tip and lined with a series of 1-inch tall brass rings. LOTB sheets are presented in Appendix A.



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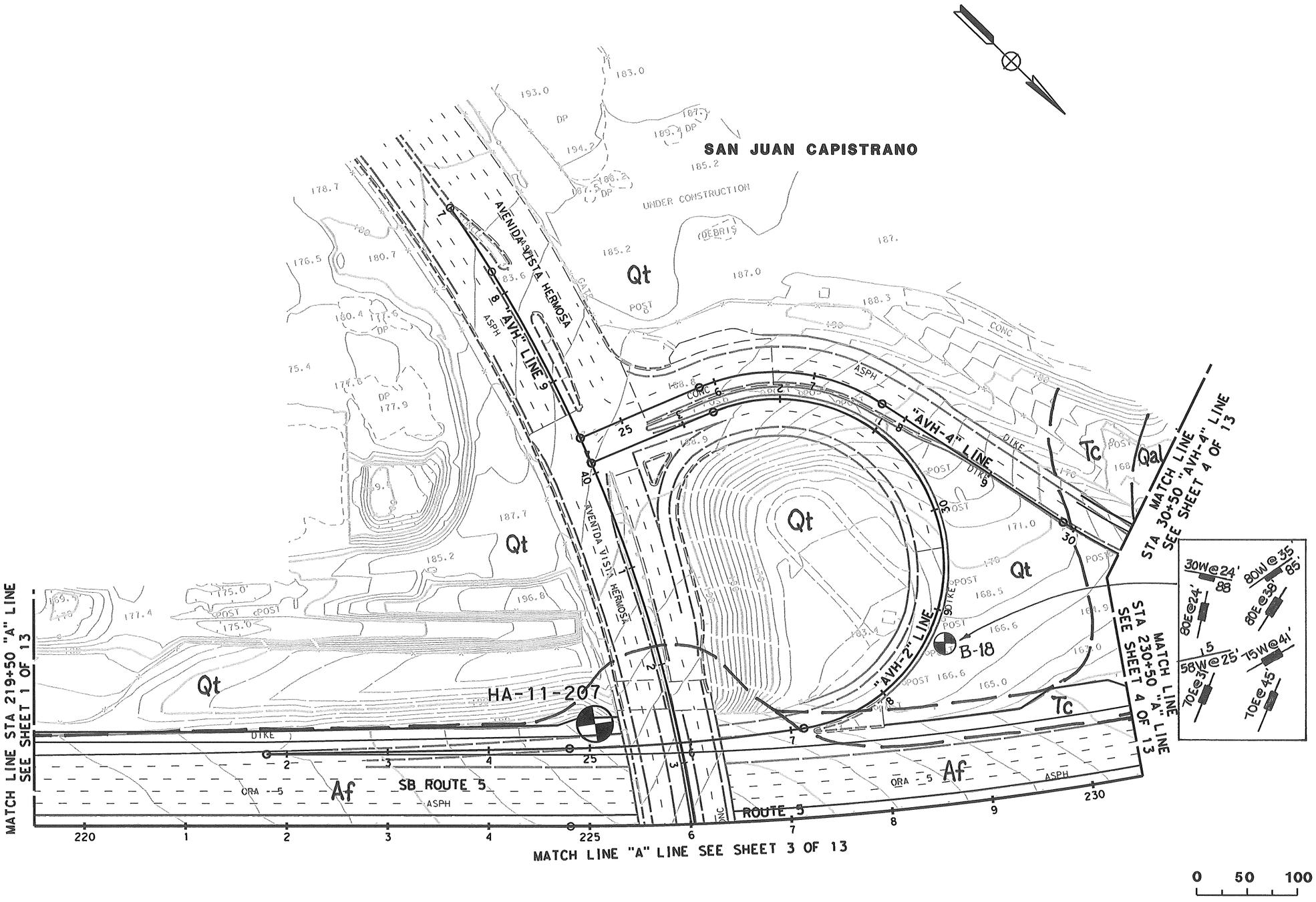
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (1 of 13)

Figure 3

Project No.: 11-136

Date: 03-01-2012



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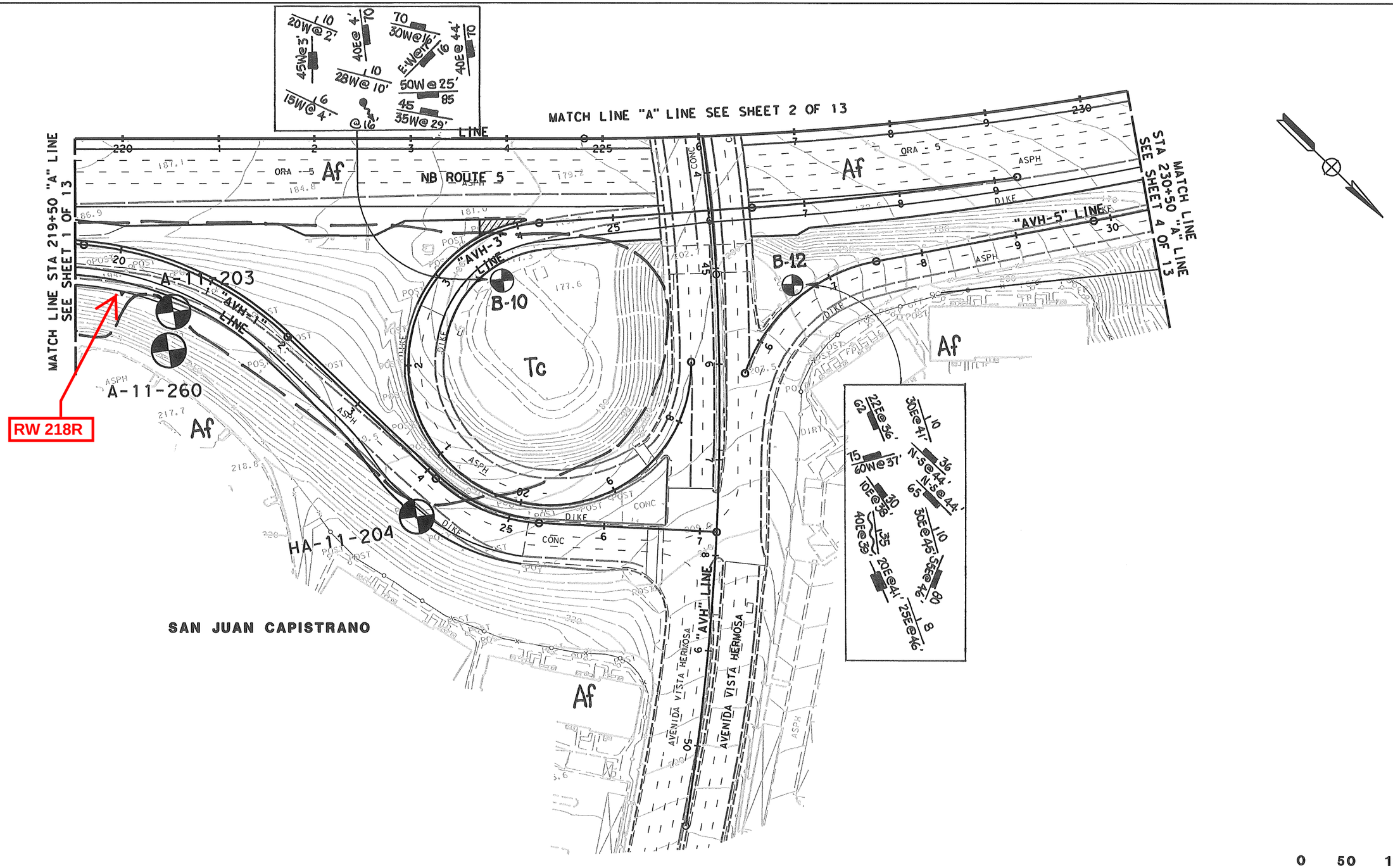
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

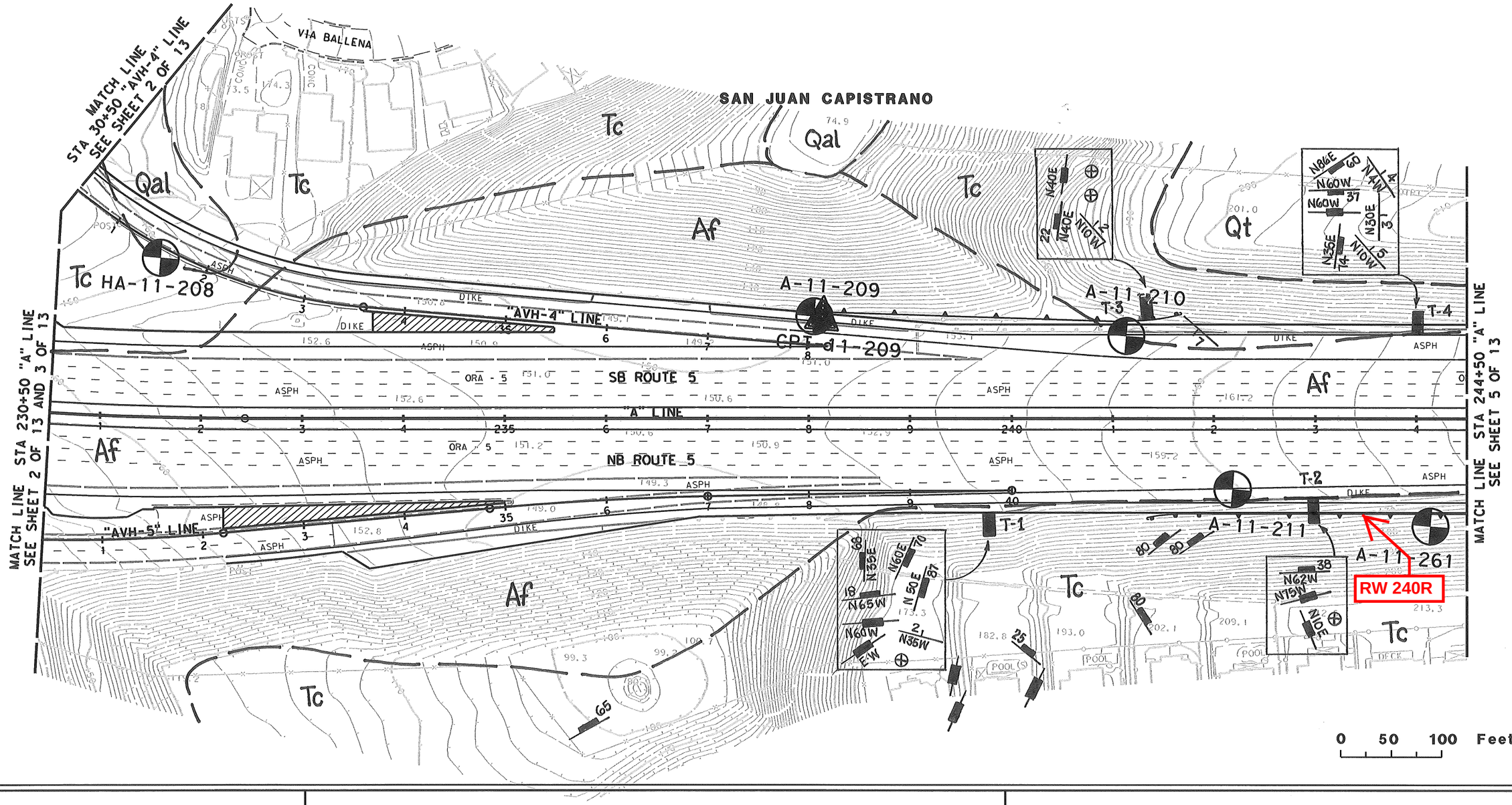
Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (2 of 13)

Figure 4



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (3 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 5



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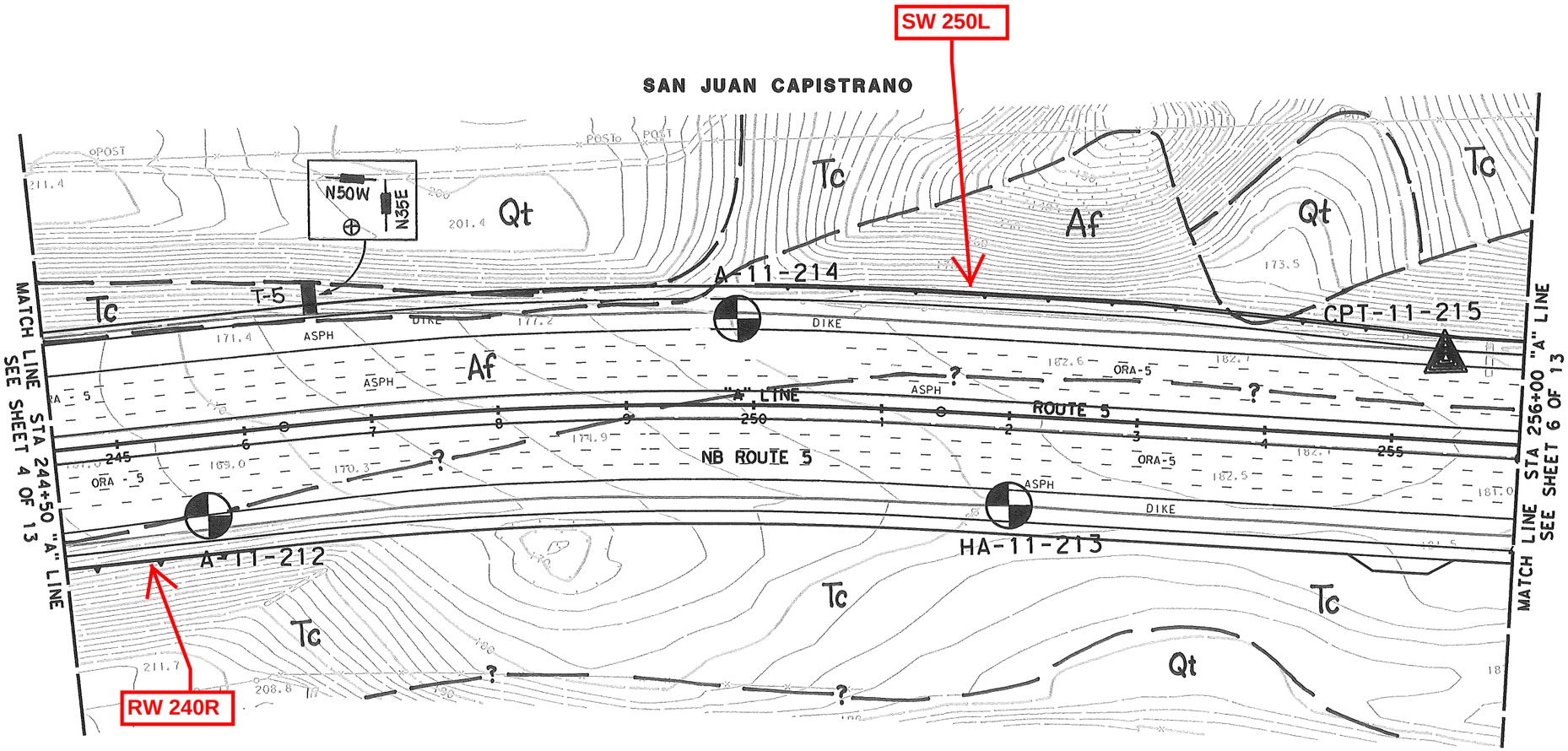
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136

Date: 03-01-2012

Exploratory Boring Location Map (4 of 13)

Figure 6



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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (5 of 13)

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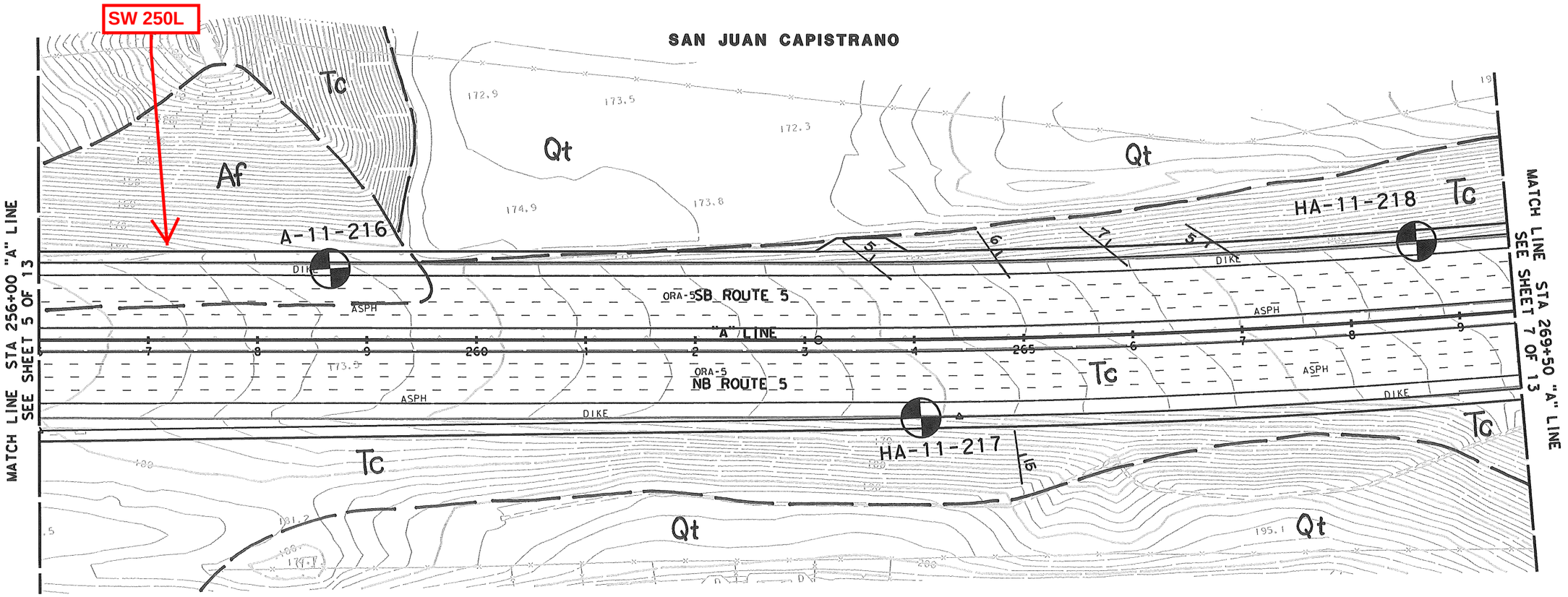
Figure 7



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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (6 of 13)

Project No.: 11-136 | **Date: 03-01-2012**

Figure 8

SAN JUAN CAPISTRANO

RW 275L

SW 278L

RW 274R

RW 280R

A-11-219

A-11-220

A-11-221

A-11-222

CPT-11-222

A-11-224

CPT-11-223

A-11-225

A-11-226

Qt

Tc

Qal

Af

SB ROUTE 5

NB ROUTE 5

"A" LINE

AVENIDA VAQUERO

CALLE ARCO

BIKE LANE

ASPH

CONC

DIRT

ORA-5

MATCH LINE STA 269+50 "A" LINE SEE SHEET 6 OF 13

MATCH LINE STA 283+50 "A" LINE SEE SHEET 8 OF 13

0 50 100 Feet

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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (7 of 13)

Project No.: 11-136

Date: 03-01-2012

Figure 9

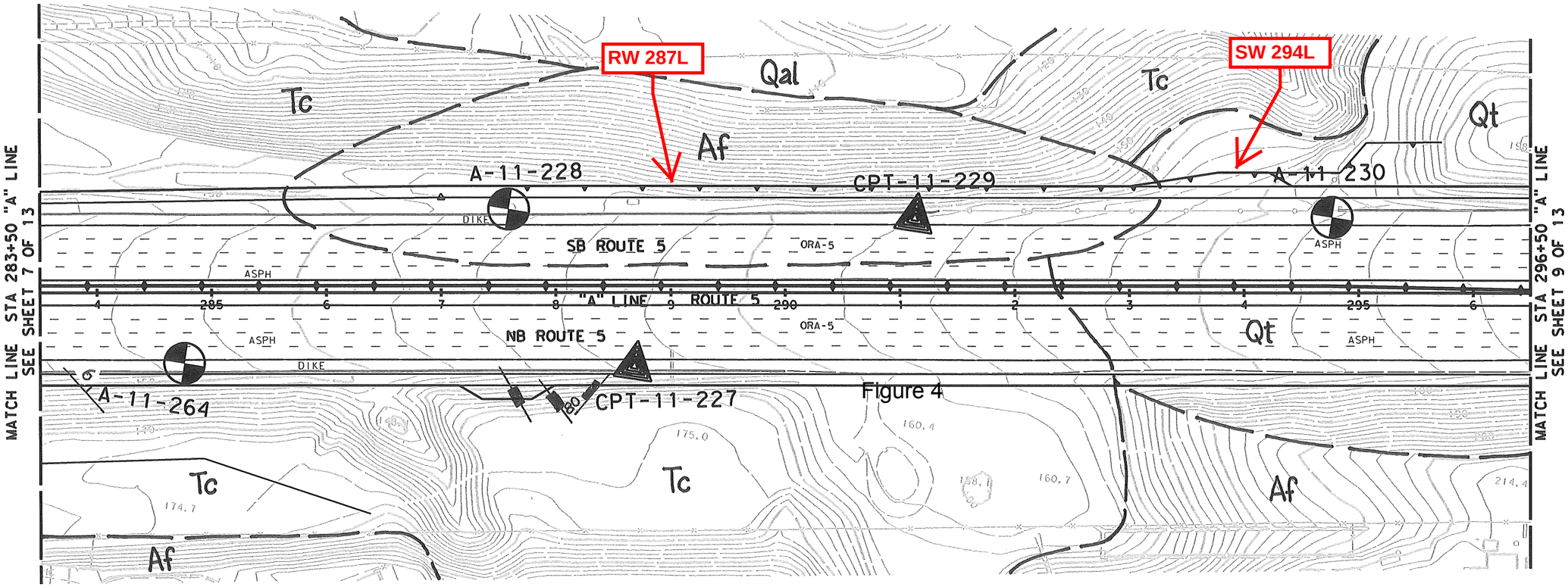

Figure 4

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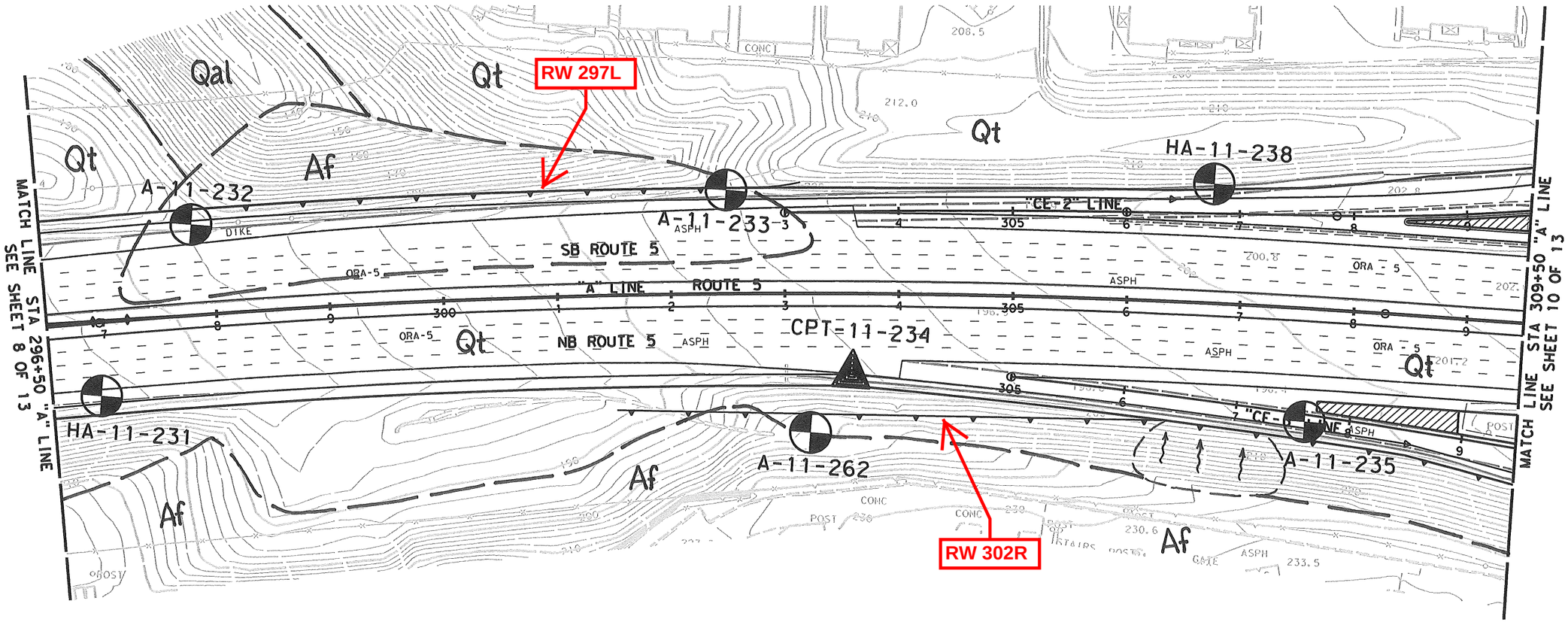
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (8 of 13)

Project No.: 11-136 | **Date: 03-01-2012**

Figure 10

SAN JUAN CAPISTRANO



0 50 100 Feet

Earth Mechanics, Inc.
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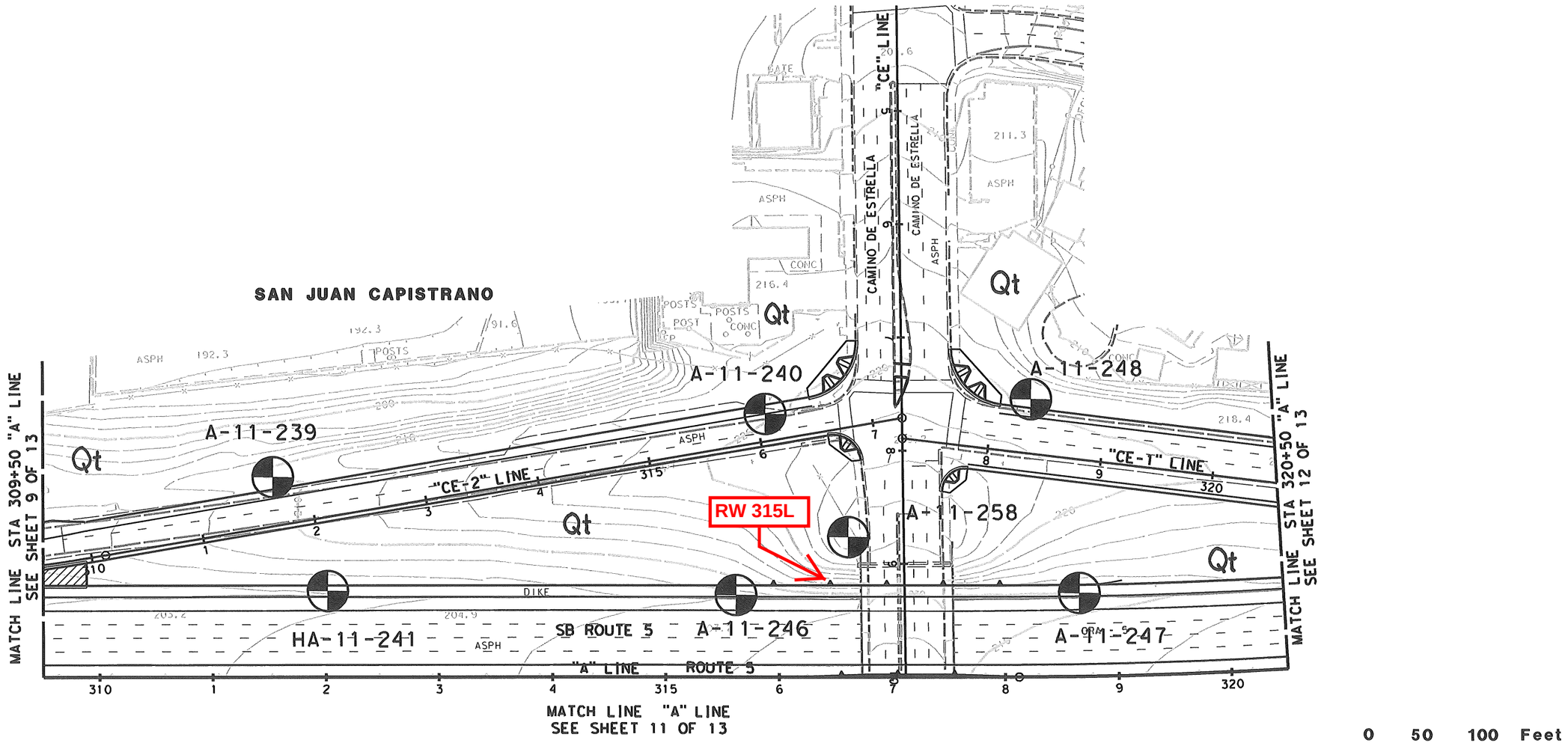
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (9 of 13)

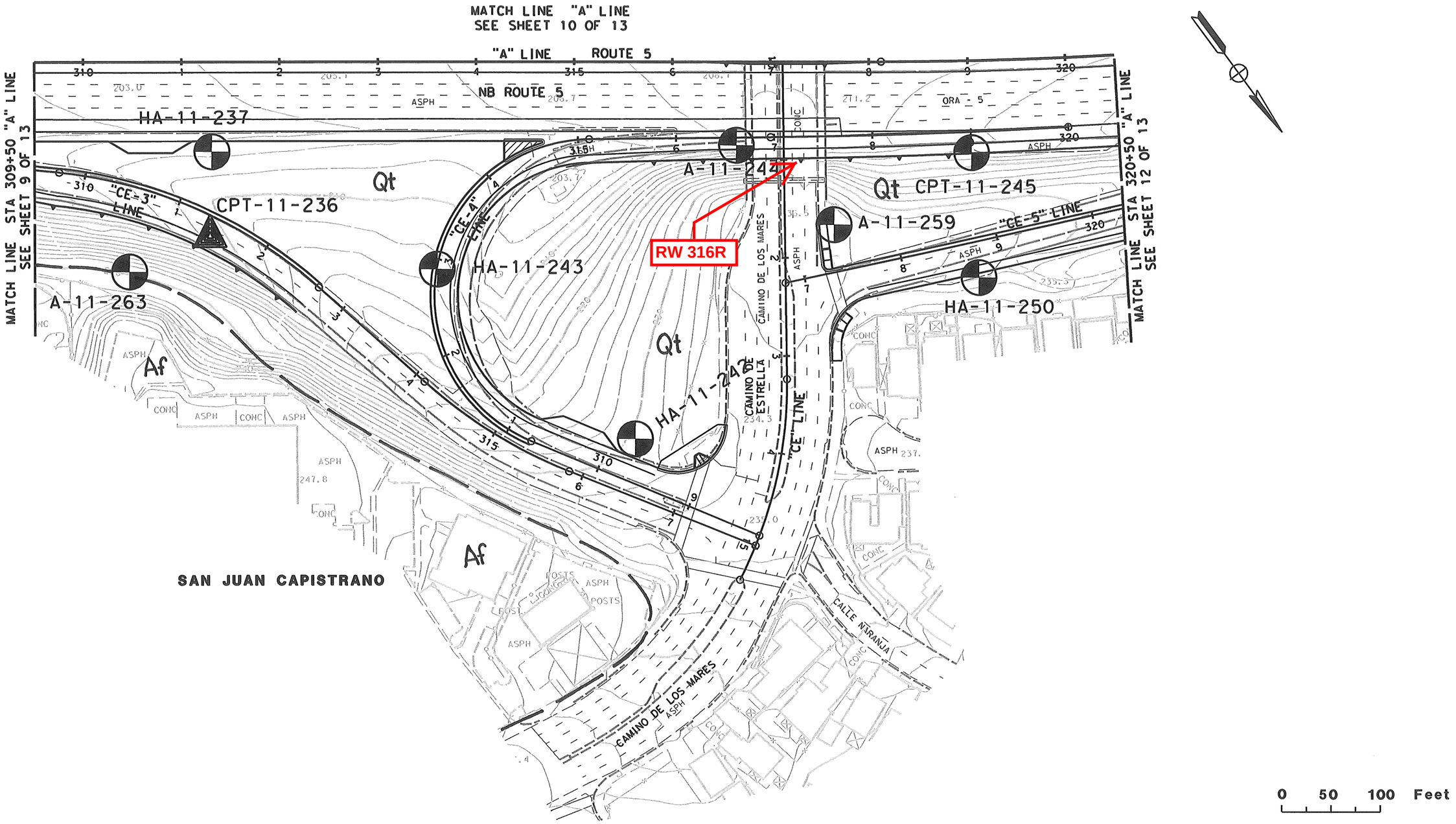
Project No.: 11-136

Date: 03-01-2012

Figure 11



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (10 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 12



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (11 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 13

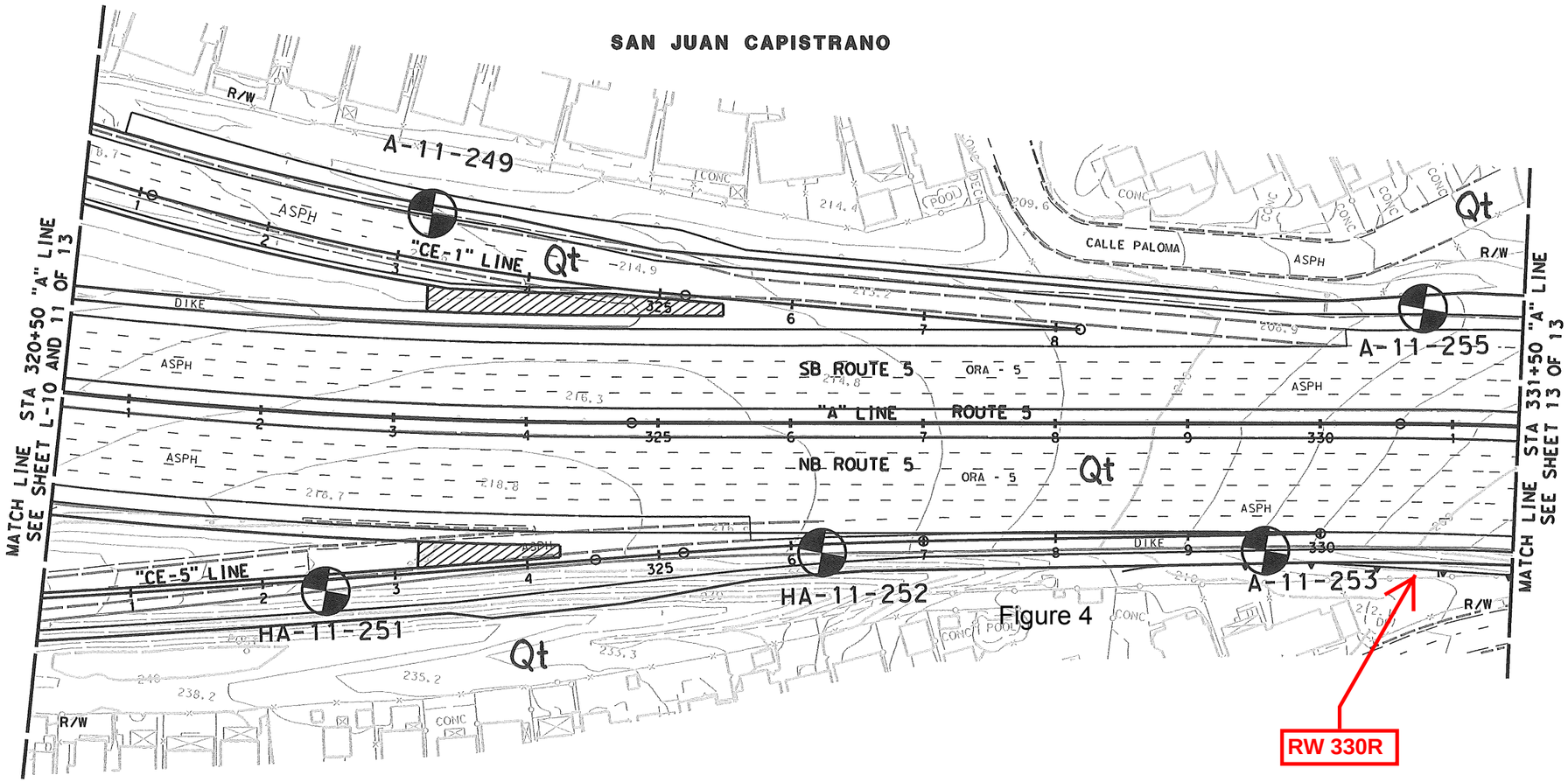
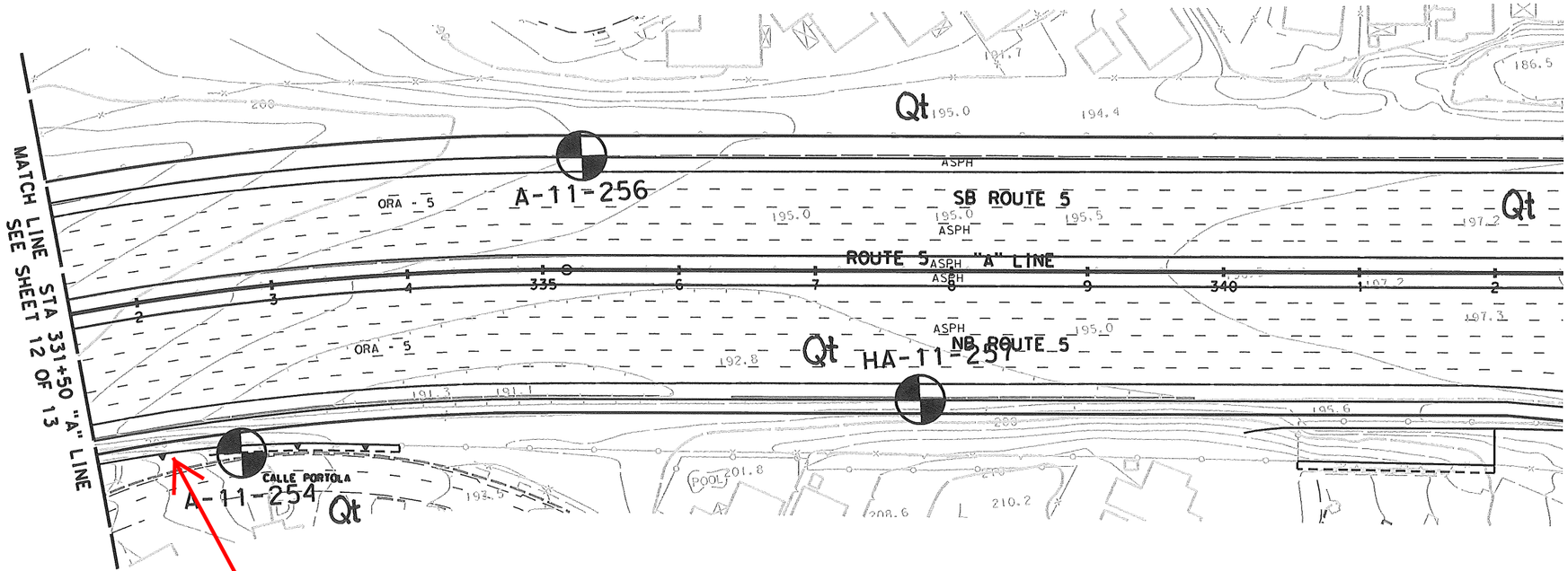


Figure 4

Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (12 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 14

SAN JUAN CAPISTRANO



0 50 100 Feet

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136

Date: 03-01-2012

Exploratory Boring Location Map (13 of 13)

Figure 15

Charts published by Winterkorn and Fang (1975) can be used to determine a reduction factor used to convert blowcounts recorded using the California Drive sampler into SPT blowcounts. Using those charts, we obtained a reduction factor of 0.5 which was used for this project.

2.2.2 CPT Soundings

To obtain continuous subsurface information, six CPT soundings were performed in the vicinity of the proposed non-standard retaining walls by Middle Earth Geo Testing, Inc. under the direction of EMI. The CPT sounding depths varied between about 20.0 and 77.9 feet below the existing ground surface. CPT soundings were performed using an electronic cone penetrometer in general accordance with current ASTM Standards (ASTM D 5778 and ASTM D 3441). CPT equipment consisted of a cone penetrometer assembly mounted at the end of a series of hollow sounding rods. The cone penetrometer assembly included of a conical tip with a 60° apex angle and a projected cross sectional area of 1.55 in^2 and a cylindrical friction sleeve with a surface area of 23.25 in^2. The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurements of cone tip resistance and sleeve friction during penetration. The cone penetrometer assembly is continuously pushed into the soil by a set of hydraulic rams at a standard rate of 0.79 inch per second while the cone tip resistance and sleeve friction are recorded every 1.967 inches and digitally stored. A specially designed all-wheel drive 25-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the testing equipment. The computer generated graphical logs include tip resistance, friction resistance, and friction ratio. Soil behavior type interpretations are based on guidelines by Robertson and Campanella (1989). CPT sounding logs are provided in Appendix A.

2.3 Laboratory Testing

Laboratory tests were performed on representative samples of soil and bedrock to determine or derive their relevant physical and engineering properties. Selected samples were tested to determine soil and bedrock classifications, plasticity, expansion index, shear strength parameters, consolidation characteristics, R-value, and corrosion potential. The following laboratory tests were performed to supplement the observations recorded during the field investigation:

- In-situ Moisture Content and Unit Weight
- Percent Passing No. 200 Sieve
- Atterberg Limit
- Direct Shear
- Unconsolidated Undrained Triaxial
- Pocket Penetrometer
- Consolidation
- Expansion Index
- Maximum Density and Optimum Moisture Content
- R-Value
- Minimum Resistivity, pH, Sulfate Content and Chloride Content

The laboratory soil tests were conducted in general accordance with California Test (CT) methods or American Society for Testing and Materials (ASTM) Standards. The test results are shown in Appendix B.

3.0 REGIONAL GEOLOGY AND SEISMICITY

3.1 Physiography

The project area is located in the northwestern part of the Peninsular Ranges physiographic province. The Peninsular Ranges comprise a northwest-southeast trending group of fault-bounded ranges between the Salton Trough and the Pacific Ocean. The Santa Ana Mountains, Puente Hills, and San Joaquin Hills are ranges within the Peninsular Ranges.

The project site is located on the low lying rolling hills westerly of the Santa Ana Mountains at the southerly end of the San Joaquin Hills in an area referred to as the Capistrano Embayment.

3.2 Stratigraphy

The geologic units encountered in the project area are described below. The distribution and location of these materials are shown on the Boring Location Maps (Figure 3 through Figure 15).

- Capistrano Formation (Tc): These marine sedimentary deposits generally consist of brown to gray silty claystone, claystone, and siltstone. Secondary gypsum is commonly found deposited along joints, fractures and shears. The formation is generally soft when moist and has engineering properties similar to stiff to very stiff soils. The formation consists generally of soft, weakly cemented to uncemented material that can be disaggregated with finger pressure. A few hard beds occur throughout the formation.

  Within the project area, the Capistrano formation consists of an oxidized (weathered) zone defined by a light brown to brown color with a mottled appearance, underlain by an unoxidized zone that is generally dark brown to dark gray with a greater degree of induration.

- Undifferentiated Marine and non-marine Terrace Deposits (Qt): Portions of the project area, mostly southerly of Camino Las Ramblas, are capped by terrace deposits. Shell fragments were found associated with the marine terrace deposits. The terrace deposits were observed to unconformably overlie bedrock units of the Capistrano formation directly. These Pleistocene terrace deposits are characterized by a basal cobble sequence fining upward to light brown and yellow brown fine to coarse grained sands, silty sand, sandy silt and clayey silt.

- Alluvium (Qal): The drainages and canyons crossing the project corridor are mantled by a relatively thin cover of alluvium. These deposits are generally derived from the surrounding bedrock units and terrace deposits and are located in the lower elevations of the site. Where encountered in the borings the alluvium was observed to consist of silty sand to sandy clay.

- Artificial Fill (Af): Artificial fill placed during construction of the I-5 freeway and adjacent residential and commercial developments is located along the project corridor. Fill materials were most likely derived from excavation of the Capistrano formation bedrock and local surficial deposits. Little or no documentation of the limits of fills or the observation and testing of the fill placement were examined.

3.3 Geologic Structure

The Peninsular Ranges are characterized by northwest-southeast trending mountains and valleys that have been faulted and uplifted by northwest-southwest trending faults. The Capistrano

Embayment is a relatively flat structural trough of Miocene to Pliocene age. The trough is bordered on the east by the Cristianitos Fault. The California Geological Survey does not show any active faults at the site (Jennings, 2010). The nearest known major active faults are the Newport-Inglewood Structural Zone about 5 miles southwest of the site in the offshore area, the Palos Verdes fault about 19 miles to the west, also in the offshore area, and the Elsinore fault about 35 miles to the northeast. A subsurface fault, the San Joaquin Hills blind thrust, is postulated west of the site at a depth of about 2.5 to 3 miles. These faults are discussed in more detail below. Other nearby faults such as the Cristianitos fault and Mission Viejo faults are about 3.5 to 7 miles east of the site but are not believed to be active.

3.4 Geologic Hazards

The geological hazards present at the site include landsliding, liquefaction, and earthquake shaking. The site lies outside identified tsunami inundation zones (CGS, 2009), and there are no large bodies of water within the project area that could generate a seiche. There are no volcanos in the region and there are no known active surface faults within the project area so ground rupture is not a factor. The California Geological Survey (CGS, 2001 and 2002) has indicated that the portion of the project alignment underlain by young alluvium in the area of the Prima Deshecha Canada (Avenida Vaquero) is susceptible to liquefaction during a strong earthquake (Figure 16).

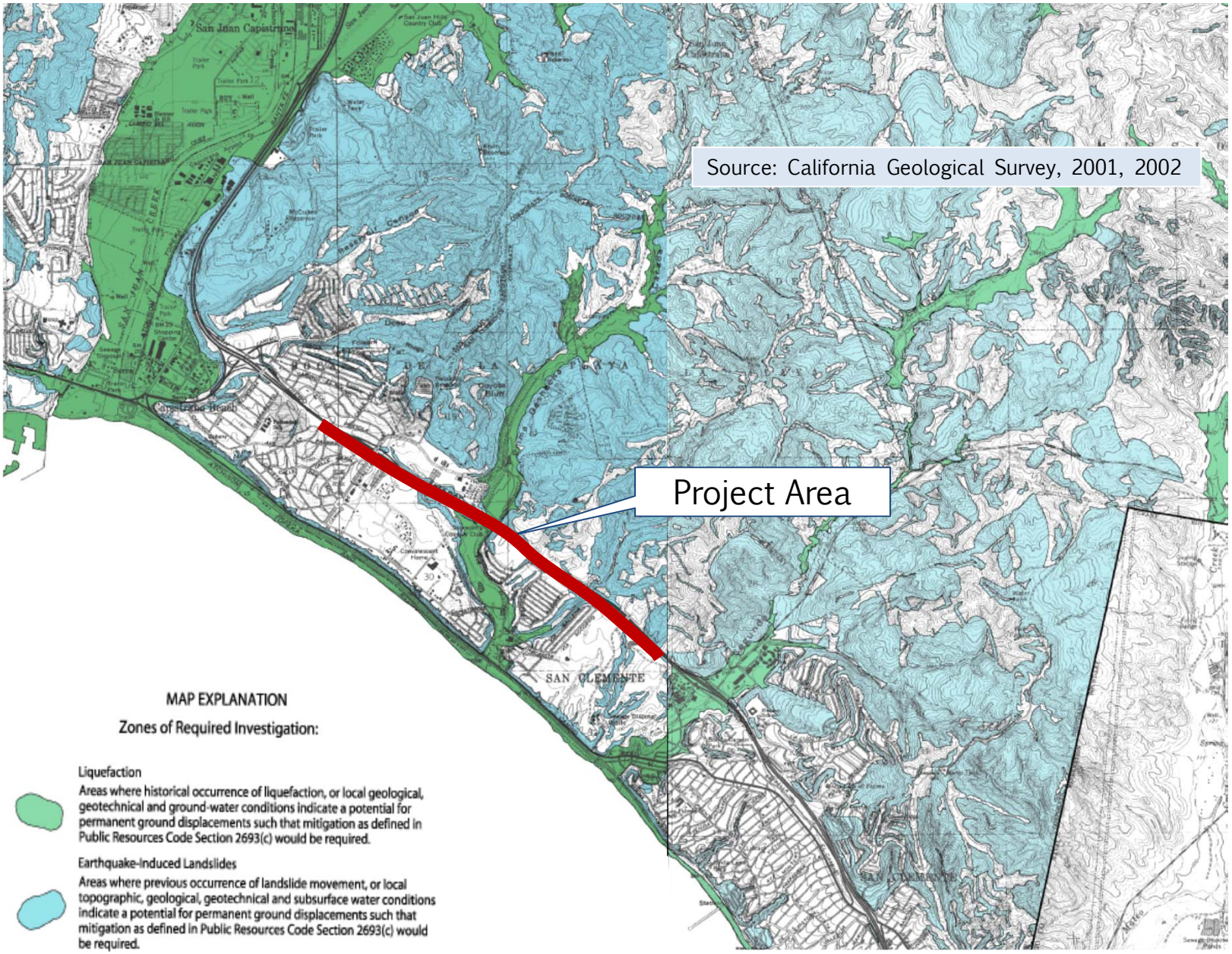
The Capistrano formation bedrock underlying the majority of the site is notoriously susceptible to landsliding. Figure 16 shows areas identified as having potential for landslides as a result of earthquake shaking.

3.5 Seismicity

The project is located in seismically active southern California. The present-day seismotectonic stress field in the Los Angeles region is one of north-northeasterly compression. This is indicated by geologic structures, by earthquake focal-mechanism solutions, and by geodetic measurements. The data suggests crustal shortening of between 0.2 and 0.35 inch/year across the greater Los Angeles area (Argus et al., 1999).

Historic earthquake epicenter maps show widespread seismicity throughout the region. Although historical earthquakes occur in proximity to known faults, they are difficult to directly associate with mapped faults. Part of this difficulty is due to the fact that the basin is underlain by several poorly known subsurface thrust faults, generally referred to as blind thrust faults. Ward (1994) estimated that about 40 percent of seismic moment cannot be associated with known faults.

Earthquakes occur primarily as loose clusters along the Newport-Inglewood Structural Zone, the southern margin of the Santa Monica Mountains, the margin between the Santa Susana-San Fernando Valley and the southern margin of the San Gabriel Mountains, and in the Coyote Hills-Puente Hills area. There is no clustering or alignment of earthquakes in proximity to the site. There are fewer earthquakes in the site region than anywhere else in the Los Angeles Basin area. This apparent lack of earthquake activity suggests that the site area is tectonically stable and suggests that there are no unrecognized active faults at the site.



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Seismic Hazard Map Figure 16
	Project No. 11-136 / Date: 03-08-12	

The largest historical earthquake within the Los Angeles Basin was the 1933 Long Beach event which had a magnitude of about M_W = 6.4 (M_L = 6.3). This earthquake did not rupture the surface but is believed to have been associated with the Newport-Inglewood Structural Zone (Benioff, 1938). The association was based on abundant ground failures along the NISZ trend but no unequivocal surface rupture was identified. Reevaluation of the seismicity data by Hauksson and Gross (1991) relocated the 1933 earthquake hypocenter to a depth of about 6 miles below the Huntington Beach-Newport Beach city boundary.

Other major earthquakes in the region include the 1994 Northridge and the 1971 San Fernando earthquake both of which occurred in the San Fernando Valley region. The 1994 earthquake had a moment magnitude (MW) of about 6.7 (MS = 6.8, ML = 6.4), and occurred on a southerly dipping subsurface fault which was unknown prior to the earthquake. The main shock occurred at a depth of about 11.8 miles (19 km). Earthquake aftershocks clearly defined the rupture surface dipping about 35 degrees southerly from a depth of about 1.2 or 1.9 miles (2 or 3 km) to 14.3 miles (23 km) (Hauksson et al, 1995). The causative fault was never identified with certainty. The event may have occurred on an eastern extension of the Oakridge fault (Yeats and Huftile, 1995), a southerly dipping feature fault bounding the Ventura Basin and the Santa Susana Mountains.

The 1971 San Fernando earthquake was of similar size (MW = 6.7, MS = 6.4, ML = 6.4) to the 1994 event but did involve surface rupture. The 1971 event occurred on a northerly dipping thrust fault that dips from the northern side of the San Fernando Valley to a depth of about 9.3 miles (15 km) under the San Gabriel Mountains. Several mapped surface faults were involved such as the Sylmar fault, Tujunga fault, and Lakeview fault. These faults are commonly considered to be part of the Sierra Madre fault system which extends easterly from the San Fernando Valley, along the base of the San Gabriel Mountains on the north side of the San Gabriel Valley, and to the Cucamonga fault in the San Bernardino area.

The 1987 Whittier earthquake (ML = 5.9, MW = 5.9) occurred on a subsurface fault dipping under the Puente Hills to about 10 miles beneath the San Gabriel Basin (Shaw and Shearer, 1999; Shaw et al., 2002). This event did not rupture the ground surface.

A magnitude 5.4 earthquake occurred at a depth of about 9 miles (15 km) on 29 July 2008. The epicenter was in the Chino Hills area between the Chino fault and the Whittier fault. Preliminary data were inconclusive with regard to the causative fault. Detailed analysis by Shao and Hauksson (2009) indicated a rupture plane striking N71°W, dipping 62° northeast. They suggested a preference for the Whittier fault being the causative fault but were uncertain, primarily because the Whittier fault is supposed to dip much steeper (~ 80°). The aftershock pattern formed a subhorizontal alignment indicating the possibility that the event could have been associated with a subsurface thrust fault such as one of the blind faults of the Puente Hills Blind Thrust Fault System or with a blind fault under the Peralta Hills.

Another significant earthquake was the 1812 earthquake which caused damage at the San Juan Capistrano Mission. The location and magnitude of the 1812 earthquake are unknown because of the sparse population at the time, but geological studies (Jacoby et al., 1988; Fumal et al., 1993; Weldon et al., 2004) postulate that it did not occur in the Capistrano area, but rather was a large (M > 7.0) distant event on the San Andreas fault in the Wrightwood area of the San Gabriel Mountains.

The earliest documented earthquake in the region was reported by the Portola' expedition as they camped near the Santa Ana River in 1769. This event has been attributed by various geoscientists to just about every fault in the Los Angeles area but it could just as well have been a distant event that shook a wide area as did the 1971 San Fernando, the 1987 Whittier, and the 1994 Northridge events, as well as many other more-distant events (for example, 1992 Landers event).

3.6 Soil Survey Mapping

Soil Survey maps were not reviewed for the project.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Soil/Bedrock Conditions

Site-specific boreholes and CPT soundings performed for the project indicate that the materials within the project area are very similar to the regional stratigraphy as described in Section 3.2. In summary, the boreholes and CPT soundings generally revealed artificial fills (Af) and/or terrace deposits (Qt), composed of fine-grained soils (clay and silt with varying amounts of sand), overlying sedimentary bedrock of the Capistrano formation (Tc). The formation consists generally of soft, weakly cemented to uncemented materials with a few hard beds occurring throughout the formation. Within the project area, the Capistrano formation consists of an oxidized (ranging from intensely to moderately weathered) zone underlain by an unoxidized zone (ranging from slightly weathered to fresh).

The above soil and bedrock descriptions are general and are intended to describe the subsurface in very broad terms. The descriptions above should not be construed to mean that the subsurface profile is uniform and soil and bedrock is homogeneous within the project area. For details on stratigraphy at each borehole and CPT location, refer to the LOTB sheets at the end of the report.

4.2 Idealized Soil Profile

An idealized subsurface profile was developed for each non-standard retaining wall based on information collected from site-specific borings and CPT soundings. The subsurface profiles and design strength parameters used for geotechnical analyses are presented in Table 3.

In Table 3, the drained soil strength parameters (friction angle and cohesion) are based on the database of results obtained from all direct shear tests performed for the overall Segment 2 project. The design friction angle and cohesion are based on the ultimate shear strength parameters obtained from the direct shear tests. Refer to the Geotechnical Design Report (EMI, 2012a) for development of design drained shear strength values for each geologic unit encountered in the project area. The undrained shear strength parameters, shown in the table, are based on the results of unconsolidated-undrained triaxial tests and SPT correlations. It should be noted that the selected design strength parameters are lesser of strength values obtained from laboratory test results and SPT correlations.

Table 3. Idealized Soil Profiles and Strength Parameters

Approximate Elevation (feet)	Predominant Soil/Bedrock Type	Equivalent SPT Blowcount [1] (blows/foot)	Total Unit Weight (pcf)	Friction Angle [3] (degree)	Cohesion [3] (psf)	Undrained Shear Strength [3] (Su) (psf)
RW No. 218R (Borings A-11-202, A-11-203, and A-11-260)						
+194 to +182	Lean Clay, Clayey Sand (Artificial Fills)	11 to (18) Average = 15	120	32	200	2,000
+182 to +162	Fat Clay, Siltstone/Claystone (Artificial Fills / Intensely to Moderately Weathered Capistrano Formation)	5 to (30) Average = 16	120	23 – 27	200 – 250	2,000
+162 to +155	Siltstone/Claystone (Capistrano Formation)	(38) to (50/6") Average = 41	120	23 – 27	200 – 250	4,000
RW No. 240R (Borings A-11-211, A-11-212, and A-11-261)						
+167 to +155	Silty Sand, Lean Clay (Artificial Fills)	(2) to 34 Average = 16	120	32	200	2,000
+155 to +128	Siltstone/Claystone (Capistrano Formation)	35 to (50/2") Average = 50	120	27	210	4,000
RW No. 274R (Borings A-11-221 and A-11-224)						
+130 to +90	Silt, Sandy Lean Clay, Lean Clay, Fat Clay (Artificial Fills)	12 to (34) Average = 20	120	32	200	2,500
+90 to +70	Sandy Lean Clay, Lean Clay, Fat Clay (Alluvium)	12 to (31) Average = 18	120	-	-	2,250
+70 to +45	Sandy Lean Clay, Lean Clay, Fat Clay (Alluvium)	8 to 23 Average = 14	120	-	-	1,500
+45 to +38	Lean Clay, Fat Clay (Intensely Weathered Capistrano Formation)	(21) to 48 Average = 35	120	23 – 27	200 – 250	3,000
RW No. 275L (Boring A-11-222 and CPT Soundings CPT-11-222 and CPT-11-223)						
+130 to +115	Silt, Sandy Lean Clay, Lean Clay, Fat Clay (Artificial Fills)	11 to (14) Average = 13	120	32	200	2,000
+115 to +90	Sandy Lean Clay, Lean Clay, Fat Clay (Alluvium)	12 to 20 Average = 15	120	32	200	2,250
+90 to +70	Sandy Lean Clay, Lean Clay, Fat Clay (Alluvium)	11 to 19 Average = 15	120	-	-	2,250
+70 to +50	Sandy Lean Clay, Lean Clay, Fat Clay (Alluvium)	7 to (11) Average = 9	120	-	-	1,500
+50 to +42	Lean Clay, Fat Clay (Alluvium / Intensely Weathered Capistrano Formation)	(19) to 29 Average = 24	120	-	-	3,000
+42 to +28	Siltstone/Claystone (Capistrano Formation)	(REF [2])	120	23 – 27	200 – 250	4,000

(1) Values in ( ) are converted SPT blowcounts corrected for sampler size; correction factor from California sampler blowcounts to SPT blowcounts is 0.5.

(2) REF – Refusal; refusal blowcounts were not used for estimating average equivalent SPT blowcounts.

(3) Friction angle and cohesion were used for global stability analyses and Su was used for pile calculations.

Table 3. Idealized Soil Profiles and Strength Parameters (Continued)

Approximate Elevation (feet)	Predominant Soil/Bedrock Type	Equivalent SPT Blowcount [1] (blows/foot)	Total Unit Weight (pcf)	Friction Angle [3] (degree)	Cohesion [3] (psf)	Undrained Shear Strength [3] (Su) (psf)
RW No. 280R (Borings A-11-226 and A-11-264)						
+146 to +120	Siltstone/Claystone (Slightly Weathered Capistrano Formation)	24 to (50/3") Average = 33	120	32	200	3,000
+120 to +100	Siltstone/Claystone (Slightly Weathered Capistrano Formation)	34 to (50/3") Average = 39	120	23 – 27	200 – 250	3,500
+100 to +88	Siltstone/Claystone (Capistrano Formation)	55 to (REF [2]) Average = 55	120	23 – 27	200 – 250	4,000
RW No. 287L (Borings A-11-228 and A-11-230 and CPT Sounding CPT-11-229)						
+162 to +134	Silty Sand, Silt with Sand, Sandy Lean Clay, Lean Clay (Artificial Fills)	13 to (18) Average = 15	120	32	200	2,000
+134 to +116	Siltstone/Claystone (Intensely to Moderately Weathered Capistrano Formation)	20 to (87/10") Average = 25	120	23 – 27	200 – 250	3,000
RW No. 297L (Borings A-11-232 and A-11-233)						
+183 to +170	Silty Sand, Sand, Clayey Sand, Lean Clay (Artificial Fills)	5 to (50/5") Average = 17	120	32	200	2,500
+170 to +160	Lean Clay, Lean Clay with Sand, Fat Clay (Terrace Deposits)	16 to (39) Average = 29	120	27	210	3,000
+160 to +131	Siltstone/Claystone (Slightly Weathered Capistrano Formation)	23 to (REF [2]) Average = 39	120	23 – 27	200 – 250	4,000
RW No. 302R (Borings A-11-235, A-11-262, and A-11-263 and CPT Soundings CPT-11-234 and CPT-11-236)						
+209 to +192	Silty Sand, Sand, Silt, Lean Clay (Artificial Fills)	4 to (30) Average = 19	120	32	200	2,500
+192 to +175	Silt with Sand, Fat Clay (Terrace Deposits)	(17) and (50/6") Average = 23	120	27	210	3,000
+175 to +147	Siltstone/Claystone (Capistrano Formation)	23 to (50/3") Average = 34	120	23 – 27	200 – 250	4,000
RW No. 330R (Borings A-11-253 and A-11-254)						
+206 to +192	Lean Clay, Lean Clay with Sand (Terrace Deposits)	7 to (26) Average = 13	120	27	210	1,500
+192 to +175	Silty Sand, Sand, Sand with Silt (Terrace Deposits)	15 and (50/5") Average = 33	120	27	210	-
+175 to +147	Siltstone/Claystone (Capistrano Formation)	23 to (REF [2]) Average = 32	120	23 – 27	200 – 250	4,000

(1) Values in ( ) are converted SPT blowcounts corrected for sampler size; correction factor from California sampler blowcounts to SPT blowcounts is 0.5.

(2) REF – Refusal; refusal blowcounts were not used for estimating average equivalent SPT blowcounts.

(3) Friction angle and cohesion were used for global stability analyses and Su was used for pile calculations.

4.3 Groundwater Conditions

During the recent 2011 geotechnical field investigation, groundwater was encountered between about elevations +74 and +184 feet in only six of the twenty-two boreholes drilled for the proposed non-standard retaining walls. Since the groundwater was encountered in only six of the twenty-two boreholes and the groundwater was found within a very wide range of elevation, the groundwater is believed to be perched groundwater.

Soil moisture content and groundwater level can fluctuate due to variations in seasonal rainfall, nearby irrigation, changes in or addition of flood control improvements, groundwater injection or extraction activities, construction activities, or numerous other man-made or natural conditions.

4.4 Expansion Potential

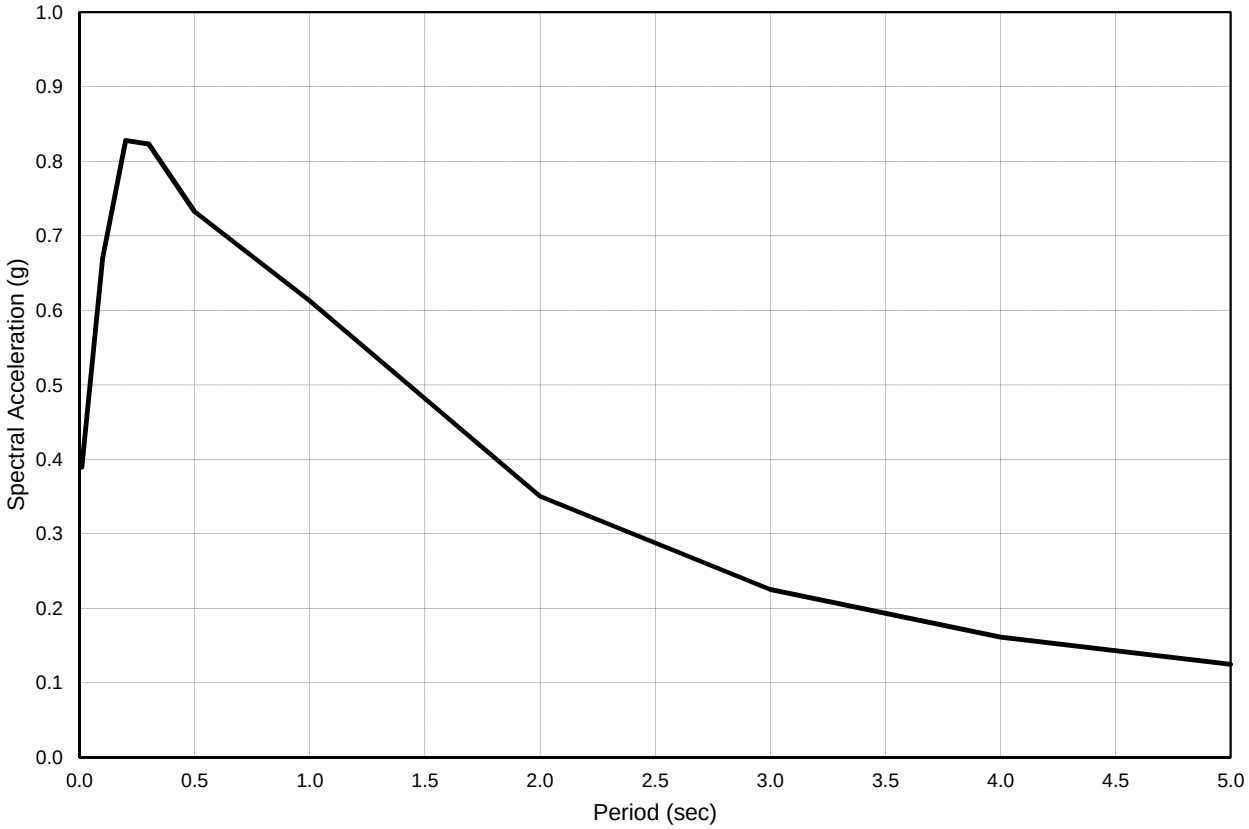
Based on visual classification and laboratory tests, the vast majority of earth materials throughout the project area are plastic fine-grained materials including the fills and alluvium composed of clay and silt, terrace deposits, and clayey siltstone and claystone of the Capistrano formation. The clays found throughout the project are predominantly fat clays and the silts are elastic silts. Based on Plasticity Index (PI) and Expansion Index (EI) values, the vast majority of earth materials throughout the project site are classified as having "high" or "very high" expansion potential. These materials have a tendency to swell as the moisture content increases. These expansive materials should not be used as backfill behind or beneath retaining walls or any other structures and should not be used beneath pavement. Laboratory tests may be required during earthwork operations to verify the expansion potential of soils used in specific areas.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Seismic Study

The seismic design parameters were determined using the current web-based Caltrans and United States Geological Survey (USGS) software. Current design methodology includes developing the deterministic and probabilistic acceleration response spectra (ARS) curves and using the largest magnitude curve for design. Using a Latitude and Longitude of 33.4528° N and -117.6437° W for the Avenida Vaquero UC, and using shear wave velocities of 252 m/s (886 ft/s) to 411 m/s (1,348 ft/s) for the upper 100 feet of subsurface soils, the controlling ARS curve was determined to be the probabilistic curve. The fault nearest the project area, which has the most influence on the ARS curves, is the Newport-Inglewood-Rose Canyon fault. Results of the analysis show that the peak ground acceleration (PGA) is approximately 0.39g. The recommended design ARS curve is shown on Figure 17. Since the I-5 mainline alignment (in the project area) essentially parallels the alignment of the Newport-Inglewood-Rose Canyon fault, and the average ARS curve (based on various shear wave velocities) is selected for design, the PGA determined for the Avenida Vaquero UC is considered applicable for the entire project.

The Newport-Inglewood-Rose Canyon fault is a Right Lateral Strike-Slip fault with a maximum earthquake magnitude of 7.5. The site-to-fault distance is about 7 km (4.36 miles). A Near-Fault Factor was applied since the bridge location is within 15 km (9.4 miles) of the fault. A Basin Factor was not applied since the bridge is located outside of the limits of the Los Angeles Basin (shown in Appendix B of the Caltrans Seismic Design Criteria, 2009).



Latitude = 33.4528 °
Longitude = -117.6437 °
Damping Ratio = 5%

Spectral Coordinates	
Period (sec)	Acc. (g)
	Design
0.010	0.390
0.100	0.670
0.200	0.828
0.300	0.823
0.500	0.733
1.000	0.613
2.000	0.350
3.000	0.225
4.000	0.162
5.000	0.125

Earth Mechanics, Inc.
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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

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Design ARS Curve

Figure 17

5.2 Liquefaction Analyses

Liquefaction is the loss of shear strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. Primary factors influencing the potential for liquefaction include: groundwater elevation, soil type and grain-size characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. Soils most susceptible to liquefaction are saturated low-density sands and silty sands situated within 50 feet of the ground surface.

Since the project area is composed of predominantly medium to high plasticity fine-grained soils (lean and fat clays) and sedimentary bedrock, and due to the absence of a shallow static groundwater table, liquefaction is unlikely and is not considered a design issue. As a result, seismically-induced settlement is anticipated to be negligible and not expected to adversely impact the proposed non-standard retaining wall foundations.

5.3 Soil Corrosivity

Nineteen representative soil and bedrock samples, collected from the boreholes drilled for the proposed retaining walls, were tested to determine minimum resistivity, pH, soluble sulfate content, and soluble chloride content. Minimum resistivities were determined to range between 140 and 909 ohm-cm. The pH values range between 3.5 and 7.8. The soluble sulfate content ranged from 230 to 3,260 parts per million (ppm), and the soluble chloride content ranged from 120 to 4,642 ppm.

Additional soil and bedrock samples, collected from where other improvements are proposed, were tested to determine corrosivity. The minimum resistivities of all samples collected from throughout Segment 2 ranged from 122 to 2,260 ohm-cm with the average value equal to 459 ohm-cm. The pH ranged from 3.5 to 8.1 with the average equal to 6.8. The soluble sulfate ranged from 220 to 8,636 ppm with the average value equal to 1,308 ppm. And, the soluble chloride ranged from 120 to 4,642 ppm with the average equal to 1,474 ppm. Test results are summarized in the Materials Report (EMI, 2012b) for this project.

According to Caltrans Corrosion Guidelines (2003c), soils are considered corrosive if the pH is 5.5 or less, or the sulfate concentration is 2,000 ppm or greater, or the chloride concentration is 500 ppm or greater. Based on the test results and the Caltrans criteria, the on-site earth materials are corrosive to concrete and bare metals. Consequently, proposed structures in contact with the on-site earth materials should be designed for the corrosive environment.

Based on the project-wide chloride concentrations, the minimum concrete cover over reinforcement should be in accordance with Table 8.22.1 of the Caltrans BDS (Caltrans, 2003a) for "Corrosive soil above MLLW level with chloride concentration between 500 and 5,000 ppm." Based on the project-wide sulfate concentrations, cement type should be in accordance with Table 8.22.2 of the Caltrans BDS (Caltrans, 2003a) for "Sulfate Concentration from 2,000 to 15,000 ppm." Additional corrosion protection requirements for concrete structural members are presented in Section 8.22 of the Caltrans BDS (Caltrans, 2003b).

5.4 Lateral Earth Pressures

For free draining and compacted backfill conditions, the recommended lateral earth pressures for cantilevered retaining walls are summarized in Table 4. If applicable, a uniform lateral pressure

due to traffic loading and seismic lateral pressure (shown in Table 4) should be added to the static lateral earth pressure.

Table 4. Recommended Lateral Earth Pressures for Cantilevered Retaining Walls

Ground Condition	Active Pressure Against Back of Wall (psf/foot of depth)	Passive Pressure in Front of Wall, Static / Seismic (psf/foot of depth)	Lateral Pressure Due to Vehicle Surcharge (psf)	Seismic Lateral Earth Pressure (psf)
Level Ground	36	360 / 600	72	8H
2H:1V Sloping Ground	54	150 / n/a	72	28H

Notes:

1. *Lateral pressure due to vehicle surcharge and seismic earth pressure are uniform pressure distributions. For seismic pressure, H is the wall height in feet.*
2. *Lateral pressures are based on granular Structure Backfill placed behind and in front of proposed retaining walls. The Structure Backfill should extend at least a distance of 2 feet behind the back of the Type 1 wall footings and at least 50% of the wall height behind Type 7 wall face. The Structure Backfill should extend at least 5 feet in front of the wall footings.*
3. *Based on accomplishing the overexcavation and backfill recommended in this report, the recommended static and seismic coefficients of friction between the bottom of the concrete footings and underlying compacted select granular material are 0.40 and 0.50, respectively.*
4. *Passive pressure for the upper 1-foot of ground, on the front side of the wall, should be neglected when determining total lateral resistance.*

5.5 Foundation Design for Type 1SWB Retaining Walls

Four Sound Wall-on-Barrier-on-Retaining Walls (Type 1SWB), supported on spread footings, are proposed for the project. Three of the walls (RW Nos. 275L, 287L, and 297L) are located along the south side of the I-5 mainline, where fill is proposed on the descending slopes. One wall (RW No. 274R) is located along the north side of the mainline, immediately west of the Avenida Vaquero UC, to widen the existing westerly approach embankment. General information for each wall is provided in Table 1.

5.5.1 Bearing Pressures

For the proposed Type 1SWB walls, footing dimensions and bearing pressures are provided on the Caltrans XS sheet 14-220-1 (approval date of July 2011) and XS sheet 14-220-2 (approval date of January 2012). The Caltrans XS sheets are included in Appendix C.

5.5.2 Bearing Capacity and Settlement

Per Caltrans LRFD design guidelines given in the latest Caltrans Memo To Designers (Caltrans, 2008), the Service-I Limit State bearing pressures must be less than the allowable bearing capacity of the foundation materials; the Service-I Limit State bearing pressures were also used to determine the anticipated settlement of the Type 1SWB walls. The Strength Limit State and Extreme Event Limit State bearing pressures were used to compare with the factored bearing capacity and ultimate bearing capacity of the foundation materials, respectively. Based on the analyses, the bearing capacities of the Type 1SWB wall spread footings, under the service limit,

strength limit, and extreme limit states are greater than the bearing pressures shown on the XS sheets. Settlement and bearing capacity calculations are included in Appendix C.

Due to the presence of compressible materials beneath the footings, remedial overexcavation immediately below the wall footings is recommended to limit footing settlement. Horizontal extent of the overexcavation and backfill and compaction requirements are described in Section 5.9. Minimum overexcavation depth and resulting settlement for each Type 1SWB wall are presented in Table 5. As shown in Table 5, the estimated settlement with overexcavation ranges between 0.6-inch and about 1.3 inches.

Table 5. Overexcavation Depth and Settlement Estimates for Type 1SWB Walls

Retaining Wall No.	Wall Height (feet)	Bottom of Footing Elevation (feet)	Recommended Minimum Overexcavation Depth Below Wall Footing (feet)	Estimated Settlement With Overexcavation (inch)
274R	8	+121.61	2	0.68
	10	+119.28 to +120.28	2	0.82
	16	+114.90	5	1.05
275L	6	+120.87	2	0.60
	8	+117.20 to +118.53	2	0.72
	10	+115.70 to +117.20	2	0.86
	12	+114.32	3	0.96
	14	+112.15	4	1.04
287L	8	+146.60	2	0.88
	10	+144.89 to +156.37	3	0.93
	12	+143.64 to +153.60	4	0.98
	14	+141.64 to +151.23	5	0.99
	16	+141.39 to +146.98	5	1.14
	18	+141.39 to +145.14	5	1.27
297L	6	+188.06	2	< 0.87
	8	+174.30 to +186.81	2	0.87
	10	+180.31	3	0.92
	12	+170.30 to +177.43	4	0.98

Note: Wall information, provided by AECOM, is based on Caltrans XS sheets 14-220-1 (Approval Date of July 2011) and 14-220-2 (Approval Date of January 2012).

5.6 Foundation Design for Type 7SW Retaining Wall

RW No. 330R is a Type 7 Sound Wall-on-Retaining Wall (Type 7SW) proposed to be supported on a spread footing. RW No. 330R is located along the north side of the mainline, where cuts into the existing ascending slope are proposed in order to widen the existing freeway. General information for this wall is provided in Table 1.

5.6.1 Bearing Pressures

For the proposed Type 7SW wall, footing dimensions and bearing pressures are provided on the Caltrans XS sheets 14-380-1 and 14-380-2 (Approval Date of July 2011). The Caltrans XS sheets are included in Appendix C.

5.6.2 Bearing Capacity and Settlement

Per Caltrans LRFD design guidelines given in the latest Caltrans Memo To Designers (Caltrans, 2008), the Service-I Limit State bearing pressures must be less than the allowable bearing capacity of the foundation materials; the Service-I Limit State bearing pressures were also used to determine the anticipated settlement of the Type 7SW wall. The Strength Limit State and Extreme Event Limit State bearing pressures were used to compare with the factored bearing capacity and ultimate bearing capacity of the foundation materials, respectively. Based on the analyses, the bearing capacities of the Type 7SW wall spread footing, under the service limit, strength limit, and extreme limit states are greater than the bearing pressures shown on the XS sheets. Settlement and bearing capacity calculations are included in Appendix C.

Due to compressible materials beneath the footing, remedial overexcavation immediately below the wall footing is recommended to limit footing settlement. The horizontal extent of the overexcavation and backfill and compaction requirements are given in Section 5.9. Minimum overexcavation depth and resulting settlement for the wall are presented in Table 6.

Table 6. Overexcavation Depth and Settlement Estimates for Type 7SW Wall

Retaining Wall No.	Wall Height (feet)	Bottom of Footing Elevation (feet)	Recommended Minimum Overexcavation Depth Below Wall Footing (feet)	Estimated Settlement With Overexcavation (inch)
330R	8	+203.33	2	< 0.42
	10	+187.29 to +199.83	2	0.42
	12	+186.96 to +196.00	2	0.93
	14	+189.93 to +193.75	2	1.00

Note: Wall information, provided by AECOM, is based on Caltrans XS sheets 14-380-1 and 14-380-2 (Approval Date of July 2011).

5.6.3 Un-bonded Length of Ground Anchors

The recommended minimum un-bonded length of the vertical ground anchors is 15 feet.

5.7 Foundation Design for Type 1 (Case 2) Retaining Walls

Three Type 1 (Case 2) retaining walls, supported on spread footings, are proposed. All three walls (RW Nos. 240R and 280R, and middle portion of RW No. 302R) are located along the north side of the I-5 mainline, where cuts into the existing ascending slopes are proposed in order to widen the existing freeway. General information for each wall is provided in Table 1.

5.7.1 Bearing Pressures

For the proposed Type 1 (Case 2) walls, foundation information including footing width, footing thickness, and bearing pressure are based on Caltrans Revised Standard Plan Sheet B3-1B and are summarized in Table 7.

Table 7. Summary of Type 1 (Case 2) Wall Foundation Information

Wall Height (H) (feet)	Footing Width (W) (feet)	Footing Thickness (F) (feet)	Bearing Pressures (ksf)		
			Service-I Limit State	Strength Limit State	Extreme Event Limit State
6	7.5	1.5	1.0	2.2	4.4
8	9.5	2	1.0	2.3	5.0
10	11.0	2.25	1.3	2.6	6.5
12	12.5	2.5	1.5	2.7	7.0
14	15.5	2.67	1.9	3.1	6.1
16	17.25	2.83	2.1	3.6	6.9
18	19.5	3	2.4	3.9	7.0
20	21.75	3.33	2.7	4.5	7.1

5.7.2 Bearing Capacity and Settlement

Per Caltrans LRFD design guidelines given in the latest Caltrans Memo To Designers (Caltrans, 2008), the Service-I Limit State bearing pressures must be less than the allowable bearing capacity of the foundation materials; the Service-I Limit State bearing pressures were also used to determine the anticipated settlement of the Type 1 (Case 2) walls. The Strength Limit State and Extreme Event Limit State bearing pressures were used to compare with the factored bearing capacity and ultimate bearing capacity of the foundation materials, respectively. Based on the analyses, the bearing capacities of the Type 1 (Case 2) wall spread footing, under the service limit, strength limit, and extreme limit states are greater than the bearing pressures shown in Table 7. Settlement and bearing capacity calculations are included in Appendix C.

Due to compressible materials beneath the footing, remedial overexcavation immediately beneath the wall footing is recommended to limit footing settlement. The horizontal extent of the overexcavation and backfill and recompaction requirements are described in Section 5.9. Minimum overexcavation depth and resulting settlement for each wall are presented in Table 8. As shown in Table 8, the estimated settlement ranges between 0.7-inch and about 1.5 inches.

5.8 Foundation Design for Type 7 (Case 2) Retaining Walls

Two Type 7 (Case 2) retaining walls, supported on spread footings, are proposed for the project. Both walls (RW No. 218R and the end portions of RW No. 302R) are located along the north side of the I-5 mainline, where cuts into the existing ascending slopes are proposed to widen the existing freeway. General information for each wall is provided in Table 1.

Table 8. Overexcavation Depth and Settlement Estimates for Type 1 (Case 2) Walls

Retaining Wall No.	Wall Height (feet)	Bottom of Footing Elevation (feet)	Recommended Minimum Overexcavation Depth Below Wall Footing (feet)	Estimated Settlement With Overexcavation (inch)
240R	10	+164.18	2	0.73
	12	+146.75 to +154.03	2	0.90
	14	+153.87 to +163.77	4	1.10
	16	+157.10 to +162.60	4	1.30
	18	+151.32 to +159.25	4	1.50
280R	10	+133.75	2	0.68
	12	+133.50 to +143.00	2	0.83
	14	+133.33 to +142.84	3	0.90
	16	+131.92 to +141.02	4	1.00
	18	+131.75 to +133.75	4	1.10
	20	+131.42	4	1.20
302R (Between Wall LOL Station 5+36 and Wall LOL Station 9+44)	8	+193.06	2	0.72
	10	+191.56 to +196.06	2	0.75
	12	+190.73 to +195.81	2	0.90

Note: Wall information is based on Caltrans Revised Standard Plan Sheet B3-1B.

5.8.1 Bearing Pressures

For the proposed Type 7 (Case 2) retaining walls, foundation information including footing width, footing thickness, and bearing pressure were provided by AECOM and are summarized in Table 9.

Table 9. Summary of Type 7 (Case 2) Wall Foundation Information

Wall Height (H) (feet)	Footing Width (W) (feet)	Footing Thickness (F) (feet)	Bearing Pressures (ksf)		
			Service-I Limit State	Strength Limit State	Extreme Event Limit State
10	7.5	2.33	1.3	3.3	4.2
12	8.5	2.5	1.2	3.5	5.0
14	9.25	2.5	1.4	4.1	6.2
16	11.25	2.75	0.7	3.4	5.5
18	12.25	2.75	0.8	4.0	6.8
20	13.25	3	0.8	4.3	7.0
22	14.75	3.5	0.8	4.6	7.6

5.8.2 Bearing Capacity and Settlement

Per Caltrans LRFD design guidelines given in the latest Caltrans Memo To Designers (Caltrans, 2008), the Service-I Limit State bearing pressures must be less than the allowable bearing capacity of the foundation materials; the Service-I Limit State bearing pressures were also used to determine the anticipated settlement of the Type 7 (Case 2) walls. The Strength Limit State and Extreme Event Limit State bearing pressures were used to compare with the factored bearing capacity and ultimate bearing capacity of the foundation materials, respectively. Based on the analyses, the bearing capacities of the Type 1 (Case 2) wall spread footing, under the service limit, strength limit, and extreme limit states are greater than the bearing pressures shown on the XS sheets. Settlement and bearing capacity calculations are included in Appendix C.

Due to compressible materials beneath the wall footings, remedial overexcavation immediately beneath the wall footings is recommended to limit footing settlement. The horizontal extent of the overexcavation and backfill and recompaction requirements are described in Section 5.9. Minimum overexcavation depth and resulting settlement for each wall are presented in Table 10; the estimated settlement was determined to be about 1-inch or less.

5.8.3 Un-bonded Length of Vertical Ground Anchors

The recommended minimum un-bonded length of the vertical ground anchors is 15 feet.

Table 10. Overexcavation Depth and Settlement Estimates for Type 7 (Case 2) Walls

Retaining Wall No.	Wall Height (feet)	Bottom of Footing Elevation (feet)	Recommended Minimum Overexcavation Depth Below Wall Footing (feet)	Estimated Settlement With Overexcavation (inch)
218R	10	+182.67 to +188.43	2	0.82
	12	+186.26	2	0.90
	14	+182.50 to +186.26	2	0.85
	16	+182.25 to +184.45	2	0.62
	18	+182.25 to +183.25	2	0.65
302R (Between Begin Wall and Wall LOL Station 5+36; Between Wall LOL Station 9+44 and End Wall LOL)	10	+184.53	2	0.75
	14	+191.31 to +201.56	2	0.80
	16	+184.12 to +196.81	2	0.61
	18	+185.37 to +201.31	2	0.65
	20	+185.12 to +187.79	2	0.66
	22	+185.87	2	0.75

Note: Wall information including footing widths, footing thicknesses, and bearing pressures were provided by AECOM.

5.9 Overexcavations for Wall Foundations

Tables presenting minimum overexcavation depths below the bottom of proposed spread footings for walls have been provided in Sections 5.5 through 5.8. The overexcavations for the

spread footings should extend horizontally a minimum distance of 2 feet beyond the outside edges of the footings. The overexcavations should be backfilled using either granular Structure Backfill or Aggregate Base. The backfill material should be compacted to a minimum relative compaction of 95 percent of maximum density; the maximum density should be determined in accordance with California Test Method 216. The bottom of the overexcavations should be scarified to a minimum depth of 8 inches, moisture-conditioned to near optimum moisture content, and compacted to a minimum relative compaction of 95 percent of maximum density. Prior to placing backfill, the bottoms of the overexcavations should be inspected by qualified geotechnical personnel to confirm that the ground is firm and unyielding.

5.10 Global Stability

Global stability analyses were performed using the computer program SLIDE 5.0 (Rocscience, 2006) for both static and pseudostatic conditions. The maximum wall heights at each of the following retaining wall locations were analyzed:

- RW No. 218R at about Station 220+00 ("A" Line)
- RW No. 240R at about Station 245+75 ("A" Line)
- RW No. 274R at about Station 274+18 ("A" Line)
- RW No. 275L at about Station 274+18 ("A" Line)
- RW No. 280R at about Station 283+75 ("A" Line)
- RW No. 287L at about Station 291+25 ("A" Line)
- RW No. 297L at about Station 299+00 ("A" Line)
- RW No. 302R at about Station 303+50 ("A" Line)
- RW No. 330R at about Station 332+00 ("A" Line)

Shear strengths of existing fill material and in-situ native soils vary and are provided in Table 3.

Slope stability analyses were conducted for the static condition including a 2-foot soil surcharge (i.e., 250 psf) to represent traffic loading. Results of the analyses indicate that the global stability for the proposed walls meet the required minimum factor-of-safety of 1.5 for a deep-seated failure. Slope stability analysis under pseudo-static condition was performed using a seismic coefficient equal to 0.2g. Analysis indicates that the calculated factor of safety is greater than the required minimum of 1.1. The results of the slope stability analyses are included in Appendix C. Stability analyses of the proposed cut and fill slopes in Segment 2 were performed and the results of the analyses are included in the Geotechnical Design Report (EMI, 2012a) for this project.

For long-term stability of the proposed retaining walls in cut areas, the minimum factors-of-safety of 1.5 and 1.1 were used for static and pseudo-static conditions, respectively, since the walls provide support for existing adjacent developments, at the top of slopes, including residential and commercial properties and related infrastructure. For consistency, the same minimum factors-of-safety were used for long-term stability of the proposed retaining walls in fill areas.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 General Earthwork

Earthwork activities should be performed in accordance with Section 19 of the Caltrans Standard Specifications (2010b). Appropriate measures should be taken to prevent damage to existing adjacent structures and utilities.

Areas disturbed by construction activities should be overexcavated to a depth where undisturbed material is exposed. Finish grades should be reestablished using fill properly compacted to the required minimum relative compaction per Caltrans Standard Specifications (2010).

Heavy construction equipment should not be used immediately adjacent to shoring due to large lateral pressures induced by such equipment unless the shoring is designed to accommodate such pressures. Excavated soil or construction materials should not be stockpiled adjacent to shoring or open excavations. Stockpiled soil and construction materials should be set back a distance at least equal to the height of the excavation.

6.2 Overexcavations for Wall Foundations

Tables presenting minimum overexcavation depths below the bottom of proposed spread footings for walls have been provided in Sections 5.5 through 5.8. The overexcavations for the spread footings should extend horizontally a minimum distance of 2 feet beyond the outside edges of the footings. The overexcavations should be backfilled using either granular Structure Backfill or Aggregate Base. The backfill material should be compacted to a minimum relative compaction of 95 percent of maximum density; the maximum density should be determined in accordance with California Test Method 216. The bottom of the overexcavations should be scarified to a minimum depth of 8 inches, moisture-conditioned to near optimum moisture content, and compacted to a minimum relative compaction of 95 percent of maximum density. Prior to placing backfill, the bottoms of the overexcavations should be inspected by qualified geotechnical personnel to confirm that the ground is firm and unyielding.

6.3 Temporary Excavations

Temporary excavations must be properly sloped or shored in accordance with all applicable codes and regulations including OSHA standards. Any design and construction of temporary slopes or shoring should be made the contractor's responsibility. If a trench shoring design plan is required, the geotechnical consultant should review the plan to confirm that recommendations presented in this report have been applied to the design. Because of the short-term use of temporary shoring, lateral loads due to swell pressures from expansive soils can be neglected for temporary shoring. If temporary shoring walls are in place during the winter months, the ground/slopes behind the walls should be covered with plastic sheeting to minimize the infiltration of water into the ground behind the walls.

Qualified geotechnical personnel should inspect temporary slopes for erosion and sloughing, and should inspect temporary shoring for signs of instability and deformations, during construction. Refer to Section 6.4 for recommendations on monitoring ground movement for tall temporary excavations.

With respect to the temporary slopes required for constructing the proposed retaining walls, the length of the temporary slopes should not exceed 300 feet (measured along the proposed wall alignment) at any given time.

Soil or other construction materials should not be stockpiled adjacent to excavations. Stockpiles should be set back a minimum distance which is equal to the height of the excavation. Shoring should be designed for site specific conditions using input from qualified geotechnical personnel during construction.

The contractor is responsible for worker safety in the field during construction. The contractor should conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California. Also, other state, county, or municipal agency requirements may supersede recommendations presented herein. If a trench shoring design plan is required, the geotechnical consultant should review the plan to confirm that recommendations presented herein were used for design or provide additional recommendations.

6.4 Monitoring Ground Movement

The contractor should exercise care to minimize construction impacts to areas surrounding the proposed retaining walls. EMI recommends that a monitoring program be implemented during construction to monitor movement of the ground and slopes behind the retaining walls. EMI recommends installing survey monuments in the ground near and behind the top edge of the temporary construction slopes (behind the proposed walls on both the north and south sides of the mainline). In addition, it may be prudent to install slope inclinometers at the top of the temporary construction slopes on the north side of the mainline (behind RW Nos. 218R, 240R, and 302R). The slope inclinometers should extend from the ground surface to a depth of 10 feet below the toe of the existing slopes. The survey monuments should be measured by licensed surveyors and the inclinometer casings should be measured by qualified geotechnical personnel prior to excavating the temporary slopes so that baseline measurements can be established.

During construction of the retaining walls, the survey monuments should be regularly measured by licensed surveyors to detect any vertical movement, and, inclinometer casings should be regularly measured using an inclinometer probe to detect any deflection in the casing. As the excavations for the temporary slopes progress, and during construction of the proposed walls, regular monitoring of the monuments and inclinometers should be performed so that any ground movements can be discovered as soon as possible. If the measured vertical or lateral movement of the ground surface is excessive, construction should be stopped immediately and measures to mitigate the ground movement should be implemented.

6.5 Groundwater Control

During the recent 2011 geotechnical field investigation, groundwater was encountered between elevations +73.9 and +183.8 feet in only six of the twenty-two boreholes drilled for proposed non-standard retaining walls. Perched groundwater was encountered in seven of the thirty-four deep boreholes (>30 feet deep), drilled for Segment 2, at elevations ranging from about +74 to +184 feet (EMI, 2012a). Based on our observations, groundwater may be encountered during some of the wall footing construction. If groundwater is encountered, it should be controlled in accordance with Section 19-3.03D of the Caltrans Standard Specifications (2010b). Any seepage or groundwater removed from an excavation should be tested and disposed of in compliance with

all applicable local, state, and federal requirements. Free water should not be allowed to stand in any excavation.

6.6 Review of Construction Plans

Recommendations contained herein are based on current design information. The geotechnical consultant should review the final construction plans and specifications in order to confirm that the general intent of the recommendations contained in this report have been incorporated into the final construction documents.

6.7 Geotechnical Observation and Testing

Qualified geotechnical personnel should perform inspections and testing during the following stages of construction:

- Earthwork operations, including excavations and placement of compacted fill.
- Installation of casing or shoring if required.
- Installation of inclinometer casing to measure ground deformation.
- Installation of steel reinforcement and placement of concrete.
- Removal or installation of support of buried utilities or structures.
- When any unusual subsurface conditions are encountered.

7.0 LIMITATIONS

This report is intended for use by AECOM, the Orange County Transportation Authority, the California Department of Transportation, and the Cities of Dana Point and San Clemente for the proposed non-standard retaining walls that are part of the I-5 HOV Widening, Segment 2 Project. This report is based on the project as described herein and the information obtained from the exploratory boreholes and Cone Penetration Test (CPT) soundings at the approximate locations indicated on the attached plans. The findings and recommendations contained in this report are based on the results of the field investigation, laboratory tests, and engineering analyses. Also, soils and subsurface conditions encountered in the exploratory boreholes and CPT soundings are presumed to be representative of the project site; however, subsurface conditions and characteristics of soils between exploratory boreholes and CPT soundings can vary. Findings reflect an interpretation of the direct evidence obtained. Recommendations presented herein are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. EMI should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Modifications to the project plans or variations in subsurface conditions may require re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained herein are applicable to the specific design elements and locations which are the subject of this report. Data, opinions, and recommendations herein have no applicability to any other design elements or to any other locations, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of EMI.

EMI is not responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the Contractor, or any other person performing any of the construction, or for the

failure of any worker to carry out the construction in accordance with the Final construction drawings and specifications.

Services performed by EMI were conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

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APPENDIX A

LOG OF TEST BORINGS AND LOG OF CPT SOUNDINGS

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

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REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¾" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

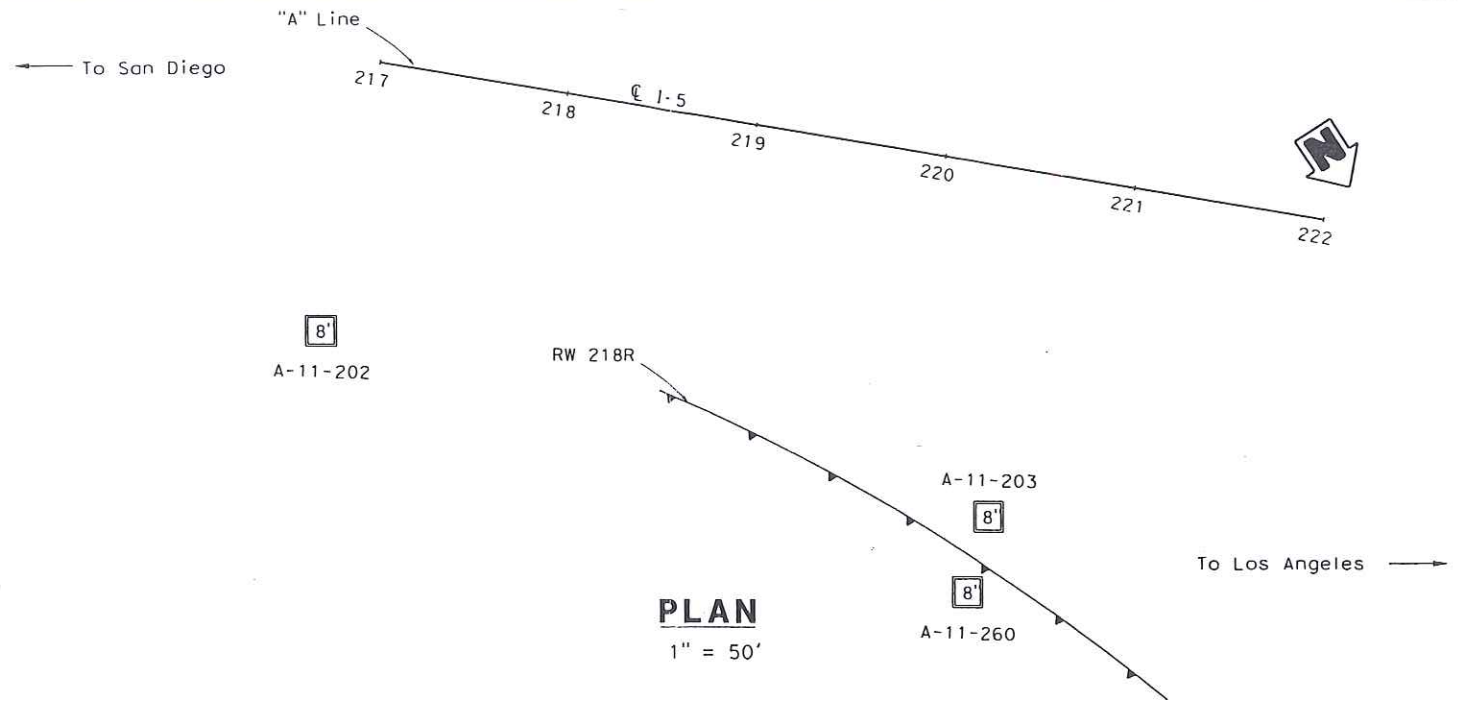
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

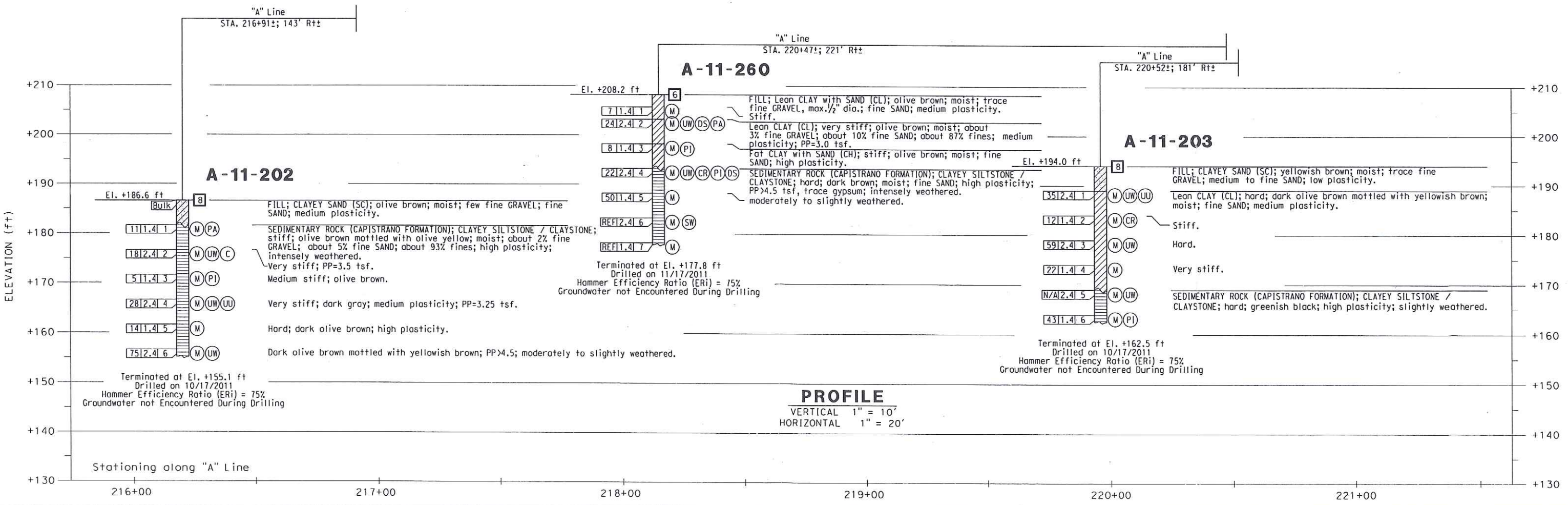
(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES 3.94

RETAINING WALL NO. 218R

LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

DATE PLOTTED => $DATE TIME PLOTTED => $TIME USERNAME => $USER

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER — DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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NOTES:

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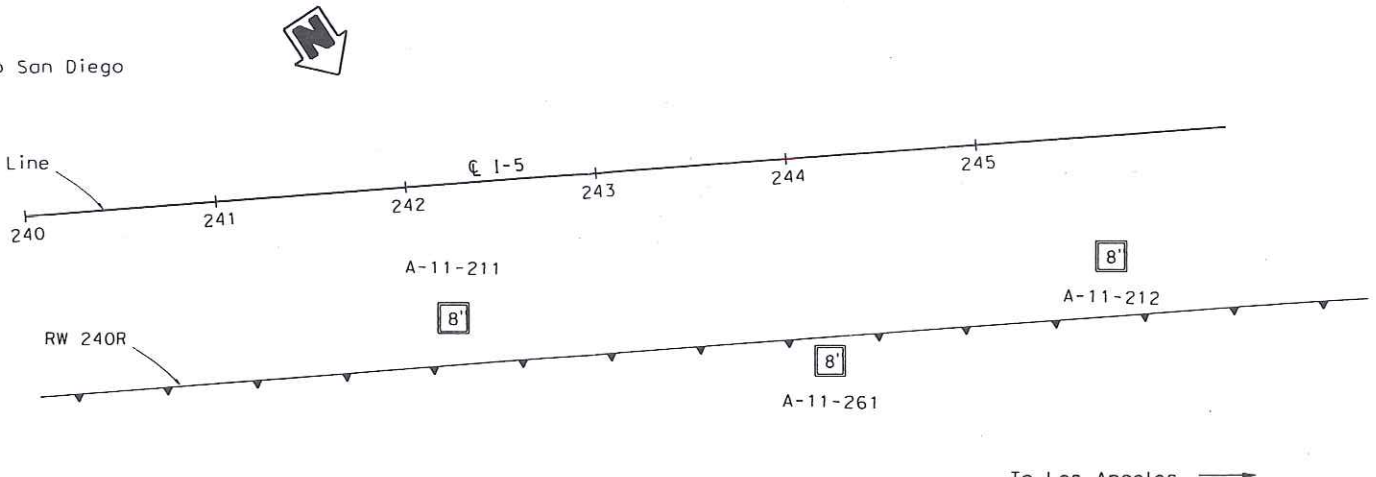
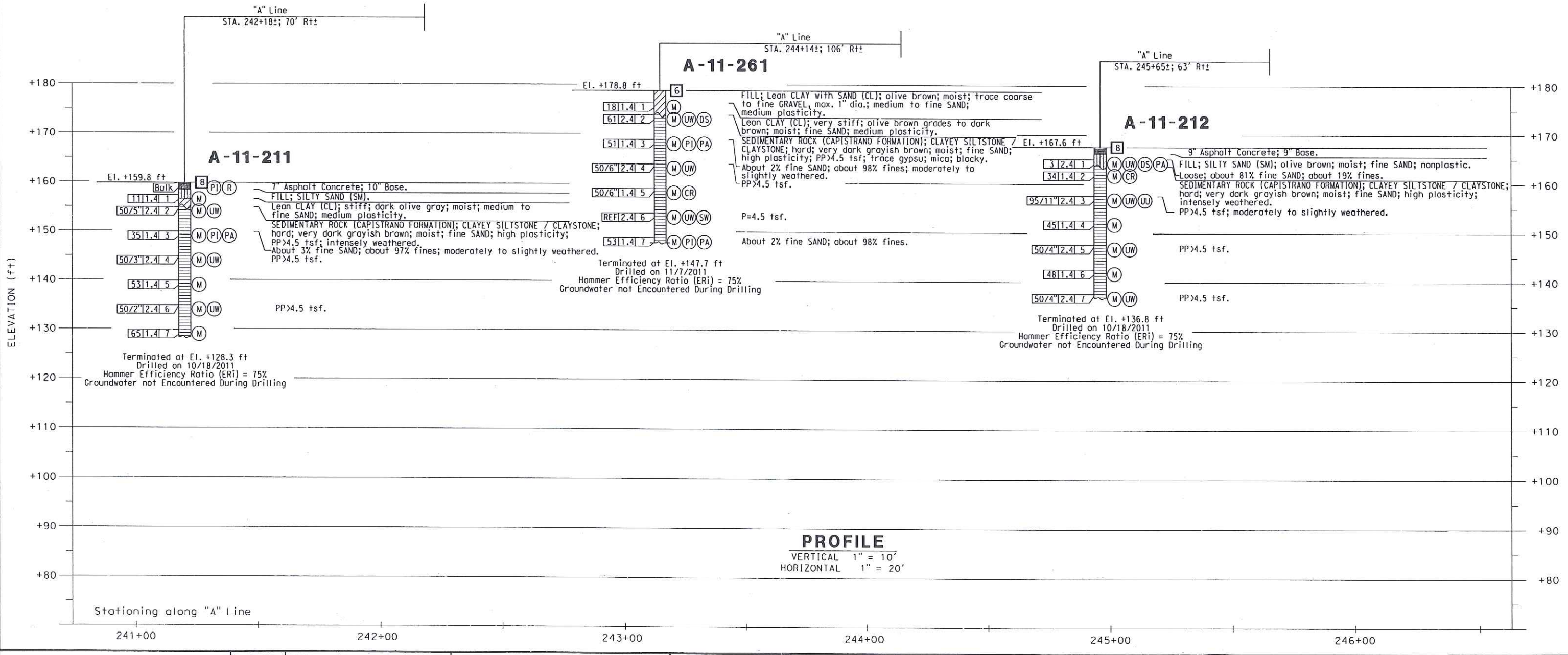


PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. - POST MILES 4.38	RETAINING WALL NO. 240R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN						LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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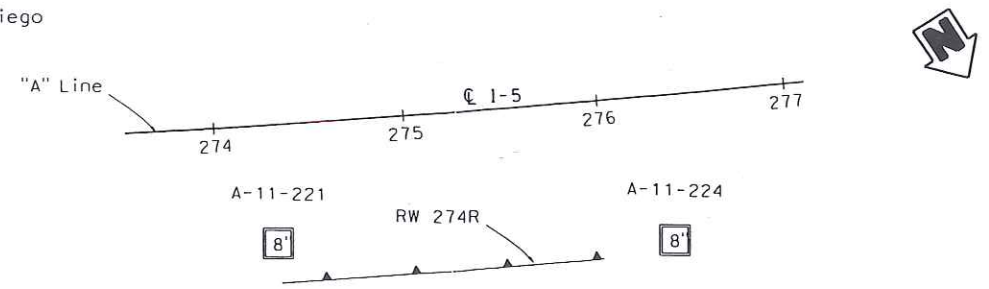
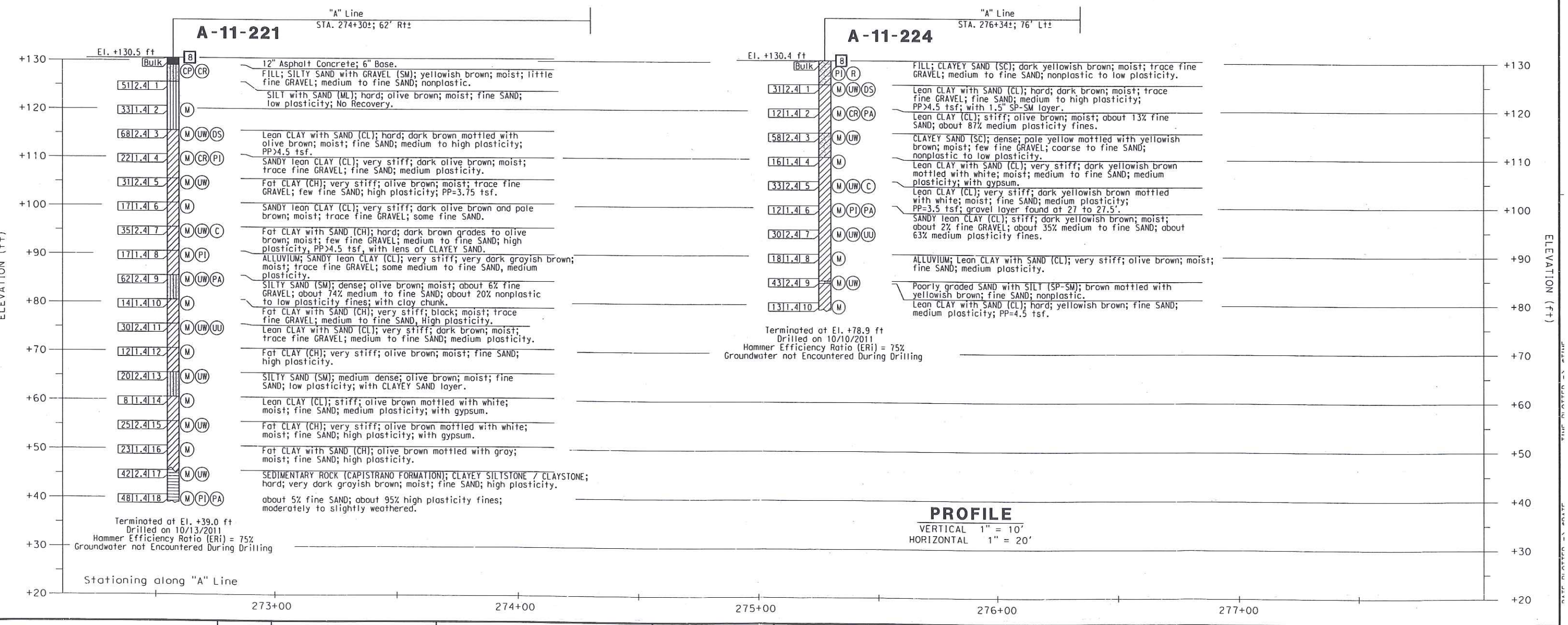


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL NO. 274R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES 4.99	LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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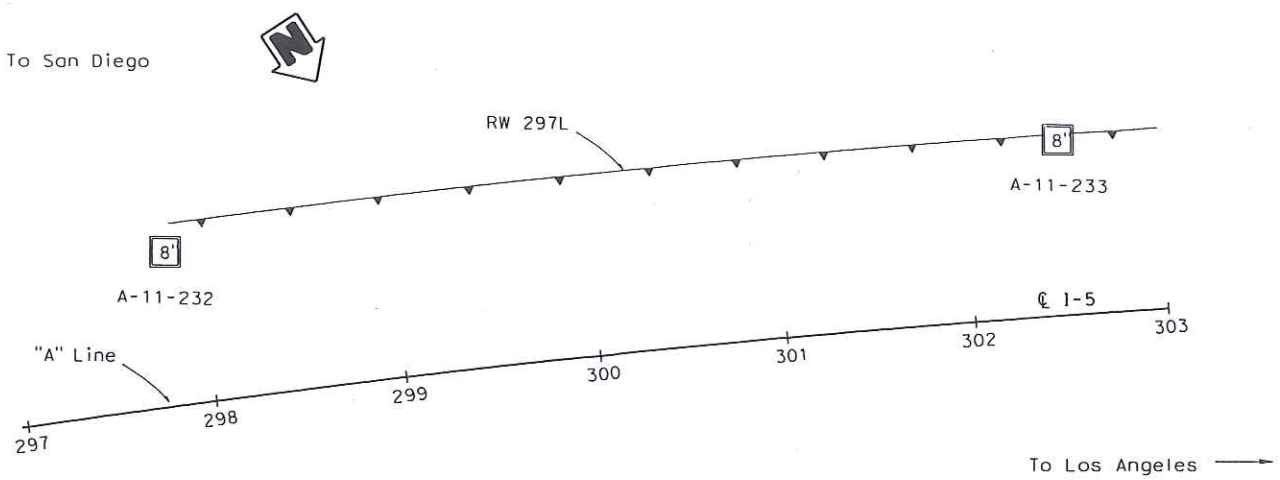

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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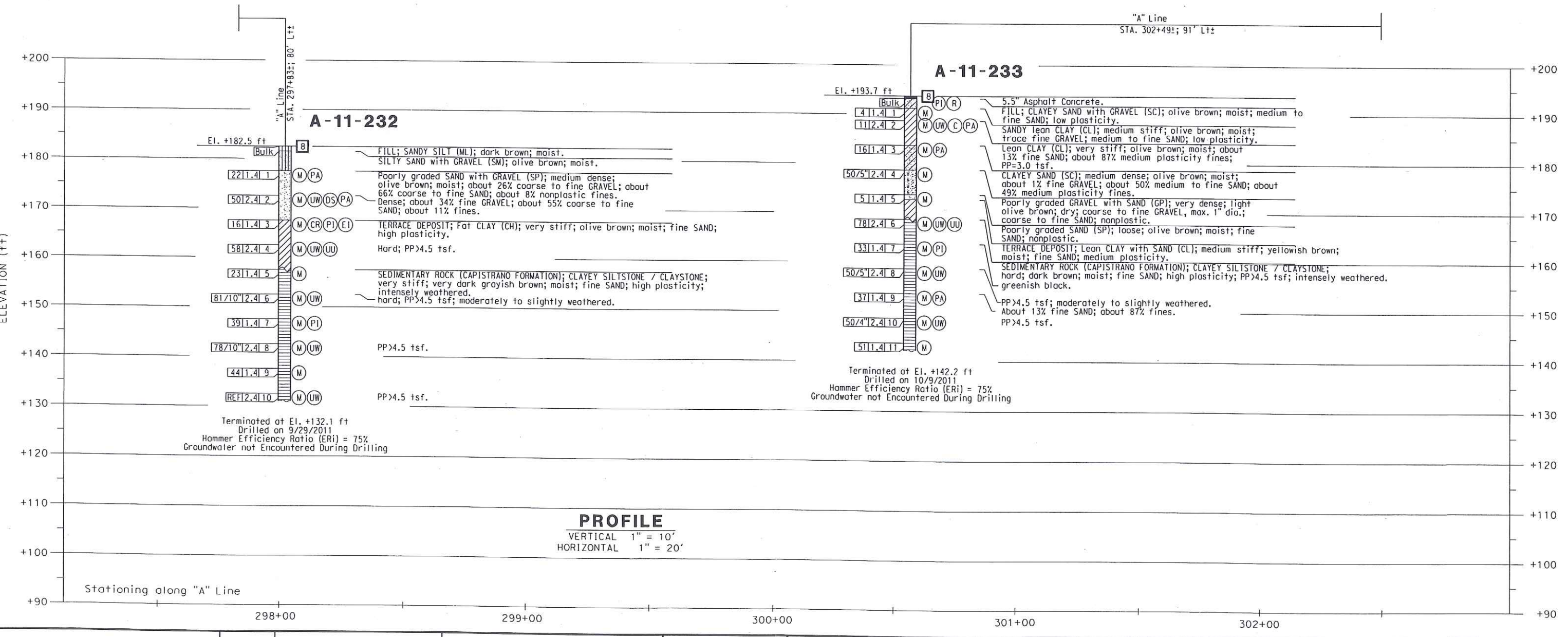
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE; K. KAEKUL; C. PONGSAKORNPATARA		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011				POST MILES 5.44

RETAINING WALL NO. 297L

LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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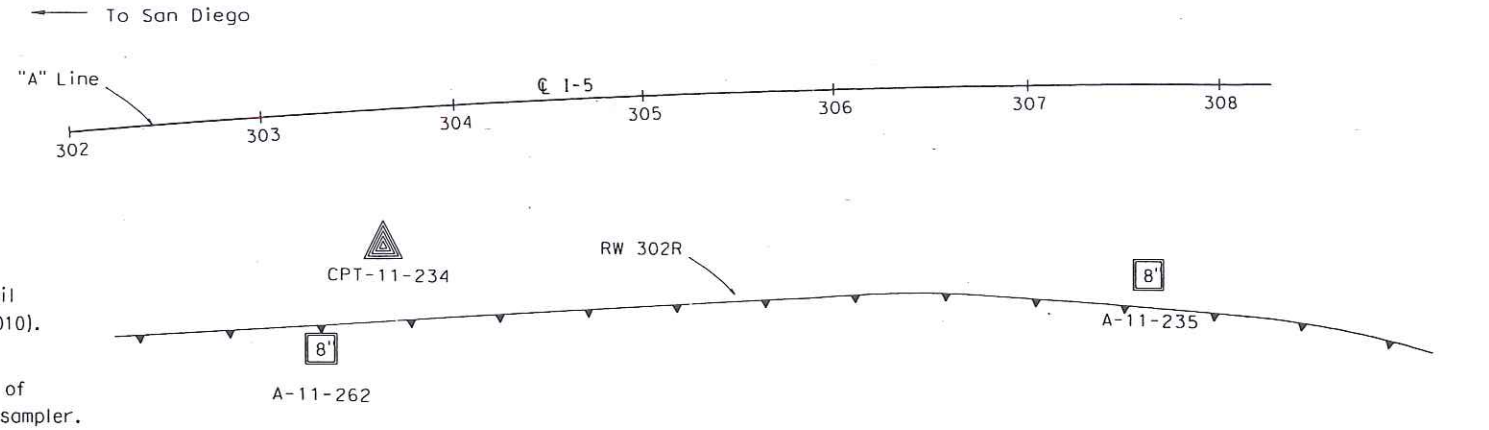

PLAN

1" = 50'

To Los Angeles

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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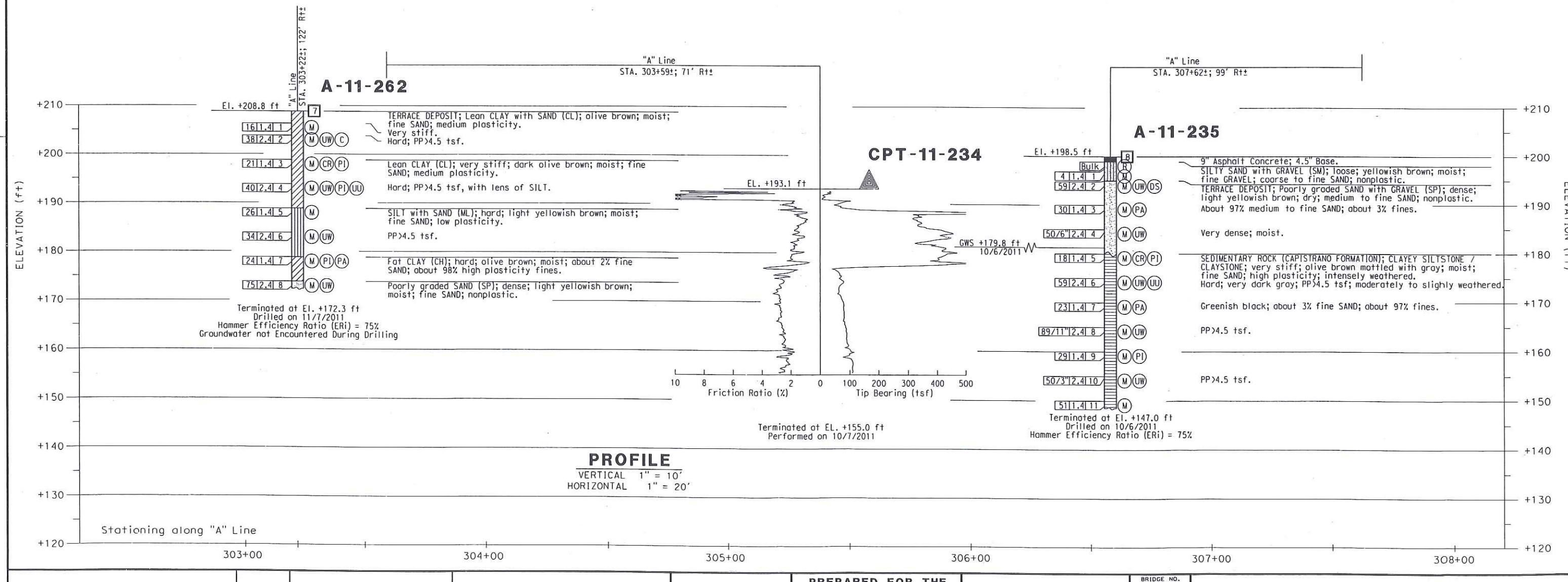
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -	RETAINING WALL NO. 302R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES 5.52	LOG OF TEST BORINGS NO. 1 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

THE DIGITIZED 1 STATE

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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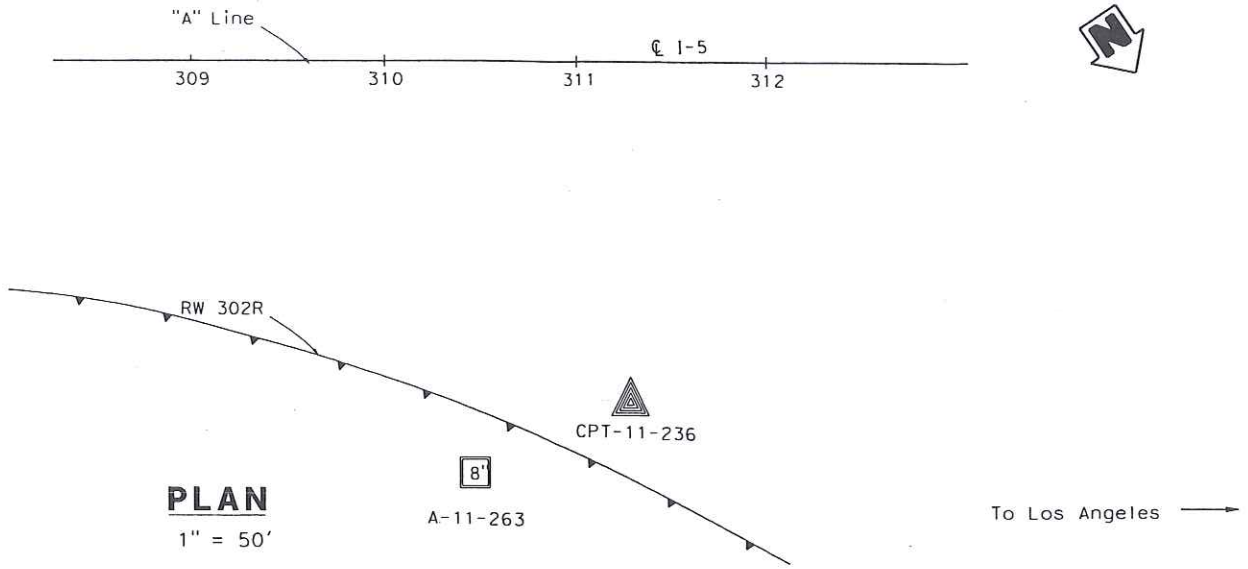

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE, CA 92863-1584

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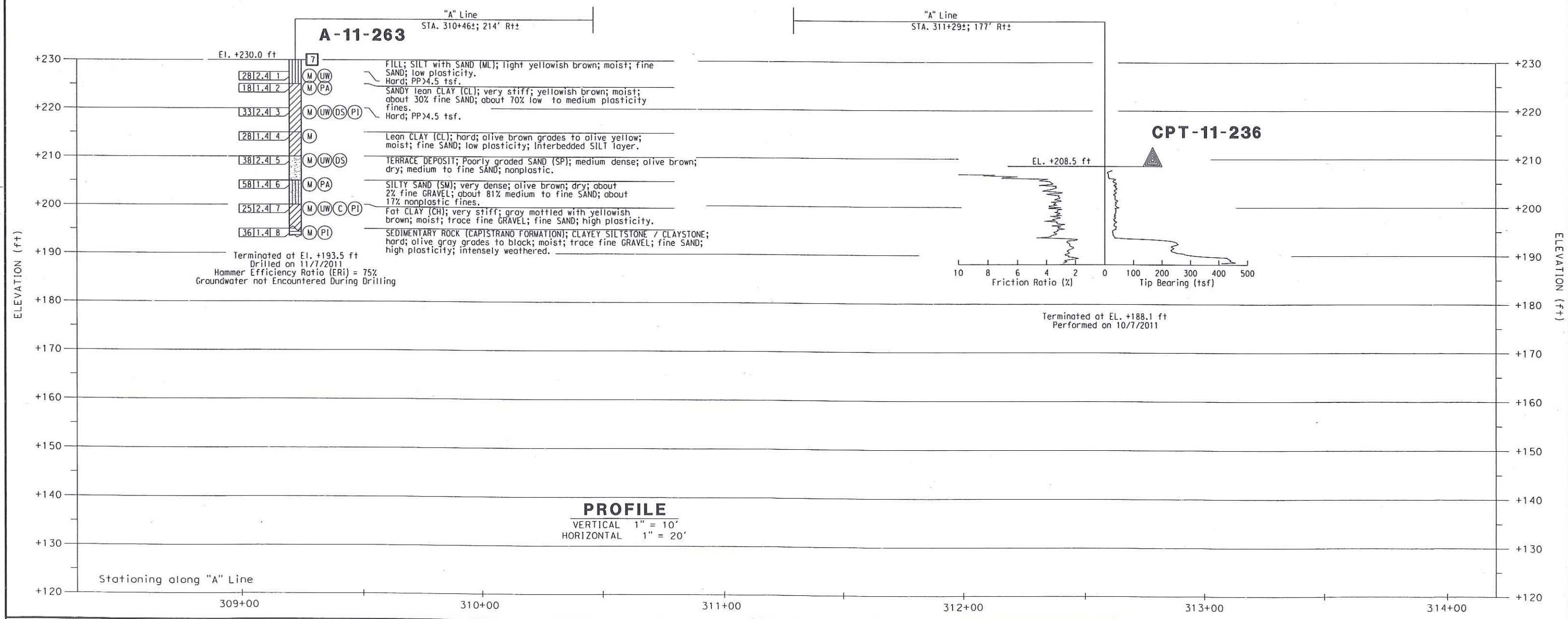
FOUNTAIN VALLEY, CA 92708



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -	RETAINING WALL NO. 302R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	R. JIE FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		POST MILES 5.52	LOG OF TEST BORINGS NO. 2 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 1200020278I

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

FILE => REQUEST

CONTRACT NO.:12-0E986I PROJECT ID:1200020278

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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550 S. MAIN STREET
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EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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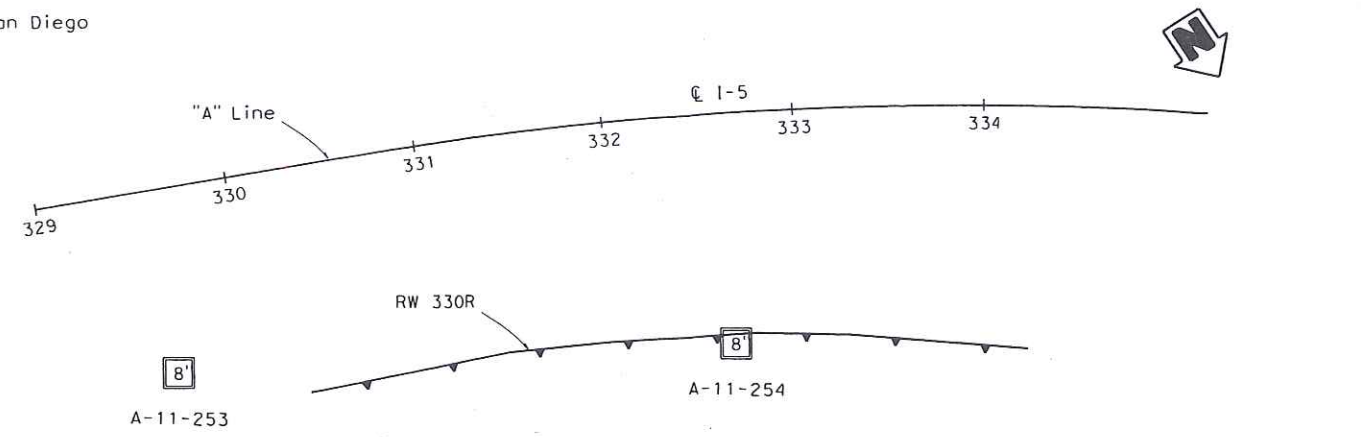
(2) 2.4" samples were taken using a California Modified Sampler.

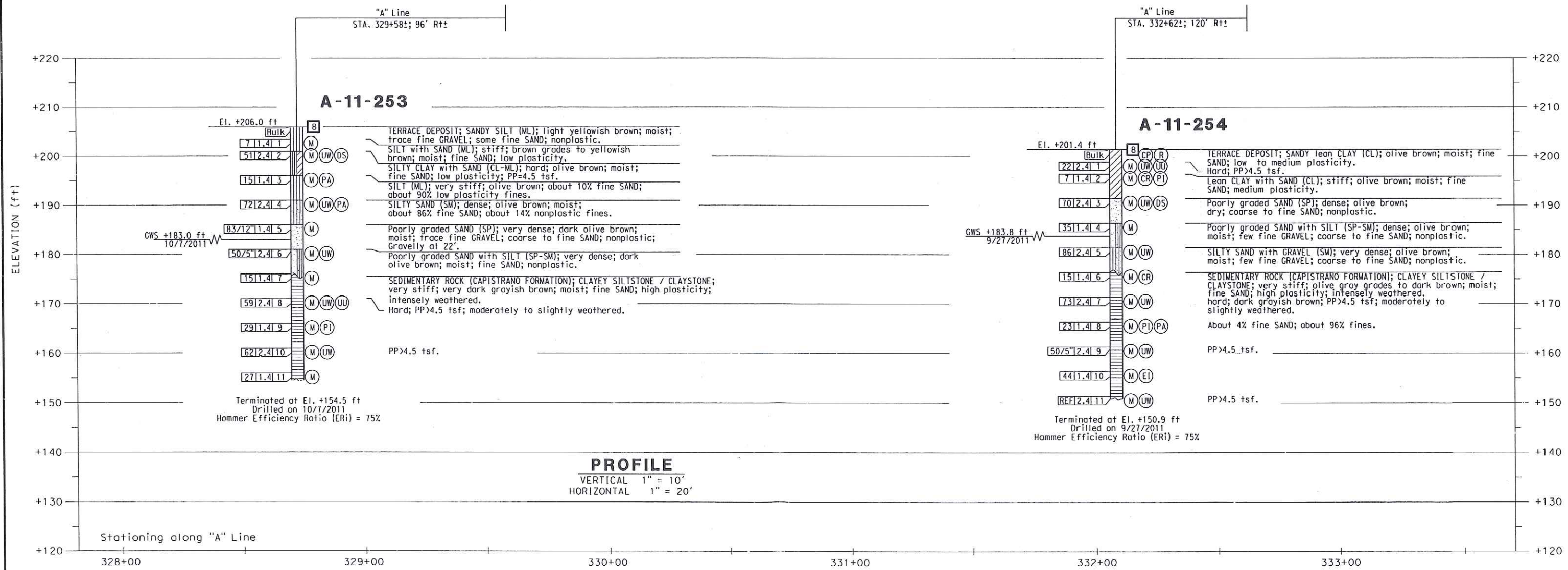
(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL NO. 330R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES 6.05	LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

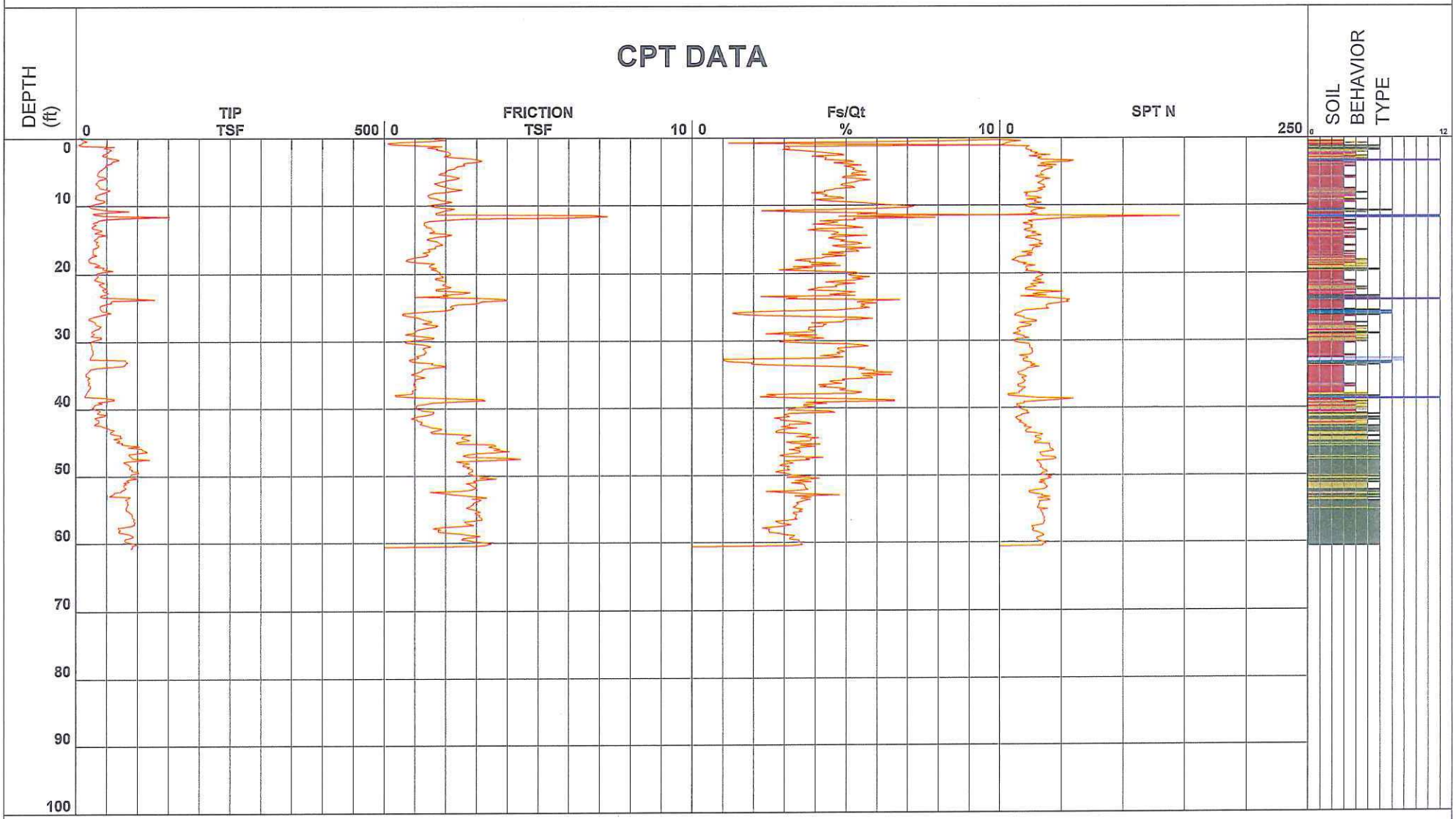
UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES | SHEET | OF

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(576).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-215	Date and Time	10/11/2011 10:34:01 PM	Maximum Depth	60.86 ft
Water Table Depth		>60.86 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qc1n PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
0.33	13.9	22.3	-	2.0	0.3	9.9	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	63	15	N/A	0.00	N/A	N/A
0.49	18.1	29.1	-	1.5	0.3	8.3	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	54	15	N/A	0.00	N/A	N/A
0.66	10.4	16.6	-	0.6	0.2	6.0	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	59	15	N/A	0.00	N/A	N/A
0.82	9.7	15.5	-	0.1	0.2	1.2	4	clayy SILT to silty CLAY	115	2.0	5	8	-	-	0.7	9.9	36	15	N/A	0.00	N/A	N/A
0.98	4.6	7.4	-	0.2	0.2	5.1	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	76	15	N/A	0.00	N/A	N/A
1.15	10.7	17.1	-	1.2	0.3	9.9	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.8	9.9	69	15	N/A	0.00	N/A	N/A
1.31	62.5	100.2	179.6	1.9	0.3	3.0	5	silty SAND to sandy SILT	120	4.0	16	25	67	48	-	-	21	16	N/A	0.00	N/A	N/A
1.48	45.0	72.1	155.0	1.4	0.3	3.2	5	silty SAND to sandy SILT	120	4.0	11	18	56	48	-	-	25	16	N/A	0.00	N/A	N/A
1.64	54.8	87.9	171.9	1.7	0.4	3.2	5	silty SAND to sandy SILT	120	4.0	14	22	63	48	-	-	23	16	N/A	0.00	N/A	N/A
1.80	57.6	92.4	169.6	1.7	0.3	2.9	5	silty SAND to sandy SILT	120	4.0	14	23	64	48	-	-	21	16	N/A	0.00	N/A	N/A
1.97	54.2	86.8	183.0	1.9	0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	24	15	N/A	0.00	N/A	N/A
2.13	52.5	84.2	191.6	2.1	0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	26	42	-	-	3.7	9.9	26	15	N/A	0.00	N/A	N/A
2.30	48.7	78.2	195.3	2.1	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	28	15	N/A	0.00	N/A	N/A
2.46	44.4	71.2	197.7	2.2	0.3	4.9	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.1	9.9	31	15	N/A	0.00	N/A	N/A
2.62	43.1	69.1	197.0	2.1	0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.0	9.9	31	15	N/A	0.00	N/A	N/A
2.79	50.1	80.3	184.3	2.0	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	26	15	N/A	0.00	N/A	N/A
2.95	53.0	85.0	202.5	2.3	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.7	9.9	27	15	N/A	0.00	N/A	N/A
3.12	63.9	102.5	223.2	2.8	0.3	4.4	9	very stiff fine SOIL	120	2.0	32	51	68	47	-	-	25	30	N/A	0.00	N/A	N/A
3.28	70.2	112.7	233.3	3.0	0.3	4.3	9	very stiff fine SOIL	120	2.0	35	56	71	47	-	-	24	30	0.00	-	0.11	0.0
3.45	62.1	99.7	242.7	3.2	0.3	5.1	9	very stiff fine SOIL	120	2.0	31	50	67	46	-	-	28	30	0.00	-	0.11	0.0
3.61	58.0	93.0	237.4	3.0	0.3	5.3	9	very stiff fine SOIL	120	2.0	29	46	65	46	-	-	29	30	0.00	-	0.11	0.0
3.77	58.2	93.4	219.6	2.7	0.3	4.6	9	very stiff fine SOIL	120	2.0	29	47	65	46	-	-	27	30	0.00	-	0.11	0.0
3.94	51.3	82.3	216.8	2.6	0.3	5.0	9	very stiff fine SOIL	120	2.0	26	41	61	45	-	-	29	30	0.00	-	0.11	0.0
4.10	47.8	76.7	222.1	2.6	0.1	5.5	9	very stiff fine SOIL	120	2.0	24	38	58	45	-	-	32	30	0.00	-	0.11	0.0
4.27	49.0	78.5	210.4	2.4	-0.5	5.0	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	30	15	0.00	-	0.11	0.0
4.43	44.8	71.8	207.2	2.3	-0.5	5.2	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.2	9.9	32	15	0.00	-	0.11	0.0
4.59	43.6	69.9	207.2	2.3	-0.5	5.3	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	32	15	0.00	-	0.11	0.0
4.76	39.9	64.0	197.0	2.1	-0.5	5.2	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	33	15	0.00	-	0.11	0.0
4.92	37.8	60.7	196.2	2.0	-0.5	5.4	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
5.09	35.8	57.3	-	2.0	-0.5	5.7	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	36	15	-	-	0.11	-
5.25	35.7	57.2	187.4	1.9	-0.5	5.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
5.41	34.3	55.0	182.9	1.8	-0.6	5.2	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	35	15	0.00	-	0.11	0.0
5.58	37.2	59.6	-	2.1	-0.6	5.7	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	36	15	-	-	0.11	-
5.74	45.4	72.9	203.6	2.3	-0.6	5.0	4	clayy SILT to silty CLAY	115	2.0	23	36	-	-	3.2	9.9	31	15	0.00	-	0.11	0.0
5.91	50.2	80.4	211.5	2.4	-0.6	4.9	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	29	15	0.00	-	0.11	0.0
6.07	43.0	69.0	209.8	2.3	-0.6	5.5	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.0	9.9	33	15	0.00	-	0.11	0.0
6.23	36.2	58.1	-	2.1	-0.6	5.9	3	silty CLAY to CLAY	115	1.5	24	39	-	-	2.5	9.9	36	15	-	-	0.11	-
6.40	36.5	58.5	194.3	2.0	-0.6	5.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	35	15	0.00	-	0.11	0.0
6.56	34.3	55.0	-	1.8	-0.9	5.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	36	15	-	-	0.11	-
6.73	32.2	51.6	-	1.6	-0.9	5.1	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	36	15	-	-	0.11	-
6.89	35.0	53.6	175.6	1.7	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
7.05	37.6	57.0	178.9	1.8	-0.9	4.9	4	clayy SILT to silty CLAY	115	2.0	19	28	-	-	2.6	9.9	34	15	0.00	-	0.11	0.0
7.22	38.0	57.1	187.4	2.0	-0.9	5.3	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
7.38	38.8	57.6	189.7	2.1	-0.8	5.3	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
7.55	49.0	71.8	194.9	2.3	-0.9	4.7	4	clayy SILT to silty CLAY	115	2.0	24	36	-	-	3.4	9.9	30	15	0.00	-	0.11	0.0
7.71	55.5	80.6	204.1	2.5	-0.9	4.6	4	clayy SILT to silty CLAY	115	2.0	28	40	-	-	3.9	9.9	29	15	0.00	-	0.11	0.0
7.87	52.0	74.7	189.6	2.2	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	26	37	-	-	3.7	9.9	29	15	0.00	-	0.11	0.0
8.04	46.5	66.2	179.6	2.0	-0.9	4.4	4	clayy SILT to silty CLAY	115	2.0	23	33	-	-	3.3	9.9	30	15	0.00	-	0.11	0.0
8.20	41.8	58.9	159.8	1.6	-0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	2.9	9.9	30	15	0.29	-	0.11	1.3
8.37	35.4	49.4	156.6	1.5	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	34	15	0.37	-	0.11	1.4
8.53	32.2	51.7	162.7	1.4	-0.9	4.5	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	34	15	0.00	-	0.11	0.0
8.69	33.9	46.4	152.9	1.5	-0.9	4.4	4	clayy SILT to silty CLAY	115	2.0	17	23	-	-	2.4	9.9	35	15	0.49	-	0.11	2.2
8.86	31.0	49.6	-	1.5	-0.9	4.9	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	36	15	-	-	0.11	-
9.02	35.2	54.4	178.4	1.7	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	18	27	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
9.19	45.3	60.3	163.8	1.8	-0.9	4.0	4	clayy SILT to silty CLAY	115	2.0	23	30	-	-	3.2	9.9	30	15	0.00	-	0.11	0.0
9.35	47.2	62.3	173.2	2.0	-1.0	4.3	4	clayy SILT to silty CLAY	115	2.0	24	31	-	-	3.3	9.9	31	15	0.00	-	0.11	0.0
9.51	44.6	58.3	183.7	2.2	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	22	29	-	-	3.1	9.9	34	15	0.00	-	0.11	0.0
9.68	35.3	56.6	-	2.0	-0.9	5.7	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	36	15	-	-	0.11	-
9.84	27.6	44.3	-	1.7	-0.9	6.2	3	silty CLAY to CLAY	115	1.5	18	30	-	-	1.9	9.9	42	15	-	-	0.11	-
10.01	22.6	36.2	-	1.5	-0.9	6.7	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	46	15	-	-	0.11	-
10.17	22.3	35.8	-	1.6	-0.9	7.4	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	49	15	-	-	0.11	-
10.34	26.4	42.4	-	1.9	-0.9	7.2	3	silty CLAY to CLAY	115	1.5	18	28	-	-	1.8	9.9	45	15	-	-	0.11	-
10.50	38.6	61.8	-	2.3	-1.0	6.0	3	silty CLAY to CLAY	115	1.5	26	41	-	-	2.7	9.9	36	15	-	-	0.11	-
10.66	47.6	58.8	176.1	2.2	-1.4	4.6	4	clayy SILT to silty CLAY	115	2.0	24	29	-	-	3.3	9.9	33	15	0.00	-	0.11	0.0
10.83	86.0	105.5	162.1	1.9	-1.6	2.3	5	silty SAND to sandy SILT	120	4.0	22	26	69	45	-	-	17	16	0.00	-	0.11	0.0
10.99	52.8	64.2	156.2	1.8	-1.5	3.5	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.7	9.9	28	15	0.49	-	0.11	3.0
11.16	27.9	43.2	-	1.7	-1.5	6.1	3	silty CLAY to CLAY	115	1.5	19	29	-	-	1.9	9.9	42	15	-	-	0.11	-
11.32	32.1	49.0	-	1.7	-1.5	5.5	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	38	15	-	-	0.11	-
11.48	48.7	73.2	-	6.7	-1.3	9.9	9	very stiff fine SOIL	120	2.0	24	37	57	41	-	-	43	30	-	-	0.11	-
11.65	152.0	179.7	326.7	7.3	0.3	4.8	9	very stiff fine SOIL	120	2.0	76	90	86	47	-	-	21	30	0.00	-	0.11	0.0
11.81	75.3	96.4	316.4	6.0	0.0	8.0	9	very stiff fine SOIL	120	2.0	38	48	66	44	-	-	35	30	0.00	-	0.11	0.0
11.98	50.7	59.1	191.8	2.7	0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.6	9.9	35	15	0.00	-	0.11	0.0
12.14	37.1	52.7	-	2.0	0.4	5.4	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.6	9.9	37	15	-	-	0.11	-
12.30	35.5	44.1	-	1.5	0.4	4.2	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.5	9.9	36	15	-	-	0.11	-
12.47	27.8	38.5	-	1.3	0.4	4.9	3	silty CLAY to CLAY	115	1.5	19	26	-	-	1.9	9.9	40	15	-	-	0.11	-
12.63	29.6	40.4	-	1.3	0.4	4.5	4	clayy SILT to silty CLAY	115	2.0	15	20	-	-	2.1	9.9	38	15	-	-	0.11	-
12.80	33.2	40.2	-	1.3	0.4	4.0	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.11	-
12.96	27.9	37.1	-	1.4	0.4	5.0	3	silty CLAY to CLAY	115	1.5	19	25	-	-	1.9	9.9	41	15	-	-	0.11	-
13.12	26.1	34.3	-	1.4	0.3	5.4	3	silty CLAY to CLAY	115	1.5	17	23	-	-	1.8	9.9	44	15	-	-	0.11	-
13.29	27.8	36.1	-	1.5	0.3	5.7	3	silty CLAY to CLAY	115	1.5	19	24	-	-	1.9	9.9	44	15	-	-	0.11	-
13.45	37.3	43.7	-	1.5	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	36	15	-	-	0.11	-
13.62	42.8	46.8	142.9	1.6	0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	3.0	9.9	33	15	1.16	-	0.11	44.3
13.78	36.2	45.3	-	1.7	0.2	4.7	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	37	15	-	-	0.10	-
13.94	30.9	38.3	-	1.5	0.2	4.9	3	silty CLAY to CLAY	115	1.5	21	26	-	-	2.2	9.9	40	15	-	-	0.10	-
14.11	41.4	50.6	-	2.0	0.2	4.8	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	2.9	9.9	35	15	-	-	0.10	-
14.27	48.7	52.0	166.2	2.2	0.2	4.6	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.4	9.9	34	15	0.00	-	0.10	0.0
14.44	35.9	43.0	-	2.0	0.2	5.8	3	silty CLAY to CLAY	115	1.5	24	29	-	-	2.5	9.9	41	15	-	-	0.10	-
14.60	35.8	42.4	-	1.7	0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.5	9.9	38	15	-	-	0.10	-
14.76	33.6	39.3	-	1.5	0.1	4.6	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	38	15	-	-	0.10	-
14.93	29.7	34.4	-	1.4	0.1	4.8	3	silty CLAY to CLAY	115	1.5	20	23	-	-	2.1	9.9	42	15	-	-	0.10	-
15.09	30.9	35.3	-	1.5	0.1	5.1	3	silty CLAY to CLAY	115	1.5	21	24	-	-	2.1	9.9	42	15	-	-	0.10	-
15.26	35.9	40.6	-	1.7	0.1	4.9	3	silty CLAY to CLAY	115	1.5	24	27	-	-	2.5	9.9	39	15	-	-	0.10	-
15.42	33.3	37.3	-	1.8	0.1	5.5	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.3	9.9	43	15	-	-	0.10	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic -	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
15.58	33.4	37.0	-	1.8	0.1	5.7	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.3	9.9	43	15	-	-	0.10	-
15.75	36.9	40.5	-	1.9	0.1	5.3	3	silty CLAY to CLAY	115	1.5	25	27	-	-	2.6	9.9	40	15	-	-	0.10	-
15.91	37.0	40.2	-	1.7	0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.6	9.9	39	15	-	-	0.10	-
16.08	34.8	37.4	-	1.7	0.1	4.9	3	silty CLAY to CLAY	115	1.5	23	25	-	-	2.4	9.9	41	15	-	-	0.10	-
16.24	29.1	31.0	-	1.7	0.1	6.0	3	silty CLAY to CLAY	115	1.5	19	21	-	-	2.0	9.9	47	15	-	-	0.10	-
16.40	28.4	29.9	-	1.4	0.0	5.2	3	silty CLAY to CLAY	115	1.5	19	20	-	-	2.0	9.9	45	15	-	-	0.10	-
16.57	27.8	29.0	-	1.5	0.0	5.5	3	silty CLAY to CLAY	115	1.5	19	19	-	-	1.9	9.9	47	15	-	-	0.10	-
16.73	27.6	28.5	-	1.5	0.0	5.6	3	silty CLAY to CLAY	115	1.5	18	19	-	-	1.9	9.9	48	15	-	-	0.10	-
16.90	28.6	29.3	-	1.3	0.0	4.6	3	silty CLAY to CLAY	115	1.5	19	20	-	-	2.0	9.9	44	15	-	-	0.10	-
17.06	28.1	28.5	-	1.4	0.0	5.1	3	silty CLAY to CLAY	115	1.5	19	19	-	-	2.0	9.9	46	15	-	-	0.10	-
17.23	34.1	34.2	-	1.4	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	17	17	-	-	2.4	9.9	40	15	-	-	0.10	-
17.39	26.8	26.6	-	1.3	0.0	5.2	3	silty CLAY to CLAY	115	1.5	18	18	-	-	1.9	9.9	48	15	-	-	0.10	-
17.55	24.4	24.0	-	1.1	0.0	4.5	3	silty CLAY to CLAY	115	1.5	16	16	-	-	1.7	9.9	47	15	-	-	0.10	-
17.72	21.0	20.5	-	0.9	-0.1	4.4	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.4	9.9	50	15	-	-	0.10	-
17.88	20.8	20.1	-	0.8	-0.1	3.9	3	silty CLAY to CLAY	115	1.5	14	13	-	-	1.4	9.9	48	15	-	-	0.10	-
18.05	21.4	20.5	-	0.7	-0.1	3.5	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.5	9.9	46	15	-	-	0.10	-
18.21	22.9	21.8	-	0.9	-0.1	4.0	3	silty CLAY to CLAY	115	1.5	15	15	-	-	1.6	9.9	47	15	-	-	0.10	-
18.37	31.5	29.7	-	1.2	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	16	15	-	-	2.2	9.9	41	15	-	-	0.10	-
18.54	35.2	32.8	-	1.6	-0.1	4.8	3	silty CLAY to CLAY	115	1.5	23	22	-	-	2.4	9.9	42	15	-	-	0.10	-
18.70	39.4	36.4	-	1.5	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	20	18	-	-	2.7	9.9	38	15	-	-	0.10	-
18.87	30.6	28.0	-	1.5	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	20	19	-	-	2.1	9.9	46	15	-	-	0.10	-
19.03	46.1	42.7	128.1	1.5	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	23	21	-	-	3.2	9.9	33	15	1.90	-	0.10	51.2
19.19	43.4	39.1	-	1.7	-1.0	4.0	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.0	9.9	37	15	-	-	0.10	-
19.36	46.5	42.7	128.5	1.5	-1.0	3.4	4	clayy SILT to silty CLAY	115	2.0	23	21	-	-	3.2	9.9	33	15	1.89	-	0.10	51.2
19.52	60.3	55.2	131.4	1.7	-0.9	2.9	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	27	15	1.81	-	0.10	38.6
19.69	44.2	38.8	-	1.8	-0.9	4.1	4	clayy SILT to silty CLAY	115	2.0	22	19	-	-	3.1	9.9	37	15	-	-	0.10	-
19.85	34.6	30.1	-	1.8	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	23	20	-	-	2.4	9.9	46	15	-	-	0.10	-
20.01	32.8	28.3	-	1.8	-0.9	5.6	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	48	15	-	-	0.10	-
20.18	36.4	31.2	-	1.9	-0.9	5.2	3	silty CLAY to CLAY	115	1.5	24	21	-	-	2.5	9.9	45	15	-	-	0.10	-
20.34	36.8	31.3	-	1.9	-0.9	5.3	3	silty CLAY to CLAY	115	1.5	25	21	-	-	2.6	9.9	45	15	-	-	0.10	-
20.51	33.5	28.3	-	1.9	-0.9	6.0	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	49	15	-	-	0.10	-
20.67	31.8	26.6	-	1.7	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	21	18	-	-	2.2	9.9	48	15	-	-	0.10	-
20.83	30.5	25.3	-	1.7	-0.9	5.8	3	silty CLAY to CLAY	115	1.5	20	17	-	-	2.1	9.9	51	15	-	-	0.10	-
21.00	35.7	29.4	-	1.9	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	24	20	-	-	2.5	9.9	47	15	-	-	0.10	-
21.16	42.9	35.1	-	2.0	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	29	23	-	-	3.0	9.9	41	15	-	-	0.10	-
21.33	46.5	37.8	-	2.0	-0.9	4.5	4	clayy SILT to silty CLAY	115	2.0	23	19	-	-	3.2	9.9	39	15	-	-	0.10	-
21.49	38.0	30.6	-	2.0	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	25	20	-	-	2.6	9.9	46	15	-	-	0.10	-
21.65	39.5	31.6	-	1.9	-0.9	5.0	3	silty CLAY to CLAY	115	1.5	26	21	-	-	2.7	9.9	44	15	-	-	0.10	-
21.82	42.4	33.7	-	2.0	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	28	22	-	-	3.0	9.9	42	15	-	-	0.10	-
21.98	46.3	36.5	-	2.2	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	31	24	-	-	3.2	9.9	41	15	-	-	0.10	-
22.15	50.8	39.7	-	2.1	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	25	20	-	-	3.5	9.9	37	15	-	-	0.10	-
22.31	43.0	33.3	-	1.7	-0.9	4.1	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	3.0	9.9	40	15	-	-	0.10	-
22.47	44.8	34.5	-	1.7	-0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	22	17	-	-	3.1	9.9	38	15	-	-	0.10	-
22.64	46.7	35.7	-	2.2	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	31	24	-	-	3.2	9.9	41	15	-	-	0.10	-
22.80	52.9	40.1	-	2.8	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	35	27	-	-	3.7	9.9	41	15	-	-	0.10	-
22.97	51.0	38.4	-	2.6	-0.9	5.2	3	silty CLAY to CLAY	115	1.5	34	26	-	-	3.6	9.9	41	15	-	-	0.10	-
23.13	42.6	31.9	-	1.9	-0.9	4.6	3	silty CLAY to CLAY	115	1.5	28	21	-	-	3.0	9.9	42	15	-	-	0.10	-
23.30	39.5	29.3	-	2.1	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	26	20	-	-	2.7	9.9	47	15	-	-	0.10	-
23.46	45.6	38.0	100.6	1.0	-0.9	2.3	5	silty SAND to sandy SILT	120	4.0	11	10	35	38	-	-	30	16	2.33	-	0.10	51.2
23.62	90.6	75.3	167.6	3.1	-0.9	3.5	4	clayy SILT to silty CLAY	115	2.0	45	38	-	-	6.3	9.9	26	15	0.00	-	0.09	0.0
23.79	128.2	106.3	188.1	3.9	-0.9	3.1	5	silty SAND to sandy SILT	120	4.0	32	27	69	43	-	-	20	16	0.00	-	0.09	0.0
23.95	59.3	42.8	-	4.0	-0.4	6.9	3	silty CLAY to CLAY	115	1.5	40	29	-	-	4.1	9.9	44	15	-	-	0.09	-
24.12	56.7	40.7	-	3.2	0.0	5.8	3	silty CLAY to CLAY	115	1.5	38	27	-	-	4.0	9.9	42	15	-	-	0.09	-
24.28	58.3	41.5	-	3.1	-0.3	5.5	3	silty CLAY to CLAY	115	1.5	39	28	-	-	4.1	9.9	41	15	-	-	0.09	-
24.44	49.7	35.2	-	3.0	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	33	23	-	-	3.5	9.9	45	15	-	-	0.09	-
24.61	43.6	30.7	-	2.4	-0.3	5.7	3	silty CLAY to CLAY	115	1.5	29	20	-	-	3.0	9.9	46	15	-	-	0.09	-
24.77	39.3	27.5	-	2.2	-0.8	5.8	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	49	15	-	-	0.09	-
24.94	39.2	27.2	-	2.2	-0.3	5.7	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	49	15	-	-	0.09	-
25.10	39.2	27.1	-	2.3	-0.5	6.0	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	50	15	-	-	0.09	-
25.26	41.7	28.6	-	2.2	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	47	15	-	-	0.09	-
25.43	42.4	28.8	-	2.0	-1.2	4.9	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	45	15	-	-	0.09	-
25.59	50.6	40.4	117.9	1.5	-1.1	3.0	4	clayy SILT to silty CLAY	115	2.0	25	20	-	-	3.5	9.9	32	15	2.04	-	0.09	51.2
25.76	57.0	45.4	94.8	1.0	-0.2	1.8	5	silty SAND to sandy SILT	120	4.0	14	11	41	39	-	-	24	16	2.44	-	0.09	49.6
25.92	47.5	37.7	78.3	0.6	-0.1	1.4	5	silty SAND to sandy SILT	120	4.0	12	9	35	38	-	-	24	16	2.85	-	0.08	51.2
26.08	39.9	31.6	78.3	0.6	-0.1	1.6	5	silty SAND to sandy SILT	120	4.0	10	8	29	37	-	-	28	16	2.86	-	0.08	51.2
26.25	32.3	21.3	-	0.8	-0.1	2.4	4	clayy SILT to silty CLAY	115	2.0	16	11	-	-	2.2	9.9	40	15	-	-	0.08	-
26.41	26.5	17.4	-	1.0	-0.1	4.1	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.8	9.9	52	15	-	-	0.08	-
26.58	21.2	13.8	-	1.1	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	8.1	64	15	-	-	0.08	-
26.74	21.2	13.7	-	1.2	-0.4	6.3	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	8.0	66	15	-	-	0.08	-
26.90	27.1	17.4	-	1.3	-0.7	5.3	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.9	9.9	57	15	-	-	0.08	-
27.07	31.4	20.1	-	1.5	-0.7	5.2	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	53	15	-	-	0.08	-
27.23	31.5	20.0	-	1.5	-1.0	5.2	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	53	15	-	-	0.08	-
27.40	32.4	20.5	-	1.3	-1.0	4.1	3	silty CLAY to CLAY	115	1.5	22	14	-	-	2.2	9.9	49	15	-	-	0.08	-
27.56	34.2	21.5	-	1.5	-1.2	4.6	3	silty CLAY to CLAY	115	1.5	23	14	-	-	2.4	9.9	50	15	-	-	0.08	-
27.72	41.0	25.6	-	1.8	-1.2	4.5	3	silty CLAY to CLAY	115	1.5	27	17	-	-	2.8	9.9	46	15	-	-	0.08	-
27.89	39.4	24.5	-	1.7	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	26	16	-	-	2.7	9.9	47	15	-	-	0.08	-
28.05	37.8	23.3	-	1.4	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	25	16	-	-	2.6	9.9	46	15	-	-	0.08	-
28.22	32.0	19.6	-	1.2	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	49	15	-	-	0.08	-
28.38	29.0	17.7	-	1.1	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	19	12	-	-	2.0	9.9	52	15	-	-	0.08	-
28.54	25.5	15.5	-	1.0	-1.7	4.3	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.2	56	15	-	-	0.08	-
28.71	26.1	15.7	-	1.0	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.8	9.4	55	15	-	-	0.08	-
28.87	30.3	18.2	-	0.9	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	48	15	-	-	0.08	-
29.04	28.7	17.1	-	0.7	-1.7	2.5	4	clayy SILT to silty CLAY	115	2.0	14	9	-	-	2.0	9.9	45	15	-	-	0.08	-
29.20	24.5	14.5	-	1.0	-1.8	4.4	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.7	8.6	58	15	-	-	0.08	-
29.36	41.4	24.4	-	1.3	-1.8	3.3	4	clayy SILT to silty CLAY	115	2.0	21	12	-	-	2.9	9.9	42	15	-	-	0.08	-
29.53	41.7	24.5	-	1.6	-2.5	4.1	3	silty CLAY to CLAY	115	1.5	28	16	-	-	2.9	9.9	45	15	-	-	0.08	-
29.69	36.9	21.5	-	1.6	-2.9	4.5	3	silty CLAY to CLAY	115	1.5	25	14	-	-	2.5	9.9	49	15	-	-	0.08	-
29.86	30.0	17.4	-	1.1	-3.0	4.0	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	52	15	-	-	0.08	-
30.02	24.9	14.3	-	0.8	-3.0	3.2	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	53	15	-	-	0.08	-
30.19	24.2	13.9	-	0.7	-3.0	3.1	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	8.3	53	15	-	-	0.08	-
30.35	24.8	14.2	-	0.9	-3.0	4.0	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.4	57	15	-	-	0.08	-
30.51	25.3	14.3	-	1.3	-3.0	5.5	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	62	15	-	-	0.08	-
30.68	25.5	14.4	-	1.4	-3.0	5.9	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.6	64	15	-	-	0.08	-
30.84	26.4	14.8	-	1.5	-3.0	6.1	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	8.9	64	15	-	-	0.08	-

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The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

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Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
31.01	25.6	14.3	-	1.3	-3.0	5.7	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	63	15	-	-	0.08	-
31.17	26.6	14.8	-	1.3	-3.0	5.1	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	8.9	60	15	-	-	0.08	-
31.33	28.1	15.5	-	1.3	-3.0	5.1	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.3	59	15	-	-	0.08	-
31.50	27.6	15.2	-	1.3	-3.0	5.2	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	9.1	60	15	-	-	0.08	-
31.66	27.9	15.3	-	1.4	-3.0	5.3	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.2	60	15	-	-	0.08	-
31.83	28.2	15.3	-	1.3	-3.0	5.0	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.2	59	15	-	-	0.08	-
31.99	27.3	14.8	-	1.3	-3.0	5.2	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	8.9	60	15	-	-	0.08	-
32.15	25.1	13.5	-	1.2	-3.0	5.0	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.1	62	15	-	-	0.08	-
32.32	24.9	13.4	-	1.0	-3.0	4.5	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.0	60	15	-	-	0.08	-
32.48	23.3	12.4	-	1.1	-3.0	5.3	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.4	65	15	-	-	0.08	-
32.65	23.5	12.5	-	1.0	-3.0	4.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.4	63	15	-	-	0.08	-
32.81	80.6	56.9	85.5	0.8	-3.0	1.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	40	-	-	17	16	2.66	-	0.08	36.9
32.97	81.1	57.1	86.1	0.8	-3.0	1.1	5	silty SAND to sandy SILT	120	4.0	20	14	48	40	-	-	17	16	2.64	-	0.07	36.7
33.14	84.3	59.2	92.1	1.0	-3.0	1.2	5	silty SAND to sandy SILT	120	4.0	21	15	50	40	-	-	17	16	2.50	-	0.07	34.6
33.30	80.6	56.5	110.9	1.6	-3.0	2.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	39	-	-	23	16	2.15	-	0.06	37.3
33.47	79.8	55.7	109.2	1.5	-2.9	2.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	39	-	-	23	16	2.17	-	0.06	38.1
33.63	76.9	53.6	120.3	1.9	-2.9	2.5	5	silty SAND to sandy SILT	120	4.0	19	13	46	39	-	-	26	16	2.01	-	0.06	40.3
33.79	52.6	26.9	-	2.0	-2.9	4.0	4	clayy SILT to silty CLAY	115	2.0	26	13	-	-	3.6	9.9	43	15	-	-	0.05	-
33.96	33.7	17.2	-	1.7	-2.9	5.3	3	silty CLAY to CLAY	115	1.5	22	11	-	-	2.3	9.9	57	15	-	-	0.05	-
34.12	23.6	12.0	-	1.3	-2.9	6.1	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.1	69	15	-	-	0.05	-
34.29	23.0	11.6	-	1.2	-2.8	5.9	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.6	6.9	69	15	-	-	0.05	-
34.45	20.7	10.4	-	1.2	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.1	75	15	-	-	0.05	-
34.61	18.8	9.4	-	1.1	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.4	78	15	-	-	0.05	-
34.78	16.0	8.0	-	1.0	-2.8	7.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.5	86	15	-	-	0.05	-
34.94	16.2	8.0	-	0.9	-2.8	6.3	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.6	82	15	-	-	0.05	-
35.11	16.3	8.0	-	1.1	-2.8	7.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.6	86	15	-	-	0.05	-
35.27	20.9	10.2	-	1.2	-2.8	6.2	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.0	74	15	-	-	0.05	-
35.43	22.9	11.2	-	1.3	-2.8	6.4	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.6	72	15	-	-	0.05	-
35.60	18.8	9.1	-	1.1	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.3	79	15	-	-	0.05	-
35.76	20.3	9.8	-	1.0	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.8	72	15	-	-	0.05	-
35.93	20.8	10.0	-	1.0	-2.8	5.5	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	72	15	-	-	0.05	-
36.09	22.1	10.6	-	1.0	-2.8	4.9	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.3	68	15	-	-	0.05	-
36.26	21.4	10.2	-	1.0	-2.8	5.1	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.0	70	15	-	-	0.05	-
36.42	20.1	9.5	-	1.0	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.6	73	15	-	-	0.05	-
36.58	23.7	11.2	-	1.0	-2.8	4.5	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	65	15	-	-	0.05	-
36.75	23.9	11.3	-	1.0	-2.8	4.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.7	66	15	-	-	0.05	-
36.91	23.9	11.2	-	1.0	-2.8	4.6	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.7	65	15	-	-	0.05	-
37.08	21.5	10.1	-	1.0	-2.8	5.3	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	71	15	-	-	0.05	-
37.24	20.9	9.7	-	1.0	-2.8	5.6	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.7	73	15	-	-	0.05	-
37.40	19.0	8.8	-	0.9	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.1	76	15	-	-	0.05	-
37.57	18.5	8.5	-	1.0	-2.8	5.8	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.9	78	15	-	-	0.05	-
37.73	17.2	7.9	-	0.9	-2.8	6.3	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.5	83	15	-	-	0.05	-
37.90	16.6	7.6	-	0.9	-2.8	6.1	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.3	83	15	-	-	0.05	-
38.06	14.9	6.8	-	0.4	-2.8	2.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	3.8	72	15	-	-	0.05	-
38.22	14.6	6.6	-	0.4	-2.8	3.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.7	75	15	-	-	0.05	-
38.39	47.6	21.5	-	1.1	-2.9	2.3	4	clayy SILT to silty CLAY	115	2.0	24	11	-	-	3.3	9.9	39	15	-	-	0.05	-
38.55	61.9	27.8	-	2.1	-3.3	3.6	4	clayy SILT to silty CLAY	115	2.0	31	14	-	-	4.3	9.9	41	15	-	-	0.05	-
38.72	62.4	27.9	-	3.2	-5.9	5.3	3	silty CLAY to CLAY	115	1.5	42	19	-	-	4.3	9.9	47	15	-	-	0.05	-
38.88	50.1	22.3	-	3.3	-7.0	6.9	3	silty CLAY to CLAY	115	1.5	33	15	-	-	3.5	9.9	56	15	-	-	0.05	-
39.04	36.2	16.0	-	2.4	-7.6	7.0	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	65	15	-	-	0.05	-
39.21	42.9	18.9	-	1.6	-7.7	3.9	3	silty CLAY to CLAY	115	1.5	29	13	-	-	3.0	9.9	50	15	-	-	0.05	-
39.37	31.7	13.9	-	1.4	-7.7	4.7	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.2	8.5	60	15	-	-	0.05	-
39.54	30.1	13.2	-	1.1	-7.7	4.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.0	8.0	58	15	-	-	0.05	-
39.70	29.0	12.7	-	1.1	-7.7	3.9	3	silty CLAY to CLAY	115	1.5	19	8	-	-	2.0	7.7	59	15	-	-	0.05	-
39.86	26.5	11.5	-	1.1	-7.7	4.4	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	6.9	64	15	-	-	0.05	-
40.03	30.5	13.2	-	1.0	-7.7	3.7	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.1	8.0	57	15	-	-	0.05	-
40.19	38.0	16.4	-	1.2	-7.7	3.4	3	silty CLAY to CLAY	115	1.5	25	11	-	-	2.6	9.9	50	15	-	-	0.05	-
40.36	40.1	17.2	-	1.2	-7.7	3.3	3	silty CLAY to CLAY	115	1.5	27	11	-	-	2.7	9.9	49	15	-	-	0.05	-
40.52	36.4	15.5	-	1.6	-7.7	4.8	3	silty CLAY to CLAY	115	1.5	24	10	-	-	2.5	9.6	58	15	-	-	0.05	-
40.68	34.9	14.9	-	1.6	-7.7	5.0	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.4	9.1	60	15	-	-	0.05	-
40.85	49.2	20.9	-	1.6	-7.7	3.3	4	clayy SILT to silty CLAY	115	2.0	25	10	-	-	3.4	9.9	45	15	-	-	0.05	-
41.01	46.4	19.6	-	1.4	-7.7	3.2	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	46	15	-	-	0.05	-
41.18	37.4	15.7	-	1.2	-7.6	3.3	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.7	51	15	-	-	0.05	-
41.34	31.5	13.2	-	1.0	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.1	56	15	-	-	0.05	-
41.50	33.4	13.9	-	0.9	-7.6	2.9	3	silty CLAY to CLAY	115	1.5	22	9	-	-	2.3	8.5	52	15	-	-	0.05	-
41.67	37.6	15.6	-	1.1	-7.7	3.1	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.7	50	15	-	-	0.05	-
41.83	38.1	15.8	-	1.1	-7.7	3.1	3	silty CLAY to CLAY	115	1.5	25	11	-	-	2.6	9.8	50	15	-	-	0.05	-
42.00	37.4	15.4	-	1.2	-7.7	3.5	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.5	53	15	-	-	0.05	-
42.16	33.1	13.6	-	1.2	-7.6	4.0	3	silty CLAY to CLAY	115	1.5	22	9	-	-	2.3	8.3	58	15	-	-	0.05	-
42.32	30.1	12.3	-	1.2	-7.6	4.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	7.5	61	15	-	-	0.05	-
42.49	41.3	16.8	-	1.3	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.9	50	15	-	-	0.05	-
42.65	45.6	18.5	-	1.4	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	30	12	-	-	3.1	9.9	48	15	-	-	0.05	-
42.82	53.1	21.5	-	1.5	-7.6	3.0	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	43	15	-	-	0.05	-
42.98	54.7	22.0	-	1.9	-7.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	45	15	-	-	0.05	-
43.15	62.3	25.0	-	1.9	-7.6	3.1	4	clayy SILT to silty CLAY	115	2.0	31	13	-	-	4.3	9.9	41	15	-	-	0.05	-
43.31	58.8	23.5	-	1.7	-7.6	3.0	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.1	9.9	41	15	-	-	0.05	-
43.47	55.9	22.3	-	1.5	-7.6	2.9	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	42	15	-	-	0.05	-
43.64	57.0	22.6	-	1.6	-7.6	2.9	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	41	15	-	-	0.05	-
43.80	63.7	25.2	-	2.2	-7.6	3.6	4	clayy SILT to silty CLAY	115	2.0	32	13	-	-	4.4	9.9	43	15	-	-	0.05	-
43.97	73.0	28.8	-	2.8	-7.6	4.0	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.1	9.9	42	15	-	-	0.05	-
44.13	71.7	28.1	-	2.7	-7.6	3.9	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	42	15	-	-	0.05	-
44.29	74.9	29.3	-	2.5	-7.4	3.5	4	clayy SILT to silty CLAY	115	2.0	37	15	-	-	5.2	9.9	40	15	-	-	0.05	-
44.46	61.5	23.9	-	2.5	-7.4	4.3	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	46	15	-	-	0.05	-
44.62	70.0	27.2	-	2.7	-7.4	4.0	4	clayy SILT to silty CLAY	115	2.0	35	14	-	-	4.9	9.9	43	15	-	-	0.05	-
44.79	71.8	27.7	-	2.8	-7.4	4.0	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	43	15	-	-	0.05	-
44.95	66.5	25.6	-	2.5	-7.3	4.0	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.6	9.9	44	15	-	-	0.05	-
45.11	76.3	29.3	-	2.3	-7.4	3.2	4	clayy SILT to silty CLAY	115	2.0	38	15	-	-	5.3	9.9	38	15	-	-	0.05	-
45.28	74.2	28.4	-	2.4	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.2	9.9	39	15	-	-	0.05	-
45.44	85.3	32.5	-	3.6	-7.3	4.3	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	41	15	-	-	0.05	-
45.61	103.4	61.9	157.5	3.7	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	52	31	-	-	7.2	9.9	29	15	0.96	-	0.05	12.7
45.77	85.3	32.3	-	3.4	-7.3	4.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	40	15	-	-	0.05	-
45.93	107.4	64.1	155.1	3.6	-7.2	3.4	4	clayy SILT to silty CLAY	115	2.0	54	32	-	-	7.5	9.9	27	15	1.07	-	0.05	15.6
46.10	108.1	64.3	159.4	3.8	-7.2	3.6	4	clayy SILT to silty CLAY	115	2.0	54	32	-	-	7.5	9.9	28	15	0.89	-	0.05	10.3
46.26	113.1	67.2	153.4	3.6	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	57	34	-	-	7.9	9.9	26	15	1.15	-	0.05	17.4

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
46.43	116.1	68.9	164.4	4.1	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	58	34	-	-	8.1	9.9	27	15	0.00	-	0.05	0.0
46.59	101.2	38.2	-	3.6	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.1	9.9	36	15	-	-	0.05	-
46.75	87.4	33.0	-	3.0	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	38	15	-	-	0.05	-
46.92	86.1	32.5	-	2.7	-7.1	3.2	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	37	15	-	-	0.05	-
47.08	89.9	53.0	131.3	2.6	-7.1	2.9	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	28	15	1.87	-	0.05	40.9
47.25	91.3	53.7	136.2	2.8	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	46	27	-	-	6.4	9.9	29	15	1.79	-	0.04	40.1
47.41	93.1	35.1	-	4.0	-7.1	4.4	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	40	15	-	-	0.04	-
47.57	120.1	70.4	171.2	4.4	-7.1	3.8	4	clayy SILT to silty CLAY	115	2.0	60	35	-	-	8.4	9.9	28	15	0.00	-	0.04	0.0
47.74	90.1	34.0	-	3.4	-7.1	3.9	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	39	15	-	-	0.04	-
47.90	77.7	29.3	-	2.3	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	38	15	-	-	0.04	-
48.07	79.9	30.2	-	2.5	-7.1	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	38	15	-	-	0.04	-
48.23	84.4	31.8	-	2.8	-7.1	3.4	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	38	15	-	-	0.04	-
48.39	87.0	32.8	-	2.6	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	36	15	-	-	0.04	-
48.56	90.0	52.2	130.6	2.6	-7.1	2.9	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	28	15	1.88	-	0.04	41.7
48.72	87.8	33.1	-	2.8	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	36	15	-	-	0.04	-
48.89	87.2	32.9	-	2.7	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	36	15	-	-	0.04	-
49.05	92.6	53.4	137.9	2.9	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	46	27	-	-	6.4	9.9	29	15	1.72	-	0.04	40.4
49.22	90.3	34.1	-	2.9	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.03	-
49.38	100.6	57.9	136.7	2.9	-7.2	3.0	4	clayy SILT to silty CLAY	115	2.0	50	29	-	-	7.0	9.9	27	15	1.78	-	0.03	35.9
49.54	102.2	58.7	133.5	2.8	-7.1	2.8	5	silty SAND to sandy SILT	120	4.0	26	15	49	39	-	-	26	16	1.84	-	0.03	35.1
49.71	90.4	51.8	134.5	2.7	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	29	15	1.83	-	0.03	42.1
49.87	90.1	34.0	-	2.9	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.02	-
50.04	89.0	33.6	-	2.9	-7.1	3.4	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.2	9.9	37	15	-	-	0.02	-
50.20	89.1	33.6	-	3.4	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	39	15	-	-	0.02	-
50.36	100.9	57.5	141.8	3.1	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	50	29	-	-	7.0	9.9	28	15	1.58	-	0.02	36.3
50.53	88.3	33.3	-	3.7	-7.2	4.3	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	40	15	-	-	0.02	-
50.69	82.3	31.1	-	3.1	-7.2	3.9	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.02	-
50.86	86.7	32.7	-	2.9	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	37	15	-	-	0.02	-
51.02	77.5	29.3	-	3.0	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	42	15	-	-	0.02	-
51.18	82.7	31.2	-	2.7	-7.2	3.3	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	38	15	-	-	0.02	-
51.35	78.0	29.4	-	2.8	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	40	15	-	-	0.02	-
51.51	77.7	29.3	-	2.8	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	41	15	-	-	0.02	-
51.68	79.3	29.9	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	40	15	-	-	0.02	-
51.84	81.9	30.9	-	3.0	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.02	-
52.00	79.3	29.9	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	41	15	-	-	0.02	-
52.17	75.0	28.3	-	2.8	-7.2	3.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	42	15	-	-	0.02	-
52.33	73.6	27.8	-	2.5	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	40	15	-	-	0.02	-
52.50	63.1	23.8	-	1.5	-7.2	2.5	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	39	15	-	-	0.02	-
52.66	62.0	23.4	-	1.9	-7.2	3.3	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	43	15	-	-	0.02	-
52.82	59.2	22.3	-	2.2	-7.2	3.9	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.1	9.9	47	15	-	-	0.02	-
52.99	54.4	20.5	-	2.6	-7.2	5.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	53	15	-	-	0.02	-
53.15	88.5	33.4	-	3.0	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	37	15	-	-	0.02	-
53.32	85.9	32.4	-	3.3	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	40	15	-	-	0.02	-
53.48	80.8	30.5	-	2.9	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	40	15	-	-	0.02	-
53.64	82.4	31.1	-	3.2	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.02	-
53.81	84.8	32.0	-	3.1	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	39	15	-	-	0.02	-
53.97	83.9	31.7	-	3.0	-7.3	3.7	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.02	-
54.14	85.4	32.2	-	2.9	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.02	-
54.30	84.3	31.8	-	2.9	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.02	-
54.46	83.4	31.5	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	38	15	-	-	0.02	-
54.63	83.0	31.3	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.8	9.9	38	15	-	-	0.02	-
54.79	81.2	30.6	-	2.7	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.6	9.9	38	15	-	-	0.02	-
54.96	82.1	31.0	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	39	15	-	-	0.02	-
55.12	81.6	30.8	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.02	-
55.28	86.5	32.6	-	3.0	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	38	15	-	-	0.02	-
55.45	87.7	33.1	-	3.1	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	38	15	-	-	0.02	-
55.61	89.7	33.8	-	3.0	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	37	15	-	-	0.02	-
55.78	91.8	34.6	-	3.0	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	36	15	-	-	0.02	-
55.94	91.4	34.5	-	3.1	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.3	9.9	37	15	-	-	0.02	-
56.11	91.3	34.4	-	3.1	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.3	9.9	37	15	-	-	0.02	-
56.27	93.4	35.2	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	36	15	-	-	0.02	-
56.43	95.4	36.0	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	36	15	-	-	0.02	-
56.60	93.5	35.3	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.02	-
56.76	94.4	50.7	135.4	2.9	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.6	9.9	30	15	1.74	-	0.02	43.4
56.93	96.5	51.7	127.1	2.6	-7.3	2.8	4	clayy SILT to silty CLAY	115	2.0	48	26	-	-	6.7	9.9	28	15	1.92	-	0.02	42.2
57.09	95.2	50.9	128.1	2.7	-7.2	2.9	4	clayy SILT to silty CLAY	115	2.0	48	25	-	-	6.6	9.9	28	15	1.91	-	0.02	43.1
57.25	95.0	50.7	131.4	2.8	-7.3	3.0	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.6	9.9	29	15	1.87	-	0.01	43.3
57.42	90.6	34.2	-	2.9	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.01	-
57.58	79.4	30.0	-	2.4	-7.3	3.1	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.01	-
57.75	68.6	25.9	-	1.9	-7.3	2.9	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	39	15	-	-	0.01	-
57.91	69.8	26.3	-	1.6	-7.3	2.4	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	36	15	-	-	0.01	-
58.07	72.8	27.5	-	1.9	-7.3	2.7	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	37	15	-	-	0.01	-
58.24	70.0	26.4	-	1.7	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	37	15	-	-	0.01	-
58.40	70.6	26.6	-	1.8	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.9	9.9	37	15	-	-	0.01	-
58.57	81.6	43.1	114.1	2.1	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	41	22	-	-	5.6	9.9	30	15	2.10	-	0.01	51.2
58.73	87.3	46.1	124.6	2.5	-7.3	3.0	4	clayy SILT to silty CLAY	115	2.0	44	23	-	-	6.1	9.9	30	15	1.95	-	0.01	48.8
58.89	91.5	48.2	129.9	2.7	-7.3	3.1	4	clayy SILT to silty CLAY	115	2.0	46	24	-	-	6.4	9.9	30	15	1.89	-	0.00	46.2
59.06	93.4	35.3	-	3.1	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	36	15	-	-	0.00	-
59.22	88.7	33.5	-	2.9	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.2	9.9	37	15	-	-	0.00	-
59.39	81.0	30.6	-	2.6	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	38	15	-	-	0.00	-
59.55	79.6	30.0	-	2.5	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.00	-
59.71	80.4	30.3	-	2.8	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	40	15	-	-	0.00	-
59.88	84.7	32.0	-	2.9	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	39	15	-	-	0.00	-
60.04	94.3	35.6	-	3.3	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.00	-
60.21	98.7	37.3	-	3.5	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	49	19	-	-	6.9	9.9	36	15	-	-	0.00	-
60.37	92.7	35.0	-	3.3	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	38	15	-	-	0.00	-
60.53	92.4	34.9	-	3.0	-7.2	3.4	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	36	15	-	-	0.00	-

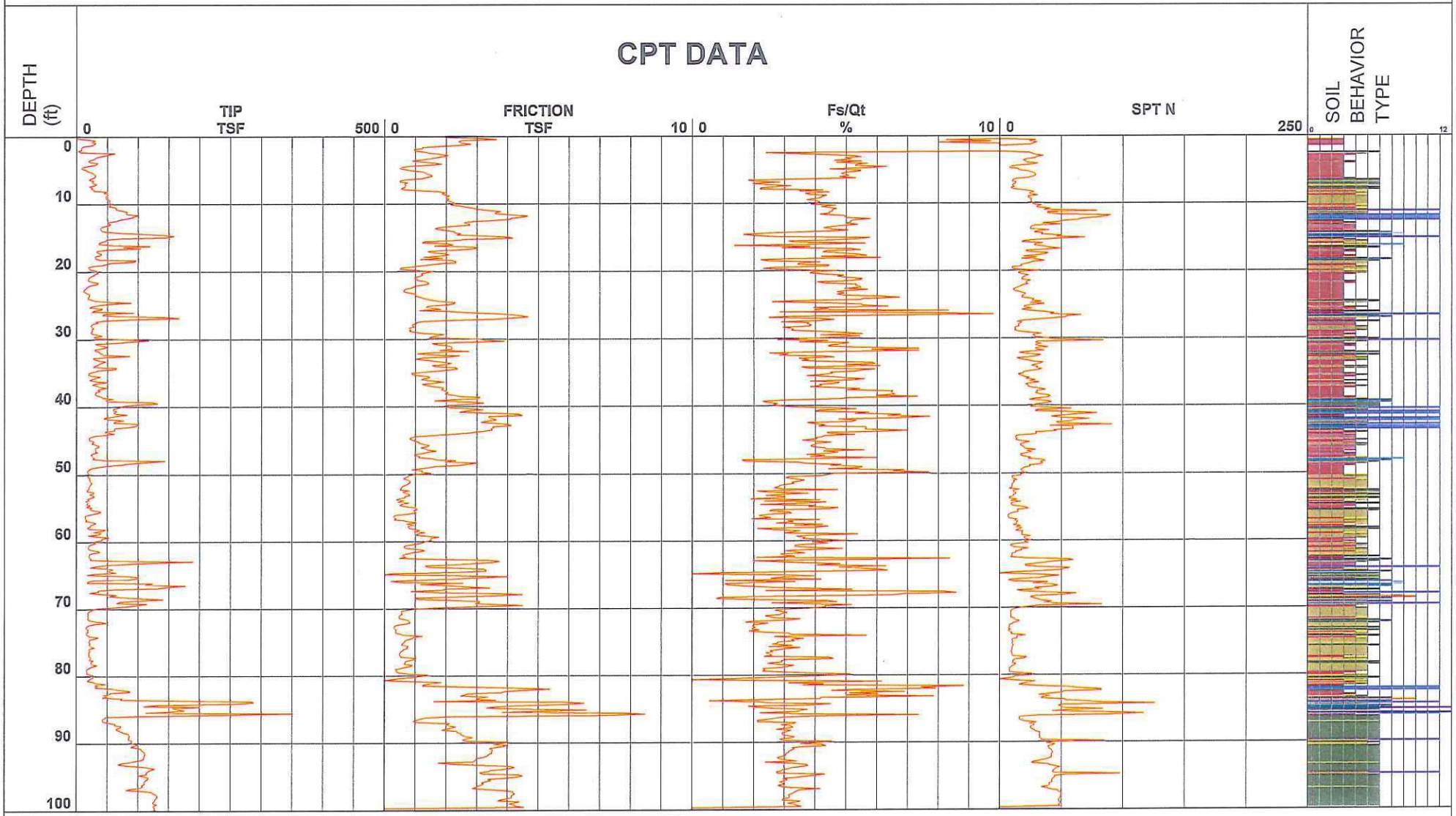
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(568).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-222	Date and Time	10/10/2011 12:58:35 AM	Maximum Depth	99.90 ft
Water Table Depth		>99.90 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
0.33	3.1	4.9	-	3.2	0.1	9.9	2	Organic SOILS - Peats	100	1.0	3	5	-	-	0.3	9.9	95	10	N/A	0.00	N/A	N/A
0.49	22.8	36.5	-	3.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	54	15	N/A	0.00	N/A	N/A
0.66	30.5	48.9	-	2.5	0.3	8.3	3	silty CLAY to CLAY	115	1.5	20	33	-	-	2.2	9.9	45	15	N/A	0.00	N/A	N/A
0.82	24.8	39.8	-	2.4	0.3	9.7	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	52	15	N/A	0.00	N/A	N/A
0.98	31.0	49.7	-	2.5	0.3	8.1	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	44	15	N/A	0.00	N/A	N/A
1.15	28.0	44.9	-	2.8	0.3	10.0	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	50	15	N/A	0.00	N/A	N/A
1.31	25.6	41.1	-	2.6	0.4	9.9	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	51	15	N/A	0.00	N/A	N/A
1.48	11.3	18.2	-	1.9	0.4	9.9	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	68	15	N/A	0.00	N/A	N/A
1.64	8.3	13.4	-	1.2	0.5	9.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	75	15	N/A	0.00	N/A	N/A
1.80	7.8	12.6	-	1.2	0.5	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.97	8.8	14.2	-	1.0	0.5	9.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	74	15	N/A	0.00	N/A	N/A
2.13	2.7	4.4	-	1.0	0.5	9.9	2	Organic SOILS - Peats	100	1.0	3	4	-	-	0.3	7.3	95	10	N/A	0.00	N/A	N/A
2.30	6.6	10.6	-	1.3	0.6	9.9	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.5	9.9	82	15	N/A	0.00	N/A	N/A
2.46	62.1	99.7	160.1	1.5	0.7	2.4	5	silty SAND to sandy SILT	120	4.0	16	25	67	48	-	-	18	16	N/A	0.00	N/A	N/A
2.62	54.8	87.8	175.2	1.8	0.8	3.3	5	silty SAND to sandy SILT	120	4.0	14	22	63	47	-	-	23	16	N/A	0.00	N/A	N/A
2.79	45.9	73.6	191.4	2.1	0.8	4.5	4	clayy SILT to silty CLAY	115	2.0	23	37	-	-	3.2	9.9	29	15	N/A	0.00	N/A	N/A
2.95	36.5	58.5	189.6	1.9	0.6	5.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	35	15	N/A	0.00	N/A	N/A
3.12	31.5	50.5	-	1.7	0.5	5.5	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.2	9.9	37	15	N/A	0.00	N/A	N/A
3.28	30.2	48.5	-	1.5	0.5	5.0	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	36	15	-	-	0.24	-
3.45	23.5	37.6	-	1.2	0.5	5.2	3	silty CLAY to CLAY	115	1.5	16	25	-	-	1.6	9.9	41	15	-	-	0.24	-
3.61	19.6	31.4	-	0.9	0.5	4.7	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	42	15	-	-	0.24	-
3.77	21.7	34.8	-	1.2	0.4	5.6	3	silty CLAY to CLAY	115	1.5	14	23	-	-	1.5	9.9	44	15	-	-	0.24	-
3.94	34.4	55.1	172.3	1.6	0.4	4.7	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	34	15	0.00	-	0.24	0.0
4.10	32.5	52.1	-	1.9	0.4	5.7	3	silty CLAY to CLAY	115	1.5	22	35	-	-	2.3	9.9	38	15	-	-	0.24	-
4.27	28.2	45.2	-	1.5	0.4	5.4	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	39	15	-	-	0.24	-
4.43	15.8	25.4	-	0.8	0.5	5.4	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	49	15	-	-	0.24	-
4.59	9.2	14.7	-	0.6	0.4	6.5	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	9.9	64	15	-	-	0.24	-
4.76	8.9	14.2	-	0.5	0.4	5.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	63	15	-	-	0.24	-
4.92	15.5	24.9	-	0.7	0.4	4.6	3	silty CLAY to CLAY	115	1.5	10	17	-	-	1.1	9.9	46	15	-	-	0.24	-
5.09	16.9	27.1	-	0.9	0.3	5.6	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	48	15	-	-	0.24	-
5.25	22.6	36.2	-	1.2	0.3	5.5	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	43	15	-	-	0.24	-
5.41	26.7	42.8	-	1.3	0.3	5.1	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	39	15	-	-	0.24	-
5.58	28.8	46.1	-	1.4	0.3	4.9	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.24	-
5.74	30.7	49.2	-	1.5	0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	36	15	-	-	0.24	-
5.91	30.4	48.8	-	1.5	0.3	5.2	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	37	15	-	-	0.24	-
6.07	28.7	46.0	-	1.4	0.3	4.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.24	-
6.23	22.9	36.8	-	1.2	0.3	5.4	3	silty CLAY to CLAY	115	1.5	15	25	-	-	1.6	9.9	42	15	-	-	0.24	-
6.40	20.3	32.5	-	0.7	0.4	3.8	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	39	15	-	-	0.24	-
6.56	28.0	44.4	95.2	0.5	0.4	1.8	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	25	16	2.43	-	0.24	50.8
6.73	25.3	39.7	96.0	0.5	0.4	2.1	5	silty SAND to sandy SILT	120	4.0	6	10	36	40	-	-	27	16	2.42	-	0.24	51.2
6.89	26.3	40.7	115.2	0.7	0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	31	15	2.08	-	0.23	51.2
7.05	32.6	49.9	103.5	0.6	0.2	2.0	5	silty SAND to sandy SILT	120	4.0	8	12	44	41	-	-	24	16	2.27	-	0.23	44.3
7.22	29.1	44.0	108.3	0.7	0.3	2.4	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	28	16	2.19	-	0.23	51.2
7.38	21.1	33.8	-	0.7	0.4	3.3	4	clayy SILT to silty CLAY	115	2.0	11	17	-	-	1.5	9.9	36	15	-	-	0.22	-
7.55	25.6	37.8	107.1	0.7	0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	13	19	-	-	1.8	9.9	31	15	2.21	-	0.22	51.2
7.71	24.4	35.7	97.1	0.5	0.4	2.3	4	clayy SILT to silty CLAY	115	2.0	12	18	-	-	1.7	9.9	30	15	2.39	-	0.22	51.2
7.87	28.2	40.7	100.9	0.6	0.4	2.2	5	silty SAND to sandy SILT	120	4.0	7	10	37	40	-	-	28	16	2.32	-	0.21	51.2
8.04	28.3	45.5	151.1	1.2	0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	35	15	0.52	-	0.21	2.4
8.20	50.3	71.2	163.9	1.8	0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	25	36	-	-	3.5	9.9	26	15	0.00	-	0.21	0.0
8.37	44.2	62.0	177.3	2.0	0.4	4.5	4	clayy SILT to silty CLAY	115	2.0	22	31	-	-	3.1	9.9	31	15	0.00	-	0.21	0.0
8.53	51.0	70.8	168.6	1.9	0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.6	9.9	27	15	0.00	-	0.21	0.0
8.69	51.5	70.9	172.3	2.0	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.6	9.9	28	15	0.00	-	0.21	0.0
8.86	48.4	66.0	180.4	2.1	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	24	33	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.02	47.8	64.5	175.2	2.0	0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.19	48.2	64.5	174.0	2.0	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.35	52.2	69.2	175.7	2.1	0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.7	9.9	29	15	0.00	-	0.21	0.0
9.51	54.5	71.6	170.9	2.0	0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	27	36	-	-	3.8	9.9	27	15	0.00	-	0.21	0.0
9.68	52.8	68.7	176.3	2.1	0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	29	15	0.00	-	0.21	0.0
9.84	54.4	70.3	180.6	2.3	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	27	35	-	-	3.8	9.9	29	15	0.00	-	0.21	0.0
10.01	56.4	72.3	180.3	2.3	0.4	4.1	4	clayy SILT to silty CLAY	115	2.0	28	36	-	-	4.0	9.9	28	15	0.00	-	0.21	0.0
10.17	55.7	70.8	173.8	2.2	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	28	35	-	-	3.9	9.9	28	15	0.00	-	0.21	0.0
10.34	52.8	66.5	188.6	2.5	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	26	33	-	-	3.7	9.9	31	15	0.00	-	0.21	0.0
10.50	63.7	79.6	192.9	2.7	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	32	40	-	-	4.5	9.9	27	15	0.00	-	0.21	0.0
10.66	65.0	80.7	200.2	2.9	0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	33	40	-	-	4.6	9.9	28	15	0.00	-	0.21	0.0
10.83	64.4	79.3	205.8	3.0	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	32	40	-	-	4.5	9.9	29	15	0.00	-	0.21	0.0
10.99	74.4	90.9	216.2	3.4	0.3	4.6	9	very stiff fine SOIL	120	2.0	37	45	64	44	-	-	27	30	0.00	-	0.21	0.0
11.16	82.7	100.4	228.1	3.8	0.3	4.6	9	very stiff fine SOIL	120	2.0	41	50	67	44	-	-	26	30	0.00	-	0.21	0.0
11.32	80.6	97.0	220.8	3.6	0.4	4.5	9	very stiff fine SOIL	120	2.0	40	48	66	44	-	-	26	30	0.00	-	0.21	0.0
11.48	81.1	97.0	220.9	3.6	0.3	4.5	9	very stiff fine SOIL	120	2.0	41	48	66	44	-	-	26	30	0.00	-	0.21	0.0
11.65	99.6	118.2	235.4	4.1	0.3	4.2	9	very stiff fine SOIL	120	2.0	50	59	73	45	-	-	23	30	0.00	-	0.21	0.0
11.81	94.1	110.8	252.0	4.6	0.3	5.0	9	very stiff fine SOIL	120	2.0	47	55	70	45	-	-	26	30	0.00	-	0.21	0.0
11.98	91.1	106.5	247.8	4.5	0.3	5.0	9	very stiff fine SOIL	120	2.0	46	53	69	44	-	-	27	30	0.00	-	0.21	0.0
12.14	82.8	96.1	235.9	4.1	0.3	5.1	9	very stiff fine SOIL	120	2.0	41	48	66	44	-	-	28	30	0.00	-	0.21	0.0
12.30	70.4	81.2	236.7	4.1	0.3	5.8	9	very stiff fine SOIL	120	2.0	35	41	60	43	-	-	32	30	0.00	-	0.21	0.0
12.47	65.5	75.0	215.2	3.5	0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	33	37	-	-	4.6	9.9	32	15	0.00	-	0.21	0.0
12.63	53.0	60.3	191.5	2.7	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	27	30	-	-	3.7	9.9	34	15	0.00	-	0.21	0.0
12.80	50.1	56.7	186.5	2.6	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	25	28	-	-	3.5	9.9	35	15	0.00	-	0.21	0.0
12.96	55.4	62.2	190.7	2.8	0.4	5.1	4	clayy SILT to silty CLAY	115	2.0	28	31	-	-	3.9	9.9	33	15	0.00	-	0.21	0.0
13.12	51.5	61.5	198.5	2.8	0.4	5.5	4	clayy SILT to silty CLAY	115	2.0	26	31	-	-	3.6	9.9	35	15	0.00	-	0.21	0.0
13.29	45.4	53.7	177.5	2.2	0.4	5.0	4	clayy SILT to silty CLAY	115	2.0	23	27	-	-	3.2	9.9	35	15	0.00	-	0.21	0.0
13.45	40.5	47.5	-	1.8	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.8	9.9	36	15	-	-	0.21	-
13.62	38.5	44.8	-	1.6	0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	36	15	-	-	0.21	-
13.78	39.6	45.7	-	1.8	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	20	23	-	-	2.8	9.9	36	15	-	-	0.21	-
13.94	41.4	51.4	-	2.1	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	21	26	-	-	2.9	9.9	36	15	-	-	0.21	-
14.11	50.7	54.6	168.8	2.3	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	25	27	-	-	3.6	9.9	33	15	0.00	-	0.21	0.0
14.27	73.5	78.7	162.2	2.3	0.4	3.1	5	silty SAND to sandy SILT	120	4.0	18	20	59	43	-	-	24	16	0.00	-	0.21	0.0
14.44	108.1	115.0	172.2	2.5	0.3	2.3	5	silty SAND to sandy SILT	120	4.0	27	29	72	45	-	-	17	16	0.00	-	0.21	0.0
14.60	141.0	149.1	183.8	2.4	0.3	1.7	6	clean SAND to silty SAND	125	5.0	28	30	80	46	-	-	11	16	0.00	-	0.21	0.0
14.76	158.0	166.1	213.8	3.3	0.2	2.1	5	silty SAND to sandy SILT	120	4.0	40	42	84	46	-	-	13	16	0.00	-	0.21	0.0
14.93	145.4	152.0	223.6	4.1	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	36	38	81	46	-	-	16	16	0.00	-	0.21	0.0
15.09	72.0	74.9	227.8	4.2	0.3	5.8	9	very stiff fine SOIL	120	2.0	36	37	57	42	-	-	33	30	0.00	-	0.21	0.0
15.26	49.1	55.6	-	2.7	0.3	5.5	4	clayy SILT to silty CLAY	115	2.0	25	28	-	-	3.4	9.9	36	15	-	-	0.21	-
15.42	47.7	50.7	167.2	2.2	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	24	25	-	-	3.3	9.9	35	15	0.00	-	0.21	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
15.58	41.3	42.3	124.4	1.3	0.3	3.2	4	clayy SILT to silty CLAY	115	2.0	21	21	-	-	2.9	9.9	32	15	1.95	-	0.21	51.2
15.75	37.3	37.9	122.4	1.2	0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	19	19	-	-	2.6	9.9	35	15	1.98	-	0.20	51.2
15.91	36.8	40.0	-	2.1	0.3	5.8	3	silty CLAY to CLAY	115	1.5	25	27	-	-	2.6	9.9	42	15	-	-	0.20	-
16.08	59.5	59.9	158.5	2.2	0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	30	30	-	-	4.2	9.9	30	15	0.55	-	0.20	3.8
16.24	118.8	119.1	147.6	1.6	0.2	1.4	6	clean SAND to silty SAND	125	5.0	24	24	73	45	-	-	12	16	1.00	-	0.20	4.9
16.40	76.0	75.8	178.9	2.9	0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	38	38	-	-	5.3	9.9	27	15	0.00	-	0.20	0.0
16.57	104.0	103.1	180.6	3.0	0.1	2.9	5	silty SAND to sandy SILT	120	4.0	26	26	68	44	-	-	20	16	0.00	-	0.20	0.0
16.73	51.4	53.0	-	2.7	0.2	5.3	4	clayy SILT to silty CLAY	115	2.0	26	27	-	-	3.6	9.9	36	15	-	-	0.20	-
16.90	35.0	35.8	-	1.9	0.2	5.6	3	silty CLAY to CLAY	115	1.5	23	24	-	-	2.4	9.9	44	15	-	-	0.20	-
17.06	32.4	32.8	-	1.4	0.2	4.5	3	silty CLAY to CLAY	115	1.5	22	22	-	-	2.3	9.9	41	15	-	-	0.20	-
17.23	35.7	35.8	-	1.5	0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	39	15	-	-	0.20	-
17.39	40.3	40.0	-	2.0	0.1	5.0	3	silty CLAY to CLAY	115	1.5	27	27	-	-	2.8	9.9	40	15	-	-	0.20	-
17.55	38.8	38.2	-	2.1	0.2	5.6	3	silty CLAY to CLAY	115	1.5	26	25	-	-	2.7	9.9	42	15	-	-	0.20	-
17.72	30.5	29.8	-	1.7	0.2	5.9	3	silty CLAY to CLAY	115	1.5	20	20	-	-	2.1	9.9	48	15	-	-	0.20	-
17.88	30.4	29.4	-	1.3	0.0	4.3	3	silty CLAY to CLAY	115	1.5	20	20	-	-	2.1	9.9	43	15	-	-	0.20	-
18.05	30.9	29.6	-	1.9	-2.1	6.3	3	silty CLAY to CLAY	115	1.5	21	20	-	-	2.1	9.9	49	15	-	-	0.20	-
18.21	37.4	35.4	116.1	1.2	-4.3	3.2	4	clayy SILT to silty CLAY	115	2.0	19	18	-	-	2.6	9.9	35	15	2.07	-	0.20	51.2
18.37	96.4	90.8	148.4	2.2	-4.3	2.3	5	silty SAND to sandy SILT	120	4.0	24	23	64	43	-	-	19	16	1.01	-	0.20	6.5
18.54	93.1	87.3	152.8	2.3	-4.3	2.5	5	silty SAND to sandy SILT	120	4.0	23	22	63	43	-	-	20	16	0.81	-	0.19	5.1
18.70	56.0	52.3	158.7	2.3	-4.2	4.2	4	clayy SILT to silty CLAY	115	2.0	28	26	-	-	3.9	9.9	33	15	0.59	-	0.19	25.1
18.87	50.2	46.6	137.4	1.8	-3.0	3.6	4	clayy SILT to silty CLAY	115	2.0	25	23	-	-	3.5	9.9	32	15	1.55	-	0.19	48.1
19.03	41.5	38.4	126.0	1.4	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	2.9	9.9	35	15	1.93	-	0.19	51.2
19.19	26.2	23.6	-	1.2	-1.0	4.6	3	silty CLAY to CLAY	115	1.5	17	16	-	-	1.8	9.9	48	15	-	-	0.19	-
19.36	19.2	17.1	-	0.8	-1.0	4.7	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.7	55	15	-	-	0.19	-
19.52	20.5	18.1	-	0.6	-0.9	2.9	4	clayy SILT to silty CLAY	115	2.0	10	9	-	-	1.4	9.9	46	15	-	-	0.19	-
19.69	21.9	19.2	-	0.5	-0.9	2.4	4	clayy SILT to silty CLAY	115	2.0	11	10	-	-	1.5	9.9	42	15	-	-	0.19	-
19.85	32.1	28.0	-	1.1	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	16	14	-	-	2.2	9.9	40	15	-	-	0.19	-
20.01	32.9	28.4	-	1.5	-0.8	4.9	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	45	15	-	-	0.19	-
20.18	34.8	29.8	-	1.4	-0.8	4.1	4	clayy SILT to silty CLAY	115	2.0	17	15	-	-	2.4	9.9	41	15	-	-	0.19	-
20.34	31.0	26.4	-	1.2	-0.8	4.0	4	clayy SILT to silty CLAY	115	2.0	16	13	-	-	2.1	9.9	43	15	-	-	0.19	-
20.51	28.8	24.3	-	1.2	-0.8	4.5	3	silty CLAY to CLAY	115	1.5	19	16	-	-	2.0	9.9	47	15	-	-	0.19	-
20.67	24.2	20.2	-	1.2	-0.8	5.2	3	silty CLAY to CLAY	115	1.5	16	13	-	-	1.7	9.9	53	15	-	-	0.19	-
20.83	22.2	18.4	-	1.0	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	9.9	55	15	-	-	0.19	-
21.00	19.6	16.1	-	1.0	-0.8	5.4	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.2	59	15	-	-	0.19	-
21.16	19.2	15.7	-	1.1	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	9.0	62	15	-	-	0.19	-
21.33	19.2	15.6	-	1.1	-0.8	5.8	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	8.9	61	15	-	-	0.19	-
21.49	25.7	20.6	-	1.3	-0.8	5.4	3	silty CLAY to CLAY	115	1.5	17	14	-	-	1.8	9.9	54	15	-	-	0.19	-
21.65	34.9	27.8	-	1.4	-0.8	4.2	3	silty CLAY to CLAY	115	1.5	23	19	-	-	2.4	9.9	43	15	-	-	0.19	-
21.82	33.5	26.5	-	1.4	-0.8	4.5	3	silty CLAY to CLAY	115	1.5	22	18	-	-	2.3	9.9	45	15	-	-	0.19	-
21.98	23.8	18.7	-	1.3	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	16	12	-	-	1.6	9.9	56	15	-	-	0.19	-
22.15	19.5	15.2	-	1.0	-0.8	5.7	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	8.8	61	15	-	-	0.19	-
22.31	17.4	13.5	-	0.9	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.7	65	15	-	-	0.19	-
22.47	15.2	11.7	-	0.8	-0.8	6.0	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.6	70	15	-	-	0.19	-
22.64	13.7	10.5	-	0.7	-0.8	5.5	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.8	71	15	-	-	0.19	-
22.80	11.2	8.5	-	0.6	-0.7	6.4	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.6	80	15	-	-	0.19	-
22.97	12.6	9.5	-	0.6	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	5.3	74	15	-	-	0.19	-
23.13	16.5	12.3	-	0.8	-0.8	5.1	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	7.0	65	15	-	-	0.19	-
23.30	20.3	15.1	-	1.0	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.7	60	15	-	-	0.19	-
23.46	21.6	15.9	-	1.0	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	14	11	-	-	1.5	9.2	58	15	-	-	0.19	-
23.62	20.8	15.2	-	1.0	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.8	60	15	-	-	0.19	-
23.79	18.8	13.7	-	1.2	-0.8	6.6	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	7.9	67	15	-	-	0.19	-
23.95	18.9	13.7	-	1.3	-0.8	7.3	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	7.9	69	15	-	-	0.19	-
24.12	25.8	18.5	-	1.4	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.8	9.9	58	15	-	-	0.19	-
24.28	29.1	20.8	-	1.6	-0.8	5.7	3	silty CLAY to CLAY	115	1.5	19	14	-	-	2.0	9.9	54	15	-	-	0.19	-
24.44	54.5	44.5	134.2	1.9	-0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	27	22	-	-	3.8	9.9	33	15	1.79	-	0.19	50.7
24.61	88.3	71.9	141.8	2.3	-0.9	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	41	-	-	23	16	1.54	-	0.18	24.9
24.77	52.6	36.7	-	2.3	-0.8	4.4	4	clayy SILT to silty CLAY	115	2.0	26	18	-	-	3.7	9.9	39	15	-	-	0.18	-
24.94	37.1	25.7	-	2.0	-1.2	5.7	3	silty CLAY to CLAY	115	1.5	25	17	-	-	2.6	9.9	50	15	-	-	0.18	-
25.10	26.1	18.0	-	1.4	-1.2	5.9	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.8	9.9	58	15	-	-	0.18	-
25.26	21.2	14.5	-	1.3	-1.2	6.8	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.5	66	15	-	-	0.18	-
25.43	41.2	28.0	-	1.6	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	21	14	-	-	2.9	9.9	43	15	-	-	0.18	-
25.59	41.2	27.9	-	1.8	-1.2	4.6	3	silty CLAY to CLAY	115	1.5	27	19	-	-	2.9	9.9	45	15	-	-	0.18	-
25.76	28.8	19.3	-	1.1	-1.2	4.2	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	9.9	50	15	-	-	0.18	-
25.92	25.5	17.0	-	2.1	-1.2	8.9	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	9.9	68	15	-	-	0.18	-
26.08	92.7	73.3	150.0	2.6	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	24	16	1.21	-	0.18	15.4
26.25	45.9	30.3	-	3.6	-1.6	8.2	3	silty CLAY to CLAY	115	1.5	31	20	-	-	3.2	9.9	54	15	-	-	0.18	-
26.41	42.5	27.8	-	4.2	-1.6	9.9	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	59	15	-	-	0.18	-
26.58	69.4	45.2	-	4.4	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	46	30	-	-	4.8	9.9	42	15	-	-	0.18	-
26.74	143.8	112.3	200.5	4.7	-1.5	3.3	5	silty SAND to sandy SILT	120	4.0	36	28	71	43	-	-	21	16	0.00	-	0.18	0.0
26.90	166.4	129.6	192.6	4.1	-1.5	2.5	5	silty SAND to sandy SILT	120	4.0	42	32	76	44	-	-	16	16	0.00	-	0.18	0.0
27.07	84.6	65.7	177.9	3.6	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	42	33	-	-	5.9	9.9	30	15	0.00	-	0.18	0.0
27.23	48.5	30.8	-	2.2	-1.4	4.8	3	silty CLAY to CLAY	115	1.5	32	21	-	-	3.4	9.9	43	15	-	-	0.18	-
27.40	31.0	19.6	-	1.3	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.1	9.9	51	15	-	-	0.18	-
27.56	35.6	22.3	-	1.0	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	18	11	-	-	2.5	9.9	42	15	-	-	0.18	-
27.72	27.5	17.2	-	1.0	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	18	11	-	-	1.9	9.9	52	15	-	-	0.18	-
27.89	24.9	15.4	-	0.9	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.1	55	15	-	-	0.18	-
28.05	23.3	14.3	-	0.9	-1.2	4.2	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.6	8.5	57	15	-	-	0.18	-
28.22	25.5	15.6	-	1.0	-1.3	4.1	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.3	55	15	-	-	0.18	-
28.38	27.8	16.9	-	0.8	-2.2	3.1	3	silty CLAY to CLAY	115	1.5	19	11	-	-	1.9	9.9	49	15	-	-	0.18	-
28.54	25.1	15.2	-	0.8	-2.4	3.4	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	53	15	-	-	0.18	-
28.71	26.2	15.8	-	0.9	-2.5	3.5	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.8	9.4	52	15	-	-	0.18	-
28.87	25.2	15.1	-	0.8	-2.7	3.5	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	53	15	-	-	0.18	-
29.04	23.4	14.0	-	1.0	-3.0	4.5	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	8.2	59	15	-	-	0.18	-
29.20	25.5	15.1	-	1.3	-3.2	5.3	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	60	15	-	-	0.18	-
29.36	35.1	20.7	-	1.9	-3.3	5.8	3	silty CLAY to CLAY	115	1.5	23	14	-	-	2.4	9.9	55	15	-	-	0.18	-
29.53	41.9	24.5	-	1.7	-4.2	4.3	3	silty CLAY to CLAY	115	1.5	28	16	-	-	2.9	9.9	46	15	-	-	0.18	-
29.69	28.9	16.8	-	1.6	-5.6	5.8	3	silty CLAY to CLAY	115	1.5	19	11	-	-	2.0	9.9	59	15	-	-	0.18	-
29.86	30.2	17.5	-	1.5	-5.9	5.1	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	56	15	-	-	0.18	-
30.02	77.2	56.9	161.6	3.1	-5.9	4.1	4	clayy SILT to silty CLAY	115	2.0	39	28	-	-	5.4	9.9	31	15	0.00	-	0.18	0.0
30.19	117.4	86.3	160.6	3.3	-5.8	2.8	5	silty SAND to sandy SILT	120	4.0	29	22	62	42	-	-	21	16	0.00	-	0.18	0.0
30.35	88.0	64.6	181.6	3.9	-5.8	4.5	4	clayy SILT to silty CLAY	115	2.0	44	32	-	-	6.2	9.9	31	15	0.00	-	0.18	0.0
30.51	64.8	36.8	-	2.3	-5.0	3.6	4	clayy SILT to silty CLAY	115	2.0	32	18	-	-	4.5	9.9	36	15	-	-	0.18	-
30.68	30.5	17.2	-	1.6	-2.5	5.4	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.1	9.9	58	15	-	-	0.18	-
30.84	35.8	20.1	-	1.7	-1.5	5.1	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	53	15	-	-	0.18	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
31.01	44.9	25.1	-	2.0	-1.6	4.7	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	47	15	-	-	0.18	-
31.17	49.3	27.3	-	2.2	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	33	18	-	-	3.4	9.9	45	15	-	-	0.18	-
31.33	40.6	22.4	-	2.2	-1.5	5.7	3	silty CLAY to CLAY	115	1.5	27	15	-	-	2.8	9.9	53	15	-	-	0.18	-
31.50	29.8	16.4	-	2.2	-1.7	7.8	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.0	9.9	66	15	-	-	0.18	-
31.66	30.9	16.9	-	1.8	-1.7	6.2	3	silty CLAY to CLAY	115	1.5	21	11	-	-	2.1	9.9	61	15	-	-	0.18	-
31.83	37.1	20.2	-	2.7	-1.8	7.8	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.6	9.9	61	15	-	-	0.18	-
31.99	37.4	20.2	-	1.6	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.6	9.9	51	15	-	-	0.18	-
32.15	42.7	23.0	-	1.1	-3.0	2.6	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	3.0	9.9	40	15	-	-	0.18	-
32.32	44.0	23.5	-	1.4	0.3	3.3	4	clayy SILT to silty CLAY	115	2.0	22	12	-	-	3.0	9.9	42	15	-	-	0.18	-
32.48	86.2	61.1	137.8	2.4	0.3	2.9	5	silty SAND to sandy SILT	120	4.0	22	15	51	40	-	-	26	16	1.78	-	0.18	33.2
32.65	48.4	25.6	-	2.1	0.4	4.5	3	silty CLAY to CLAY	115	1.5	32	17	-	-	3.4	9.9	46	15	-	-	0.18	-
32.81	27.3	14.4	-	1.3	0.4	5.0	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	8.6	60	15	-	-	0.18	-
32.97	29.7	15.6	-	1.0	0.4	3.7	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.0	9.4	53	15	-	-	0.18	-
33.14	36.0	18.8	-	1.4	0.4	4.0	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	50	15	-	-	0.18	-
33.30	47.2	24.5	-	1.7	0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	24	12	-	-	3.3	9.9	44	15	-	-	0.18	-
33.47	42.0	21.7	-	2.0	0.4	4.9	3	silty CLAY to CLAY	115	1.5	28	14	-	-	2.9	9.9	51	15	-	-	0.18	-
33.63	37.0	19.1	-	2.2	0.4	6.2	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.5	9.9	58	15	-	-	0.18	-
33.79	34.2	17.5	-	2.0	0.4	6.3	3	silty CLAY to CLAY	115	1.5	23	12	-	-	2.3	9.9	60	15	-	-	0.18	-
33.96	30.7	15.7	-	1.5	0.4	5.4	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	9.5	60	15	-	-	0.18	-
34.12	27.3	13.8	-	1.7	0.4	6.6	3	silty CLAY to CLAY	115	1.5	18	9	-	-	1.9	8.3	67	15	-	-	0.18	-
34.29	65.1	32.8	-	2.3	0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	33	16	-	-	4.5	9.9	38	15	-	-	0.18	-
34.45	63.5	31.9	-	2.4	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	32	16	-	-	4.4	9.9	39	15	-	-	0.18	-
34.61	35.4	17.7	-	2.1	0.3	6.3	3	silty CLAY to CLAY	115	1.5	24	12	-	-	2.4	9.9	60	15	-	-	0.18	-
34.78	32.5	16.2	-	1.8	0.3	5.9	3	silty CLAY to CLAY	115	1.5	22	11	-	-	2.2	9.8	61	15	-	-	0.18	-
34.94	24.7	12.2	-	1.3	0.3	5.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.7	7.3	67	15	-	-	0.18	-
35.11	19.8	9.7	-	0.9	0.2	5.0	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.7	71	15	-	-	0.18	-
35.27	19.8	9.7	-	0.9	0.2	5.1	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.7	71	15	-	-	0.18	-
35.43	23.7	11.6	-	1.0	0.2	4.7	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.9	65	15	-	-	0.18	-
35.60	38.1	18.5	-	1.4	0.2	3.9	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.6	9.9	50	15	-	-	0.18	-
35.76	32.0	15.5	-	1.5	0.2	4.9	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.2	9.4	58	15	-	-	0.18	-
35.93	25.4	12.2	-	1.3	0.2	5.4	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.7	7.3	66	15	-	-	0.18	-
36.09	21.6	10.3	-	1.2	0.2	6.2	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.5	6.1	74	15	-	-	0.18	-
36.26	30.6	14.6	-	1.6	0.2	5.5	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	8.9	62	15	-	-	0.18	-
36.42	50.3	23.9	-	1.9	0.2	4.0	3	silty CLAY to CLAY	115	1.5	34	16	-	-	3.5	9.9	45	15	-	-	0.18	-
36.58	33.0	15.6	-	1.6	0.2	5.1	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.3	9.5	59	15	-	-	0.18	-
36.75	25.9	12.2	-	1.2	0.2	5.1	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.8	7.3	65	15	-	-	0.18	-
36.91	32.7	15.3	-	1.3	0.2	4.4	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.2	9.4	57	15	-	-	0.18	-
37.08	36.5	17.0	-	1.5	0.2	4.5	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	54	15	-	-	0.18	-
37.24	48.5	22.5	-	1.9	0.2	4.0	3	silty CLAY to CLAY	115	1.5	32	15	-	-	3.3	9.9	47	15	-	-	0.18	-
37.40	40.8	18.9	-	1.9	0.2	5.0	3	silty CLAY to CLAY	115	1.5	27	13	-	-	2.8	9.9	54	15	-	-	0.18	-
37.57	34.1	15.7	-	1.9	0.2	5.8	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.3	9.6	61	15	-	-	0.18	-
37.73	38.7	17.7	-	1.9	0.1	5.3	3	silty CLAY to CLAY	115	1.5	26	12	-	-	2.7	9.9	57	15	-	-	0.18	-
37.90	31.0	14.2	-	2.0	0.1	7.0	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.6	68	15	-	-	0.18	-
38.06	31.9	14.5	-	2.1	0.1	6.9	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.2	8.8	67	15	-	-	0.18	-
38.22	30.4	13.8	-	2.0	0.0	7.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.1	8.4	68	15	-	-	0.18	-
38.39	34.2	15.4	-	2.3	0.0	7.1	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.3	9.4	66	15	-	-	0.18	-
38.55	41.2	18.5	-	2.5	0.0	6.3	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	59	15	-	-	0.18	-
38.72	42.3	18.9	-	3.1	0.0	7.7	3	silty CLAY to CLAY	115	1.5	28	13	-	-	2.9	9.9	63	15	-	-	0.18	-
38.88	59.8	26.6	-	3.1	0.0	5.3	3	silty CLAY to CLAY	115	1.5	40	18	-	-	4.1	9.9	48	15	-	-	0.18	-
39.04	47.6	21.1	-	2.3	0.1	5.0	3	silty CLAY to CLAY	115	1.5	32	14	-	-	3.3	9.9	52	15	-	-	0.18	-
39.21	50.8	22.4	-	1.6	0.1	3.4	4	clayy SILT to silty CLAY	115	2.0	25	11	-	-	3.5	9.9	44	15	-	-	0.18	-
39.37	123.4	79.5	140.4	2.8	0.0	2.3	5	silty SAND to sandy SILT	120	4.0	31	20	59	41	-	-	20	16	1.75	-	0.18	23.4
39.54	131.6	84.6	149.8	3.2	0.1	2.5	5	silty SAND to sandy SILT	120	4.0	33	21	61	41	-	-	20	16	1.38	-	0.17	15.8
39.70	96.2	61.7	137.5	2.7	0.1	2.8	5	silty SAND to sandy SILT	120	4.0	24	15	51	40	-	-	26	16	1.80	-	0.17	32.9
39.86	78.5	50.2	122.9	2.1	0.1	2.7	5	silty SAND to sandy SILT	120	4.0	20	13	44	38	-	-	28	16	1.97	-	0.17	43.9
40.03	71.4	30.9	-	2.0	0.1	2.9	4	clayy SILT to silty CLAY	115	2.0	36	15	-	-	5.0	9.9	36	15	-	-	0.16	-
40.19	65.1	28.0	-	2.2	0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	33	14	-	-	4.5	9.9	40	15	-	-	0.16	-
40.36	60.7	26.0	-	2.7	0.2	4.7	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	46	15	-	-	0.16	-
40.52	60.1	25.6	-	3.2	0.2	5.6	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	50	15	-	-	0.16	-
40.68	65.5	27.8	-	2.7	0.2	4.3	3	silty CLAY to CLAY	115	1.5	44	19	-	-	4.5	9.9	43	15	-	-	0.16	-
40.85	60.6	25.7	-	2.4	0.2	4.2	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	45	15	-	-	0.16	-
41.01	64.0	27.0	-	3.7	0.1	6.0	3	silty CLAY to CLAY	115	1.5	43	18	-	-	4.4	9.9	50	15	-	-	0.16	-
41.18	82.2	34.6	-	4.4	0.2	5.5	3	silty CLAY to CLAY	115	1.5	55	23	-	-	5.7	9.9	44	15	-	-	0.16	-
41.34	66.0	27.6	-	4.5	0.2	7.0	3	silty CLAY to CLAY	115	1.5	44	18	-	-	4.6	9.9	52	15	-	-	0.16	-
41.50	53.6	22.4	-	3.4	0.0	6.6	3	silty CLAY to CLAY	115	1.5	36	15	-	-	3.7	9.9	56	15	-	-	0.16	-
41.67	44.0	18.3	-	3.4	0.0	8.2	3	silty CLAY to CLAY	115	1.5	29	12	-	-	3.0	9.9	65	15	-	-	0.16	-
41.83	51.9	21.5	-	3.5	0.0	7.1	3	silty CLAY to CLAY	115	1.5	35	14	-	-	3.6	9.9	58	15	-	-	0.16	-
42.00	76.5	31.5	-	3.6	0.0	4.9	3	silty CLAY to CLAY	115	1.5	51	21	-	-	5.3	9.9	44	15	-	-	0.16	-
42.16	62.7	25.7	-	3.3	0.0	5.5	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.3	9.9	49	15	-	-	0.16	-
42.32	60.5	24.7	-	3.1	0.0	5.4	3	silty CLAY to CLAY	115	1.5	40	16	-	-	4.2	9.9	50	15	-	-	0.16	-
42.49	96.8	39.4	-	3.6	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.8	9.9	36	15	-	-	0.16	-
42.65	101.0	41.0	-	4.0	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	50	20	-	-	7.0	9.9	36	15	-	-	0.16	-
42.82	95.3	38.5	-	4.1	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	48	19	-	-	6.6	9.9	38	15	-	-	0.16	-
42.98	85.7	34.5	-	3.5	0.0	4.2	4	clayy SILT to silty CLAY	115	2.0	43	17	-	-	6.0	9.9	39	15	-	-	0.16	-
43.15	63.1	25.3	-	3.6	0.0	5.9	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.4	9.9	51	15	-	-	0.16	-
43.31	61.2	24.5	-	3.5	0.0	5.9	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	52	15	-	-	0.16	-
43.47	62.6	24.9	-	3.5	0.1	5.8	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.3	9.9	51	15	-	-	0.16	-
43.64	46.4	18.4	-	3.2	0.1	7.4	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.9	62	15	-	-	0.16	-
43.80	47.9	18.9	-	3.0	0.1	6.6	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	59	15	-	-	0.16	-
43.97	61.0	24.0	-	2.7	0.1	4.6	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	47	15	-	-	0.16	-
44.13	47.5	18.7	-	2.1	0.1	4.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	53	15	-	-	0.16	-
44.29	30.7	12.0	-	1.6	0.1	5.8	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	7.3	68	15	-	-	0.16	-
44.46	24.0	9.3	-	1.0	0.1	4.8	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.5	72	15	-	-	0.16	-
44.62	20.6	8.0	-	0.9	0.0	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	76	15	-	-	0.16	-
44.79	20.5	7.9	-	0.8	0.0	4.6	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	75	15	-	-	0.16	-
44.95	21.9	8.4	-	0.9	0.0	4.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.9	74	15	-	-	0.16	-
45.11	28.0	10.7	-	1.0	0.7	3.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.5	64	15	-	-	0.16	-
45.28	27.7	10.6	-	1.1	0.7	4.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.9	6.4	66	15	-	-	0.16	-
45.44	24.9	9.5	-	1.1	0.7	5.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.6	72	15	-	-	0.16	-
45.61	31.4	11.9	-	1.3	0.7	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	7.3	63	15	-	-	0.16	-
45.77	36.4	13.8	-	1.5	0.7	4.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	8.5	59	15	-	-	0.16	-
45.93	36.4	13.7	-	1.4	0.7	4.2	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	8.5	58	15	-	-	0.16	-
46.10	30.4	11.5	-	1.2	0.7	4.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.9	64	15	-	-	0.16	-
46.26	30.7	11.6	-	1.3	0.7	4.7	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	7.0	65	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
46.43	32.1	12.1	-	1.4	0.7	4.7	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	7.3	64	15	-	-	0.16	-
46.59	30.1	11.3	-	1.7	0.7	6.1	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	6.8	71	15	-	-	0.16	-
46.75	34.4	13.0	-	1.5	0.7	4.6	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.8	62	15	-	-	0.16	-
46.92	27.3	10.3	-	1.3	0.7	5.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.0	70	15	-	-	0.16	-
47.08	23.4	8.8	-	1.0	0.7	5.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.1	74	15	-	-	0.16	-
47.25	26.2	9.9	-	1.0	0.7	4.2	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.8	5.7	67	15	-	-	0.16	-
47.41	26.4	10.0	-	1.1	0.7	4.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.8	70	15	-	-	0.16	-
47.57	29.2	11.0	-	1.1	0.7	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	2.0	6.4	64	15	-	-	0.16	-
47.74	26.3	9.9	-	1.6	0.7	6.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.7	77	15	-	-	0.16	-
47.90	48.7	18.4	-	1.7	0.7	3.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	50	15	-	-	0.16	-
48.07	143.6	83.7	124.7	2.3	0.6	1.7	5	silty SAND to sandy SILT	120	4.0	36	21	61	41	-	-	16	16	1.95	-	0.16	21.8
48.23	114.6	66.7	112.9	2.0	0.7	1.8	5	silty SAND to sandy SILT	120	4.0	29	17	54	40	-	-	19	16	2.11	-	0.16	30.0
48.39	87.0	32.8	-	3.0	0.7	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	38	15	-	-	0.16	-
48.56	72.6	27.4	-	2.7	0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	42	15	-	-	0.16	-
48.72	49.4	18.6	-	2.4	0.7	5.1	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.9	55	15	-	-	0.16	-
48.89	37.0	14.0	-	1.7	0.8	4.9	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	8.1	61	15	-	-	0.16	-
49.05	26.0	9.8	-	1.4	0.5	6.2	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.5	75	15	-	-	0.16	-
49.22	21.1	8.0	-	1.2	-0.8	6.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.3	83	15	-	-	0.16	-
49.38	20.2	7.6	-	0.9	-1.3	5.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.1	80	15	-	-	0.16	-
49.54	18.0	6.8	-	1.2	-1.6	8.2	2	Organic SOILS - Peats	100	1.0	18	7	-	-	1.8	3.5	95	10	-	-	0.16	-
49.71	18.6	7.0	-	1.2	-1.7	7.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.7	92	15	-	-	0.16	-
49.87	19.8	7.5	-	1.5	-1.7	9.0	2	Organic SOILS - Peats	100	1.0	20	7	-	-	1.9	3.9	93	10	-	-	0.16	-
50.04	22.2	8.4	-	1.0	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	77	15	-	-	0.16	-
50.20	18.1	6.8	-	0.8	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	84	15	-	-	0.16	-
50.36	18.2	6.9	-	0.8	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	83	15	-	-	0.16	-
50.53	21.9	8.3	-	0.7	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.4	70	15	-	-	0.16	-
50.69	20.5	7.7	-	0.6	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	4.0	72	15	-	-	0.16	-
50.86	22.2	8.4	-	0.7	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.4	71	15	-	-	0.16	-
51.02	22.5	8.5	-	0.8	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	72	15	-	-	0.16	-
51.18	23.9	9.0	-	0.8	-1.8	4.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.8	69	15	-	-	0.16	-
51.35	24.8	9.4	-	0.8	-1.8	3.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.0	67	15	-	-	0.16	-
51.51	22.7	8.6	-	0.8	-1.8	3.8	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	70	15	-	-	0.16	-
51.68	21.9	8.3	-	0.7	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.3	70	15	-	-	0.16	-
51.84	21.2	8.0	-	0.6	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.1	70	15	-	-	0.16	-
52.00	19.9	7.5	-	0.6	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.8	72	15	-	-	0.16	-
52.17	20.0	7.5	-	0.5	-1.8	3.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.8	71	15	-	-	0.16	-
52.33	17.5	6.6	-	0.5	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	3.2	77	15	-	-	0.16	-
52.50	17.1	6.4	-	0.8	-1.8	5.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.1	88	15	-	-	0.16	-
52.66	28.1	10.6	-	0.6	-1.8	2.4	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.5	56	15	-	-	0.16	-
52.82	27.5	10.4	-	0.7	-1.8	2.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.4	59	15	-	-	0.16	-
52.99	21.2	8.0	-	0.8	-1.8	4.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.0	75	15	-	-	0.16	-
53.15	27.4	10.3	-	0.8	-1.8	3.4	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.3	62	15	-	-	0.16	-
53.32	28.5	10.8	-	0.7	-1.8	2.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.6	57	15	-	-	0.16	-
53.48	22.0	8.3	-	0.7	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.1	70	15	-	-	0.16	-
53.64	17.5	6.6	-	0.5	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	3.1	78	15	-	-	0.16	-
53.81	20.7	7.8	-	0.4	-1.7	2.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.8	64	15	-	-	0.16	-
53.97	15.0	5.7	-	0.6	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.6	92	15	-	-	0.16	-
54.14	18.9	7.1	-	0.4	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.4	71	15	-	-	0.16	-
54.30	18.2	6.9	-	0.8	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.2	84	15	-	-	0.16	-
54.46	16.4	6.2	-	0.6	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.8	85	15	-	-	0.16	-
54.63	22.7	8.6	-	0.5	-1.7	2.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.2	63	15	-	-	0.16	-
54.79	16.1	6.1	-	0.6	-1.7	4.9	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.7	88	15	-	-	0.16	-
54.96	25.3	9.5	-	1.0	-1.8	4.3	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.7	69	15	-	-	0.16	-
55.12	21.8	8.2	-	1.0	-1.7	5.6	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	3.9	79	15	-	-	0.16	-
55.28	23.9	9.0	-	1.1	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.4	75	15	-	-	0.16	-
55.45	36.1	13.6	-	0.9	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	52	15	-	-	0.16	-
55.61	39.2	14.8	-	1.0	-1.7	2.7	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.6	50	15	-	-	0.16	-
55.78	32.3	12.2	-	1.0	-1.7	3.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.1	59	15	-	-	0.16	-
55.94	23.3	8.8	-	0.8	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	4.2	69	15	-	-	0.16	-
56.11	15.7	5.9	-	0.4	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.6	79	15	-	-	0.16	-
56.27	13.7	5.2	-	0.3	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.2	83	15	-	-	0.16	-
56.43	14.1	5.3	-	0.3	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.2	83	15	-	-	0.16	-
56.60	14.7	5.6	-	0.4	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.4	83	15	-	-	0.16	-
56.76	16.5	6.2	-	0.3	-1.7	2.4	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	2.7	73	15	-	-	0.16	-
56.93	14.9	5.6	-	0.6	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.4	93	15	-	-	0.16	-
57.09	26.1	9.8	-	0.8	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.7	65	15	-	-	0.16	-
57.25	31.4	11.8	-	1.0	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.7	60	15	-	-	0.16	-
57.42	26.7	10.1	-	0.7	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	62	15	-	-	0.16	-
57.58	22.3	8.4	-	0.9	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	3.9	76	15	-	-	0.16	-
57.75	23.1	8.7	-	0.8	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.0	70	15	-	-	0.16	-
57.91	17.8	6.7	-	0.8	-1.7	5.4	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.9	86	15	-	-	0.16	-
58.07	20.3	7.7	-	0.8	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.4	79	15	-	-	0.16	-
58.24	46.6	17.6	-	1.0	-1.7	2.3	4	clayy SILT to silty CLAY	115	2.0	23	9	-	-	3.2	8.7	43	15	-	-	0.16	-
58.40	42.7	16.1	-	1.1	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	7.9	49	15	-	-	0.16	-
58.57	28.1	10.6	-	1.0	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	4.9	65	15	-	-	0.16	-
58.73	39.9	15.1	-	1.3	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.3	54	15	-	-	0.16	-
58.89	36.6	13.8	-	1.1	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.6	55	15	-	-	0.16	-
59.06	19.2	7.2	-	1.0	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.1	88	15	-	-	0.16	-
59.22	36.8	13.9	-	1.4	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.6	59	15	-	-	0.16	-
59.39	52.4	19.8	-	1.8	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	48	15	-	-	0.16	-
59.55	41.5	15.6	-	1.5	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	7.5	55	15	-	-	0.16	-
59.71	41.6	15.7	-	1.5	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	7.5	54	15	-	-	0.16	-
59.88	34.7	13.1	-	1.5	-1.6	4.9	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.1	63	15	-	-	0.16	-
60.04	26.3	9.9	-	1.3	-1.6	5.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.5	74	15	-	-	0.16	-
60.21	31.3	11.8	-	1.2	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.4	64	15	-	-	0.16	-
60.37	23.9	9.0	-	1.1	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.0	75	15	-	-	0.16	-
60.53	20.5	7.7	-	0.8	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.3	78	15	-	-	0.16	-
60.70	19.4	7.3	-	0.7	-1.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.1	77	15	-	-	0.16	-
60.86	19.2	7.2	-	0.6	-1.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.0	78	15	-	-	0.16	-
61.03	19.2	7.2	-	0.7	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.0	81	15	-	-	0.16	-
61.19	24.0	9.1	-	1.2	-1.7	5.7	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	3.9	77	15	-	-	0.16	-
61.35	35.6	13.4	-	1.3	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.1	59	15	-	-	0.16	-
61.52	37.9	14.3	-	1.2	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	6.6	54	15	-	-	0.16	-
61.68	26.2	9.9	-	0.9	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.3	67	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
61.85	20.5	7.7	-	0.7	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.2	77	15	-	-	0.16	-
62.01	21.5	8.1	-	0.6	-1.7	3.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.4	71	15	-	-	0.16	-
62.17	20.2	7.6	-	0.6	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.1	74	15	-	-	0.16	-
62.34	20.9	7.9	-	0.7	-1.6	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.3	75	15	-	-	0.16	-
62.50	23.5	8.9	-	0.5	-1.6	2.5	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	3.8	62	15	-	-	0.16	-
62.67	22.7	8.6	-	1.9	-1.6	10.0	2	Organic SOILS - Peats	100	1.0	23	9	-	-	2.2	3.6	92	10	-	-	0.16	-
62.83	57.9	21.9	-	3.4	-1.7	6.3	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	55	15	-	-	0.16	-
63.00	189.2	96.4	146.7	3.7	-1.6	2.0	5	silty SAND to sandy SILT	120	4.0	47	24	66	41	-	-	17	16	1.42	-	0.16	12.3
63.16	117.9	60.0	141.7	3.5	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	59	30	-	-	8.2	9.9	27	15	1.46	-	0.16	33.8
63.32	81.8	30.9	-	2.9	-1.6	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.15	-
63.49	48.0	18.1	-	2.3	-1.6	5.2	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.2	56	15	-	-	0.15	-
63.65	32.7	12.3	-	1.3	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.4	64	15	-	-	0.15	-
63.82	22.3	8.4	-	1.4	-1.5	7.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	3.4	86	15	-	-	0.15	-
63.98	46.9	17.7	-	2.2	-1.6	5.2	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.0	57	15	-	-	0.15	-
64.14	59.3	22.4	-	3.2	-2.6	5.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	53	15	-	-	0.15	-
64.31	54.1	20.4	-	3.3	-5.1	6.5	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.2	58	15	-	-	0.15	-
64.47	52.2	19.7	-	3.3	-8.2	6.8	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	8.9	60	15	-	-	0.15	-
64.64	64.2	24.2	-	2.3	-8.2	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	44	15	-	-	0.15	-
64.80	27.5	10.4	-	0.2	-8.2	1.0	4	clayy SILT to silty CLAY	115	2.0	14	5	-	-	1.8	4.3	46	15	-	-	0.15	-
64.96	17.9	6.8	-	0.0	-8.2	0.1	1	sensitive fine SOIL	115	2.0	9	3	-	-	1.1	2.6	43	15	-	-	0.15	-
65.13	79.2	29.9	-	2.4	-8.3	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.15	-
65.29	100.7	38.0	-	4.0	-8.3	4.1	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	38	15	-	-	0.15	-
65.46	100.5	50.2	131.5	3.0	-8.3	3.1	4	clayy SILT to silty CLAY	115	2.0	50	25	-	-	7.0	9.9	29	15	1.79	-	0.15	43.9
65.62	86.8	43.3	115.2	2.2	-8.4	2.7	4	clayy SILT to silty CLAY	115	2.0	43	22	-	-	6.0	9.9	30	15	2.08	-	0.15	51.2
65.78	27.3	10.3	-	1.1	-8.5	4.9	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.2	70	15	-	-	0.15	-
65.95	19.1	7.2	-	0.2	-8.5	1.3	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.7	60	15	-	-	0.15	-
66.11	17.5	6.6	-	0.6	-8.6	4.3	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.4	83	15	-	-	0.15	-
66.28	123.6	61.4	119.1	2.6	-8.7	2.1	5	silty SAND to sandy SILT	120	4.0	31	15	51	38	-	-	22	16	2.02	-	0.15	33.0
66.44	111.5	55.3	85.8	1.2	-8.6	1.1	5	silty SAND to sandy SILT	120	4.0	28	14	47	38	-	-	17	16	2.65	-	0.14	38.4
66.60	176.8	87.7	115.3	2.1	-8.6	1.2	6	clean SAND to silty SAND	125	5.0	35	18	63	40	-	-	13	16	2.08	-	0.14	20.5
66.77	147.1	72.8	120.7	2.6	-8.6	1.8	5	silty SAND to sandy SILT	120	4.0	37	18	57	39	-	-	19	16	2.00	-	0.14	26.7
66.93	132.4	65.5	137.0	3.4	-8.5	2.7	5	silty SAND to sandy SILT	120	4.0	33	16	53	39	-	-	24	16	1.64	-	0.13	30.1
67.10	57.7	21.8	-	2.0	-8.5	3.8	3	silty CLAY to CLAY	115	1.5	38	15	-	-	3.9	9.5	47	15	-	-	0.13	-
67.26	35.1	13.3	-	1.8	-8.5	5.8	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	5.5	67	15	-	-	0.13	-
67.42	36.0	13.6	-	0.9	-8.7	2.7	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.6	52	15	-	-	0.13	-
67.59	21.4	8.1	-	1.8	-8.8	9.9	2	Organic SOILS - Peats	100	1.0	21	8	-	-	2.1	3.1	95	10	-	-	0.13	-
67.75	44.2	16.7	-	3.8	-8.8	9.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.0	71	15	-	-	0.13	-
67.92	64.8	24.4	-	4.5	-8.8	7.4	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	56	15	-	-	0.13	-
68.08	53.4	20.1	-	3.5	-8.9	7.0	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.6	8.6	60	15	-	-	0.13	-
68.24	79.2	29.9	-	2.1	-9.0	2.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	36	15	-	-	0.13	-
68.41	105.6	51.7	79.9	1.0	-9.0	1.0	5	silty SAND to sandy SILT	120	4.0	26	13	45	37	-	-	17	16	2.81	-	0.13	42.3
68.57	140.5	68.6	88.7	1.1	-9.0	0.8	6	clean SAND to silty SAND	125	5.0	28	14	55	39	-	-	13	16	2.58	-	0.13	28.9
68.74	97.7	47.7	110.9	2.2	-9.0	2.3	5	silty SAND to sandy SILT	120	4.0	24	12	43	37	-	-	27	16	2.15	-	0.12	46.9
68.90	70.6	26.6	-	3.1	-9.0	4.7	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.9	9.9	46	15	-	-	0.12	-
69.07	65.4	24.7	-	3.1	-9.0	5.0	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	49	15	-	-	0.12	-
69.23	114.0	55.4	127.8	3.0	-9.0	2.7	5	silty SAND to sandy SILT	120	4.0	29	14	48	38	-	-	26	16	1.89	-	0.12	38.3
69.39	99.0	37.4	-	3.8	-9.1	4.0	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	38	15	-	-	0.11	-
69.56	86.7	32.7	-	4.5	-9.1	5.4	3	silty CLAY to CLAY	115	1.5	58	22	-	-	6.0	9.9	45	15	-	-	0.11	-
69.72	66.0	24.9	-	2.8	-9.1	4.6	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.5	9.9	47	15	-	-	0.11	-
69.89	36.4	13.8	-	1.6	-9.1	4.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.5	62	15	-	-	0.11	-
70.05	25.1	9.5	-	1.0	-9.1	4.5	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.6	72	15	-	-	0.11	-
70.21	25.1	9.5	-	0.8	-9.2	3.6	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.6	67	15	-	-	0.11	-
70.38	20.4	7.7	-	0.5	-9.2	3.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.7	73	15	-	-	0.11	-
70.54	19.4	7.3	-	0.6	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.6	77	15	-	-	0.11	-
70.71	18.2	6.9	-	0.6	-9.2	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.4	80	15	-	-	0.11	-
70.87	19.8	7.5	-	0.6	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.6	76	15	-	-	0.11	-
71.03	18.1	6.8	-	0.5	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.3	79	15	-	-	0.11	-
71.20	19.8	7.5	-	0.5	-9.2	3.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.6	72	15	-	-	0.11	-
71.36	19.2	7.2	-	0.5	-9.2	3.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	74	15	-	-	0.11	-
71.53	18.5	7.0	-	0.5	-9.2	3.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.4	77	15	-	-	0.11	-
71.69	19.6	7.4	-	0.7	-9.2	4.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.6	80	15	-	-	0.11	-
71.85	25.2	9.5	-	0.8	-9.2	3.8	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.5	68	15	-	-	0.11	-
72.02	40.7	15.4	-	0.8	-9.1	2.2	4	clayy SILT to silty CLAY	115	2.0	20	8	-	-	2.7	6.0	46	15	-	-	0.11	-
72.18	48.0	18.1	-	0.8	-9.2	1.9	4	clayy SILT to silty CLAY	115	2.0	24	9	-	-	3.3	7.2	41	15	-	-	0.11	-
72.35	28.8	10.8	-	0.7	-9.2	2.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	4.0	59	15	-	-	0.11	-
72.51	20.4	7.7	-	0.4	-9.2	2.7	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.7	69	15	-	-	0.11	-
72.67	17.8	6.7	-	0.4	-9.2	2.6	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.2	73	15	-	-	0.11	-
72.84	16.2	6.1	-	0.3	-9.1	2.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	78	15	-	-	0.11	-
73.00	16.0	6.1	-	0.3	-9.2	2.8	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	79	15	-	-	0.11	-
73.17	19.4	7.3	-	0.4	-9.1	2.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	70	15	-	-	0.11	-
73.33	17.9	6.8	-	0.4	-9.1	2.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.2	75	15	-	-	0.11	-
73.49	19.5	7.4	-	0.4	-9.1	2.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	69	15	-	-	0.11	-
73.66	16.2	6.1	-	0.4	-9.1	3.1	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	81	15	-	-	0.11	-
73.82	16.0	6.0	-	0.5	-9.1	4.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	88	15	-	-	0.11	-
73.99	19.0	7.2	-	0.6	-9.1	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.4	80	15	-	-	0.11	-
74.15	21.8	8.2	-	1.2	-9.1	7.1	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.8	86	15	-	-	0.11	-
74.31	35.5	13.4	-	1.0	-9.1	3.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.0	55	15	-	-	0.11	-
74.48	29.0	11.0	-	0.9	-9.1	3.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	3.9	63	15	-	-	0.11	-
74.64	21.8	8.2	-	0.8	-9.1	4.5	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.8	77	15	-	-	0.11	-
74.81	21.3	8.1	-	0.7	-9.1	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	2.7	75	15	-	-	0.11	-
74.97	20.0	7.5	-	0.7	-9.1	4.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.5	79	15	-	-	0.11	-
75.13	22.6	8.5	-	0.6	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.9	70	15	-	-	0.11	-
75.30	20.9	7.9	-	0.6	-9.1	3.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.6	73	15	-	-	0.11	-
75.46	21.7	8.2	-	0.6	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	2.7	71	15	-	-	0.11	-
75.63	23.9	9.0	-	0.8	-9.0	4.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	3.1	71	15	-	-	0.11	-
75.79	29.0	11.0	-	0.7	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	3.9	60	15	-	-	0.11	-
75.96	21.9	8.2	-	0.8	-9.0	4.4	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.7	76	15	-	-	0.11	-
76.12	20.3	7.6	-	0.6	-9.0	3.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	77	15	-	-	0.11	-
76.28	21.9	8.2	-	0.6	-9.0	3.5	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.7	72	15	-	-	0.11	-
76.45	21.2	8.0	-	0.5	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.6	71	15	-	-	0.11	-
76.61	19.8	7.5	-	0.5	-9.0	3.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.4	75	15	-	-	0.11	-
76.78	20.5	7.7	-	0.5	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	72	15	-	-	0.11	-
76.94	20.1	7.6	-	0.5	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.4	73	15	-	-	0.11	-
77.10	20.8	7.8	-	0.5	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	72	15	-	-	0.11	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
77.27	23.3	8.8	-	0.5	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	66	15	-	-	0.11	-
77.43	23.0	8.7	-	1.0	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	2.8	79	15	-	-	0.11	-
77.60	21.0	7.9	-	1.0	-9.0	5.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	84	15	-	-	0.11	-
77.76	27.3	10.3	-	0.8	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	3.5	65	15	-	-	0.11	-
77.92	23.5	8.9	-	0.7	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	70	15	-	-	0.11	-
78.09	23.6	8.9	-	0.7	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	70	15	-	-	0.11	-
78.25	26.0	9.8	-	0.6	-9.0	3.0	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	3.3	63	15	-	-	0.11	-
78.42	32.8	12.4	-	0.9	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	4.3	58	15	-	-	0.11	-
78.58	25.8	9.7	-	0.9	-9.0	4.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	3.2	69	15	-	-	0.11	-
78.74	21.1	8.0	-	0.7	-9.0	3.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	76	15	-	-	0.11	-
78.91	18.7	7.1	-	0.5	-9.0	3.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.1	79	15	-	-	0.11	-
79.07	16.2	6.1	-	0.4	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	82	15	-	-	0.11	-
79.24	16.4	6.2	-	0.4	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	82	15	-	-	0.11	-
79.40	17.7	6.7	-	0.4	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.0	78	15	-	-	0.11	-
79.56	16.4	6.2	-	0.5	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	88	15	-	-	0.11	-
79.73	20.4	7.7	-	0.8	-9.0	5.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.4	82	15	-	-	0.11	-
79.89	27.6	10.4	-	1.4	-9.0	6.2	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	3.4	76	15	-	-	0.11	-
80.06	26.8	10.1	-	1.2	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	3.3	74	15	-	-	0.11	-
80.22	27.0	10.2	-	1.0	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	3.3	69	15	-	-	0.11	-
80.38	22.3	8.4	-	0.5	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.6	68	15	-	-	0.11	-
80.55	20.8	7.9	-	0.3	-9.0	1.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.4	63	15	-	-	0.11	-
80.71	18.3	6.9	-	0.0	-9.0	0.1	1	sensitive fine SOIL	115	2.0	9	3	-	-	1.1	2.0	44	15	-	-	0.11	-
80.88	27.8	10.5	-	1.0	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.8	3.4	68	15	-	-	0.11	-
81.04	30.1	11.4	-	1.9	-9.0	7.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	77	15	-	-	0.11	-
81.20	47.5	17.9	-	1.5	-9.0	3.5	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	6.3	50	15	-	-	0.11	-
81.37	30.0	11.3	-	1.3	-9.0	5.1	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	69	15	-	-	0.11	-
81.53	34.5	13.0	-	1.2	-9.0	4.2	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	4.4	61	15	-	-	0.11	-
81.70	30.2	11.4	-	2.7	-9.0	9.9	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	84	15	-	-	0.11	-
81.86	57.3	21.6	-	4.3	-9.0	8.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	7.7	61	15	-	-	0.11	-
82.02	67.8	25.6	-	5.4	-9.0	8.5	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.6	9.2	59	15	-	-	0.11	-
82.19	86.0	32.4	-	4.5	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	57	22	-	-	5.9	9.9	46	15	-	-	0.11	-
82.35	86.9	32.8	-	3.9	-9.0	4.8	3	silty CLAY to CLAY	115	1.5	58	22	-	-	6.0	9.9	43	15	-	-	0.11	-
82.52	55.2	20.8	-	3.8	-9.0	7.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.7	7.3	61	15	-	-	0.11	-
82.68	52.6	19.9	-	2.7	-9.0	5.6	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	6.9	56	15	-	-	0.11	-
82.85	43.6	16.4	-	2.6	-8.9	6.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	5.6	64	15	-	-	0.11	-
83.01	49.6	18.7	-	2.5	-8.9	5.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	6.4	57	15	-	-	0.11	-
83.17	42.9	16.2	-	3.4	-8.9	8.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	5.5	71	15	-	-	0.11	-
83.34	74.1	28.0	-	3.1	-8.9	4.5	3	silty CLAY to CLAY	115	1.5	49	19	-	-	5.1	9.9	45	15	-	-	0.11	-
83.50	71.5	27.0	-	3.0	-9.0	4.5	3	silty CLAY to CLAY	115	1.5	48	18	-	-	4.9	9.5	45	15	-	-	0.11	-
83.67	166.2	73.5	133.2	3.6	-9.0	2.2	5	silty SAND to sandy SILT	120	4.0	42	18	57	39	-	-	21	16	1.71	-	0.11	25.7
83.83	284.5	125.7	129.6	1.6	-9.0	0.6	6	clean SAND to silty SAND	125	5.0	57	25	75	42	-	-	6	16	1.89	-	0.11	12.5
83.99	287.5	126.9	176.7	5.9	-8.9	2.1	5	silty SAND to sandy SILT	120	4.0	72	32	75	42	-	-	15	16	0.00	-	0.11	0.0
84.16	257.1	113.4	179.5	6.5	-9.0	2.6	5	silty SAND to sandy SILT	120	4.0	64	28	71	41	-	-	18	16	0.00	-	0.11	0.0
84.32	131.7	49.7	-	5.9	-9.0	4.7	4	clayy SILT to silty CLAY	115	2.0	66	25	-	-	9.1	9.9	35	15	-	-	0.11	-
84.49	109.4	41.3	-	4.2	-9.2	4.0	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	36	15	-	-	0.11	-
84.65	200.4	88.1	135.1	3.7	-9.1	1.9	5	silty SAND to sandy SILT	120	4.0	50	22	63	40	-	-	17	16	1.70	-	0.11	19.3
84.81	156.2	68.6	127.3	3.3	-9.0	2.2	5	silty SAND to sandy SILT	120	4.0	39	17	55	38	-	-	21	16	1.89	-	0.11	28.9
84.98	164.5	72.2	145.6	4.4	-9.1	2.7	5	silty SAND to sandy SILT	120	4.0	41	18	56	39	-	-	23	16	1.12	-	0.10	11.1
85.14	175.3	76.8	181.1	6.6	-9.0	3.9	4	clayy SILT to silty CLAY	115	2.0	88	38	-	-	12.2	9.9	27	15	0.00	-	0.10	0.0
85.31	153.5	67.2	165.7	5.5	-9.2	3.7	4	clayy SILT to silty CLAY	115	2.0	77	34	-	-	10.7	9.9	28	15	0.00	-	0.10	0.0
85.47	112.6	49.2	142.2	3.8	-9.2	3.6	4	clayy SILT to silty CLAY	115	2.0	56	25	-	-	7.8	9.9	32	15	1.06	-	0.10	36.9
85.63	351.2	153.5	206.2	7.7	-8.9	2.2	5	silty SAND to sandy SILT	120	4.0	88	38	81	43	-	-	14	16	0.00	-	0.10	0.0
85.80	244.7	106.8	203.7	8.5	-8.9	3.5	5	silty SAND to sandy SILT	120	4.0	61	27	69	41	-	-	22	16	0.00	-	0.10	0.0
85.96	94.3	35.6	-	6.9	-9.0	7.8	3	silty CLAY to CLAY	115	1.5	63	24	-	-	6.5	9.9	50	15	-	-	0.10	-
86.13	48.3	18.2	-	2.1	-9.1	4.9	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	6.0	55	15	-	-	0.10	-
86.29	45.4	17.1	-	1.4	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	5.6	51	15	-	-	0.10	-
86.45	42.5	16.1	-	1.2	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	5.2	51	15	-	-	0.10	-
86.62	42.3	16.0	-	1.0	-9.0	2.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	5.2	49	15	-	-	0.10	-
86.78	43.7	16.5	-	0.9	-9.0	2.4	4	clayy SILT to silty CLAY	115	2.0	22	8	-	-	2.9	5.3	46	15	-	-	0.10	-
86.95	52.5	19.8	-	1.1	-9.1	2.3	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	6.5	42	15	-	-	0.10	-
87.11	63.0	23.8	-	2.1	-9.1	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.3	8.0	45	15	-	-	0.10	-
87.27	62.2	23.5	-	2.0	-9.1	3.5	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.2	7.8	45	15	-	-	0.10	-
87.44	72.2	27.2	-	2.1	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	9.2	40	15	-	-	0.10	-
87.60	72.4	27.3	-	2.3	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	9.2	41	15	-	-	0.10	-
87.77	66.4	25.1	-	2.2	-9.2	3.6	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.5	8.4	43	15	-	-	0.10	-
87.93	64.9	24.5	-	2.1	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	8.1	43	15	-	-	0.10	-
88.09	68.5	25.8	-	1.9	-9.2	3.0	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	8.6	40	15	-	-	0.10	-
88.26	73.5	27.7	-	2.4	-9.2	3.5	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.0	9.3	41	15	-	-	0.10	-
88.42	77.1	29.1	-	2.4	-9.2	3.3	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.7	39	15	-	-	0.10	-
88.59	85.1	32.1	-	2.5	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.8	9.9	37	15	-	-	0.10	-
88.75	84.8	32.0	-	2.5	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	37	15	-	-	0.10	-
88.92	87.3	32.9	-	2.6	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.0	9.9	36	15	-	-	0.10	-
89.08	84.7	32.0	-	2.6	-9.2	3.3	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	38	15	-	-	0.10	-
89.24	85.9	32.4	-	2.9	-9.2	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.10	-
89.41	83.8	31.6	-	2.7	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.7	9.9	38	15	-	-	0.10	-
89.57	89.7	38.3	118.1	2.6	-9.1	3.0	4	clayy SILT to silty CLAY	115	2.0	45	19	-	-	6.2	9.9	33	15	2.04	-	0.10	51.2
89.74	89.6	33.8	-	2.7	-9.2	3.2	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	36	15	-	-	0.10	-
89.90	88.8	33.5	-	4.0	-9.1	4.8	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	43	15	-	-	0.10	-
90.06	93.1	35.1	-	3.9	-9.1	4.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	40	15	-	-	0.10	-
90.23	100.5	37.9	-	3.5	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	36	15	-	-	0.10	-
90.39	94.2	35.5	-	4.0	-9.0	4.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	40	15	-	-	0.10	-
90.56	89.1	33.6	-	3.9	-9.0	4.6	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	42	15	-	-	0.10	-
90.72	100.9	38.1	-	3.6	-8.9	3.8	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	36	15	-	-	0.10	-
90.88	105.3	44.7	134.0	3.4	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	33	15	1.40	-	0.10	50.0
91.05	105.7	44.8	135.9	3.5	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	33	15	1.30	-	0.09	49.5
91.21	108.6	46.0	135.1	3.5	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	54	23	-	-	7.5	9.9	32	15	1.36	-	0.09	47.0
91.38	110.6	46.8	134.3	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	32	15	1.42	-	0.09	45.7
91.54	111.4	47.1	134.2	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.7	9.9	31	15	1.43	-	0.09	45.2
91.70	111.6	47.1	132.2	3.4	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.7	9.9	31	15	1.53	-	0.08	46.3
91.87	110.9	46.8	131.7	3.4	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.7	9.9	31	15	1.55	-	0.08	47.0
92.03	109.7	46.2	130.5	3.3	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.61	-	0.08	48.4
92.20	110.1	46.4	127.8	3.2	-8.9	3.1	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.75	-	0.08	48.4
92.36	109.0	45.8	124.0	3.0	-8.9	2.9	4	clayy SILT to silty CLAY	115	2.0	54	23	-	-	7.5	9.9	30	15	1.88	-	0.07	49.0
92.52	105.2	44.2	124.1	3.0	-8.9	3.0	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	31	15	1.87	-	0.07	51.1

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
92.69	95.6	36.1	-	2.9	-8.9	3.3	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	35	15	-	-	0.07	-
92.85	84.9	32.0	-	2.9	-8.9	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.07	-
93.02	74.0	27.9	-	1.8	-8.9	2.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	8.9	36	15	-	-	0.07	-
93.18	68.0	25.6	-	2.2	-8.9	3.6	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.6	8.1	43	15	-	-	0.07	-
93.34	82.6	31.2	-	3.1	-8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	41	15	-	-	0.07	-
93.51	108.1	40.8	-	4.1	-8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	54	20	-	-	7.5	9.9	36	15	-	-	0.07	-
93.67	119.5	49.9	146.5	4.2	-8.9	3.7	4	clayy SILT to silty CLAY	115	2.0	60	25	-	-	8.3	9.9	32	15	0.82	-	0.07	33.2
93.84	127.2	53.1	142.8	4.1	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	64	27	-	-	8.8	9.9	30	15	1.05	-	0.07	26.8
94.00	121.2	50.6	138.2	3.8	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	61	25	-	-	8.4	9.9	30	15	1.25	-	0.06	35.7
94.16	117.5	49.0	131.4	3.5	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	59	24	-	-	8.1	9.9	30	15	1.58	-	0.06	44.6
94.33	116.1	48.4	130.1	3.4	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.0	9.9	30	15	1.65	-	0.06	46.0
94.49	113.1	47.1	124.6	3.1	-9.0	2.9	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.8	9.9	30	15	1.86	-	0.06	47.6
94.66	114.8	47.7	126.3	3.2	-9.0	2.9	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.9	9.9	30	15	1.81	-	0.05	46.8
94.82	102.2	38.6	-	4.4	-9.0	4.6	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.0	9.9	39	15	-	-	0.05	-
94.98	110.7	41.8	-	4.5	-9.0	4.3	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	37	15	-	-	0.05	-
95.15	116.7	48.4	148.1	4.3	-9.0	3.9	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.1	9.9	33	15	0.72	-	0.05	37.3
95.31	116.9	48.4	139.8	3.9	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.1	9.9	32	15	1.13	-	0.05	39.5
95.48	114.0	47.2	129.7	3.4	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.9	9.9	31	15	1.65	-	0.05	47.4
95.64	112.0	46.3	132.3	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	56	23	-	-	7.7	9.9	31	15	1.49	-	0.05	47.2
95.81	110.0	45.4	129.4	3.3	-9.0	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.64	-	0.04	49.6
95.97	111.1	45.9	126.0	3.2	-9.0	3.0	4	clayy SILT to silty CLAY	115	2.0	56	23	-	-	7.7	9.9	30	15	1.80	-	0.04	49.0
96.13	109.4	45.1	127.9	3.2	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.5	9.9	31	15	1.72	-	0.04	49.9
96.30	105.7	43.6	127.2	3.2	-9.0	3.2	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	32	15	1.74	-	0.03	51.2
96.46	107.8	44.4	123.5	3.0	-9.0	3.0	4	clayy SILT to silty CLAY	115	2.0	54	22	-	-	7.4	9.9	31	15	1.88	-	0.03	50.9
96.63	102.2	42.0	124.3	3.0	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	51	21	-	-	7.0	9.9	32	15	1.85	-	0.03	51.2
96.79	89.2	33.7	-	2.9	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.1	9.9	37	15	-	-	0.03	-
96.95	80.9	30.5	-	3.4	-9.0	4.5	3	silty CLAY to CLAY	115	1.5	54	20	-	-	5.5	9.3	43	15	-	-	0.03	-
97.12	107.5	40.6	-	3.8	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	54	20	-	-	7.4	9.9	35	15	-	-	0.03	-
97.28	122.3	50.1	144.2	4.2	-9.1	3.6	4	clayy SILT to silty CLAY	115	2.0	61	25	-	-	8.5	9.9	32	15	0.92	-	0.03	33.2
97.45	125.1	51.2	143.5	4.2	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	63	26	-	-	8.6	9.9	31	15	0.97	-	0.02	30.6
97.61	129.3	52.9	143.8	4.2	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	65	26	-	-	9.0	9.9	30	15	0.97	-	0.02	26.2
97.77	130.9	53.6	142.2	4.2	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.1	9.9	30	15	1.06	-	0.02	25.9
97.94	131.8	53.9	141.0	4.1	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	66	27	-	-	9.1	9.9	29	15	1.13	-	0.02	26.2
98.10	130.2	53.2	141.8	4.2	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.0	9.9	30	15	1.07	-	0.02	27.0
98.27	128.6	52.5	140.3	4.1	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.9	9.9	30	15	1.14	-	0.02	29.7
98.43	128.3	52.3	135.4	3.8	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.9	9.9	29	15	1.37	-	0.01	34.4
98.59	126.4	51.5	133.7	3.7	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	63	26	-	-	8.7	9.9	29	15	1.46	-	0.01	37.8
98.76	124.9	50.8	147.2	4.4	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	32	15	0.76	-	0.01	30.1
98.92	124.4	50.6	144.5	4.2	-9.0	3.6	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	31	15	0.89	-	0.01	31.6
99.09	130.7	53.1	139.6	4.1	-9.1	3.2	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.0	9.9	29	15	1.17	-	0.01	28.6
99.25	127.1	51.6	143.8	4.2	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.8	9.9	31	15	0.94	-	0.00	29.3
99.41	124.9	50.7	144.4	4.2	-9.0	3.6	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	31	15	0.90	-	0.00	31.5
99.58	127.5	51.7	149.2	4.5	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.8	9.9	32	15	0.68	-	0.00	27.2

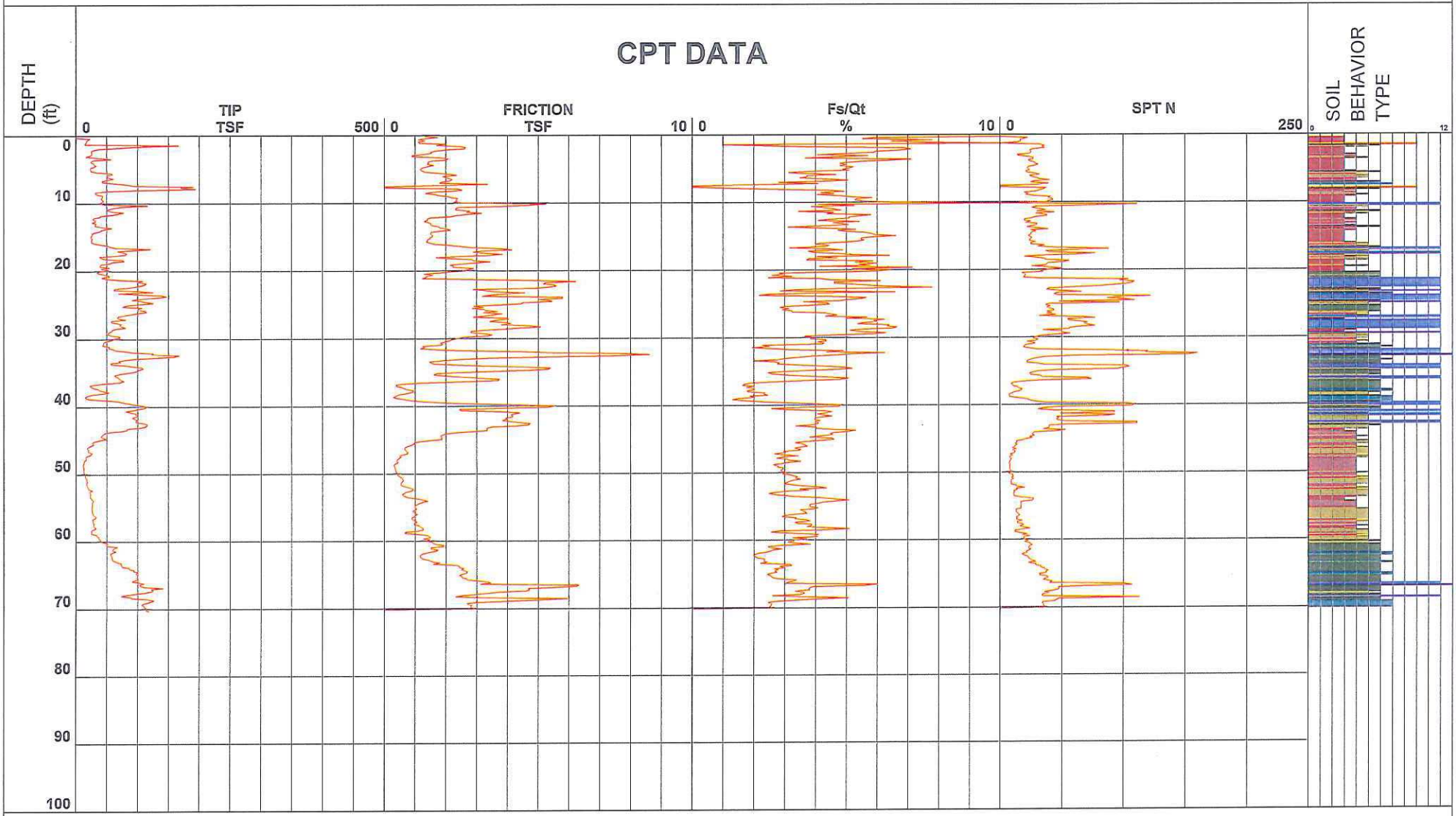
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(567).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-223	Date and Time	10/9/2011 11:47:56 PM	Maximum Depth	70.37 ft
Water Table Depth		>70.37 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
0.33	1.1	0.0	-	1.7	0.2	0.1	1	sensitive fine SOIL	115	2.0	1	0	-	-	0.1	9.9	95	15	N/A	0.00	N/A	N/A
0.49	22.8	36.6	-	1.3	0.3	5.9	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	43	15	N/A	0.00	N/A	N/A
0.66	20.0	32.1	-	1.1	0.3	5.5	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	45	15	N/A	0.00	N/A	N/A
0.82	17.1	27.4	-	1.3	0.4	7.8	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	54	15	N/A	0.00	N/A	N/A
0.98	17.2	27.6	-	1.1	0.4	6.5	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	50	15	N/A	0.00	N/A	N/A
1.15	15.1	24.2	-	1.1	0.4	7.6	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	56	15	N/A	0.00	N/A	N/A
1.31	14.6	23.5	-	2.0	0.4	9.9	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	62	15	N/A	0.00	N/A	N/A
1.48	166.0	266.2	266.2	1.7	0.5	1.0	6	clean SAND to silty SAND	125	5.0	33	53	95	48	-	-	5	16	N/A	0.00	N/A	N/A
1.64	94.2	151.1	215.9	2.5	0.6	2.6	5	silty SAND to sandy SILT	120	4.0	24	38	81	48	-	-	15	16	N/A	0.00	N/A	N/A
1.80	71.8	115.1	215.6	2.6	0.7	3.7	5	silty SAND to sandy SILT	120	4.0	18	29	72	48	-	-	22	16	N/A	0.00	N/A	N/A
1.97	37.8	60.6	-	2.6	0.7	6.9	3	silty CLAY to CLAY	115	1.5	25	40	-	-	2.7	9.9	39	15	N/A	0.00	N/A	N/A
2.13	28.1	45.0	-	2.0	0.7	7.1	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	44	15	N/A	0.00	N/A	N/A
2.30	24.7	39.6	-	1.7	0.7	6.7	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	45	15	N/A	0.00	N/A	N/A
2.46	25.6	41.1	-	1.5	0.4	6.0	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	42	15	N/A	0.00	N/A	N/A
2.62	26.2	42.0	-	1.5	0.4	5.9	3	silty CLAY to CLAY	115	1.5	17	28	-	-	1.8	9.9	41	15	N/A	0.00	N/A	N/A
2.79	25.4	40.7	-	1.3	0.4	5.0	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	39	15	N/A	0.00	N/A	N/A
2.95	22.3	35.8	-	0.9	-0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	38	15	N/A	0.00	N/A	N/A
3.12	16.0	25.6	-	0.9	0.6	5.8	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	50	15	N/A	0.00	N/A	N/A
3.28	37.7	60.5	181.5	1.8	0.6	4.8	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	33	15	0.00	-	0.16	0.0
3.45	56.5	90.7	189.4	2.1	0.6	3.7	4	clayy SILT to silty CLAY	115	2.0	28	45	-	-	4.0	9.9	24	15	0.00	-	0.16	0.0
3.61	28.5	45.7	-	2.0	0.5	7.2	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	43	15	-	-	0.16	-
3.77	24.1	38.6	-	1.6	0.5	6.6	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	45	15	-	-	0.16	-
3.94	25.4	40.8	-	1.4	-0.3	5.6	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	41	15	-	-	0.16	-
4.10	29.0	46.6	-	1.5	-0.7	5.1	4	clayy SILT to silty CLAY	115	2.0	15	23	-	-	2.0	9.9	37	15	-	-	0.16	-
4.27	29.0	46.5	-	1.4	0.0	4.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.16	-
4.43	32.4	51.9	-	1.6	-0.1	5.0	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	36	15	-	-	0.16	-
4.59	29.7	47.6	-	1.4	-0.8	4.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	36	15	-	-	0.16	-
4.76	24.2	38.8	-	1.3	-1.6	5.3	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	41	15	-	-	0.16	-
4.92	23.3	37.4	-	1.2	-1.6	5.1	3	silty CLAY to CLAY	115	1.5	16	25	-	-	1.6	9.9	41	15	-	-	0.16	-
5.09	24.2	38.8	-	1.2	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	40	15	-	-	0.16	-
5.25	24.6	39.5	-	1.2	-2.4	5.1	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	40	15	-	-	0.16	-
5.41	33.2	53.2	154.1	1.3	-2.5	4.0	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.3	9.9	32	15	0.25	-	0.16	0.8
5.58	56.4	90.4	173.7	1.8	-2.5	3.1	5	silty SAND to sandy SILT	120	4.0	14	23	64	45	-	-	22	16	0.00	-	0.16	0.0
5.74	59.4	95.3	189.9	2.1	-1.9	3.5	5	silty SAND to sandy SILT	120	4.0	15	24	65	45	-	-	23	16	0.00	-	0.16	0.0
5.91	50.5	81.0	206.4	2.4	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	29	15	0.00	-	0.16	0.0
6.07	51.1	81.9	182.2	1.9	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	26	15	0.00	-	0.16	0.0
6.23	53.8	86.3	186.9	2.0	-0.1	3.7	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	25	15	0.00	-	0.16	0.0
6.40	61.0	97.4	192.1	2.1	0.0	3.5	5	silty SAND to sandy SILT	120	4.0	15	24	66	45	-	-	23	16	0.00	-	0.16	0.0
6.56	50.2	79.1	197.3	2.2	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	28	15	0.00	-	0.16	0.0
6.73	42.0	65.3	195.6	2.1	0.0	5.1	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	33	15	0.00	-	0.16	0.0
6.89	43.7	67.3	180.3	1.9	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.1	9.9	30	15	0.00	-	0.16	0.0
7.05	64.0	97.3	171.0	1.8	0.0	2.8	5	silty SAND to sandy SILT	120	4.0	16	24	66	45	-	-	20	16	0.00	-	0.16	0.0
7.22	82.1	123.3	238.6	3.4	0.0	4.1	9	very stiff fine SOIL	120	2.0	41	62	74	46	-	-	22	30	0.00	-	0.16	0.0
7.38	93.6	138.9	174.3	1.6	0.1	1.7	6	clean SAND to silty SAND	125	5.0	19	28	78	46	-	-	12	16	0.00	-	0.16	0.0
7.55	190.5	279.4	279.4	0.0	0.0	0.1	7	grvly SAND to dense SAND	130	6.0	32	47	95	48	-	-	5	16	0.00	-	0.16	0.0
7.71	169.9	246.3	246.3	0.0	0.0	0.1	7	grvly SAND to dense SAND	130	6.0	28	41	95	48	-	-	5	16	0.00	-	0.16	0.0
7.87	193.9	277.8	281.9	2.4	0.2	1.2	6	clean SAND to silty SAND	125	5.0	39	56	95	48	-	-	6	16	0.00	-	0.16	0.0
8.04	90.5	128.2	200.2	2.5	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	23	32	75	46	-	-	17	16	0.00	-	0.16	0.0
8.20	50.0	70.1	187.4	2.2	0.2	4.5	4	clayy SILT to silty CLAY	115	2.0	25	35	-	-	3.5	9.9	30	15	0.00	-	0.16	0.0
8.37	31.7	50.8	-	1.6	0.2	5.0	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	36	15	-	-	0.16	-
8.53	32.1	51.3	157.5	1.3	0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.2	9.9	33	15	0.35	-	0.16	1.4
8.69	35.8	56.6	174.0	1.6	0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	33	15	0.00	-	0.16	0.0
8.86	43.3	58.5	163.7	1.8	0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	22	29	-	-	3.0	9.9	31	15	0.00	-	0.16	0.0
9.02	43.0	57.5	179.9	2.1	0.1	4.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	3.0	9.9	34	15	0.00	-	0.16	0.0
9.19	42.3	56.1	185.1	2.2	0.1	5.2	4	clayy SILT to silty CLAY	115	2.0	21	28	-	-	3.0	9.9	35	15	0.00	-	0.16	0.0
9.35	41.1	61.6	-	2.4	0.1	5.9	4	clayy SILT to silty CLAY	115	2.0	21	31	-	-	2.9	9.9	36	15	-	-	0.16	-
9.51	43.6	64.7	202.2	2.3	0.1	5.4	4	clayy SILT to silty CLAY	115	2.0	22	32	-	-	3.1	9.9	34	15	0.00	-	0.16	0.0
9.68	45.0	58.2	191.1	2.4	0.1	5.4	4	clayy SILT to silty CLAY	115	2.0	23	29	-	-	3.2	9.9	35	15	0.00	-	0.16	0.0
9.84	40.8	59.1	-	2.3	0.1	5.7	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.9	9.9	36	15	-	-	0.16	-
10.01	39.4	63.2	-	2.5	0.1	6.5	9	very stiff fine SOIL	120	2.0	20	32	52	41	-	-	37	30	-	-	0.16	-
10.17	46.7	75.0	-	5.3	0.1	9.9	9	very stiff fine SOIL	120	2.0	23	37	57	42	-	-	42	30	-	-	0.16	-
10.34	116.1	145.2	262.7	4.7	0.0	4.1	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	7.7	9.9	21	16	0.00	-	0.16	0.0
10.50	73.2	90.8	236.1	3.8	-0.1	5.3	9	very stiff fine SOIL	120	2.0	37	45	64	44	-	-	29	30	0.00	-	0.16	0.0
10.66	62.6	77.1	180.9	2.4	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	31	39	-	-	4.4	9.9	27	15	0.00	-	0.16	0.0
10.83	54.3	66.4	179.3	2.3	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	27	33	-	-	3.8	9.9	30	15	0.00	-	0.16	0.0
10.99	50.6	61.3	180.4	2.3	0.0	4.7	4	clayy SILT to silty CLAY	115	2.0	25	31	-	-	3.5	9.9	32	15	0.00	-	0.16	0.0
11.16	57.6	69.4	196.5	2.8	0.0	4.9	4	clayy SILT to silty CLAY	115	2.0	29	35	-	-	4.0	9.9	31	15	0.00	-	0.16	0.0
11.32	77.4	92.5	185.8	2.7	0.0	3.5	5	silty SAND to sandy SILT	120	4.0	19	23	64	44	-	-	23	16	0.00	-	0.16	0.0
11.48	68.8	81.7	206.1	3.2	0.0	4.6	4	clayy SILT to silty CLAY	115	2.0	34	41	-	-	4.8	9.9	28	15	0.00	-	0.16	0.0
11.65	60.3	71.1	187.5	2.6	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	30	36	-	-	4.2	9.9	30	15	0.00	-	0.16	0.0
11.81	39.7	57.6	-	2.3	-0.1	5.9	3	silty CLAY to CLAY	115	1.5	26	38	-	-	2.8	9.9	37	15	-	-	0.16	-
11.98	40.0	57.3	-	2.2	-0.1	5.5	4	clayy SILT to silty CLAY	115	2.0	20	29	-	-	2.8	9.9	36	15	-	-	0.16	-
12.14	30.0	42.3	-	1.5	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	20	28	-	-	2.1	9.9	39	15	-	-	0.16	-
12.30	27.4	38.2	-	1.4	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	18	25	-	-	1.9	9.9	41	15	-	-	0.16	-
12.47	31.9	43.9	-	1.4	-0.1	4.5	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.2	9.9	37	15	-	-	0.16	-
12.63	31.8	43.2	-	1.3	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.2	9.9	36	15	-	-	0.16	-
12.80	26.4	35.4	-	1.4	-0.1	5.6	3	silty CLAY to CLAY	115	1.5	18	24	-	-	1.8	9.9	44	15	-	-	0.16	-
12.96	33.1	43.9	-	1.5	-0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	17	22	-	-	2.3	9.9	37	15	-	-	0.16	-
13.12	30.9	40.5	-	1.5	-0.1	5.0	3	silty CLAY to CLAY	115	1.5	21	27	-	-	2.2	9.9	40	15	-	-	0.16	-
13.29	31.0	40.0	-	1.6	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	21	27	-	-	2.2	9.9	40	15	-	-	0.16	-
13.45	42.6	46.8	151.5	1.8	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	3.0	9.9	35	15	0.74	-	0.16	42.6
13.62	58.1	63.4	146.5	1.8	-0.1	3.2	4	clayy SILT to silty CLAY	115	2.0	29	32	-	-	4.1	9.9	26	15	0.98	-	0.16	9.7
13.78	47.4	51.4	161.4	2.1	-0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.3	9.9	34	15	0.00	-	0.16	0.0
13.94	40.3	49.7	-	2.1	-0.2	5.4	3	silty CLAY to CLAY	115	1.5	27	33	-	-	2.8	9.9	38	15	-	-	0.16	-
14.11	38.7	47.2	-	1.8	-0.5	4.8	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	37	15	-	-	0.16	-
14.27	30.6	36.8	-	1.5	-0.4	5.2	3	silty CLAY to CLAY	115	1.5	20	25	-	-	2.1	9.9	42	15	-	-	0.16	-
14.44	27.0	32.2	-	1.5	-0.4	5.8	3	silty CLAY to CLAY	115	1.5	18	21	-	-	1.9	9.9	46	15	-	-	0.16	-
14.60	26.3	31.0	-	1.5	-0.4	6.0	3	silty CLAY to CLAY	115	1.5	18	21	-	-	1.8	9.9	47	15	-	-	0.16	-
14.76	26.4	30.7	-	1.6	-0.4	6.1	3	silty CLAY to CLAY	115	1.5	18	20	-	-	1.8	9.9	48	15	-	-	0.16	-
14.93	23.8	27.5	-	1.6	-0.4	6.9	3	silty CLAY to CLAY	115	1.5	16	18	-	-	1.6	9.9	52	15	-	-	0.16	-
15.09	25.0	28.5	-	1.5	-0.5	6.2	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.7	9.9	49	15	-	-	0.16	-
15.26	27.0	30.4	-	1.5	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	18	20	-	-	1.9	9.9	47	15	-	-	0.16	-
15.42	25.6	28.6	-	1.4	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.8	9.9	48	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qc1n PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
15.58	25.3	28.0	-	1.4	-0.4	5.8	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.8	9.9	49	15	-	-	0.16	-
15.75	25.4	27.7	-	1.4	-0.4	5.6	3	silty CLAY to CLAY	115	1.5	17	18	-	-	1.8	9.9	48	15	-	-	0.16	-
15.91	30.1	32.5	-	1.5	-0.5	5.1	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.1	9.9	44	15	-	-	0.16	-
16.08	39.6	42.4	-	1.6	-0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	36	15	-	-	0.16	-
16.24	51.4	51.4	154.1	2.1	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	26	26	-	-	3.6	9.9	33	15	0.71	-	0.16	28.3
16.40	55.7	55.4	169.2	2.5	-0.5	4.5	4	clayy SILT to silty CLAY	115	2.0	28	28	-	-	3.9	9.9	33	15	0.00	-	0.16	0.0
16.57	64.6	64.0	178.2	2.8	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	32	32	-	-	4.5	9.9	31	15	0.00	-	0.16	0.0
16.73	120.6	118.8	204.0	3.8	-0.4	3.2	5	silty SAND to sandy SILT	120	4.0	30	30	73	44	-	-	20	16	0.00	-	0.16	0.0
16.90	91.9	90.1	214.7	4.1	-0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	46	45	-	-	6.5	9.9	27	15	0.00	-	0.16	0.0
17.06	67.3	65.7	193.4	3.3	-0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	34	33	-	-	4.7	9.9	32	15	0.00	-	0.16	0.0
17.23	76.5	74.3	175.7	2.9	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	38	37	-	-	5.4	9.9	27	15	0.00	-	0.16	0.0
17.39	82.7	80.0	186.4	3.2	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	41	40	-	-	5.8	9.9	27	15	0.00	-	0.16	0.0
17.55	80.4	77.4	206.0	3.8	-0.3	4.8	4	clayy SILT to silty CLAY	115	2.0	40	39	-	-	5.6	9.9	30	15	0.00	-	0.16	0.0
17.72	64.5	61.8	195.2	3.3	-0.3	5.3	4	clayy SILT to silty CLAY	115	2.0	32	31	-	-	4.5	9.9	34	15	0.00	-	0.16	0.0
17.88	38.4	37.0	-	2.5	-0.2	6.6	3	silty CLAY to CLAY	115	1.5	26	25	-	-	2.7	9.9	46	15	-	-	0.16	-
18.05	41.6	39.7	-	1.7	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	37	15	-	-	0.16	-
18.21	47.3	44.8	-	2.2	-0.2	4.8	4	clayy SILT to silty CLAY	115	2.0	24	22	-	-	3.3	9.9	37	15	-	-	0.16	-
18.37	75.4	70.9	172.5	2.9	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	38	35	-	-	5.3	9.9	28	15	0.00	-	0.16	0.0
18.54	78.3	73.3	173.2	2.9	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	39	37	-	-	5.5	9.9	27	15	0.00	-	0.16	0.0
18.70	58.7	54.0	-	3.4	-0.2	6.0	3	silty CLAY to CLAY	115	1.5	39	36	-	-	4.1	9.9	38	15	-	-	0.16	-
18.87	54.8	50.0	-	2.9	-0.2	5.4	3	silty CLAY to CLAY	115	1.5	37	33	-	-	3.8	9.9	37	15	-	-	0.16	-
19.03	40.8	37.0	-	2.5	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	27	25	-	-	2.8	9.9	45	15	-	-	0.16	-
19.19	39.6	35.5	-	2.1	-0.2	5.6	3	silty CLAY to CLAY	115	1.5	26	24	-	-	2.8	9.9	44	15	-	-	0.16	-
19.36	39.1	34.8	-	2.3	-0.2	6.0	3	silty CLAY to CLAY	115	1.5	26	23	-	-	2.7	9.9	45	15	-	-	0.16	-
19.52	54.0	49.3	154.8	2.2	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	27	25	-	-	3.8	9.9	34	15	0.77	-	0.16	35.1
19.69	40.6	35.6	-	2.9	-0.2	7.4	3	silty CLAY to CLAY	115	1.5	27	24	-	-	2.8	9.9	49	15	-	-	0.16	-
19.85	52.4	45.5	-	2.7	-0.2	5.3	3	silty CLAY to CLAY	115	1.5	35	30	-	-	3.7	9.9	39	15	-	-	0.16	-
20.01	40.8	35.1	-	2.6	-0.2	6.6	3	silty CLAY to CLAY	115	1.5	27	23	-	-	2.8	9.9	47	15	-	-	0.16	-
20.18	34.1	29.1	-	2.1	-0.2	6.3	3	silty CLAY to CLAY	115	1.5	23	19	-	-	2.4	9.9	49	15	-	-	0.16	-
20.34	36.9	31.3	-	1.8	-0.2	5.1	3	silty CLAY to CLAY	115	1.5	25	21	-	-	2.6	9.9	44	15	-	-	0.16	-
20.51	45.8	40.8	116.2	1.3	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	23	20	-	-	3.2	9.9	31	15	2.07	-	0.16	51.2
20.67	53.3	47.2	126.5	1.6	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	27	24	-	-	3.7	9.9	30	15	1.93	-	0.15	47.3
20.83	54.2	47.9	118.2	1.4	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	14	12	43	39	-	-	28	16	2.04	-	0.15	46.6
21.00	41.9	34.4	-	1.4	-0.2	3.3	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	2.9	9.9	36	15	-	-	0.15	-
21.16	50.4	44.2	111.8	1.2	-0.2	2.5	5	silty SAND to sandy SILT	120	4.0	13	11	40	39	-	-	29	16	2.13	-	0.15	51.1
21.33	69.6	60.8	169.8	2.9	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	35	30	-	-	4.9	9.9	31	15	0.00	-	0.14	0.0
21.49	108.5	94.4	218.4	4.8	-0.2	4.5	9	very stiff fine SOIL	120	2.0	54	47	65	43	-	-	26	30	0.00	-	0.14	0.0
21.65	101.8	88.2	256.5	6.2	-0.2	6.2	9	very stiff fine SOIL	120	2.0	51	44	63	43	-	-	32	30	0.00	-	0.14	0.0
21.82	113.8	98.2	227.8	5.3	-0.2	4.7	9	very stiff fine SOIL	120	2.0	57	49	66	43	-	-	26	30	0.00	-	0.14	0.0
21.98	112.0	96.3	225.3	5.2	-0.2	4.7	9	very stiff fine SOIL	120	2.0	56	48	66	43	-	-	27	30	0.00	-	0.14	0.0
22.15	106.5	91.2	235.8	5.5	-0.2	5.3	9	very stiff fine SOIL	120	2.0	53	46	64	43	-	-	29	30	0.00	-	0.14	0.0
22.31	96.0	81.9	239.9	5.6	-0.2	5.9	9	very stiff fine SOIL	120	2.0	48	41	60	42	-	-	32	30	0.00	-	0.14	0.0
22.47	82.3	63.0	-	5.3	-0.2	6.5	9	very stiff fine SOIL	120	2.0	41	32	52	41	-	-	37	30	-	-	0.14	-
22.64	63.4	48.2	-	4.9	-0.1	8.0	3	silty CLAY to CLAY	115	1.5	42	32	-	-	4.4	9.9	45	15	-	-	0.14	-
22.80	61.9	46.7	-	2.9	-0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.3	9.9	36	15	-	-	0.14	-
22.97	99.4	83.6	173.9	3.3	-0.1	3.4	5	silty SAND to sandy SILT	120	4.0	25	21	61	42	-	-	24	16	0.00	-	0.14	0.0
23.13	125.2	104.9	180.2	3.6	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	26	69	43	-	-	20	16	0.00	-	0.14	0.0
23.30	69.4	51.2	-	4.6	-0.2	6.7	3	silty CLAY to CLAY	115	1.5	46	34	-	-	4.8	9.9	41	15	-	-	0.14	-
23.46	99.9	83.1	191.4	4.0	-0.2	4.0	4	clayy SILT to silty CLAY	115	2.0	50	42	-	-	7.0	9.9	26	15	0.00	-	0.14	0.0
23.62	139.3	115.5	179.3	3.5	-0.2	2.5	5	silty SAND to sandy SILT	120	4.0	35	29	72	44	-	-	17	16	0.00	-	0.14	0.0
23.79	146.8	121.3	174.4	3.2	-0.2	2.2	5	silty SAND to sandy SILT	120	4.0	37	30	73	44	-	-	16	16	0.00	-	0.14	0.0
23.95	127.8	105.2	233.6	5.8	-0.2	4.6	9	very stiff fine SOIL	120	2.0	64	53	69	43	-	-	25	30	0.00	-	0.14	0.0
24.12	102.6	84.1	238.7	5.8	-0.1	5.7	9	very stiff fine SOIL	120	2.0	51	42	61	42	-	-	31	30	0.00	-	0.14	0.0
24.28	91.0	74.3	221.0	5.0	0.0	5.6	9	very stiff fine SOIL	120	2.0	45	37	57	42	-	-	32	30	0.00	-	0.14	0.0
24.44	106.7	86.9	226.0	5.4	0.0	5.1	9	very stiff fine SOIL	120	2.0	53	43	62	42	-	-	29	30	0.00	-	0.14	0.0
24.61	113.4	92.0	226.1	5.5	0.0	4.9	9	very stiff fine SOIL	120	2.0	57	46	64	43	-	-	28	30	0.00	-	0.14	0.0
24.77	125.4	101.4	200.7	4.5	0.0	3.6	5	silty SAND to sandy SILT	120	4.0	31	25	67	43	-	-	23	16	0.00	-	0.14	0.0
24.94	101.1	81.5	201.5	4.4	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	51	41	-	-	7.1	9.9	28	15	0.00	-	0.14	0.0
25.10	82.8	66.6	184.9	3.7	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	41	33	-	-	5.8	9.9	31	15	0.00	-	0.14	0.0
25.26	76.2	61.0	162.3	2.9	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	38	31	-	-	5.3	9.9	30	15	0.00	-	0.14	0.0
25.43	107.3	85.6	166.9	3.2	-0.2	3.1	5	silty SAND to sandy SILT	120	4.0	27	21	62	42	-	-	23	16	0.00	-	0.14	0.0
25.59	100.4	79.9	156.5	2.9	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	23	16	0.92	-	0.14	7.4
25.76	103.6	82.2	167.0	3.2	-0.2	3.2	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	23	16	0.00	-	0.14	0.0
25.92	112.3	88.8	167.3	3.3	-0.2	3.0	5	silty SAND to sandy SILT	120	4.0	28	22	63	42	-	-	22	16	0.00	-	0.14	0.0
26.08	114.2	90.0	177.7	3.7	-0.2	3.3	5	silty SAND to sandy SILT	120	4.0	29	23	64	42	-	-	23	16	0.00	-	0.14	0.0
26.25	99.4	78.0	166.2	3.2	-0.2	3.3	5	silty SAND to sandy SILT	120	4.0	25	20	59	42	-	-	25	16	0.00	-	0.14	0.0
26.41	88.6	69.4	185.1	3.8	-0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	44	35	-	-	6.2	9.9	30	15	0.00	-	0.14	0.0
26.58	79.7	62.2	180.1	3.6	-0.1	4.6	4	clayy SILT to silty CLAY	115	2.0	40	31	-	-	5.6	9.9	32	15	0.00	-	0.14	0.0
26.74	69.7	44.8	-	3.3	-0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	35	22	-	-	4.9	9.9	37	15	-	-	0.14	-
26.90	67.0	42.7	-	2.9	-0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	33	21	-	-	4.7	9.9	37	15	-	-	0.14	-
27.07	70.7	44.9	-	4.0	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	47	30	-	-	4.9	9.9	40	15	-	-	0.14	-
27.23	80.6	50.8	-	4.1	-0.2	5.1	4	clayy SILT to silty CLAY	115	2.0	40	25	-	-	5.6	9.9	36	15	-	-	0.14	-
27.40	57.9	36.3	-	3.6	-0.2	6.4	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.0	9.9	46	15	-	-	0.14	-
27.56	58.3	36.3	-	3.4	-0.2	6.1	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.1	9.9	45	15	-	-	0.14	-
27.72	65.9	40.8	-	4.0	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	44	27	-	-	4.6	9.9	43	15	-	-	0.14	-
27.89	73.8	45.4	-	4.1	-0.2	5.7	3	silty CLAY to CLAY	115	1.5	49	30	-	-	5.2	9.9	40	15	-	-	0.14	-
28.05	70.9	43.4	-	3.8	-0.2	5.5	3	silty CLAY to CLAY	115	1.5	47	29	-	-	4.9	9.9	40	15	-	-	0.14	-
28.22	74.8	45.5	-	4.8	-0.2	6.5	3	silty CLAY to CLAY	115	1.5	50	30	-	-	5.2	9.9	42	15	-	-	0.14	-
28.38	80.2	48.5	-	5.1	-0.5	6.5	3	silty CLAY to CLAY	115	1.5	53	32	-	-	5.6	9.9	41	15	-	-	0.14	-
28.54	66.3	39.9	-	4.4	-0.5	6.8	3	silty CLAY to CLAY	115	1.5	44	27	-	-	4.6	9.9	45	15	-	-	0.14	-
28.71	59.2	35.4	-	3.8	-0.5	6.7	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.1	9.9	47	15	-	-	0.14	-
28.87	58.8	35.0	-	3.3	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	39	23	-	-	4.1	9.9	44	15	-	-	0.14	-
29.04	55.2	32.7	-	2.8	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	37	22	-	-	3.8	9.9	44	15	-	-	0.14	-
29.20	52.2	30.7	-	2.8	-0.5	5.6	3	silty CLAY to CLAY	115	1.5	35	20	-	-	3.6	9.9	46	15	-	-	0.14	-
29.36	52.5	30.7	-	3.3	-0.5	6.5	3	silty CLAY to CLAY	115	1.5	35	20	-	-	3.7	9.9	49	15	-	-	0.14	-
29.53	59.6	34.7	-	3.5	-0.5	6.1	3	silty CLAY to CLAY	115	1.5	40	23	-	-	4.1	9.9	45	15	-	-	0.14	-
29.69	71.1	41.2	-	3.3	-0.5	4.8	4	clayy SILT to silty CLAY	115	2.0	36	21	-	-	5.0	9.9	39	15	-	-	0.14	-
29.86	71.0	52.3	148.5	2.6	-0.5	3.7	4	clayy SILT to silty CLAY	115	2.0	36	26	-	-	5.0	9.9	31	15	1.30	-	0.14	38.9
30.02	61.6	35.3	-	2.4	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	31	18	-	-	4.3	9.9	38	15	-	-	0.14	-
30.19	57.4	32.7	-	2.2	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	29	16	-	-	4.0	9.9	39	15	-	-	0.14	-
30.35	48.9	27.7	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	33	18	-	-	3.4	9.9	44	15	-	-	0.14	-
30.51	44.9	25.3	-	2.0	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	46	15	-	-	0.14	-
30.68	45.1	25.3	-	1.8	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	45	15	-	-	0.14	-
30.84	44.3	24.7	-	1.9	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	16	-	-	3.1	9.9	46	15	-	-	0.14	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
31.01	44.0	24.4	-	1.9	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	29	16	-	-	3.0	9.9	47	15	-	-	0.14	-
31.17	54.6	39.4	103.4	1.2	-0.4	2.4	5	silty SAND to sandy SILT	120	4.0	14	10	36	37	-	-	29	16	2.27	-	0.14	51.2
31.33	53.4	38.4	107.7	1.3	-0.5	2.6	4	clayy SILT to silty CLAY	115	2.0	27	19	-	-	3.7	9.9	31	15	2.20	-	0.14	51.2
31.50	60.6	43.5	99.2	1.2	-0.5	2.0	5	silty SAND to sandy SILT	120	4.0	15	11	40	38	-	-	26	16	2.35	-	0.13	51.2
31.66	64.6	46.3	121.7	1.8	-0.5	2.9	4	clayy SILT to silty CLAY	115	2.0	32	23	-	-	4.5	9.9	29	15	1.99	-	0.13	48.5
31.83	78.8	56.3	140.5	2.5	-0.6	3.2	4	clayy SILT to silty CLAY	115	2.0	39	28	-	-	5.5	9.9	28	15	1.67	-	0.13	37.5
31.99	91.1	49.0	-	4.5	-0.6	5.0	4	clayy SILT to silty CLAY	115	2.0	46	24	-	-	6.4	9.9	37	15	-	-	0.12	-
32.15	125.8	89.3	210.1	5.5	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	63	45	-	-	8.8	9.9	27	15	0.00	-	0.12	0.0
32.32	122.8	65.3	-	7.7	-0.6	6.4	9	very stiff fine SOIL	120	2.0	61	33	53	42	-	-	36	30	-	-	0.12	-
32.48	167.4	118.3	268.9	8.6	-0.6	5.2	9	very stiff fine SOIL	120	2.0	84	59	73	43	-	-	26	30	0.00	-	0.12	0.0
32.65	160.2	112.9	246.6	7.4	-0.5	4.7	9	very stiff fine SOIL	120	2.0	80	56	71	43	-	-	25	30	0.00	-	0.12	0.0
32.81	134.1	94.3	202.9	5.3	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	67	47	-	-	9.4	9.9	25	15	0.00	-	0.12	0.0
32.97	95.6	67.0	162.0	3.4	-0.4	3.6	4	clayy SILT to silty CLAY	115	2.0	48	34	-	-	6.7	9.9	27	15	0.00	-	0.12	0.0
33.14	80.0	56.0	138.8	2.5	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	40	28	-	-	5.6	9.9	28	15	1.73	-	0.12	37.8
33.30	68.9	48.0	124.0	1.9	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	34	24	-	-	4.8	9.9	29	15	1.96	-	0.12	46.4
33.47	72.5	50.5	107.6	1.5	-0.3	2.1	5	silty SAND to sandy SILT	120	4.0	18	13	44	39	-	-	25	16	2.20	-	0.12	43.6
33.63	56.9	29.1	-	1.5	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	28	15	-	-	3.9	9.9	36	15	-	-	0.11	-
33.79	57.5	29.2	-	1.6	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.0	9.9	37	15	-	-	0.11	-
33.96	80.1	55.4	130.8	2.2	-0.3	2.8	5	silty SAND to sandy SILT	120	4.0	20	14	47	39	-	-	27	16	1.88	-	0.11	38.4
34.12	92.7	63.9	155.8	3.2	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	32	-	-	6.5	9.9	28	15	1.05	-	0.11	15.0
34.29	106.8	73.5	188.9	4.5	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	53	37	-	-	7.5	9.9	29	15	0.00	-	0.11	0.0
34.45	109.3	75.0	208.5	5.4	-0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	55	37	-	-	7.7	9.9	31	15	0.00	-	0.11	0.0
34.61	102.9	51.1	-	5.3	-0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	51	26	-	-	7.2	9.9	37	15	-	-	0.11	-
34.78	100.3	49.6	-	4.8	-0.5	4.9	4	clayy SILT to silty CLAY	115	2.0	50	25	-	-	7.0	9.9	36	15	-	-	0.11	-
34.94	93.4	63.7	166.0	3.6	-0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	47	32	-	-	6.5	9.9	29	15	0.00	-	0.11	0.0
35.11	80.0	54.4	133.8	2.3	-0.5	3.0	4	clayy SILT to silty CLAY	115	2.0	40	27	-	-	5.6	9.9	28	15	1.84	-	0.11	39.4
35.27	70.0	47.5	115.5	1.7	-0.5	2.5	5	silty SAND to sandy SILT	120	4.0	18	12	42	38	-	-	28	16	2.08	-	0.11	47.1
35.43	62.8	42.5	113.5	1.6	-0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	31	21	-	-	4.4	9.9	30	15	2.11	-	0.10	51.2
35.60	65.6	31.7	-	2.0	-0.4	3.1	4	clayy SILT to silty CLAY	115	2.0	33	16	-	-	4.6	9.9	36	15	-	-	0.10	-
35.76	69.5	33.4	-	2.6	-0.4	3.8	4	clayy SILT to silty CLAY	115	2.0	35	17	-	-	4.8	9.9	39	15	-	-	0.10	-
35.93	71.4	34.2	-	3.3	-0.4	4.7	3	silty CLAY to CLAY	115	1.5	48	23	-	-	5.0	9.9	41	15	-	-	0.10	-
36.09	73.7	35.1	-	3.7	-0.4	5.2	3	silty CLAY to CLAY	115	1.5	49	23	-	-	5.1	9.9	43	15	-	-	0.10	-
36.26	77.6	36.8	-	3.7	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	52	25	-	-	5.4	9.9	41	15	-	-	0.10	-
36.42	70.9	33.5	-	2.5	-0.5	3.7	4	clayy SILT to silty CLAY	115	2.0	35	17	-	-	4.9	9.9	38	15	-	-	0.10	-
36.58	46.4	21.8	-	1.2	-0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	23	11	-	-	3.2	9.9	41	15	-	-	0.10	-
36.75	29.1	13.6	-	0.5	-0.4	2.0	4	clayy SILT to silty CLAY	115	2.0	15	7	-	-	2.0	8.2	47	15	-	-	0.10	-
36.91	22.6	10.5	-	0.4	-0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	11	5	-	-	1.5	6.2	52	15	-	-	0.10	-
37.08	25.3	11.7	-	0.4	-0.4	1.8	4	clayy SILT to silty CLAY	115	2.0	13	6	-	-	1.7	7.0	49	15	-	-	0.10	-
37.24	29.1	13.4	-	0.6	-0.4	2.2	4	clayy SILT to silty CLAY	115	2.0	15	7	-	-	2.0	8.1	48	15	-	-	0.10	-
37.40	36.1	16.6	-	0.6	-0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	18	8	-	-	2.5	9.9	42	15	-	-	0.10	-
37.57	38.0	17.4	-	0.8	-0.4	2.1	4	clayy SILT to silty CLAY	115	2.0	19	9	-	-	2.6	9.9	42	15	-	-	0.10	-
37.73	45.8	20.9	-	0.9	-0.5	2.1	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	39	15	-	-	0.10	-
37.90	53.3	34.9	88.2	0.9	-0.5	1.9	5	silty SAND to sandy SILT	120	4.0	13	9	32	36	-	-	29	16	2.59	-	0.10	51.2
38.06	46.0	20.8	-	0.8	-0.6	1.9	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	37	15	-	-	0.09	-
38.22	28.0	12.6	-	0.7	-0.6	2.6	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.5	52	15	-	-	0.09	-
38.39	19.4	8.7	-	0.5	-0.6	2.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.0	63	15	-	-	0.09	-
38.55	15.4	6.9	-	0.4	-0.6	2.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	3.8	71	15	-	-	0.09	-
38.72	16.2	7.2	-	0.3	-0.6	2.2	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.0	65	15	-	-	0.09	-
38.88	21.4	9.5	-	0.4	-0.6	2.3	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	58	15	-	-	0.09	-
39.04	43.5	19.2	-	0.7	-0.7	1.6	4	clayy SILT to silty CLAY	115	2.0	22	10	-	-	3.0	9.9	37	15	-	-	0.09	-
39.21	68.2	43.9	83.5	0.9	-0.7	1.4	5	silty SAND to sandy SILT	120	4.0	17	11	40	38	-	-	22	16	2.71	-	0.09	51.2
39.37	76.1	48.9	98.9	1.3	-0.7	1.8	5	silty SAND to sandy SILT	120	4.0	19	12	43	38	-	-	23	16	2.36	-	0.09	45.5
39.54	86.4	55.4	119.4	2.0	-0.7	2.4	5	silty SAND to sandy SILT	120	4.0	22	14	47	39	-	-	25	16	2.02	-	0.09	38.4
39.70	96.2	61.5	149.8	3.1	-0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	48	31	-	-	6.7	9.9	28	15	1.29	-	0.08	28.6
39.86	108.1	69.0	180.2	4.4	-0.7	4.2	4	clayy SILT to silty CLAY	115	2.0	54	34	-	-	7.6	9.9	29	15	0.00	-	0.08	0.0
40.03	114.2	49.1	-	5.5	-0.7	4.9	4	clayy SILT to silty CLAY	115	2.0	57	25	-	-	8.0	9.9	36	15	-	-	0.08	-
40.19	111.7	47.8	-	5.3	-0.7	4.9	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.8	9.9	36	15	-	-	0.08	-
40.36	103.0	65.3	167.0	3.9	-0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	52	33	-	-	7.2	9.9	29	15	0.00	-	0.08	0.0
40.52	94.9	60.1	130.5	2.4	-0.6	2.6	5	silty SAND to sandy SILT	120	4.0	24	15	50	39	-	-	25	16	1.88	-	0.08	33.9
40.68	81.4	51.4	134.4	2.5	-0.7	3.2	4	clayy SILT to silty CLAY	115	2.0	41	26	-	-	5.7	9.9	29	15	1.83	-	0.08	42.6
40.85	88.8	37.4	-	3.8	-0.6	4.4	4	clayy SILT to silty CLAY	115	2.0	44	19	-	-	6.2	9.9	39	15	-	-	0.07	-
41.01	97.4	40.9	-	4.4	-0.6	4.6	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.18	97.1	40.6	-	4.2	-0.6	4.5	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.34	101.4	42.2	-	4.1	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	51	21	-	-	7.1	9.9	36	15	-	-	0.07	-
41.50	97.4	40.4	-	4.2	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.67	91.8	37.9	-	4.2	-0.5	4.6	4	clayy SILT to silty CLAY	115	2.0	46	19	-	-	6.4	9.9	39	15	-	-	0.07	-
41.83	95.4	39.2	-	3.9	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.7	9.9	37	15	-	-	0.07	-
42.00	99.9	40.9	-	4.0	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	50	20	-	-	7.0	9.9	36	15	-	-	0.07	-
42.16	96.7	39.4	-	3.8	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.7	9.9	37	15	-	-	0.07	-
42.32	98.9	40.2	-	4.1	-0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.9	9.9	37	15	-	-	0.07	-
42.49	110.3	68.2	176.1	4.4	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	55	34	-	-	7.7	9.9	29	15	0.00	-	0.07	0.0
42.65	115.7	71.4	182.8	4.7	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	58	36	-	-	8.1	9.9	29	15	0.00	-	0.07	0.0
42.82	115.5	71.1	181.5	4.7	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	58	36	-	-	8.1	9.9	29	15	0.00	-	0.07	0.0
42.98	111.7	68.6	172.6	4.3	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	56	34	-	-	7.8	9.9	28	15	0.00	-	0.07	0.0
43.15	103.9	63.8	155.1	3.5	-0.5	3.4	4	clayy SILT to silty CLAY	115	2.0	52	32	-	-	7.3	9.9	28	15	1.07	-	0.07	15.8
43.31	83.3	33.1	-	3.3	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	42	17	-	-	5.8	9.9	40	15	-	-	0.07	-
43.47	82.9	32.8	-	3.3	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.8	9.9	40	15	-	-	0.07	-
43.64	73.7	29.1	-	3.3	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	49	19	-	-	5.1	9.9	44	15	-	-	0.07	-
43.80	55.7	21.9	-	3.0	-0.4	5.6	3	silty CLAY to CLAY	115	1.5	37	15	-	-	3.8	9.9	53	15	-	-	0.07	-
43.97	46.7	18.3	-	2.4	-0.4	5.4	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.9	56	15	-	-	0.07	-
44.13	44.3	17.3	-	2.0	-0.4	4.9	3	silty CLAY to CLAY	115	1.5	30	12	-	-	3.0	9.9	56	15	-	-	0.07	-
44.29	42.9	16.7	-	1.9	-0.4	4.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	9.9	56	15	-	-	0.07	-
44.46	40.4	15.7	-	1.8	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	9.7	58	15	-	-	0.07	-
44.62	44.6	17.2	-	1.9	-0.7	4.4	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.1	9.9	54	15	-	-	0.07	-
44.79	49.2	18.9	-	1.9	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	9.9	50	15	-	-	0.07	-
44.95	41.4	15.9	-	1.9	-0.7	4.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.8	57	15	-	-	0.07	-
45.11	32.4	12.4	-	1.5	-0.7	5.0	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	7.5	64	15	-	-	0.07	-
45.28	27.5	10.4	-	1.1	-0.7	4.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.2	67	15	-	-	0.07	-
45.44	26.9	10.2	-	1.0	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.1	66	15	-	-	0.07	-
45.61	28.9	10.9	-	1.0	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.6	62	15	-	-	0.07	-
45.77	25.0	9.4	-	0.9	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.5	68	15	-	-	0.07	-
45.93	21.3	8.0	-	0.8	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	74	15	-	-	0.07	-
46.10	18.5	7.0	-	0.7	-0.7	4.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	79	15	-	-	0.07	-
46.26	19.1	7.2	-	0.7	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.0	77	15	-	-	0.07	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
46.43	20.5	7.7	-	0.7	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.4	73	15	-	-	0.07	-
46.59	20.1	7.6	-	0.7	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	75	15	-	-	0.07	-
46.75	21.0	7.9	-	0.7	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.5	73	15	-	-	0.07	-
46.92	26.0	9.8	-	0.8	-0.7	3.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.7	63	15	-	-	0.07	-
47.08	24.9	9.4	-	0.8	-0.7	3.4	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.4	65	15	-	-	0.07	-
47.25	21.9	8.3	-	0.6	-0.7	3.1	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.6	67	15	-	-	0.07	-
47.41	17.0	6.4	-	0.5	-0.7	3.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.4	78	15	-	-	0.07	-
47.57	15.9	6.0	-	0.5	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.2	83	15	-	-	0.07	-
47.74	16.6	6.3	-	0.5	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.3	79	15	-	-	0.07	-
47.90	16.5	6.2	-	0.5	-0.7	3.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.3	78	15	-	-	0.07	-
48.07	13.6	5.1	-	0.4	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.6	88	15	-	-	0.07	-
48.23	13.5	5.1	-	0.4	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.5	89	15	-	-	0.07	-
48.39	12.8	4.8	-	0.4	-0.7	4.5	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.8	2.4	94	15	-	-	0.07	-
48.56	12.1	4.6	-	0.4	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	94	15	-	-	0.07	-
48.72	11.4	4.3	-	0.3	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.7	2.0	95	15	-	-	0.07	-
48.89	12.0	4.5	-	0.3	-0.7	3.5	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.7	2.1	91	15	-	-	0.07	-
49.05	12.5	4.7	-	0.3	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.3	90	15	-	-	0.07	-
49.22	12.5	4.7	-	0.3	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	91	15	-	-	0.07	-
49.38	12.5	4.7	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	92	15	-	-	0.07	-
49.54	12.7	4.8	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.3	91	15	-	-	0.07	-
49.71	13.3	5.0	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.8	2.4	88	15	-	-	0.07	-
49.87	13.7	5.2	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.5	87	15	-	-	0.07	-
50.04	14.3	5.4	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.6	86	15	-	-	0.07	-
50.20	14.6	5.5	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.7	85	15	-	-	0.07	-
50.36	15.1	5.7	-	0.5	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.8	85	15	-	-	0.07	-
50.53	15.8	6.0	-	0.5	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.9	84	15	-	-	0.07	-
50.69	17.0	6.4	-	0.6	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.2	81	15	-	-	0.07	-
50.86	18.2	6.8	-	0.6	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	78	15	-	-	0.07	-
51.02	17.8	6.7	-	0.6	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	80	15	-	-	0.07	-
51.18	18.7	7.1	-	0.6	-0.6	3.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	77	15	-	-	0.07	-
51.35	17.8	6.7	-	0.6	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	78	15	-	-	0.07	-
51.51	17.8	6.7	-	0.5	-0.6	3.7	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	77	15	-	-	0.07	-
51.68	18.2	6.9	-	0.5	-0.6	3.6	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	76	15	-	-	0.07	-
51.84	18.5	7.0	-	0.6	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	77	15	-	-	0.07	-
52.00	19.6	7.4	-	0.7	-0.6	4.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.7	77	15	-	-	0.07	-
52.17	20.3	7.7	-	0.8	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.8	78	15	-	-	0.07	-
52.33	21.3	8.0	-	0.9	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.0	78	15	-	-	0.07	-
52.50	27.0	10.2	-	0.9	-0.6	3.9	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.3	65	15	-	-	0.07	-
52.66	22.2	8.4	-	0.8	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.2	73	15	-	-	0.07	-
52.82	22.9	8.6	-	0.7	-0.6	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.3	68	15	-	-	0.07	-
52.99	24.1	9.1	-	0.6	-0.6	3.1	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.6	64	15	-	-	0.07	-
53.15	23.8	9.0	-	0.6	-0.6	2.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.5	64	15	-	-	0.07	-
53.32	23.2	8.8	-	0.6	-0.6	3.1	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.4	66	15	-	-	0.07	-
53.48	23.3	8.8	-	0.7	-0.6	3.5	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	4.4	68	15	-	-	0.07	-
53.64	24.5	9.3	-	0.8	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.6	68	15	-	-	0.07	-
53.81	26.0	9.8	-	1.1	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.9	70	15	-	-	0.07	-
53.97	27.8	10.5	-	1.3	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	70	15	-	-	0.07	-
54.14	27.8	10.5	-	1.4	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	72	15	-	-	0.07	-
54.30	26.9	10.1	-	1.3	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.0	72	15	-	-	0.07	-
54.46	27.2	10.2	-	1.2	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.1	69	15	-	-	0.07	-
54.63	26.3	9.9	-	1.1	-0.5	4.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.9	70	15	-	-	0.07	-
54.79	26.3	9.9	-	1.0	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.9	68	15	-	-	0.07	-
54.96	26.2	9.9	-	1.0	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	68	15	-	-	0.07	-
55.12	25.9	9.8	-	1.0	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	69	15	-	-	0.07	-
55.28	25.9	9.8	-	1.1	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	70	15	-	-	0.07	-
55.45	25.9	9.8	-	1.0	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.7	69	15	-	-	0.07	-
55.61	26.4	10.0	-	0.9	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	67	15	-	-	0.07	-
55.78	26.9	10.1	-	1.0	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.9	66	15	-	-	0.07	-
55.94	27.8	10.5	-	1.0	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.8	5.1	66	15	-	-	0.07	-
56.11	28.9	10.9	-	1.1	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	65	15	-	-	0.07	-
56.27	31.2	11.8	-	1.0	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.8	60	15	-	-	0.07	-
56.43	33.0	12.4	-	1.0	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.1	57	15	-	-	0.07	-
56.60	30.9	11.6	-	0.9	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.6	59	15	-	-	0.07	-
56.76	27.0	10.2	-	0.9	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	65	15	-	-	0.07	-
56.93	28.2	10.6	-	0.9	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	64	15	-	-	0.07	-
57.09	27.7	10.4	-	1.0	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.0	66	15	-	-	0.07	-
57.25	28.0	10.6	-	1.1	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.0	67	15	-	-	0.07	-
57.42	29.7	11.2	-	1.0	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	20	7	-	-	2.0	5.3	62	15	-	-	0.07	-
57.58	28.5	10.8	-	1.0	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	64	15	-	-	0.07	-
57.75	28.8	10.9	-	1.1	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	66	15	-	-	0.07	-
57.91	30.3	11.4	-	1.2	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	5.4	64	15	-	-	0.07	-
58.07	32.5	12.3	-	1.2	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.8	62	15	-	-	0.07	-
58.24	29.5	11.1	-	1.3	-0.4	4.9	3	silty CLAY to CLAY	115	1.5	20	7	-	-	2.0	5.2	67	15	-	-	0.07	-
58.40	24.8	9.4	-	1.3	-0.4	5.9	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	4.3	76	15	-	-	0.07	-
58.57	25.9	9.8	-	1.1	-0.4	4.8	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.5	71	15	-	-	0.07	-
58.73	25.2	9.5	-	0.7	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.3	65	15	-	-	0.07	-
58.89	25.7	9.7	-	0.7	-0.4	3.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.4	62	15	-	-	0.07	-
59.06	33.4	12.6	-	1.1	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.9	59	15	-	-	0.07	-
59.22	34.8	13.1	-	1.4	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.1	62	15	-	-	0.07	-
59.39	36.8	13.9	-	1.5	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.5	59	15	-	-	0.07	-
59.55	37.1	14.0	-	1.5	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.6	60	15	-	-	0.07	-
59.71	39.0	14.7	-	1.3	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	6.9	54	15	-	-	0.07	-
59.88	39.9	15.1	-	1.5	-0.3	4.1	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.1	56	15	-	-	0.07	-
60.04	41.8	15.8	-	1.4	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	7.4	53	15	-	-	0.07	-
60.21	47.6	18.0	-	1.6	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	8.5	50	15	-	-	0.07	-
60.37	51.4	19.4	-	1.6	-0.3	3.3	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.2	47	15	-	-	0.07	-
60.53	49.3	18.6	-	1.7	-0.3	3.7	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	8.8	50	15	-	-	0.07	-
60.70	50.3	19.0	-	1.9	-0.3	4.1	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	9.0	51	15	-	-	0.07	-
60.86	67.1	25.3	-	1.9	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.6	9.9	40	15	-	-	0.07	-
61.03	62.7	23.6	-	1.5	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	39	15	-	-	0.07	-
61.19	59.8	22.6	-	1.5	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	41	15	-	-	0.07	-
61.35	59.9	22.6	-	1.7	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	43	15	-	-	0.07	-
61.52	64.7	24.4	-	1.7	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	40	15	-	-	0.07	-
61.68	59.3	22.4	-	1.5	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	41	15	-	-	0.07	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
61.85	56.0	21.1	-	1.3	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.8	9.9	41	15	-	-	0.07	-
62.01	56.7	21.4	-	1.2	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	40	15	-	-	0.07	-
62.17	57.8	21.8	-	1.2	-0.3	2.2	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	39	15	-	-	0.07	-
62.34	58.5	22.1	-	1.2	-0.3	2.1	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	38	15	-	-	0.07	-
62.50	58.1	21.9	-	1.2	-0.3	2.2	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	39	15	-	-	0.07	-
62.67	59.4	22.4	-	1.3	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	38	15	-	-	0.07	-
62.83	59.4	22.4	-	1.4	-0.3	2.5	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	40	15	-	-	0.07	-
63.00	64.0	24.2	-	1.5	-0.2	2.5	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	38	15	-	-	0.07	-
63.16	68.8	25.9	-	1.6	-0.3	2.4	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	37	15	-	-	0.07	-
63.32	74.4	28.1	-	1.8	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	36	15	-	-	0.07	-
63.49	72.4	36.7	101.0	1.6	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	36	18	-	-	5.0	9.9	31	15	2.32	-	0.07	51.2
63.65	74.7	28.2	-	2.4	-0.3	3.3	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.2	9.9	40	15	-	-	0.07	-
63.82	75.6	28.5	-	2.4	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	40	15	-	-	0.07	-
63.98	86.3	32.5	-	2.4	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	35	15	-	-	0.07	-
64.14	86.7	32.7	-	2.6	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	36	15	-	-	0.07	-
64.31	94.1	47.3	121.7	2.5	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	47	24	-	-	6.5	9.9	29	15	1.99	-	0.07	47.2
64.47	93.7	47.1	124.8	2.6	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	47	24	-	-	6.5	9.9	30	15	1.95	-	0.07	47.5
64.64	101.3	50.9	125.4	2.7	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	51	25	-	-	7.0	9.9	28	15	1.94	-	0.06	43.2
64.80	97.3	48.8	125.2	2.7	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	49	24	-	-	6.7	9.9	29	15	1.94	-	0.06	45.5
64.96	99.1	49.6	122.2	2.6	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	1.98	-	0.06	44.6
65.13	100.8	50.4	119.0	2.5	-0.3	2.5	5	silty SAND to sandy SILT	120	4.0	25	13	44	37	-	-	27	16	2.03	-	0.05	43.7
65.29	99.6	49.8	121.0	2.5	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	2.00	-	0.05	44.4
65.46	98.9	49.4	121.5	2.5	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	1.99	-	0.05	44.9
65.62	101.8	50.7	124.5	2.7	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	51	25	-	-	7.1	9.9	28	15	1.95	-	0.04	43.4
65.78	95.7	47.6	125.7	2.7	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	48	24	-	-	6.6	9.9	30	15	1.94	-	0.04	46.9
65.95	90.7	34.2	-	3.1	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	37	15	-	-	0.04	-
66.11	103.2	51.2	140.6	3.4	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	52	26	-	-	7.2	9.9	30	15	1.38	-	0.04	39.4
66.28	110.2	54.6	140.7	3.5	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	55	27	-	-	7.7	9.9	29	15	1.41	-	0.03	35.8
66.44	103.1	51.1	134.7	3.1	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	52	26	-	-	7.2	9.9	30	15	1.66	-	0.03	43.0
66.60	105.1	39.7	-	6.3	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	70	26	-	-	7.3	9.9	44	15	-	-	0.03	-
66.77	111.4	42.0	-	6.3	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	74	28	-	-	7.7	9.9	42	15	-	-	0.03	-
66.93	140.8	69.5	177.2	5.5	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	70	35	-	-	9.8	9.9	29	15	0.00	-	0.03	0.0
67.10	122.1	60.2	164.0	4.7	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.5	9.9	30	15	0.00	-	0.03	0.0
67.26	125.1	61.6	164.3	4.7	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	63	31	-	-	8.7	9.9	30	15	0.00	-	0.03	0.0
67.42	121.5	59.7	162.9	4.6	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.5	9.9	30	15	0.00	-	0.03	0.0
67.59	111.1	54.5	145.8	3.7	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	56	27	-	-	7.7	9.9	30	15	1.14	-	0.03	26.6
67.75	94.3	35.6	-	3.4	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.03	-
67.92	83.0	31.3	-	3.0	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.03	-
68.08	73.7	27.8	-	2.6	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.03	-
68.24	88.9	43.4	116.8	2.3	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	44	22	-	-	6.1	9.9	30	15	2.06	-	0.03	51.2
68.41	90.8	34.3	-	3.1	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	37	15	-	-	0.02	-
68.57	117.8	44.4	-	6.0	-0.2	5.2	3	silty CLAY to CLAY	115	1.5	79	30	-	-	8.2	9.9	39	15	-	-	0.02	-
68.74	126.1	61.4	169.6	5.0	-0.2	4.1	4	clayy SILT to silty CLAY	115	2.0	63	31	-	-	8.8	9.9	31	15	0.00	-	0.02	0.0
68.90	121.4	59.0	150.0	4.0	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.4	9.9	29	15	0.96	-	0.02	12.4
69.07	115.0	55.8	130.3	3.1	-0.3	2.8	5	silty SAND to sandy SILT	120	4.0	29	14	48	38	-	-	27	16	1.81	-	0.02	37.9
69.23	109.6	53.2	122.3	2.7	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	27	13	46	37	-	-	26	16	1.98	-	0.02	40.7
69.39	106.5	51.6	123.9	2.7	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	27	13	45	37	-	-	27	16	1.96	-	0.02	42.4
69.56	110.3	53.4	125.5	2.8	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	13	46	37	-	-	27	16	1.94	-	0.01	40.5
69.72	110.2	53.3	125.0	2.8	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	13	46	37	-	-	27	16	1.95	-	0.01	40.6
69.89	113.4	54.8	125.0	2.8	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	28	14	47	37	-	-	26	16	1.95	-	0.01	39.0
70.05	113.2	54.6	127.1	2.9	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	14	47	37	-	-	27	16	1.90	-	0.00	39.2

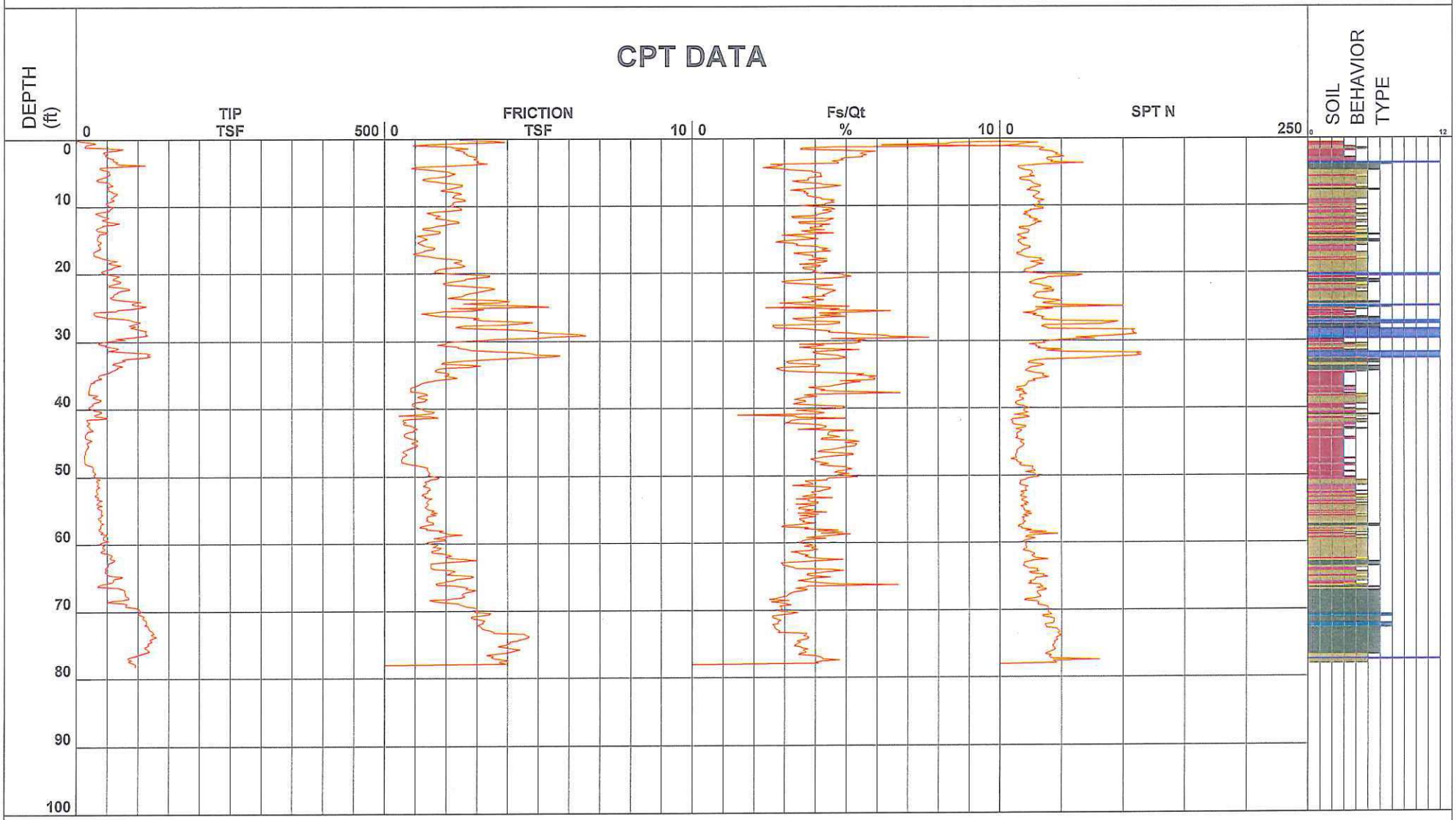
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(566)-45-5.cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-229	Date and Time	10/9/2011 10:38:59 PM	Maximum Depth	78.25 ft
Water Table Depth		45.50 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
0.33	10.9	17.5	-	3.5	0.9	9.9	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	69	15	N/A	0.00	N/A	N/A
0.49	28.0	44.9	-	3.9	0.9	9.9	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	50	15	N/A	0.00	N/A	N/A
0.66	32.0	51.3	-	2.7	0.9	8.5	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.3	9.9	45	15	N/A	0.00	N/A	N/A
0.82	18.3	29.3	-	1.5	0.8	8.3	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	54	15	N/A	0.00	N/A	N/A
0.98	15.1	24.2	-	0.9	0.8	6.2	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	52	15	N/A	0.00	N/A	N/A
1.15	13.8	22.1	-	2.2	0.8	9.9	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	63	15	N/A	0.00	N/A	N/A
1.31	49.2	78.8	199.5	2.2	1.0	4.6	4	clayy SILT to silty CLAY	115	2.0	25	39	-	-	3.5	9.9	29	15	N/A	0.00	N/A	N/A
1.48	76.1	122.0	219.4	2.7	1.0	3.6	5	silty SAND to sandy SILT	120	4.0	19	31	74	48	-	-	21	16	N/A	0.00	N/A	N/A
1.64	65.8	105.6	200.2	2.3	1.1	3.5	5	silty SAND to sandy SILT	120	4.0	16	26	69	48	-	-	22	16	N/A	0.00	N/A	N/A
1.80	51.3	82.2	211.5	2.5	1.1	4.8	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	29	15	N/A	0.00	N/A	N/A
1.97	43.9	70.4	222.8	2.6	1.2	6.0	9	very stiff fine SOIL	120	2.0	22	35	55	47	-	-	34	30	N/A	0.00	N/A	N/A
2.13	46.1	74.0	219.6	2.6	1.3	5.6	9	very stiff fine SOIL	120	2.0	23	37	57	47	-	-	32	30	N/A	0.00	N/A	N/A
2.30	49.2	78.8	223.3	2.7	1.2	5.5	9	very stiff fine SOIL	120	2.0	25	39	59	47	-	-	31	30	N/A	0.00	N/A	N/A
2.46	47.4	76.1	224.7	2.7	0.5	5.7	9	very stiff fine SOIL	120	2.0	24	38	58	46	-	-	32	30	N/A	0.00	N/A	N/A
2.62	51.2	82.1	229.2	2.8	0.2	5.5	9	very stiff fine SOIL	120	2.0	26	41	61	46	-	-	31	30	N/A	0.00	N/A	N/A
2.79	54.1	86.7	236.6	3.0	0.2	5.6	9	very stiff fine SOIL	120	2.0	27	43	62	46	-	-	30	30	N/A	0.00	N/A	N/A
2.95	60.8	97.6	235.1	3.0	0.2	5.0	9	very stiff fine SOIL	120	2.0	30	49	66	47	-	-	27	30	N/A	0.00	N/A	N/A
3.12	60.1	96.3	229.8	2.9	0.1	4.9	9	very stiff fine SOIL	120	2.0	30	48	66	46	-	-	27	30	N/A	0.00	N/A	N/A
3.28	61.2	98.1	233.9	3.0	0.1	4.9	9	very stiff fine SOIL	120	2.0	31	49	66	46	-	-	27	30	0.00	-	0.16	0.0
3.45	67.6	108.4	235.6	3.1	-0.1	4.6	9	very stiff fine SOIL	120	2.0	34	54	70	47	-	-	25	30	0.00	-	0.16	0.0
3.61	63.6	102.0	233.8	3.0	-0.3	4.7	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	26	30	0.00	-	0.16	0.0
3.77	70.5	113.1	248.0	3.4	-1.3	4.8	9	very stiff fine SOIL	120	2.0	35	57	71	47	-	-	25	30	0.00	-	0.16	0.0
3.94	111.8	179.2	240.9	2.8	-1.1	2.6	5	silty SAND to sandy SILT	120	4.0	28	45	86	48	-	-	14	16	0.00	-	0.16	0.0
4.10	66.4	106.4	183.2	1.9	-1.1	2.9	5	silty SAND to sandy SILT	120	4.0	17	27	69	46	-	-	20	16	0.00	-	0.16	0.0
4.27	38.6	61.9	134.6	1.1	-1.0	2.8	5	silty SAND to sandy SILT	120	4.0	10	15	51	43	-	-	25	16	0.62	-	0.16	3.6
4.43	38.8	62.3	122.7	0.9	-1.0	2.3	5	silty SAND to sandy SILT	120	4.0	10	16	51	43	-	-	23	16	1.42	-	0.16	13.5
4.59	45.5	72.9	150.0	1.3	-1.0	2.9	5	silty SAND to sandy SILT	120	4.0	11	18	57	44	-	-	24	16	0.24	-	0.16	1.1
4.76	53.1	85.2	170.7	1.7	-1.0	3.2	5	silty SAND to sandy SILT	120	4.0	13	21	62	45	-	-	23	16	0.00	-	0.16	0.0
4.92	53.3	85.5	190.6	2.1	-1.0	3.9	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.7	9.9	26	15	0.00	-	0.16	0.0
5.09	55.1	88.3	194.8	2.2	-1.0	4.0	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	3.9	9.9	25	15	0.00	-	0.16	0.0
5.25	55.5	88.9	202.2	2.3	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	3.9	9.9	26	15	0.00	-	0.16	0.0
5.41	51.9	83.2	196.4	2.2	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	26	42	-	-	3.7	9.9	27	15	0.00	-	0.16	0.0
5.58	49.5	79.5	191.6	2.1	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	27	15	0.00	-	0.16	0.0
5.74	43.6	70.0	181.2	1.8	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	29	15	0.00	-	0.16	0.0
5.91	37.0	59.3	158.3	1.4	-1.0	3.8	4	clayy SILT to silty CLAY	115	2.0	18	30	-	-	2.6	9.9	30	15	0.21	-	0.16	0.7
6.07	32.9	52.7	149.2	1.2	-1.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	31	15	0.40	-	0.16	1.7
6.23	37.1	59.5	157.9	1.4	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	30	15	0.23	-	0.15	0.9
6.40	52.1	82.6	169.6	1.7	-1.1	3.3	5	silty SAND to sandy SILT	120	4.0	13	21	61	44	-	-	24	16	0.00	-	0.15	0.0
6.56	54.4	85.1	180.0	1.9	-1.1	3.6	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	24	15	0.00	-	0.15	0.0
6.73	56.4	87.1	199.0	2.3	-1.1	4.1	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	4.0	9.9	26	15	0.00	-	0.15	0.0
6.89	59.7	91.1	207.4	2.5	-1.1	4.3	4	clayy SILT to silty CLAY	115	2.0	30	46	-	-	4.2	9.9	26	15	0.00	-	0.15	0.0
7.05	52.4	79.1	208.7	2.5	-1.1	4.9	4	clayy SILT to silty CLAY	115	2.0	26	40	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
7.22	51.9	77.5	198.2	2.3	-1.1	4.5	4	clayy SILT to silty CLAY	115	2.0	26	39	-	-	3.6	9.9	29	15	0.00	-	0.15	0.0
7.38	53.1	78.4	188.9	2.2	-1.1	4.2	4	clayy SILT to silty CLAY	115	2.0	27	39	-	-	3.7	9.9	27	15	0.00	-	0.15	0.0
7.55	53.2	77.7	174.4	1.9	-1.1	3.6	4	clayy SILT to silty CLAY	115	2.0	27	39	-	-	3.7	9.9	26	15	0.00	-	0.15	0.0
7.71	57.7	83.3	168.7	1.8	-1.1	3.2	5	silty SAND to sandy SILT	120	4.0	14	21	61	44	-	-	23	16	0.00	-	0.15	0.0
7.87	60.2	86.1	185.7	2.2	-1.1	3.7	4	clayy SILT to silty CLAY	115	2.0	30	43	-	-	4.2	9.9	25	15	0.00	-	0.15	0.0
8.04	67.2	95.1	193.8	2.4	-1.1	3.7	5	silty SAND to sandy SILT	120	4.0	17	24	65	44	-	-	24	16	0.00	-	0.15	0.0
8.20	66.3	92.8	195.8	2.5	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	33	46	-	-	4.7	9.9	24	15	0.00	-	0.15	0.0
8.37	62.0	85.9	186.2	2.3	-1.1	3.7	4	clayy SILT to silty CLAY	115	2.0	31	43	-	-	4.4	9.9	25	15	0.00	-	0.15	0.0
8.53	60.5	83.2	184.5	2.3	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	30	42	-	-	4.3	9.9	25	15	0.00	-	0.15	0.0
8.69	56.3	76.7	182.0	2.2	-1.2	4.0	4	clayy SILT to silty CLAY	115	2.0	28	38	-	-	4.0	9.9	27	15	0.00	-	0.15	0.0
8.86	58.1	78.3	190.8	2.4	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	29	39	-	-	4.1	9.9	28	15	0.00	-	0.15	0.0
9.02	61.8	82.6	196.5	2.6	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	31	41	-	-	4.3	9.9	27	15	0.00	-	0.15	0.0
9.19	57.1	75.7	199.1	2.6	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	29	38	-	-	4.0	9.9	29	15	0.00	-	0.15	0.0
9.35	51.4	67.5	185.6	2.3	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.6	9.9	31	15	0.00	-	0.15	0.0
9.51	48.0	62.5	182.0	2.2	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	24	31	-	-	3.4	9.9	32	15	0.00	-	0.15	0.0
9.68	52.2	67.4	181.3	2.3	-1.2	4.4	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
9.84	50.3	64.4	177.4	2.2	-1.2	4.4	4	clayy SILT to silty CLAY	115	2.0	25	32	-	-	3.5	9.9	31	15	0.00	-	0.15	0.0
10.01	61.0	77.5	172.5	2.2	-1.2	3.6	4	clayy SILT to silty CLAY	115	2.0	31	39	-	-	4.3	9.9	26	15	0.00	-	0.15	0.0
10.17	58.3	73.4	184.3	2.4	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	29	37	-	-	4.1	9.9	28	15	0.00	-	0.15	0.0
10.34	55.4	69.3	188.0	2.5	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	28	35	-	-	3.9	9.9	30	15	0.00	-	0.15	0.0
10.50	54.2	67.2	188.9	2.5	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	27	34	-	-	3.8	9.9	31	15	0.00	-	0.15	0.0
10.66	52.4	64.5	175.8	2.2	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
10.83	38.6	52.3	166.5	1.7	-1.1	4.6	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	34	15	0.00	-	0.15	0.0
10.99	31.1	41.7	-	1.4	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.2	9.9	37	15	-	-	0.15	-
11.16	36.2	48.0	154.6	1.5	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.5	9.9	34	15	0.54	-	0.15	2.9
11.32	40.2	48.1	150.7	1.6	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.8	9.9	34	15	0.70	-	0.15	38.3
11.48	45.2	53.7	157.6	1.8	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	23	27	-	-	3.2	9.9	32	15	0.46	-	0.15	2.5
11.65	52.9	62.4	148.4	1.7	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	26	31	-	-	3.7	9.9	27	15	0.81	-	0.15	6.8
11.81	50.6	59.3	146.3	1.7	-1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.5	9.9	28	15	0.92	-	0.15	10.1
11.98	42.5	49.4	163.7	1.9	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	3.0	9.9	35	15	0.00	-	0.15	0.0
12.14	48.2	55.6	169.5	2.1	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	24	28	-	-	3.4	9.9	33	15	0.00	-	0.15	0.0
12.30	55.8	64.0	177.4	2.4	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	28	32	-	-	3.9	9.9	31	15	0.00	-	0.15	0.0
12.47	70.5	80.3	173.3	2.4	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	35	40	-	-	4.9	9.9	25	15	0.00	-	0.15	0.0
12.63	60.4	68.4	161.6	2.1	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	30	34	-	-	4.2	9.9	27	15	0.00	-	0.15	0.0
12.80	45.0	50.6	163.0	2.0	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	22	25	-	-	3.1	9.9	35	15	0.00	-	0.15	0.0
12.96	41.4	46.3	150.4	1.7	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	2.9	9.9	35	15	0.78	-	0.15	44.0
13.12	37.2	44.1	-	1.6	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	36	15	-	-	0.15	-
13.29	33.2	39.1	-	1.3	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.14	-
13.45	32.5	41.5	-	1.2	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.3	9.9	35	15	-	-	0.14	-
13.62	36.5	46.1	-	1.6	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	-	-	0.14	-
13.78	51.1	55.4	148.6	1.8	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	26	28	-	-	3.6	9.9	30	15	0.88	-	0.14	19.1
13.94	48.1	51.8	149.8	1.8	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.4	9.9	32	15	0.83	-	0.14	28.1
14.11	36.7	44.8	-	1.7	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.6	9.9	37	15	-	-	0.14	-
14.27	38.0	40.5	132.6	1.4	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	35	15	1.68	-	0.14	51.2
14.44	36.7	39.0	115.8	1.1	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.6	9.9	32	15	2.07	-	0.14	51.2
14.60	34.5	38.1	-	1.2	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.4	9.9	36	15	-	-	0.13	-
14.76	35.1	38.4	-	1.3	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.4	9.9	36	15	-	-	0.13	-
14.93	34.3	39.5	-	1.4	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.4	9.9	37	15	-	-	0.13	-
15.09	35.7	38.5	127.7	1.3	-1.4	3.6	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	35	15	1.87	-	0.13	51.2
15.26	40.2	41.5	119.6	1.2	-1.4	3.0	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	32	15	2.02	-	0.12	51.2
15.42	40.3	41.3	113.9	1.1	-1.4	2.8	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	31	15	2.10	-	0.12	51.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
15.58	35.5	36.3	119.7	1.2	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	35	15	2.02	-	0.12	51.2
15.75	36.4	38.1	125.3	1.2	-1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	35	15	1.94	-	0.11	51.2
15.91	39.1	39.5	125.9	1.3	-1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	20	20	-	-	2.7	9.9	34	15	1.93	-	0.11	51.2
16.08	38.2	40.9	-	1.6	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	37	15	-	-	0.11	-
16.24	39.8	42.2	-	1.6	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	36	15	-	-	0.11	-
16.40	36.4	38.2	-	1.6	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	39	15	-	-	0.11	-
16.57	31.7	33.0	-	1.3	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	16	-	-	2.2	9.9	41	15	-	-	0.11	-
16.73	28.3	29.1	-	1.3	-1.3	4.7	3	silty CLAY to CLAY	115	1.5	19	19	-	-	2.0	9.9	44	15	-	-	0.11	-
16.90	28.7	29.2	-	1.1	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	14	15	-	-	2.0	9.9	41	15	-	-	0.11	-
17.06	28.6	28.9	-	0.9	-1.3	3.4	4	clayy SILT to silty CLAY	115	2.0	14	14	-	-	2.0	9.9	39	15	-	-	0.11	-
17.23	29.7	29.7	-	1.1	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	15	15	-	-	2.1	9.9	40	15	-	-	0.11	-
17.39	36.2	35.9	-	1.4	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	38	15	-	-	0.11	-
17.55	41.3	40.6	-	1.6	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	36	15	-	-	0.11	-
17.72	47.5	45.5	146.8	1.9	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	24	23	-	-	3.3	9.9	35	15	1.06	-	0.11	47.3
17.88	53.8	51.3	162.4	2.4	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	27	26	-	-	3.8	9.9	34	15	0.00	-	0.11	0.0
18.05	66.6	63.2	163.7	2.5	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	33	32	-	-	4.7	9.9	29	15	0.00	-	0.11	0.0
18.21	56.6	53.4	165.7	2.5	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	28	27	-	-	4.0	9.9	34	15	0.00	-	0.11	0.0
18.37	52.5	49.4	158.3	2.3	-1.4	4.4	4	clayy SILT to silty CLAY	115	2.0	26	25	-	-	3.7	9.9	34	15	0.58	-	0.11	33.7
18.54	59.8	56.0	161.2	2.4	-1.4	4.1	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	32	15	0.00	-	0.11	0.0
18.70	72.4	67.5	161.1	2.5	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	36	34	-	-	5.1	9.9	27	15	0.00	-	0.11	0.0
18.87	62.9	58.4	167.2	2.6	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	31	29	-	-	4.4	9.9	31	15	0.00	-	0.11	0.0
19.03	59.6	55.1	162.2	2.5	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	32	15	0.00	-	0.11	0.0
19.19	57.0	52.5	146.6	2.0	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	29	26	-	-	4.0	9.9	31	15	1.12	-	0.11	30.7
19.36	49.9	45.7	138.9	1.8	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	25	23	-	-	3.5	9.9	33	15	1.49	-	0.10	49.2
19.52	44.7	39.5	-	1.7	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.1	9.9	36	15	-	-	0.10	-
19.69	40.9	35.9	-	1.6	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	20	18	-	-	2.8	9.9	38	15	-	-	0.10	-
19.85	42.7	37.1	-	1.7	-1.2	4.0	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	3.0	9.9	37	15	-	-	0.10	-
20.01	51.0	43.9	-	2.1	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	25	22	-	-	3.6	9.9	36	15	-	-	0.10	-
20.18	61.2	52.3	-	3.0	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	31	26	-	-	4.3	9.9	35	15	-	-	0.10	-
20.34	70.3	62.9	190.0	3.4	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	35	31	-	-	4.9	9.9	33	15	0.00	-	0.10	0.0
20.51	65.8	55.4	-	3.4	-1.2	5.3	4	clayy SILT to silty CLAY	115	2.0	33	28	-	-	4.6	9.9	35	15	-	-	0.10	-
20.67	60.9	50.8	-	3.0	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	30	25	-	-	4.3	9.9	36	15	-	-	0.10	-
20.83	59.4	52.5	166.4	2.7	-1.2	4.6	4	clayy SILT to silty CLAY	115	2.0	30	26	-	-	4.1	9.9	34	15	0.00	-	0.10	0.0
21.00	68.6	60.4	162.1	2.6	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	34	30	-	-	4.8	9.9	30	15	0.00	-	0.10	0.0
21.16	72.5	63.6	149.5	2.3	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	36	32	-	-	5.1	9.9	27	15	1.07	-	0.10	13.3
21.33	71.6	62.5	140.9	2.1	-1.2	3.0	5	silty SAND to sandy SILT	120	4.0	18	16	52	41	-	-	26	16	1.47	-	0.10	31.3
21.49	62.6	54.5	136.4	1.9	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.4	9.9	28	15	1.66	-	0.10	39.3
21.65	54.3	47.1	141.7	2.0	-1.4	3.7	4	clayy SILT to silty CLAY	115	2.0	27	24	-	-	3.8	9.9	33	15	1.42	-	0.09	47.2
21.82	53.3	42.2	-	2.4	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	27	21	-	-	3.7	9.9	38	15	-	-	0.09	-
21.98	73.6	63.4	171.4	3.0	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	37	32	-	-	5.2	9.9	30	15	0.00	-	0.09	0.0
22.15	85.4	73.3	182.1	3.4	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	43	37	-	-	6.0	9.9	28	15	0.00	-	0.09	0.0
22.31	87.4	74.6	185.9	3.6	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	44	37	-	-	6.1	9.9	28	15	0.00	-	0.09	0.0
22.47	73.9	62.9	181.6	3.3	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	37	31	-	-	5.2	9.9	32	15	0.00	-	0.09	0.0
22.64	68.6	58.2	178.5	3.2	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	34	29	-	-	4.8	9.9	33	15	0.00	-	0.09	0.0
22.80	67.0	56.7	173.3	3.0	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	34	28	-	-	4.7	9.9	33	15	0.00	-	0.09	0.0
22.97	62.5	47.0	-	2.8	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.4	9.9	36	15	-	-	0.09	-
23.13	60.4	45.1	-	2.6	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	30	23	-	-	4.2	9.9	36	15	-	-	0.09	-
23.30	61.1	45.3	-	2.6	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.3	9.9	35	15	-	-	0.09	-
23.46	55.5	40.8	-	2.4	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	28	20	-	-	3.9	9.9	37	15	-	-	0.09	-
23.62	58.0	48.1	141.2	2.1	-1.2	3.7	4	clayy SILT to silty CLAY	115	2.0	29	24	-	-	4.0	9.9	32	15	1.50	-	0.09	46.3
23.79	67.1	55.5	156.3	2.6	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	34	28	-	-	4.7	9.9	31	15	0.85	-	0.09	19.4
23.95	86.2	71.1	185.7	3.7	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	43	36	-	-	6.0	9.9	29	15	0.00	-	0.09	0.0
24.12	105.2	86.5	192.5	4.1	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	53	43	-	-	7.4	9.9	26	15	0.00	-	0.09	0.0
24.28	93.7	76.7	185.0	3.7	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	47	38	-	-	6.6	9.9	27	15	0.00	-	0.09	0.0
24.44	90.4	73.8	150.4	2.6	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	24	16	1.15	-	0.09	12.9
24.61	95.6	77.8	168.0	3.2	-1.3	3.4	4	clayy SILT to silty CLAY	115	2.0	48	39	-	-	6.7	9.9	25	15	0.00	-	0.09	0.0
24.77	113.8	92.3	202.6	4.5	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	57	46	-	-	8.0	9.9	25	15	0.00	-	0.09	0.0
24.94	104.5	84.5	224.8	5.3	-1.4	5.2	9	very stiff fine SOIL	120	2.0	52	42	61	42	-	-	30	30	0.00	-	0.09	0.0
25.10	91.5	73.7	137.3	2.2	-1.2	2.4	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	22	16	1.73	-	0.09	26.2
25.26	67.7	46.2	-	3.2	-1.2	4.9	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.7	9.9	37	15	-	-	0.08	-
25.43	65.4	44.4	-	2.9	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	33	22	-	-	4.6	9.9	37	15	-	-	0.08	-
25.59	30.3	20.4	-	2.0	-1.3	6.8	3	silty CLAY to CLAY	115	1.5	20	14	-	-	2.1	9.9	58	15	-	-	0.08	-
25.76	29.0	19.5	-	1.6	-1.3	5.7	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	9.9	56	15	-	-	0.08	-
25.92	29.4	19.6	-	1.2	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	20	13	-	-	2.0	9.9	51	15	-	-	0.08	-
26.08	31.2	20.7	-	1.5	-1.3	5.1	3	silty CLAY to CLAY	115	1.5	21	14	-	-	2.1	9.9	52	15	-	-	0.08	-
26.25	42.0	27.7	-	1.7	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	28	18	-	-	2.9	9.9	44	15	-	-	0.08	-
26.41	51.4	33.6	-	2.6	-1.3	5.2	3	silty CLAY to CLAY	115	1.5	34	22	-	-	3.6	9.9	43	15	-	-	0.08	-
26.58	75.9	59.4	166.4	3.1	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	38	30	-	-	5.3	9.9	31	15	0.00	-	0.08	0.0
26.74	88.5	69.0	157.5	2.9	-1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	44	35	-	-	6.2	9.9	26	15	0.90	-	0.08	9.2
26.90	92.1	71.7	165.7	3.2	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	36	-	-	6.5	9.9	26	15	0.00	-	0.08	0.0
27.07	104.7	81.2	189.8	4.2	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	52	41	-	-	7.3	9.9	27	15	0.00	-	0.08	0.0
27.23	100.6	77.8	207.8	4.8	-1.3	4.9	4	clayy SILT to silty CLAY	115	2.0	50	39	-	-	7.1	9.9	30	15	0.00	-	0.08	0.0
27.40	93.5	72.1	200.6	4.5	-1.3	4.9	4	clayy SILT to silty CLAY	115	2.0	47	36	-	-	6.6	9.9	31	15	0.00	-	0.08	0.0
27.56	85.9	66.1	183.9	3.8	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	43	33	-	-	6.0	9.9	31	15	0.00	-	0.08	0.0
27.72	97.5	74.8	145.6	2.6	-1.3	2.7	5	silty SAND to sandy SILT	120	4.0	24	19	57	41	-	-	22	16	1.45	-	0.08	21.8
27.89	88.6	67.7	138.6	2.3	-1.3	2.7	5	silty SAND to sandy SILT	120	4.0	22	17	54	41	-	-	24	16	1.72	-	0.08	29.4
28.05	98.0	74.7	147.5	2.7	-1.4	2.8	5	silty SAND to sandy SILT	120	4.0	25	19	57	41	-	-	23	16	1.37	-	0.08	20.4
28.22	105.6	80.2	181.3	3.9	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	53	40	-	-	7.4	9.9	26	15	0.00	-	0.07	0.0
28.38	114.8	87.0	199.3	4.7	-1.4	4.1	4	clayy SILT to silty CLAY	115	2.0	57	43	-	-	8.1	9.9	26	15	0.00	-	0.07	0.0
28.54	111.6	84.3	207.8	5.0	-1.4	4.6	4	clayy SILT to silty CLAY	115	2.0	56	42	-	-	7.8	9.9	28	15	0.00	-	0.07	0.0
28.71	114.0	85.9	208.0	5.0	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	57	43	-	-	8.0	9.9	27	15	0.00	-	0.07	0.0
28.87	112.5	84.5	223.7	5.7	-1.3	5.1	9	very stiff fine SOIL	120	2.0	56	42	61	42	-	-	30	30	0.00	-	0.07	0.0
29.04	116.2	87.0	238.6	6.4	-1.3	5.6	9	very stiff fine SOIL	120	2.0	58	44	62	42	-	-	30	30	0.00	-	0.07	0.0
29.20	104.2	61.6	-	6.6	-1.3	6.4	3	silty CLAY to CLAY	115	1.5	69	41	-	-	7.3	9.9	37	15	-	-	0.07	-
29.36	85.5	50.2	-	5.5	-1.2	6.6	3	silty CLAY to CLAY	115	1.5	57	33	-	-	6.0	9.9	41	15	-	-	0.07	-
29.53	64.8	37.9	-	5.0	-1.2	7.9	3	silty CLAY to CLAY	115	1.5	43	25	-	-	4.5	9.9	49	15	-	-	0.07	-
29.69	80.0	46.5	-	3.6	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	40	23	-	-	5.6	9.9	36	15	-	-	0.07	-
29.86	57.6	33.3	-	3.2	-1.2	5.8	3	silty CLAY to CLAY	115	1.5	38	22	-	-	4.0	9.9	45	15	-	-	0.07	-
30.02	44.2	25.4	-	2.3	-1.2	5.5	3	silty CLAY to CLAY	115	1.5	29	17	-	-	3.1	9.9	50	15	-	-	0.07	-
30.19	36.4	20.8	-	2.0	-1.2	5.8	3	silty CLAY to CLAY	115	1.5	24	14	-	-	2.5	9.9	55	15	-	-	0.07	-
30.35	38.4	21.8	-	2.0	-1.2	5.5	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.6	9.9	53	15	-	-	0.07	-
30.51	49.6	28.1	-	1.7	-1.2	3.6	4	clayy SILT to silty CLAY	115	2.0	25	14	-	-	3.4	9.9	41	15	-	-	0.07	-
30.68	47.6	26.8	-	2.0	-1.2	4.5	3	silty CLAY to CLAY	115	1.5	32	18	-	-	3.3	9.9	45	15	-	-	0.07	-
30.84	60.8	34.1	-	2.4	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	30	17	-	-	4.2	9.9	39	15	-	-	0.07	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qincs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
31.01	69.0	50.0	142.2	2.4	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	34	25	-	-	4.8	9.9	31	15	1.58	-	0.07	44.2
31.17	65.2	36.1	-	2.7	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	33	18	-	-	4.5	9.9	39	15	-	-	0.07	-
31.33	52.1	28.7	-	2.8	-1.4	5.6	3	silty CLAY to CLAY	115	1.5	35	19	-	-	3.6	9.9	48	15	-	-	0.07	-
31.50	80.1	43.9	-	3.5	-1.5	4.5	4	clayy SILT to silty CLAY	115	2.0	40	22	-	-	5.6	9.9	37	15	-	-	0.07	-
31.66	113.2	81.2	188.7	4.4	-1.5	4.0	4	clayy SILT to silty CLAY	115	2.0	57	41	-	-	7.9	9.9	27	15	0.00	-	0.07	0.0
31.83	120.4	86.1	195.3	4.8	-1.5	4.0	4	clayy SILT to silty CLAY	115	2.0	60	43	-	-	8.4	9.9	26	15	0.00	-	0.07	0.0
31.99	115.4	82.4	199.5	4.9	-1.5	4.3	4	clayy SILT to silty CLAY	115	2.0	58	41	-	-	8.1	9.9	27	15	0.00	-	0.07	0.0
32.15	120.5	85.8	217.0	5.7	-1.5	4.8	4	clayy SILT to silty CLAY	115	2.0	60	43	-	-	8.4	9.9	29	15	0.00	-	0.07	0.0
32.32	113.3	80.4	212.5	5.5	-1.4	4.9	4	clayy SILT to silty CLAY	115	2.0	57	40	-	-	7.9	9.9	30	15	0.00	-	0.07	0.0
32.48	88.8	47.2	-	4.4	-1.5	5.1	4	clayy SILT to silty CLAY	115	2.0	44	24	-	-	6.2	9.9	37	15	-	-	0.07	-
32.65	74.6	39.5	-	3.6	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	50	26	-	-	5.2	9.9	40	15	-	-	0.07	-
32.81	79.8	56.2	155.9	3.0	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	40	28	-	-	5.6	9.9	31	15	1.02	-	0.07	22.7
32.97	72.6	51.0	138.4	2.4	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	36	26	-	-	5.1	9.9	30	15	1.74	-	0.07	43.0
33.14	63.6	33.2	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	32	17	-	-	4.4	9.9	36	15	-	-	0.07	-
33.30	59.6	30.9	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.1	9.9	37	15	-	-	0.07	-
33.47	68.7	35.5	-	2.7	-1.4	4.0	4	clayy SILT to silty CLAY	115	2.0	34	18	-	-	4.8	9.9	38	15	-	-	0.07	-
33.63	75.5	38.8	-	3.1	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	38	19	-	-	5.3	9.9	38	15	-	-	0.07	-
33.79	67.1	34.3	-	2.8	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	34	17	-	-	4.7	9.9	40	15	-	-	0.07	-
33.96	67.8	47.0	126.4	2.0	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.7	9.9	30	15	1.93	-	0.07	47.7
34.12	63.6	44.0	118.7	1.7	-1.3	2.8	4	clayy SILT to silty CLAY	115	2.0	32	22	-	-	4.4	9.9	30	15	2.03	-	0.06	51.2
34.29	58.7	29.6	-	1.7	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.1	9.9	37	15	-	-	0.06	-
34.45	55.8	28.0	-	1.7	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	28	14	-	-	3.9	9.9	38	15	-	-	0.06	-
34.61	52.3	26.1	-	1.9	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	26	13	-	-	3.6	9.9	43	15	-	-	0.06	-
34.78	44.5	22.1	-	2.1	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	30	15	-	-	3.1	9.9	50	15	-	-	0.06	-
34.94	37.9	18.7	-	2.1	-1.5	5.9	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.6	9.9	57	15	-	-	0.06	-
35.11	36.8	18.1	-	2.0	-1.5	5.7	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.5	9.9	57	15	-	-	0.06	-
35.27	36.1	17.7	-	2.2	-1.5	6.4	3	silty CLAY to CLAY	115	1.5	24	12	-	-	2.5	9.9	60	15	-	-	0.06	-
35.43	41.4	20.2	-	2.4	-1.5	6.0	3	silty CLAY to CLAY	115	1.5	28	13	-	-	2.9	9.9	56	15	-	-	0.06	-
35.60	34.1	16.6	-	2.0	-1.5	6.3	3	silty CLAY to CLAY	115	1.5	23	11	-	-	2.3	9.9	62	15	-	-	0.06	-
35.76	28.3	13.7	-	1.7	-1.5	6.4	3	silty CLAY to CLAY	115	1.5	19	9	-	-	1.9	8.2	67	15	-	-	0.06	-
35.93	30.7	14.8	-	1.5	-1.5	5.2	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	9.0	60	15	-	-	0.06	-
36.09	24.1	11.5	-	1.3	-1.5	6.0	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.8	70	15	-	-	0.06	-
36.26	23.5	11.2	-	1.2	-1.5	5.6	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	69	15	-	-	0.06	-
36.42	23.5	11.1	-	1.1	-1.5	5.3	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	69	15	-	-	0.06	-
36.58	22.6	10.7	-	1.0	-1.5	5.1	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.3	69	15	-	-	0.06	-
36.75	21.4	10.1	-	0.9	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	70	15	-	-	0.06	-
36.91	22.6	10.6	-	0.9	-1.6	4.2	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.2	65	15	-	-	0.06	-
37.08	21.5	10.0	-	0.9	-1.6	4.5	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	68	15	-	-	0.06	-
37.24	20.2	9.4	-	0.9	-1.6	4.8	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.4	5.5	71	15	-	-	0.06	-
37.40	20.5	9.5	-	0.9	-1.6	4.7	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	71	15	-	-	0.06	-
37.57	20.8	9.6	-	1.1	-1.6	6.1	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.6	76	15	-	-	0.06	-
37.73	19.9	9.1	-	1.3	-1.7	7.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.3	82	15	-	-	0.06	-
37.90	34.9	15.9	-	1.4	-1.7	4.3	3	silty CLAY to CLAY	115	1.5	23	11	-	-	2.4	9.8	55	15	-	-	0.06	-
38.06	33.7	15.3	-	1.2	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.3	9.4	54	15	-	-	0.06	-
38.22	26.7	12.1	-	1.1	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	7.2	63	15	-	-	0.06	-
38.39	32.4	14.6	-	1.2	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.2	8.9	56	15	-	-	0.06	-
38.55	40.4	18.1	-	1.4	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	50	15	-	-	0.06	-
38.72	40.4	18.1	-	1.3	-1.7	3.5	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	49	15	-	-	0.06	-
38.88	36.4	16.2	-	1.3	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	53	15	-	-	0.06	-
39.04	29.3	13.0	-	1.1	-1.6	4.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.0	7.9	59	15	-	-	0.06	-
39.21	27.1	11.9	-	0.9	-1.6	3.8	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	7.2	60	15	-	-	0.06	-
39.37	27.8	12.2	-	0.9	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.4	59	15	-	-	0.06	-
39.54	23.9	10.4	-	0.9	-1.6	4.3	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.2	66	15	-	-	0.06	-
39.70	20.5	8.9	-	1.0	-1.6	5.5	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.2	76	15	-	-	0.06	-
39.86	21.5	9.3	-	1.1	-1.6	5.6	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	74	15	-	-	0.06	-
40.03	25.6	11.1	-	1.2	-1.6	5.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	6.6	69	15	-	-	0.06	-
40.19	31.4	13.5	-	1.3	-1.6	4.4	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.2	60	15	-	-	0.06	-
40.36	40.7	17.5	-	1.4	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	50	15	-	-	0.06	-
40.52	41.5	17.7	-	1.6	-1.6	4.2	3	silty CLAY to CLAY	115	1.5	28	12	-	-	2.9	9.9	52	15	-	-	0.06	-
40.68	36.7	15.6	-	1.6	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	24	10	-	-	2.5	9.6	57	15	-	-	0.06	-
40.85	29.8	12.6	-	1.2	-1.6	4.4	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	7.7	61	15	-	-	0.06	-
41.01	32.0	13.5	-	0.5	-1.6	1.6	4	clayy SILT to silty CLAY	115	2.0	16	7	-	-	2.2	8.2	44	15	-	-	0.06	-
41.18	45.7	19.2	-	1.5	-1.6	3.5	3	silty CLAY to CLAY	115	1.5	30	13	-	-	3.1	9.9	48	15	-	-	0.06	-
41.34	51.1	21.4	-	1.7	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	46	15	-	-	0.06	-
41.50	17.3	7.2	-	0.9	-1.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	4.1	84	15	-	-	0.06	-
41.67	18.0	7.5	-	0.6	-1.5	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.3	75	15	-	-	0.06	-
41.83	18.8	7.8	-	0.6	-0.9	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	4.5	72	15	-	-	0.06	-
42.00	22.2	9.1	-	0.7	-0.6	3.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	67	15	-	-	0.06	-
42.16	20.4	8.4	-	0.6	-0.6	3.4	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	4.9	68	15	-	-	0.06	-
42.32	17.5	7.2	-	0.7	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.1	78	15	-	-	0.06	-
42.49	20.4	8.3	-	0.8	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	4.8	75	15	-	-	0.06	-
42.65	22.1	8.9	-	1.0	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.2	73	15	-	-	0.06	-
42.82	22.0	8.9	-	1.0	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.2	73	15	-	-	0.06	-
42.98	25.9	10.4	-	1.1	-0.6	4.6	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	6.2	67	15	-	-	0.06	-
43.15	27.8	11.1	-	1.0	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.7	62	15	-	-	0.06	-
43.31	19.2	7.6	-	1.0	-0.6	6.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.4	83	15	-	-	0.06	-
43.47	18.0	7.2	-	0.8	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.1	82	15	-	-	0.06	-
43.64	15.9	6.3	-	0.7	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.5	86	15	-	-	0.06	-
43.80	14.9	5.9	-	0.7	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	89	15	-	-	0.06	-
43.97	14.7	5.8	-	0.6	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	90	15	-	-	0.06	-
44.13	14.8	5.8	-	0.7	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	91	15	-	-	0.06	-
44.29	16.1	6.3	-	0.8	-0.6	5.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.5	88	15	-	-	0.06	-
44.46	21.1	8.2	-	0.9	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.8	76	15	-	-	0.06	-
44.62	25.5	9.9	-	1.1	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.9	69	15	-	-	0.06	-
44.79	21.2	8.2	-	1.1	-0.6	5.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.8	80	15	-	-	0.06	-
44.95	17.9	6.9	-	1.0	-0.6	6.3	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	87	15	-	-	0.06	-
45.11	18.0	6.9	-	0.9	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	85	15	-	-	0.06	-
45.28	19.6	7.5	-	1.0	-0.6	6.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	84	15	-	-	0.06	-
45.44	20.4	7.8	-	1.1	-0.6	6.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.5	82	15	-	-	0.06	-
45.61	19.8	7.5	-	1.0	-0.6	6.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	83	15	-	-	0.06	-
45.77	18.3	6.9	-	0.9	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	85	15	-	-	0.06	-
45.93	17.1	6.5	-	0.8	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.6	87	15	-	-	0.06	-
46.10	15.9	6.0	-	0.7	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.3	89	15	-	-	0.06	-
46.26	15.0	5.7	-	0.6	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.1	90	15	-	-	0.06	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
46.43	14.8	5.6	-	0.6	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.0	90	15	-	-	0.06	-
46.59	15.0	5.7	-	0.7	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.0	92	15	-	-	0.06	-
46.75	14.1	5.3	-	0.7	-0.6	6.4	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.8	95	15	-	-	0.06	-
46.92	13.6	5.1	-	0.7	-0.6	6.5	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.7	95	15	-	-	0.06	-
47.08	13.8	5.2	-	0.6	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.7	95	15	-	-	0.06	-
47.25	14.0	5.3	-	0.6	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.7	94	15	-	-	0.06	-
47.41	14.2	5.4	-	0.6	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.8	92	15	-	-	0.06	-
47.57	14.4	5.4	-	0.6	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	90	15	-	-	0.06	-
47.74	14.4	5.4	-	0.6	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	91	15	-	-	0.06	-
47.90	14.3	5.4	-	0.6	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	92	15	-	-	0.06	-
48.07	15.5	5.9	-	0.7	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.1	89	15	-	-	0.06	-
48.23	19.0	7.2	-	0.8	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.9	82	15	-	-	0.06	-
48.39	25.5	9.6	-	1.1	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.4	70	15	-	-	0.06	-
48.56	28.0	10.6	-	1.3	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	69	15	-	-	0.06	-
48.72	28.2	10.6	-	1.4	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
48.89	28.3	10.7	-	1.4	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
49.05	26.8	10.1	-	1.4	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.6	73	15	-	-	0.06	-
49.22	28.9	10.9	-	1.4	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.1	70	15	-	-	0.06	-
49.38	30.6	11.5	-	1.5	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.5	67	15	-	-	0.06	-
49.54	32.3	12.2	-	1.5	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	65	15	-	-	0.06	-
49.71	28.8	10.9	-	1.5	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
49.87	30.1	11.4	-	1.4	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	6.3	68	15	-	-	0.06	-
50.04	31.7	12.0	-	1.6	-0.5	5.6	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	6.7	68	15	-	-	0.06	-
50.20	33.1	12.5	-	1.8	-0.5	5.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	7.0	68	15	-	-	0.06	-
50.36	38.7	14.6	-	1.7	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	8.2	60	15	-	-	0.06	-
50.53	34.4	13.0	-	1.5	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.2	62	15	-	-	0.06	-
50.69	33.3	12.6	-	1.5	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	6.9	63	15	-	-	0.06	-
50.86	36.0	13.6	-	1.3	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.5	58	15	-	-	0.06	-
51.02	36.3	13.7	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.6	58	15	-	-	0.06	-
51.18	34.9	13.2	-	1.4	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.4	7.2	60	15	-	-	0.06	-
51.35	34.1	12.9	-	1.3	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.0	61	15	-	-	0.06	-
51.51	38.6	14.6	-	1.3	-0.5	3.5	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	8.0	54	15	-	-	0.06	-
51.68	35.5	13.4	-	1.5	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.3	60	15	-	-	0.06	-
51.84	33.1	12.5	-	1.5	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.7	64	15	-	-	0.06	-
52.00	33.3	12.6	-	1.5	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.8	64	15	-	-	0.06	-
52.17	32.8	12.4	-	1.4	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.6	63	15	-	-	0.06	-
52.33	34.7	13.1	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.0	61	15	-	-	0.06	-
52.50	35.9	13.6	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.3	59	15	-	-	0.06	-
52.66	32.0	12.1	-	1.3	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	6.4	63	15	-	-	0.06	-
52.82	30.5	11.5	-	1.2	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.0	65	15	-	-	0.06	-
52.99	36.3	13.7	-	1.3	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.3	58	15	-	-	0.06	-
53.15	36.5	13.8	-	1.3	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.3	57	15	-	-	0.06	-
53.32	34.1	12.9	-	1.6	-0.5	5.0	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.8	64	15	-	-	0.06	-
53.48	42.6	16.1	-	1.4	-0.5	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.6	52	15	-	-	0.06	-
53.64	37.6	14.2	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.5	58	15	-	-	0.06	-
53.81	37.2	14.0	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.4	58	15	-	-	0.06	-
53.97	33.6	12.7	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	6.6	62	15	-	-	0.06	-
54.14	35.3	13.3	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	61	15	-	-	0.06	-
54.30	42.4	16.0	-	1.4	-0.5	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.4	53	15	-	-	0.06	-
54.46	34.9	13.2	-	1.4	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.4	6.8	61	15	-	-	0.06	-
54.63	35.5	13.4	-	1.3	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	59	15	-	-	0.06	-
54.79	39.8	15.0	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.8	55	15	-	-	0.06	-
54.96	42.5	16.0	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.3	53	15	-	-	0.06	-
55.12	41.3	15.6	-	1.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	8.1	56	15	-	-	0.06	-
55.28	42.2	15.9	-	1.5	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.2	54	15	-	-	0.06	-
55.45	39.6	14.9	-	1.7	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.7	59	15	-	-	0.06	-
55.61	43.6	16.4	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.5	52	15	-	-	0.06	-
55.78	41.1	15.5	-	1.7	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.9	57	15	-	-	0.06	-
55.94	40.2	15.2	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.7	55	15	-	-	0.06	-
56.11	35.5	13.4	-	1.4	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.7	60	15	-	-	0.06	-
56.27	36.6	13.8	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.9	58	15	-	-	0.06	-
56.43	41.0	15.5	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.8	54	15	-	-	0.06	-
56.60	39.1	14.8	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.4	55	15	-	-	0.06	-
56.76	40.7	15.4	-	1.5	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.7	55	15	-	-	0.06	-
56.93	44.5	16.8	-	1.6	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	8.5	52	15	-	-	0.06	-
57.09	40.4	15.2	-	1.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.6	57	15	-	-	0.06	-
57.25	39.3	14.8	-	1.4	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.3	56	15	-	-	0.06	-
57.42	40.7	15.4	-	1.2	-0.5	3.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.6	52	15	-	-	0.06	-
57.58	39.6	14.9	-	1.1	-0.5	3.2	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.4	52	15	-	-	0.06	-
57.75	36.8	13.9	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.8	58	15	-	-	0.06	-
57.91	37.7	14.2	-	1.4	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.6	6.9	57	15	-	-	0.06	-
58.07	40.2	15.2	-	1.9	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.4	60	15	-	-	0.06	-
58.24	44.1	16.6	-	1.8	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.2	55	15	-	-	0.06	-
58.40	39.9	15.0	-	1.9	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.3	61	15	-	-	0.06	-
58.57	49.6	18.7	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.2	53	15	-	-	0.06	-
58.73	49.3	18.6	-	2.5	-0.5	5.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.1	57	15	-	-	0.06	-
58.89	44.4	16.7	-	2.0	-0.5	5.0	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	8.1	57	15	-	-	0.06	-
59.06	45.4	17.1	-	1.9	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.1	8.3	55	15	-	-	0.06	-
59.22	43.5	16.4	-	1.6	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.9	54	15	-	-	0.06	-
59.39	46.0	17.4	-	2.0	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.4	55	15	-	-	0.06	-
59.55	52.5	19.8	-	2.0	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	50	15	-	-	0.06	-
59.71	43.6	16.5	-	1.6	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.9	53	15	-	-	0.06	-
59.88	38.7	14.6	-	1.4	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	6.9	56	15	-	-	0.06	-
60.04	42.3	16.0	-	1.5	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	7.6	53	15	-	-	0.06	-
60.21	46.3	17.5	-	1.7	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.3	53	15	-	-	0.06	-
60.37	43.2	16.3	-	1.7	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	7.7	55	15	-	-	0.06	-
60.53	43.4	16.4	-	1.6	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	7.7	54	15	-	-	0.06	-
60.70	46.7	17.6	-	1.9	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.4	53	15	-	-	0.06	-
60.86	46.6	17.6	-	1.8	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.3	53	15	-	-	0.06	-
61.03	41.2	15.5	-	1.7	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.2	57	15	-	-	0.06	-
61.19	40.5	15.3	-	1.5	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.1	56	15	-	-	0.06	-
61.35	49.2	18.6	-	1.6	-0.5	3.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	8.7	49	15	-	-	0.06	-
61.52	54.9	20.7	-	1.9	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.8	47	15	-	-	0.06	-
61.68	58.5	22.1	-	2.1	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	46	15	-	-	0.06	-

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The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

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GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
61.85	57.9	21.9	-	2.2	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	48	15	-	-	0.06	-
62.01	54.7	20.7	-	2.0	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.7	48	15	-	-	0.06	-
62.17	55.8	21.1	-	2.1	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	48	15	-	-	0.06	-
62.34	62.9	23.7	-	2.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	47	15	-	-	0.06	-
62.50	61.5	23.2	-	3.0	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	41	15	-	-	4.2	9.9	51	15	-	-	0.06	-
62.67	57.0	21.5	-	2.3	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	49	15	-	-	0.06	-
62.83	52.6	19.8	-	1.9	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.2	49	15	-	-	0.06	-
63.00	52.4	19.8	-	1.5	-0.4	3.1	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.6	9.1	45	15	-	-	0.06	-
63.16	51.6	19.5	-	1.5	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	8.9	46	15	-	-	0.06	-
63.32	52.0	19.6	-	1.5	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	9.0	46	15	-	-	0.06	-
63.49	48.8	18.4	-	1.5	-0.4	3.4	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	8.4	48	15	-	-	0.06	-
63.65	46.4	17.5	-	1.5	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	7.9	50	15	-	-	0.06	-
63.82	49.0	18.5	-	1.6	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	8.4	49	15	-	-	0.06	-
63.98	48.0	18.1	-	2.2	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.2	55	15	-	-	0.06	-
64.14	47.0	17.7	-	2.3	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.0	57	15	-	-	0.06	-
64.31	49.7	18.8	-	2.2	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	8.4	54	15	-	-	0.06	-
64.47	51.0	19.2	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	8.6	52	15	-	-	0.06	-
64.64	54.2	20.5	-	2.0	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.2	49	15	-	-	0.06	-
64.80	75.0	28.3	-	2.8	-0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	42	15	-	-	0.06	-
64.96	73.4	27.7	-	2.9	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	43	15	-	-	0.06	-
65.13	61.8	23.3	-	2.8	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	49	15	-	-	0.06	-
65.29	60.2	22.7	-	2.3	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.06	-
65.46	60.6	22.9	-	2.3	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	46	15	-	-	0.06	-
65.62	58.6	22.1	-	2.0	-0.4	3.7	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	46	15	-	-	0.06	-
65.78	50.6	19.1	-	1.9	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	8.4	51	15	-	-	0.06	-
65.95	40.2	15.2	-	1.7	-0.4	4.6	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	6.5	58	15	-	-	0.06	-
66.11	36.2	13.7	-	1.7	-0.4	5.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.8	64	15	-	-	0.06	-
66.28	34.6	13.1	-	2.3	-0.4	7.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	5.5	72	15	-	-	0.06	-
66.44	67.9	25.6	-	2.6	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.7	9.9	44	15	-	-	0.06	-
66.60	73.7	27.8	-	2.7	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.06	-
66.77	78.8	29.7	-	2.6	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	40	15	-	-	0.06	-
66.93	79.3	29.9	-	3.0	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	41	15	-	-	0.06	-
67.10	78.1	29.5	-	2.9	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	41	15	-	-	0.06	-
67.26	79.9	30.1	-	2.7	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
67.42	79.5	30.0	-	2.6	-0.4	3.4	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
67.59	80.0	30.2	-	2.5	-0.4	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.06	-
67.75	83.8	31.6	-	2.6	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	37	15	-	-	0.06	-
67.92	85.2	32.1	-	2.6	-0.3	3.2	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	37	15	-	-	0.06	-
68.08	85.1	32.1	-	2.4	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	36	15	-	-	0.06	-
68.24	75.7	28.6	-	2.1	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	37	15	-	-	0.06	-
68.41	58.7	22.2	-	1.5	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.5	41	15	-	-	0.06	-
68.57	51.5	19.4	-	1.6	-0.3	3.4	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	8.2	48	15	-	-	0.06	-
68.74	77.1	29.1	-	2.0	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.9	36	15	-	-	0.06	-
68.90	82.5	31.2	-	2.4	-0.2	3.1	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	37	15	-	-	0.06	-
69.07	80.3	30.3	-	2.5	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.06	-
69.23	80.3	30.3	-	2.6	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
69.39	94.3	50.8	130.2	2.7	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.5	9.9	29	15	1.73	-	0.06	43.3
69.56	101.6	54.6	135.6	2.9	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	27	-	-	7.0	9.9	28	15	1.50	-	0.06	36.8
69.72	102.9	55.3	136.5	3.0	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	28	-	-	7.1	9.9	28	15	1.46	-	0.06	34.1
69.89	104.2	56.0	137.3	3.0	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	52	28	-	-	7.2	9.9	28	15	1.42	-	0.05	31.5
70.05	105.5	56.6	134.7	2.9	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	53	28	-	-	7.3	9.9	27	15	1.55	-	0.05	37.2
70.21	101.9	54.7	135.4	2.9	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	27	-	-	7.1	9.9	28	15	1.50	-	0.05	36.4
70.38	101.0	38.1	-	3.5	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	36	15	-	-	0.05	-
70.54	106.2	56.9	145.9	3.4	-0.2	3.3	4	clayy SILT to silty CLAY	115	2.0	53	28	-	-	7.4	9.9	29	15	0.98	-	0.05	16.9
70.71	110.9	59.4	139.0	3.2	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	55	30	-	-	7.7	9.9	27	15	1.34	-	0.04	22.7
70.87	109.0	58.4	131.8	2.9	-0.2	2.7	5	silty SAND to sandy SILT	120	4.0	27	15	49	37	-	-	26	16	1.68	-	0.04	35.4
71.03	108.5	58.0	131.3	2.8	-0.2	2.7	5	silty SAND to sandy SILT	120	4.0	27	15	49	37	-	-	26	16	1.70	-	0.04	35.8
71.20	110.6	59.1	133.7	2.9	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	28	15	50	37	-	-	26	16	1.59	-	0.04	34.7
71.36	114.1	60.9	138.4	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.36	-	0.03	22.4
71.53	113.6	60.6	141.0	3.3	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	57	30	-	-	7.9	9.9	27	15	1.22	-	0.03	16.9
71.69	114.3	60.9	139.0	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.32	-	0.03	20.6
71.85	114.7	61.1	139.5	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.30	-	0.03	19.3
72.02	111.6	59.4	137.2	3.1	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	28	15	50	37	-	-	26	16	1.39	-	0.02	24.7
72.18	116.8	62.1	135.0	3.0	-0.1	2.7	5	silty SAND to sandy SILT	120	4.0	29	16	51	37	-	-	25	16	1.52	-	0.02	29.6
72.35	117.2	62.3	137.1	3.1	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	29	16	51	37	-	-	25	16	1.41	-	0.02	23.5
72.51	118.0	62.7	137.7	3.2	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	37	-	-	25	16	1.38	-	0.02	21.9
72.67	118.0	62.7	137.6	3.2	-0.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	37	-	-	25	16	1.38	-	0.02	21.8
72.84	120.4	63.9	139.8	3.3	-0.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	38	-	-	25	16	1.27	-	0.01	17.0
73.00	123.4	65.4	143.3	3.4	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	16	53	38	-	-	25	16	1.11	-	0.01	11.8
73.17	124.8	66.1	145.4	3.5	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	17	53	38	-	-	25	16	1.00	-	0.01	9.5
73.33	126.8	67.1	145.2	3.6	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	32	17	54	38	-	-	25	16	1.01	-	0.01	9.5
73.49	121.6	64.4	167.1	4.5	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	61	32	-	-	8.4	9.9	29	15	0.00	-	0.01	0.0
73.66	124.2	65.7	168.3	4.6	-0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	62	33	-	-	8.6	9.9	29	15	0.00	-	0.01	0.0
73.82	130.3	68.9	169.1	4.7	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	65	34	-	-	9.1	9.9	28	15	0.00	-	0.01	0.0
73.99	124.3	65.6	169.8	4.7	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	62	33	-	-	8.6	9.9	29	15	0.00	-	0.01	0.0
74.15	120.5	63.6	167.7	4.6	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.4	9.9	30	15	0.00	-	0.01	0.0
74.31	119.5	63.0	165.2	4.4	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.3	9.9	29	15	0.00	-	0.01	0.0
74.48	123.1	64.9	162.2	4.3	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	62	32	-	-	8.6	9.9	28	15	0.00	-	0.01	0.0
74.64	120.3	63.4	157.7	4.1	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.4	9.9	28	15	0.45	-	0.01	2.6
74.81	116.0	61.0	158.4	4.1	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	58	31	-	-	8.0	9.9	29	15	0.41	-	0.01	2.3
74.97	118.1	62.1	156.7	4.0	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.2	9.9	28	15	0.47	-	0.00	2.8
75.13	115.9	60.9	154.3	3.9	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	58	30	-	-	8.0	9.9	29	15	0.53	-	0.00	3.4
75.30	111.7	58.7	150.5	3.7	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	56	29	-	-	7.7	9.9	29	15	0.65	-	0.00	7.5
75.46	111.4	58.5	155.1	3.9	-0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	56	29	-	-	7.7	9.9	30	15	0.48	-	0.00	2.9
75.63	115.3	60.5	159.2	4.1	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	58	30	-	-	8.0	9.9	29	15	0.38	-	0.00	2.0
75.79	117.3	61.5	165.0	4.4	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.1	9.9	30	15	0.00	-	0.00	0.0
75.96	118.5	62.1	161.5	4.3	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.2	9.9	29	15	0.00	-	0.00	0.0
76.12	112.9	59.1	160.0	4.1	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	56	30	-	-	7.8	9.9	30	15	0.36	-	0.00	1.8
76.28	106.2	40.1	-	3.9	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	53	20	-	-	7.4	9.9	36	15	-	-	0.00	-
76.45	102.2	38.6	-	3.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.1	9.9	36	15	-	-	0.00	-
76.61	96.3	36.3	-	3.3	-0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	37	15	-	-	0.00	-
76.78	88.6	33.4	-	3.5	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	40	15	-	-	0.00	-
76.94	83.8	31.6	-	3.5	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	42	15	-	-	0.00	-
77.10	84.7	32.0	-	3.6	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	42	15	-	-	0.00	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
77.27	90.1	34.0	-	3.8	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	60	23	-	-	6.2	9.9	41	15	-	-	0.00	-
77.43	84.3	31.8	-	4.0	-0.3	5.1	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	44	15	-	-	0.00	-
77.60	89.1	33.6	-	3.7	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	41	15	-	-	0.00	-
77.76	93.4	35.2	-	3.7	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	39	15	-	-	0.00	-
77.92	96.3	36.3	-	4.0	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	39	15	-	-	0.00	-

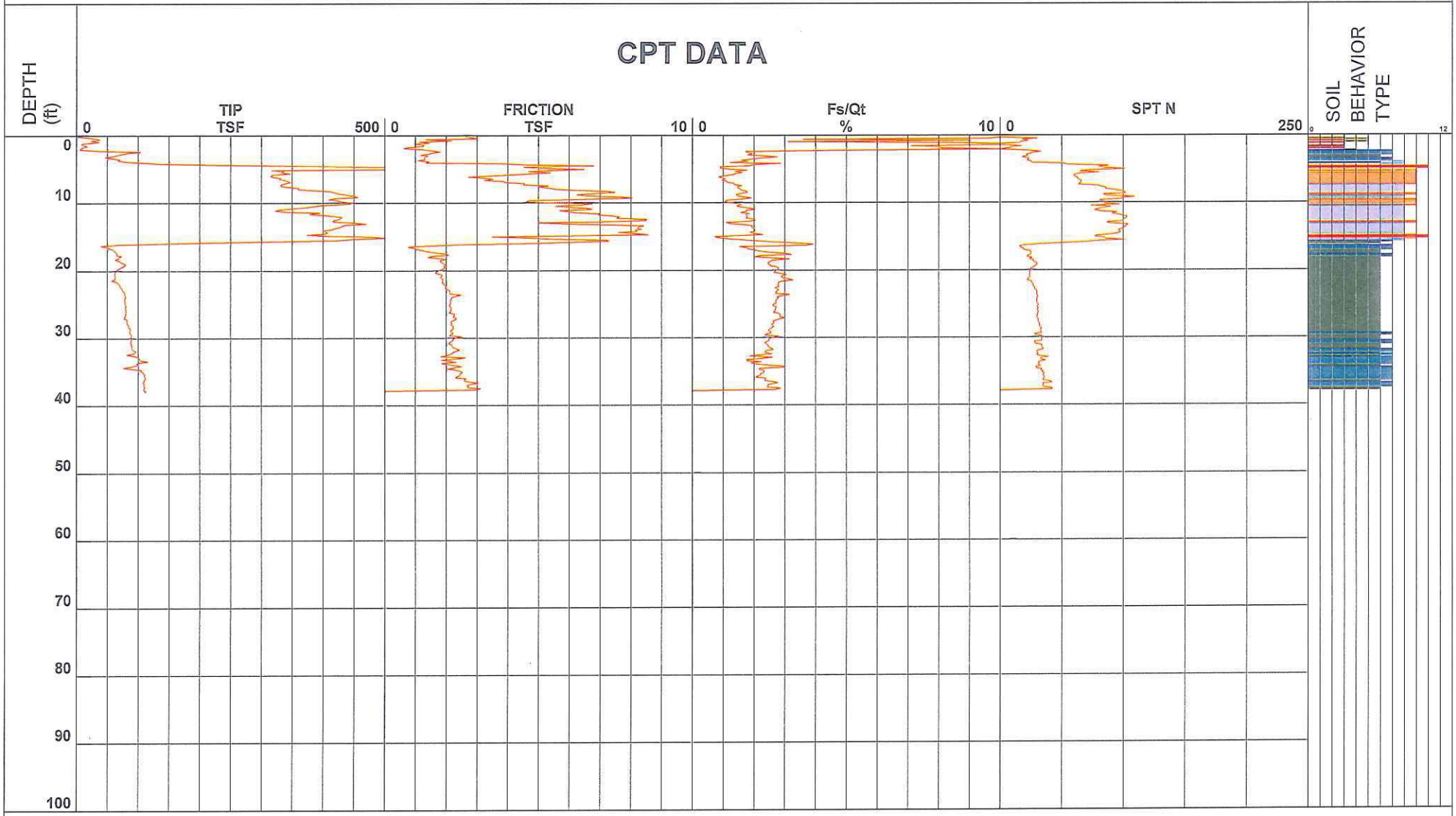
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(554)-19.cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-234	Date and Time	10/7/2011 12:51:40 AM	Maximum Depth	38.06 ft
Water Table Depth	19.00 ft				

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
0.33	17.4	27.9	-	2.8	0.0	9.9	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	59	15	N/A	0.00	N/A	N/A
0.49	31.3	50.2	-	3.0	0.1	9.7	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	48	15	N/A	0.00	N/A	N/A
0.66	37.4	60.0	152.4	1.3	0.1	3.6	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	29	15	N/A	0.00	N/A	N/A
0.82	23.9	38.3	-	2.2	0.1	9.1	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	51	15	N/A	0.00	N/A	N/A
0.98	36.4	58.4	138.8	1.1	0.1	3.1	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	27	15	N/A	0.00	N/A	N/A
1.15	17.0	27.3	-	1.4	0.1	8.5	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	56	15	N/A	0.00	N/A	N/A
1.31	7.7	12.4	-	1.0	0.2	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.48	11.7	18.8	-	1.3	0.2	9.9	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.64	17.6	28.2	-	1.3	0.2	7.1	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	52	15	N/A	0.00	N/A	N/A
1.80	10.5	16.9	-	0.8	0.2	8.1	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	65	15	N/A	0.00	N/A	N/A
1.97	7.7	12.4	-	0.6	0.2	8.2	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	73	15	N/A	0.00	N/A	N/A
2.13	5.6	9.0	-	1.2	0.2	9.9	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	86	15	N/A	0.00	N/A	N/A
2.30	35.0	56.2	167.6	1.6	0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	33	15	N/A	0.00	N/A	N/A
2.46	103.9	166.6	201.2	1.8	0.1	1.7	6	clean SAND to silty SAND	125	5.0	21	33	84	48	-	-	11	16	N/A	0.00	N/A	N/A
2.62	84.7	135.8	176.1	1.5	0.1	1.8	6	clean SAND to silty SAND	125	5.0	17	27	77	48	-	-	13	16	N/A	0.00	N/A	N/A
2.79	74.2	119.1	163.9	1.4	0.1	1.9	5	silty SAND to sandy SILT	120	4.0	19	30	73	48	-	-	14	16	N/A	0.00	N/A	N/A
2.95	65.9	105.6	147.5	1.2	0.2	1.8	5	silty SAND to sandy SILT	120	4.0	16	26	69	47	-	-	15	16	N/A	0.00	N/A	N/A
3.12	59.6	95.6	155.3	1.4	0.2	2.4	5	silty SAND to sandy SILT	120	4.0	15	24	66	46	-	-	18	16	N/A	0.00	N/A	N/A
3.28	46.8	75.1	147.2	1.3	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	12	19	58	45	-	-	23	16	0.18	-	0.33	0.7
3.45	59.5	95.5	150.1	1.3	0.2	2.2	5	silty SAND to sandy SILT	120	4.0	15	24	65	46	-	-	18	16	0.17	-	0.33	0.9
3.61	71.0	113.8	156.8	1.3	0.2	1.9	5	silty SAND to sandy SILT	120	4.0	18	28	71	47	-	-	14	16	0.13	-	0.33	0.9
3.77	67.5	108.2	144.2	1.1	0.2	1.6	5	silty SAND to sandy SILT	120	4.0	17	27	70	46	-	-	14	16	0.26	-	0.33	1.6
3.94	79.9	128.1	168.2	1.4	0.2	1.8	5	silty SAND to sandy SILT	120	4.0	20	32	75	47	-	-	13	16	0.00	-	0.33	0.0
4.10	110.4	177.1	194.8	1.3	0.2	1.2	6	clean SAND to silty SAND	125	5.0	22	35	86	48	-	-	8	16	0.00	-	0.33	0.0
4.27	133.4	213.9	286.6	3.8	0.1	2.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	8.8	9.9	14	16	0.00	-	0.33	0.0
4.43	227.9	365.4	398.6	4.6	0.0	2.0	6	clean SAND to silty SAND	125	5.0	46	73	95	48	-	-	8	16	0.00	-	0.33	0.0
4.59	367.0	588.5	588.3	6.8	-0.2	1.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.3	9.9	5	16	0.00	-	0.33	0.0
4.76	500.5	802.6	802.6	4.5	-0.3	0.9	7	grvly SAND to dense SAND	130	6.0	83	100	95	48	-	-	5	16	0.00	-	0.33	0.0
4.92	551.0	883.7	883.7	5.0	-1.9	0.9	7	grvly SAND to dense SAND	130	6.0	92	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.09	525.2	842.3	842.3	6.5	-1.6	1.2	6	clean SAND to silty SAND	125	5.0	100	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.25	316.9	508.2	512.2	5.6	-1.4	1.8	6	clean SAND to silty SAND	125	5.0	63	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.41	336.8	540.1	540.1	4.7	-1.4	1.4	6	clean SAND to silty SAND	125	5.0	67	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.58	332.7	533.5	533.5	5.4	-1.5	1.6	6	clean SAND to silty SAND	125	5.0	67	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.74	346.7	556.0	556.0	4.9	-1.5	1.4	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.91	319.5	512.4	512.4	4.2	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	64	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.07	315.0	505.2	505.2	3.4	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	63	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.23	319.4	507.8	507.8	2.7	-1.4	0.9	6	clean SAND to silty SAND	125	5.0	64	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.40	331.1	519.4	519.4	3.2	-1.4	1.0	6	clean SAND to silty SAND	125	5.0	66	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.56	329.7	510.4	510.4	3.5	-1.7	1.1	6	clean SAND to silty SAND	125	5.0	66	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.73	339.1	518.3	518.3	3.3	-1.8	1.0	6	clean SAND to silty SAND	125	5.0	68	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.89	344.2	519.5	519.5	3.9	-1.8	1.1	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
7.05	346.8	517.0	517.0	3.9	-1.8	1.1	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
7.22	337.0	496.5	496.5	4.5	-1.8	1.3	6	clean SAND to silty SAND	125	5.0	67	99	95	48	-	-	5	16	0.00	-	0.33	0.0
7.38	331.9	483.2	483.2	4.5	-1.7	1.4	6	clean SAND to silty SAND	125	5.0	66	97	95	48	-	-	5	16	0.00	-	0.33	0.0
7.55	332.1	478.1	478.1	5.3	-1.7	1.6	6	clean SAND to silty SAND	125	5.0	66	96	95	48	-	-	5	16	0.00	-	0.33	0.0
7.71	340.5	484.7	484.7	5.0	-1.7	1.5	6	clean SAND to silty SAND	125	5.0	68	97	95	48	-	-	5	16	0.00	-	0.33	0.0
7.87	360.4	507.5	507.5	5.3	-1.7	1.5	6	clean SAND to silty SAND	125	5.0	72	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.04	359.8	501.4	501.4	5.6	-1.8	1.5	6	clean SAND to silty SAND	125	5.0	72	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.20	382.2	527.0	527.0	6.1	-1.8	1.6	6	clean SAND to silty SAND	125	5.0	76	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.37	411.6	561.8	561.8	7.2	-1.9	1.8	6	clean SAND to silty SAND	125	5.0	82	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.53	420.3	567.9	567.9	7.5	-2.0	1.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.8	9.9	5	16	0.00	-	0.33	0.0
8.69	426.6	571.2	571.2	6.7	-2.0	1.6	6	clean SAND to silty SAND	125	5.0	85	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.86	438.7	581.8	581.8	6.3	-1.9	1.4	6	clean SAND to silty SAND	125	5.0	88	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.02	450.6	591.9	591.9	6.6	-1.9	1.5	6	clean SAND to silty SAND	125	5.0	90	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.19	456.8	594.5	594.5	7.7	-1.9	1.7	6	clean SAND to silty SAND	125	5.0	91	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.35	421.6	543.7	553.7	8.0	-1.7	1.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.9	9.9	6	16	0.00	-	0.33	0.0
9.51	409.5	523.8	523.8	6.5	-1.6	1.6	6	clean SAND to silty SAND	125	5.0	82	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.68	424.4	538.1	538.1	4.7	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	85	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.84	431.4	542.2	542.2	4.6	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	86	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.01	447.8	558.1	558.1	5.2	-1.2	1.2	6	clean SAND to silty SAND	125	5.0	90	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.17	442.0	546.3	546.3	6.8	-1.1	1.5	6	clean SAND to silty SAND	125	5.0	88	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.34	405.4	496.9	496.9	6.4	-1.2	1.6	6	clean SAND to silty SAND	125	5.0	81	99	95	48	-	-	5	16	0.00	-	0.33	0.0
10.50	385.6	468.9	468.9	5.6	-1.1	1.4	6	clean SAND to silty SAND	125	5.0	77	94	95	48	-	-	5	16	0.00	-	0.33	0.0
10.66	376.3	453.8	453.8	5.9	-1.0	1.6	6	clean SAND to silty SAND	125	5.0	75	91	95	48	-	-	5	16	0.00	-	0.33	0.0
10.83	355.3	425.2	443.9	6.6	-0.9	1.8	6	clean SAND to silty SAND	125	5.0	71	85	95	48	-	-	6	16	0.00	-	0.33	0.0
10.99	332.4	394.7	426.0	6.8	-0.8	2.0	6	clean SAND to silty SAND	125	5.0	66	79	95	48	-	-	7	16	0.00	-	0.33	0.0
11.16	322.8	380.5	399.0	5.7	-0.8	1.8	6	clean SAND to silty SAND	125	5.0	65	76	95	48	-	-	6	16	0.00	-	0.33	0.0
11.32	340.7	398.6	415.7	6.0	-2.6	1.8	6	clean SAND to silty SAND	125	5.0	68	80	95	48	-	-	6	16	0.00	-	0.33	0.0
11.48	395.6	459.3	459.3	6.2	-2.4	1.6	6	clean SAND to silty SAND	125	5.0	79	92	95	48	-	-	5	16	0.00	-	0.33	0.0
11.65	378.4	436.3	453.6	7.0	-2.7	1.8	6	clean SAND to silty SAND	125	5.0	76	87	95	48	-	-	6	16	0.00	-	0.33	0.0
11.81	401.5	459.5	467.1	7.0	-2.8	1.7	6	clean SAND to silty SAND	125	5.0	80	92	95	48	-	-	6	16	0.00	-	0.33	0.0
11.98	417.3	474.3	482.8	7.4	-2.7	1.8	6	clean SAND to silty SAND	125	5.0	83	95	95	48	-	-	6	16	0.00	-	0.33	0.0
12.14	430.4	485.7	492.8	7.6	-2.5	1.8	6	clean SAND to silty SAND	125	5.0	86	97	95	48	-	-	5	16	0.00	-	0.33	0.0
12.30	429.3	481.2	487.5	7.5	-2.4	1.8	6	clean SAND to silty SAND	125	5.0	86	96	95	48	-	-	5	16	0.00	-	0.33	0.0
12.47	423.7	471.7	495.8	8.5	-2.5	2.0	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	28.0	9.9	6	16	0.00	-	0.33	0.0
12.63	416.3	460.6	487.4	8.5	-2.4	2.0	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.5	9.9	7	16	0.00	-	0.33	0.0
12.80	417.4	459.0	473.3	7.7	-2.4	1.8	6	clean SAND to silty SAND	125	5.0	83	92	95	48	-	-	6	16	0.00	-	0.33	0.0
12.96	452.5	494.4	494.4	5.0	-2.7	1.1	6	clean SAND to silty SAND	125	5.0	91	99	95	48	-	-	5	16	0.00	-	0.33	0.0
13.12	470.3	510.5	510.5	5.9	-2.0	1.3	6	clean SAND to silty SAND	125	5.0	94	100	95	48	-	-	5	16	0.00	-	0.33	0.0
13.29	435.1	469.4	472.0	7.3	-1.8	1.7	6	clean SAND to silty SAND	125	5.0	87	94	95	48	-	-	5	16	0.00	-	0.33	0.0
13.45	431.4	462.4	483.8	8.4	-2.1	2.0	6	clean SAND to silty SAND	125	5.0	86	92	95	48	-	-	6	16	0.00	-	0.33	0.0
13.62	427.0	454.9	475.9	8.3	-1.9	1.9	6	clean SAND to silty SAND	125	5.0	85	91	95	48	-	-	6	16	0.00	-	0.33	0.0
13.78	419.5	444.2	467.7	8.2	-1.9	2.0	6	clean SAND to silty SAND	125	5.0	84	89	95	48	-	-	7	16	0.00	-	0.33	0.0
13.94	413.9	435.6	463.1	8.4	-1.8	2.0	6	clean SAND to silty SAND	125	5.0	83	87	95	48	-	-	7	16	0.00	-	0.33	0.0
14.11	401.7	420.2	449.5	8.1	-1.8	2.0	6	clean SAND to silty SAND	125	5.0	80	84	95	48	-	-	7	16	0.00	-	0.33	0.0
14.27	403.1	419.2	448.9	8.2	-1.7	2.0	6	clean SAND to silty SAND	125	5.0	81	84	95	48	-	-	7	16	0.00	-	0.33	0.0
14.44	407.4	421.2	441.5	7.6	-1.7	1.9	6	clean SAND to silty SAND	125	5.0	81	84	95	48	-	-	6	16	0.00	-	0.33	0.0
14.60	402.9	414.2	443.6	8.1	-1.7	2.0	6	clean SAND to silty SAND	125	5.0	81	83	95	48	-	-	7	16	0.00	-	0.33	0.0
14.76	374.7	382.9	427.3	8.6	-3.1	2.3	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.8	9.9	8	16	0.00	-	0.33	0.0
14.93	414.1	421.1	421.1	5.5	-3.1	1.3	6	clean SAND to silty SAND	125	5.0	83	84	95	48	-	-	5	16	0.00	-	0.33	0.0
15.09	481.0	486.3	486.3	3.5	-3.1	0.7	6	clean SAND to silty SAND	125	5.0	96	97	95	48	-	-	5	16	0.00	-	0.33	0.0
15.26	530.5	533.4	533.4	4.7	-3.3	0.9	6	clean SAND to silty SAND	125	5.0	100	100	95	48	-	-	5	16	0.00	-	0.33	0.0
15.42	448.7	448.7	448.7	5.5	-2.5	1.2	6	clean SAND to silty SAND	125	5.0	90	90	95	48	-	-	5	16	0.00	-	0.33	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
15.58	421.5	419.2	430.6	7.2	-3.2	1.7	6	clean SAND to silty SAND	125	5.0	84	84	95	48	-	-	6	16	0.00	-	0.33	0.0
15.75	338.1	334.5	375.2	7.3	-3.2	2.2	6	clean SAND to silty SAND	125	5.0	68	67	95	48	-	-	9	16	0.00	-	0.33	0.0
15.91	217.9	214.4	281.8	5.9	-2.1	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	14.4	9.9	13	16	0.00	-	0.33	0.0
16.08	129.0	126.4	223.7	4.6	-1.9	3.6	5	silty SAND to sandy SILT	120	4.0	32	32	75	45	-	-	20	16	0.00	-	0.33	0.0
16.24	67.4	65.7	170.0	2.6	-1.8	4.0	4	clayy SILT to silty CLAY	115	2.0	34	33	-	-	4.7	9.9	29	15	0.00	-	0.33	0.0
16.40	39.7	39.6	-	1.5	-1.9	3.8	4	clayy SILT to silty CLAY	115	2.0	20	20	-	-	2.8	9.9	36	15	-	-	0.33	-
16.57	50.5	48.8	92.2	0.8	-2.7	1.6	5	silty SAND to sandy SILT	120	4.0	13	12	43	40	-	-	22	16	2.50	-	0.33	45.6
16.73	52.9	50.8	100.3	0.9	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	13	13	45	40	-	-	23	16	2.33	-	0.33	43.3
16.90	58.9	56.3	106.2	1.1	-2.7	1.9	5	silty SAND to sandy SILT	120	4.0	15	14	48	40	-	-	22	16	2.22	-	0.32	37.4
17.06	60.7	57.7	112.3	1.2	-2.9	2.0	5	silty SAND to sandy SILT	120	4.0	15	14	49	41	-	-	22	16	2.12	-	0.32	36.0
17.23	62.9	59.6	118.0	1.4	-3.0	2.2	5	silty SAND to sandy SILT	120	4.0	16	15	50	41	-	-	23	16	2.04	-	0.32	34.3
17.39	65.2	61.4	128.2	1.6	-3.0	2.5	5	silty SAND to sandy SILT	120	4.0	16	15	51	41	-	-	24	16	1.83	-	0.31	33.1
17.55	66.1	62.0	142.4	2.0	-3.1	3.0	4	clayy SILT to silty CLAY	115	2.0	33	31	-	-	4.6	9.9	26	15	1.19	-	0.31	15.6
17.72	65.2	60.9	146.6	2.1	-3.4	3.3	4	clayy SILT to silty CLAY	115	2.0	33	30	-	-	4.6	9.9	27	15	1.00	-	0.31	10.7
17.88	72.5	67.5	126.8	1.6	-3.5	2.3	5	silty SAND to sandy SILT	120	4.0	18	17	54	41	-	-	22	16	1.89	-	0.31	29.5
18.05	68.8	63.8	118.7	1.4	-3.4	2.1	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	21	16	2.03	-	0.30	31.7
18.21	68.0	62.7	133.9	1.8	-3.3	2.7	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	25	16	1.64	-	0.30	31.6
18.37	62.9	57.7	141.7	2.0	-3.4	3.2	4	clayy SILT to silty CLAY	115	2.0	31	29	-	-	4.4	9.9	28	15	1.26	-	0.30	23.3
18.54	69.9	63.9	133.8	1.8	-3.3	2.6	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	24	16	1.65	-	0.30	30.7
18.70	71.7	65.3	133.8	1.8	-3.3	2.6	5	silty SAND to sandy SILT	120	4.0	18	16	53	41	-	-	24	16	1.66	-	0.29	29.7
18.87	76.7	69.5	135.5	1.9	-3.3	2.5	5	silty SAND to sandy SILT	120	4.0	19	17	55	41	-	-	23	16	1.59	-	0.29	25.7
19.03	79.5	71.9	137.5	2.0	-3.2	2.5	5	silty SAND to sandy SILT	120	4.0	20	18	56	41	-	-	22	16	1.50	-	0.29	22.4
19.19	78.2	70.6	138.1	2.0	-3.2	2.6	5	silty SAND to sandy SILT	120	4.0	20	18	55	41	-	-	23	16	1.47	-	0.28	22.3
19.36	76.2	68.7	136.5	1.9	-3.2	2.6	5	silty SAND to sandy SILT	120	4.0	19	17	55	41	-	-	23	16	1.56	-	0.28	26.0
19.52	72.0	64.8	138.4	2.0	-3.2	2.8	5	silty SAND to sandy SILT	120	4.0	18	16	53	41	-	-	25	16	1.47	-	0.28	27.1
19.69	68.7	61.6	137.1	1.9	-3.1	2.9	5	silty SAND to sandy SILT	120	4.0	17	15	51	41	-	-	26	16	1.53	-	0.28	32.3
19.85	66.2	59.2	134.6	1.8	-3.1	2.8	5	silty SAND to sandy SILT	120	4.0	17	15	50	40	-	-	26	16	1.65	-	0.27	34.6
20.01	64.4	57.5	130.9	1.7	-3.1	2.8	5	silty SAND to sandy SILT	120	4.0	16	14	49	40	-	-	26	16	1.79	-	0.27	36.3
20.18	62.8	56.0	128.6	1.7	-3.1	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	48	40	-	-	26	16	1.87	-	0.27	37.8
20.34	62.3	55.5	127.2	1.7	-3.1	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	48	40	-	-	26	16	1.91	-	0.27	38.3
20.51	62.5	55.5	133.0	1.8	-3.1	2.9	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.72	-	0.26	38.2
20.67	61.4	54.4	136.1	1.9	-3.1	3.1	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.3	9.9	28	15	1.60	-	0.26	39.3
20.83	63.3	56.0	135.3	1.9	-2.7	3.0	4	clayy SILT to silty CLAY	115	2.0	32	28	-	-	4.4	9.9	27	15	1.63	-	0.26	37.7
21.00	62.8	55.5	133.2	1.8	-2.6	2.9	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.72	-	0.25	38.2
21.16	63.0	55.5	134.5	1.8	-2.6	3.0	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.67	-	0.25	38.3
21.33	61.2	53.8	137.3	1.9	-2.6	3.2	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.3	9.9	29	15	1.56	-	0.25	40.0
21.49	57.2	50.2	136.9	1.9	-2.6	3.3	4	clayy SILT to silty CLAY	115	2.0	29	25	-	-	4.0	9.9	30	15	1.57	-	0.25	43.9
21.65	65.2	57.2	135.8	1.9	-2.6	3.0	4	clayy SILT to silty CLAY	115	2.0	33	29	-	-	4.6	9.9	27	15	1.63	-	0.24	36.5
21.82	66.7	58.4	133.9	1.9	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	17	15	49	40	-	-	26	16	1.70	-	0.24	35.3
21.98	68.9	60.2	136.1	1.9	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	17	15	50	40	-	-	26	16	1.62	-	0.24	33.7
22.15	70.1	61.1	135.9	1.9	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	26	16	1.63	-	0.24	33.0
22.31	70.9	61.8	137.2	2.0	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	25	16	1.58	-	0.23	32.3
22.47	71.2	61.9	138.0	2.0	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	26	16	1.55	-	0.23	32.1
22.64	73.3	63.6	136.3	2.0	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	18	16	52	40	-	-	25	16	1.63	-	0.23	31.1
22.80	74.3	64.3	138.4	2.0	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	19	16	52	40	-	-	25	16	1.54	-	0.23	29.9
22.97	75.1	64.9	140.8	2.1	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	19	16	53	40	-	-	25	16	1.43	-	0.22	26.7
23.13	77.1	66.5	140.6	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	19	17	54	40	-	-	24	16	1.44	-	0.22	26.1
23.30	78.1	67.2	140.7	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	24	16	1.44	-	0.22	25.6
23.46	78.6	67.5	140.5	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	24	16	1.45	-	0.22	26.0
23.62	78.7	67.5	152.5	2.5	-2.6	3.2	4	clayy SILT to silty CLAY	115	2.0	39	34	-	-	5.5	9.9	26	15	0.90	-	0.21	8.4
23.79	79.5	68.1	146.9	2.3	-2.6	3.0	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	25	16	1.16	-	0.21	14.2
23.95	79.8	68.2	142.4	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.37	-	0.21	21.7
24.12	77.6	66.2	142.0	2.2	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	19	17	53	40	-	-	25	16	1.39	-	0.21	24.3
24.28	78.2	66.6	141.0	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.44	-	0.21	26.8
24.44	78.5	66.8	140.2	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.48	-	0.20	27.4
24.61	79.0	67.0	140.1	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.20	27.3
24.77	79.1	67.0	140.7	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.47	-	0.20	27.1
24.94	79.0	66.8	140.3	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.20	27.5
25.10	80.4	67.9	138.7	2.1	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.57	-	0.19	27.5
25.26	80.8	68.1	138.8	2.1	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.56	-	0.19	27.2
25.43	79.3	66.7	140.4	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.19	27.6
25.59	79.9	67.1	140.7	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.48	-	0.19	27.2
25.76	80.6	67.5	140.6	2.2	-2.5	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.18	26.9
25.92	79.6	66.6	139.8	2.1	-2.5	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.53	-	0.18	28.1
26.08	80.8	67.5	140.0	2.2	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.52	-	0.18	27.3
26.25	79.8	66.5	137.7	2.1	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.62	-	0.18	29.2
26.41	80.9	67.3	143.7	2.3	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	25	16	1.35	-	0.17	22.3
26.58	79.1	65.7	142.8	2.2	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	16	53	40	-	-	25	16	1.39	-	0.17	25.6
26.74	79.7	66.1	143.5	2.3	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	17	53	40	-	-	25	16	1.36	-	0.17	23.9
26.90	77.8	64.4	141.9	2.2	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	19	16	52	40	-	-	25	16	1.44	-	0.17	29.7
27.07	77.5	64.1	145.7	2.3	-2.6	3.1	4	clayy SILT to silty CLAY	115	2.0	39	32	-	-	5.4	9.9	26	15	1.27	-	0.16	20.6
27.23	82.0	67.7	144.4	2.3	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	25	16	1.33	-	0.16	21.5
27.40	82.2	67.7	141.6	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	24	16	1.46	-	0.16	26.6
27.56	82.0	67.4	138.7	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.59	-	0.16	28.4
27.72	81.6	67.0	138.6	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.60	-	0.15	28.8
27.89	82.8	67.9	139.8	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	24	16	1.55	-	0.15	27.5
28.05	84.3	69.0	138.5	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	23	16	1.61	-	0.15	27.7
28.22	84.8	69.3	140.2	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	23	16	1.54	-	0.15	26.4
28.38	84.6	69.0	140.6	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	24	16	1.53	-	0.14	26.4
28.54	87.1	70.9	140.5	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.53	-	0.14	25.1
28.71	87.7	71.3	139.8	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.57	-	0.14	25.4
28.87	87.1	70.7	137.9	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.65	-	0.14	27.5
29.04	86.6	70.2	137.1	2.1	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	23	16	1.68	-	0.13	28.0
29.20	86.3	69.8	139.0	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	17	55	40	-	-	23	16	1.61	-	0.13	27.1
29.36	87.8	70.9	139.7	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.58	-	0.13	25.9
29.53	89.1	71.8	137.0	2.2	-2.5	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.69	-	0.13	27.2
29.69	89.3	71.9	135.6	2.1	-2.5	2.4	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.75	-	0.12	27.1
29.86	89.0	71.5	147.6	2.5	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	24	16	1.23	-	0.12	16.0
30.02	89.0	71.4	142.1	2.3	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.48	-	0.12	24.0
30.19	89.2	71.4	138.7	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.63	-	0.12	26.8
30.35	89.3	71.4	138.9	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.62	-	0.11	26.6
30.51	87.5	69.8	137.2	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	17	55	40	-	-	23	16	1.69	-	0.11	28.2
30.68	88.2	70.3	135.5	2.1	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	22	16	1.75	-	0.11	28.0
30.84	88.6	70.5	134.1	2.1	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	22	16	1.80	-	0.11	27.9

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
31.01	89.7	71.2	136.2	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.72	-	0.10	27.5
31.17	89.6	71.1	137.4	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.68	-	0.10	27.6
31.33	89.6	71.0	137.6	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.67	-	0.10	27.6
31.50	89.7	70.9	138.8	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.62	-	0.09	26.9
31.66	91.1	71.9	141.9	2.4	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	23	18	56	40	-	-	23	16	1.49	-	0.09	23.7
31.83	92.5	72.9	144.2	2.4	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	23	18	57	40	-	-	23	16	1.39	-	0.09	20.6
31.99	96.0	75.6	140.6	2.3	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	24	19	58	40	-	-	21	16	1.55	-	0.09	22.5
32.15	94.3	74.1	137.5	2.2	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	24	19	57	40	-	-	21	16	1.68	-	0.08	26.0
32.32	92.9	72.9	137.0	2.2	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	23	18	57	40	-	-	22	16	1.70	-	0.08	26.6
32.48	81.8	64.1	134.6	2.1	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	20	16	52	39	-	-	24	16	1.77	-	0.08	31.5
32.65	94.3	73.8	130.4	2.0	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	24	18	57	40	-	-	20	16	1.88	-	0.08	26.2
32.81	99.0	77.3	125.8	1.8	-2.6	1.9	5	silty SAND to sandy SILT	120	4.0	25	19	59	40	-	-	18	16	1.94	-	0.07	24.4
32.97	101.5	79.1	148.8	2.6	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	25	20	59	40	-	-	22	16	1.19	-	0.07	11.4
33.14	102.5	79.8	140.2	2.3	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.57	-	0.07	20.5
33.30	104.0	80.9	126.5	1.8	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	18	16	1.93	-	0.06	22.7
33.47	115.7	89.8	134.8	2.1	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	29	22	63	41	-	-	17	16	1.79	-	0.06	19.3
33.63	103.8	80.5	139.8	2.3	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.59	-	0.06	20.6
33.79	97.0	75.1	125.7	1.9	-2.6	2.0	5	silty SAND to sandy SILT	120	4.0	24	19	58	40	-	-	19	16	1.94	-	0.06	25.5
33.96	100.3	77.5	131.3	2.0	-2.6	2.1	5	silty SAND to sandy SILT	120	4.0	25	19	59	40	-	-	19	16	1.87	-	0.05	24.3
34.12	95.9	74.0	137.5	2.3	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	24	19	57	40	-	-	21	16	1.67	-	0.05	26.0
34.29	85.7	66.0	145.7	2.5	-2.6	3.0	5	silty SAND to sandy SILT	120	4.0	21	17	53	39	-	-	25	16	1.30	-	0.05	21.6
34.45	75.9	58.4	140.7	2.3	-2.6	3.1	4	clayy SILT to silty CLAY	115	2.0	38	29	-	-	5.3	9.9	27	15	1.52	-	0.05	35.4
34.61	94.1	72.3	131.1	2.1	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	24	18	56	40	-	-	21	16	1.87	-	0.04	26.9
34.78	105.3	80.8	138.4	2.3	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.65	-	0.04	22.7
34.94	104.3	79.9	142.0	2.4	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.50	-	0.04	18.0
35.11	108.8	83.3	145.2	2.5	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.36	-	0.03	13.4
35.27	108.0	82.5	144.1	2.5	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.40	-	0.03	14.6
35.43	111.2	84.8	143.0	2.5	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	19	16	1.45	-	0.03	15.2
35.60	110.6	84.2	142.7	2.4	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	19	16	1.47	-	0.03	15.6
35.76	110.9	84.4	140.4	2.4	-2.7	2.2	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	19	16	1.57	-	0.02	18.3
35.93	111.7	84.9	138.8	2.3	-2.6	2.1	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	19	16	1.63	-	0.02	20.3
36.09	112.0	84.9	148.0	2.7	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	20	16	1.23	-	0.02	10.7
36.26	109.1	82.6	145.9	2.6	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.32	-	0.02	12.8
36.42	110.5	83.6	146.3	2.6	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	20	16	1.30	-	0.02	12.2
36.58	107.2	81.0	151.7	2.8	-2.7	2.7	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	22	16	1.06	-	0.01	8.7
36.75	109.4	82.5	157.6	3.0	-2.7	2.8	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	22	16	0.80	-	0.01	5.7
36.91	109.4	82.4	152.2	2.8	-2.7	2.6	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	21	16	1.04	-	0.01	8.2
37.08	109.1	82.1	147.6	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	27	21	60	40	-	-	21	16	1.24	-	0.01	11.3
37.24	111.0	83.3	149.3	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	21	16	1.17	-	0.01	9.9
37.40	110.7	83.0	148.0	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	21	16	1.22	-	0.00	10.9
37.57	108.9	81.5	159.3	3.1	-2.7	2.9	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	23	16	0.74	-	0.00	5.1
37.73	109.2	81.6	155.0	3.0	-2.7	2.8	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	22	16	0.91	-	0.00	6.8

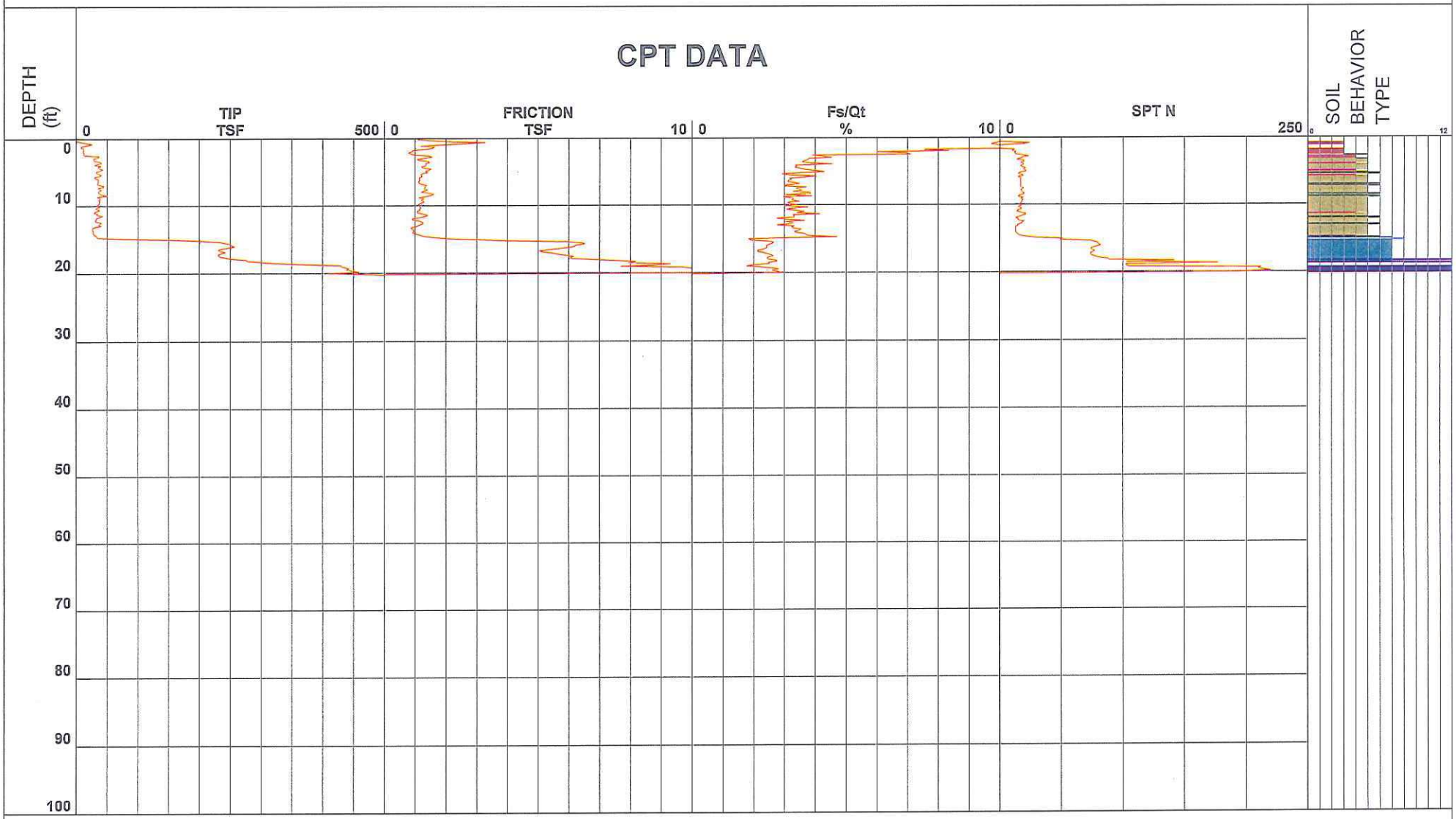
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(553).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-236	Date and Time	10/7/2011 12:08:14 AM	Maximum Depth	20.34 ft
Water Table Depth		>20.34 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

(*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(553).cpt
CPT Date: 10/7/2011 12:08:14 AM
GW During Test: No GW

Sounding ID: CPT-11-236
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.10	Cycl SStn %
0.33	1.1	1.6	-	1.5	0.0	9.9	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.49	7.1	11.4	-	2.2	0.1	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	79	15	N/A	0.00	N/A	N/A
0.66	15.9	25.5	-	3.3	0.1	9.9	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	60	15	N/A	0.00	N/A	N/A
0.82	25.5	40.9	-	2.5	0.2	9.9	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	52	15	N/A	0.00	N/A	N/A
0.98	18.3	29.4	-	1.8	0.2	9.8	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	57	15	N/A	0.00	N/A	N/A
1.15	9.5	15.3	-	1.2	0.2	9.9	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.7	9.9	72	15	N/A	0.00	N/A	N/A
1.31	7.7	12.3	-	1.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.48	11.5	18.5	-	1.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.64	12.0	19.2	-	1.3	0.3	9.9	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.80	12.3	19.7	-	0.9	1.2	7.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	60	15	N/A	0.00	N/A	N/A
1.97	10.9	17.6	-	0.9	1.2	8.4	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	65	15	N/A	0.00	N/A	N/A
2.13	13.2	21.2	-	0.8	1.2	6.1	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	54	15	N/A	0.00	N/A	N/A
2.30	12.4	19.9	-	0.9	1.2	7.0	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	59	15	N/A	0.00	N/A	N/A
2.46	13.9	22.3	-	1.0	0.9	7.2	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	57	15	N/A	0.00	N/A	N/A
2.62	36.9	59.1	159.7	1.4	0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	18	30	-	-	2.6	9.9	30	15	N/A	0.00	N/A	N/A
2.79	36.2	58.1	166.5	1.5	0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	32	15	N/A	0.00	N/A	N/A
2.95	28.8	46.1	-	1.3	1.7	4.5	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	36	15	N/A	0.00	N/A	N/A
3.12	28.3	45.4	140.0	1.1	2.0	3.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	33	15	N/A	0.00	N/A	N/A
3.28	29.9	48.0	142.5	1.1	2.0	3.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	32	15	0.22	-	0.10	0.5
3.45	39.1	62.6	158.3	1.4	2.1	3.7	4	clayy SILT to silty CLAY	115	2.0	20	31	-	-	2.7	9.9	28	15	0.10	-	0.10	0.2
3.61	41.2	66.1	159.8	1.5	2.1	3.6	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	27	15	0.10	-	0.10	0.2
3.77	35.1	56.2	154.4	1.3	2.1	3.8	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	30	15	0.16	-	0.10	0.3
3.94	30.3	48.6	159.5	1.4	2.1	4.6	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	35	15	0.13	-	0.10	0.1
4.10	40.4	64.9	152.9	1.4	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	27	15	0.19	-	0.10	0.6
4.27	35.5	57.0	145.9	1.2	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	0.29	-	0.10	1.1
4.43	37.7	60.5	147.9	1.3	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	28	15	0.27	-	0.10	1.1
4.59	42.9	68.9	161.7	1.5	2.0	3.5	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	27	15	0.00	-	0.10	0.0
4.76	39.6	63.4	160.0	1.5	2.0	3.7	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.16	-	0.10	0.4
4.92	33.1	53.1	155.7	1.3	2.1	4.1	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.3	9.9	32	15	0.20	-	0.10	0.5
5.09	32.8	52.5	160.4	1.4	1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	33	15	0.00	-	0.10	0.0
5.25	36.0	57.7	149.1	1.3	1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	0.34	-	0.10	1.4
5.41	40.3	64.7	142.1	1.2	1.0	3.0	5	silty SAND to sandy SILT	120	4.0	10	16	53	43	-	-	25	16	0.56	-	0.10	3.3
5.58	38.3	61.4	145.6	1.2	1.0	3.2	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	27	15	0.46	-	0.10	2.5
5.74	30.2	48.5	149.5	1.2	1.0	4.1	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	33	15	0.37	-	0.10	1.3
5.91	31.3	50.2	143.4	1.1	0.9	3.7	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	31	15	0.58	-	0.09	3.1
6.07	35.8	57.5	140.7	1.1	0.9	3.2	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.73	-	0.09	11.0
6.23	36.1	57.8	142.8	1.2	0.9	3.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.65	-	0.09	9.4
6.40	35.9	57.6	140.1	1.1	0.9	3.2	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.82	-	0.09	11.7
6.56	35.7	56.6	138.5	1.1	0.8	3.1	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	28	15	0.93	-	0.09	15.4
6.73	34.5	54.0	141.1	1.2	0.8	3.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	29	15	0.81	-	0.09	21.3
6.89	35.8	55.5	146.3	1.2	0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	30	15	0.59	-	0.09	3.6
7.05	44.7	68.3	150.2	1.4	0.8	3.1	5	silty SAND to sandy SILT	120	4.0	11	17	54	43	-	-	25	16	0.47	-	0.09	2.7
7.22	44.1	66.6	146.5	1.3	0.8	3.0	5	silty SAND to sandy SILT	120	4.0	11	17	54	43	-	-	25	16	0.61	-	0.09	3.9
7.38	35.8	53.4	149.2	1.3	0.8	3.8	4	clayy SILT to silty CLAY	115	2.0	18	27	-	-	2.5	9.9	31	15	0.53	-	0.08	2.9
7.55	38.7	57.2	145.5	1.3	0.8	3.4	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	29	15	0.69	-	0.08	11.7
7.71	40.6	59.3	150.1	1.4	0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.8	9.9	29	15	0.53	-	0.08	3.2
7.87	36.4	52.6	144.9	1.3	0.8	3.6	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.5	9.9	31	15	0.75	-	0.08	24.8
8.04	36.7	52.5	138.5	1.2	0.8	3.3	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.6	9.9	30	15	1.10	-	0.08	28.5
8.20	38.3	54.3	153.0	1.5	0.8	3.9	4	clayy SILT to silty CLAY	115	2.0	19	27	-	-	2.7	9.9	31	15	0.47	-	0.08	2.4
8.37	41.7	58.4	158.6	1.6	0.8	3.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	2.9	9.9	30	15	0.34	-	0.08	1.6
8.53	49.7	69.0	149.7	1.5	0.7	3.1	5	silty SAND to sandy SILT	120	4.0	12	17	55	43	-	-	25	16	0.60	-	0.08	3.8
8.69	34.4	47.4	145.4	1.3	0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	17	24	-	-	2.4	9.9	33	15	0.80	-	0.08	40.8
8.86	38.2	52.1	130.4	1.1	0.7	3.0	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	28	15	1.60	-	0.08	40.9
9.02	39.7	53.6	139.2	1.3	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	20	27	-	-	2.8	9.9	29	15	1.15	-	0.07	26.9
9.19	36.4	48.6	134.3	1.2	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.5	9.9	31	15	1.41	-	0.07	42.1
9.35	39.1	51.9	136.8	1.3	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	20	26	-	-	2.7	9.9	30	15	1.29	-	0.07	33.5
9.51	37.3	49.0	138.9	1.3	0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.6	9.9	31	15	1.20	-	0.07	38.8
9.68	37.8	49.3	130.5	1.2	0.7	3.1	4	clayy SILT to silty CLAY	115	2.0	19	25	-	-	2.6	9.9	30	15	1.64	-	0.06	45.0
9.84	35.0	45.2	128.1	1.1	0.7	3.2	4	clayy SILT to silty CLAY	115	2.0	17	23	-	-	2.4	9.9	31	15	1.76	-	0.06	49.9
10.01	33.2	42.6	129.0	1.1	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	17	21	-	-	2.3	9.9	33	15	1.73	-	0.06	51.2
10.17	38.3	48.7	127.6	1.1	0.6	3.0	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	29	15	1.79	-	0.06	45.7
10.34	31.8	45.1	140.5	1.2	0.7	3.8	4	clayy SILT to silty CLAY	115	2.0	16	23	-	-	2.2	9.9	34	15	1.16	-	0.05	48.6
10.50	35.1	43.9	128.1	1.1	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.5	9.9	32	15	1.78	-	0.05	51.2
10.66	38.0	47.1	127.7	1.2	0.7	3.1	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	30	15	1.80	-	0.05	47.5
10.83	32.2	39.7	125.5	1.1	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.3	9.9	34	15	1.88	-	0.05	51.2
10.99	29.4	39.9	131.5	1.1	0.7	3.7	4	clayy SILT to silty CLAY	115	2.0	15	20	-	-	2.1	9.9	35	15	1.66	-	0.04	51.2
11.16	35.3	42.8	129.9	1.2	0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.5	9.9	33	15	1.73	-	0.04	51.2
11.32	32.8	43.5	-	1.4	0.7	4.2	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.3	9.9	36	15	-	-	0.04	-
11.48	42.8	51.2	137.0	1.4	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	21	26	-	-	3.0	9.9	30	15	1.39	-	0.03	37.8
11.65	37.8	44.9	131.0	1.3	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	32	15	1.70	-	0.03	50.3
11.81	32.9	38.8	123.4	1.1	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	16	19	-	-	2.3	9.9	34	15	1.96	-	0.03	51.2
11.98	33.3	39.0	112.0	0.9	0.6	2.8	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	32	15	2.13	-	0.03	51.2
12.14	30.9	35.9	114.7	0.9	0.6	3.1	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.2	9.9	34	15	2.09	-	0.02	51.2
12.30	32.1	40.3	132.3	1.2	0.6	3.7	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.2	9.9	35	15	1.66	-	0.02	51.2
12.47	41.4	47.5	127.6	1.3	0.6	3.1	4	clayy SILT to silty CLAY	115	2.0	21	24	-	-	2.9	9.9	30	15	1.84	-	0.02	47.1
12.63	38.5	43.9	128.9	1.3	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	32	15	1.80	-	0.01	51.2
12.80	36.8	41.7	124.8	1.2	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.6	9.9	33	15	1.94	-	0.01	51.2
12.96	39.9	44.9	118.8	1.1	0.6	2.8	4	clayy SILT to silty CLAY	115	2.0	20	22	-	-	2.8	9.9	30	15	2.03	-	0.01	50.2
13.12	30.8	36.9	121.4	1.0	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.1	9.9	35	15	1.99	-	0.00	51.2
13.29	27.1	35.6	-	0.9	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	35	15	-	-	0.00	-
13.45	26.9	34.8	-	0.9	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	13	17	-	-	1.9	9.9	36	15	-	-	0.00	-
13.62	27.2	34.8	-	1.0	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	37	15	-	-	0.00	-
13.78	27.9	35.3	-	1.0	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	37	15	-	-	0.00	-
13.94	27.9	34.9	-	0.9	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	36	15	-	-	0.00	-
14.11	28.1	34.6	-	1.0	0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	37	15	-	-	0.00	-
14.27	29.1	35.5	-	1.1	0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.0	9.9	37	15	-	-	0.00	-
14.44	31.8	38.4	-	1.2	0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	16	19	-	-	2.2	9.9	36	15	-	-	0.00	-
14.60	33.7	40.1	-	1.3	0.6	3.9	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.00	-
14.76	34.6	40.8	-	1.6	0.6	4.8	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.4	9.9	39	15	-	-	0.00	-
14.93	77.4	81.2	152.8	2.1	0.5	2.7	5	silty SAND to sandy SILT	120	4.0	19	20	60	43	-	-	22	16	0.75	-	0.00	4.8
15.09	158.6	165.4	204.3	2.9	0.2	1.9	6	clean SAND to silty SAND	125	5.0	32	33	84	46	-	-	12	16	0.00	-	0.00	0.0
15.26	204.2	211.7	250.2	3.9	0.1	1.9	6	clean SAND to silty SAND	125	5.0	41	42	92	47	-	-	10	16	0.00	-	0.00	0.0
15.42	233.3	240.5	301.0	6.0	0.2	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	15.4	9.9	12	16	0.00	-	0.00	0.0

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The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(553).cpt
CPT Date: 10/7/2011 12:08:14 AM
GW During Test: No GW

Sounding ID: CPT-11-236
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.10	Cycl SStn %
15.58	243.4	249.5	313.3	6.4	0.2	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.1	9.9	12	16	0.00	-	0.00	0.0
15.75	250.9	255.9	317.6	6.5	0.4	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.6	9.9	12	16	0.00	-	0.00	0.0
15.91	251.6	255.4	312.6	6.2	0.5	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.6	9.9	11	16	0.00	-	0.00	0.0
16.08	256.7	259.2	313.3	6.2	0.7	2.4	6	clean SAND to silty SAND	125	5.0	51	52	95	48	-	-	11	16	0.00	-	0.00	0.0
16.24	249.7	250.7	306.3	6.1	0.8	2.4	6	clean SAND to silty SAND	125	5.0	50	50	95	48	-	-	11	16	0.00	-	0.00	0.0
16.40	237.7	237.4	292.8	5.8	0.9	2.4	6	clean SAND to silty SAND	125	5.0	48	47	95	48	-	-	11	16	0.00	-	0.00	0.0
16.57	230.7	229.2	281.6	5.4	1.1	2.3	6	clean SAND to silty SAND	125	5.0	46	46	94	47	-	-	11	16	0.00	-	0.00	0.0
16.73	234.2	231.3	276.9	5.0	1.2	2.2	6	clean SAND to silty SAND	125	5.0	47	46	95	48	-	-	11	16	0.00	-	0.00	0.0
16.90	242.0	237.8	282.4	5.2	1.2	2.1	6	clean SAND to silty SAND	125	5.0	48	48	95	48	-	-	10	16	0.00	-	0.00	0.0
17.06	237.5	232.2	283.0	5.4	1.3	2.3	6	clean SAND to silty SAND	125	5.0	48	46	95	47	-	-	11	16	0.00	-	0.00	0.0
17.23	230.8	224.4	280.9	5.6	1.3	2.4	6	clean SAND to silty SAND	125	5.0	46	45	94	47	-	-	12	16	0.00	-	0.00	0.0
17.39	231.1	223.6	284.6	5.9	1.4	2.6	5	silty SAND to sandy SILT	120	4.0	58	56	94	47	-	-	12	16	0.00	-	0.00	0.0
17.55	233.9	225.2	289.1	6.2	1.4	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	15.5	9.9	13	16	0.00	-	0.00	0.0
17.72	244.2	234.1	291.8	6.1	1.4	2.5	6	clean SAND to silty SAND	125	5.0	49	47	95	47	-	-	12	16	0.00	-	0.00	0.0
17.88	250.5	238.9	295.0	6.1	1.4	2.4	6	clean SAND to silty SAND	125	5.0	50	48	95	48	-	-	12	16	0.00	-	0.00	0.0
18.05	275.6	261.6	318.6	6.8	-1.8	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	18.2	9.9	11	16	0.00	-	0.00	0.0
18.21	278.6	263.2	331.0	7.7	-1.8	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	18.4	9.9	12	16	0.00	-	0.00	0.0
18.37	297.3	279.6	347.1	8.2	-1.9	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	19.7	9.9	12	16	0.00	-	0.00	0.0
18.54	321.4	301.0	356.5	7.9	-2.1	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	21.3	9.9	10	16	0.00	-	0.00	0.0
18.70	369.4	344.5	400.7	9.3	-2.4	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.4	9.9	10	16	0.00	-	0.00	0.0
18.87	429.7	399.0	430.3	8.8	-2.5	2.0	6	clean SAND to silty SAND	125	5.0	86	80	95	48	-	-	7	16	0.00	-	0.00	0.0
19.03	431.7	398.9	416.9	7.7	-2.2	1.8	6	clean SAND to silty SAND	125	5.0	86	80	95	48	-	-	6	16	0.00	-	0.00	0.0
19.19	437.3	402.2	442.5	9.7	-2.2	2.2	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	28.9	9.9	8	16	0.00	-	0.00	0.0
19.36	442.8	405.6	466.7	11.7	-2.3	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.3	9.9	9	16	0.00	-	0.00	0.0
19.52	438.2	399.7	469.1	12.3	-2.3	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.0	9.9	10	16	0.00	-	0.00	0.0
19.69	447.8	406.7	465.4	11.6	-2.3	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.6	9.9	9	16	0.00	-	0.00	0.0
19.85	459.4	415.5	482.4	12.7	-2.3	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	30.4	9.9	10	16	0.00	-	0.00	0.0
20.01	409.7	369.1	442.8	11.9	-2.3	2.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.1	9.9	11	16	0.00	-	0.00	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

APPENDIX B

LABORATORY SOIL TEST RESULTS

TABLE B1 SUMMARY OF LABORATORY TEST RESULTS FOR RETAINING WALLS (1 OF 6)

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-202	S-1	5	CL	26.6				2:5:93						
A-11-202	D-2	10	CL	28.8	111.8	3.5								
A-11-202	S-3	15	CH	32.9						56/27/29				
A-11-202	D-4	20	CL	26.4	117.8	3.25								
A-11-202	S-5	25	CH	28.3										
A-11-202	D-6	30	CH	30.8	119.6	>4.5								
A-11-203	D-1	5	CL	28.7	119.7	>4.5								
A-11-203	S-2	10	CL	30.5							160	4.6	1060	4391
A-11-203	D-3	15	CL	31.7	118.2	>4.5								
A-11-203	S-4	20	CL	27.9										
A-11-203	D-5	25	MH	27.3	120.7	>4.5								
A-11-203	S-6	30	MH	28.2						63/33/30				
A-11-211	S-1	2.5	SM to CL	22.5										
A-11-211	D-2	5	MH	28.4	118.9	>4.5								
A-11-211	S-3	10	MH	29.6				0:3:97		69/38/31				
A-11-211	D-4	15	MH	26.5	121.5	>4.5								
A-11-211	S-5	20	MH	34.2										
A-11-211	D-6	25	MH	24.3	121.7	>4.5								
A-11-211	S-7	30	MH	25.2										
A-11-212	D-1	2.5	SM	5.3	121.2			0:81:19						
A-11-212	S-2	5	MH	27.6							300	7.4	980	1340
A-11-212	D-3	10	MH	26.9	118.8	>4.5								
A-11-212	S-4	15	MH	26.6										
A-11-212	D-5	20	MH	26.3	121.1	>4.5								
A-11-212	S-6	25	MH	27.3										
A-11-212	D-7	30	MH	23.6	121.8	>4.5								
A-11-214	S-1	2.5	CL	10.7										
A-11-214	D-2	5	SC	5.3	119.7									
A-11-214	S-3	10	CL	21.5							290	7.6	260	2216
A-11-214	D-4	15	CH	21.0	118.5	>4.5								
A-11-214	S-5	20	CH	22.3						64/30/34				
A-11-214	D-6	25	CH	22.1	121.8	>4.5								
A-11-214	S-7	30	CH	30.2										
A-11-214	D-8	35	MH	25.8	121.6	>4.5								
A-11-214	S-9	40	MH	28.0						74/37/37				

TABLE B1 SUMMARY OF LABORATORY TEST RESULTS FOR RETAINING WALLS (2 OF 6)

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-216	D-4	15	CH	31.2	119.4	3.25								
A-11-216	S-5	20	CL	26.2							270	6.8	550	1084
A-11-216	D-6	25	CL	27.5	119.8	2.25								
A-11-216	S-7	30	CH	23.8				0:11:89		54/21/33				
A-11-216	D-8	35	CH	21.1	123.7	4.0								
A-11-216	S-9	40	CL	25.4										
A-11-216	D-10	45	CL	23.1	123.6	2.25								
A-11-216	S-11	50	CL	23.9										
A-11-221	S-2	10	ML	12.3										
A-11-221	D-3	15	CL/CH	15.1	131.1	>4.5								
A-11-221	S-4	20	CL	14.2						43/18/25	440	7.5	390	845
A-11-221	D-5	25	CH	35.7	116.9	3.75								
A-11-221	S-6	30	CL	18.1										
A-11-221	D-7	35	CH	11.7	134.9	>4.5								
A-11-221	S-8	40	CL	15.9						40/17/23				
A-11-221	D-9	45	SM	7.7	115.4			6:74:20						
A-11-221	S-10	50	CH	18.4										
A-11-221	D-11	55	CL	20.3	129.9	2.25								
A-11-221	S-12	60	CH	25.6										
A-11-221	D-13	65	SC to SM	12.2	121.7									
A-11-221	S-14	70	CL	26.7										
A-11-221	D-15	75	CH	24.9	123.7	2.5								
A-11-221	S-16	80	CH	37.9										
A-11-221	D-17	85	CH	33.9	117.7	4.5								
A-11-221	S-18	90	MH	26.0				0:5:95		64/34/30				
A-11-222	S-1	5	CL	14.0							400	6.8	510	1011
A-11-222	D-2	10	CL	14.8	122.2	>4.5								
A-11-222	D-4	20	CH	33.7	111.2	>4.5								
A-11-222	S-5	25	CH	11.4						84/37/47				
A-11-222	D-6	30	CL	14.1	130.3	>4.5								
A-11-222	S-7	35	CL	16.7										
A-11-222	D-8	40	SC to CL	12.6	131.4	3.5								
A-11-222	S-9	45	CL	16.8										
A-11-222	D-10	50	CL	23.5	118.5	1.5								
A-11-222	S-11	55	CL	25.5										

TABLE B1 SUMMARY OF LABORATORY TEST RESULTS FOR RETAINING WALLS (3 OF 6)

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-222	S-17	85	CH	33.1										
A-11-222	D-18	90	CH to MH	31.7	122.2	3.5 to >4.5								
A-11-224	D-1	5	SP-SM to CL	14.2	121.9	>4.5								
A-11-224	S-2	10	CL	12.5				0:13:87			210	7.2	1180	3824
A-11-224	D-3	15	SC	6.4	129.8									
A-11-224	S-4	20	CL	30.1										
A-11-224	D-5	25	CL	28.1	121.4	3.5								
A-11-224	S-6	30	CL	14.1				2:35:63		44/17/27				
A-11-224	D-7	35	CL	11.5	127.9									
A-11-224	S-8	40	CL	14.4										
A-11-224	D-9	45	SP-SM to SC to CL	16.5	129.5	4.5								
A-11-224	S-10	50	CL	25.8										
A-11-225	D-1	5	MH	26.2	119.2	>4.5								
A-11-225	S-2	10	MH	26.8						69/36/33	380	4.4	930	1004
A-11-225	D-3	15	MH	31.9	117.1	>4.5								
A-11-225	S-4	20	MH	33.0										
A-11-225	D-5	25	MH	26.2	126.7	>4.5								
A-11-225	S-6	30	MH	27.5						63/36/27				
A-11-226	D-1	2.5	CL/CH	23.8	117.7	>4.5								
A-11-226	S-2	5	MH	28.2										
A-11-226	D-3	10	MH	28.9	118.2	>4.5								
A-11-226	S-4	15	MH	27.0				0:8:92		60/31/29				
A-11-226	D-5	20	MH	28.1	118.8	>4.5								
A-11-226	S-6	25	MH	35.2										
A-11-226	D-7	30	MH	26.6	119.2	>4.5								
A-11-226	S-8	35	MH	25.6						58/31/27	240	6.0	1550	1616
A-11-226	D-9	40	MH	26.7	122.0	>4.5								
A-11-226	S-10	45	MH	28.7										
A-11-226	D-11	50	MH	25.2	120.3	>4.5								
A-11-228	S-1	5	CL	22.5							320	6.5	710	2435
A-11-228	D-2	10	ML	12.4	105.8	>4.5								
A-11-228	S-3	15	CL	12.4				0:14:86		40/16/24				
A-11-228	D-4	20	CL-ML	11.5	118.5	>4.5		0:22:78						
A-11-228	S-5	25	CL	10.0										
A-11-228	D-6	30	CL	10.6	126.8	>4.5								

TABLE B1 SUMMARY OF LABORATORY TEST RESULTS FOR RETAINING WALLS (4 OF 6)

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-230	S-4	15	MH	30.3				0:1:99		76/37/39				
A-11-230	D-5	20	MH	32.0	114.5	>4.5								
A-11-230	S-6	25	MH	30.5										
A-11-230	D-7	30	MH	23.7	114.1	>4.5								
A-11-230	S-8	35	MH	29.7						65/35/30				
A-11-230	D-9	40	MH	26.1	119.7	>4.5								
A-11-230	S-10	45	MH	30.3										
A-11-230	D-11	50	CH	19.5										
A-11-232	S-1	5	SP-SM	3.8				26:66:8						
A-11-232	D-2	10	SP-SM	2.4	115.4			34:55:11						
A-11-232	S-3	15	CH	33.0						69/32/37	320	6.6	570.0	1253
A-11-232	D-4	20	CH	34.3	114.4	>4.5								
A-11-232	S-5	25	MH	34.4										
A-11-232	D-6	30	MH	32.2	115.1	>4.5								
A-11-232	S-7	35	MH	28.9						70/36/34				
A-11-232	D-8	40	MH	36.6	112.2	>4.5								
A-11-232	S-9	45	MH	29.3										
A-11-232	D-10	50	MH	27.2	115.0	>4.5								
A-11-233	S-1	2.5	CL	14.6										
A-11-233	D-2	5	CL	21.3	155.1	3.0		0:13:87						
A-11-233	S-3	10	SC	14.2				1:50:49						
A-11-233	D-4	15	GP	1.0										
A-11-233	S-5	20	SP to CL	40.4										
A-11-233	D-6	25	CH	26.3	116.0	>4.5								
A-11-233	S-7	30	MH	26.3						58/30/28				
A-11-233	D-8	35	MH	26.7	121.1	>4.5								
A-11-233	S-9	40	MH	25.9				0:13:87						
A-11-233	D-10	45	MH	31.1	116.4	>4.5								
A-11-233	S-11	50	MH	26.7										
A-11-235	S-1	2.5	SM	6.4										
A-11-235	D-2	5	SP	1.2	100.5									
A-11-235	S-3	10	SP	1.5				0:97:3						
A-11-235	D-4	15	SP	4.0	101.4									
A-11-235	S-5	20	MH	40.6						72/38/34	300	6.9	500	2119
A-11-235	D-6	25	MH	34.3	112.0	>4.5								

TABLE B1 SUMMARY OF LABORATORY TEST RESULTS FOR RETAINING WALLS (5 OF 6)

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-253	S-1	2.5	ML	13.4										
A-11-253	D-2	5	CL-ML	6.7	118.2	4.5								
A-11-253	S-3	10	ML	17.8				0:10:90						
A-11-253	D-4	15	SM	4.1	113.8			0:86:14						
A-11-253	S-5	20	SP	9.5										
A-11-253	D-6	25	SP-SM	25.7	125.0									
A-11-253	S-7	30	MH	37.7										
A-11-253	D-8	35	MH	31.5	116.6	>4.5								
A-11-253	S-9	40	MH	32.5						67/33/34				
A-11-253	D-10	45	MH	32.5	113.9	>4.5								
A-11-253	S-11	50	MH	33.8										
A-11-254	D-1	2.5	CL	15.5	123.7	>4.5								
A-11-254	S-2	5	CL	19.5						45/18/27	310	6.8	600	907
A-11-254	D-3	10	SP	2.8	106.7									
A-11-254	S-4	15	SP-SM	12.7										
A-11-254	D-5	20	SM	12.9	124.4									
A-11-254	S-6	25	CH	33.8							280	6.6	1200	1163
A-11-254	D-7	30	MH	27.8	118.4	>4.5								
A-11-254	S-8	35	MH	28.4				0:4:96		60/37/23				
A-11-254	D-9	40	MH	34.9	111.7	>4.5								
A-11-254	S-10	45	MH	26.7										
A-11-254	D-11	50	MH	26.8	119.6	>4.5								
A-11-260	S-1	2.5	CL	21.7										
A-11-260	D-2	5	CL	25.9	110.7	3.0		3:10:87						
A-11-260	S-3	10	CH	29.7						60/28/32	140	6.2	3260	4642
A-11-260	D-4	15	MH	29.2	104.2	>4.5				55/36/19				
A-11-260	S-5	20	MH	39.4										
A-11-260	D-6	25	MH	26.8										
A-11-260	S-7	30	MH	26.1										
A-11-261	S-1	2.5	CL	31.6										
A-11-261	D-2	5	MH	28.3	116.4	>4.5								
A-11-261	S-3	10	MH	30.0				0:2:98		73/35/38				
A-11-261	D-4	15	MH	26.6	114.3	>4.5								
A-11-261	S-5	20	MH	25.8							250	7.3	960	1874
A-11-261	D-6	25	MH	24.0	110.3	4.5								

TABLE B1 SUMMARY OF LABORATORY TEST RESULTS FOR RETAINING WALLS (6 OF 6)

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

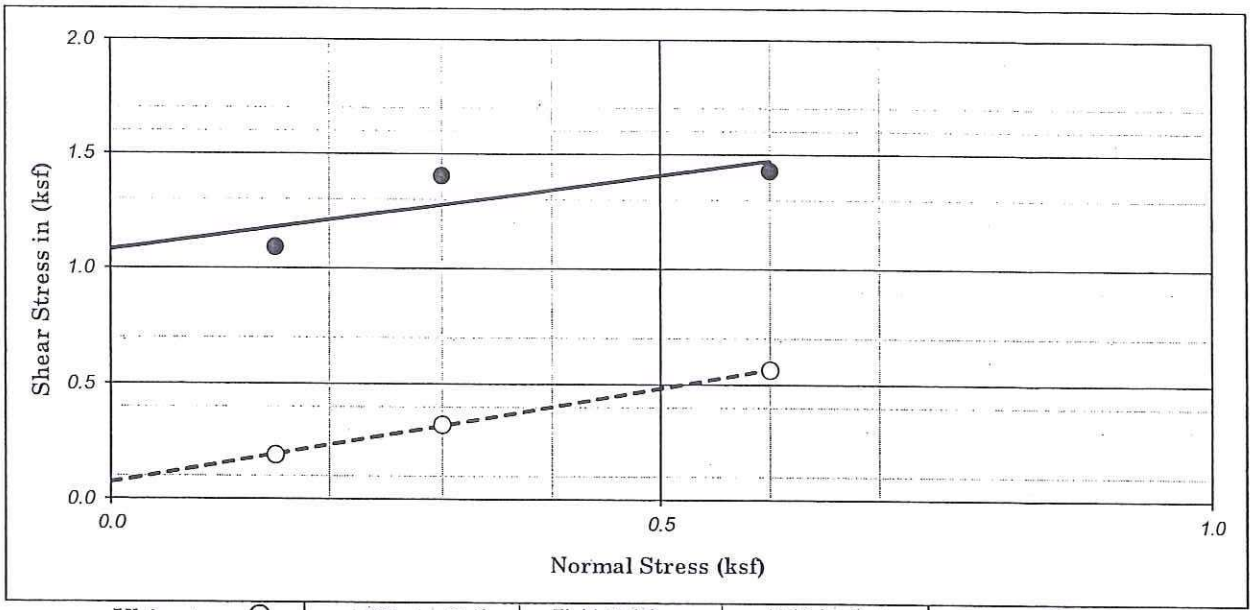
Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-262	S-5	20	ML	12.9										
A-11-262	D-6	25	ML	12.9	116.2	>4.5								
A-11-262	S-7	30	CH	18.4				0:2:98		74/32/42				
A-11-262	D-8	35	SP	1.1	100.2									
A-11-263	D-1	2.5	ML	12.3	116.7	>4.5								
A-11-263	S-2	5	CL	14.9				0:30:70						
A-11-263	D-3	10	CL	12.6	115.4	>4.5				29/19/10				
A-11-263	S-4	15	ML/CL	18.5										
A-11-263	D-5	20	SP	1.0	107.6									
A-11-263	S-6	25	SM	2.6				2:81:17						
A-11-263	D-7	30	CH	31.4	118.7	2.25				64/29/35				
A-11-263	S-8	35	MH	31.4						79/37/42				
A-11-264	S-1	5	MH	29.2						69/36/33				
A-11-264	D-2	10	MH	27.7	118.7	>4.5								
A-11-264	S-3	15	MH	31.2							270	6.1	1090	1271
A-11-264	D-4	20	MH	27.0	119.3	>4.5								
A-11-264	S-5	25	MH	27.0										
A-11-264	D-6	30	MH	25.7	119.0	>4.5								
A-11-264	D-7	40	MH	27.7	118.2	>4.5								
A-11-264	D-8	50	MH	26.4	120.3	>4.5								

EXPANSION INDEX

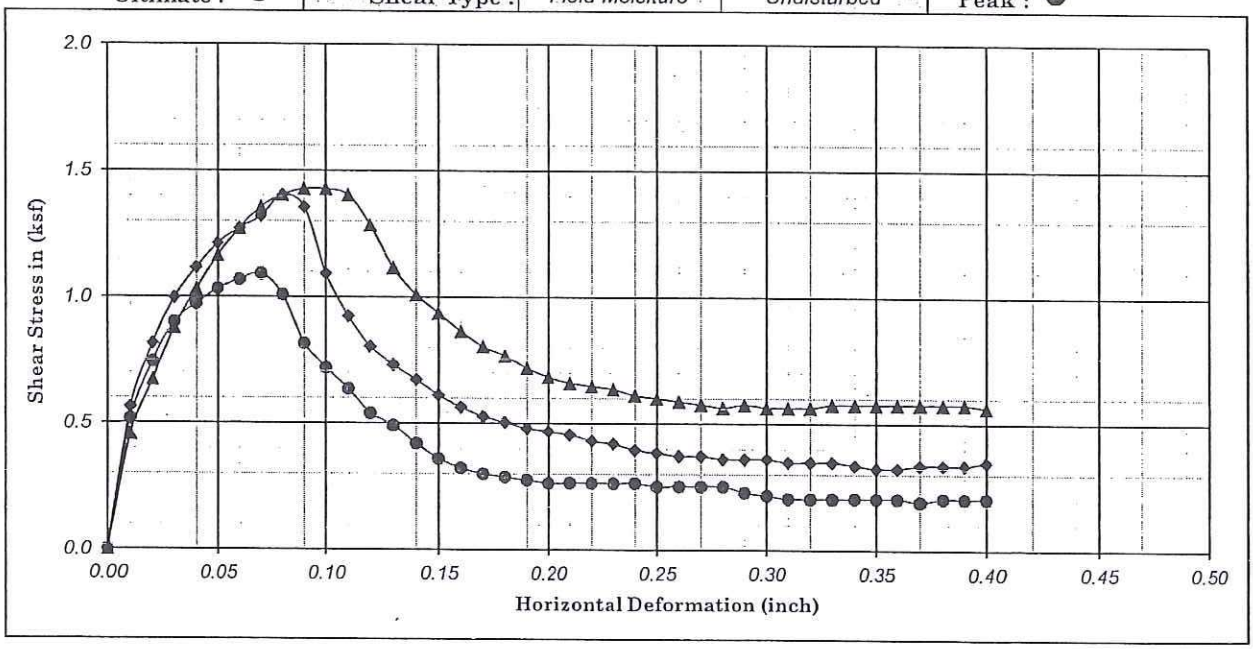
Borehole No.	Depth (feet)	Description	Expansion Index	Expansion Potential
A-11-201	15/20	Elastic Silt (MH)	126	High
A-11-206	0 – 5	Sandy Fat Clay (CH)	157	Very High
A-11-225	20/25	Elastic Silt (MH)	95	High
A-11-232	15/20	Fat Clay (CH)	118	High
A-11-254	45/50	Elastic Silt (MH)	98	High
A-11-258	0 – 5	Lean Clay with Sand (CL)	99	High

SOIL CORROSION TEST RESULTS

Borehole No.	Sample Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
A-11-203	10	CL	160	4.5	1,060	4,391
A-11-212	5	MH	300	7.4	980	1,340
A-11-214	10	CL	290	7.6	260	2,216
A-11-216	20	CL	270	6.8	550	1,084
A-11-221	0 – 5	SM	909	7.8	636	120
A-11-221	20	CL	440	7.5	390	845
A-11-222	5	CL	400	6.8	510	1,011
A-11-224	10	CL	210	7.2	1,180	3,824
A-11-226	35	MH	240	5.9	1,550	1,616
A-11-228	5	CL	320	6.4	710	2,435
A-11-230	5	MH	420	3.5	1,350	1,760
A-11-232	10	CH	320	6.6	570	1,253
A-11-235	20	MH	300	6.9	500	2,119
A-11-254	5	MH	310	6.8	600	907
A-11-254	25	CH	280	6.6	1,200	1,163
A-11-260	10	CH	140	6.1	3,260	4,642
A-11-261	20	MH	250	7.3	960	1,874
A-11-262	10	CL	220	6.5	230	3,143
A-11-264	15	MH	270	6.1	1,090	1,271



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-210		Strength Intercept (C) :	1.08	(ksf)	Peak	0.07	(ksf)	Ultimate	
Sample No. : D-1			51.71	(kPa)		3.45	(kPa)		
Depth (ft/m) : 2.5	0.00	Friction Angle (ϕ) :	33.08	Degree		39.45	Degree		
Description : Pale brown, CLAYEY SAND (SC)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	12.74	117.84	18.55	0.43	0.15	7.18	1.09	52.28	0.19	9.19
◆	12.66	120.43	18.96	0.40	0.30	14.36	1.40	67.22	0.32	15.51
▲	13.45	114.73	18.06	0.47	0.60	28.73	1.43	68.37	0.56	27.00

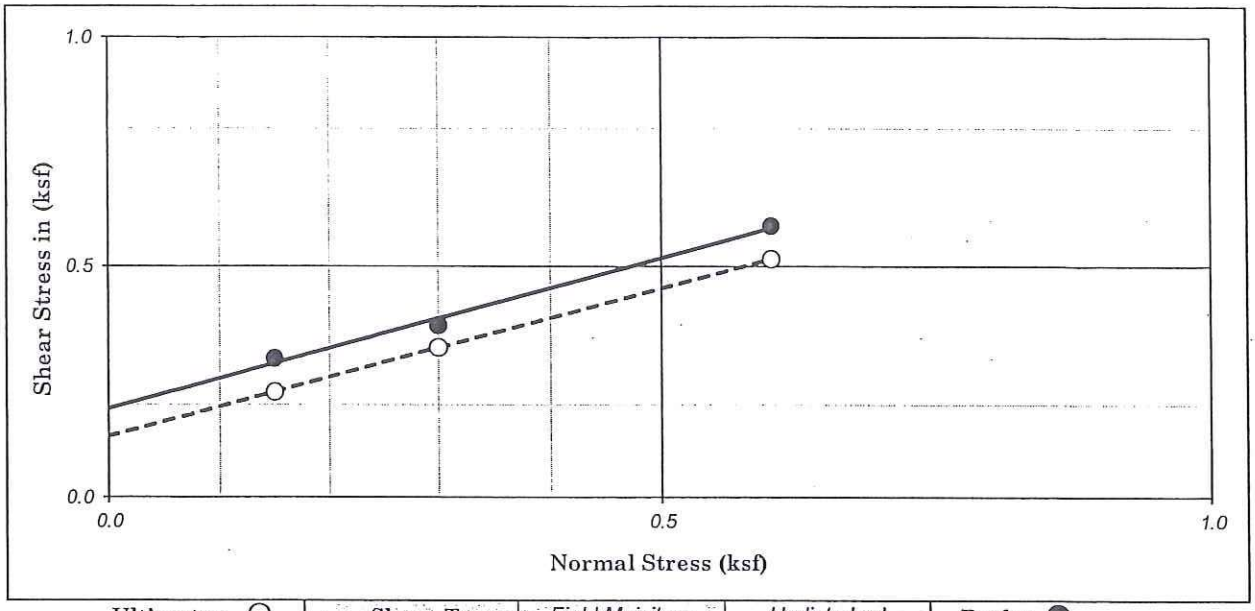
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

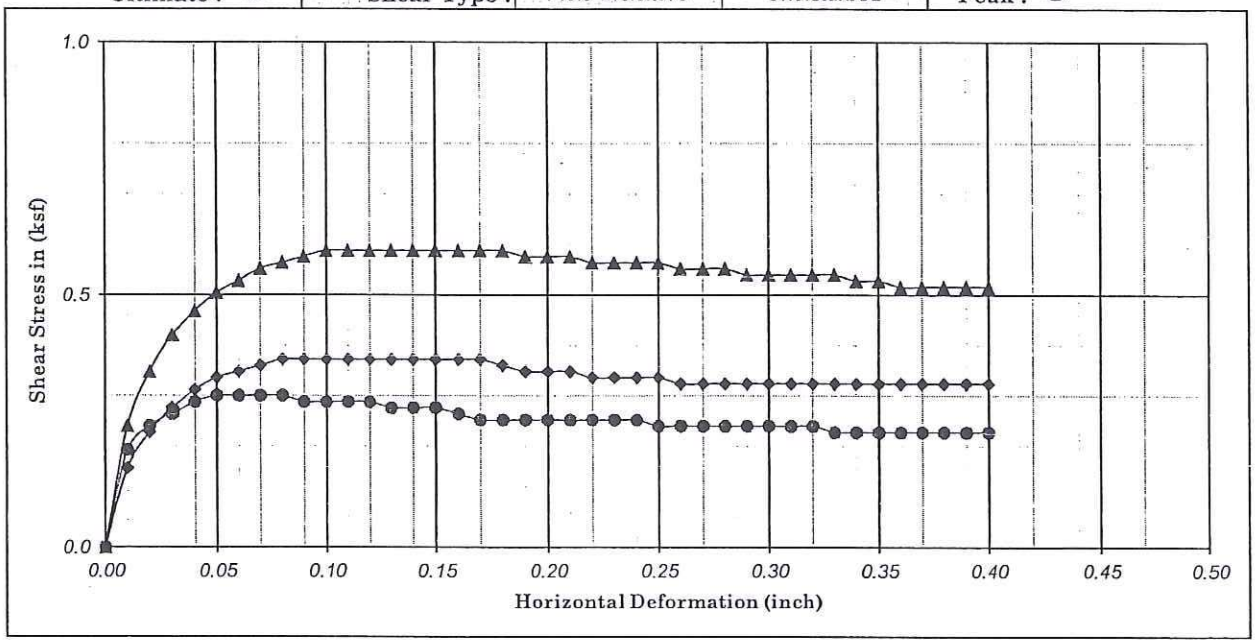
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-212		Strength Intercept (C) :	0.19	(ksf)	Peak	0.13	(ksf)	Ultimate
Sample No. : D-1			9.19	(kPa)		6.32	(kPa)	
Depth (ft/m) : 2.5	0.00	Friction Angle (ϕ) :	33.08	Degree		32.62	Degree	
Description : Olive-brown, SILTY SAND (SM)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	20.75	100.82	15.87	0.67	0.15	7.18	0.30	14.36	0.23	10.92
◆	20.72	98.79	15.55	0.71	0.30	14.36	0.37	17.81	0.32	15.51
▲	20.95	98.79	15.55	0.71	0.60	28.73	0.59	28.15	0.52	24.71

Earth Mechanics, Inc.
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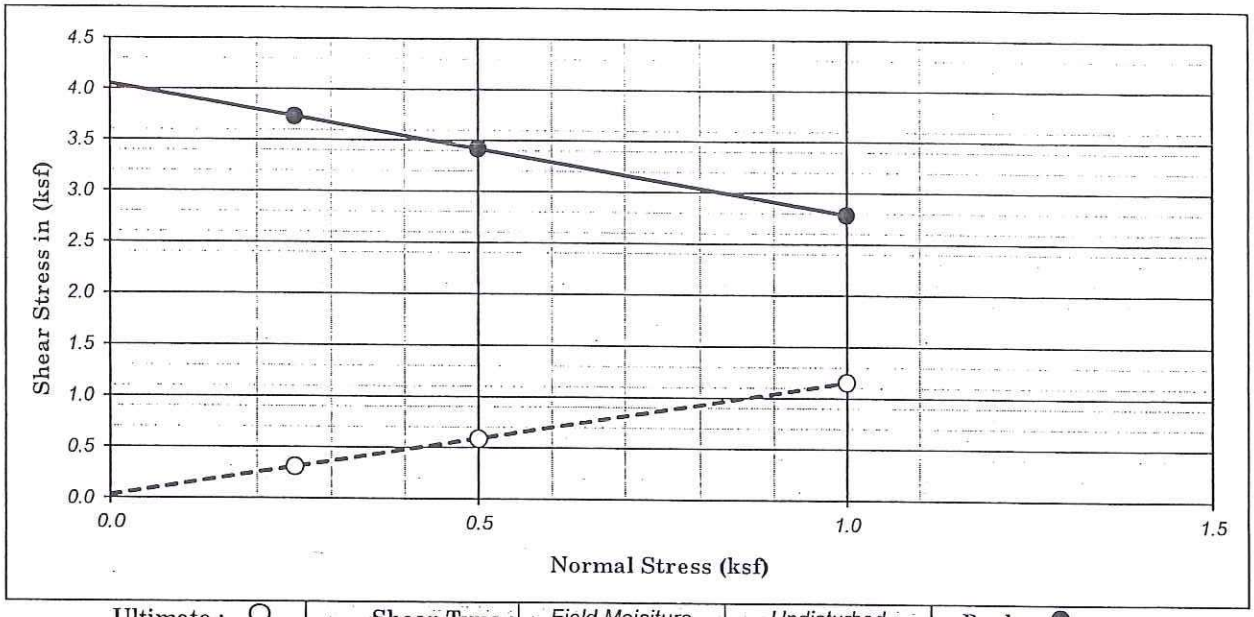
AECOM/I-5 HOV Widening Segment 2

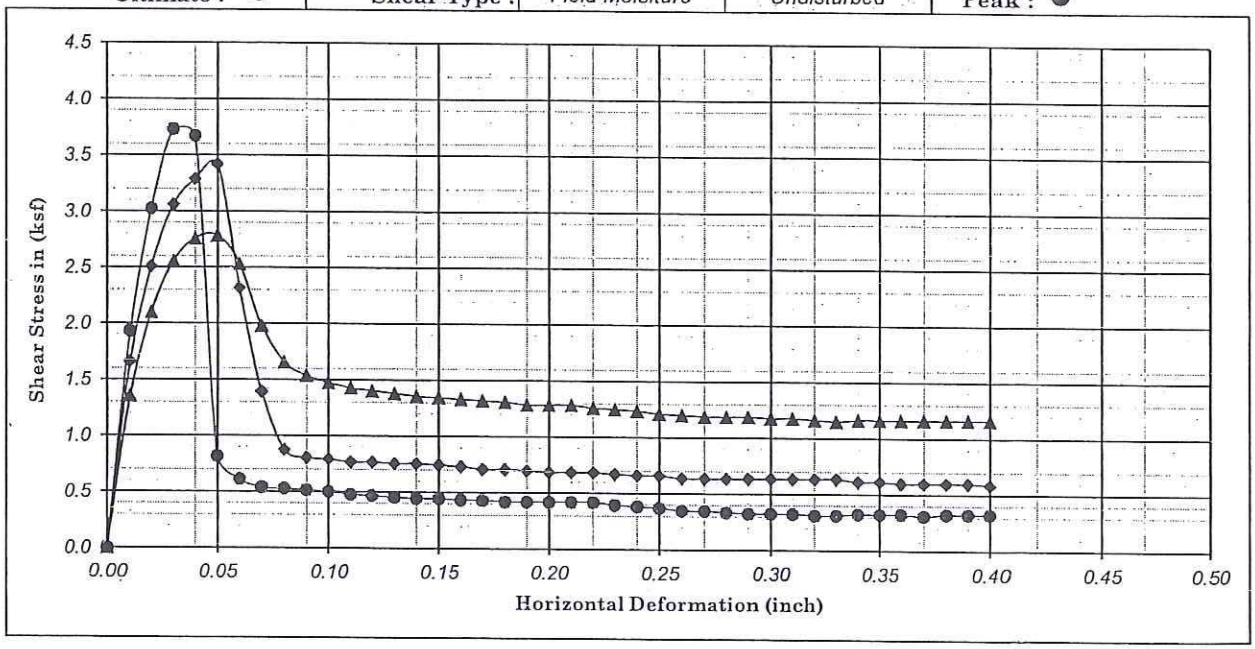
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-214		Strength Intercept (C) :	4.05	(ksf)	Peak	0.03	(ksf)	Ultimate
Sample No. : D-2			193.91	(kPa)		1.44	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	-51.68	Degree		48.27	Degree	
Description : Dark brown, CLAYEY SAND (SC)						Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	8.16	117.71	18.53	0.43	0.25	11.97	3.73	178.69	0.31	14.94
◆	7.98	114.14	17.97	0.48	0.50	23.94	3.42	163.75	0.59	28.15
▲	6.90	105.33	16.58	0.60	1.00	47.88	2.78	133.30	1.15	55.16

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AECOM/I-5 HOV Widening Segment 2

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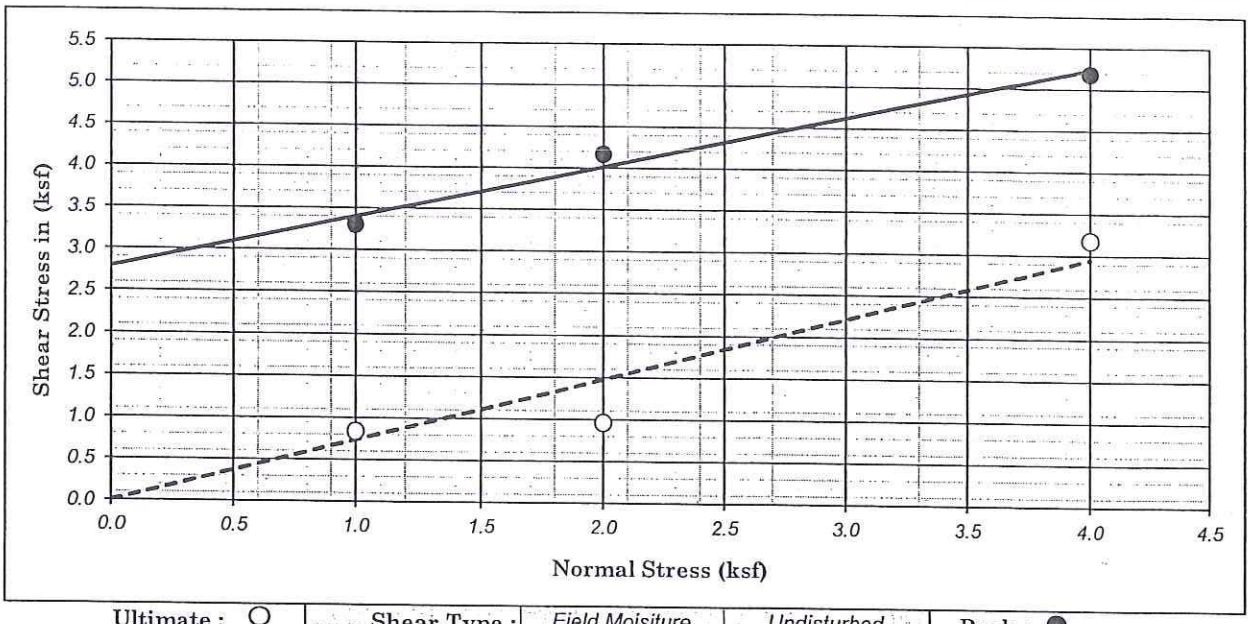
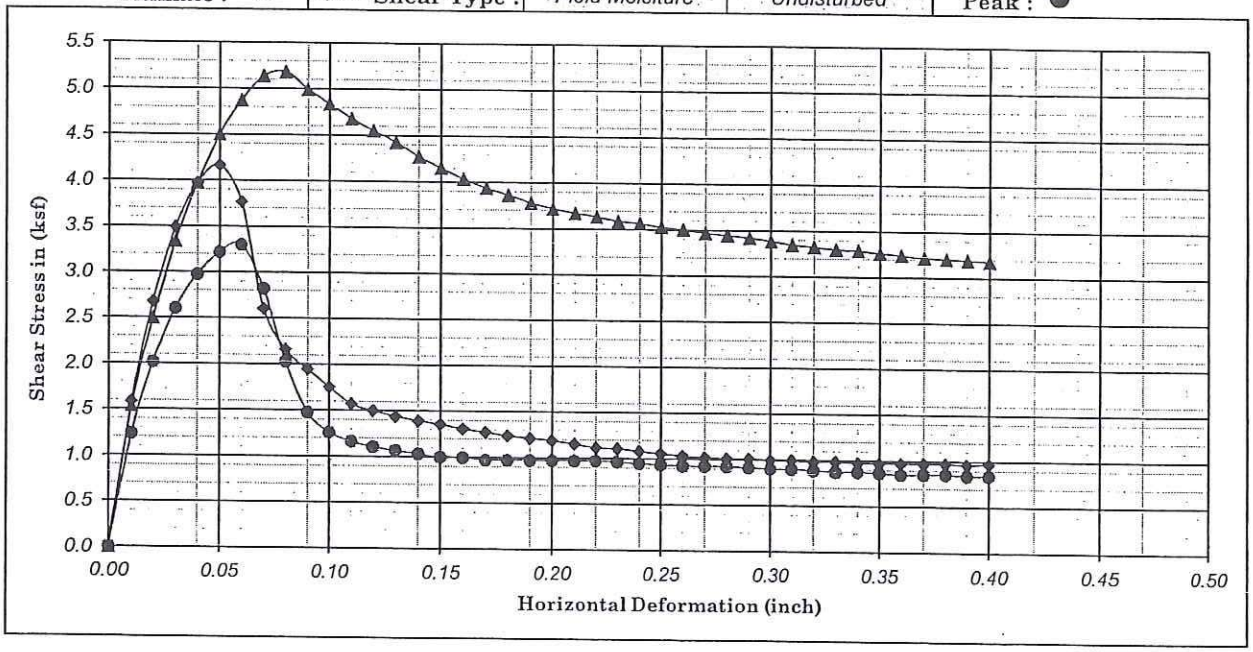
DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-221	Strength Intercept (C) :	2.79	(ksf)	Peak	0.00	(ksf)	Ultimate
Sample No. : D-3		133.59	(kPa)		0.00	(kPa)	
Depth (ft/m) : 15.0 | 0.00	Friction Angle (ϕ) :	31.43	Degree		36.40	Degree	

Description : Dark brown to olive-brown, Lean CLAY with SAND (CL) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	15.08	116.33	18.31	0.45	1.00	47.88	3.30	158.00	0.84	40.22
◆	17.09	110.07	17.32	0.53	2.00	95.76	4.16	199.37	0.96	45.96
▲	13.85	113.84	17.92	0.48	4.00	191.52	5.18	248.21	3.18	152.26

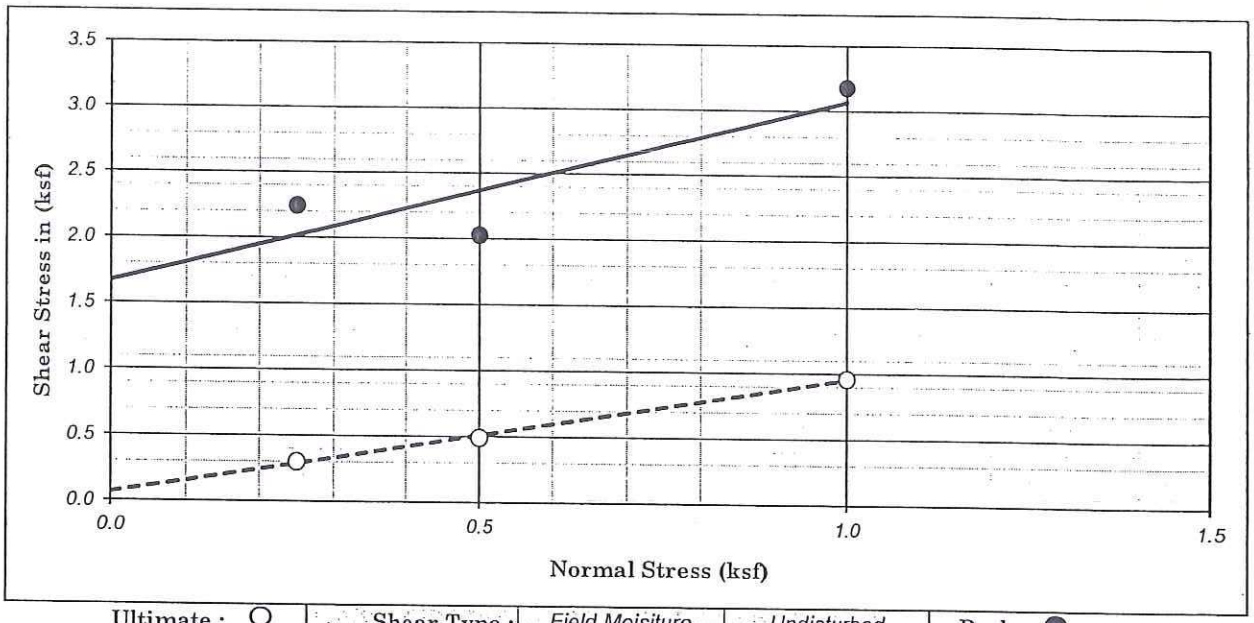
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

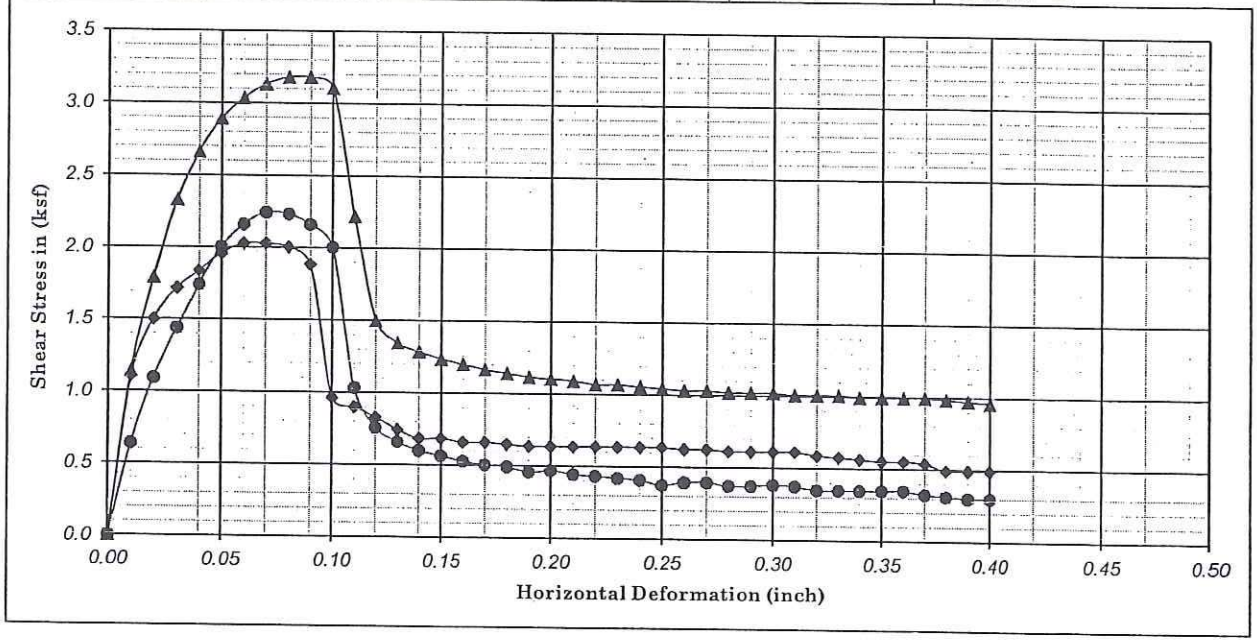
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○ | Shear Type : *Field Moisiture* | *Undisturbed* | Peak : ●



Boring No. : *A-11-224*	Strength Intercept (C) :	*1.67*	(ksf)	Peak	*0.07*	(ksf)	Ultimate
Sample No. : *D-1*		*79.86*	(kPa)		*3.16*	(kPa)	
Depth (ft/m) : *5.0* / *0.00*	Friction Angle (ϕ) :	*54.44*	Degree		*41.61*	Degree	

Description : *Dark brown, Lean CLAY with SAND (CL)* — Shear Rate (inch/minute) : *0.02*

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	*17.09*	*106.68*	*16.79*	*0.58*	*0.25*	*11.97*	*2.24*	*107.44*	*0.30*	*14.36*
◆	*23.87*	*96.36*	*15.17*	*0.75*	*0.50*	*23.94*	*2.03*	*97.10*	*0.49*	*23.56*
▲	*22.41*	*100.94*	*15.89*	*0.67*	*1.00*	*47.88*	*3.18*	*152.26*	*0.96*	*45.96*

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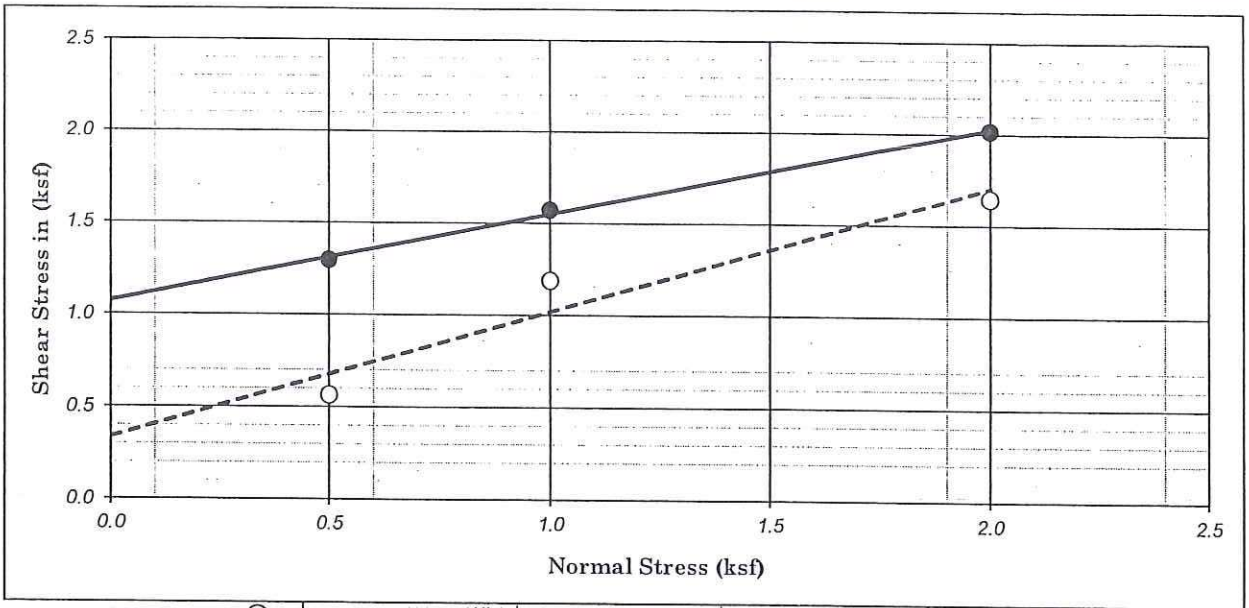
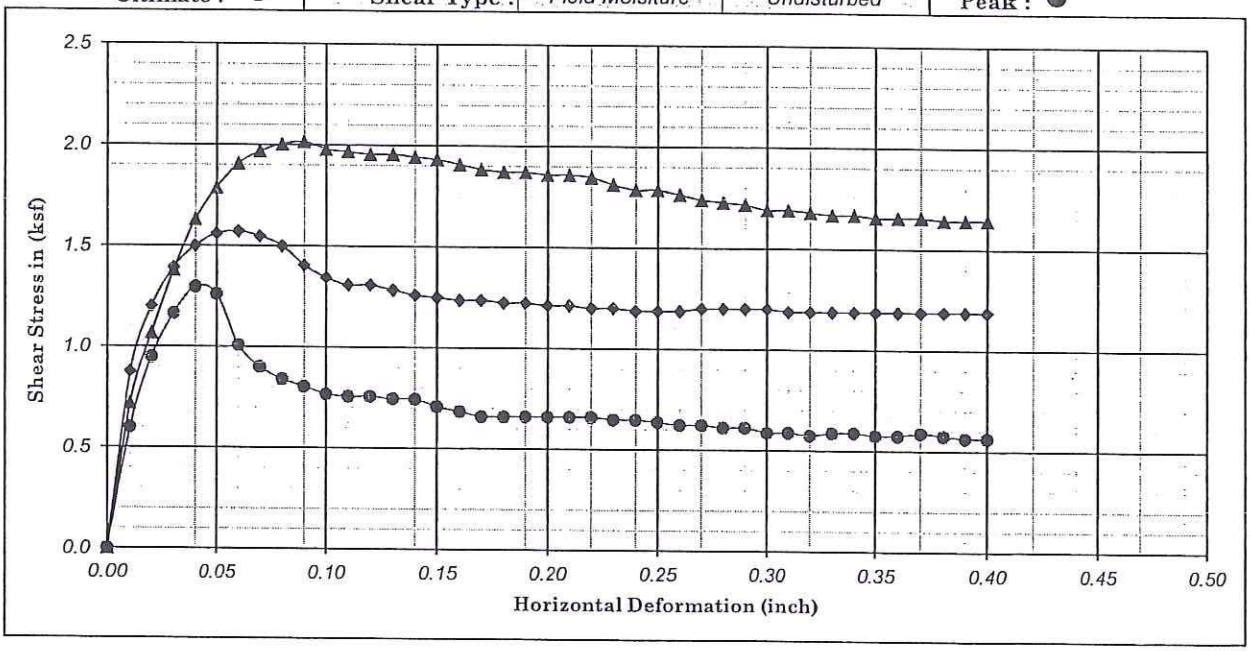


Ultimate : ○ | Shear Type : *Field Moisiture* | *Undisturbed* | Peak : ●



Boring No. : *A-11-228*	Strength Intercept (C) :	*1.07*	(ksf)	Peak	*0.34*	(ksf)	Ultimate
Sample No. : *D-2*		*51.42*	(kPa)		*16.09*	(kPa)	
Depth (ft/m) : *10.0* *0.00*	Friction Angle (ϕ) :	*25.40*	Degree		*34.31*	Degree	

Description : *Olive-brown, SILT with SAND (ML)* — Shear Rate (inch/minute) : *0.02*

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	*11.13*	*100.27*	*15.78*	*0.68*	*0.50*	*23.94*	*1.30*	*62.05*	*0.56*	*27.00*
◆	*11.39*	*98.84*	*15.56*	*0.71*	*1.00*	*47.88*	*1.57*	*75.27*	*1.19*	*56.88*
▲	*12.68*	*90.38*	*14.23*	*0.86*	*2.00*	*95.76*	*2.02*	*96.53*	*1.64*	*78.71*

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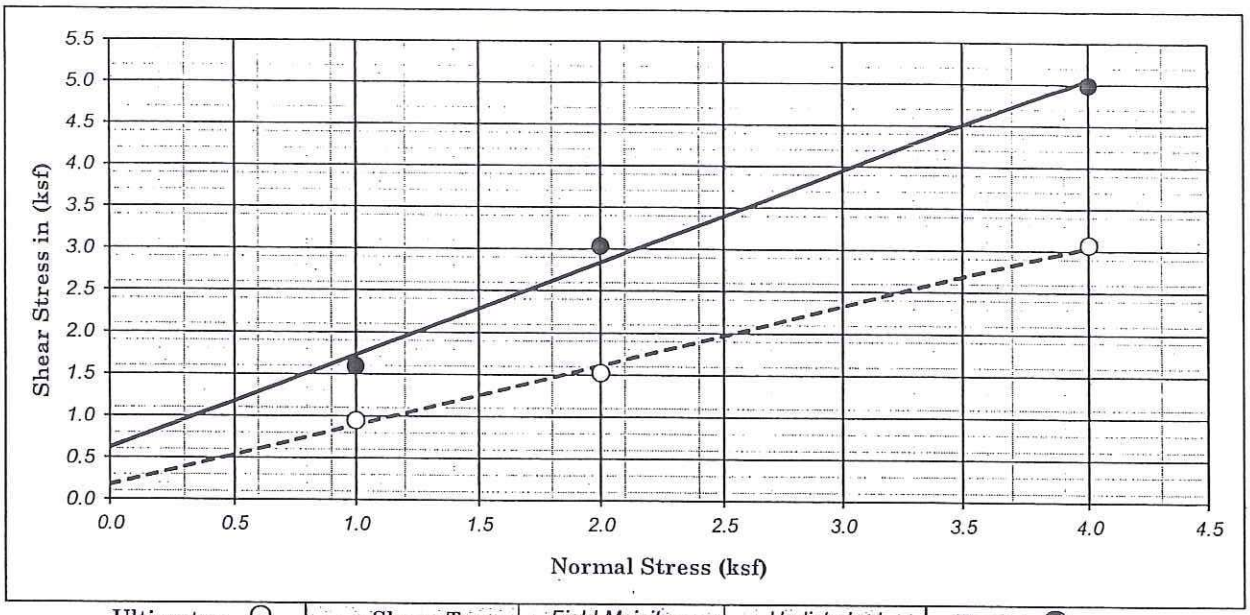
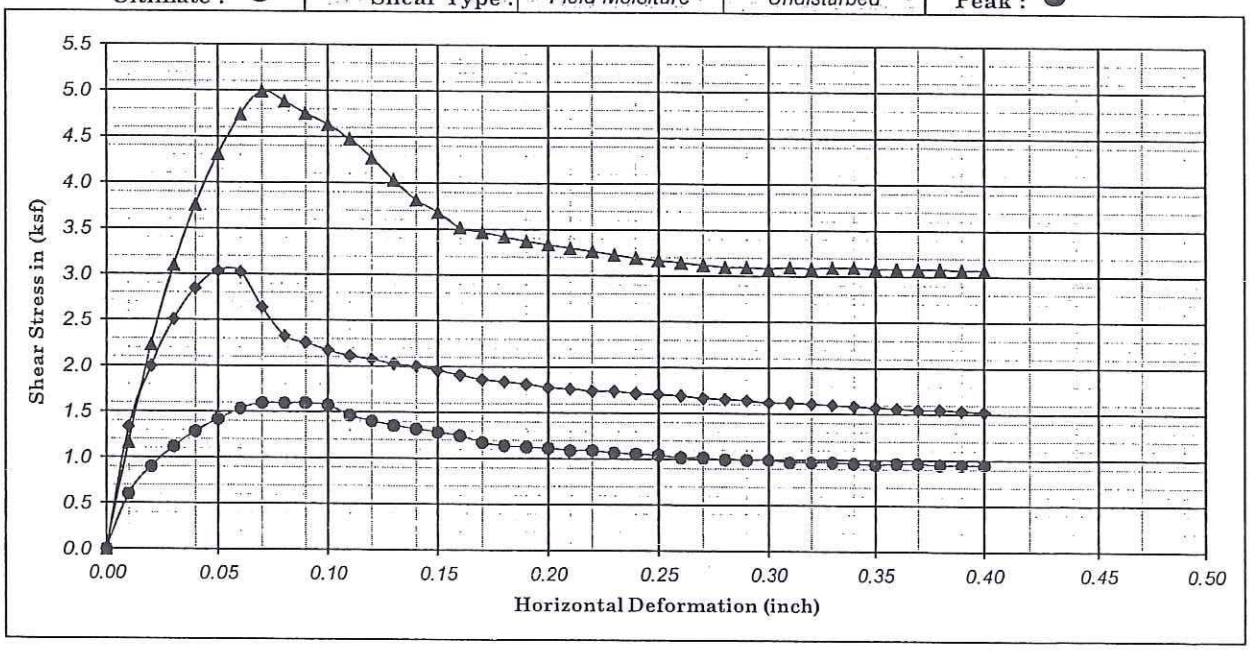


Ultimate : ○ | Shear Type : *Field Moisiture* | *Undisturbed* | Peak : ●



Boring No. : *A-11-228*	Strength Intercept (C) :	*0.62*	(ksf)	Peak	*0.17*	(ksf)	Ultimate
Sample No. : *D-4*		*29.59*	(kPa)		*8.33*	(kPa)	
Depth (ft/m) : *20.0* *0.00*	Friction Angle (ϕ) :	*47.98*	Degree		*35.66*	Degree	
Description : *Olive-brown, SILTY CLAY (CL-ML)*					Shear Rate (inch/minute) :		*0.02*

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	*11.81*	*92.34*	*14.54*	*0.83*	*1.00*	*47.88*	*1.60*	*76.42*	*0.95*	*45.39*
◆	*12.69*	*99.60*	*15.68*	*0.69*	*2.00*	*95.76*	*3.04*	*145.36*	*1.52*	*72.97*
▲	*12.93*	*105.36*	*16.58*	*0.60*	*4.00*	*191.52*	*4.99*	*239.02*	*3.07*	*147.09*

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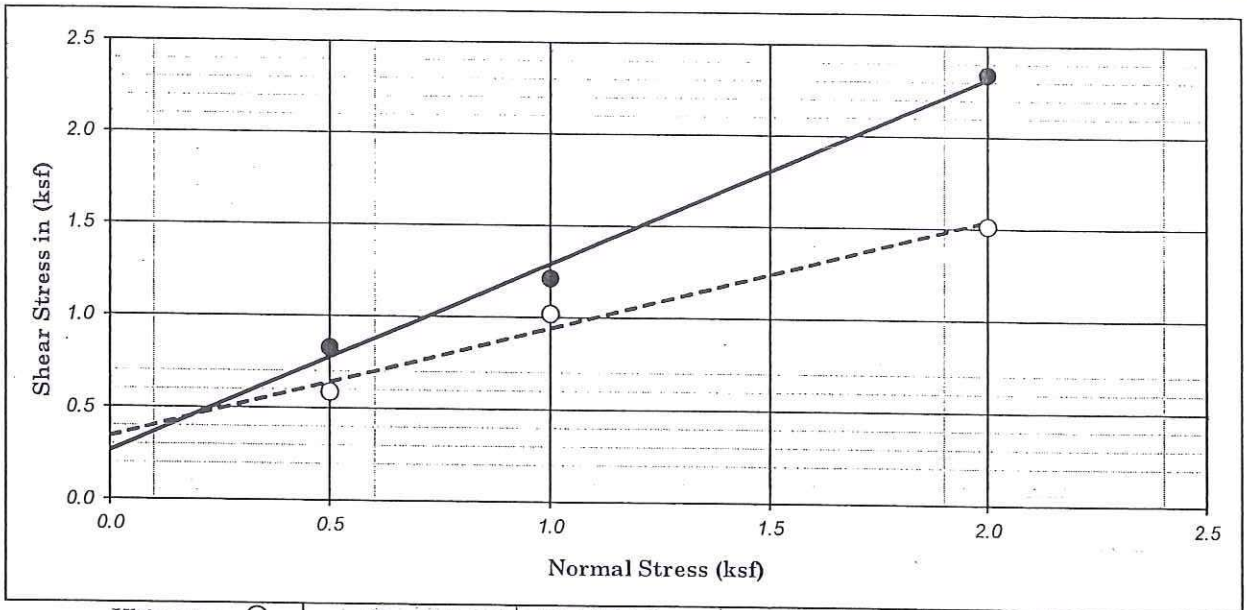
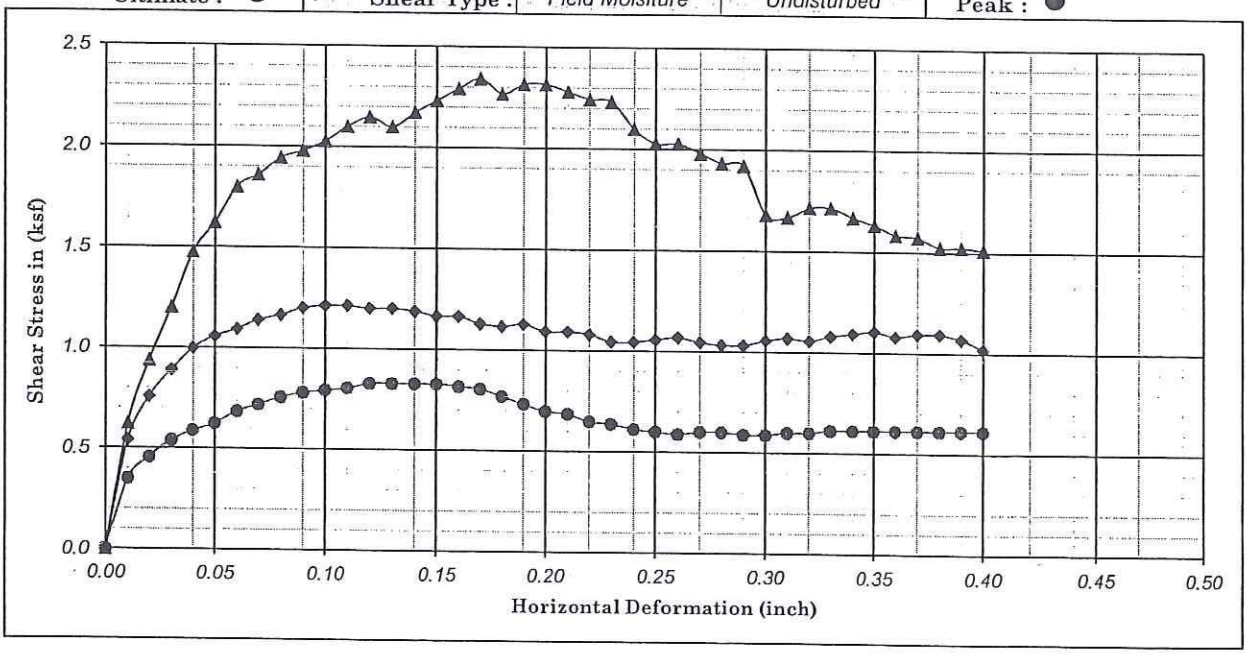
Figure No. :



Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-232	Strength Intercept (C) :	0.26	(ksf)	Peak	0.34	(ksf)	Ultimate
Sample No. : D-2		12.64	(kPa)		16.37	(kPa)	
Depth (ft/m) : 10.0 / 0.00	Friction Angle (ϕ) :	45.71	Degree		30.89	Degree	

Description : Olive-brown, Poorly graded SAND with SILT (SP-SM) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m³)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	3.84	106.86	16.82	0.58	0.50	23.94	0.83	39.64	0.59	28.15
◆	2.33	118.75	18.69	0.42	1.00	47.88	1.21	58.03	1.02	48.84
▲	1.27	119.78	18.85	0.41	2.00	95.76	2.34	112.04	1.51	72.39

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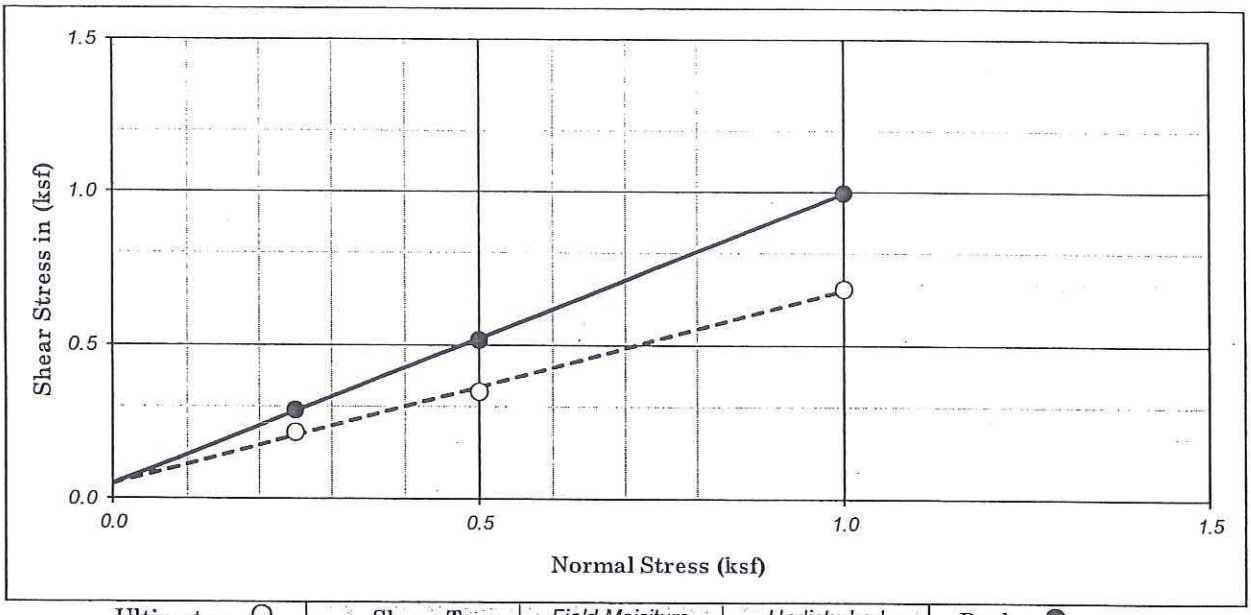
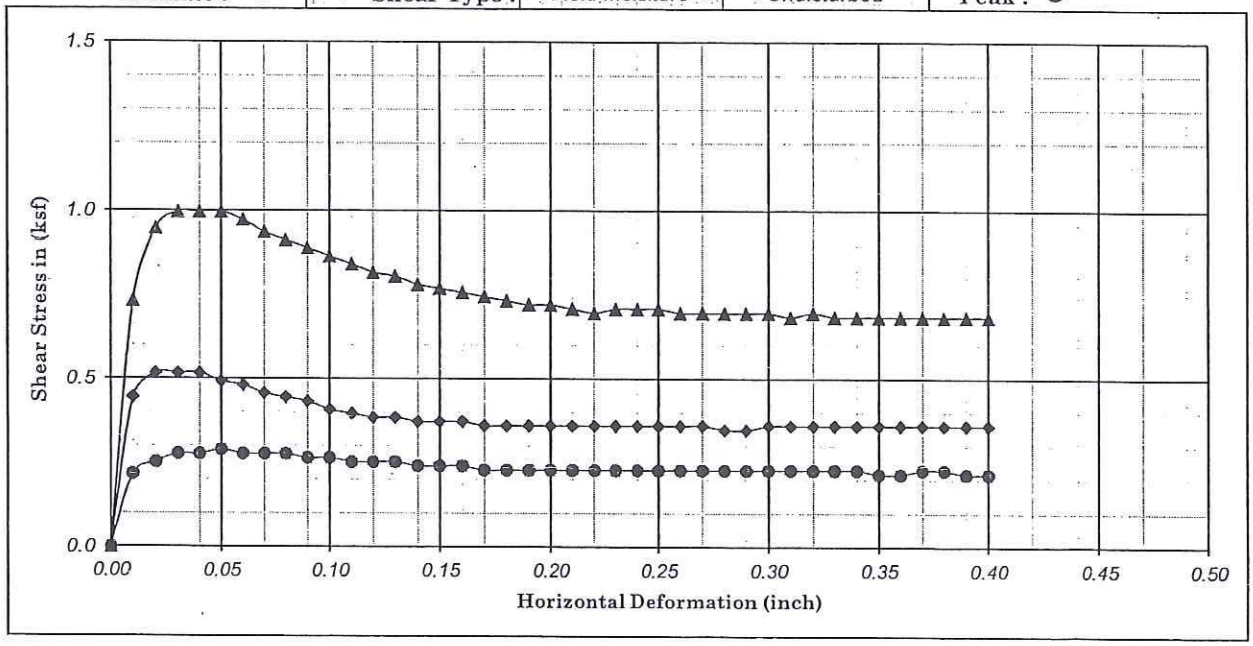
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-235		Strength Intercept (C) :	0.05	(ksf)	Peak	0.05	(ksf)	Ultimate
Sample No. : D-2			2.30	(kPa)		2.30	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	43.42	Degree		32.25	Degree	
Description : Olive-brown, Poorly graded SAND (SP)						Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.94	98.37	15.48	0.71	0.25	11.97	0.29	13.79	0.22	10.34
◆	1.51	98.51	15.50	0.71	0.50	23.94	0.52	24.71	0.35	16.66
▲	2.57	99.69	15.69	0.69	1.00	47.88	1.00	47.69	0.68	32.75

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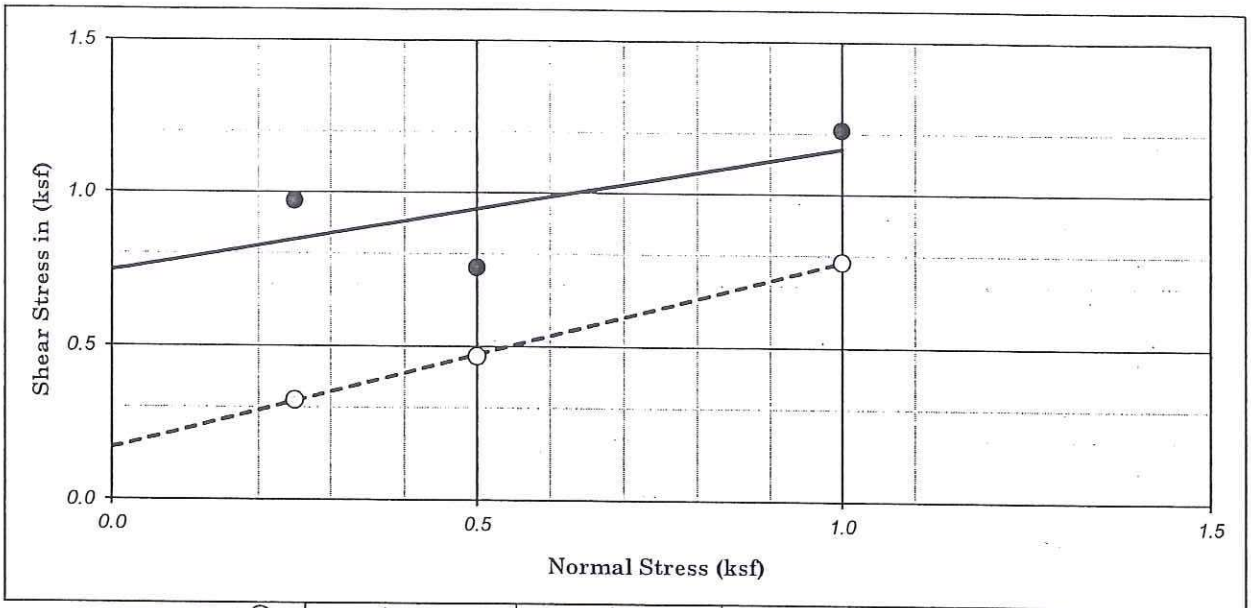
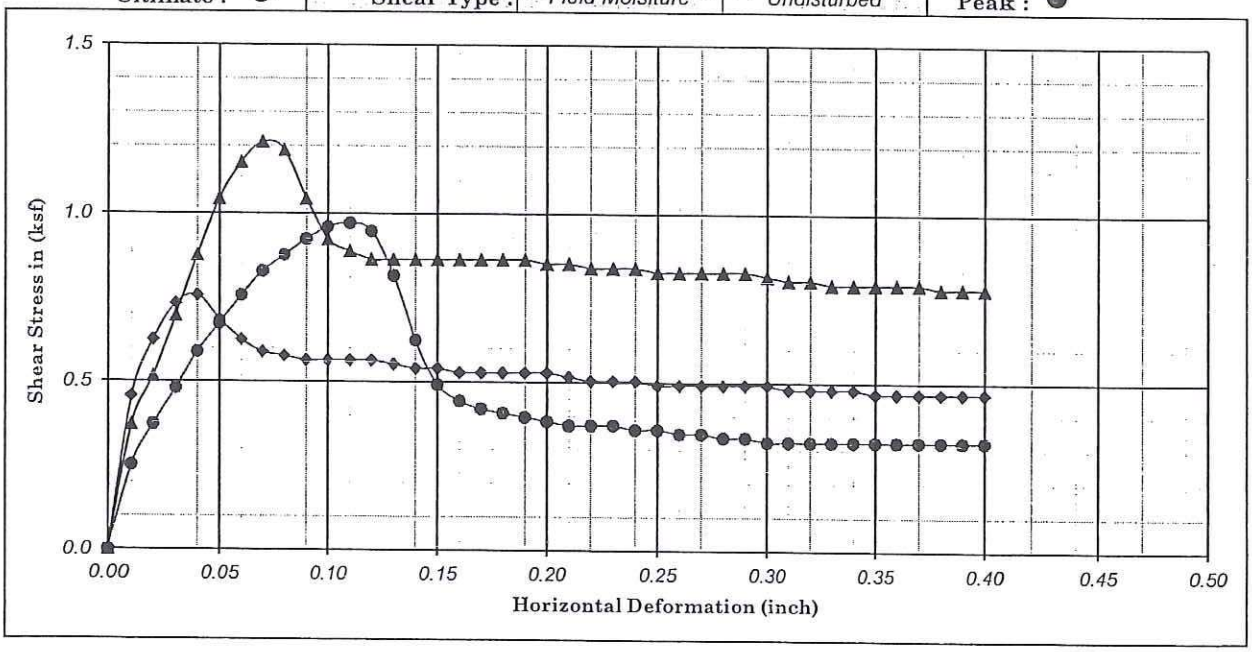


Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-253		Strength Intercept (C) :	0.74	(ksf)	Peak	0.17	(ksf)	Ultimate
Sample No. : D-2			35.62	(kPa)		8.04	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	22.03	Degree		31.40	Degree	

Description : Olive-brown, SILTY CLAY with SAND (CL-ML) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	14.04	114.44	18.01	0.47	0.25	11.97	0.97	46.54	0.32	15.51
◆	10.31	109.42	17.22	0.54	0.50	23.94	0.76	36.20	0.47	22.41
▲	12.09	104.83	16.50	0.61	1.00	47.88	1.21	58.03	0.78	37.35

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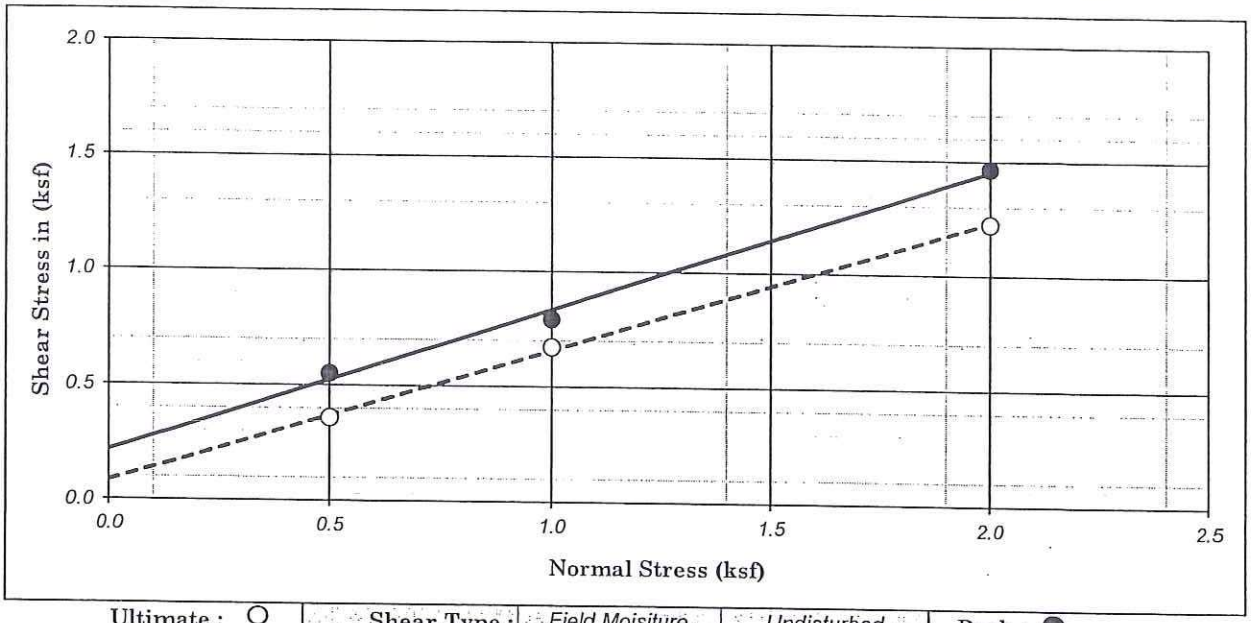
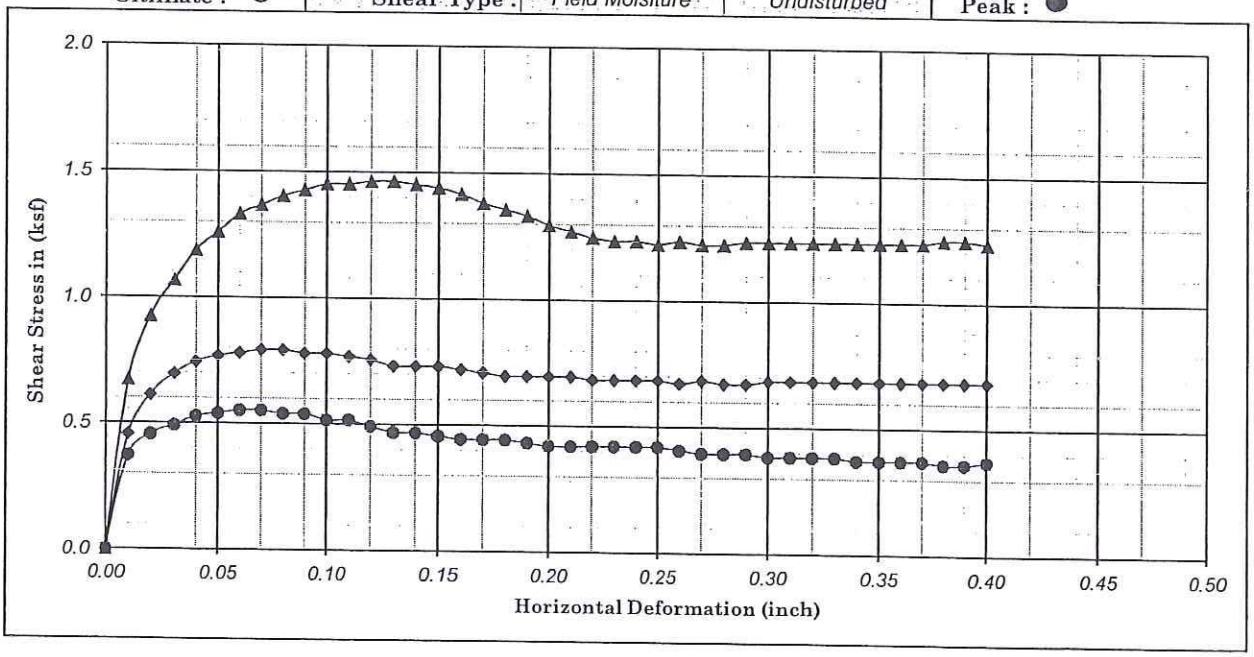
Figure No. :



Ultimate : ○ | Shear Type : *Field Moisiture* | *Undisturbed* | Peak : ●



Boring No. : *A-11-254*	Strength Intercept (C) :	*0.22*	(ksf)	Peak	*0.08*	(ksf)	Ultimate
Sample No. : *D-3*		*10.34*	(kPa)		*4.02*	(kPa)	
Depth (ft/m) : *10.0* | *0.00*	Friction Angle (ϕ) :	*31.68*	Degree		*29.79*	Degree	
Description : *Olive-brown, Poorly graded SAND (SP)*					Shear Rate (inch/minute) :		*0.02*

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	*2.70*	*105.83*	*16.66*	*0.59*	*0.50*	*23.94*	*0.55*	*26.43*	*0.36*	*17.24*
◆	*2.86*	*105.23*	*16.56*	*0.60*	*1.00*	*47.88*	*0.79*	*37.92*	*0.67*	*32.18*
▲	*2.83*	*100.34*	*15.79*	*0.68*	*2.00*	*95.76*	*1.46*	*70.10*	*1.22*	*58.61*

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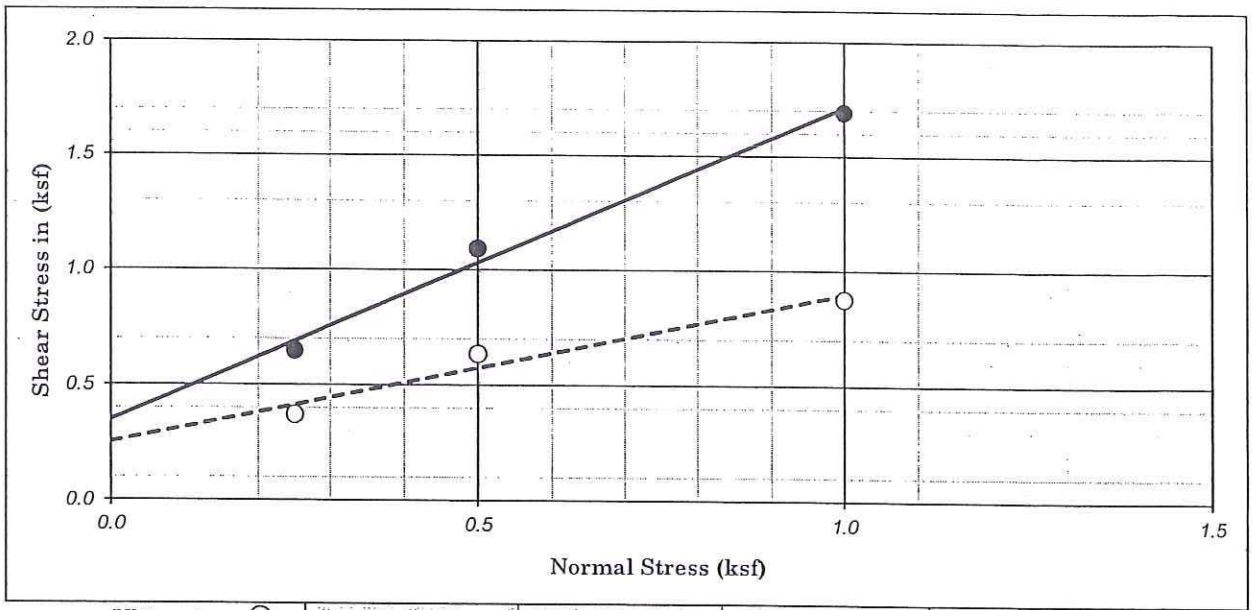
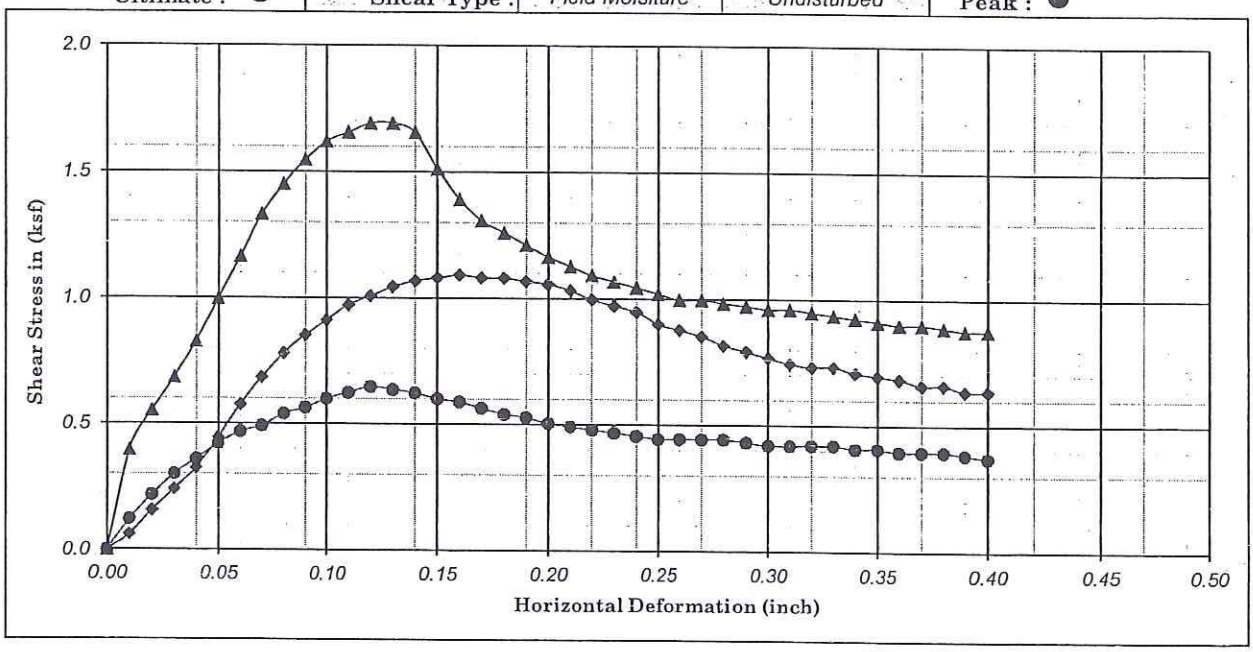


Ultimate : ○ | Shear Type : *Field Moisiture* | *Undisturbed* | Peak : ●



Boring No. : *A-11-260*	Strength Intercept (C) :	*0.35*	(ksf)	Peak	*0.25*	(ksf)	Ultimate
Sample No. : *D-2*		*16.66*	(kPa)		*12.07*	(kPa)	
Depth (ft/m) : *5.0* *0.00*	Friction Angle (ϕ) :	*53.76*	Degree		*32.80*	Degree	

Description : *Dark brown, Lean CLAY with SAND (CL)* — Shear Rate (inch/minute) : *0.02*

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	*25.21*	*87.89*	*13.83*	*0.92*	*0.25*	*11.97*	*0.65*	*31.03*	*0.37*	*17.81*
◆	*26.43*	*87.50*	*13.77*	*0.93*	*0.50*	*23.94*	*1.09*	*52.28*	*0.64*	*30.45*
▲	*26.28*	*85.27*	*13.42*	*0.98*	*1.00*	*47.68*	*1.69*	*81.01*	*0.88*	*41.94*

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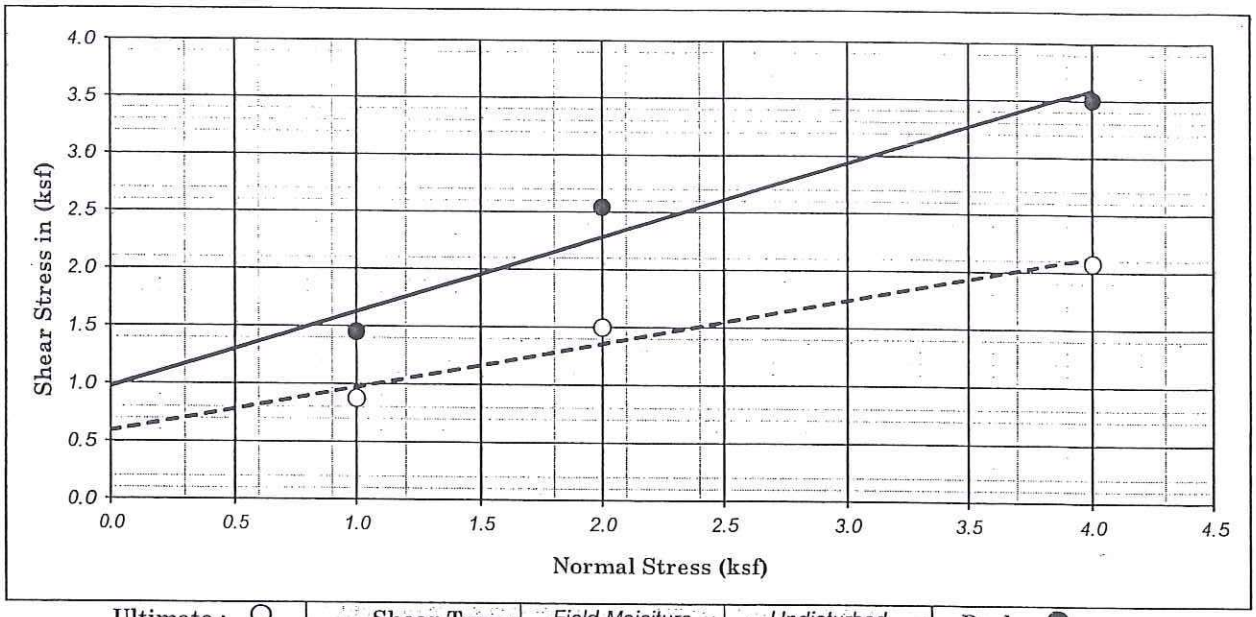
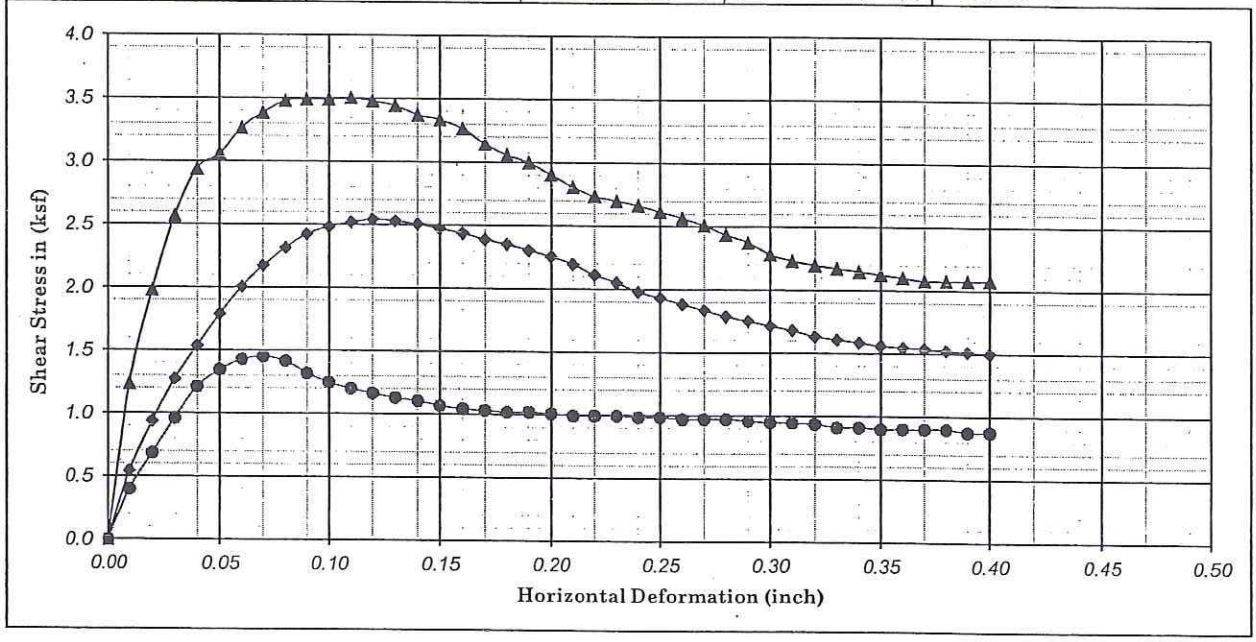
Figure No. :



Ultimate : ○ | Shear Type : *Field Moisiture* | *Undisturbed* | Peak : ●



Boring No. : *A-11-260*	Strength Intercept (C) :	*0.97*	(ksf)	Peak	*0.59*	(ksf)	Ultimate
Sample No. : *D-4*		*46.54*	(kPa)		*28.15*	(kPa)	
Depth (ft/m) : *15.0* *0.00*	Friction Angle (ϕ) :	*33.22*	Degree		*21.01*	Degree	
Description : *Dark brown, Elastic SILT (MH)*					Shear Rate (inch/minute) :		*0.02*

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	*29.59*	*84.97*	*13.37*	*0.98*	*1.00*	*47.88*	*1.45*	*69.52*	*0.88*	*41.94*
◆	*28.31*	*83.62*	*13.16*	*1.02*	*2.00*	*95.76*	*2.54*	*121.81*	*1.50*	*71.82*
▲	*28.72*	*84.00*	*13.22*	*1.01*	*4.00*	*191.52*	*3.50*	*167.77*	*2.08*	*99.40*

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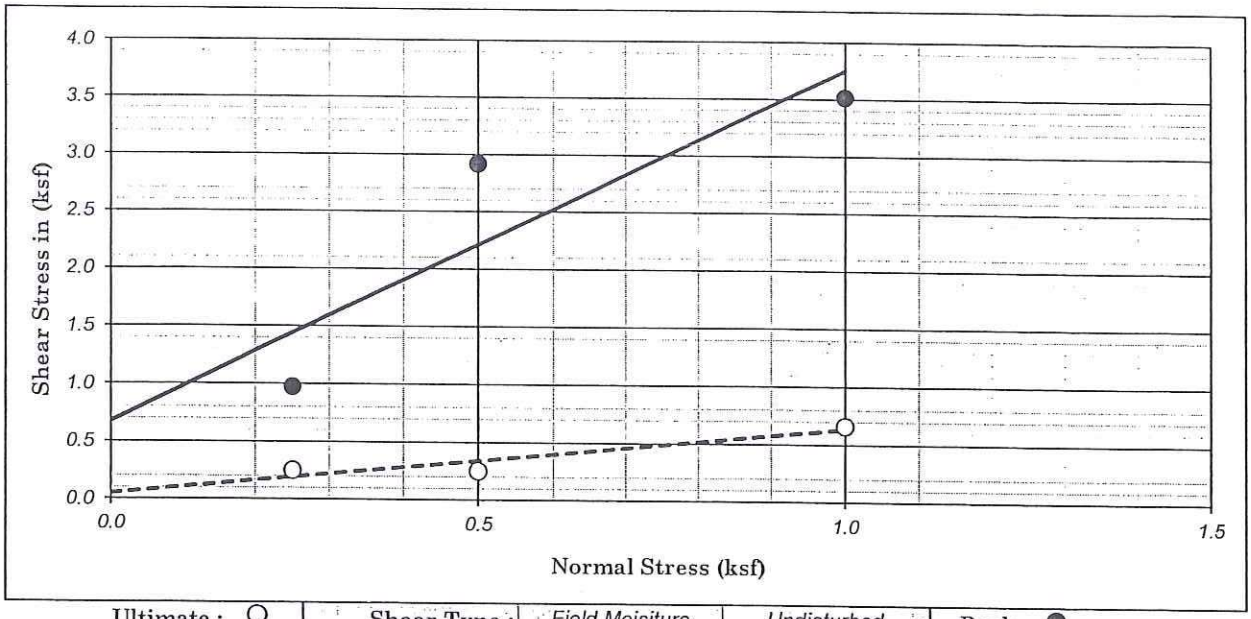
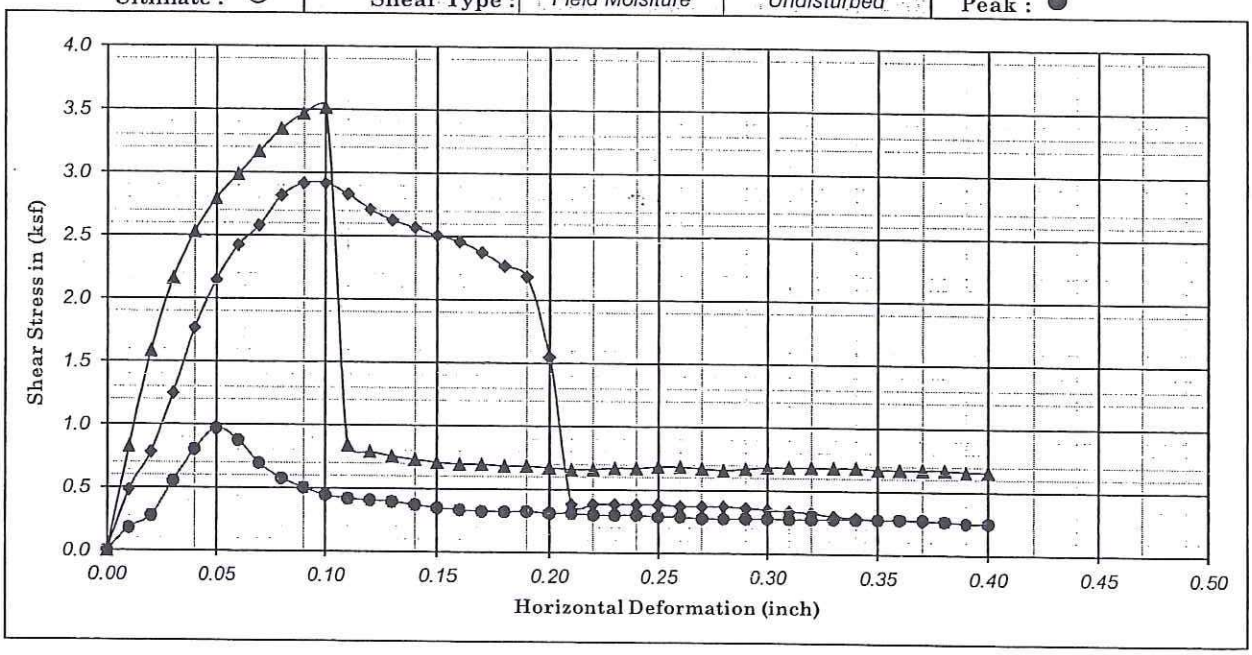


Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-261	Strength Intercept (C) :	0.67	(ksf)	Peak	0.05	(ksf)	Ultimate
Sample No. : D-2		32.18	(kPa)		2.30	(kPa)	
Depth (ft/m) : 5.0 / 0.00	Friction Angle (ϕ) :	72.01	Degree		30.24	Degree	

Description : Very dark grayish brown, Elastic SILT (MH) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	28.66	88.86	13.99	0.90	0.25	11.97	0.97	46.54	0.25	12.07
◆	28.51	91.26	14.36	0.85	0.50	23.94	2.92	139.62	0.25	12.07
▲	28.38	92.11	14.50	0.83	1.00	47.88	3.52	168.35	0.66	31.60

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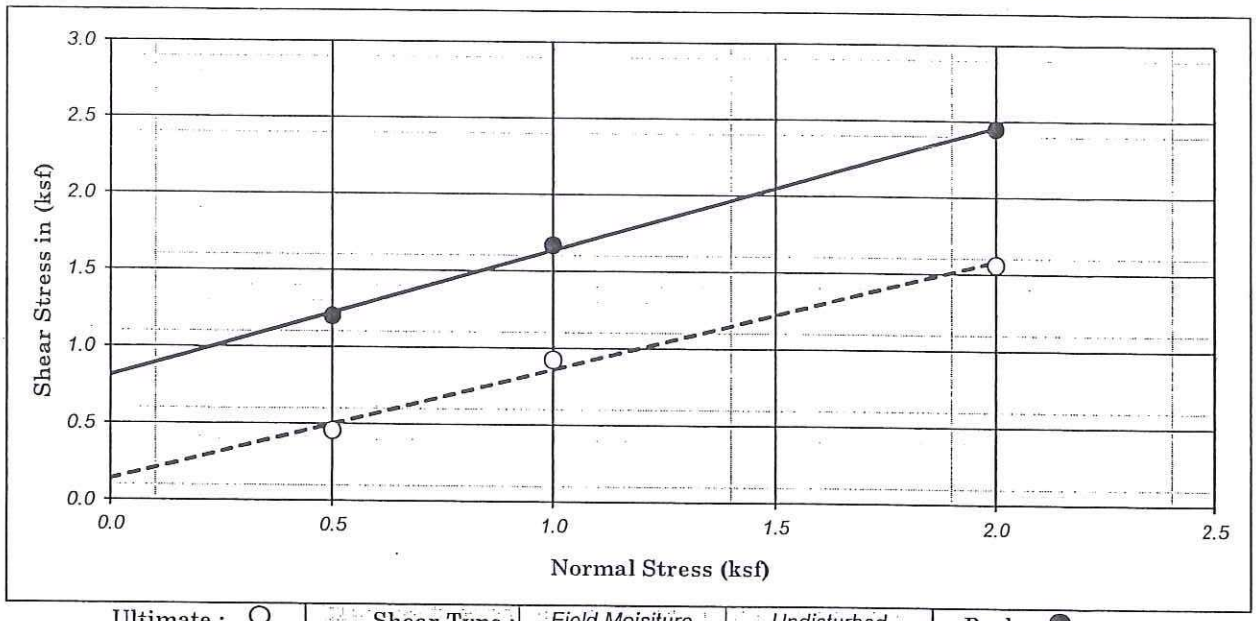
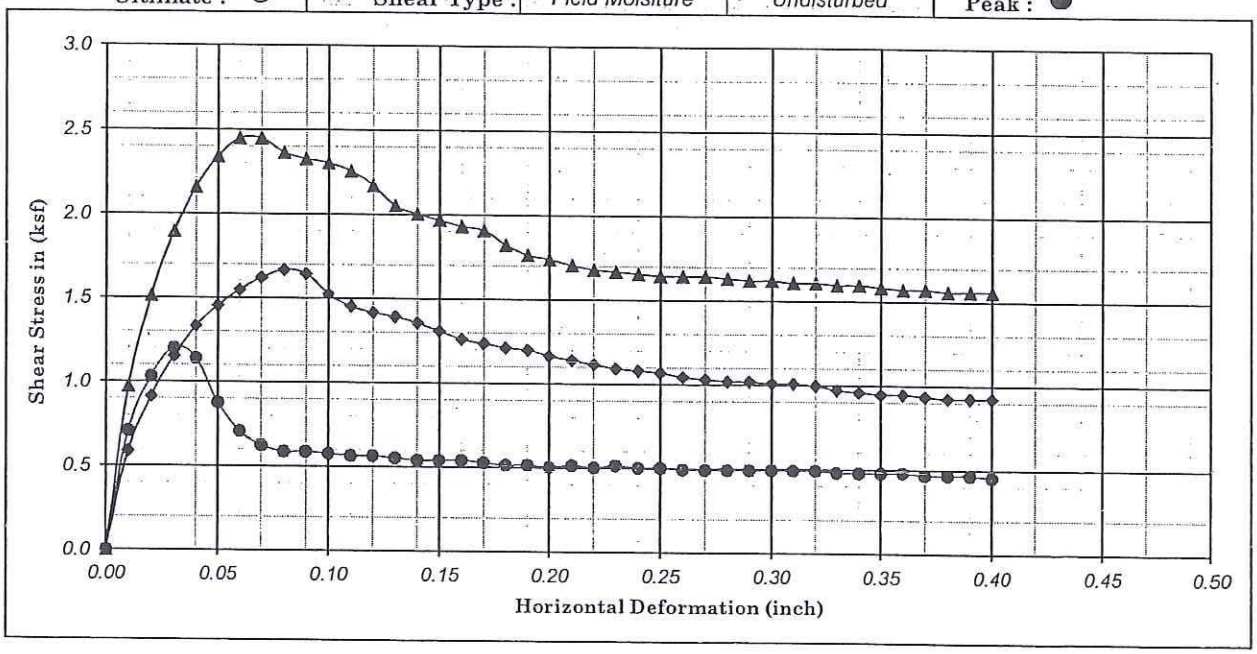
DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-263		Strength Intercept (C) :	0.81	(ksf)	Peak	0.14	(ksf)	Ultimate
Sample No. : D-3			38.78	(kPa)		6.61	(kPa)	
Depth (ft/m) : 10.0	0.00	Friction Angle (ϕ) :	39.51	Degree		35.82	Degree	
Description : Olive-brown, SANDY lean CLAY (CL)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	11.83	104.40	16.43	0.61	0.50	23.94	1.20	57.46	0.46	21.83
◆	12.71	103.78	16.33	0.62	1.00	47.88	1.67	79.86	0.92	44.24
▲	12.31	100.98	15.89	0.67	2.00	95.76	2.45	117.21	1.56	74.69

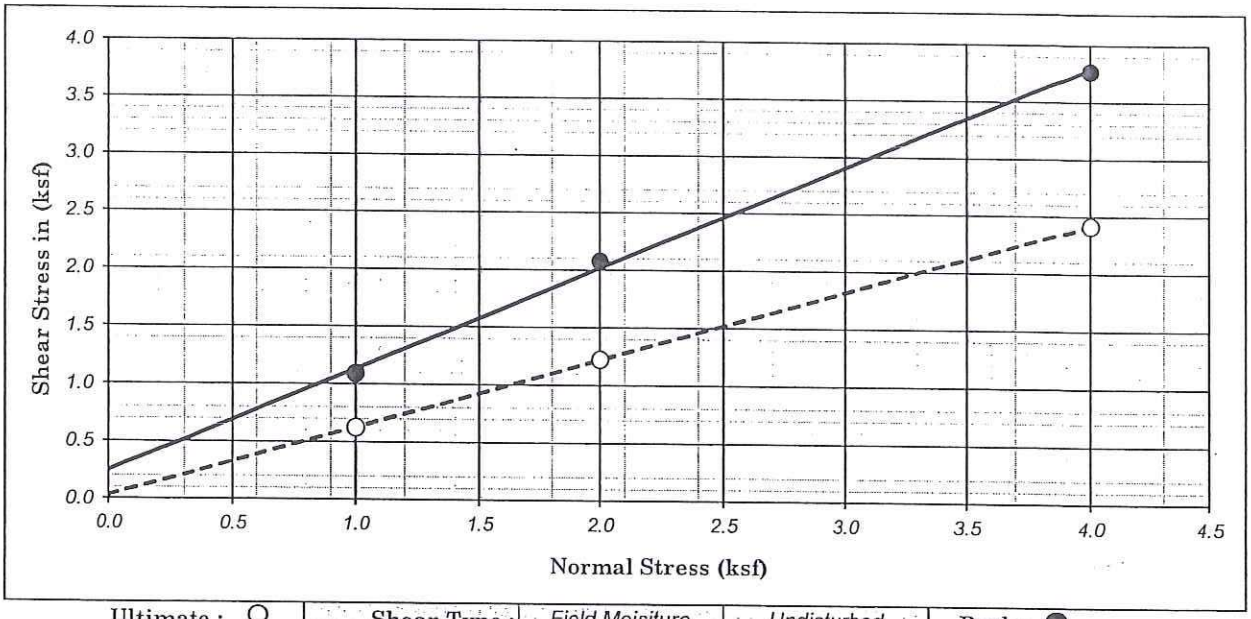
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

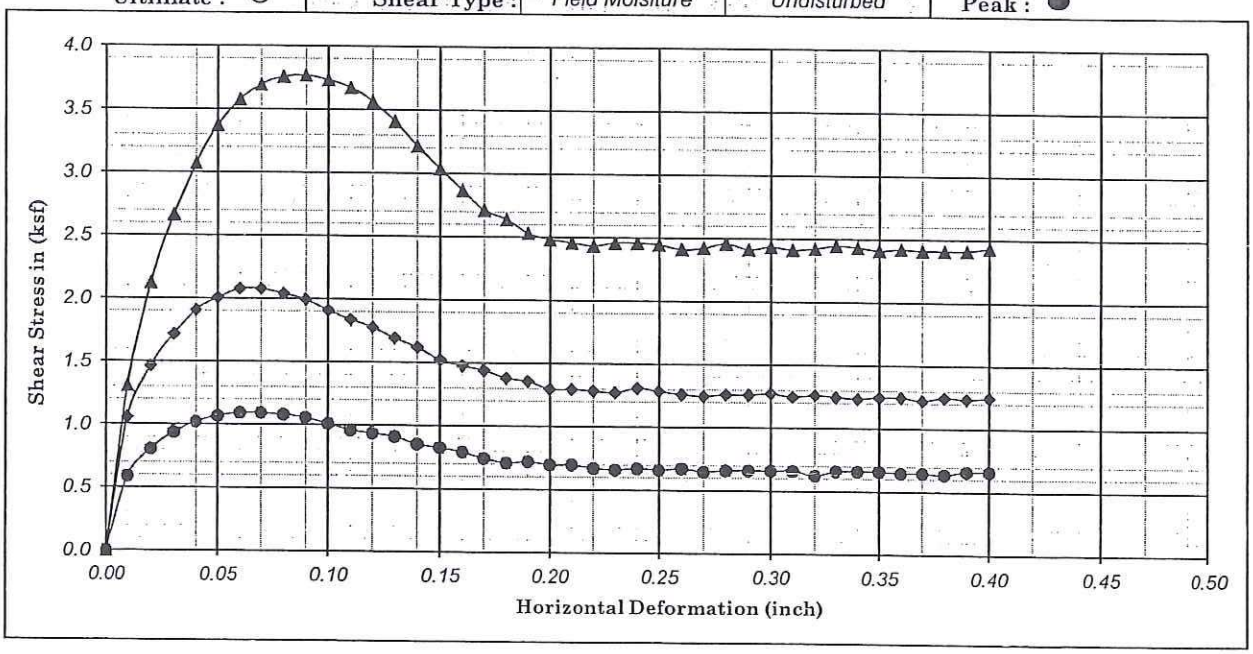
Project No. : 11-136 | Date : 11/19/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-263	Strength Intercept (C) :	0.25	(ksf)	Peak	0.03	(ksf)	Ultimate
Sample No. : D-5		11.78	(kPa)		1.44	(kPa)	
Depth (ft/m) : 20.0 | 0.00	Friction Angle (ϕ) :	41.52	Degree		30.78	Degree	

Description : Olive-brown, Poorly graded SAND (SP) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.90	108.17	17.03	0.56	1.00	47.88	1.09	52.28	0.62	29.88
◆	0.90	107.84	16.97	0.56	2.00	95.76	2.08	99.40	1.22	58.61
▲	0.95	108.23	17.04	0.56	4.00	191.52	3.77	180.41	2.41	115.49

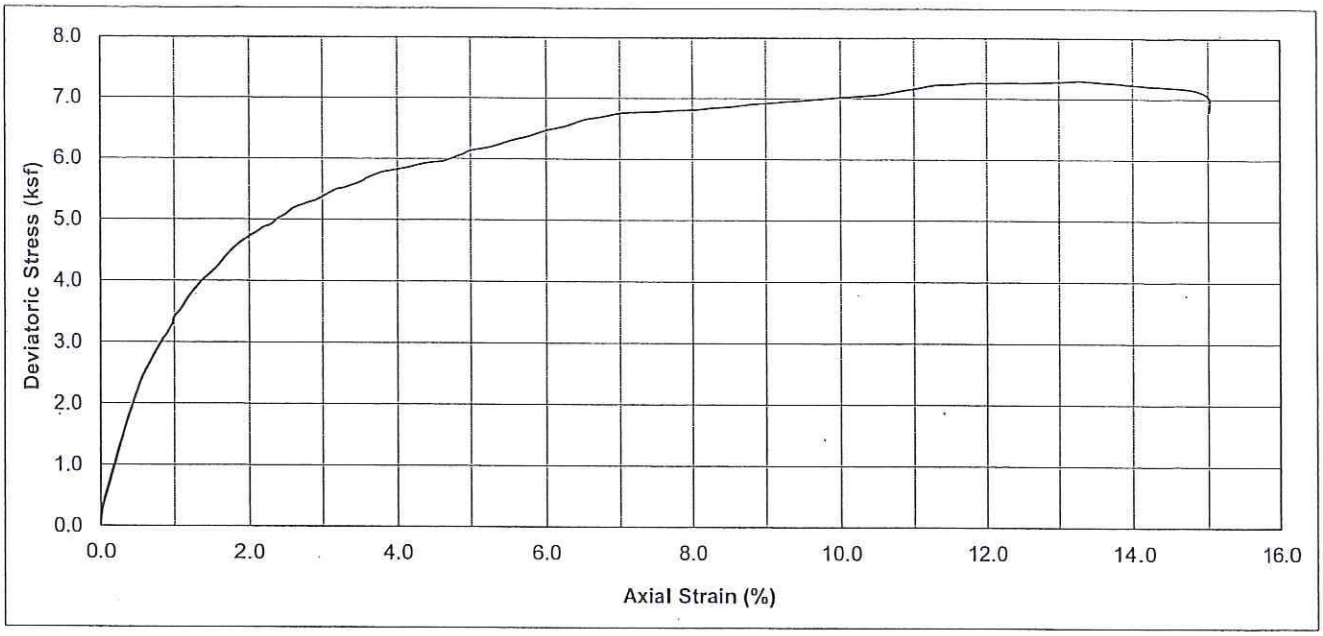
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

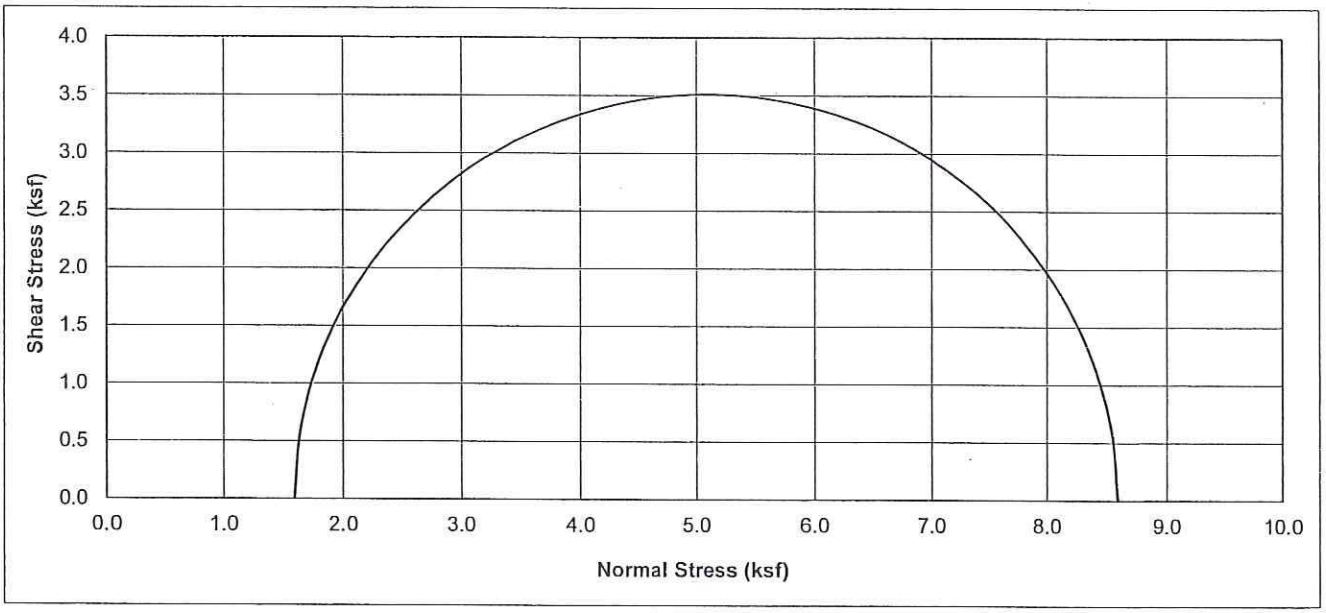
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 | Date : 11/19/11

DIRECT SHEAR TEST (ASTM D-3080)

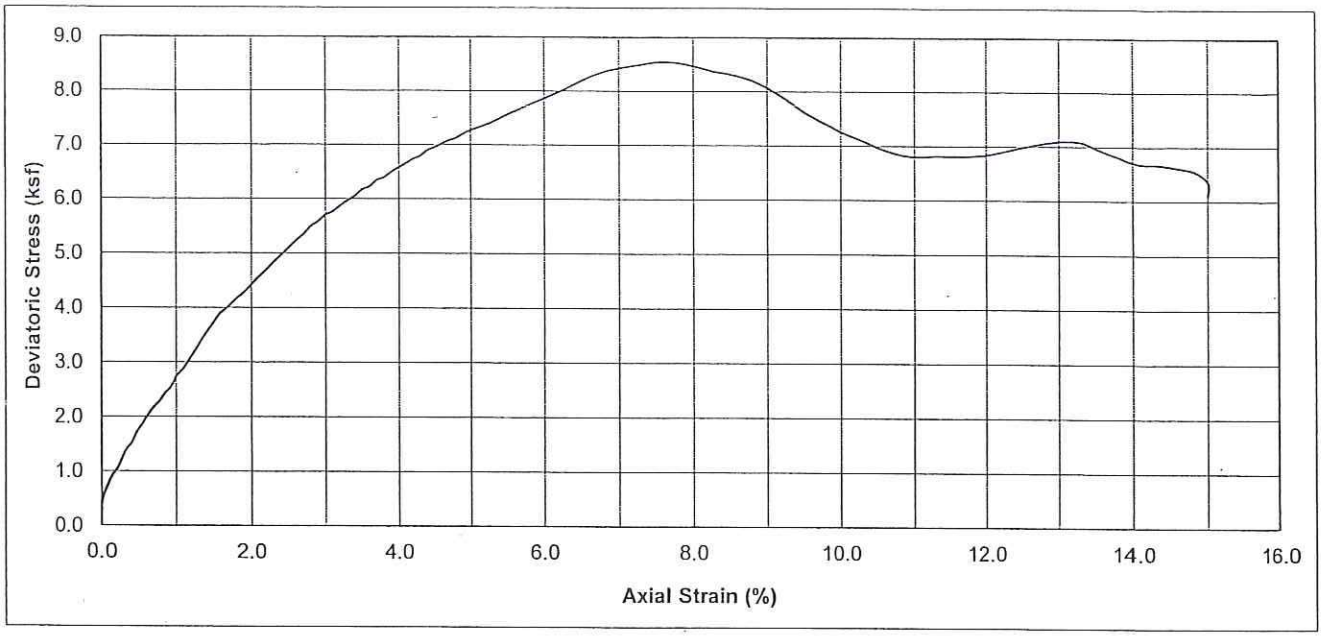
Figure No. :

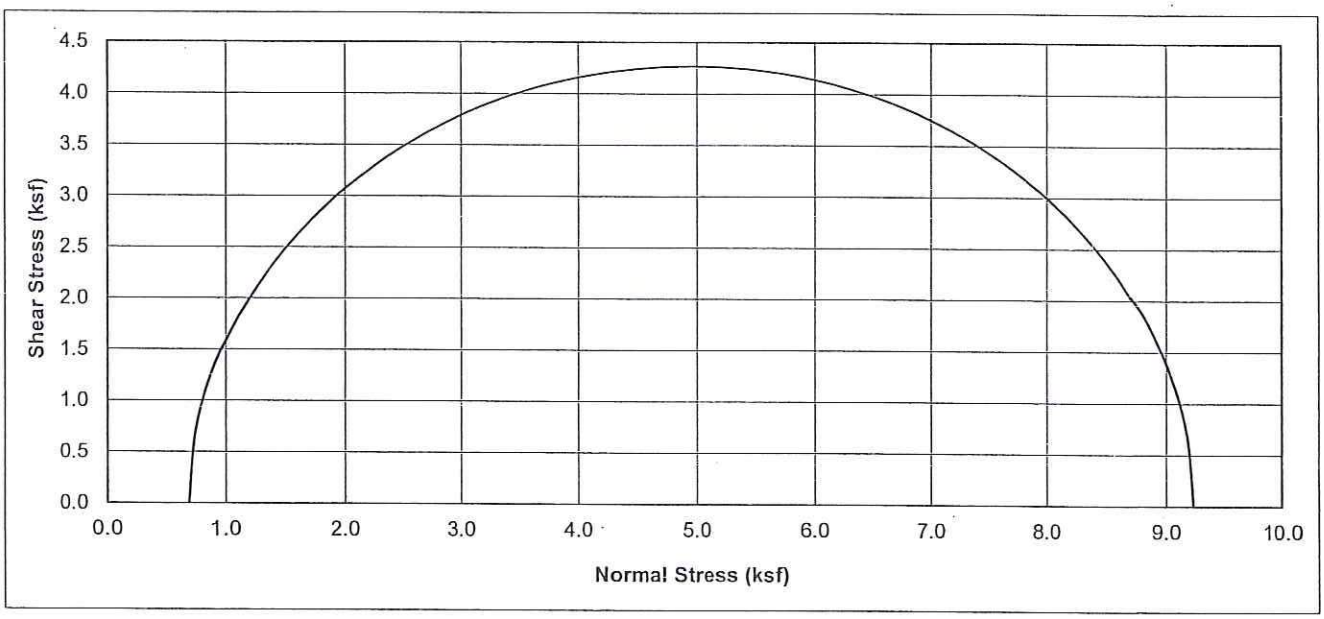




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-202	D-4	20	Dark gray , Lean CLAY (CL)	93.8	26.34	1.58	7.02	89.3

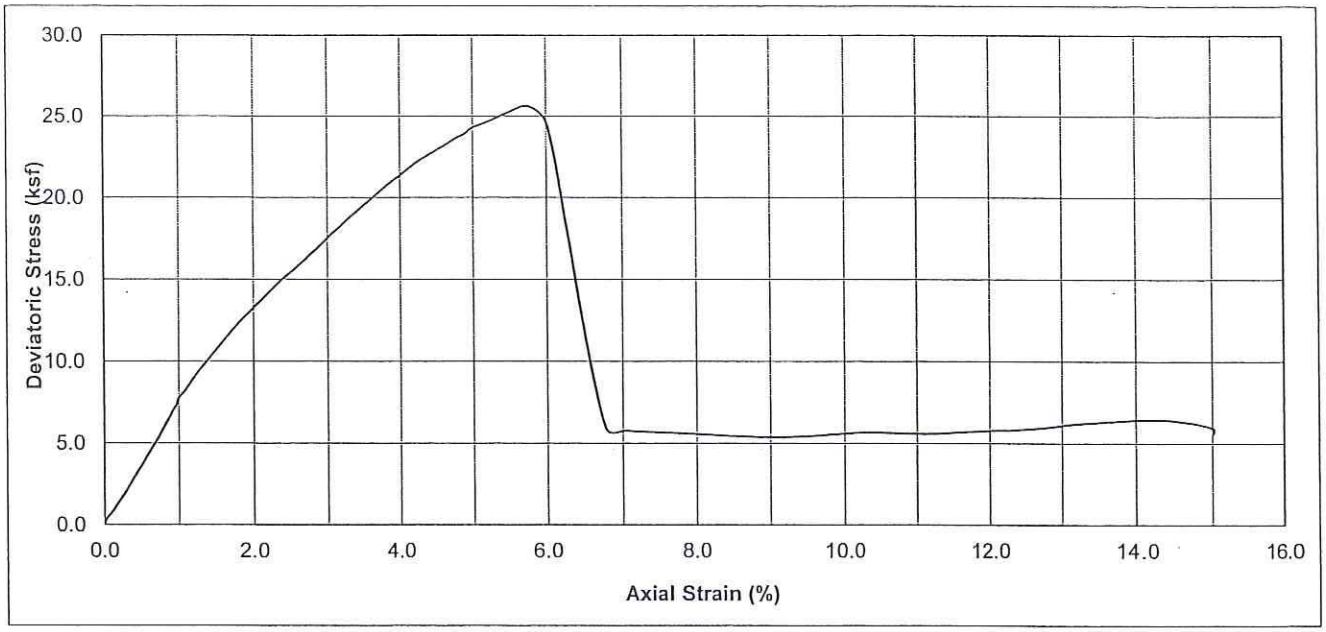
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/06/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

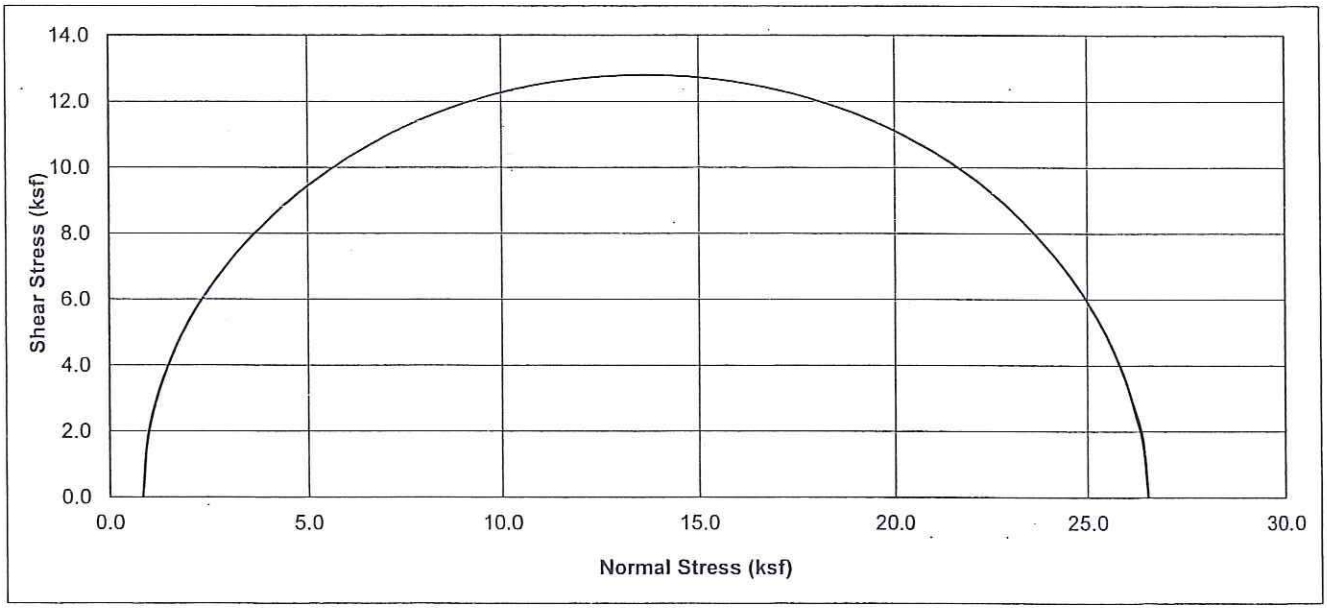




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-203	D-1	5	Olive-brown, Lean CLAY(CL)	93.3	28.72	0.69	8.54	96.2

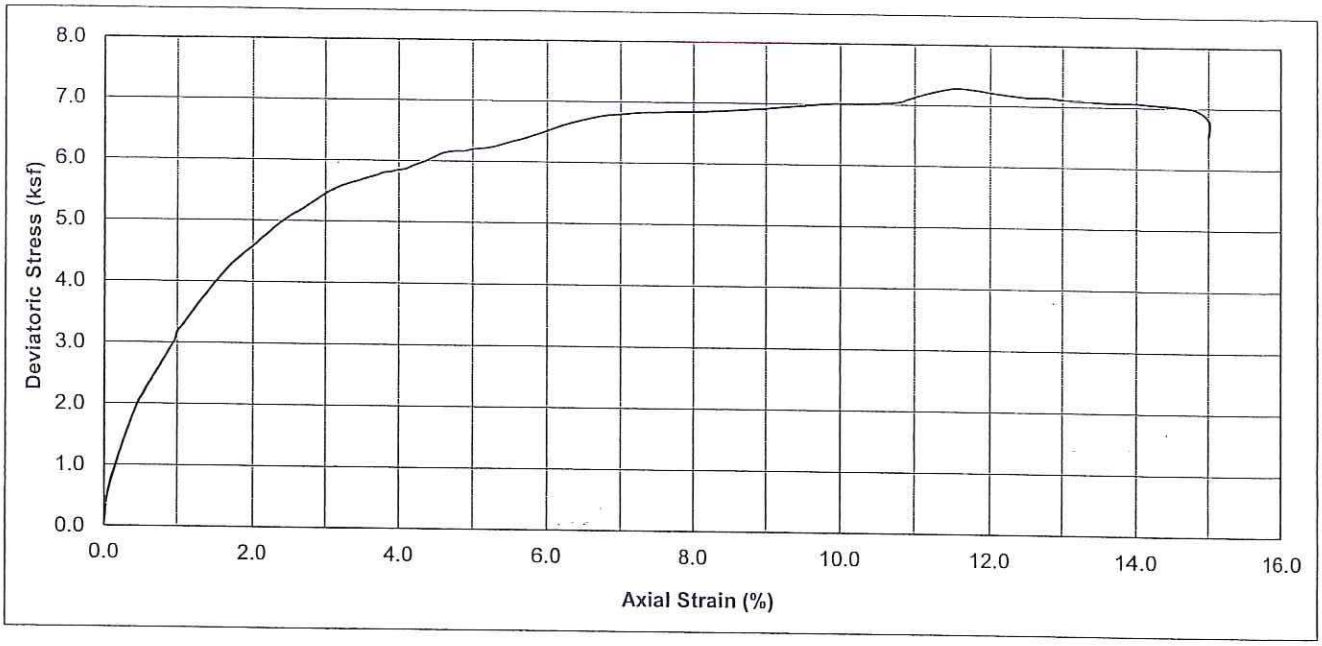
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 / Date : 11/06/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

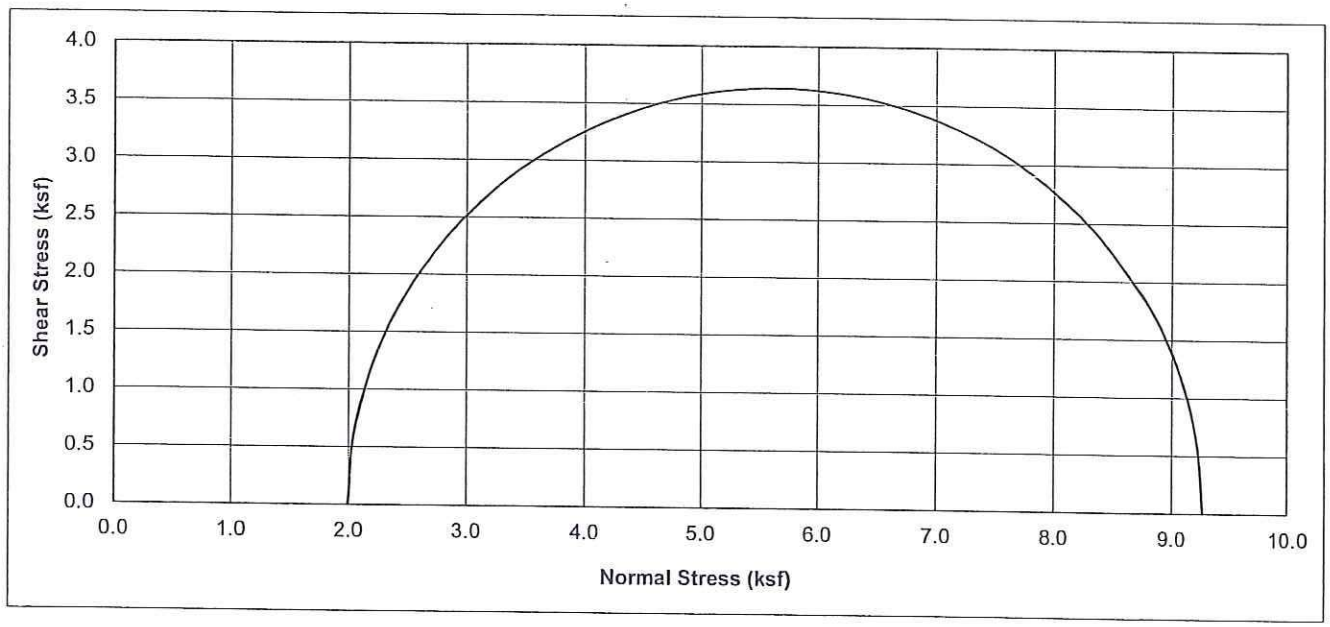




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-212	D-3	10	Very dark gray , Elastic SILT (MH)	95.1	26.94	0.85	25.61	94.2

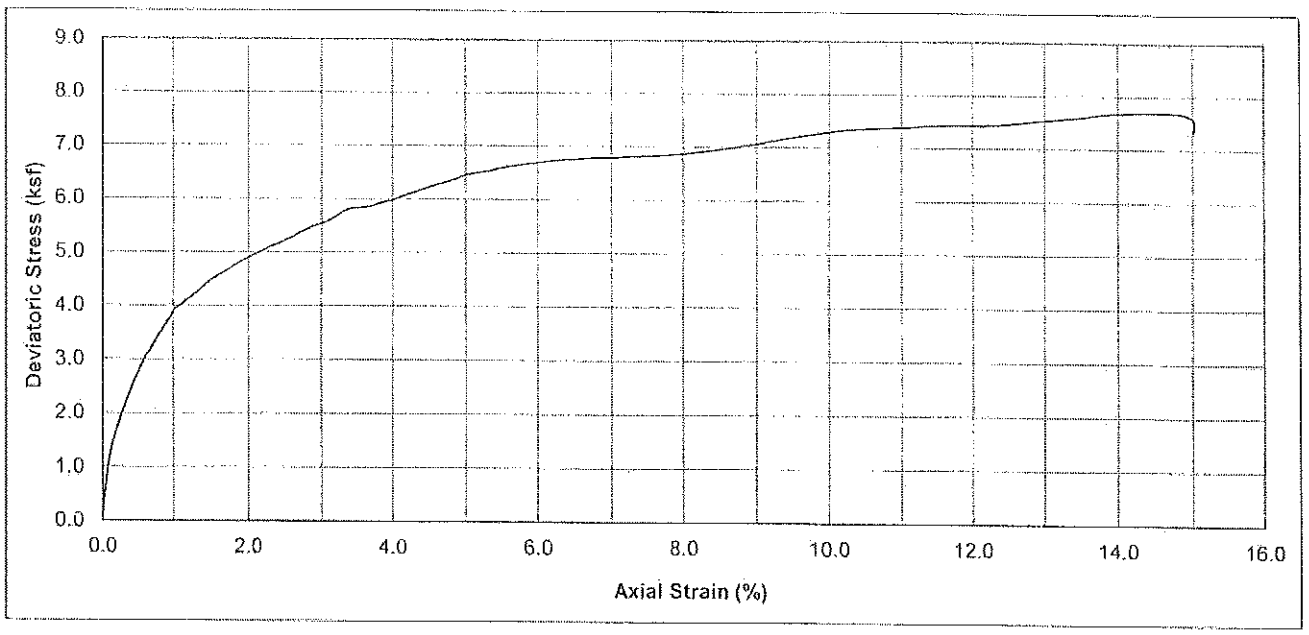
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136	Date : 11/06/11	(ASTM D2850) Figure No. :

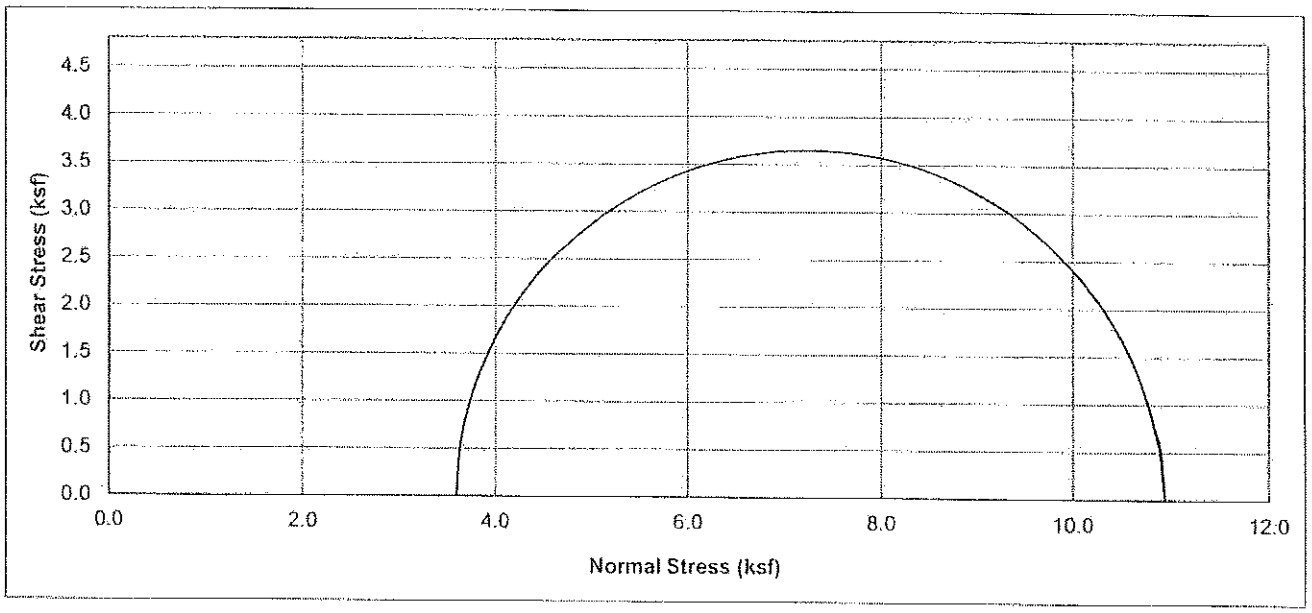




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-216	D-6	25	Olive-brown , Lean CLAY (CL)	92.9	27.84	1.99	7.28	92.4

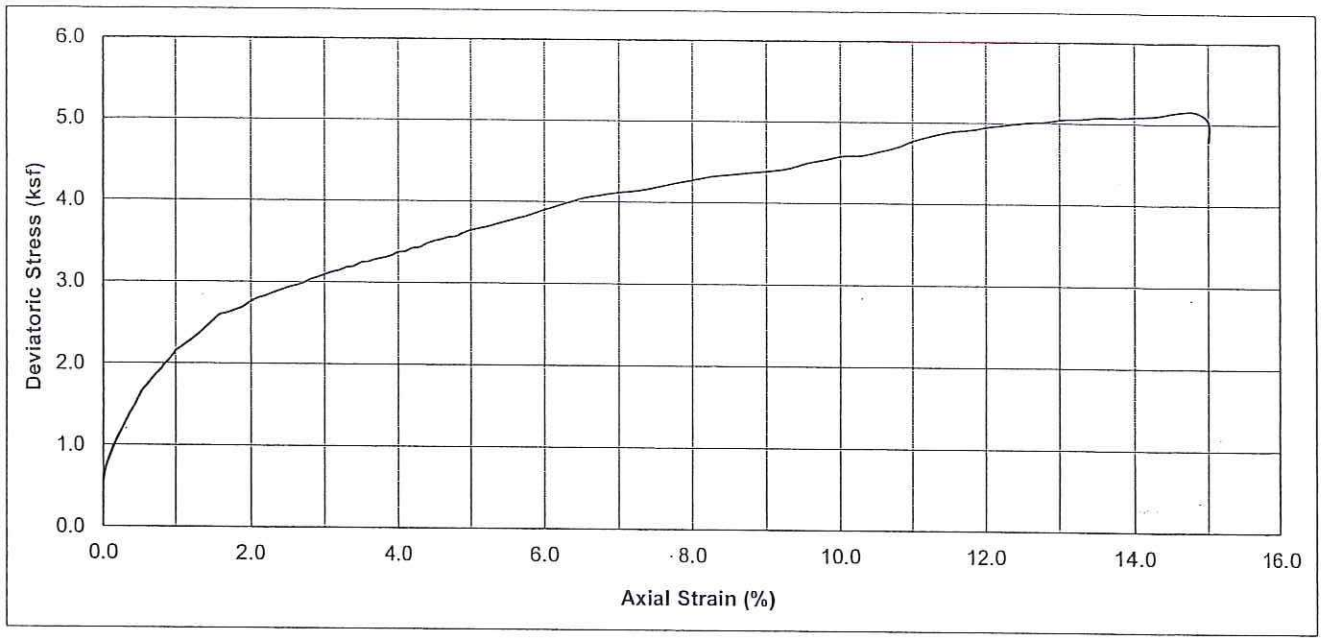
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

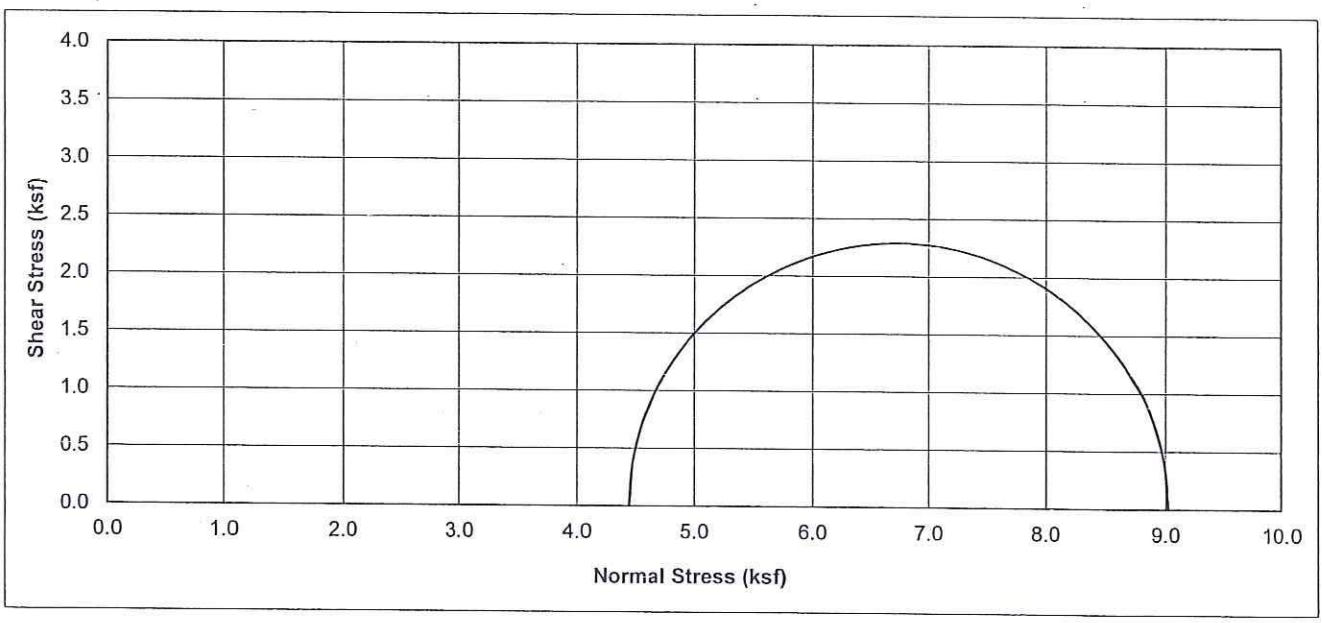




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-216	D-10	45	Olive-brown , Lean CLAY (CL)	101.9	23.06	3.60	7.31	95.4

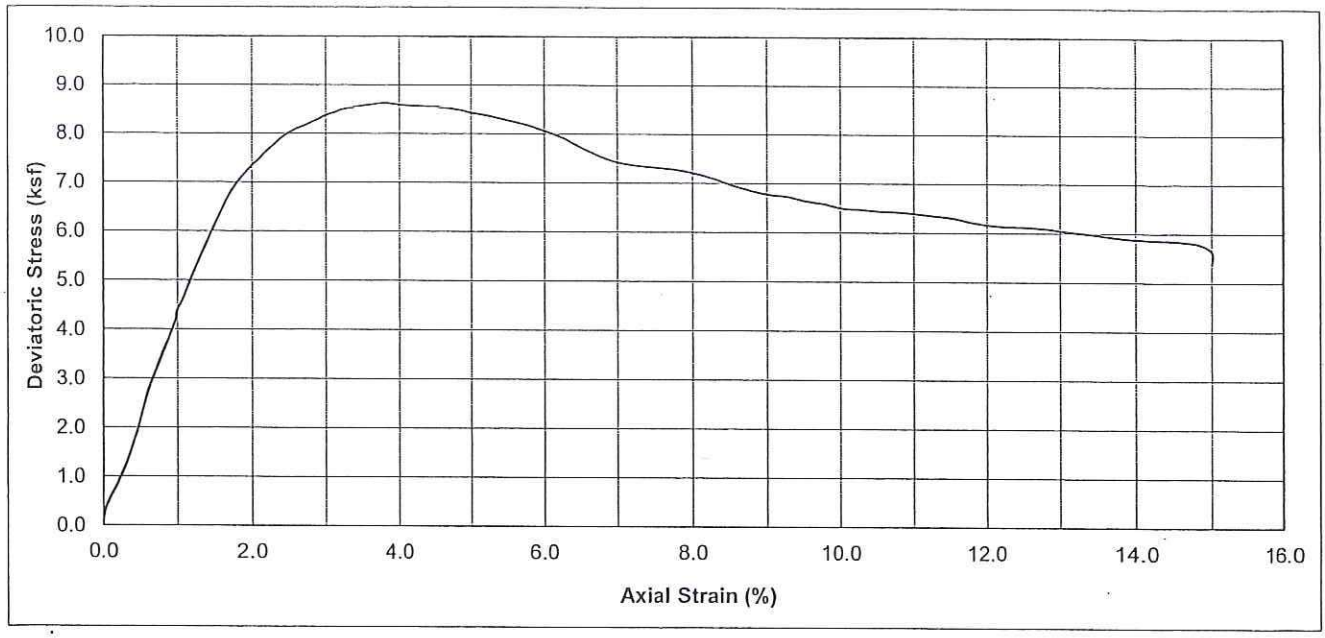
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

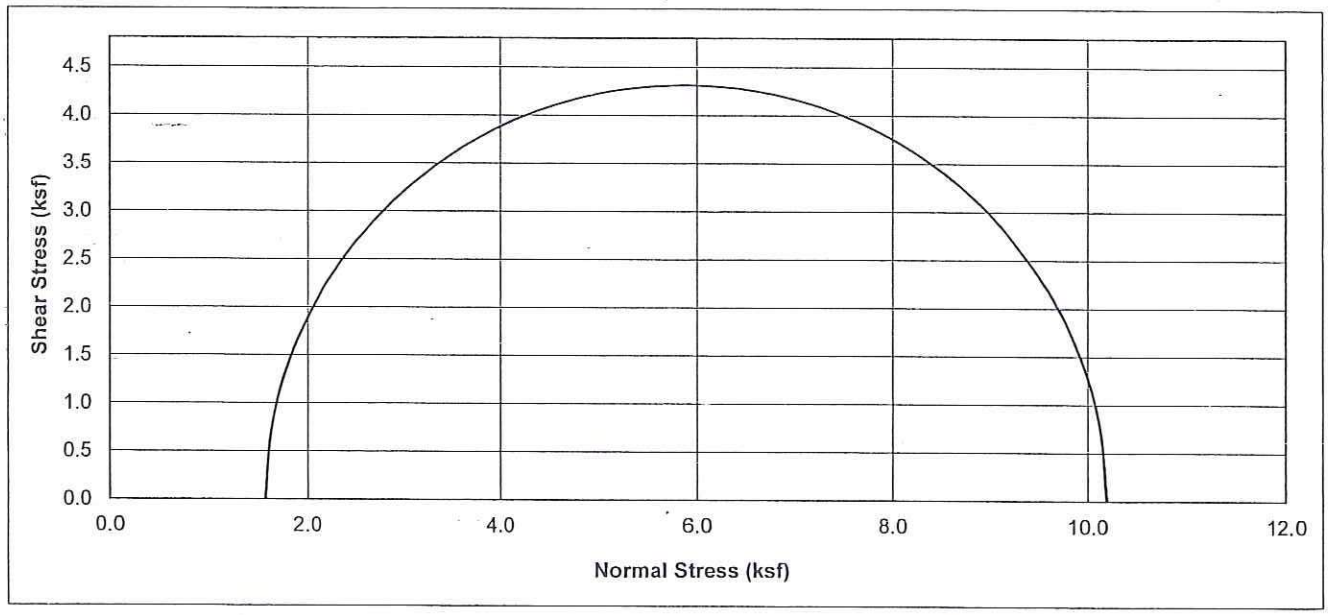




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-221	D-11	55	Dark brown , Lean CLAY (CL)	108.3	20.29	4.44	4.58	98.7

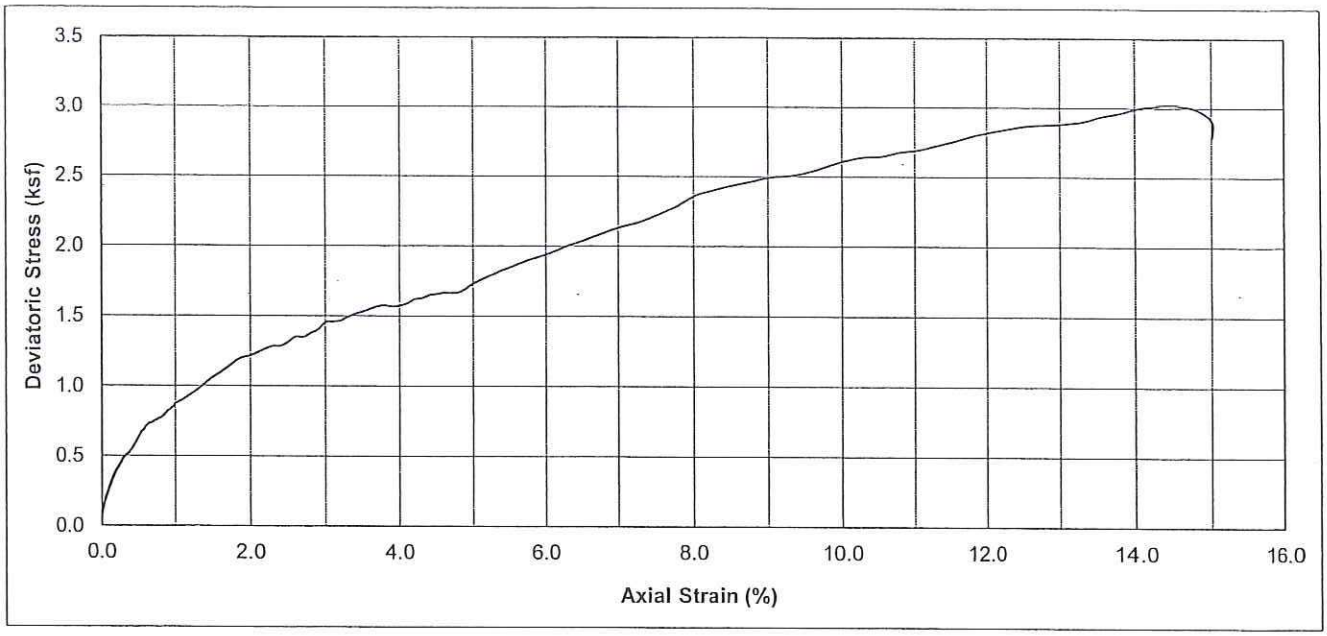
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

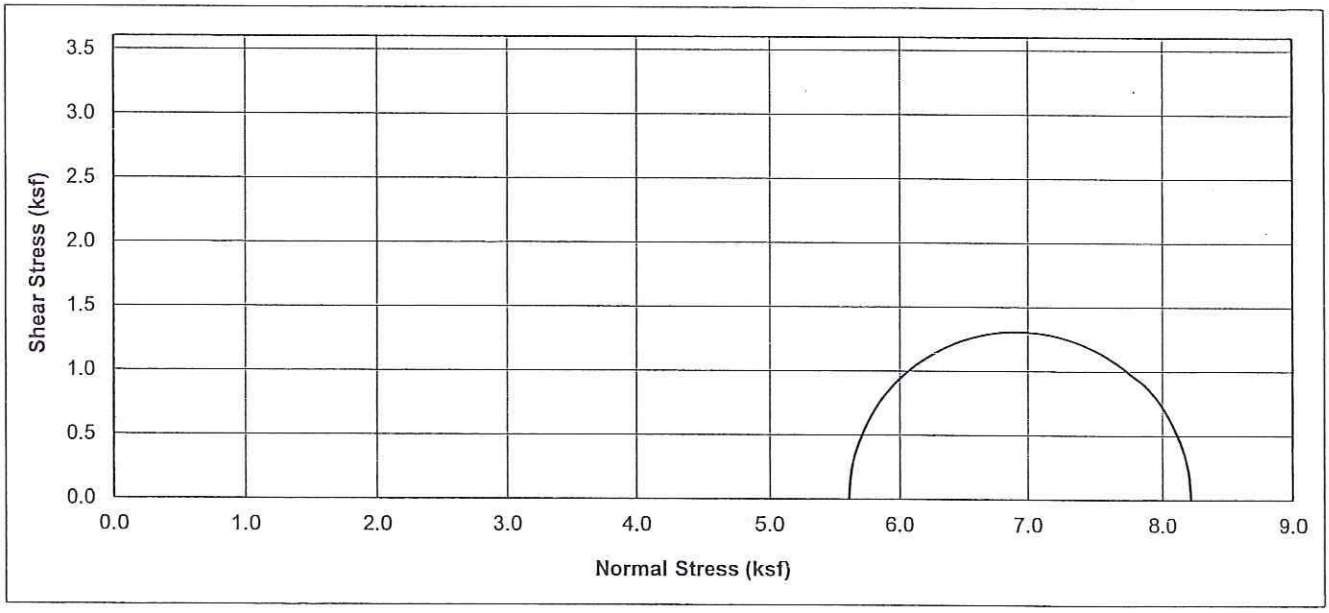




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-222	D-4	20	Dk. Olive-brown to Dk. gray, Elastic SILT (MH)	83.0	33.70	1.57	8.63	88.4

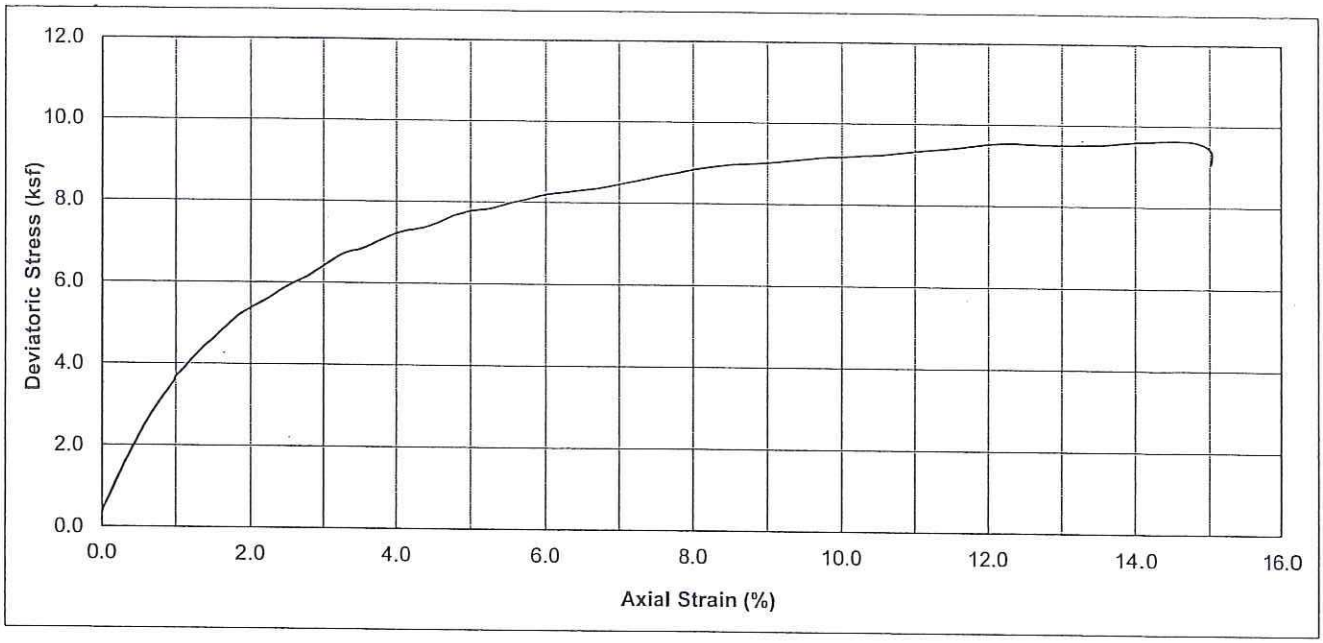
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136 / Date : 11/07/11	(ASTM D2850) Figure No. :

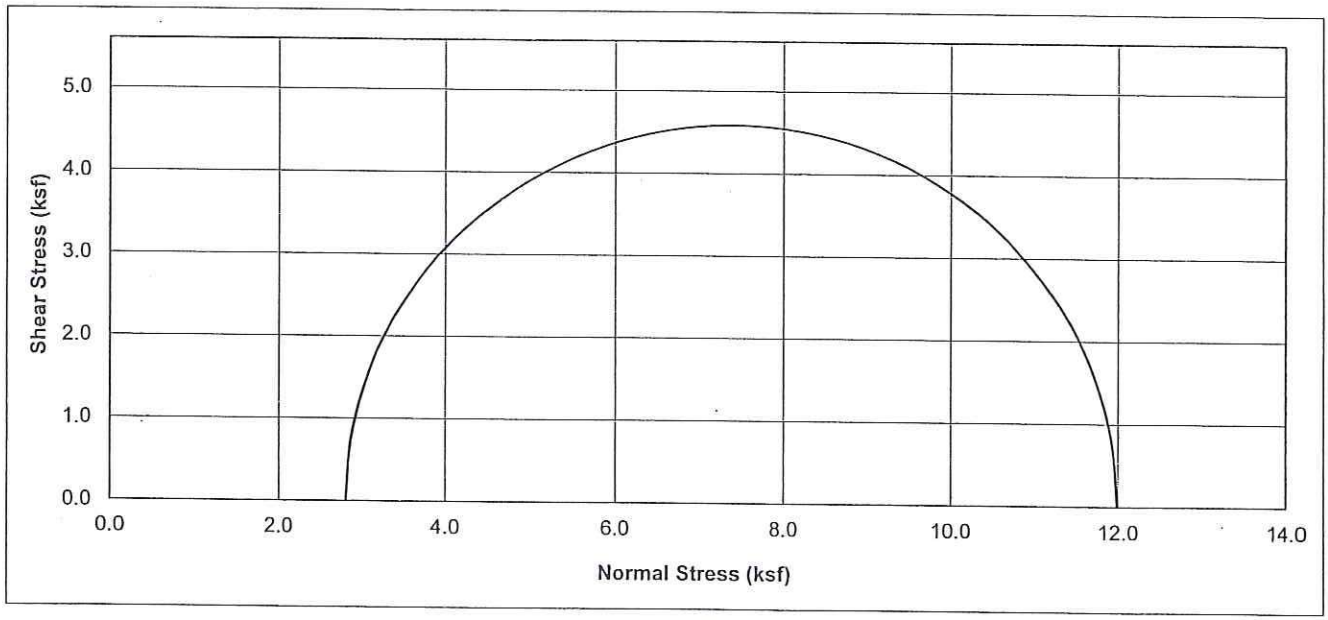




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-222	D-14	70	Olive-brown , Lean CLAY(CL)	99.8	24.54	5.60	2.61	96.2

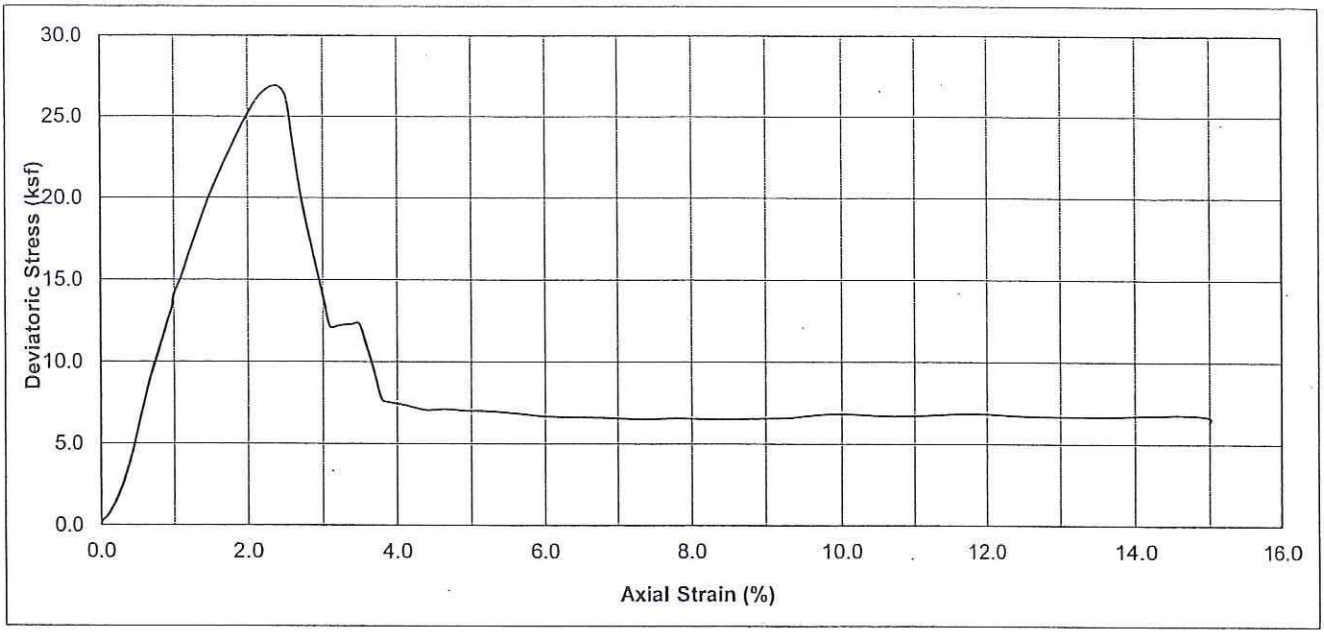
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

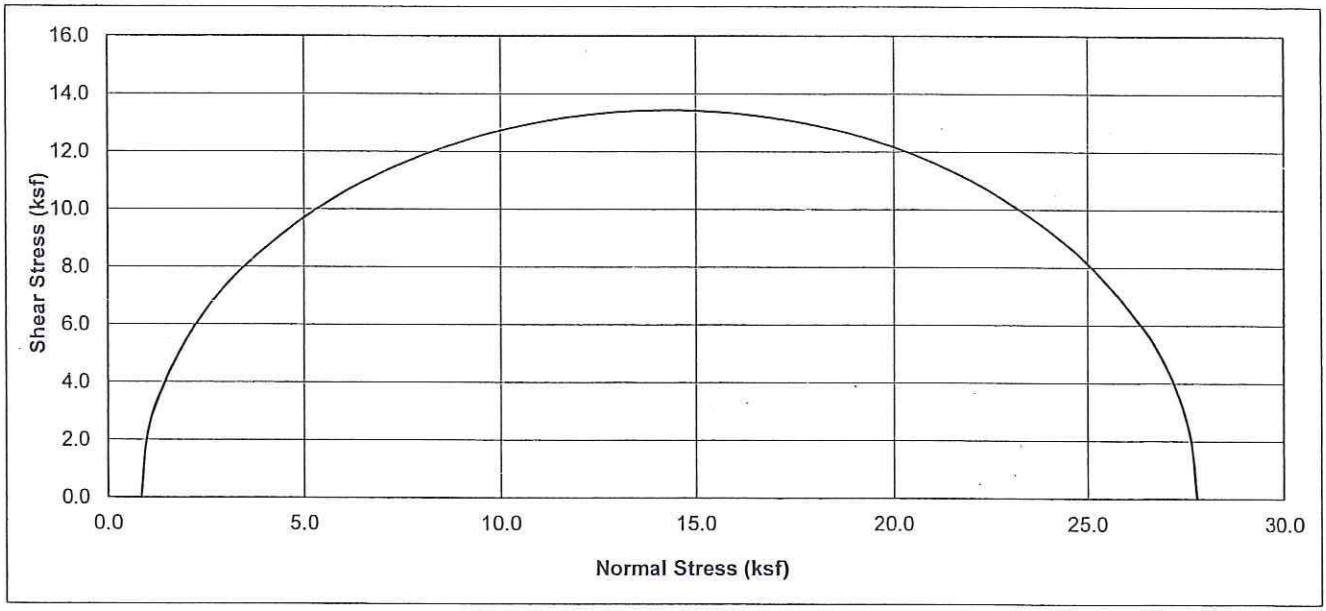




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-224	D-7	35	Olive-brown , SANDY lean CLAY (CL)	113.6	11.49	2.82	9.17	64.1

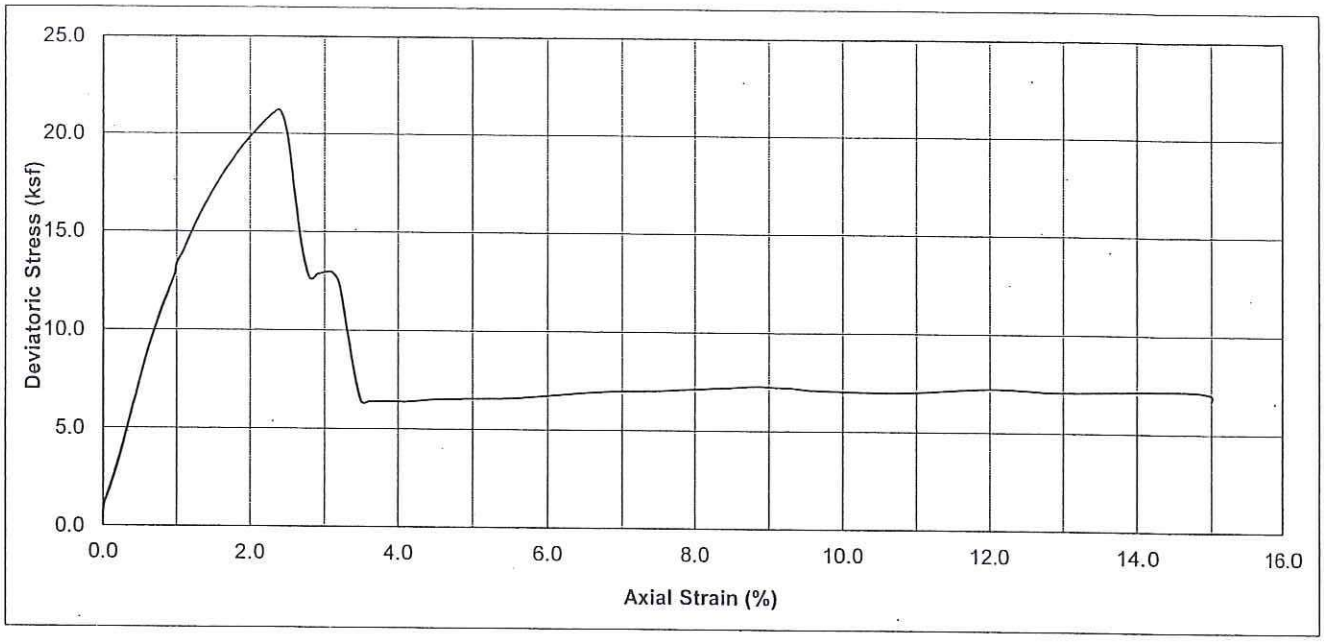
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

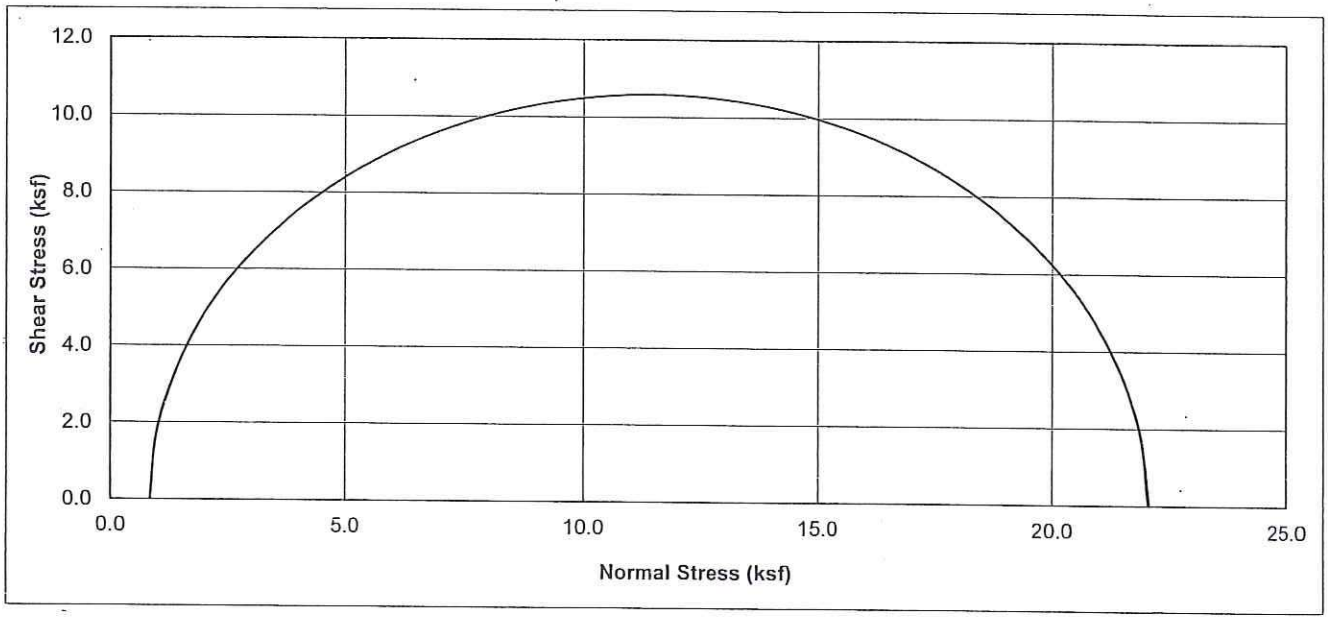




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-226	D-1	2.5	Dk. Greyish Brown, Lean CLAY (CL-CH)	95.6	23.79	0.86	26.88	84.2

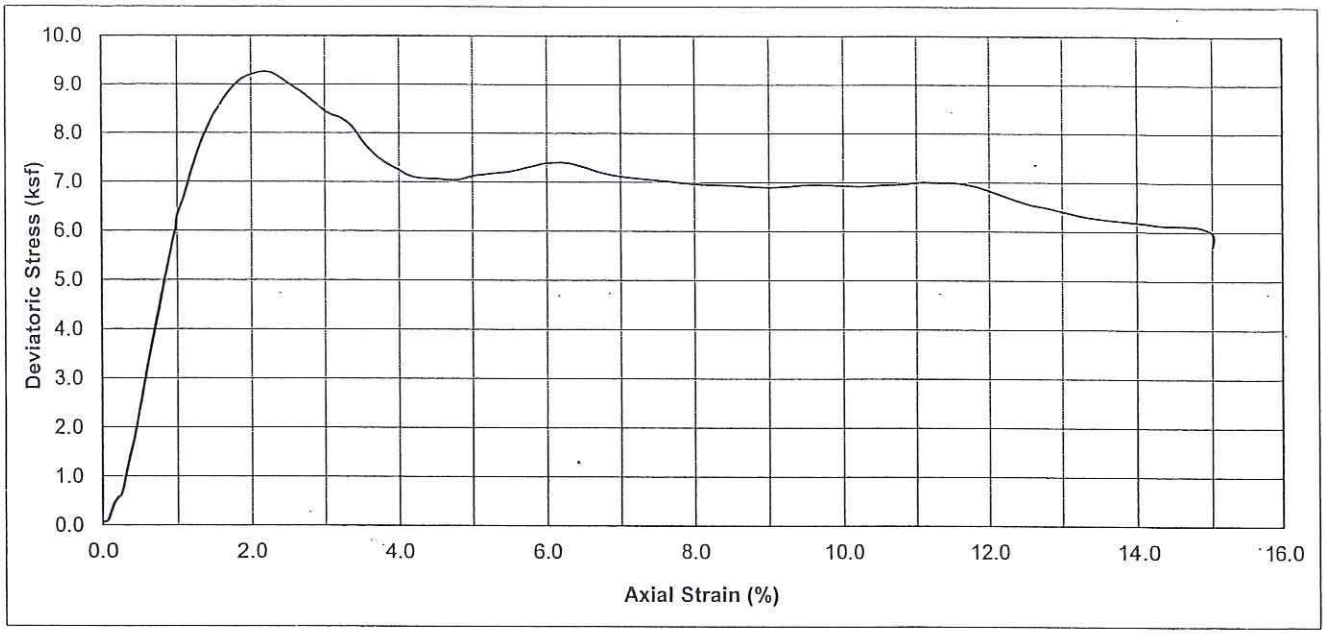
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/23/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

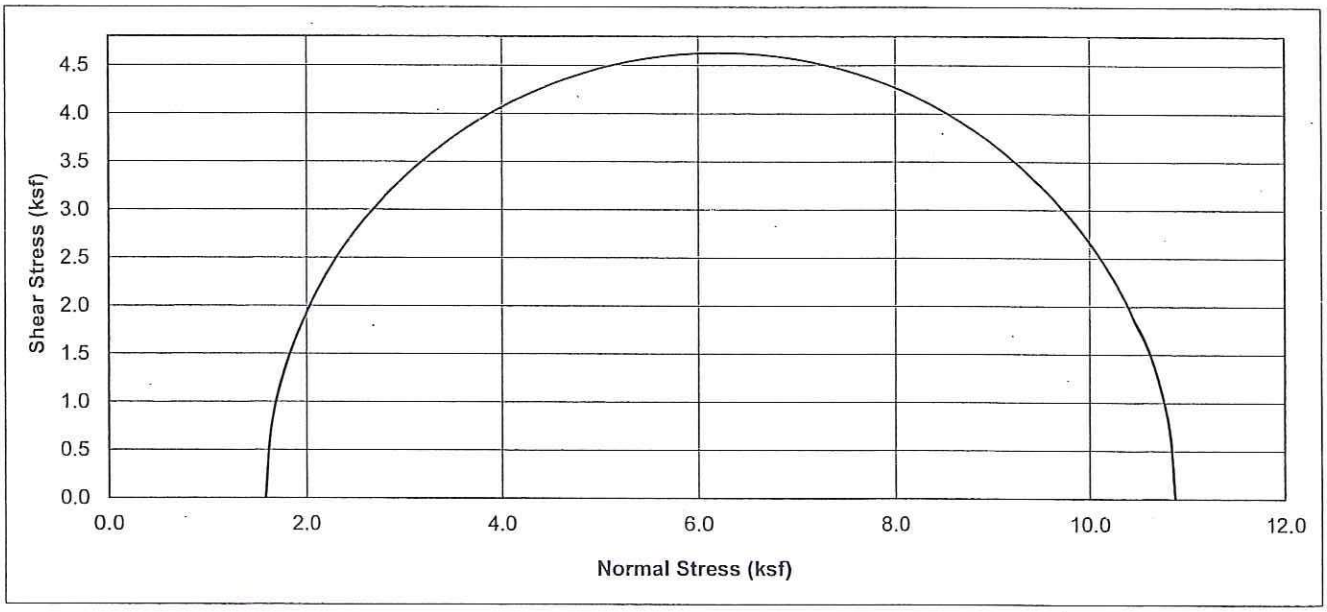




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-230	D-3	10	Very dark gray , Elastic SILT (MH)	95.0	26.83	0.86	21.18	93.7

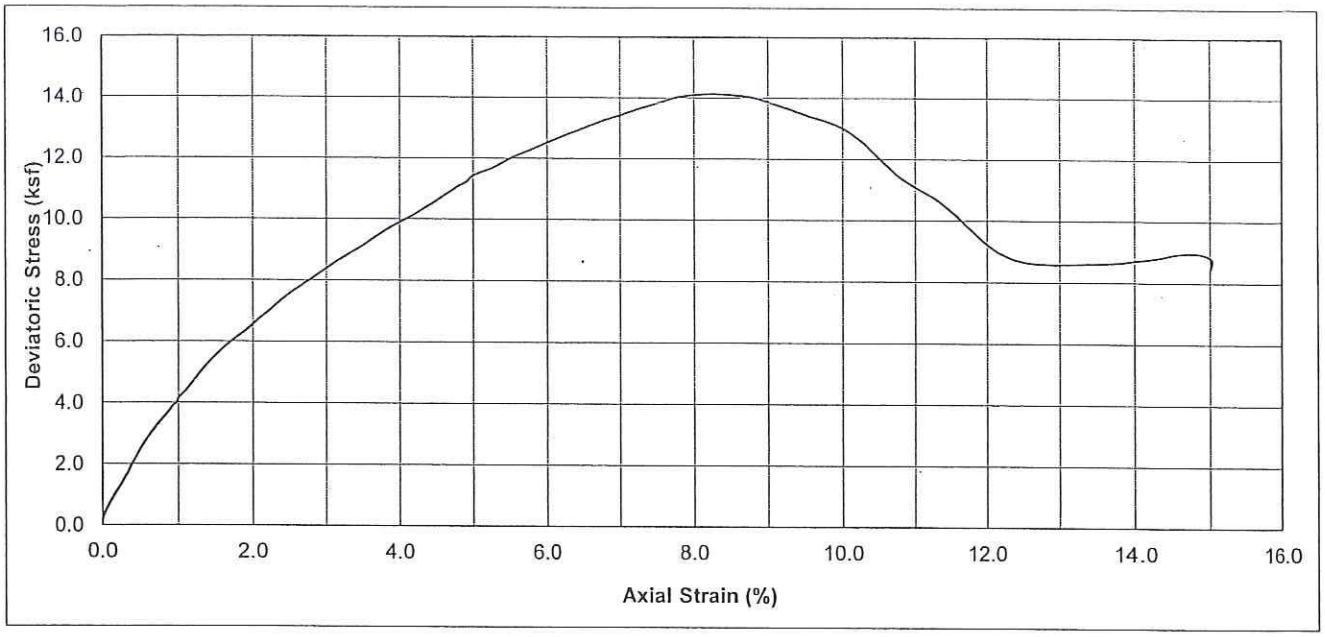
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 / Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

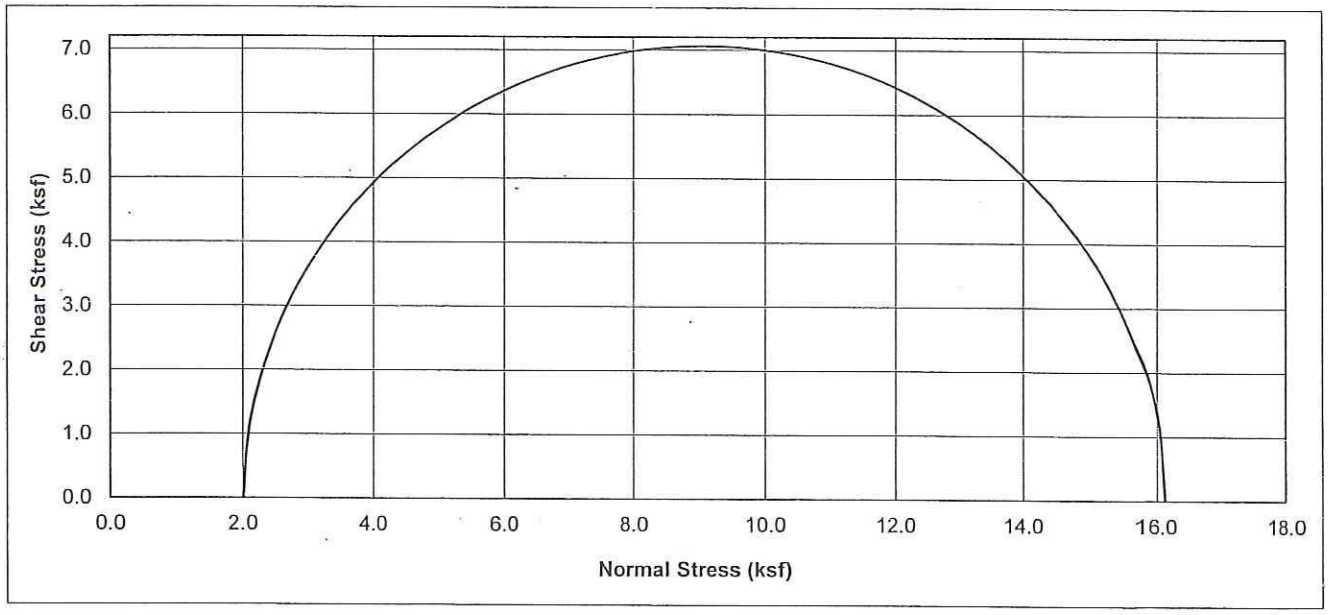




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-232	D-4	20	Olive-brown , Fat CLAY (CH)	85.2	34.95	1.58	9.26	96.4

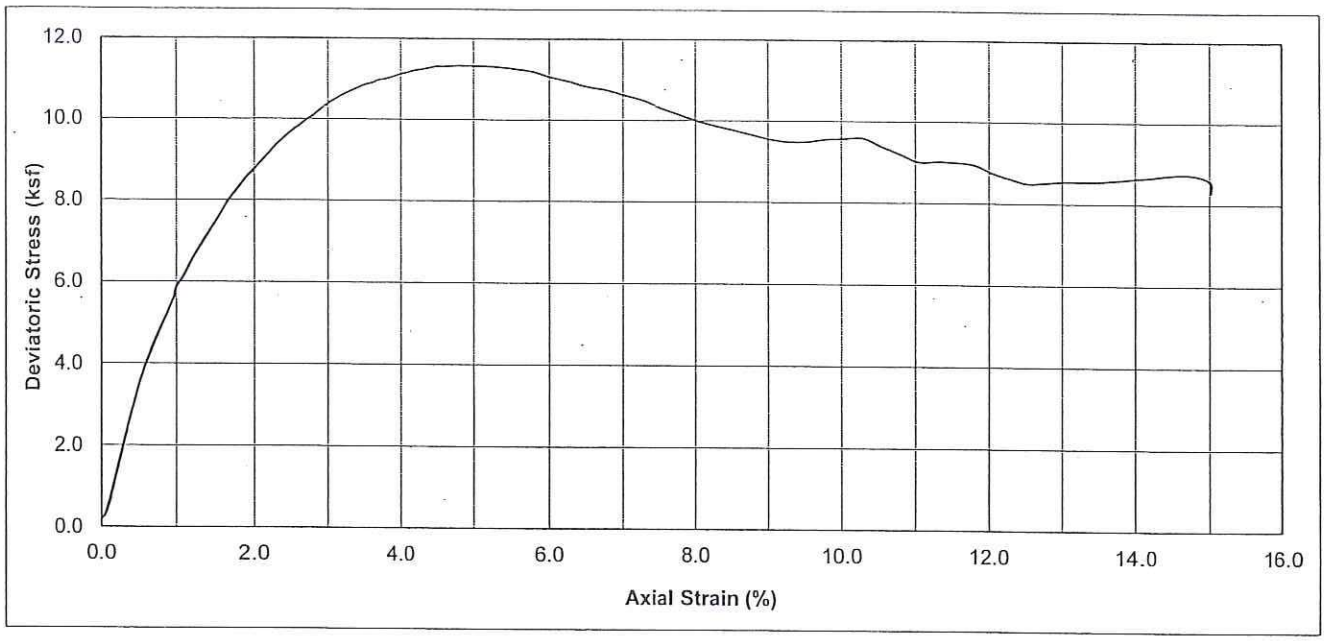
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

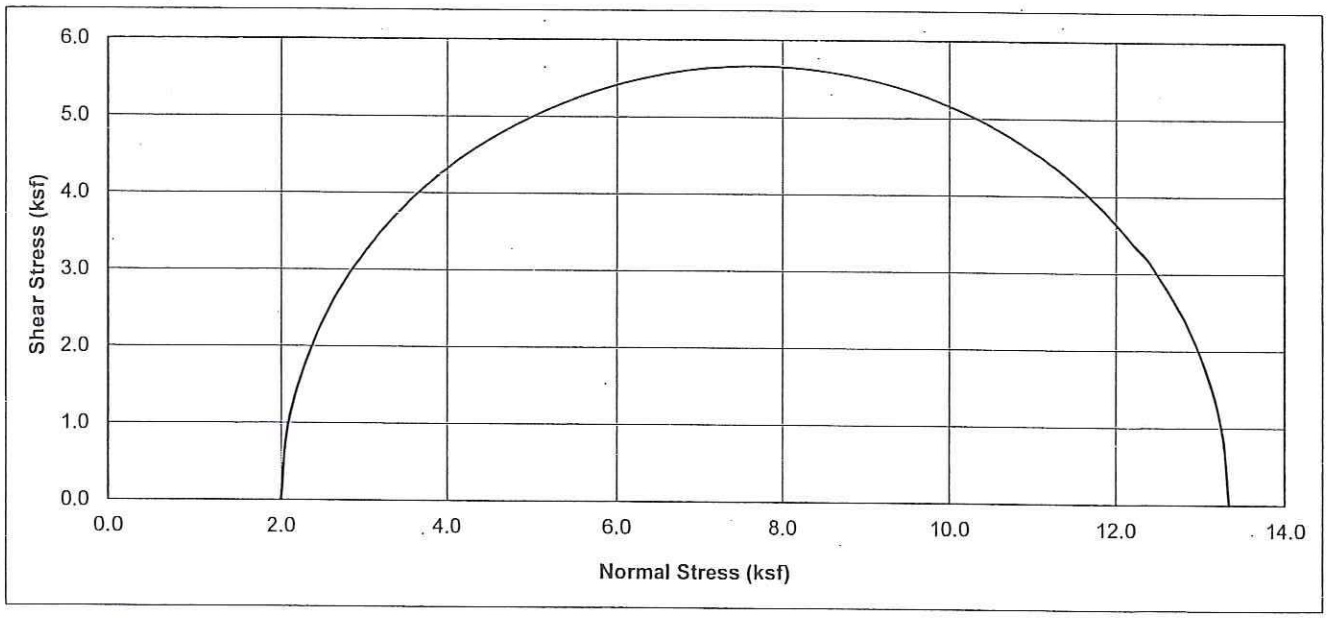




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-233	D-6	25	Dk. brown, Elastic SILT (MH)	91.6	26.32	2.00	14.13	84.7

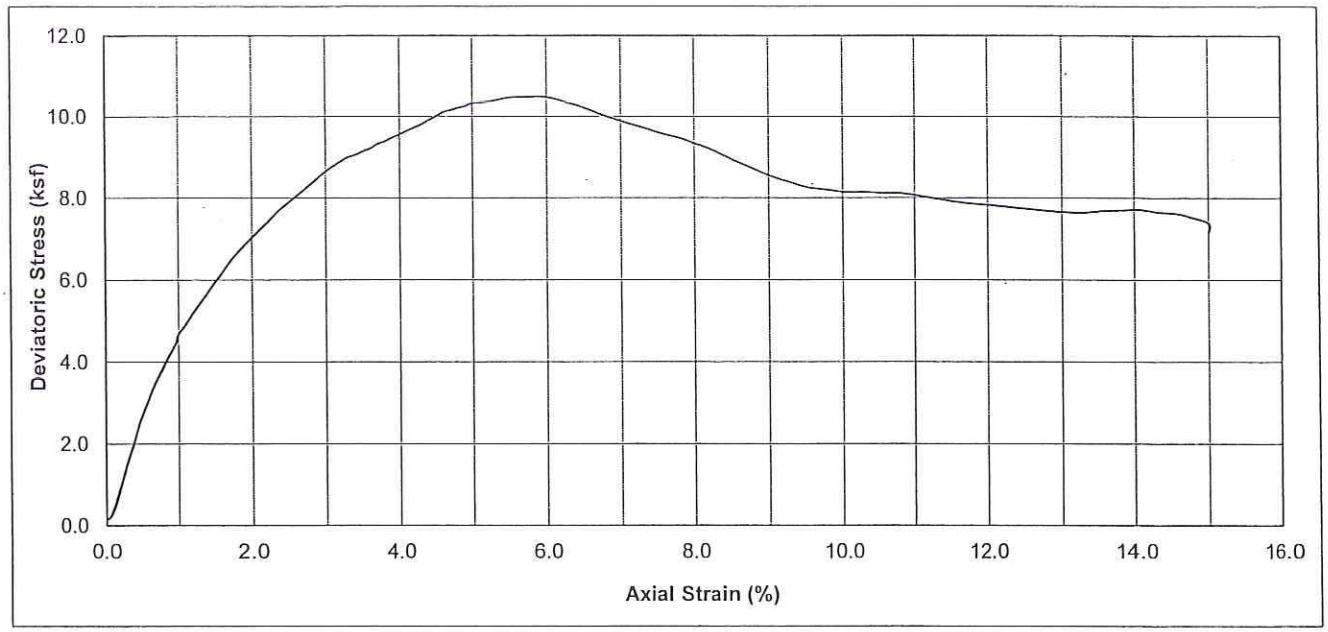
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :
Project No. : 11-136	Date : 11/08/11	

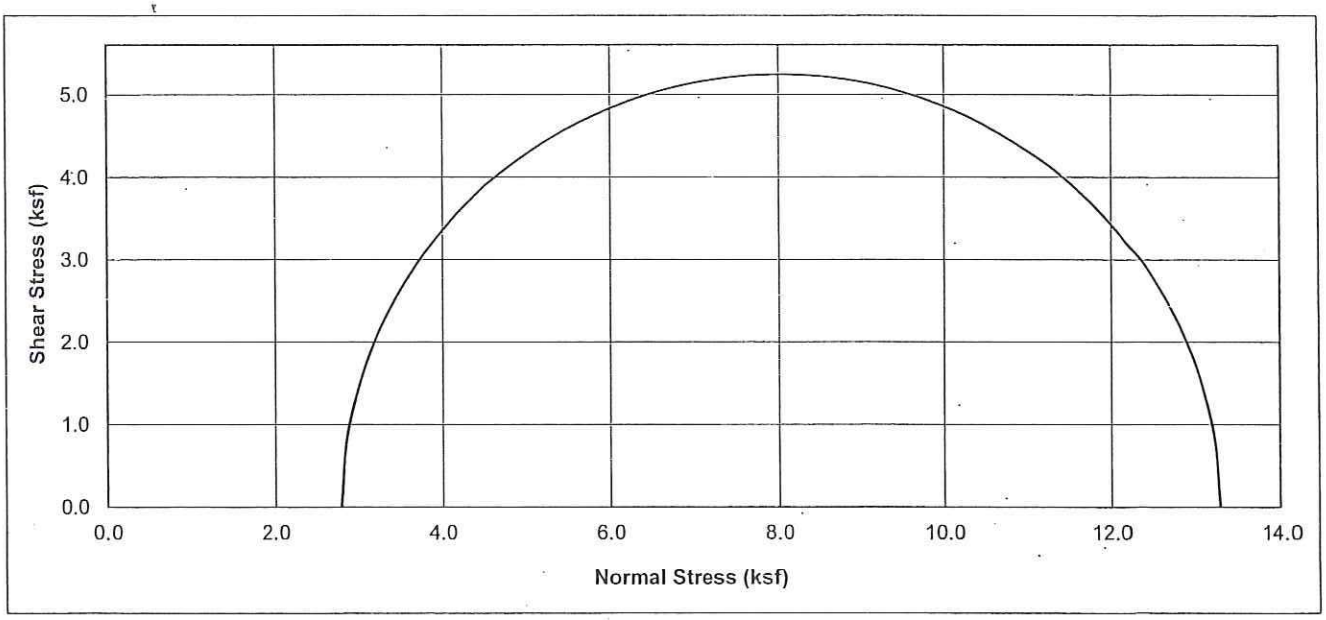




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-235	D-6	25	Very dark gray , Elastic SILT (MH)	83.4	34.27	2.00	11.33	90.8

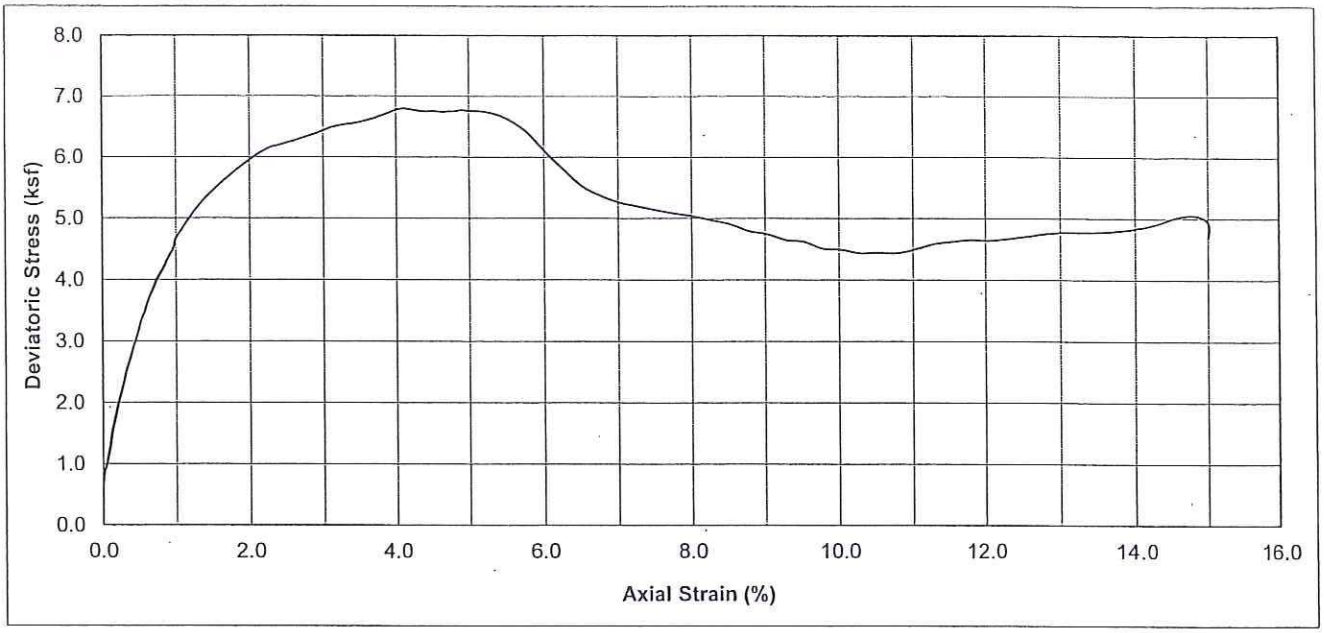
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

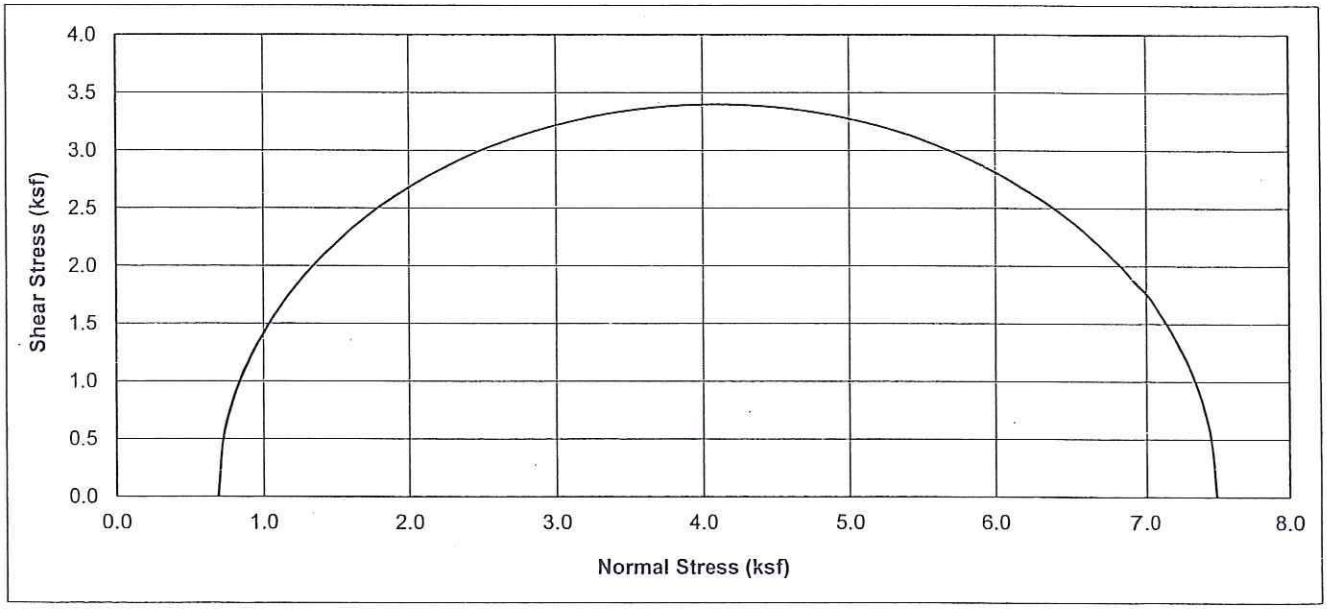




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-253	D-8	35	Very dark gray , Elastic SILT (MH)	88.2	31.54	2.79	10.49	93.5

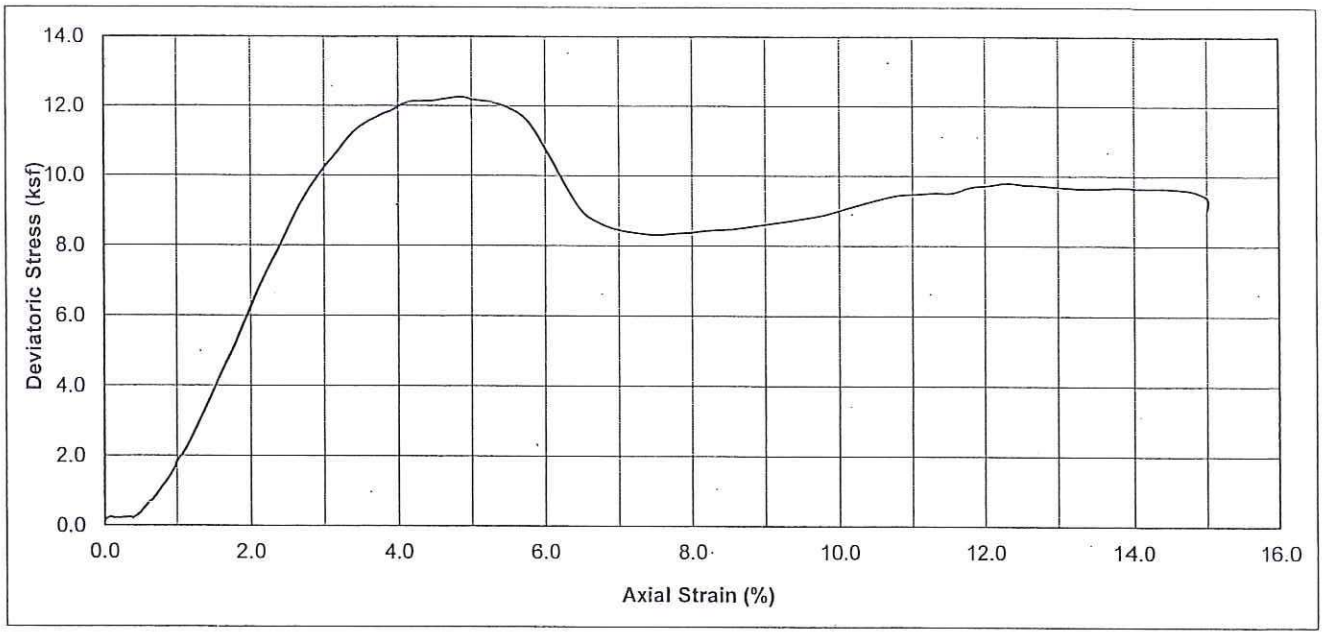
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136	Date : 11/10/11	(ASTM D2850) Figure No. :

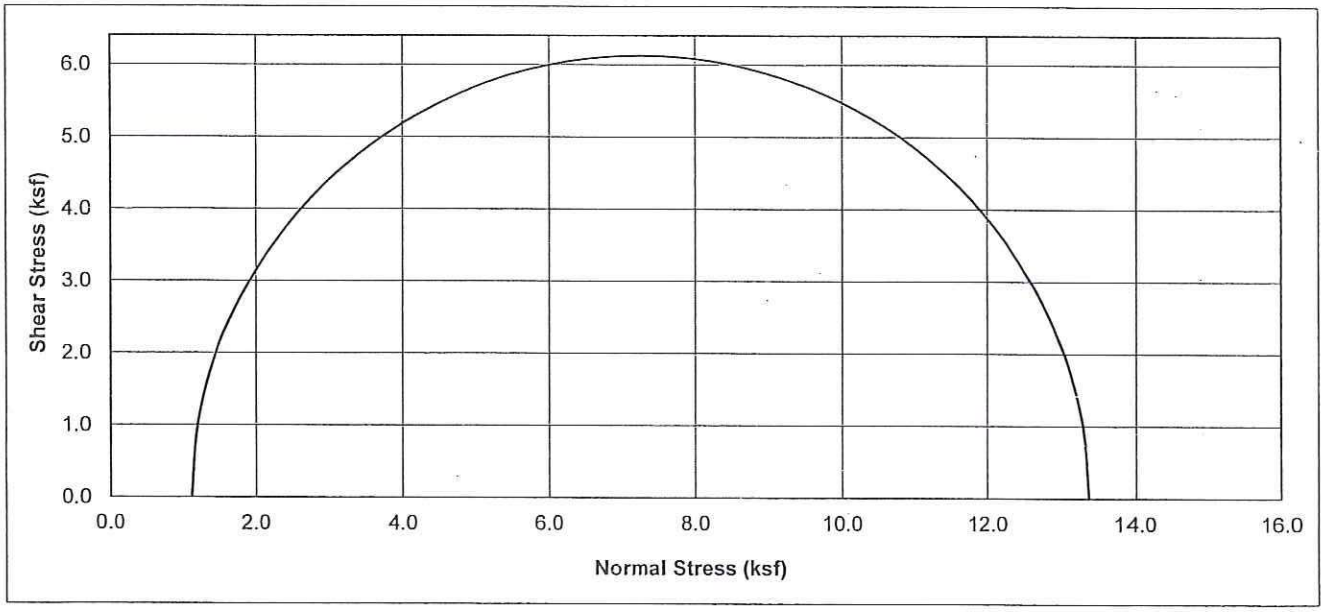




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-254	D-1	2.5	Olive-brown , SANDY lean CLAY (CL)	107.9	15.54	0.69	6.80	74.7

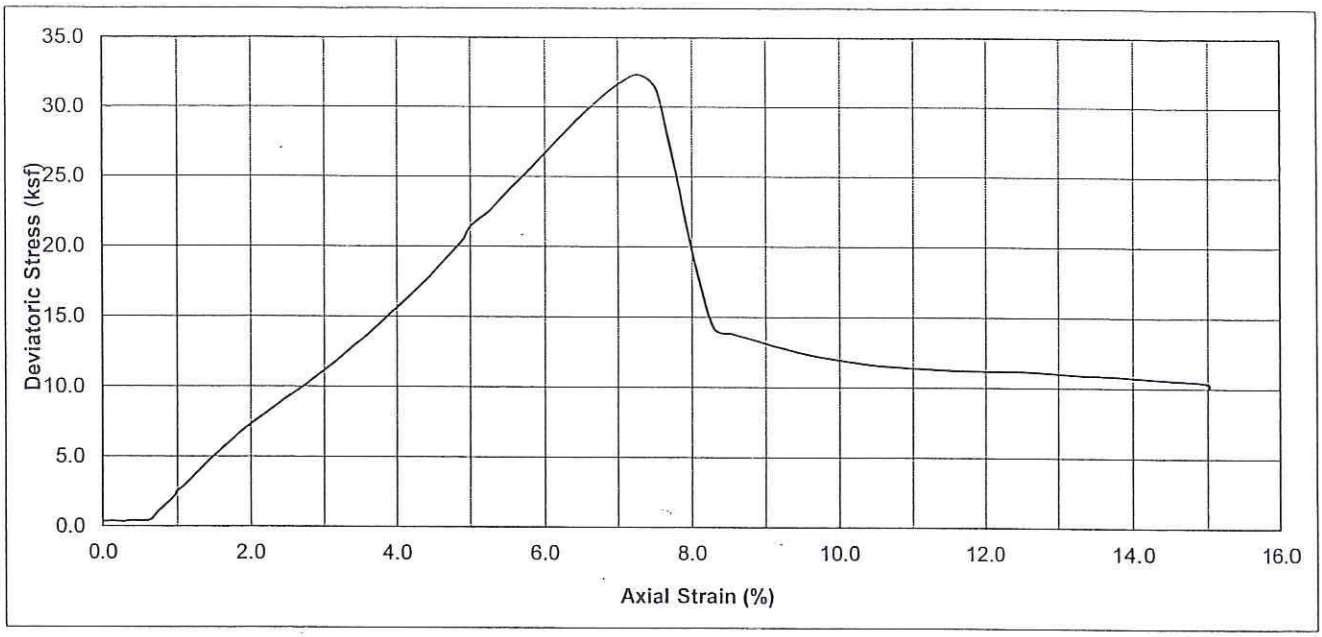
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136 Date : 11/10/11	(ASTM D2850) Figure No. :

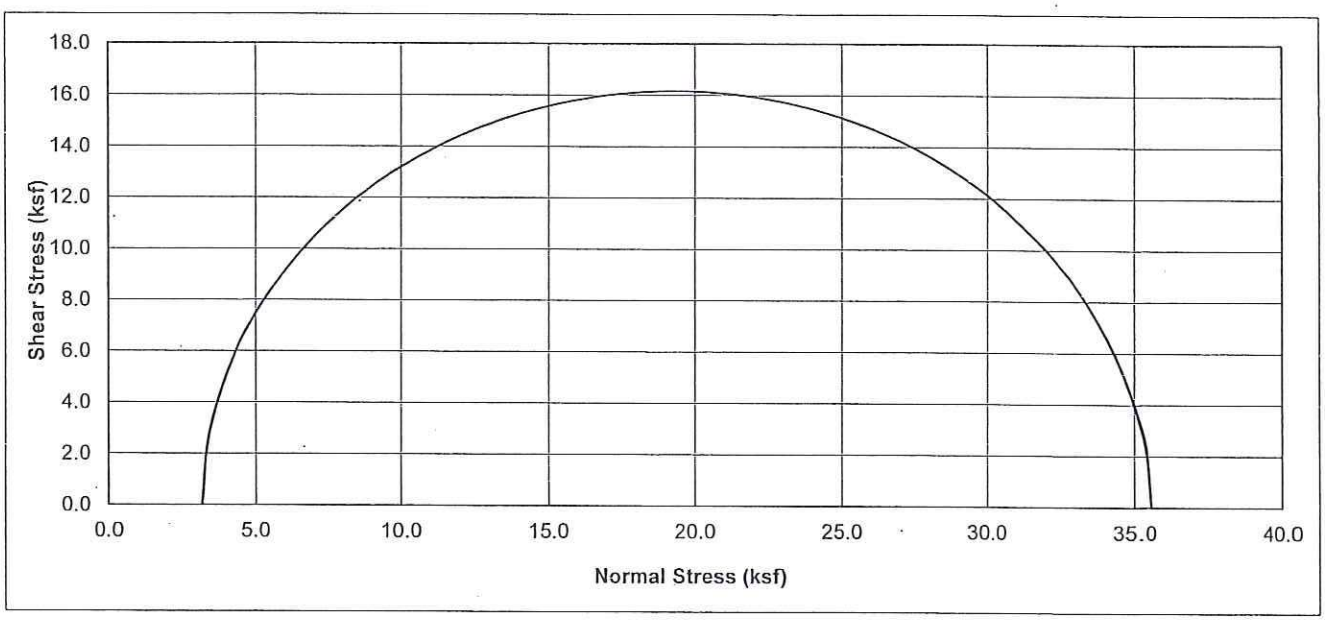




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-262	D-4	15	Olive Brown, SILT With CLAY (ML) to Lean CLAY (CL)	106.2	15.31	1.13	12.25	70.6

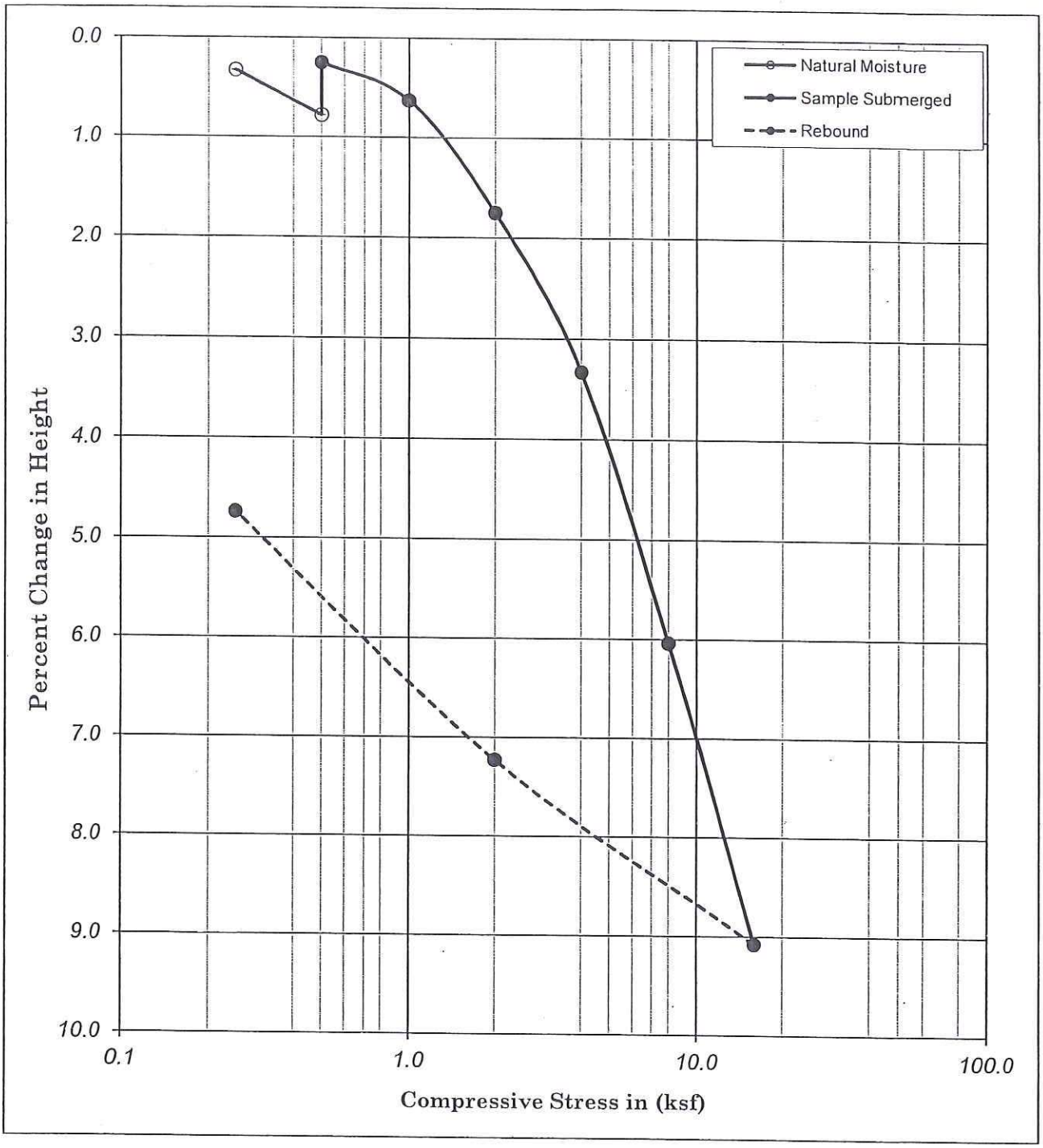
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136	Date : 11/23/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :





Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-264	D-7	40	Dk. Grey, Elastic SILT (MH)	92.7	27.71	3.16	32.33	91.5

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 / Date : 11/23/11	Figure No. :



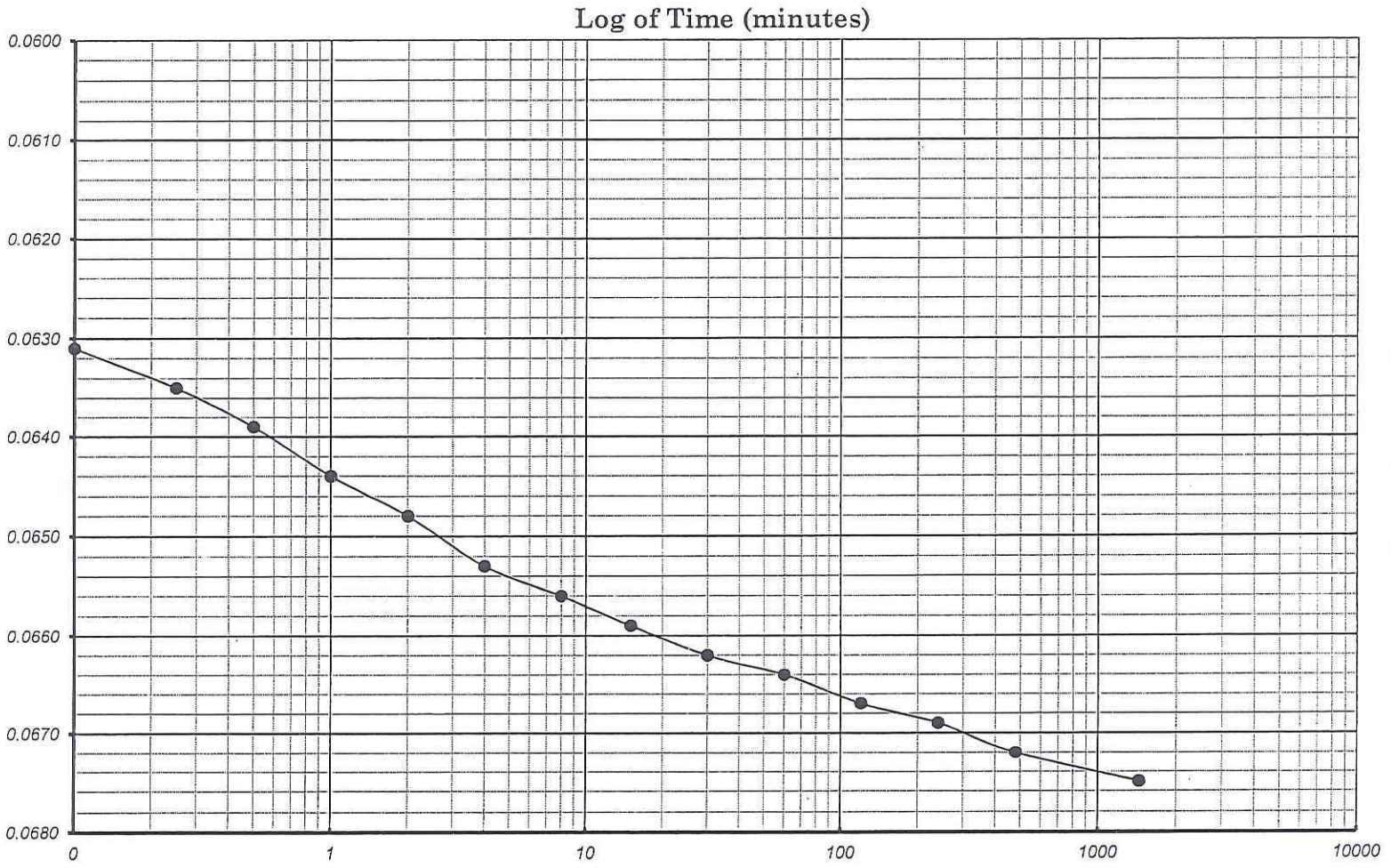
Boring No. : A-11-202				Liquid Limit :	-		Moisture Content (%)	Dry Density		Percent Saturation	Void Ratio
Sample No. : D-2				Plastic Limit :	-			(pcf)	(kN/m³)		
Depth	(ft) :	10.0	11.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
	(m) :	3.05	3.51	Specific Gravity :	2.70	Final	31.08	91.60	14.42	99.88	0.84
Description : Dark olive-brown with yellowish brown , Lean CLAY (CL)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

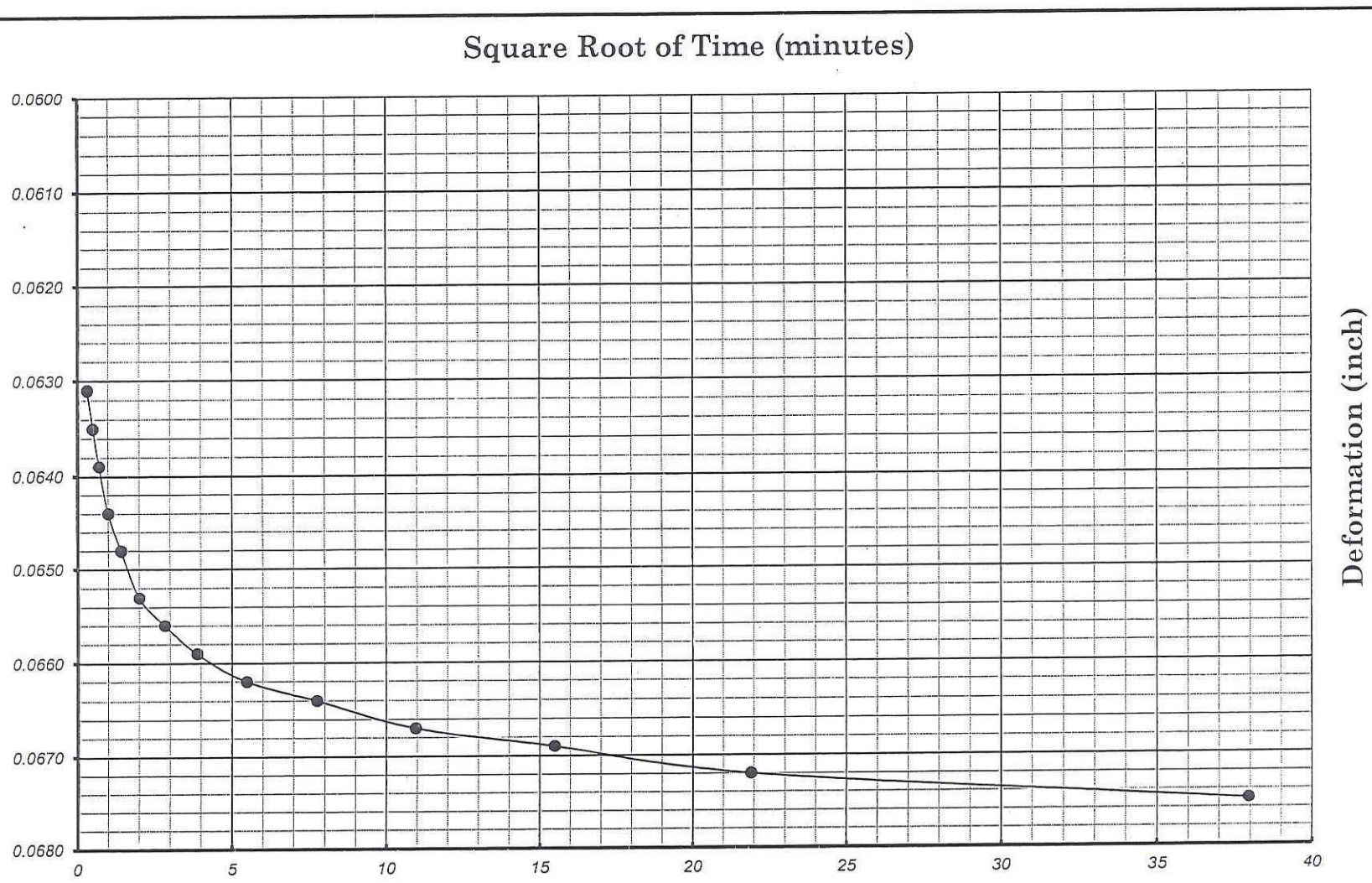
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

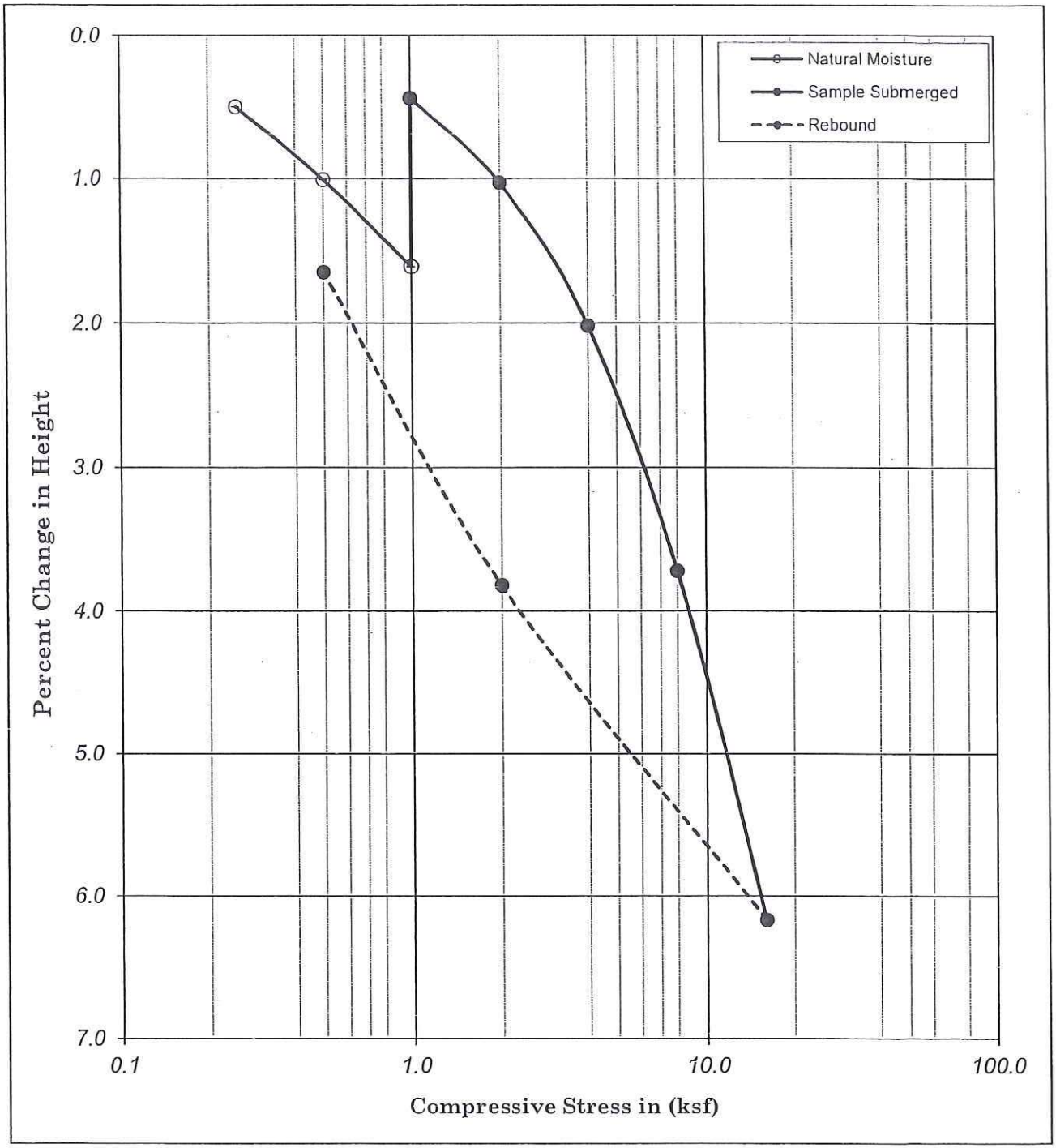
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-202	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 10.0 | 3.1	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-202*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



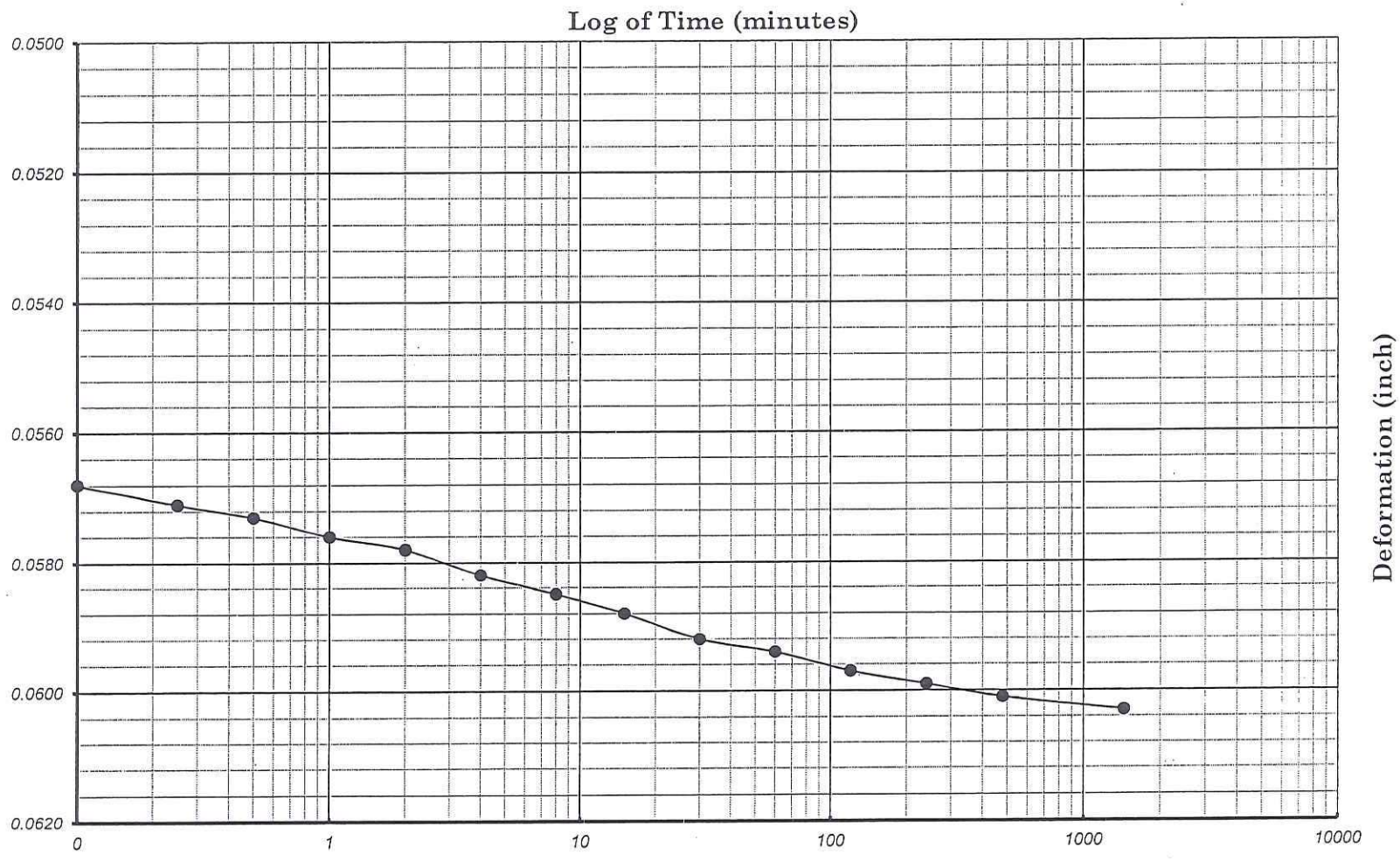
Boring No.	: A-11-216			Liquid Limit :	-		Moisture Content (%)	Dry Density		Percent Saturation	Void Ratio
Sample No.	: D-4			Plastic Limit :	-			(pcf)	(kN/m³)		
Depth	(ft) :	15.0	16.5	Plastic Index :	-	Initial	28.27	94.25	14.84	96.81	0.79
	(m) :	4.58	5.03	Specific Gravity :	2.70	Final	28.77	95.86	15.09	102.43	0.76
Description : Mottled very dark brown, yellowish brown, white, olive-gray, Fat CLAY (CH)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

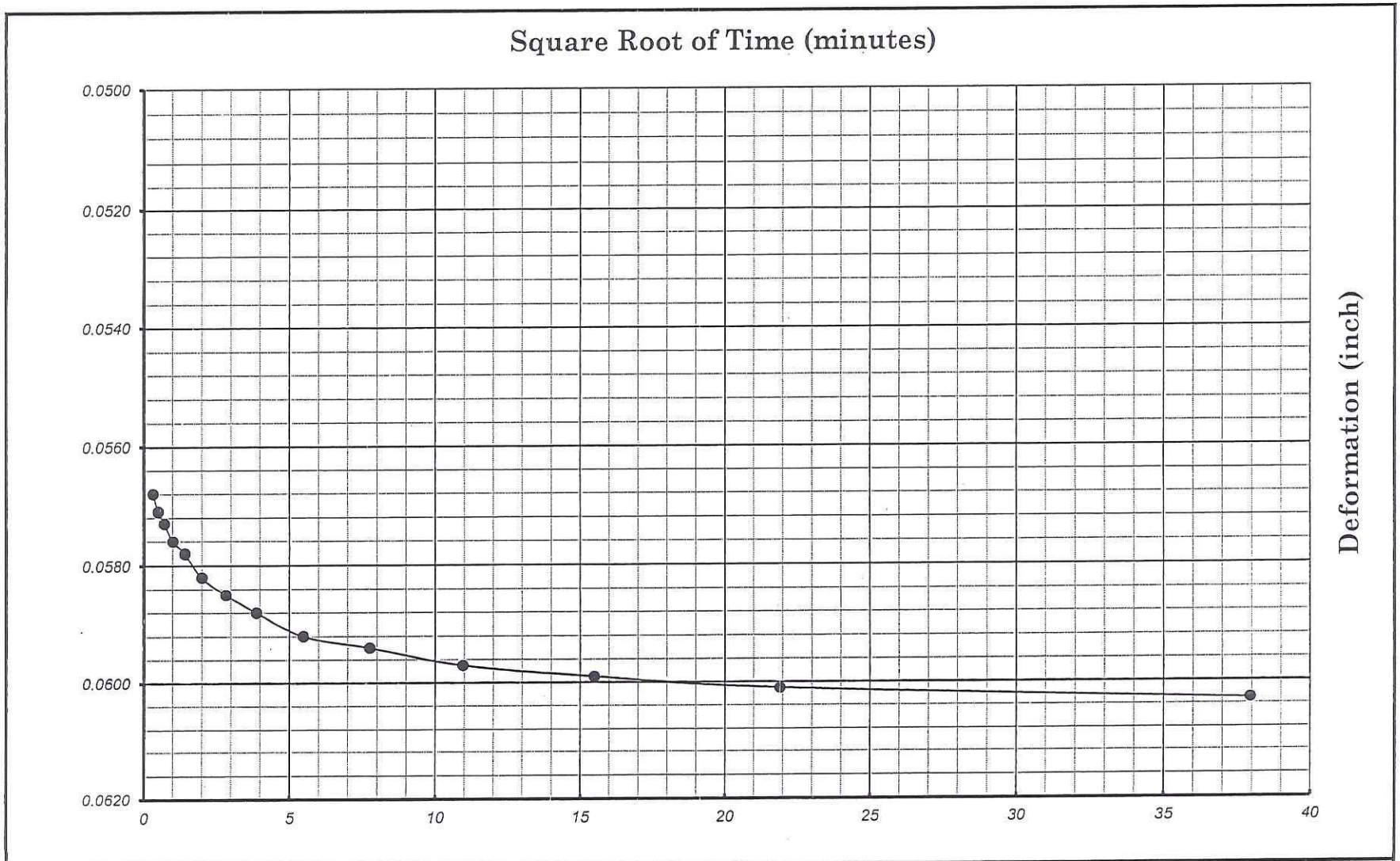
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

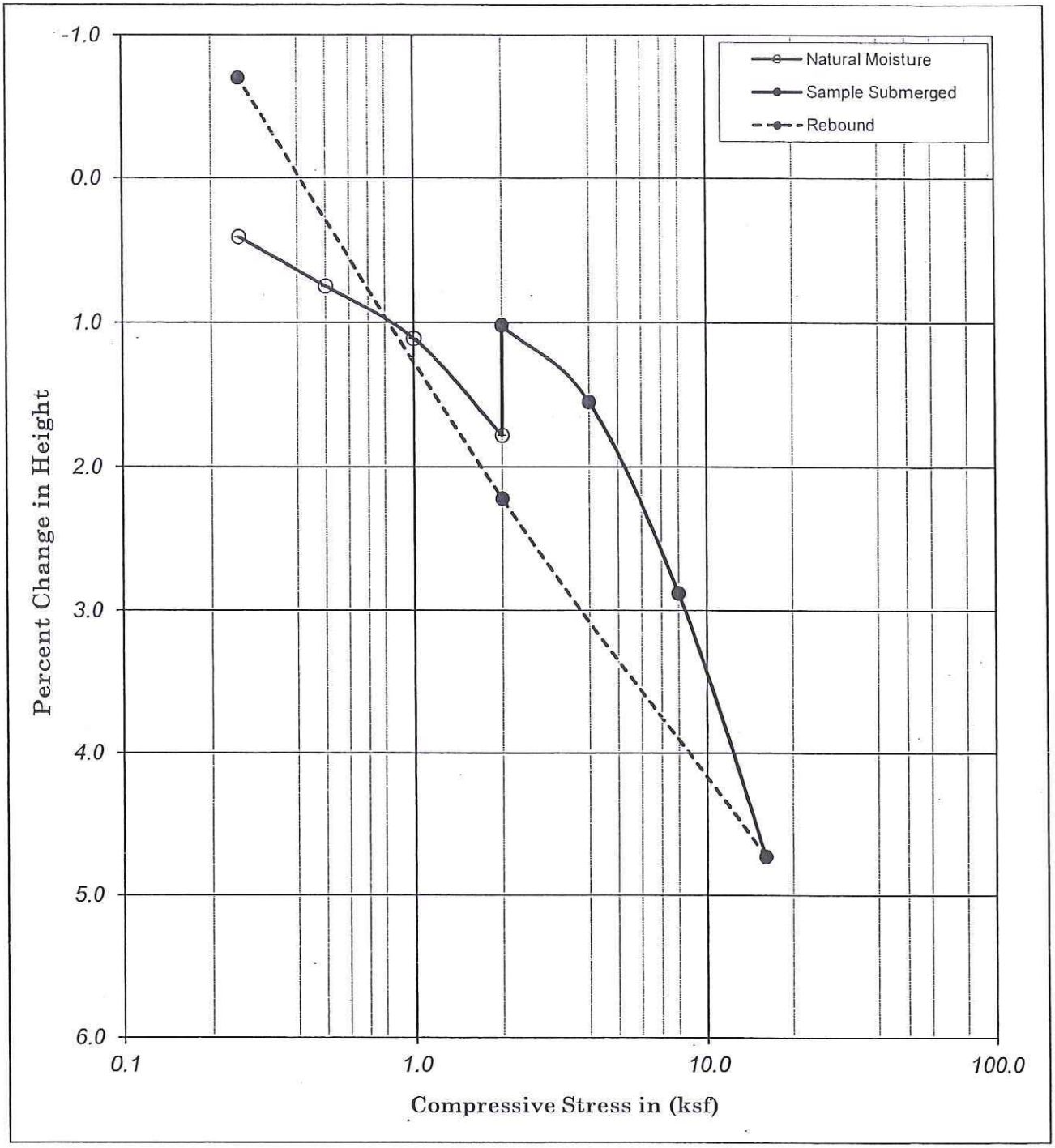
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-216	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-4	
EMI Project No. : 11-136		Depth (ft/m) : 15.0 4.6	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-216	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-4	
EMI Project No. : 11-136		Depth (ft/m) : 15.0 4.6	eritcal Load (ksf/kpa) : 2.0 95.8



Boring No.	: A-11-221		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-7		Plastic Limit :	-						
Depth (ft)	: 35.0	36.5	Plastic Index :	-	Initial	20.34	107.64	16.94	97.05	0.57
Depth (m)	: 10.68	11.13	Specific Gravity :	2.70	Final	22.15	106.90	16.83	103.69	0.58

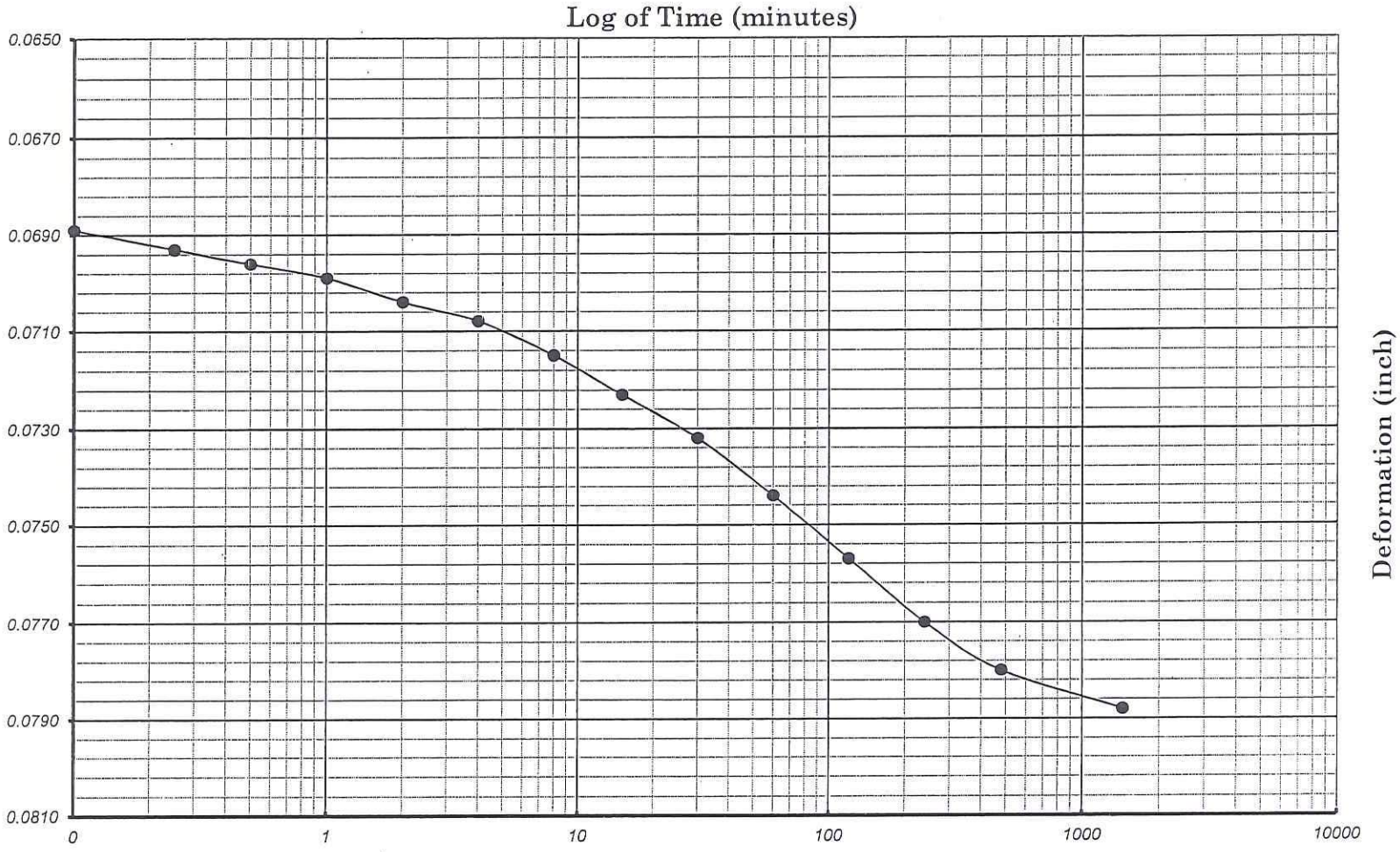
Description : Olive-brown, Fat CLAY (CH)

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

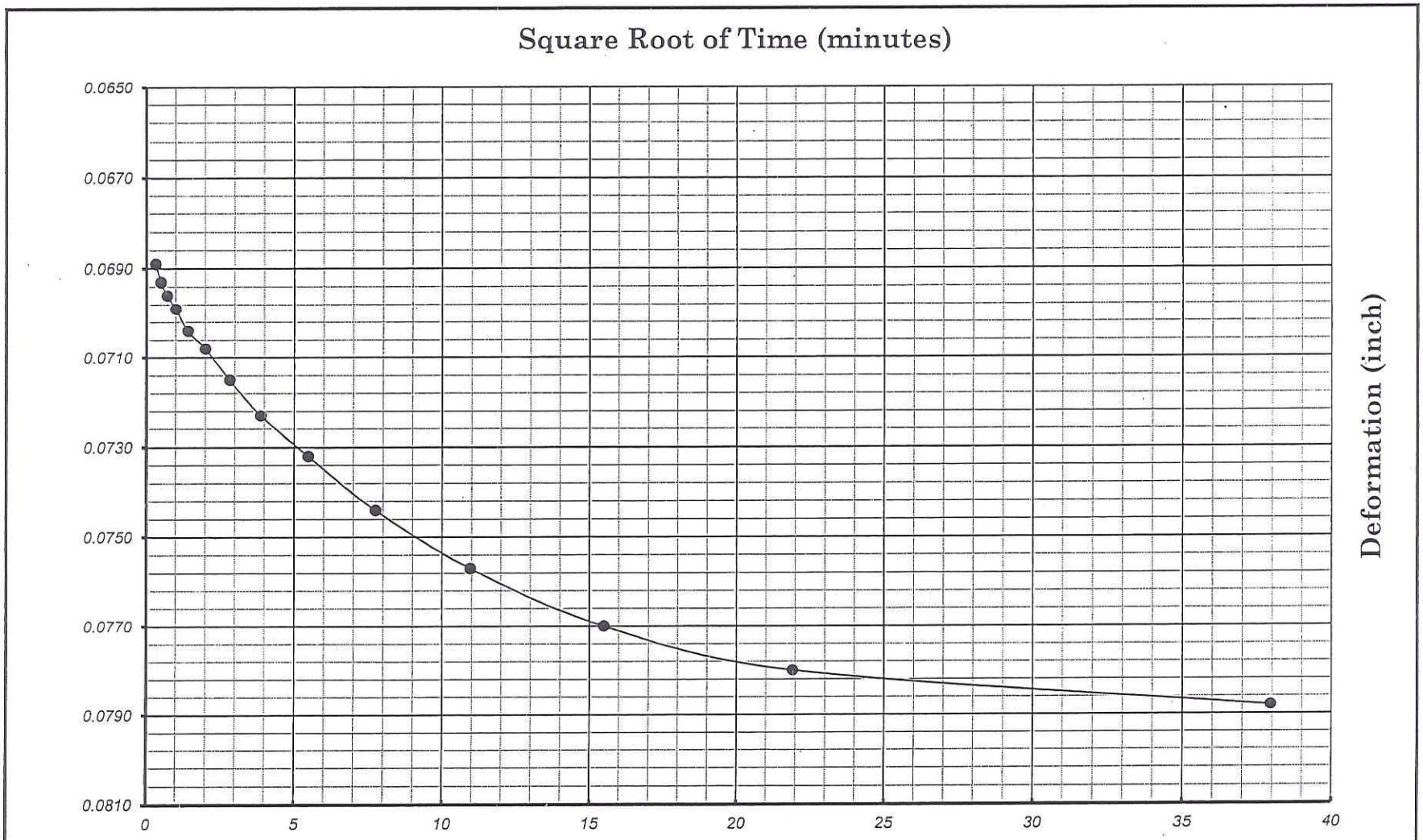
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

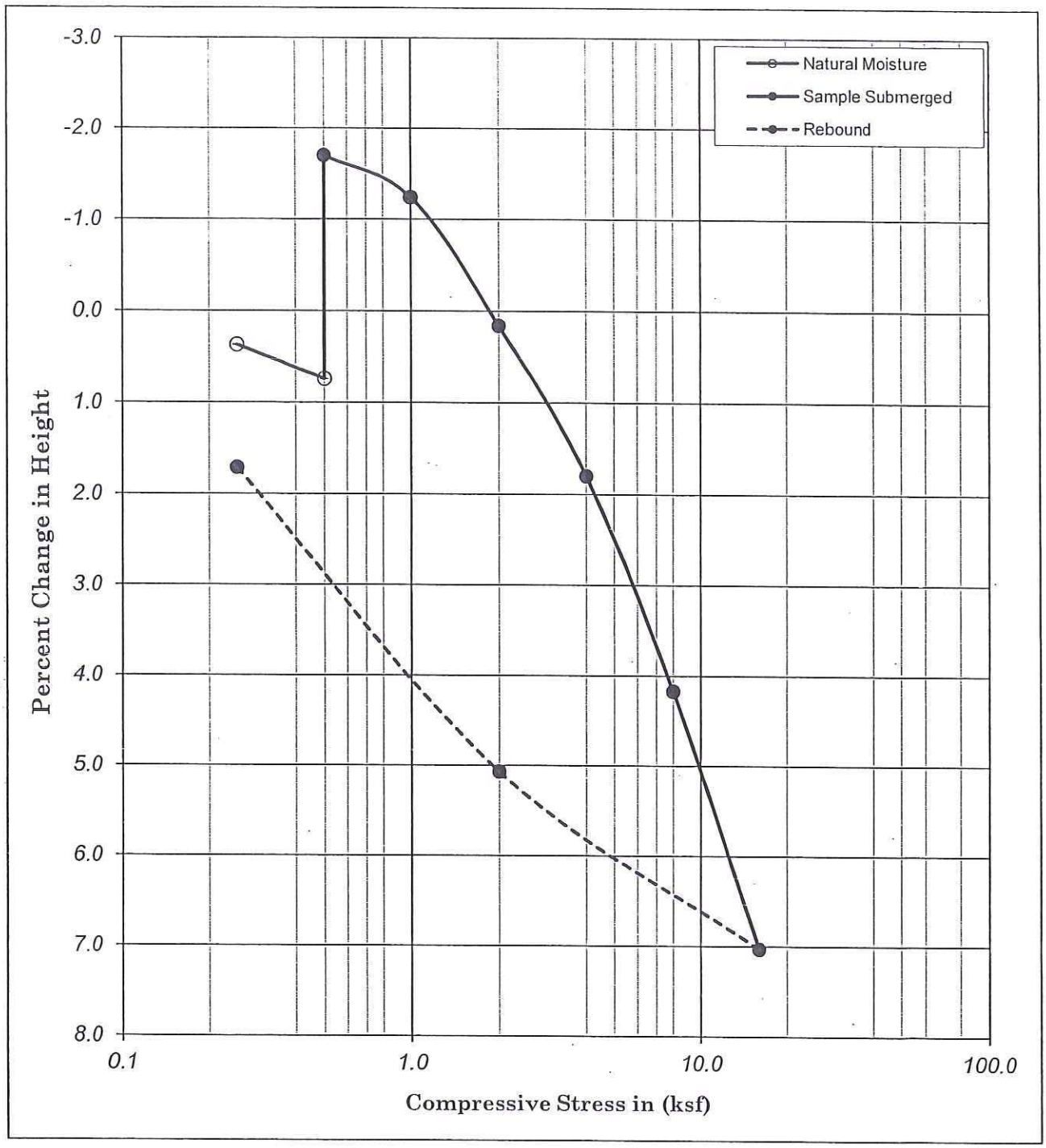
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-221*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-7*	
EMI Project No. : *11-136*		Depth (ft/m) : *35.0* *10.7*	Veritcal Load (ksf/kpa) : *8.00* *383.0*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-221*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-7*	
EMI Project No. : *11-136*		Depth (ft/m) : *35.0* *10.7*	Veritcal Load (ksf/kpa) : *8.0* *383.0*



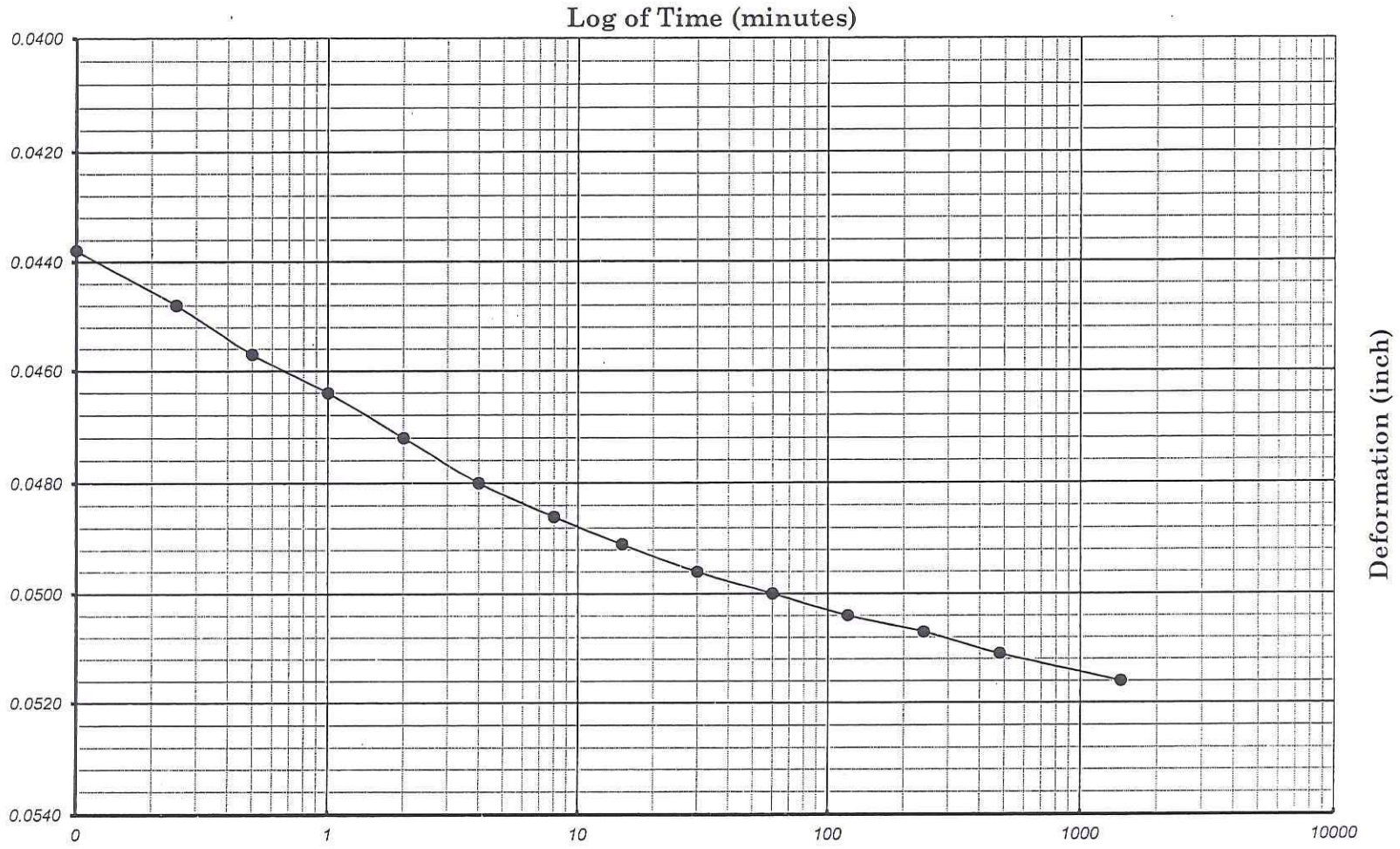
Boring No. : A-11-222				Liquid Limit :	-		Moisture Content (%)	Dry Density		Percent Saturation	Void Ratio
Sample No. : D-2				Plastic Limit :	-			(pcf)	(kN/m³)		
Depth	(ft) :	10.0	11.5	Plastic Index :	-	Initial	15.04	102.99	16.21	63.77	0.64
	(m) :	3.05	3.51	Specific Gravity :	2.70	Final	22.36	104.79	16.49	99.19	0.61
Description : Olive-yellow with olive-brown, Lean CLAY (CL)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

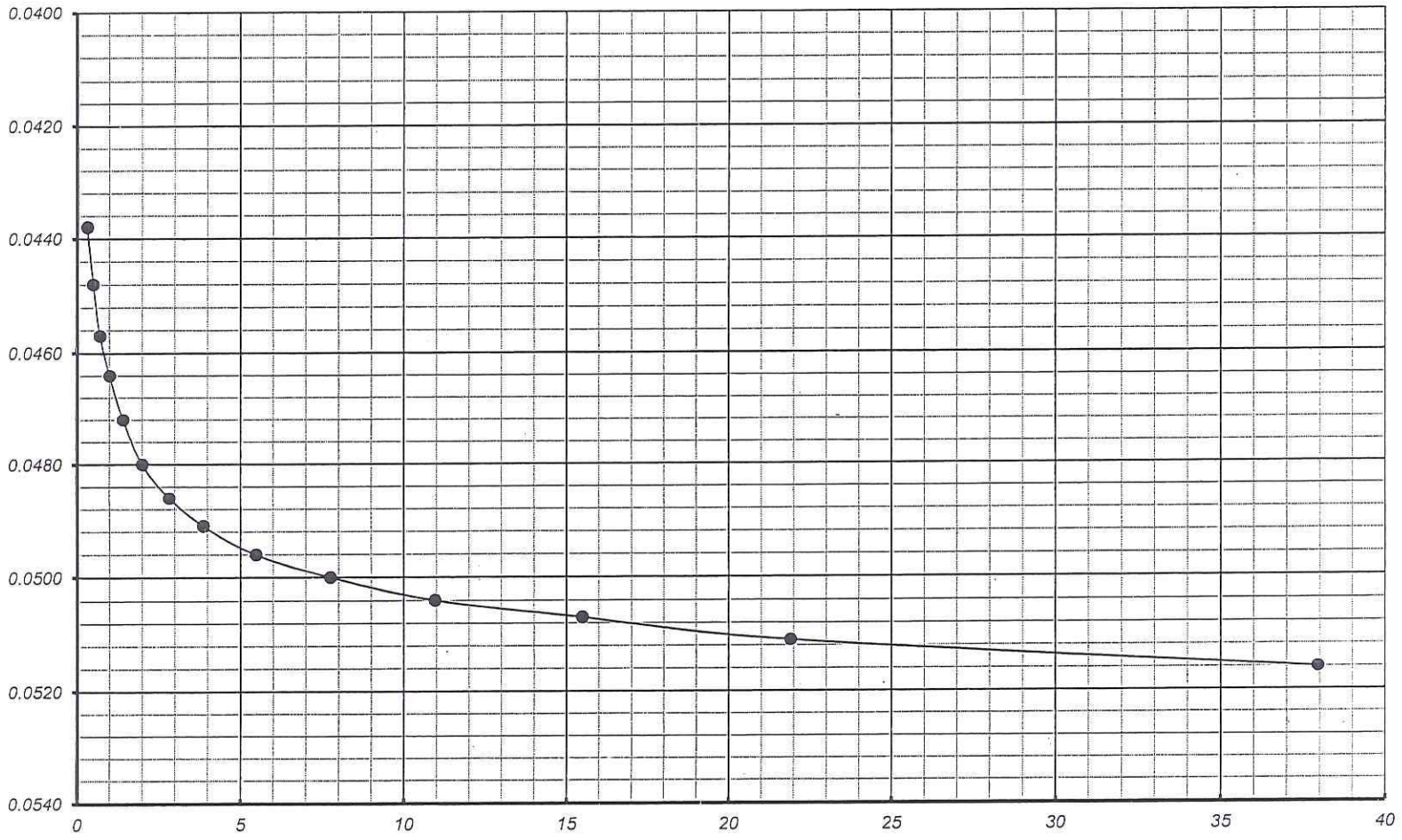
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

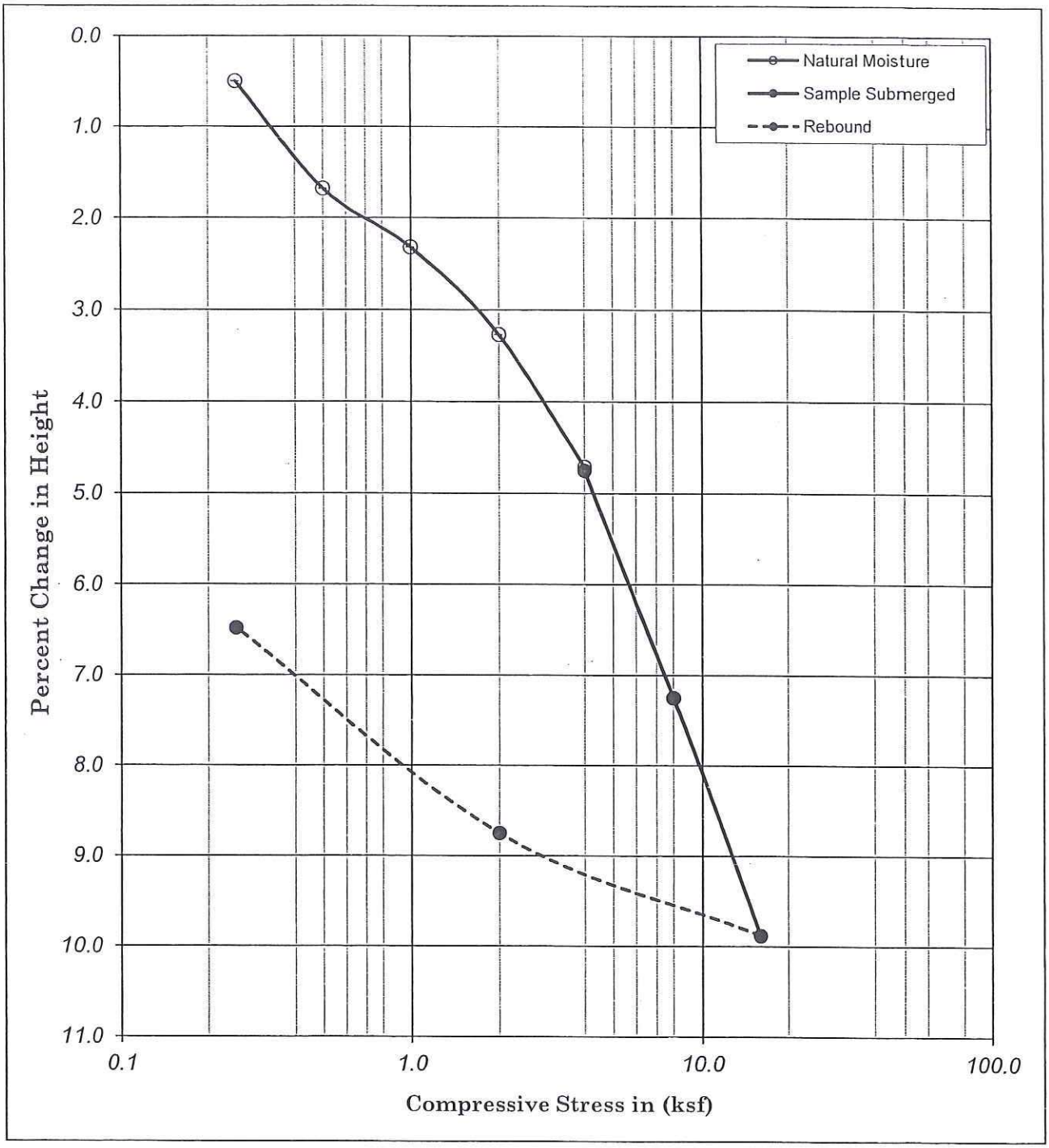
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-222	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 10.0 3.1	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-222*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



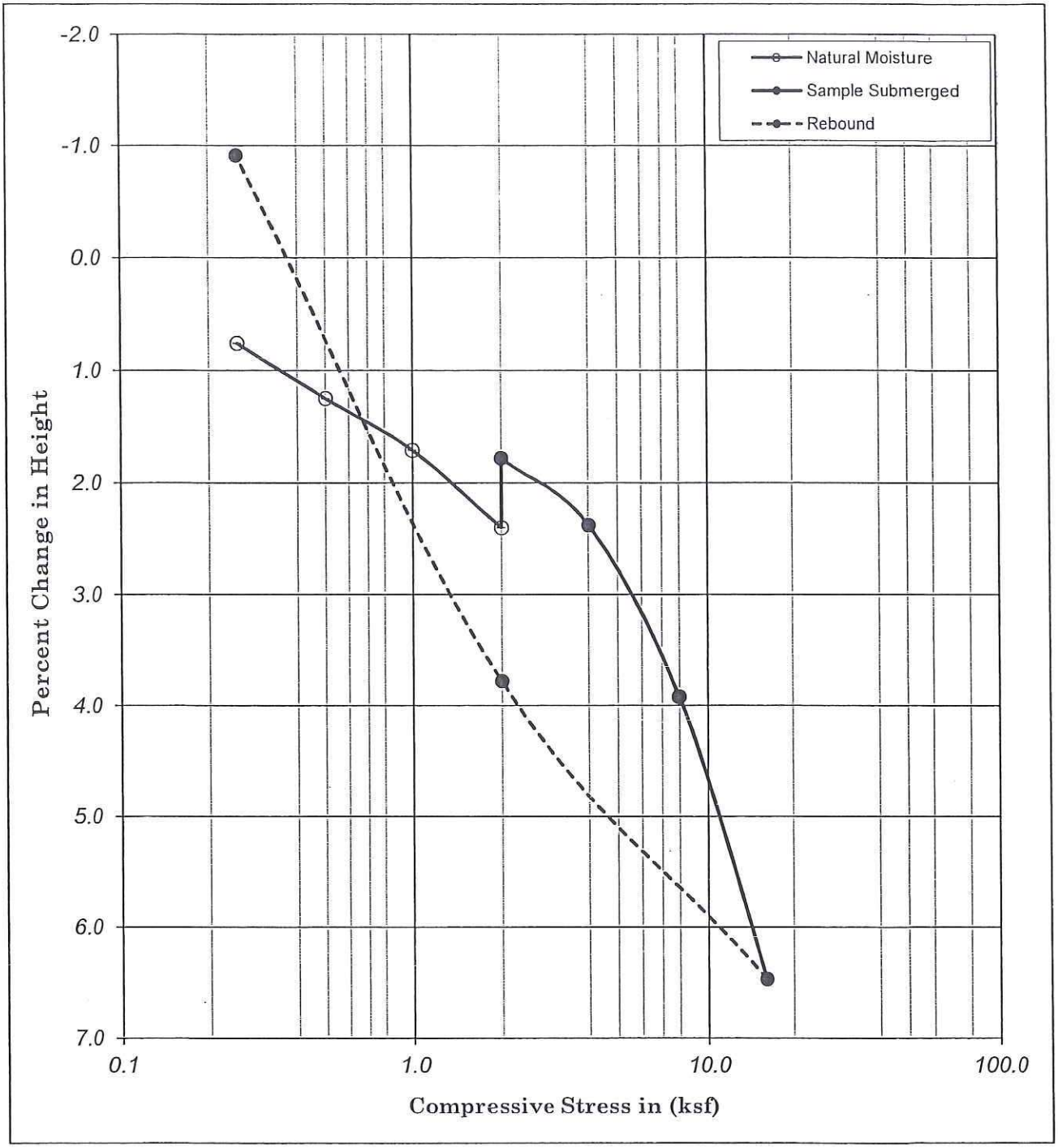
Boring No. : A-11-222				Liquid Limit :	-		Moisture Content (%)	Dry Density		Percent Saturation	Void Ratio
Sample No. : D-12				Plastic Limit :	-			(pcf)	(kN/m³)		
Depth	(ft) :	60.0	61.5	Plastic Index :	-	Initial	24.48	100.83	15.87	98.39	0.67
	(m) :	18.30	18.76	Specific Gravity :	2.70	Final	21.87	107.83	16.97	104.85	0.56
Description : Olive-brown with white, Lean CLAY with SAND (CL)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Boring No.	: A-11-224		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-5		Plastic Limit :	-						
Depth (ft)	: 25.0	26.5	Plastic Index :	-	Initial	32.66	87.85	13.83	95.97	0.92
Depth (m)	: 7.63	8.08	Specific Gravity :	2.70	Final	34.90	87.08	13.71	100.72	0.94

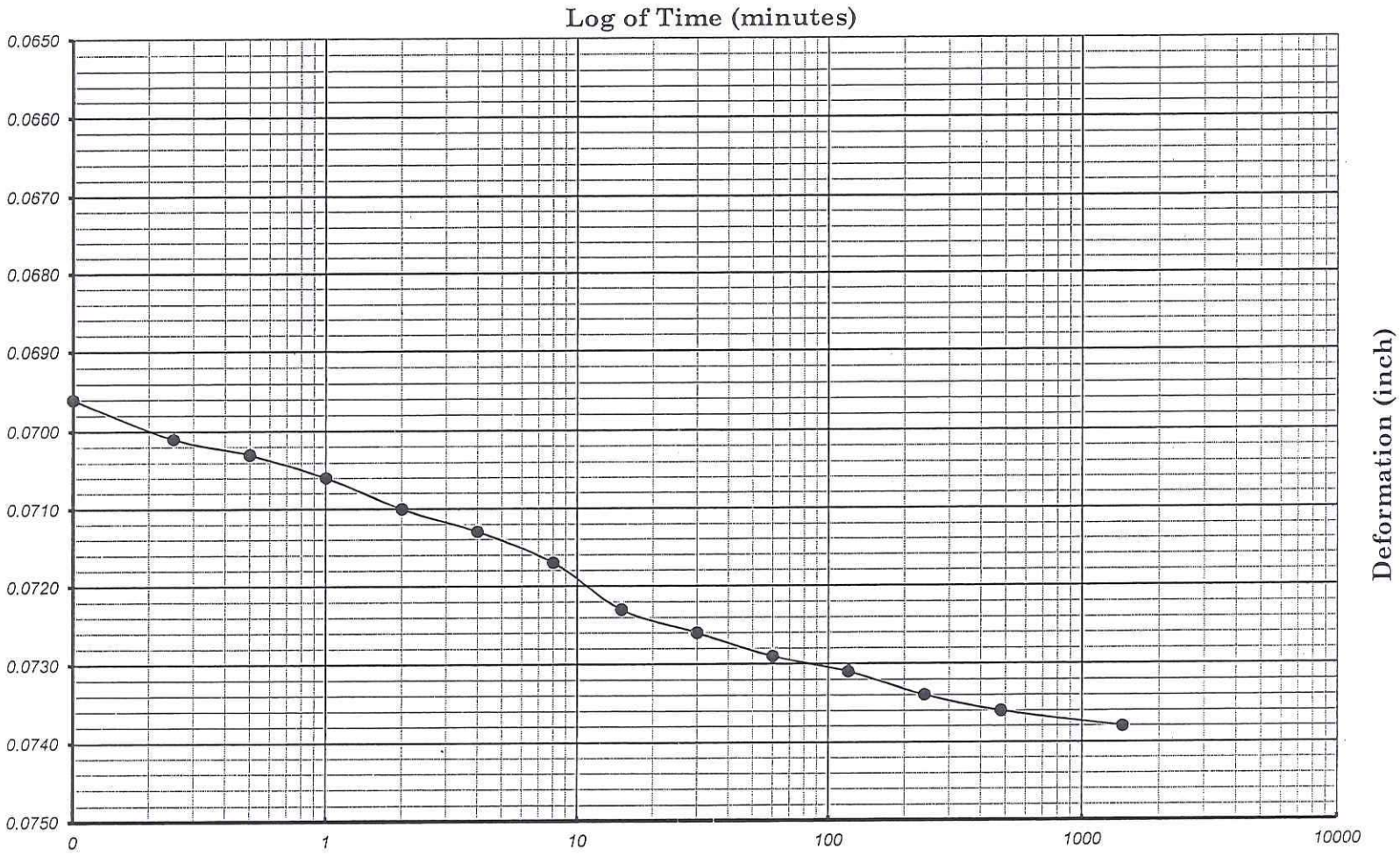
Description : *Olive-yellow with olive-brown, Lean CLAY (CL)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

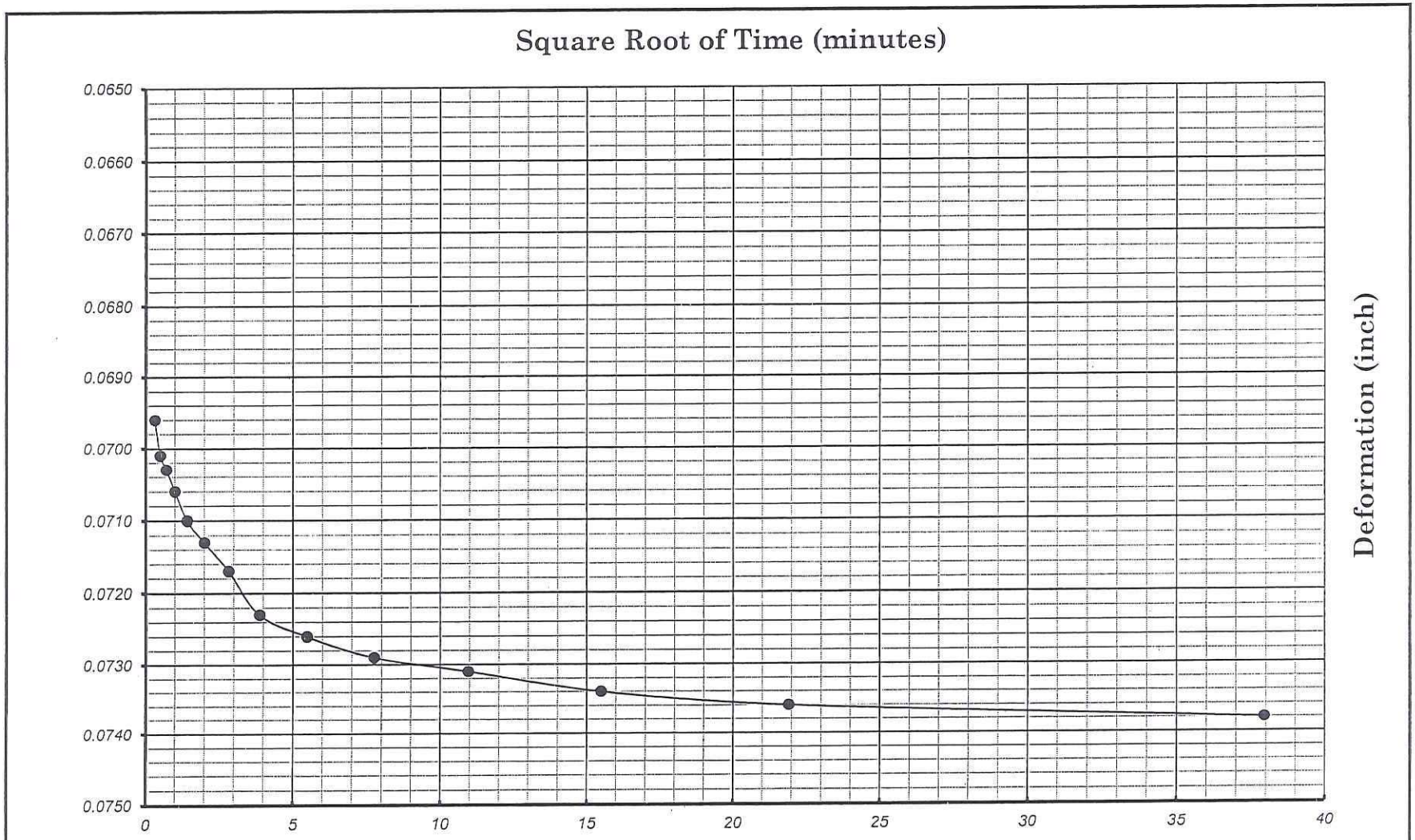
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

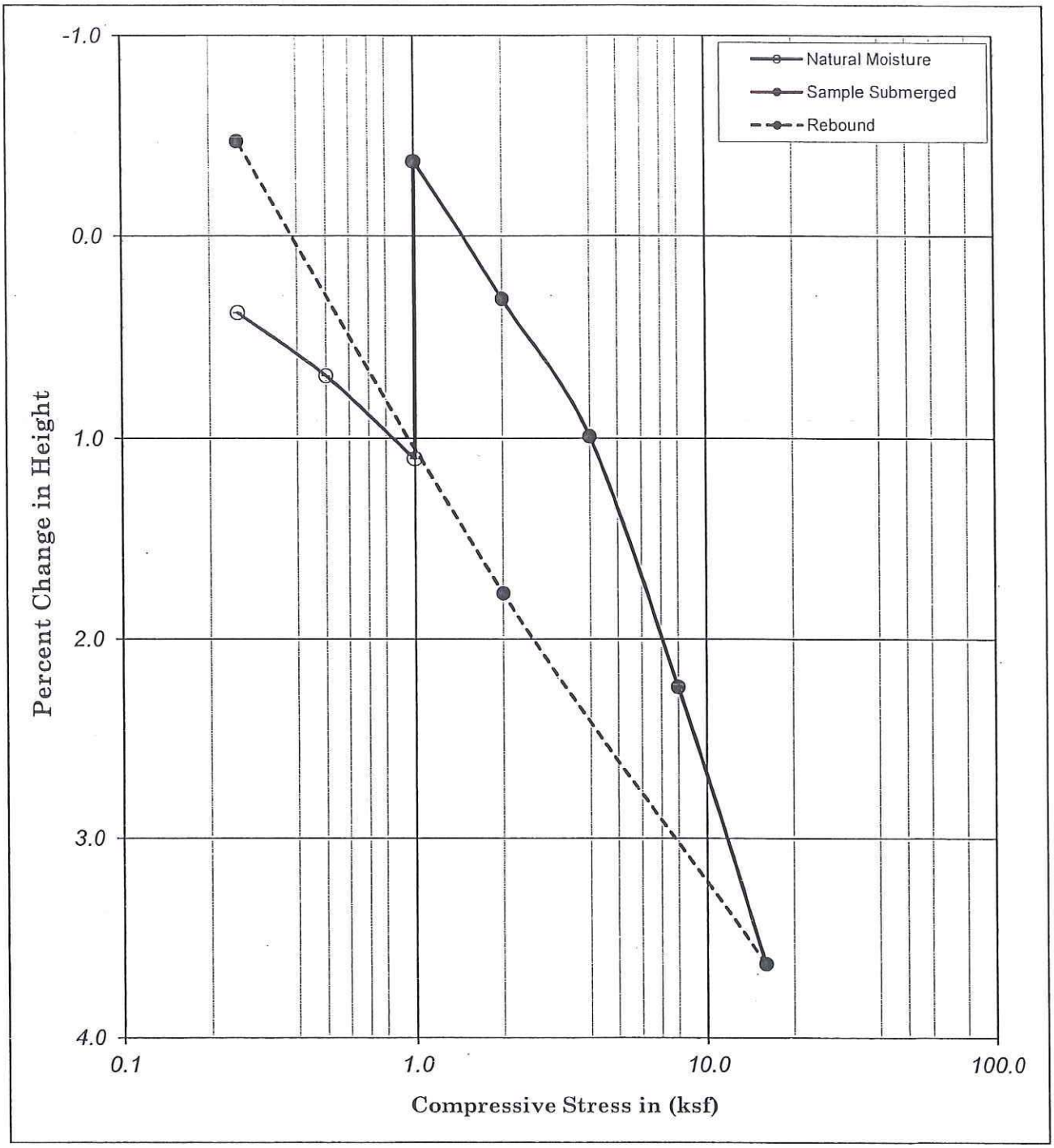
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-224	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-5	
EMI Project No. : 11-136		Depth (ft/m) : 25.0 7.6	Veritcal Load (ksf/kpa) : 4.00 191.5



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-224*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-5*	
EMI Project No. : *11-136*		Depth (ft/m) : *25.0* *7.6*	eritcal Load (ksf/kpa) : *4.0* *191.5*



Boring No.	: A-11-226		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-3		Plastic Limit :	-						
Depth (ft)	: 10.0	11.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
Depth (m)	: 3.05	3.51	Specific Gravity :	2.70	Final	31.08	86.87	13.67	89.23	0.94

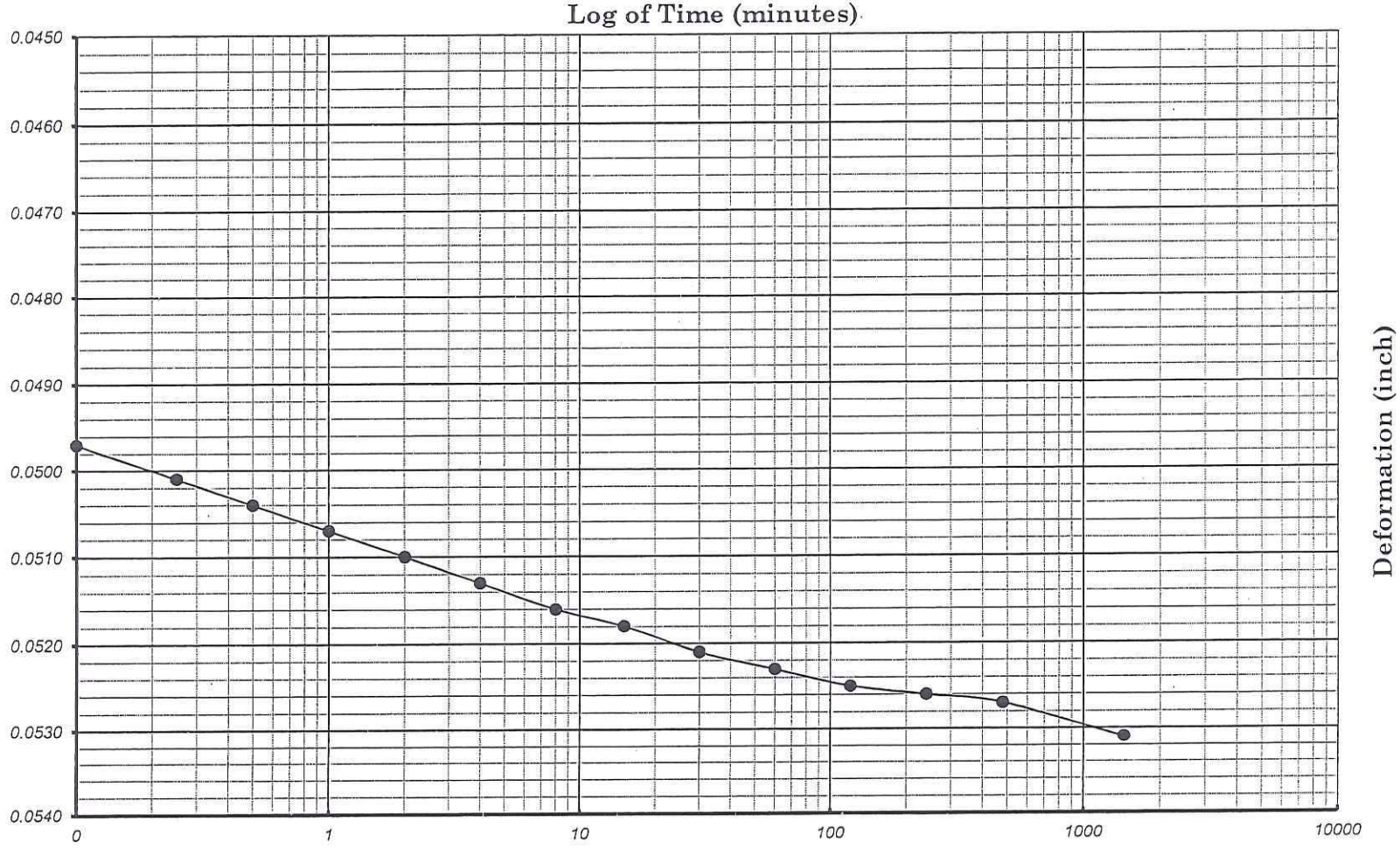
Description : *Dark olive-gray, Elastic SILT (MH)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

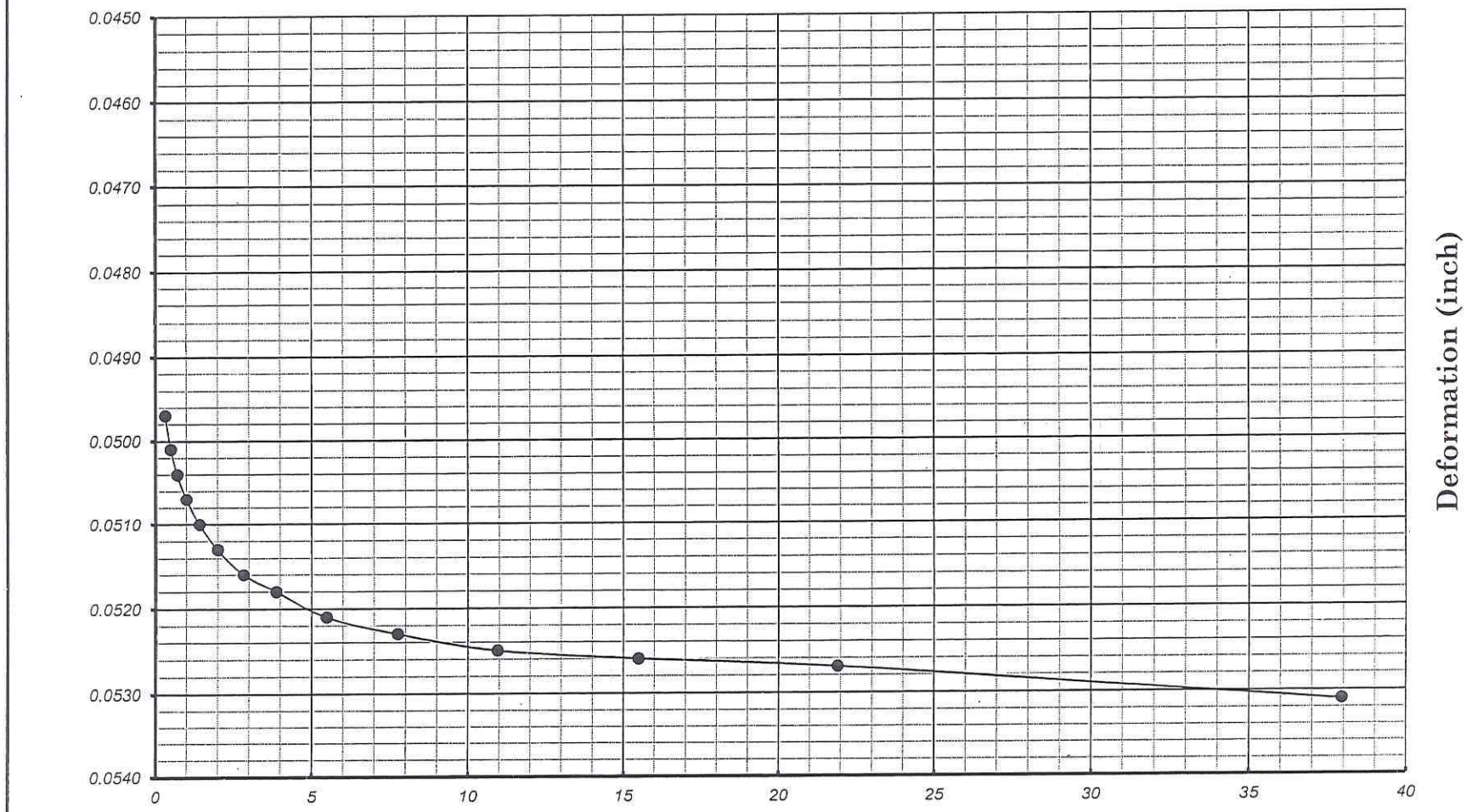
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

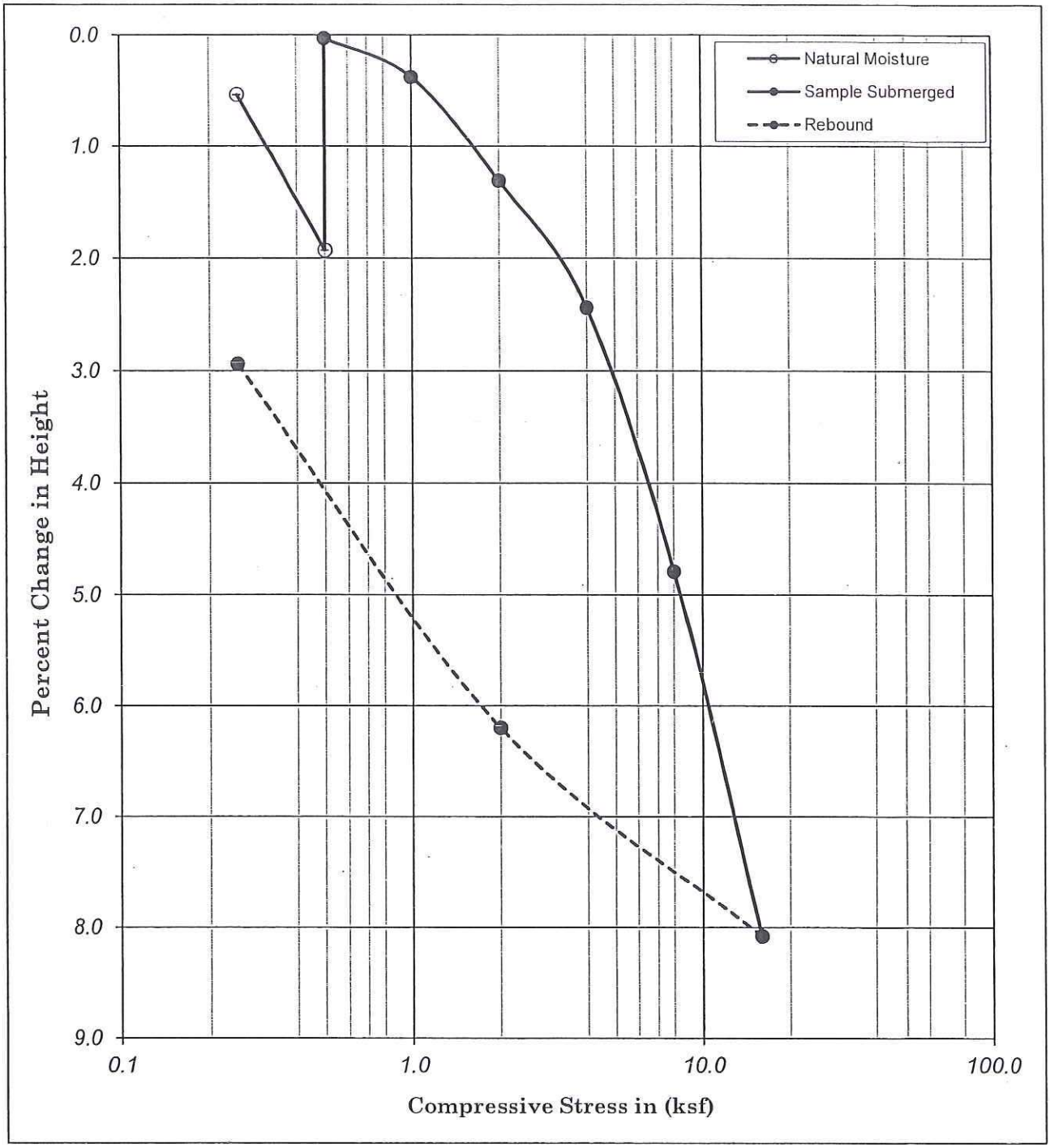
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-226*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-3*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.00* *95.8*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-226	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-3	
EMI Project No. : 11-136		Depth (ft/m) : 10.0 3.1	Veritcal Load (ksf/kpa) : 2.0 95.8



Boring No.	: A-11-233		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-2		Plastic Limit :	-						
Depth (ft)	: 5.0	6.5	Plastic Index :	-	Initial	19.80	105.16	16.55	88.67	0.60
Depth (m)	: 1.53	1.98	Specific Gravity :	2.70	Final	21.27	108.45	17.07	103.61	0.55

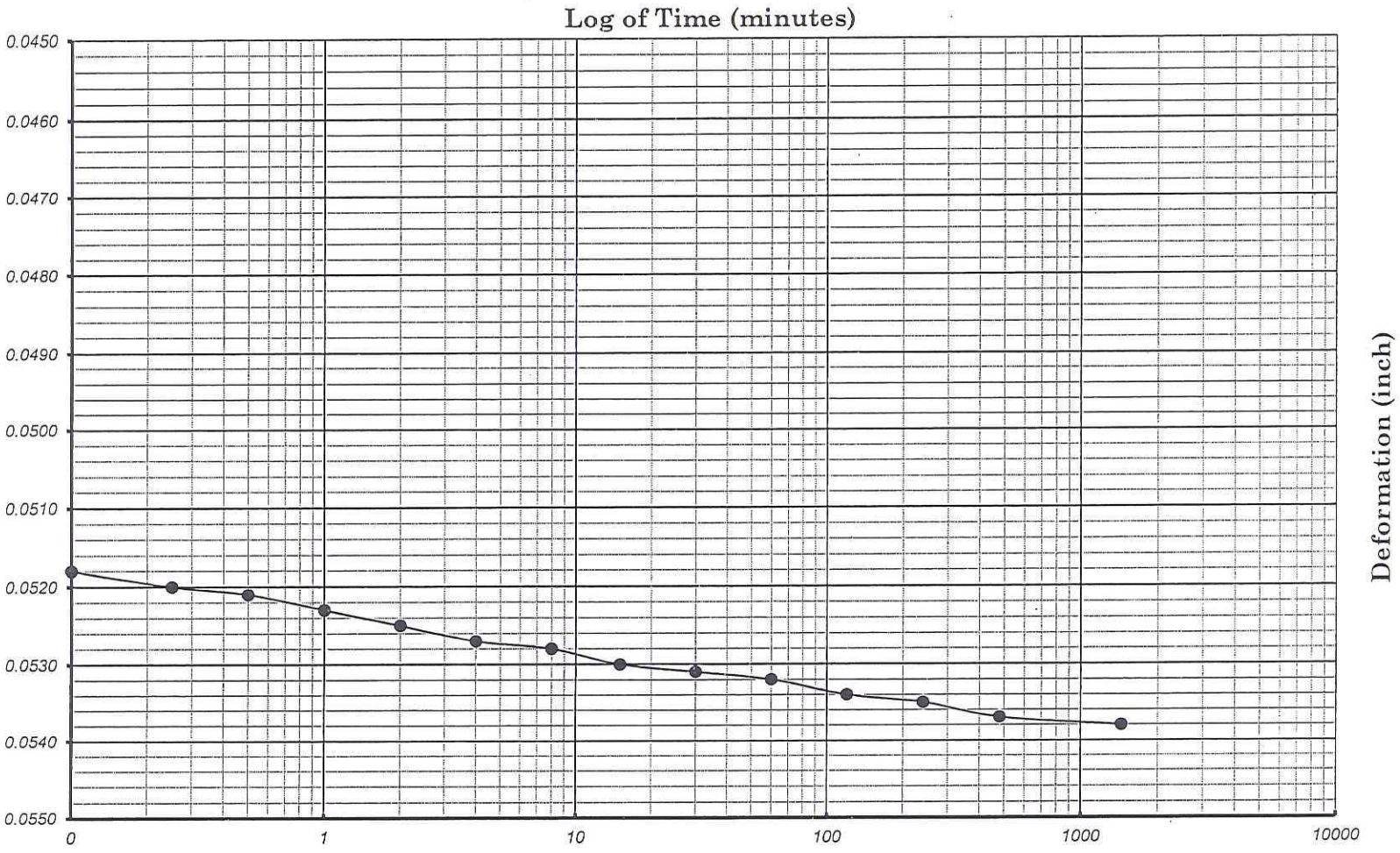
Description : *Olive-brown, Lean CLAY with SAND (CL)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

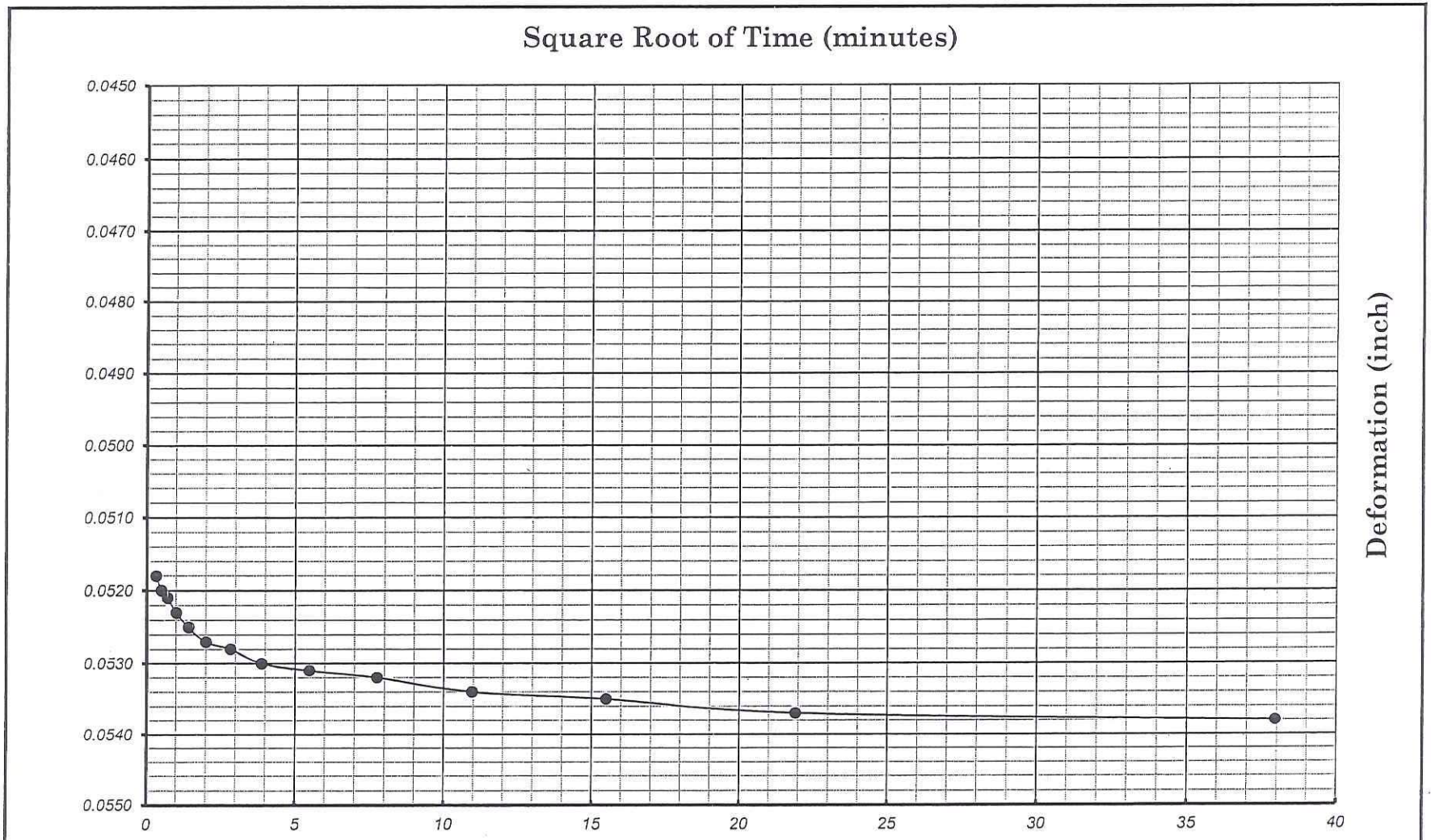
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

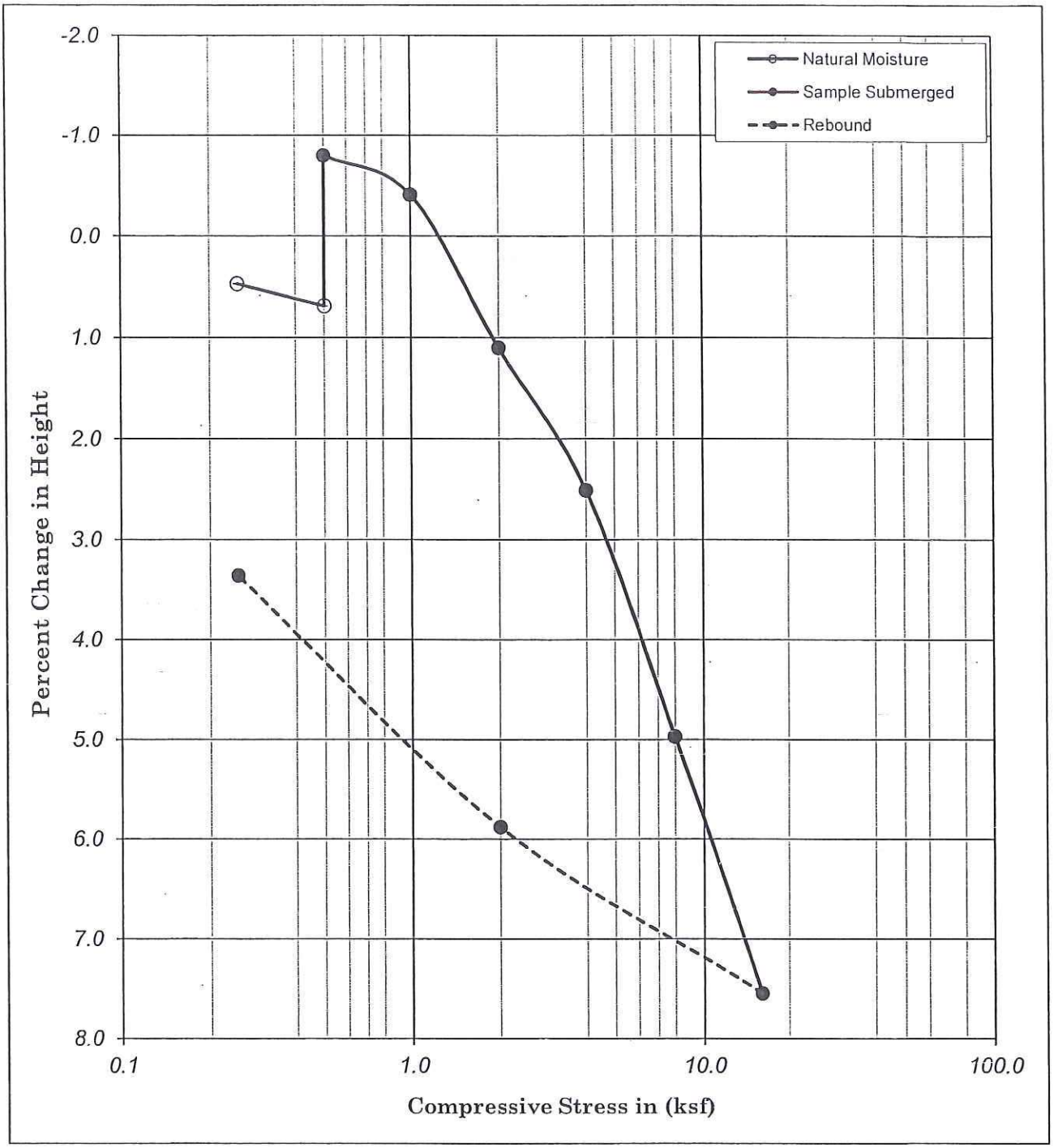
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-233	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 1.00 47.9



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-233*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	eritcal Load (ksf/kpa) : *1.0* *47.9*



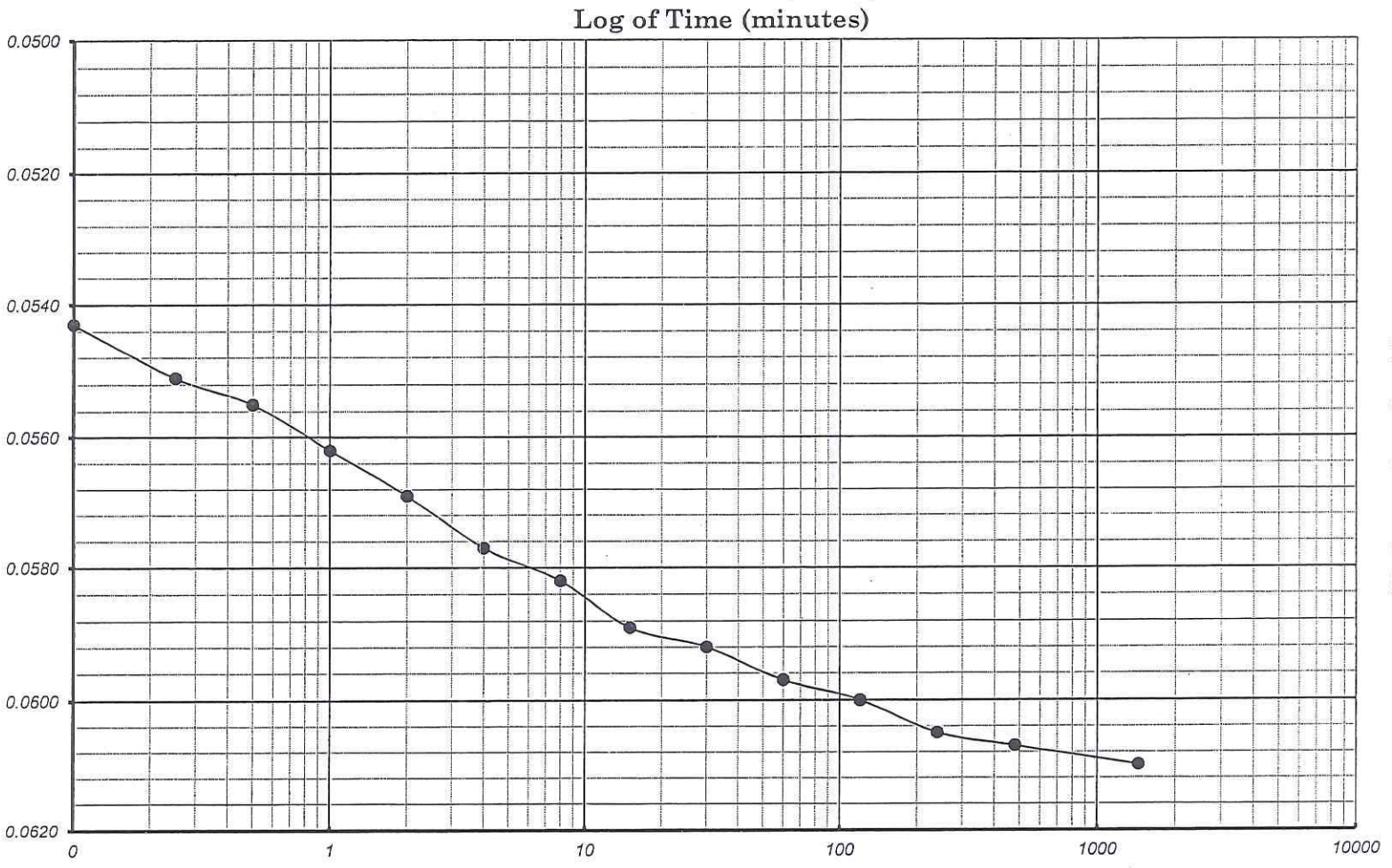
Boring No.	: A-11-262		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-2		Plastic Limit :	-						
Depth (ft)	: 5.0	6.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
Depth (m)	: 1.53	1.98	Specific Gravity :	2.70	Final	31.08	90.30	14.21	96.81	0.87
Description	: Olive-brown, Lean CLAY with SAND (CL)									

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

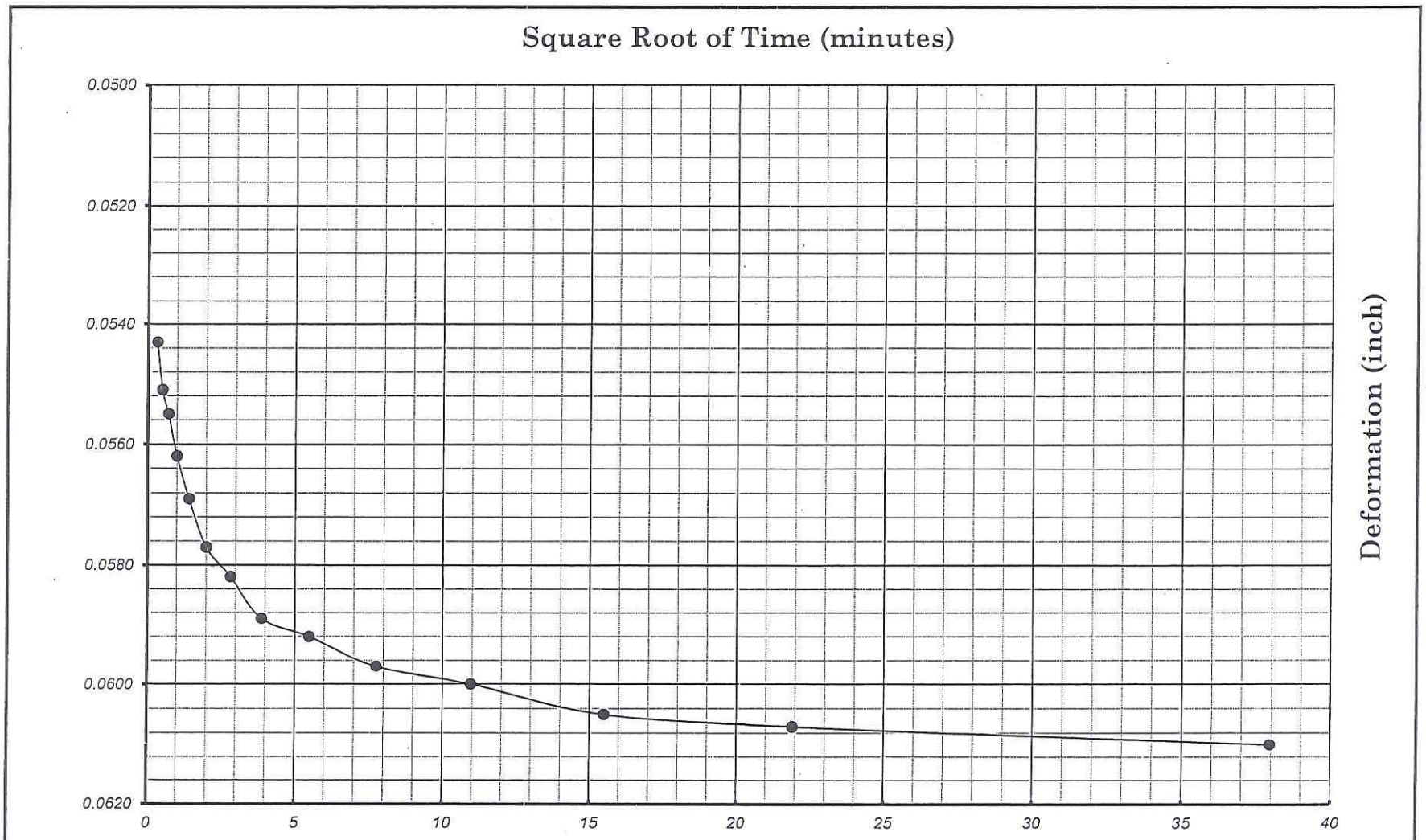
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

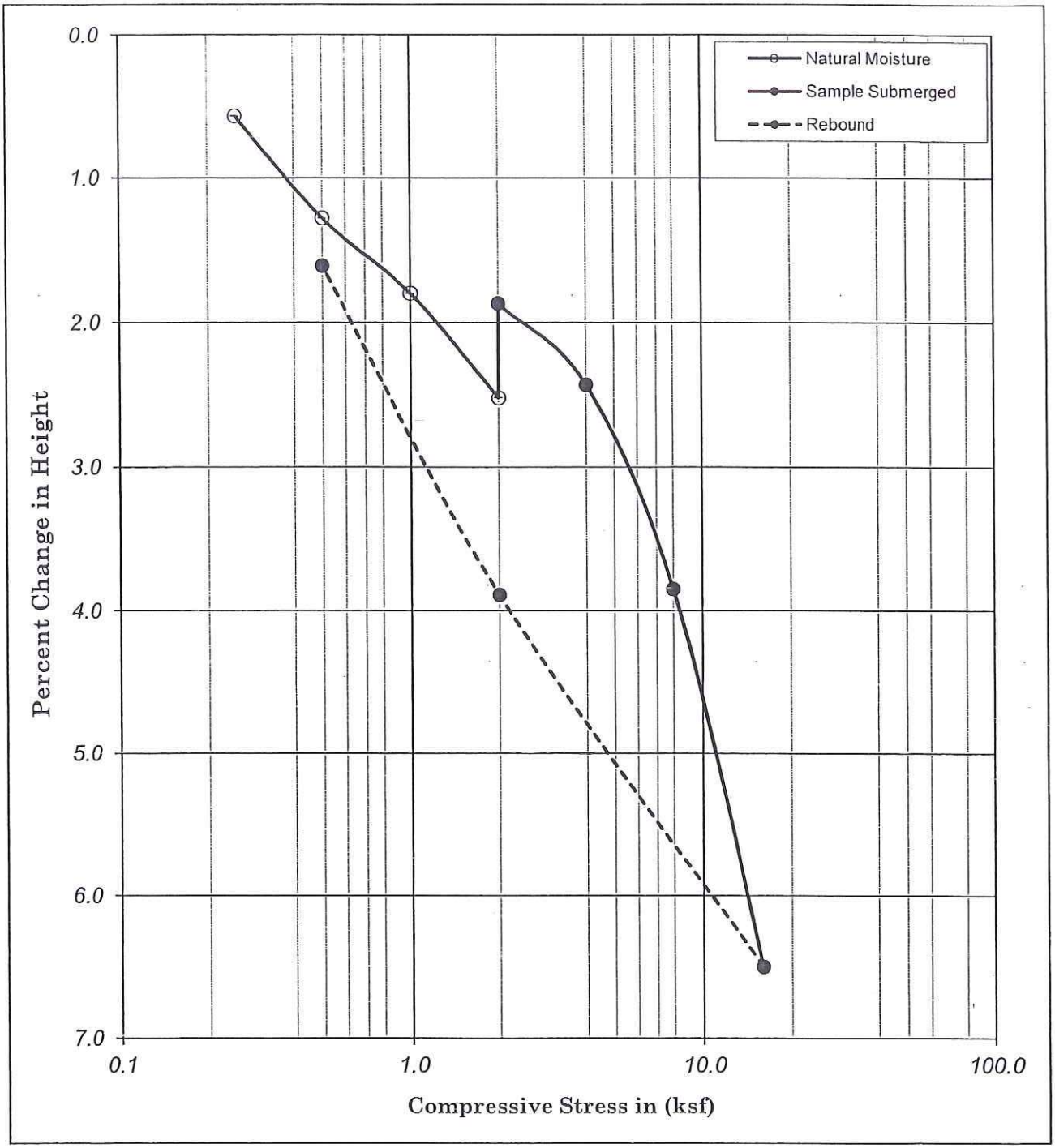
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-262	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-262*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No.	: A-11-263		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-7		Plastic Limit :	-						
Depth (ft)	: 30.0	31.5	Plastic Index :	-	Initial	33.60	88.28	13.90	99.75	0.91
Depth (m)	: 9.15	9.61	Specific Gravity :	2.70	Final	34.08	89.78	14.13	104.87	0.88

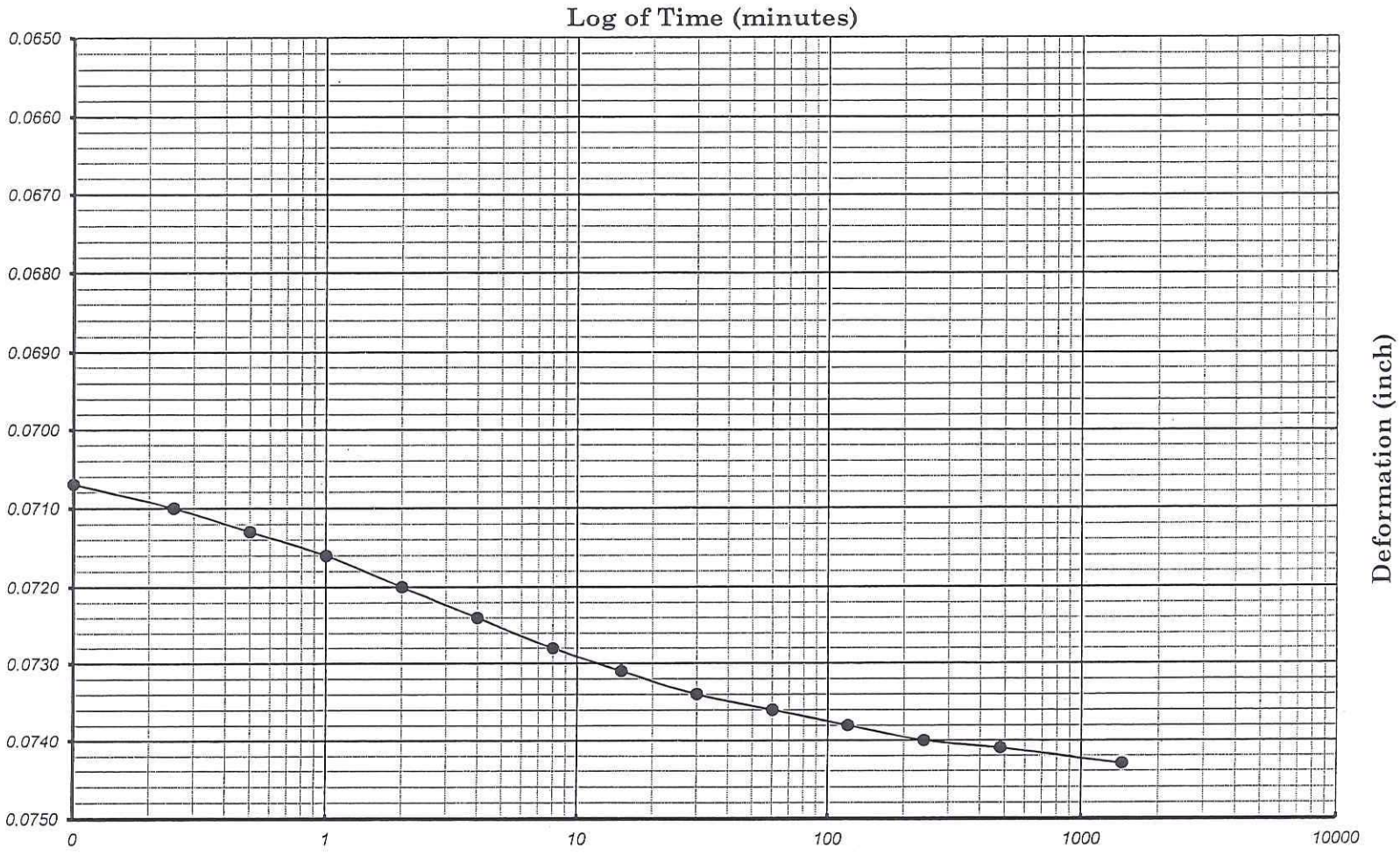
Description : *Gray with yellowish brown, Fat CLAY (CH)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

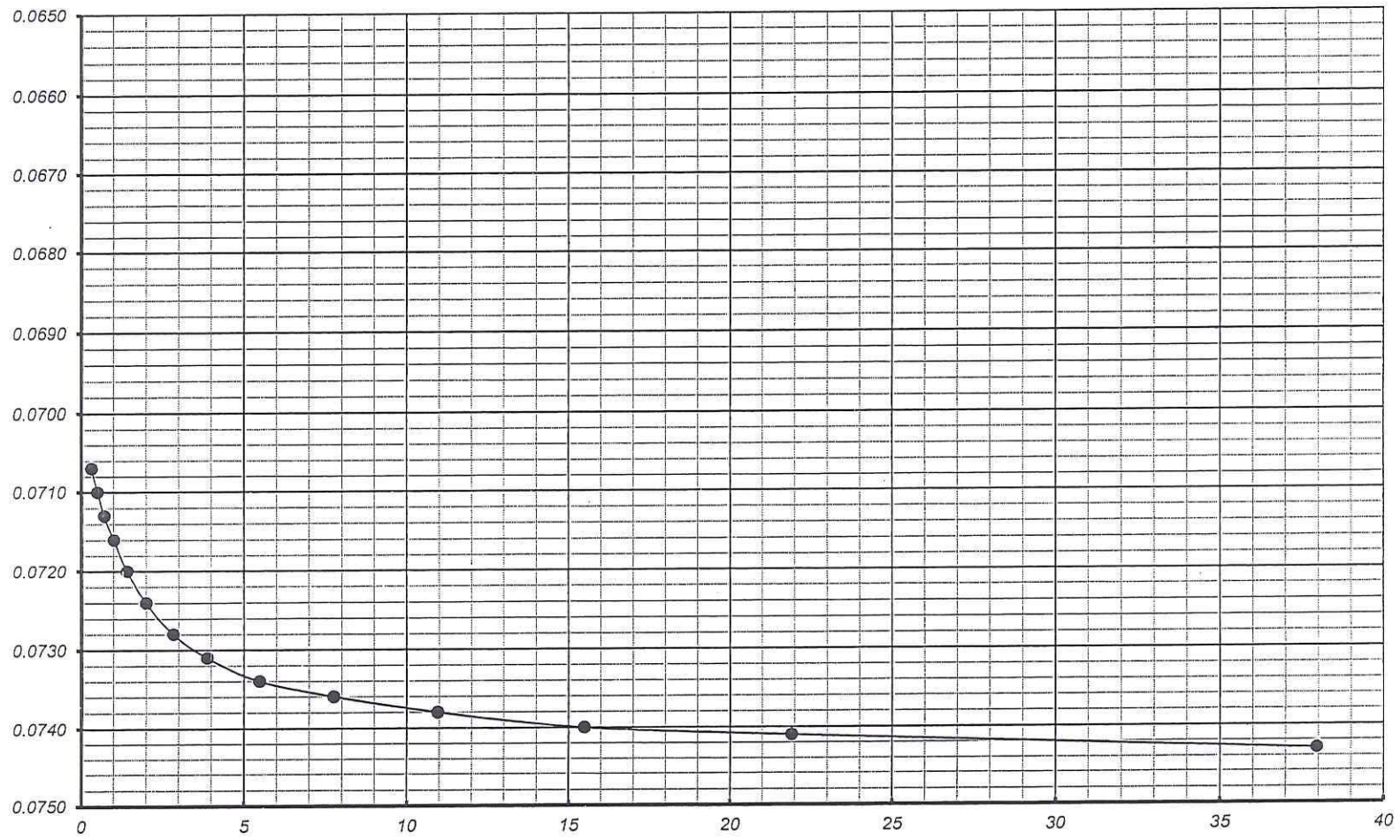
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-263	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-7	
EMI Project No. : 11-136		Depth (ft/m) : 30.0 9.2	Veritcal Load (ksf/kpa) : 4.00 191.5



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-263	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-7	
EMI Project No. : 11-136		Depth (ft/m) : 30.0 9.2	eritcal Load (ksf/kpa) : 4.0 191.5

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils
(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

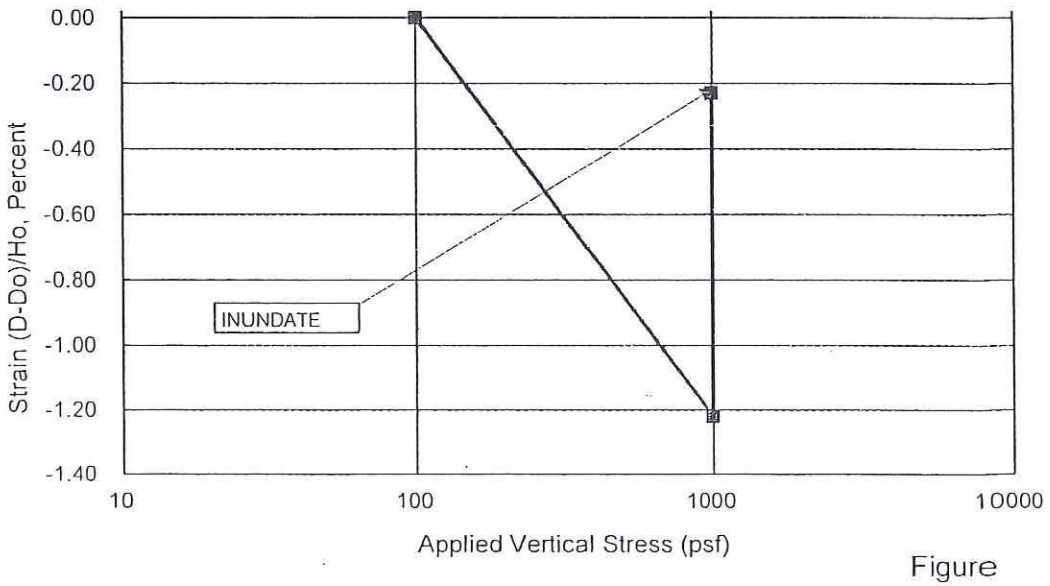
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	28.3	Final Moisture (%) :	33.5
Initial Dry Density (pcf):	89.7	Final Dry Density (pcf) :	92.8
Initial Void Ratio:	0.880	Final Void Ratio:	0.884
Initial Saturation (%)	87	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.880
1000	0.0622	1.0122	-1.22	0.903
H2O	0.0523	1.0023	-0.23	0.884

Percent Swell (+) / Collapse (-) 0.99

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

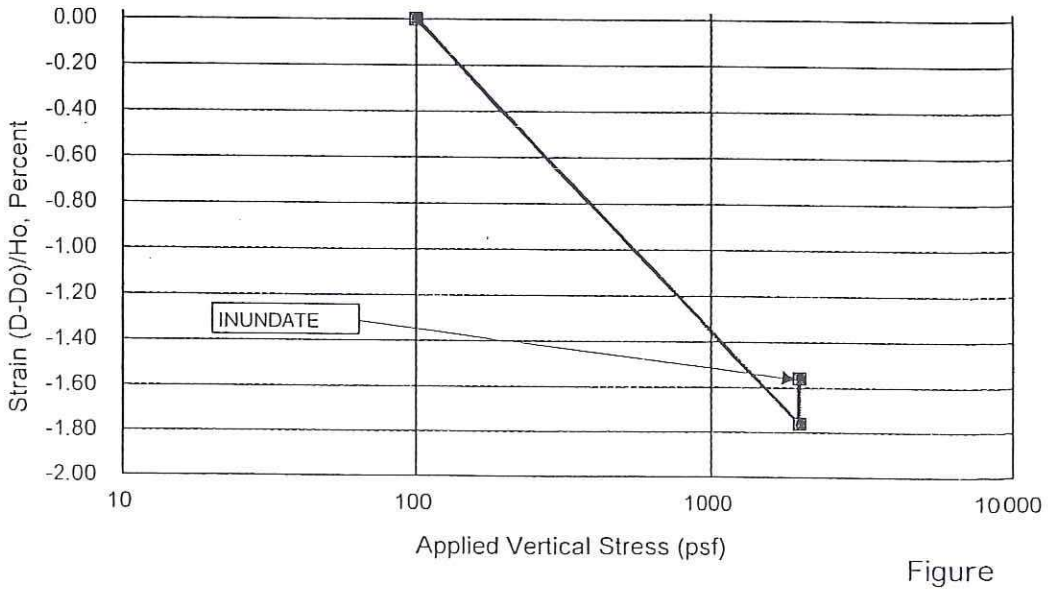
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	28.4	Final Moisture (%) :	33.1
Initial Dry Density (pcf):	88.8	Final Dry Density (pcf) :	91.9
Initial Void Ratio:	0.898	Final Void Ratio:	0.928
Initial Saturation (%)	86	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.898
2000	0.0676	1.0176	-1.76	0.931
H2O	0.0656	1.0156	-1.56	0.928

Percent Swell (+) / Collapse (-) 0.20

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

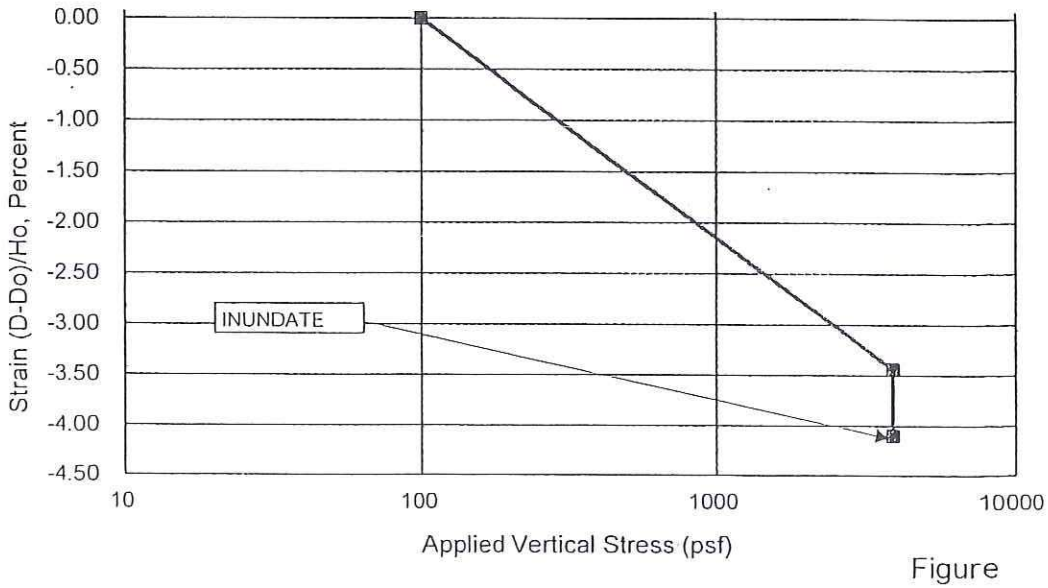
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	26.0	Final Moisture (%) :	33.0
Initial Dry Density (pcf):	88.6	Final Dry Density (pcf) :	91.8
Initial Void Ratio:	0.901	Final Void Ratio:	0.979
Initial Saturation (%)	78	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.901
4000	0.0844	1.0344	-3.44	0.967
H2O	0.0910	1.0410	-4.10	0.979

Percent Swell (+) / Collapse (-) -0.66

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

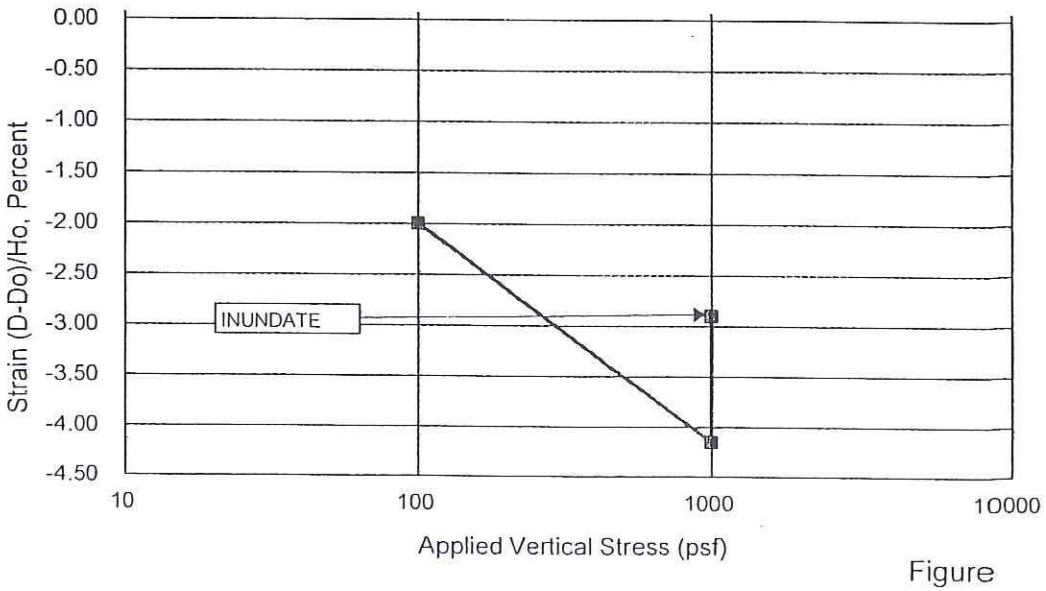
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	25.4	Final Moisture (%) :	34.2
Initial Dry Density (pcf):	85.6	Final Dry Density (pcf) :	88.6
Initial Void Ratio:	0.970	Final Void Ratio:	1.027
Initial Saturation (%)	71	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	1.009
1000	0.0915	1.0415	-4.15	1.051
H2O	0.0790	1.0290	-2.90	1.027

Percent Swell (+) / Collapse (-) 1.25

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

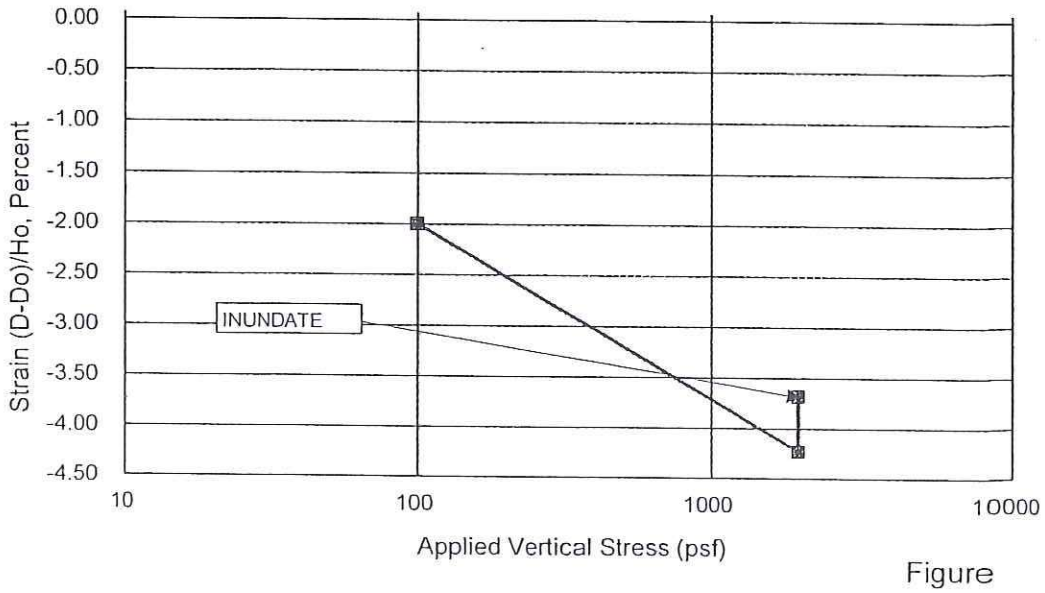
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	25.3	Final Moisture (%) :	32.8
Initial Dry Density (pcf):	89.6	Final Dry Density (pcf) :	92.7
Initial Void Ratio:	0.882	Final Void Ratio:	0.951
Initial Saturation (%)	77	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	0.920
2000	0.0923	1.0423	-4.23	0.961
H2O	0.0868	1.0368	-3.68	0.951

Percent Swell (+) / Collapse (-) 0.55

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

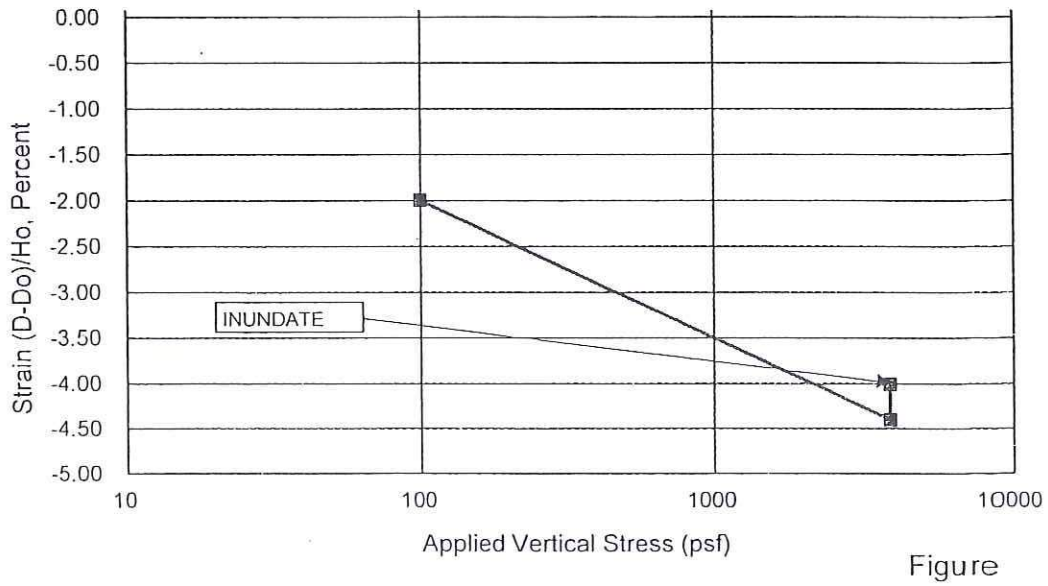
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	24.7	Final Moisture (%) :	31.4
Initial Dry Density (pcf):	88.8	Final Dry Density (pcf) :	92.0
Initial Void Ratio:	0.897	Final Void Ratio:	0.973
Initial Saturation (%)	74	Final Saturation (%) :	100.

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	0.935
4000	0.0940	1.0440	-4.40	0.981
H2O	0.0901	1.0401	-4.01	0.973

Percent Swell (+) / Collapse (-) 0.39

Compression Curve of the Swell Potential



Figure

APPENDIX C

DESIGN CALCULATIONS

BEARING CAPACITY & SETTLEMENT ESTIMATES

TYPE 1SWB RETAINING WALLS

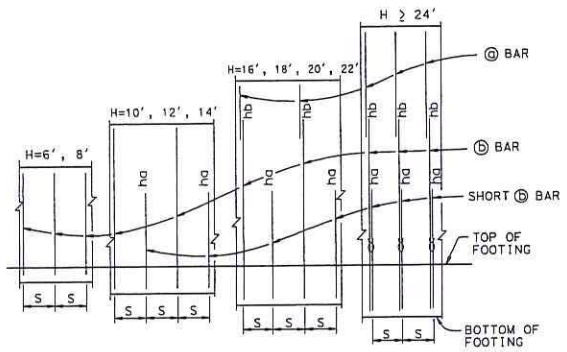
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5	3.7/6.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

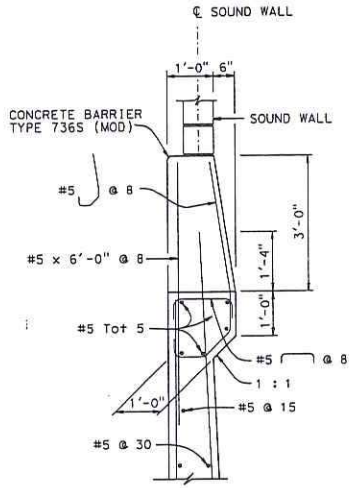
Mohan S. Char No. 57894 Exp. 6/30/2012 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

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



ELEVATION
No Scale

NOTES:
"ha" and "hb" above ⓑ bars indicate distance from top of footing to upper end of ⓑ bars, see table.
"S" is ⓑ bar spacing, see table.
ϑ : 2 bar bundle



② DETAIL A
¾ = 1'-0"

DESIGN DATA

Design: AASHTO LRFD Bridge Design Specifications, 4th edition with California Amendments

WS: 33 psf on Sound Wall and Barrier

LS: Varied surcharge on level ground surface

CT: 54 kip maximum traffic impact loading evenly distributed over 10 feet at top of the barrier and 1:1 distribution down and outward

EQE: Mononabe-Okabe Method
K_h = 0.3
K_v = 0.0

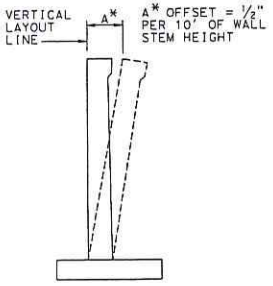
Soil: ø = 34°
γ = 120 pcf

Reinforced Concrete: f'c = 3600 psi
fy = 60,000 psi

Load Combinations and Limit States

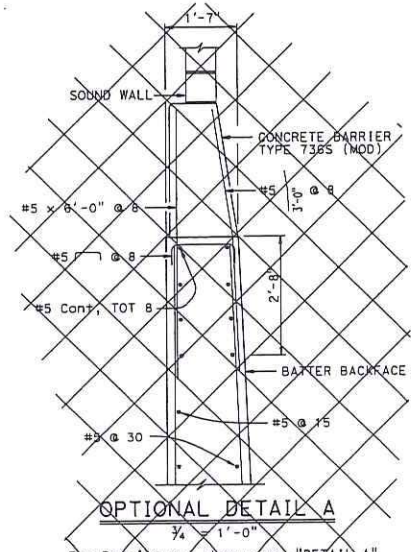
Service I	Q=1.00DC+1.00EV+1.00EH+1.00LS+0.30WS
Service II	Q=1.00DC+1.00EV+1.00EH+1.00WS
Strength I	Q=αDC+βEV+1.50EH+1.75LS
Strength III	Q=αDC+βEV+1.50EH+1.40WS
Strength V	Q=αDC+βEV+1.50EH+1.35LS+0.40WS
Extreme I	Q=1.00DC+1.00EV+1.00EH+1.00EQD+1.00EQE
Extreme II	Q=1.00DC+1.00EV+1.00EH+1.00CT

Where: Q: Force Effects
α: 1.25 or 0.90, Which ever Controls Design
β: 1.35 or 1.00, which ever Controls Design
DC: Dead Load of Structure Components
EV: Vertical Earth Fill Pressure
LS: Live Load Surcharge
EQE: Seismic Earth Pressure
EQD: Soil and Structure Components Inertia. Soil inertia ignored for stem design
WS: Wind Load on Sound Wall and Barrier
CT: Vehicular Collision Force



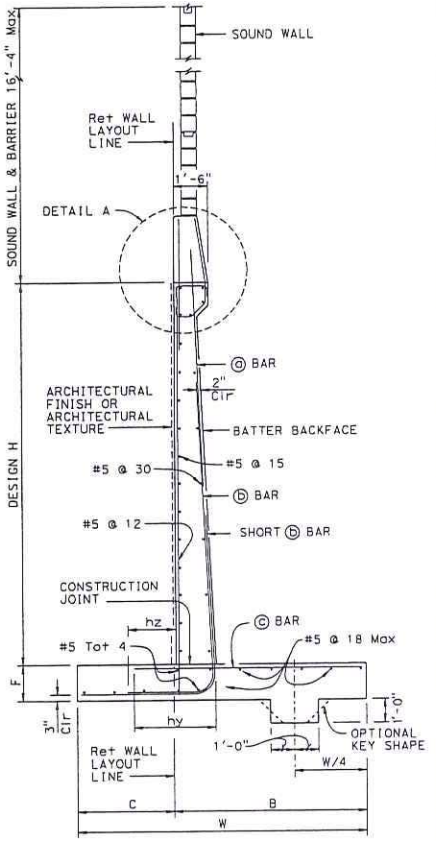
WALL OFFSET
No Scale

Values for offsetting forms to be determined by the Engineer



OPTIONAL DETAIL A
¾ = 1'-0"
For Details not shown, see "DETAIL A"

NOTES:
1. For sound wall and retaining wall Architectural finish or texture see details elsewhere in Project Plans.
2. For details not shown and drainage notes see B3-5
3. Footing cover, 1'-6" minimum.
4. For sound wall and barrier reinforcement details, see "MASONRY BLOCK SOUND WALL WITH BARRIER ON RETAINING WALL DETAILS NO. 1" sheet.
5. For H = 6' through 14', extend ⓑ bars into Barrier for stem with haunch.
6. For H ≥ 16', extend ⓐ bars into Barrier for stem with haunch.



SPREAD FOOTING SECTION ②
No Scale

SPECIAL DETAILS

REVISED STANDARD DRAWING

FILE NO. xs14-220-1

APPROVAL DATE July 2011

① DOES NOT APPLY ② MODIFIED DETAIL ③ REVISED NOTE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES

BRIDGE NO.

POST MILE

RETAINING WALL TYPE 1SWB
DETAILS NO. 1

UNIT: PROJECT NUMBER & PHASE: 1200020278 CONTRACT NO.:

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

DS 050 214YA (ENGLISH STANDARD DRAWING "YS" BORDER REV. 02-02-11)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

FILE => RW999-g-rwdt01.dgn

USERNAME => gquinones@ATE PLOTTED => 11-APR-2012 TIME PLOTTED => 13:41

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5	3.7/6.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER — Mohan S. Char — No. 57894 — Exp. 6/30/2012 — CIVIL — STATE OF CALIFORNIA

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

DESIGN H	6′	8′	10′	12′	14′	16′	18′	20′	22′	24′	26′	28′	30′	32′
W	6′-9″	7′-3″	8′-0″	8′-9″	10′-0″	11′-6″	12′-9″	14′-0″	15′-9″	18′-0″	19′-9″	21′-9″	23′-3″	25′-3″
C	2′-3″	2′-5″	2′-8″	2′-11″	3′-4″	3′-10″	4′-3″	4′-8″	5′-3″	6′-0″	6′-7″	7′-3″	7′-9″	8′-5″
B	4′-6″	4′-10″	5′-4″	5′-10″	6′-8″	7′-8″	8′-6″	9′-4″	10′-6″	12′-0″	13′-2″	14′-6″	15′-6″	16′-10″
F SPREAD FOOTING	1′-3″	1′-3″	1′-3″	1′-3″	1′-6″	1′-9″	1′-9″	2′-3″	2′-6″	2′-6″	2′-9″	3′-0″	3′-6″	3′-9″
STEM WITH HAUNCH, BATTER	0	½:12	½:12	½:12	½:12	½:12	½:12	½:12	½:12	⅝:12	¾:12	⅞:12	1:12	1:12
STEM WITHOUT HAUNCH, BATTER	0	0	0	0	0	0	0	0	¼:12	¼:12	½:12	¾:12	¾:12	¾:12
ⓐ BARS						#7 @ 15	#7 @ 12	#7 @ 12	#8 @ 12	#6 @ 6	#6 @ 6	#6 @ 6	#8 @ 9	#9 @ 9
ⓑ BARS	#8 @ 12	#8 @ 12	#7 @ 6	#7 @ 6	#7 @ 6	#9 @ 7.5	#9 @ 6	#10 @ 6	#10 @ 6	#8 @ 6ϑ	#8 @ 6ϑ	#8 @ 6ϑ	#10 @ 9ϑ	#11 @ 9ϑ
ha			5′-0″	6′-0″	7′-0″	7′-0″	6′-0″	7′-0″	7′-6″	7′-6″	8′-6″	9′-3″	15′-0″	11′-3″
hb						11′-6″	12′-0″	13′-3″	16′-0″	15′-6″	17′-6″	18′-9″	21′-0″	20′-9″
hy	2′-0″	2′-4″	1′-8″	2′-0″	2′-4″	2′-10″	2′-10″	3′-7″	3′-7″	4′-6″	5′-6″	2′-10″	4′-6″	5′-6″
hz			0	0	3′-1″	3′-7″	4′-0″	4′-5″	5′-0″	3′-0″	3′-0″	3′-6″	5′-6″	3′-0″
ⓒ BARS	#6 @ 12	#7 @ 12	#5 @ 6	#6 @ 6	#7 @ 6	#8 @ 7.5	#8 @ 6	#9 @ 6	#9 @ 6	#10 @ 6	#11 @ 6	#8 @ 6ϑ	#10 @ 9ϑ	#11 @ 9ϑ
SER I: B′(ft), q'_a(ksf)	5.9, 1.2	6.0, 1.4	6.5, 1.6	7.0, 1.8	8.1, 1.9	9.7, 2.0	11.0, 2.1	12.1, 2.3	13.8, 2.4	16.6, 2.4	18.5, 2.6	20.7, 2.7	22.1, 2.9	24.3, 3.0
STR Ia: B′(ft), q_a(ksf)	6.3, 1.9	6.3, 2.3	6.7, 2.5	7.0, 2.9	8.1, 3.1	9.5, 3.2	10.8, 3.4	11.8, 3.7	13.4, 4.0	16.2, 4.0	18.0, 4.2	20.2, 4.4	21.5, 5.0	23.7, 5.0
STR, Ib: B′(ft), q_a(ksf)	4.3, 1.6	4.3, 2.0	4.3, 2.4	4.3, 2.8	4.3, 2.9	4.3, 2.9	4.3, 3.0	4.3, 3.4	4.3, 3.5	4.3, 3.4	4.3, 3.5	4.3, 3.6	4.3, 3.9	4.3, 4.1
STR, IIIa: B′(ft), q_a(ksf)	4.3, 2.1	4.3, 2.4	4.3, 2.5	4.3, 2.8	4.3, 2.9	4.3, 3.0	4.3, 3.2	4.3, 3.7	4.3, 3.7	4.3, 3.8	4.3, 4.0	4.3, 4.2	4.3, 4.6	4.3, 4.9
STR, IIIb: B′(ft), q_a(ksf)	3.2, 2.1	3.2, 2.3	3.2, 2.4	3.2, 2.6	3.2, 2.7	3.2, 2.7	3.2, 2.8	3.2, 3.1	3.2, 3.0	3.2, 3.2	3.2, 3.8	3.2, 3.4	3.2, 3.7	3.2, 3.9
STR, Va: B′(ft), q_a(ksf)	5.9, 2.0	5.9, 2.3	5.9, 2.6	5.9, 2.9	5.9, 3.1	5.9, 3.2	5.9, 3.4	5.9, 3.9	5.9, 3.9	5.9, 4.0	5.9, 4.2	5.9, 4.5	5.9, 4.9	5.9, 5.1
STR, Vb: B′(ft), q_a(ksf)	3.8, 1.7	3.8, 2.1	3.8, 2.5	3.8, 2.8	3.8, 2.9	3.8, 2.9	3.8, 3.0	3.8, 3.3	3.8, 3.4	3.8, 3.3	3.8, 3.5	3.8, 3.6	3.8, 3.9	3.8, 4.0
Ext I: B′(ft), q_a(ksf)	2.5, 2.8	2.5, 4.3	2.5, 6.4	2.5, 10.9	2.5, 13.3	2.5, 12.4	2.5, 13.2	2.5, 17.6	2.5, 15.0	2.5, 10.2	2.5, 10.0	2.5, 9.6	2.5, 10.8	2.5, 10.5
Ext II: B′(ft), q_a(ksf)	1.4, 4.9	1.4, 3.5	1.4, 2.8	1.4, 2.7	1.4, 2.5	1.4, 2.5	1.4, 2.5	1.4, 2.6	1.4, 2.8	1.4, 2.8	1.4, 2.9	1.4, 3.1	1.4, 3.3	1.4, 3.5

LEGEND:
SER: service limit state
STR: strength limit state
EXT: extreme event limit state
B′ : effective footing width (ft)
q'_a : net bearing stress (ksf)

q_a : gross uniform bearing stress (ksf)

ϑ : 2 bar bundle

STANDARD DRAWING

FILE NO. xs14-220-2 APPROVAL DATE January 2012

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION — DIVISION OF ENGINEERING SERVICES

BRIDGE NO. POST MILE

RETAINING WALL TYPE 1SWB
DETAILS NO. 2

DS DSD 2147A (ENGLISH STANDARD DRAWING "XS" BORDER REV. (02-02-11))

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 1200020278 CONTRACT NO.:

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

FILE => RW999-g-rwdt02.dgn

USERNAME => quinoveo DATE PLOTTED => 11-APR-2012 TIME PLOTTED => 13:42

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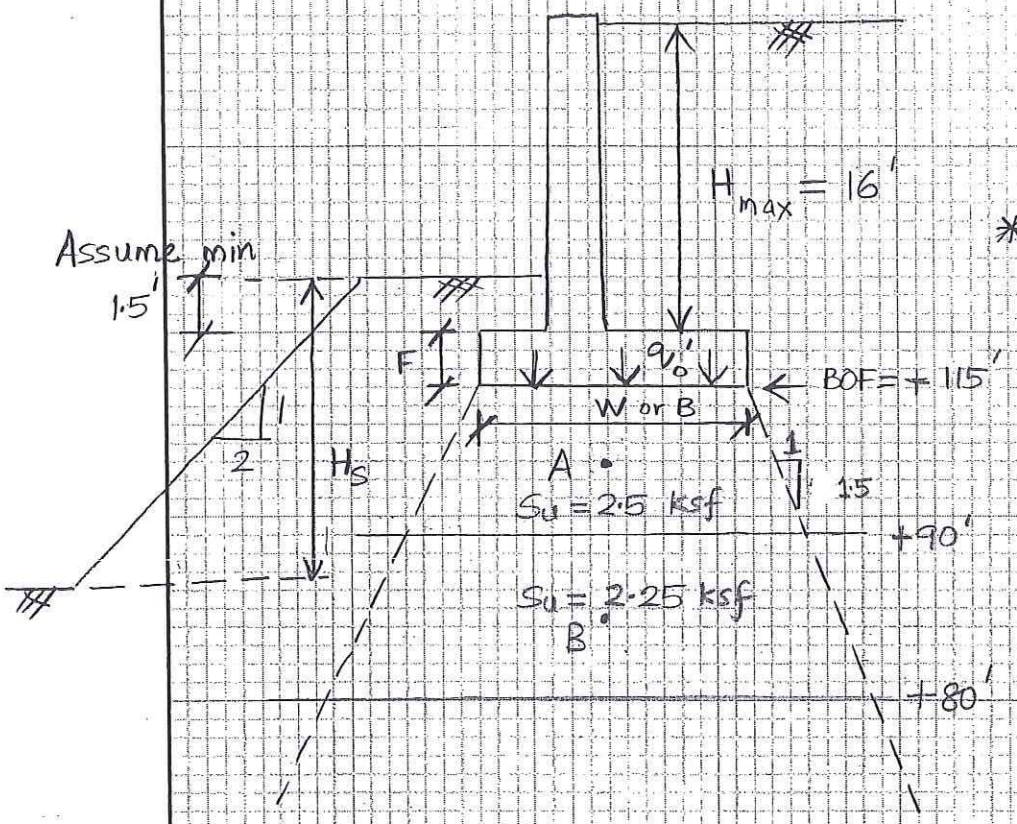
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 274R

Type I SWB

* 'H' varies from 8' to 16'
* Footing Embedment
  D = 1.5' + 1.75
  = 3.25'
* Based on the Standard XS plan sheet; (2010)
  W = 11.5'
  F = 1.75'
  Service q_o' = 2 ksf
  Service B' = 9.7 ft
  Strength q_o' = 3.2 ksf
  Strength B' = 9.5 ft
  Extreme q_o' = 12.4 ksf
  Extreme B' = 2.5 ft



Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{ru} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$

shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L \gg B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

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Project AECOM / I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/ /12 Sheet 2 of 3

$q_2 = C N_{cq}$

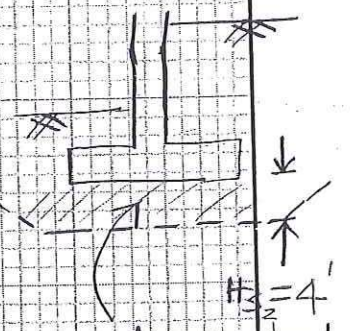
For footing in cohesive soils and on or adjacent to slopes,

For $H_s > W$; $N_s = 0$

From Figure 10.6.3.1.2C-1, $N_{cq} = 4.75$ ($\because D/B = 0.28$ & $i = 26^\circ$)

$\therefore q_2 = 4.75 \times 2.25$

$= 10.7$ ksf



For Extreme Limit,

$q_{all} = \phi q_2 = 10.7$ ksf $< q_0 = 12.4$ ksf

CHECK NOT SATISFIED //

⇒ Consider 4-ft of removal & recompaction below footing

$q_n = q_2 e^{0.67 \left[1 + (B/L)\right] \frac{H_{s_2}}{B}}$ (C10.6.3.1.2f-1)

For $B = 11.5'$; $L \geq 190'$; $H_{s_2} = 4'$

$q_n = 10.7 \times 1.28 = 13.7$ ksf

LRFD Limit State Check

Strength Limit State

$q_{all} = \phi q_n = 0.55 \times 13.7 = 7.5$ ksf $> q_0 = 3.2$ ksf

Extreme Limit State

$q_{all} = \phi q_n = 1 \times 13.7 = 13.7$ ksf $> q_0 = 12.4$ ksf

Service Limit State

$q_{all} = \frac{q_n}{FOS} = \frac{13.7}{3} = 4.5$ ksf $> q_0' = 2$ ksf

⇒ CHECK SATISFIED //
Consider 4-ft of overexcavation //

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth.

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	21	0.03	2.13	0.75	0.99
B	10	0.03	3.99	0.45	0.17

$\Sigma \Delta H_i = 1.16''$

For 5" overex, estimated settlement = 1.05"

⇒ Consider 5-ft of overexcavation for 16-ft high wall.

Similarly for wall 274R,

Wall height, H (ft)	Req'd minimum overex (ft)	Estimated Settlement (in)
10	2	0.82
8	2	0.68

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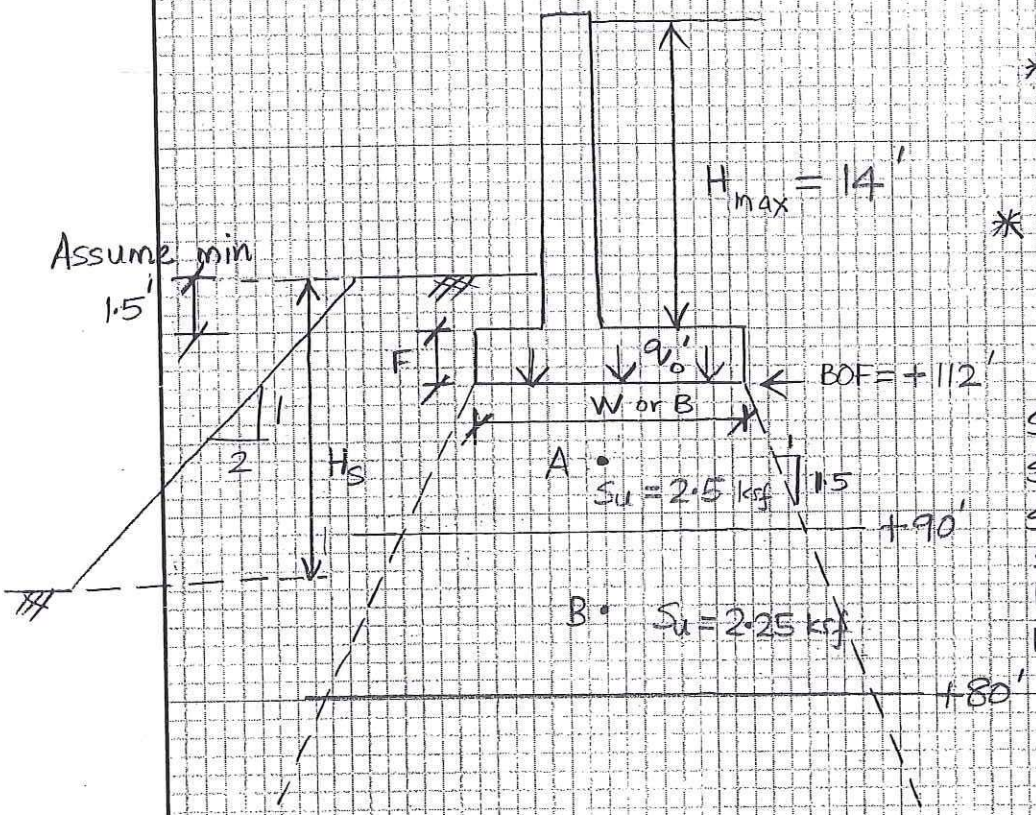
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 275 L

Type 1 SWB

* 'H' varies from 6' to 14'
* Footing Embedment
  D = 1.5' + 1.5'
  = 3'
* Based on the Standard XS plan sheet;
  W = 10 ft
  F = 1.5 ft
  Service q_o' = 1.9 ksf
  Service B' = 8.1 ft
  Strength q_o' = 3.1 ksf
  Strength B' = 8.1 ft
  Extreme q_o' = 13.3 ksf
  Extreme B' = 2.5 ft



Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{vu} = cN_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$$N_{cm} = N_c s_c i_c \; ; \; N_{qm} = N_q s_q i_q d_q \; ; \; N_{\gamma m} = N_\gamma s_\gamma i_\gamma$$

load inclination factors $i_c = i_q = i_\gamma = 1$

shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >>> B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

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Project AECOM / I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/ /12 Sheet 2 of 3

$q_2 = C N_{cq}$

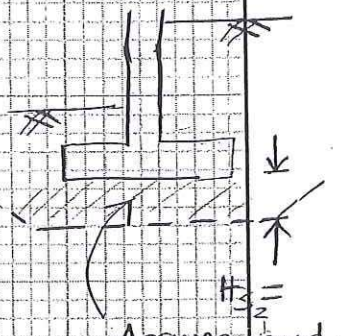
For footing in cohesive soils and on or adjacent to slopes,

For $H_s > W$; $N_s = 0$

From Figure 10.6.3.1.2C-1, $N_{cq} = 4.75$ ($D/B = 0.3$ & $i = 26°$)

$q_2 = 4.75 \times 2.25$

$= 10.7$ ksf



For Extreme Limit,

$q_{all} = \phi q_2 = 10.7 < q_0 = 13.3$ ksf

CHECK NOT SATISFIED //

⇒ Consider 4-ft of removal & recompaction below footing

$q_n = q_2 e^{0.67 \left[1 + (B/L)\right] \frac{H_{s_2}}{B}}$ (C10.6.3.1.2f-1)

For B = 10 ft ; L = 300 ft ; H_{s_2} = 4 ft

$q_n = 10.7 \times 1.32 = 14.1$ ksf

Strength Limit State

$q_{all} = \phi q_n = 0.55 \times 14.1 = 7.7$ ksf $> q_0 = 3.1$ ksf

Extreme Limit State

$q_{all} = \phi q_n = 1 \times 14.1 = 14.1$ ksf $> q_0 = 13.3$ ksf

Service Limit State

$q_{all} = \frac{q_n}{FOS} = \frac{14.1}{3} = 4.7$ ksf $> q_0' = 1.9$ ksf

⇒ CHECK SATISFIED //

Consider 4-ft of overexcavation //

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	18	0.03	1.92	0.70	0.87
B	10	0.03	3.60	0.41	0.17

$\Sigma \Delta H_i = 1.04"$

$\Rightarrow$ Consider 4-ft of overexcavation for 14-ft high wall.

Similarly for wall 275 L

Wall height 'H' (ft)	Req'd minimum overex (ft)	Estimated settlement (in)
12	3	0.96
10	2	0.86
8	2	0.72
6	2	0.60

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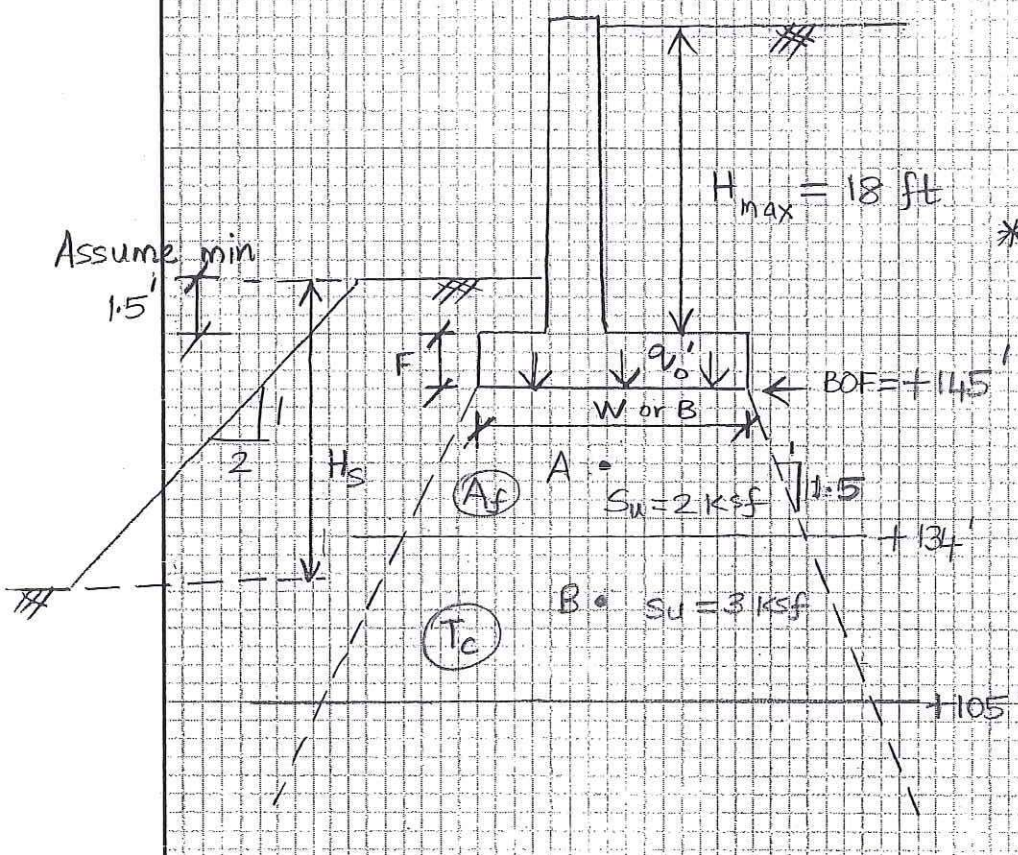
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 287L

Type 1 SWB

* 'H' varies from 8 ft to 18 ft
* Footing Embedment
  D = 1.5' + 1.75
  = 3.25 ft
* Based on the Standard xs plan sheet; (2010)
  W = 12.75 ft
  F = 1.75 ft
  Service q_o' = 2.1 ksf
  Service B' = 11 ft
  Strength q_o' = 3.4 ksf
  Strength B' = 10.8 ft
  Extreme q_o' = 13.2 ksf
  Extreme B' = 25 ft



Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_u = cN_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$

shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >>> B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

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Project AECOM / I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/ /12 Sheet 2 of 3

6.0 $q_2 = c N_{cq}$

For footing in cohesive soils and on or adjacent to slopes,

For $H_s > W$; $N_s = 0$

From Figure 10.6.3.1.2C-1, $N_{cq} = 4.8$ ($\because D/B = 0.25$ & $i = 26^\circ$)

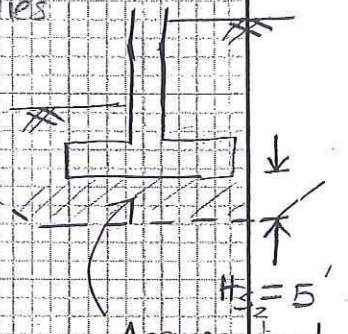
$\therefore q_2 = 5.14 \times 2$ (For bearing stratum overlies stiffer cohesive soil, $N_m \leq N_c = 5.14$)

$= 10.3$ ksf

For Extreme Limit,

$q_{all} = \phi q_2 = 10.3$ ksf $< q_0 = 13.2$ ksf

CHECK NOT SATISFIED //



⇒ Consider of removal & recompaction below footing

$q_n = q_2 e^{0.67 \left[1 + (B/L)\right] \frac{H_{s_2}}{B}}$ (C 10.6.3.1.2f-1)

For $B = 12.75'$; $L = 500'$; $H_{s_2} = 5'$

$q_n = 10.3 \times 1.31 = 13.5$ ksf

Strength Limit State

$q_{all} = \phi q_n = 0.55 \times 13.5 = 7.4$ ksf $> q_0 = 3.4$ ksf

Extreme Limit State

$q_{all} = \phi q_n = 1 \times 13.5 = 13.5$ ksf $> q_0 = 13.2$ ksf

Service Limit State

$q_{all} = \frac{q_n}{FOS} = \frac{13.5}{3} = 4.5$ ksf $> q_0' = 2.1$ ksf

⇒ CHECK SATISFIED //

Consider 5-ft of overexcavation //

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 5' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	6	0.03	1.35	1.14	0.58
B	28	0.03	3.39	0.58	0.69

$\Sigma \Delta H_i = 1.27$"

$\Rightarrow$ Consider 5-ft of overexcavation for 18-ft high wall.

Similarly for wall 287L,

Wall height 'H' (ft)	Req'd minimum overex (ft)	Estimated settlement (in)
16	5	1.14
14	5	0.99
12	4	0.98
10	3	0.93
8	2	0.88

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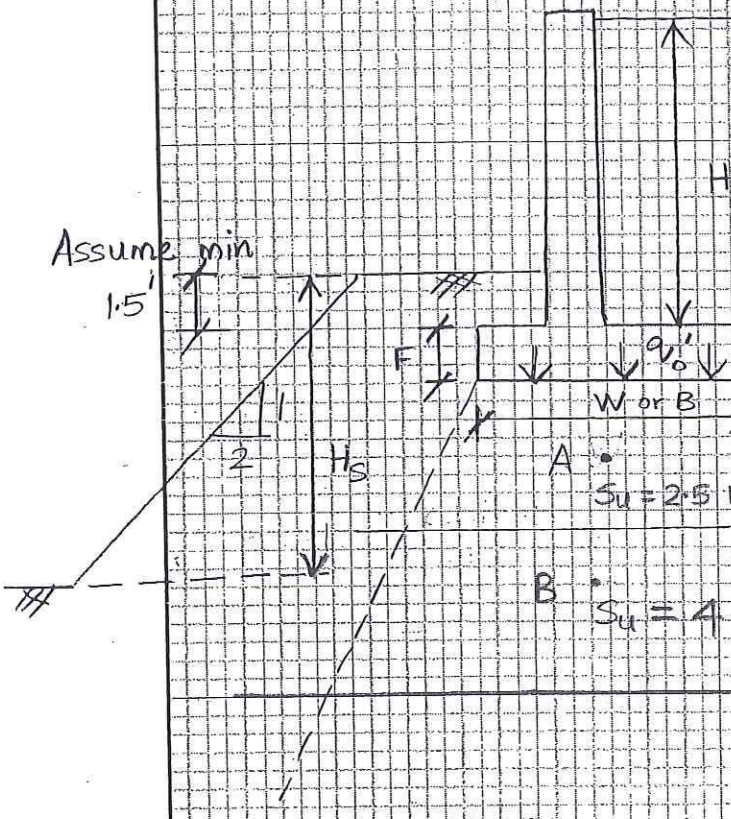
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 2971

Type 1 SWB

* 'H' varies from 6' to 12'
* Footing Embedment D = 1.5' + 1.25' = 2.75'
* Based on the Standard XS plan sheet;
  - W = 8.75 ft
  - F = 1.25 ft
  - Service q_o' = 1.8 ksf
  - Service B' = 7 ft
  - Strength q_o' = 2.9 ksf
  - Strength B' = 7 ft
  - Extreme q_o' = 10.9 ksf
  - Extreme B' = 2.5 ft



Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{vu} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$

Shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >> B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 2 of 3

$\therefore q_u = C\, N_{cq}$

For footing in cohesive soils and on or adjacent to slopes

For $H_s > W$; $N_s = 0$

$D/B = 0.31$ & slope '2' : '1' $= 26^\circ$

From Figure 10.6.3.1.2c-1 (AASHTO LRFD)

$N_{cq} = 4.75$

$\therefore$ nominal bearing capacity $q_u = 2.5 \times 4.75$

$= 11.9$ ksf

Service Limit State

$$q_{all} = \frac{q_u}{FoS} = \frac{11.9}{3} = 3.9 \text{ ksf} > q_o = 1.8 \text{ ksf}$$

Strength Limit State

$$q_{all} = \phi\, q_u = 0.55 \times 11.9 = 6.5 \text{ ksf} > q_o = 2.9 \text{ ksf}$$

(ϕ: resistance factor)

Extreme Limit State

$$q_{all} = \phi\, q_u = 1.0 \times 11.9 = 11.9 > q_o = 10.9 \text{ ksf}$$

$\Rightarrow$ Check Satisfied

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	8	0.03	1.29	0.81	0.61
B	15	0.03	2.67	0.45	0.37

$\Sigma \Delta H_i = 0.98"$

⇒ Consider 4-ft of overexcavation for 12-ft± high wall.

Similarly for wall 297L,

Wall height H (ft)	Req'd minimum overex (ft)	Estimated Settlement (in)
10	3	0.92
8	2	0.87
6	2	<0.87

TYPE 7SW RETAINING WALL

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5	3.7/6.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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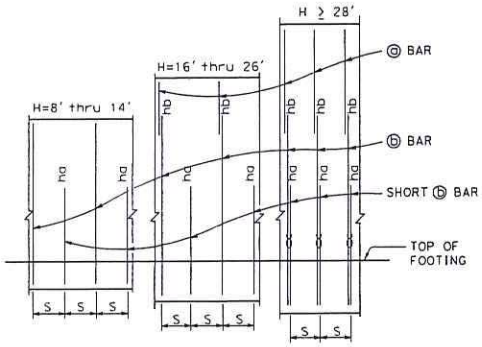
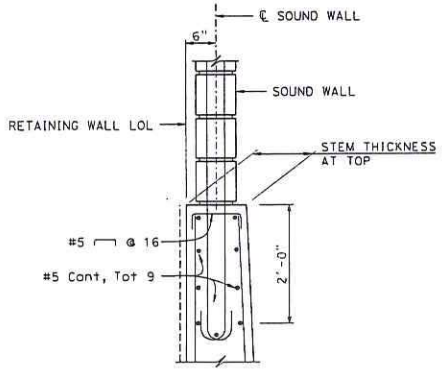
REGISTERED PROFESSIONAL ENGINEER — Mohan S. Char — No. 57894 — Exp. 6/30/2012 — CIVIL — STATE OF CALIFORNIA

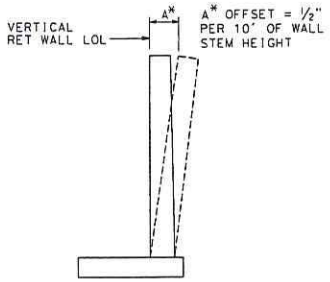


ELEVATION
No Scale

NOTES:
"ha", "hb" above ⓑ bars indicate distance from top of footing to upper end of ⓑ bars, see table.
"S" is ⓑ bar spacing, see table.



DETAIL A
1" = 1'-0"



WALL OFFSET
No Scale

Values for offsetting forms to be determined by the Engineer

DESIGN DATA

Design: AASHTO LRFD Bridge Design Specifications, 4th edition with California Amendments

WS: 33 psf on Sound wall

LS: Varied surcharge on level ground surface

EQE: Mononabe-Okabe Method
K_h = 0.3
K_v = 0.0

Soil: ϕ = 34°
γ = 120 pcf

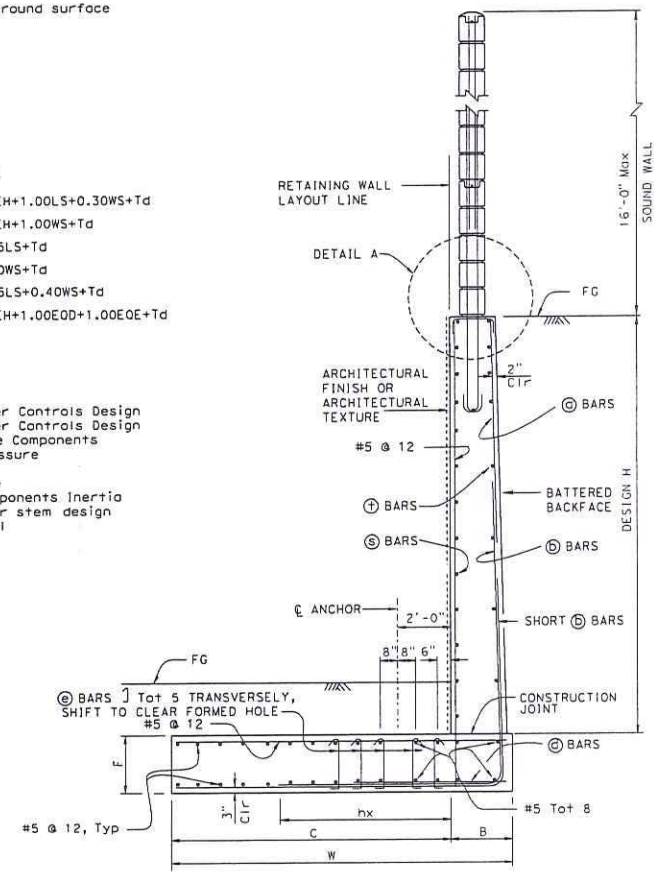
Reinforced Concrete: f'c = 3600 psi
fy = 60,000 psi

Load Combinations and Limit States

Service I	0=1.00DC+1.00EV+1.00EH+1.00LS+0.30WS+Td
Service II	0=1.00DC+1.00EV+1.00EH+1.00WS+Td
Strength I	0=αDC+βEV+1.50EH+1.75LS+Td
Strength III	0=αDC+βEV+1.50EH+1.40WS+Td
Strength V	0=αDC+βEV+1.50EH+1.35LS+0.40WS+Td
Extreme I	0=1.00DC+1.00EV+1.00EH+1.00EQD+1.00EQE+Td

Where: Q: Force Effects
α: 1.25 or 0.90, Which ever Controls Design
β: 1.35 or 1.00, which ever Controls Design
DC: Dead Load of Structure Components
EV: Vertical Earth Fill Pressure
LS: Live Load Surcharge
EQE: Seismic Earth Pressure
EQD: Soil and Structure Components Inertia
Soil inertia ignored for stem design
WS: Wind Load on Sound wall
Td: Anchor Design Load

NOTES:
1. For Sound wall and Retaining wall Architectural finish or texture see details elsewhere in Project Plans.
2. For Details not shown and drainage notes see B3-5
3. Footing cover, 2'-0" minimum.
<1> 4. For sound wall reinforcement details, see "MASONRY BLOCK SOUND WALL ON RETAINING WALL DETAILS NO. 1" sheet.
5. Shift ⓑ bars and ⓓ bars as required to clear formed hole for ground anchor.
6. Footing is designed to resist 1.33 Td assuming the maximum anchor spacing shown in the table.



SPREAD FOOTING SECTION
No Scale

SPECIAL DETAILS

REVISED STANDARD DRAWING FILE NO. xs14-380-1 APPROVAL DATE July 2011	<1> REVISED NOTE	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES	BRIDGE NO. POST MILE	RETAINING WALL TYPE 7SW DETAILS NO.1

DS 050 2147A (ENGLISH STANDARD DRAWING "B5" BORDER REV. 02-02-11)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020278 CONTRACT NO.:
FILE => RW999-g-rwdt03.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES			SHEET	OF

USERNAME => auroveg DATE PLOTTED => 11-APR-2012 TIME PLOTTED => 13:42

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5	3.7/6.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — Mohan S. Char — No. 57894 — Exp. 6/30/2012 — CIVIL — STATE OF CALIFORNIA

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TABLE OF WALL DIMENSIONS, REINFORCING STEEL, AND BEARING STRESS

DESIGN H	8'	10'	12'	14'	16'	18'	20'	22'	24'	26'	28'	30'	32'
W	6'-9"	7'-6"	7'-0"	7'-6"	8'-6"	9'-3"	10'-3"	11'-3"	12'-3"	13'-0"	14'-3"	15'-3"	16'-3"
C	5'-6"	6'-3"	5'-6"	6'-0"	6'-9"	7'-3"	8'-0"	8'-6"	9'-6"	10'-0"	10'-10"	11'-6"	12'-5"
B	1'-3"	1'-3"	1'-6"	1'-6"	1'-9"	2'-0"	2'-3"	2'-9"	2'-9"	3'-0"	3'-5"	3'-9"	3'-10"
F	1'-6"	2'-0"	2'-4"	2'-4"	2'-6"	2'-6"	2'-9"	2'-9"	3'-0"	3'-3"	3'-6"	3'-9"	4'-0"
STEM THICKNESS AT TOP	1'-0"	1'-0"	1'-3"	1'-3"	1'-7"	1'-9"	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"	2'-3"	2'-3"
BATTER	0	0	0	0	0	0	0	1/4:12	1/4:12	1/4:12	1/2:12	1/2:12	1/2:12
ⓒ BARS					#5 @ 14	#6 @ 13	#6 @ 13	#6 @ 13	#6 @ 11	#7 @ 12	#7 @ 11	#7 @ 10	#8 @ 11
ⓑ BARS	#5 @ 6	#5 @ 5.5	#6 @ 5	#6 @ 5	#8 @ 7	#8 @ 6.5	#9 @ 6.5	#9 @ 6.5	#9 @ 5.5	#10 @ 6	#10 @ 11 X	#10 @ 10 X	#11 @ 11 X
ha	7'-10"	9'-10"	5'-3"	6'-0"	6'-9"	7'-6"	7'-3"	9'-0"	9'-9"	9'-3"	11'-3"	13'-0"	13'-0"
hb					13'-0"	13'-0"	13'-0"	14'-6"	15'-6"	18'-6"	20'-6"	21'-6"	23'-0"
hx	5'-3"	6'-0"	5'-3"	5'-9"	6'-6"	7'-0"	7'-9"	7'-6"	8'-3"	9'-9"	10'-0"	11'-0"	12'-2"
ⓓ BARS	#5 @ 12	#5 @ 11	#5 @ 10	#5 @ 10	#5 @ 14	#5 @ 13	#5 @ 13	#5 @ 13	#5 @ 11	#5 @ 12	#5 @ 11	#5 @ 10	#5 @ 11
ⓓ BAR LENGTH	3'-6"	3'-6"	3'-6"	3'-6"	4'-6"	7'-0"	7'-6"	10'-9"	11'-9"	12'-6"	13'-9"	14'-9"	15'-9"
ⓔ BARS								#4 @ 13	#4 @ 11	#4 @ 12	#4 @ 11	#4 @ 10	#4 @ 11
Ⓢ Bars	#4 @ 12	#4 @ 12	#5 @ 15	#5 @ 15	#5 @ 12	#5 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#7 @ 12	#7 @ 12
Ⓣ Bars	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#5 @ 12	#5 @ 12	#5 @ 12	#5 @ 12
Td (KIPS/FT)	0	0	5.25	7.5	9.0	11.25	12.75	15.0	16.5	21.0	21.75	24.75	27.75
① To (KIPS/FT)	0	0			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tp = Larger of 1.33 Td & 1.25 To (KIPS/FT)	0	0			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max ANCHOR SPACING			10'-6"	9'-6"	7'-9"	6'-3"	7'-9"	6'-6"	8'-0"	6'-3"	6'-0"	5'-3"	4'-9"
SER I: B'(ft), q'_a (ksf)	6.3, 0.6	6.9, 0.7	5.7, 2.1	6.1, 2.4	7.4, 2.4	8.1, 2.7	9.1, 2.8	9.8, 3.0	10.9, 3.0	11.4, 3.5	12.6, 3.5	13.6, 3.7	14.7, 3.8
STR Ia: B'(ft), q_a(ksf)	6.5, 1.3	6.7, 1.6	5.4, 3.3	5.7, 3.7	6.7, 3.8	7.4, 4.2	8.2, 4.3	8.9, 4.8	9.8, 4.9	10.1, 5.5	11.2, 5.6	12.1, 5.9	12.8, 6.2
STR, Ib: B'(ft), q_a(ksf)	5.7, 1.2	5.7, 1.5	4.6, 3.3	5.0, 3.7	5.9, 3.8	6.6, 4.0	7.3, 4.2	7.9, 4.6	8.7, 4.7	9.1, 5.3	10.0, 5.4	10.8, 5.7	11.5, 6.0
STR, IIIa: B'(ft), q_a(ksf)	5.0, 1.9	5.7, 2.6	4.9, 4.0	5.4, 4.4	6.4, 4.0	7.2, 4.5	8.2, 4.6	9.0, 4.9	10.0, 4.9	10.4, 5.4	11.6, 5.4	12.6, 5.7	13.4, 5.8
STR, IIIb: B'(ft), q_a(ksf)	3.7, 2.3	4.2, 2.8	4.0, 4.2	4.5, 4.5	5.6, 4.2	6.3, 4.5	7.2, 4.5	8.0, 4.8	8.9, 4.7	9.4, 5.3	10.4, 5.3	11.3, 5.3	12.1, 5.6
STR, Va: B'(ft), q_a(ksf)	6.0, 1.4	6.4, 1.7	5.2, 3.4	5.5, 3.8	6.6, 3.9	7.3, 4.3	8.2, 4.5	8.8, 4.8	9.8, 4.9	10.2, 5.6	11.2, 5.5	12.2, 5.9	12.9, 6.1
STR, Vb: B'(ft), q_a(ksf)	5.0, 1.3	5.2, 1.6	4.4, 3.4	4.8, 3.8	5.7, 3.8	6.4, 4.2	7.2, 4.4	7.8, 4.7	8.7, 4.8	9.1, 5.5	10.0, 5.4	10.9, 5.8	11.6, 6.0
Ext I: B'(ft), q_a(ksf)	3.4, 2.0	3.1, 3.6	2.4, 6.5	2.6, 8.1	3.0, 7.7	3.3, 9.0	3.5, 9.4	3.9, 10.1	4.3, 10.4	4.4, 11.9	4.9, 11.9	5.3, 12.7	5.5, 13.4

NOTE:

ⓔ Bar spacing shown is along the length of the retaining wall.

SYMBOLS:

SER: service limit state
STR: strength limit state
EXT: extreme event limit state
B': effective footing width (ft)
q'_a: net bearing stress (ksf)
q_a: gross uniform bearing stress (ksf)
X: 2 bar bundle
To: Anchor Lockoff Load
Tp: Anchor Factored Test Load
② N/A: Not Applicable (Design H not used)

SPECIAL DETAILS

REVISED STANDARD DRAWING

FILE NO. x814-380-2

APPROVAL DATE July 2011

① MODIFIED TABLE
② ADDED SYMBOL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES

BRIDGE NO.

POST MILE

RETAINING WALL TYPE 7SW

DETAILS NO.2

DS 05D 2147A (ENGLISH STANDARD DRAWING "HS" BORDER REV. 02-02-11)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020278 CONTRACT NO.:

FILE => RW999-g-rwdt04.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES				SHEET	OF

USERNAME => quinovo DATE PLOTTED => 11-APR-2012 TIME PLOTTED => 13:42

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

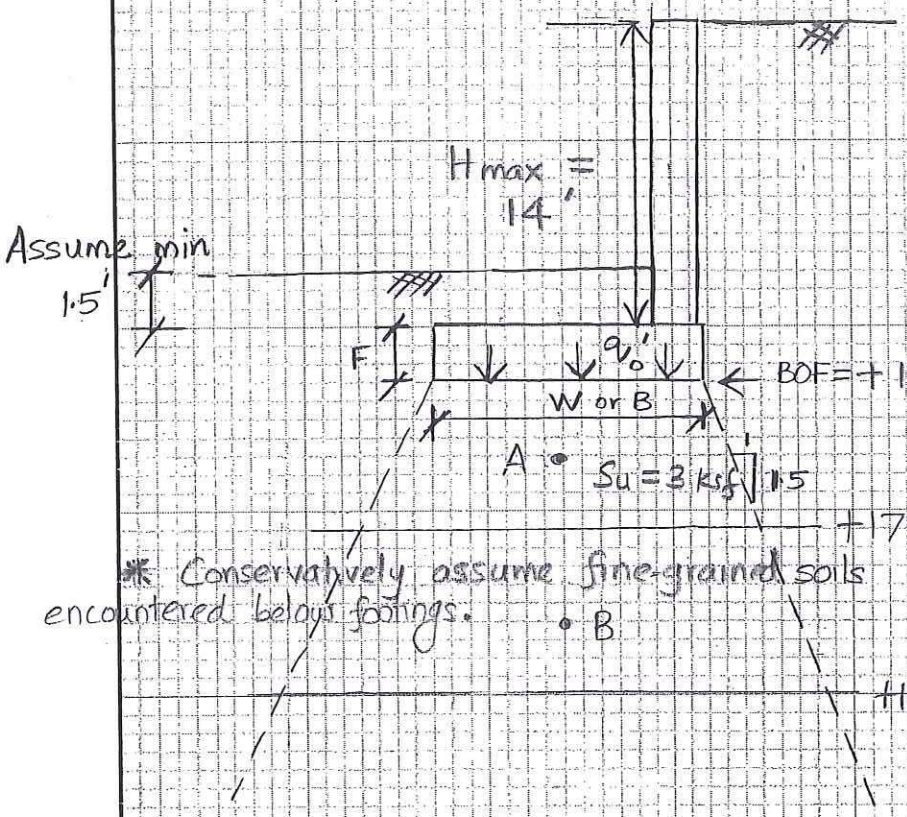
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 330R

Type 7SW

* 'H' varies from 8' to 14'
* Footing Embedment
  D = 1.5' + 2.3'
  = 3.8'
* Based on the Standard XS plan sheet; (2010)
  W = 7.5 ft
  F = 2.33 ft
  Service q_o' = 2.4 ksf
  Service B' = 6.1 ft
  Strength q_o' = 4.5 ksf
  Strength B' = 4.5 ft
  Extreme q_o' = 8.1 ksf
  Extreme B' = 2.6 ft



* Conservatively assume fine-grained soils encountered below footings.

Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_u = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$$N_{cm} = N_c s_c i_c \; ; \; N_{qm} = N_q s_q i_q d_q \; ; \; N_{\gamma m} = N_\gamma s_\gamma i_\gamma$$

load inclination factors $i_c = i_q = i_\gamma = 1$

Shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L \gg B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$ & $N_q = 1$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 2 of 3

$\therefore q_u = C N_{cm} + \gamma D$

$N_{cm} = N_c \times S_c$

$S_c = 1 + \left(\frac{B}{5L}\right) = 1.02$

$\therefore N_{cm} = 5.14 \times 1.02 = 5.25$

Nominal bearing capacity

$q_u = (5.25 \times 3) + (120 \times 3.8')$

$= 15.75 + 0.456$

$= 16.2$ ksf

Service Limit State

$q_{all} = \frac{q_u}{F.S} = \frac{16.2}{3} = 5.4$ ksf $> q_{10}' = 2.4$ ksf

Strength Limit State

$q_{all} = \phi q_u = 0.55 \times 16.2 = 8.9$ ksf $> q_D = 4.5$ ksf

(ϕ ↑ resistance factor)

Extreme Limit State

$q_{all} = \phi q_u = 1.0 \times 16.2 = 16.2$ ksf $> q_D = 8.1$ ksf

$\Rightarrow$ Check Satisfied

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 2' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	12	0.03	2.65	1.50	0.7
B	10	0.025	3.90	0.81	0.3

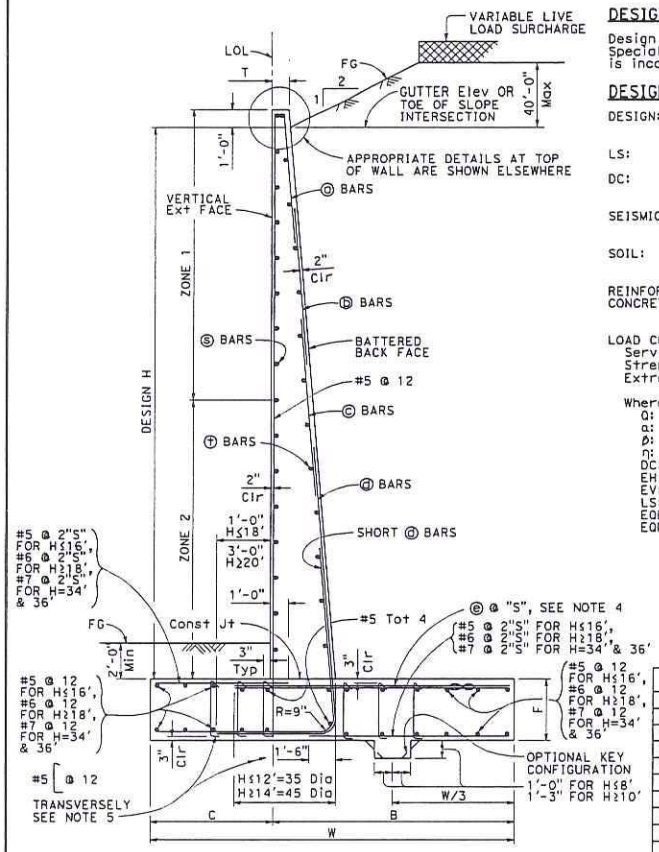
$\sum \Delta H_i = 1.0$"

⇒ Consider 2-ft of overexcavation for 14-ft high wall.

Similarly for wall 330R

Wall height 'H' (ft)	Reqd minimum overex (ft)	Estimated Settlement (in)
12	2	0.93
10	2	0.42
8	2	< 0.42

TYPE 1 (CASE 2) RETAINING WALLS



TYPICAL SECTION

NOTES:

1. For details not shown and drainage notes see RSP B3-5.
2. For wall stem joint details see B0-3 3-3 and B0-3 3-4.
3. At ⓓ and short ⓓ bars:
   H ≤ 6', no splices are allowed within 1'-8" above the top of footing.
   H > 6', no splices are allowed within H/4 above the top of footing.
4. Bundle ⓔ bars for H ≥ 26'.
5. Hook stirrups around & space with alternating transverse reinforcement at 2 x "S".

DESIGN CONDITIONS:

Design H may be exceeded by 6" before going to the next size. Special footing design is required where foundation material is incapable of supporting bearing stress listed in the table.

DESIGN NOTES:

DESIGN: AASHTO LRFD Bridge Design Specifications, 4th Edition with California Amendments

LS: Varied surcharge on level ground surface

DC: Stem Architectural Treatment of thickness up to 6" of concrete (75 psf) considered

SEISMIC: $k_h = 0.2$, $k_v = 0.0$

SOIL: $\phi = 34°$, $\gamma = 120$ pcf

REINFORCED CONCRETE: $f'c = 3{,}600$ psi, $fy = 60{,}000$ psi

LOAD COMBINATIONS AND LIMIT STATES:

Service I	$Q = 1.00DC+1.00EV+1.00EH+1.00LS$
Strength I	$Q = \alpha DC+\beta EV+\eta EH+1.75LS$
Extreme I	$Q = 1.00DC+1.00EV+1.00EH+1.00EQD+1.00EQE$

Where:

Q:	Force Effects
α:	1.25 or 0.90, Whichever Controls Design
β:	1.35 or 1.00, Whichever Controls Design
η:	1.50 or 0.90, Whichever Controls Design
DC:	Dead Load of Structure Components
EH:	Horizontal Earth Fill Pressure
EV:	Vertical Earth Pressure from Earth Fill Weight
LS:	Live Load Surcharge
EQE:	Seismic Earth Pressure
EQD:	Soil and Structural and Nonstructural Components Inertia

SYMBOLS:

TO ACCOMPANY PLANS DATED _____

Ser - service limit state I
Str - strength limit state I
Ext - extreme event limit state I
B' - effective footing width (ft)
q_o - net bearing stress (ksf), OG assumed to be FG at toe
q_o - gross uniform bearing stress (ksf)
h1 = Top of footing to top of short ⓓ bar
h2 = Top of footing to top of ⓓ bar
h3 = Top of footing to top of ⓒ bar
h4 = Top of footing to top of ⓑ bar
Zone 1 = Top half of stem height
Zone 2 = Bottom half of stem height
⋈ - Bundle of two bars

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

April 20, 2012
PLANS APPROVAL DATE

Gary Wang
No. C58298
Exp. 6-30-12
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER

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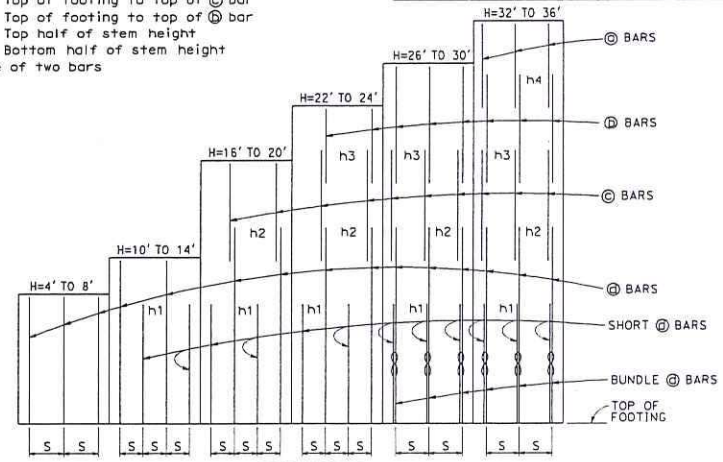


ELEVATION

TABLE OF REINFORCING STEEL, DIMENSIONS AND DATA

DESIGN H	4'	6'	8'	10'	12'	14'	16'	18'	20'	22'	24'	26'	28'	30'	32'	34'	36'
W	6'-0"	7'-6"	9'-6"	11'-0"	12'-6"	15'-6"	17'-3"	19'-6"	21'-9"	23'-6"	26'-0"	28'-1"	30'-3"	31'-6"	33'-0"	34'-8"	35'-11"
C	2'-0"	2'-6"	3'-3"	3'-6"	4'-3"	5'-0"	5'-3"	5'-9"	6'-9"	7'-3"	8'-3"	8'-9"	9'-0"	9'-6"	10'-0"	10'-10"	11'-3"
B	4'-0"	5'-0"	6'-3"	7'-6"	8'-3"	10'-6"	12'-0"	13'-9"	15'-0"	16'-3"	17'-9"	19'-4"	21'-3"	22'-0"	23'-0"	23'-10"	24'-8"
F	1'-6"	1'-6"	2'-0"	2'-3"	2'-6"	2'-8"	2'-10"	3'-0"	3'-4"	3'-6"	3'-6"	3'-7"	3'-7"	3'-9"	3'-9"	4'-0"	4'-4"
T	11½"	11½"	11½"	11½"	11½"	11½"	11½"	11½"	11½"	11½"	11½"	11½"	1'-2"	1'-5"	1'-10"	2'-3"	2'-9"
BATTER	½: 12	½: 12	½: 12	½: 12	½: 12	⅝: 12	⅝: 12	¾: 12	⅞: 12	1 : 12	1⅛: 12	1⅛: 12	1¼: 12	1⅛: 12	1⅛: 12	1¼: 12	1⅛: 12
SPACING "S"	16"	12"	10"	7"	7"	7"	7"	7"	7"	6"	6"	10"	8"	7"	7"	7"	7"
ⓒ BARS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	#5	#5	#5
ⓓ BARS	-	-	-	-	-	-	-	-	-	#5	#5	#5	#5	#5	#7	#7	#7
ⓒ BARS	-	-	-	-	-	-	#6	#6	#6	#7	#8	#8	#8	#8	#9	#9	#9
ⓓ BARS	#5	#5	#6	#6	#7	#8	#9	#10	#10	#10	#11	#11	#11	#11	#11	#11	#11
ⓔ BARS	#5	#5	#6	#6	#7	#8	#9	#10	#10	#10	#11	#11	#11	#11	#11	#11	#11
h1	-	-	-	5'-3"	6'-4"	7'-6"	8'-9"	9'-9"	11'-0"	11'-3"	11'-6"	10'-3"	11'-9"	12'-3"	12'-6"	13'-3"	13'-8"
h2	-	-	-	-	-	-	12'-8"	15'-6"	17'-0"	16'-6"	17'-3"	18'-0"	17'-6"	17'-4"	14'-10"	15'-9"	16'-4"
h3	-	-	-	-	-	-	-	-	-	18'-9"	21'-3"	21'-3"	22'-4"	22'-8"	18'-0"	18'-6"	19'-6"
h4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26'-3"	27'-4"	28'-6"
No. of Toe Stirrups	0	0	0	0	0	0	0	0	0	0	0	5	5	6	7	8	9
No. of Heel Stirrups	0	0	0	0	0	0	0	0	4	6	7	8	10	10	11	11	11
ZONE 1 ⓢ BARS	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 12	#5 @ 12	#5 @ 12	#5 @ 12	#5 @ 12	#6 @ 12	#6 @ 12	#6 @ 10	#6 @ 10
ZONE 2 ⓢ BARS	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 12	#5 @ 12	#5 @ 12	#5 @ 12	#6 @ 12	#6 @ 12	#7 @ 12	#7 @ 12	#7 @ 12	#7 @ 12	#7 @ 10	#7 @ 10
ZONE 1 ⓣ BARS	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 12	#4 @ 12	#4 @ 12	#5 @ 12	#5 @ 12	#5 @ 12
ZONE 2 ⓣ BARS	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 18	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#5 @ 12	#5 @ 12	#5 @ 12	#6 @ 12	#6 @ 12	#6 @ 12
Ser: B', q_o	4.0, 0.9	5.5, 1.0	9.3, 1.0	10.9, 1.3	12.3, 1.5	14.8, 1.9	16.6, 2.1	18.7, 2.4	20.6, 2.7	22.3, 3.0	24.2, 3.3	26.1, 3.5	28.2, 3.9	29.6, 4.0	31.1, 4.2	32.7, 4.4	34.1, 4.6
Str: B', q_o	2.2, 2.2	3.5, 2.2	5.1, 2.3	6.3, 2.6	7.6, 2.7	12.9, 3.1	14.3, 3.6	16.5, 3.9	19.4, 4.5	20.7, 4.8	22.5, 5.2	24.3, 5.6	26.2, 6.0	27.5, 6.3	28.8, 6.6	30.3, 6.9	31.8, 7.2
Ext: B', q_o	2.3, 3.4	2.7, 4.4	3.6, 5.0	3.8, 6.5	4.5, 7.0	7.0, 6.1	7.6, 6.9	9.3, 7.0	11.0, 7.1	11.8, 7.6	14.1, 7.4	15.6, 7.7	17.1, 8.0	17.2, 8.7	18.1, 9.0	19.0, 9.4	19.4, 10.0

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL TYPE 1 (CASE 2)

NO SCALE

RSP B3-1B DATED APRIL 20, 2012 SUPPLEMENTS THE STANDARD PLANS BOOK DATED 2010.

REVISED STANDARD PLAN RSP B3-1B

3-10

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

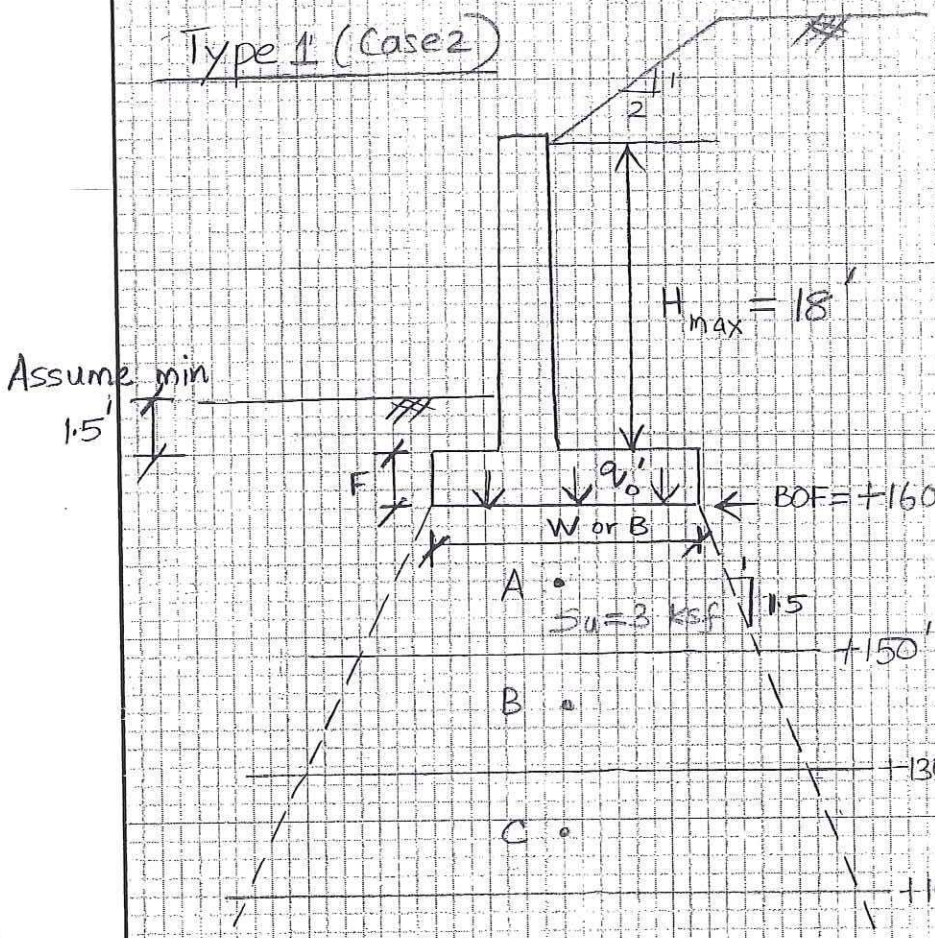
17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 240R

Type 1 (Case 2)



* 'H' varies from 10' to 18'
* Footing Embedment
  D = 1.5' + 3'
  = 4.5'
* Based on the Standard plan sheet; (B3-1B)
  W = 19.5 ft
  F = 3 ft
  Service q_o' = 2.4 ksf
  Service B' = 18.7 ft
  Strength q_o' = 3.4 ksf
  Strength B' = 16.5 ft
  Extreme q_o' = 7 ksf
  Extreme B' = 9.2 ft

Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{ult} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$

shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >>> B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 2 of 3

$\therefore q_u = C N_{cm} + \gamma D$

$N_{cm} = N_c \times S_c$

$S_c = 1 + \left(\frac{B}{5L}\right) = 1.006$

$\therefore N_{cm} = 5.14 \times 1.006 = 5.17$

Nominal bearing capacity

$q_u = (3 \times 5.17) + (120 \times 4.5')$

$= 1551.0 + 540$

≈ 16 ksf

Service Limit State

$q_{all} = \frac{q_u}{FOS} = \frac{16}{3} = 5.3$ ksf $> q_0' = 2.4$ ksf

Strength Limit State

$q_{all} = \phi q_u = 0.55 \times 16 = 8.8$ ksf $> q_0 = 3.9$ ksf

(ϕ: resistance factor)

Extreme Limit State

$q_{all} = \phi q_u = 1.0 \times 16 = 16$ ksf $> q_0 = 7$ ksf

$\Rightarrow$ Check Satisfied

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	6	0.03	2.74	1.77	0.47
B	20	0.03	5.25	1.18	0.64
C	30	0.03	9.05	0.73	0.36

$\Sigma \Delta H_i = 1.5''$

⇒ Consider 4-ft of overexcavation for 18-ft high wall.

Similarly for wall 240R

Wall height 'H' (ft)	Req'd minimum overex (ft)	Estimated Settlement (in)
16	4	1.30
14	4	1.10
12	2	0.90
10	2	0.73

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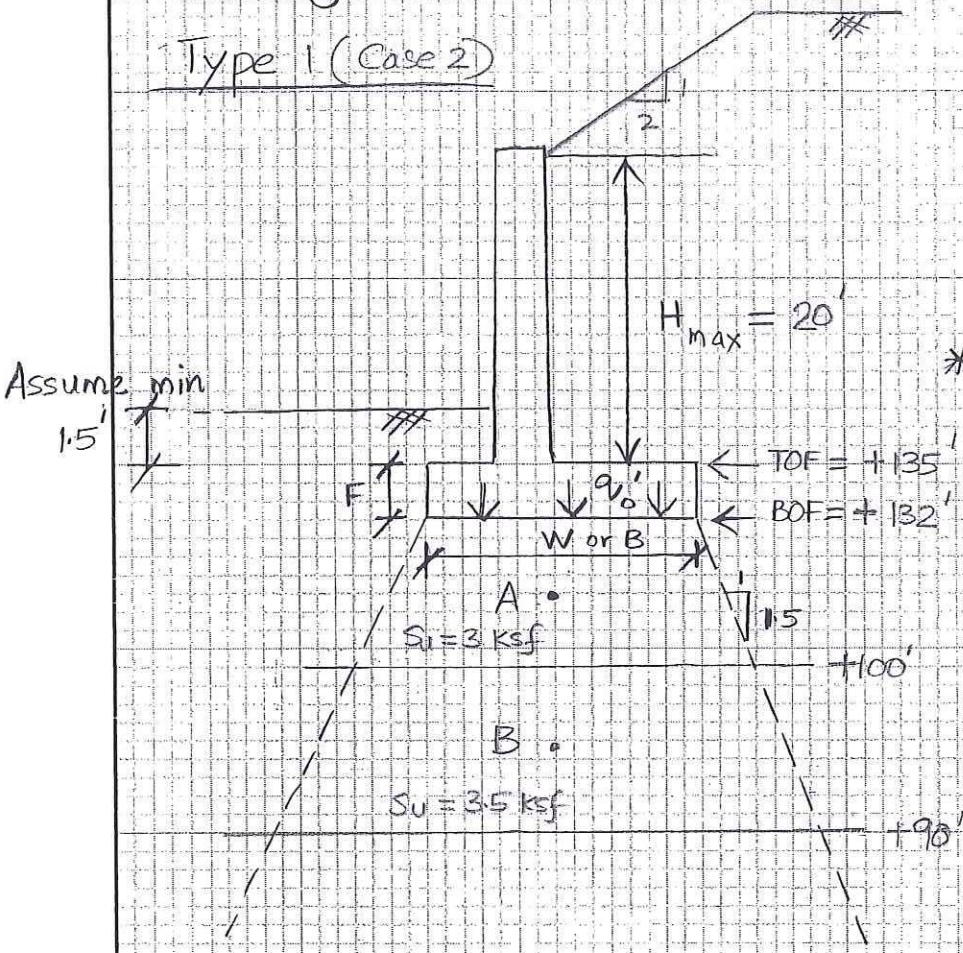
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 280R

Type 1 (Case 2)



* 'H' varies from 10 ft to 20 ft
* Footing Embedment
  $D = 1.5' + 3.3'$
  $= 4.8'$
* Based on the Standard plan sheet; (B3-1B)
  $W = 21.5'$
  $F = 3.33'$
  Service $q_o' = 2.7$ ksf
  Service $B' = 20.6'$
  Strength $q_o' = 4.5$ ksf
  Strength $B' = 9.4'$
  Extreme $q_o' = 7.1$ ksf
  Extreme $B' = 11.0$

Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{ult} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$

shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L \gg B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$ & $N_q = 1$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 2 of 3

$\therefore q_u = C N_{cm} + \gamma D$

$N_{cm} = N_c \times S_c$

$S_c = 1 + \left(\frac{B}{5L}\right) = 1 + \left(\frac{21.5}{5 \times 500}\right) = 1.008$

$\therefore N_{cm} = 5.14 \times 1.008 = 5.18$

Nominal bearing capacity

$q_u = (3 \times 5.18) + (0.12 \times 4.5)$

$= 15.54 + 0.54$

≈ 16 ksf

Service Limit State

$q_{all} = \frac{q_u}{FOS} = \frac{16}{3} = 5.3$ ksf $> q_0' =$ 2.7 ksf

Strength Limit State

$q_{all} = \phi q_u = 0.55 \times 16 = 8.8$ ksf $> q_0 =$ 4.5 ksf

(ϕ: resistance factor)

Extreme Limit State

$q_{all} = \phi q_u = 1.0 \times 16 = 16$ ksf $> q_0 =$ 7.1 ksf

$\Rightarrow$ Check Satisfied

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	28	0.025	3.66	1.91	0.78
B	10	0.025	6.15	1.13	0.37

$\Sigma \Delta H_i = 1.2$"

⇒ Consider 4-ft of overexcavation for 20-ft high wall.

Similarly for wall 280R,

Wall height 'H' (ft)	Req'd minimum overex (ft)	Estimated Settlement (in)
18	4	1.10
16	4	1.00
14	3	0.90
12	2	0.83
10	2	0.68

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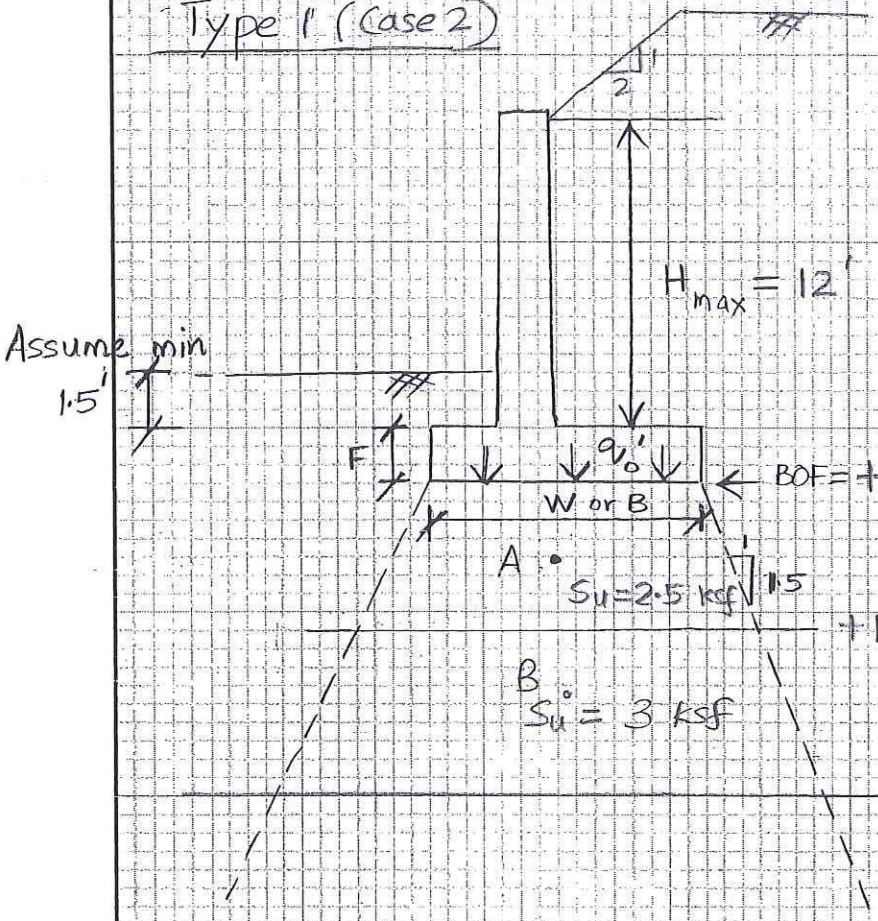
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 302R

Type 1 (Case 2)



* 'H' varies from 8' to 12'
* Footing Embedment
  D = 1.5' + 2.5'
  = 4'
* Based on the Standard plan sheet; (B3-1B)

W = 12.5 ft
F = 2.5 ft
Service q_o' = 1.5 ksf
Service B' = 12.3 ft
Strength q_o' = 2.7 ksf
Strength B' = 7.6 ft
Extreme q_o' = 7.0 ksf
Extreme B' = 4.5 ft

Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{ult} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$
shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >>> B$)
depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$ & $N_q = 1$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 2 of 3

$\therefore q_u = C N_{cm} + \gamma D$

$N_{cm} = N_c \times S_c$

$S_c = 1 + \left(\frac{B}{5L}\right) = 1.012$

$\therefore N_{cm} = 5.14 \times 1.012 = 5.2$

Nominal bearing capacity

$q_u = (5.2 \times 2.5) + (4 \times 120)$

$= 13.0 + 480$

$= 13.4$ ksf

Service Limit State

$q_{all} = \frac{q_u}{FOS} = \frac{13.4}{3} = 4.5$ ksf $> q_{to}' = 1.5$ ksf

Strength Limit State

$q_{all} = \phi q_u = 0.55 \times 13.4 = 7.3$ ksf $> q_{to} = 2.7$ ksf

(ϕ ← resistance factor)

Extreme Limit State

$q_{all} = \phi q_u = 1.0 \times 13.4 = 13.4$ ksf $> q_{to} = 7$ ksf

$\Rightarrow$ Check Satisfied

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_0' + \Delta\sigma_v'}{\sigma_0'}\right)$$

σ_0' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 2' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_0' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	15	0.03	2.99	0.99	0.63
B	21	0.03	5.44	0.49	0.20

$\Sigma \Delta H_i = \pm$ 0.9"

⇒ Consider 2-ft of overexcavation for 12-ft high wall.

Similarly for wall 302R (Type 1 - Case 2)

Wall height H (ft)	Req'd minimum overex (ft)	Estimated Settlement (in)
10	2	0.75
8	2	0.72

TYPE 7 (CASE 2) RETAINING WALLS

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	Ora	5			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — MOHAN S. CHAR — No. 57894 — EXP. 6/30/14 — CIVIL — STATE OF CALIFORNIA

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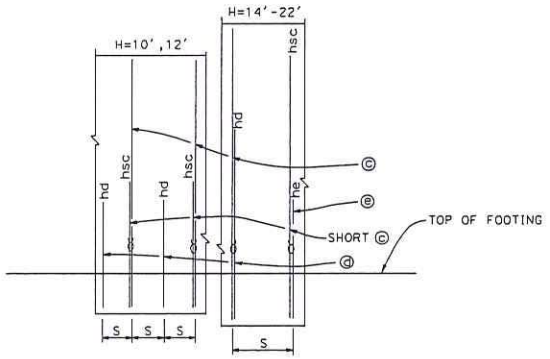
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 SOUTH MAIN STREET
ORANGE, CA 92863-1584

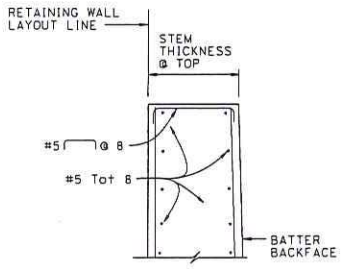
AECOM TECHNICAL SERVICES INC.
999 W. TOWN & COUNTRY ROAD
ORANGE, CALIFORNIA 92868



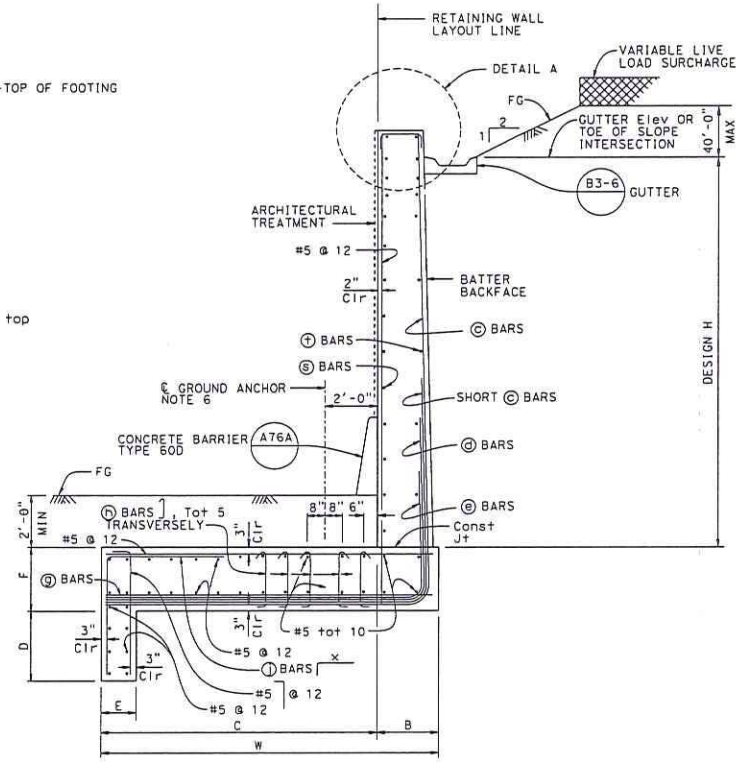
ELEVATION
No Scale

NOTE:

"hsc", "hd" and "he" above bars indicate distance from top of footing to upper end of the bars, see table.



DETAIL A
¾ = 1'-0"



SPREAD FOOTING SECTION
No Scale

DESIGN DATA

Design: AASHTO LRFD Bridge Design Specifications, 4th edition with California Amendments

LS: Varied surcharge on level ground surface

EQE: Mononobe-Okabe Method
K_h = 0.2
K_v = 0.0

Soil: ø = 34°
γ = 120 pcf

Reinforced Concrete: f'c = 3600 psi
fy = 60,000 psi

Load Combinations and Limit States

Service I Q=1.00DC+1.00EV+1.00EH+1.00LS+Td

Strength I Q=αDC+βEV+1.50EH+1.75LS+Td

Extreme I Q=1.00DC+1.00EV+1.00EH+1.00EQD+1.00EQE+Td

Where: Q: Force Effects
α: 1.25 or 0.90, Whichever Controls Design
β: 1.35 or 1.00, whichever Controls Design
DC: Dead Load of Structure Components
EV: Vertical Earth Fill Pressure
LS: Live Load Surcharge
EQE: Seismic Earth Pressure
EQD: Soil and Structure Components Inertia. Soil inertia ignored for stem design
Td: Anchor Design Load

NOTES:

1. For Architectural Treatment, see Details elsewhere in Project Plans.
2. For details not shown and drainage notes, see B3-5 & B3-6
3. Shift © bars, ⓓ bars and ⓔ bars as required to clear formed hole for ground anchor.
4. Footing is designed to resist 1.33 Td assuming the maximum anchor spacing shown in the table on "RETAINING WALL TYPE 7 (CASE 2) - DETAILS NO. 2" sheet.
5. For wall dimensions, reinforcing steel and bearing stress data, see table on "RETAINING WALL TYPE 7 (CASE 2) - DETAILS NO. 2" sheet.
6. For ground anchor details, see "VERTICAL GROUND ANCHOR DETAILS NO. 1" and "VERTICAL GROUND ANCHOR DETAILS NO. 2" sheets.

DESIGN OVERSIGHT	DESIGN	BY D. Kim	CHECKED M. Wise	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	Mohan S. Char PROJECT ENGINEER
SIGN OFF DATE	DETAILS	BY H. Withers	CHECKED M. Wise		
	QUANTITIES	BY J. Quinoveva	CHECKED D. Kim		

BRIDGE NO. 55E0129
POST MILES 3.94

RETAINING WALL NO. 218R

RETAINING WALL TYPE 7 (CASE 2)-DETAILS NO. 1

DESIGN DETAIL SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 1200020278 CONTRACT NO.: 12-0F96C1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 04-30-13 09-24-13

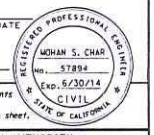
SHEET 4 OF 8

FILE => RW218R-g-rwdt01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	5			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE



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AECOM TECHNICAL SERVICES INC.
999 W. TOWN & COUNTRY ROAD
ORANGE, CALIFORNIA 92868

TABLE OF WALL DIMENSIONS, REINFORCING STEEL AND BEARING STRESS DATA

DESIGN H	10'	12'	14'	16'	18'	20'	22'
W	7'-6"	8'-6"	9'-3"	11'-3"	12'-3"	13'-3"	14'-9"
C	6'-0"	6'-9"	7'-3"	9'-0"	9'-6"	10'-6"	11'-4"
B	1'-6"	1'-9"	2'-0"	2'-3"	2'-9"	2'-9"	3'-5"
F	2'-4"	2'-6"	2'-6"	2'-9"	2'-9"	3'-0"	3'-6"
D (FOOTING KEY DEPTH)	1'-0"	1'-0"	2'-0"	3'-0"	3'-0"	3'-0"	3'-0"
E	1'-0"	1'-0"	1'-3"	1'-6"	1'-6"	1'-6"	1'-6"
STEM THICKNESS AT TOP	1'-3"	1'-7"	1'-9"	2'-0"	2'-0"	2'-0"	2'-0"
BATTER	0	0	0	0	1/4:12	1/4:12	1/2:12
S	0'-8"	0'-8"	0'-7"	0'-6"	0'-8"	0'-7"	0'-6"
© BARS	#5 2	#5 2	#5	#5	#5	#5	#5
hsc	8'-9"	9'-0"	11'-6"	12'-6"	13'-6"	14'-6"	16'-0"
@ BARS	#7	#8	#6	#6	#8	#9	#8
hd	5'-9"	6'-0"	9'-6"	10'-6"	11'-6"	12'-6"	13'-9"
@ BARS			#9	#10	#10	#11	#11
he			7'-6"	8'-6"	9'-6"	10'-6"	11'-6"
ⓖ BARS	#5 @ 16	#6 @ 16	#5 @ 14	#5 @ 12	#8 @ 16	#8 @ 14	#8 @ 12
BARS BUNDLED WITH ⓖ in ftg	ⓓ	ⓒ	SHORT ⓒ & ⓔ	SHORT ⓒ & ⓔ	SHORT ⓒ & ⓔ	SHORT ⓒ & ⓔ	SHORT ⓒ & ⓔ
ⓗ BARS		#4 @ 16	#4 @ 14	#4 @ 12	#6 @ 16	#6 @ 14	#6 @ 12
ⓘ BARS	#5 @ 12	#5 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12
x	3'-6"	4'-0"	4'-6"	5'-0"	5'-6'	6'-0"	6'-6"
ⓢ BARS	#5 @ 15	#5 @ 12	#5 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12
ⓣ BARS	#4 @ 18	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#5 @ 12
Td (KIPS/FT)	7.50	9.0	11.25	9.0	11.25	16.50	20.25
To (KIPS/FT)	7.50	9.0	11.25	9.0	11.25	16.50	20.25
Tp = Larger of 1.33 To & 1.25 Td (KIPS/FT)	10.0	12.0	15.0	12.0	15.0	22.0	27.0
MAX. ANCHOR SPACING	9'-6"	7'-9"	6'-3"	7'-9"	6'-3"	6'-3"	6'-3"
SER I: B'(ft), q'_a (ksf)	6.5, 1.3	7.5, 1.2	8.0, 1.4	10.7, 0.7	11.0, 0.8	12.9, 0.8	15.0, 0.8
STR Ia: B'(ft), q_a(ksf)	5.9, 3.3	6.8, 3.5	7.2, 4.1	9.6, 3.4	9.8, 4.0	11.6, 4.3	13.6, 4.6
STR, Ib: B'(ft), q_a(ksf)	5.5, 3.1	6.3, 3.4	6.5, 4.0	8.8, 3.2	8.9, 3.9	10.9, 4.1	12.6, 4.3
Ext I: B'(ft), q_a(ksf)	4.1, 4.2	4.4, 5.0	4.4, 6.1	5.3, 5.5	5.3, 6.8	6.5, 7.0	7.4, 7.6

NOTE:
ⓗ Bar spacing shown is along the length of the retaining wall.

LEGEND:
SER: service limit state
STR: strength limit state
EXT: extreme event limit state
B': effective footing width (ft)
q'_a: net bearing stress (ksf)
q_a: gross uniform bearing stress (ksf)
2: 2 bar bundle
To: Anchor Lockoff Load
Tp: Anchor Factored Test Load

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN DETAIL SHEET (ENGLISH) (REV.7/18/10)

	BY	CHECKED
DESIGN	D. Kim	W. Wise
DETAILS	H. Withers	W. Wise
QUANTITIES	J. Quinoveva	D. Kim

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Mohan S. Char
PROJECT ENGINEER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020278

CONTRACT NO.: 12-0F96C1

FILE => RW218R-g-rwdt02.dgn

BRIDGE NO.	POST MILES
55E0129	3.94

RETAINING WALL NO. 218R

RETAINING WALL TYPE 7 (CASE 2)-DETAILS NO. 2

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES				SHEET	OF
06-30-12	09-21-17			5	8

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

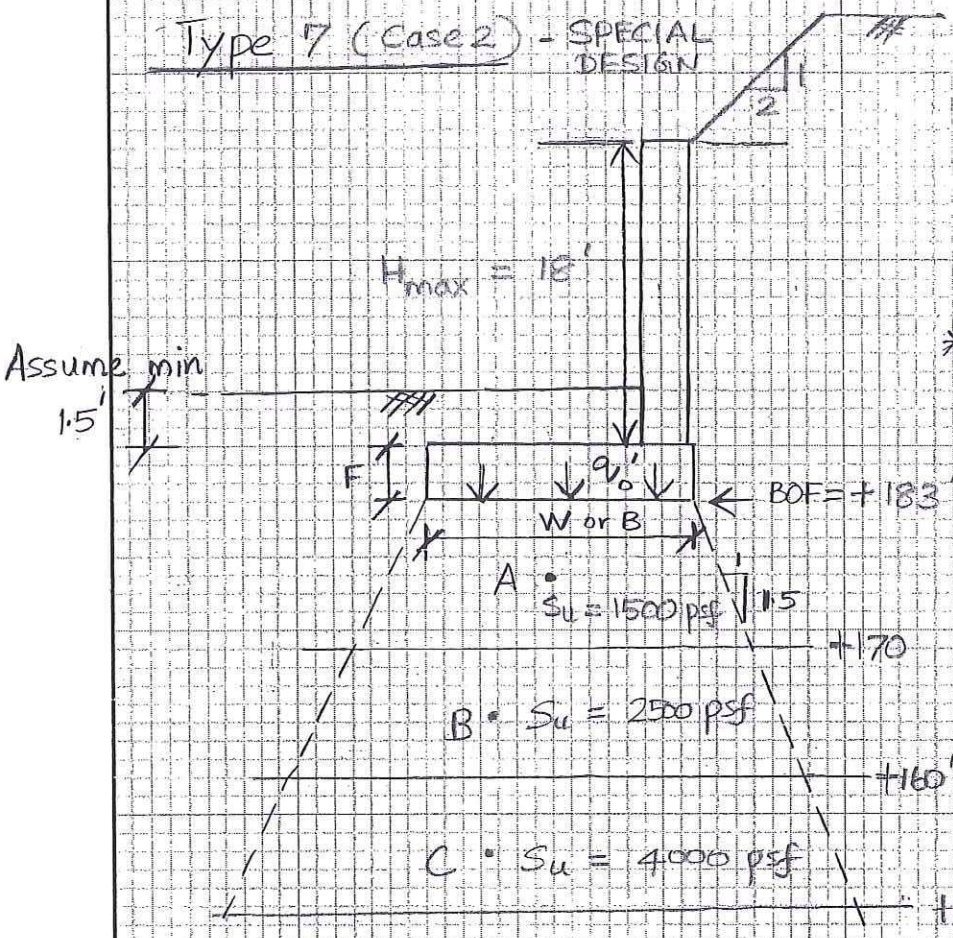
17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 218 R

Type 7 (Case 2) - SPECIAL DESIGN



* 'H' varies from 10' to 18'
* Footing Embedment
  D = 1.5' + 2.75'
  = 4.25'
* Based on the information provided by AECOM,
  W = 12.25'
  F = 2.75'
  Service q_o' = 1 ksf
  Service B' = 10.3'
  Strength q_o' = 4.0 ksf
  Strength B' = 9.8'
  Extreme q_o' = 6.8 ksf
  Extreme B' = 5.3'

Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{ult} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$$N_{cm} = N_c s_c i_c \; ; \; N_{qm} = N_q s_q i_q d_q \; ; \; N_{\gamma m} = N_\gamma s_\gamma i_\gamma$$

load inclination factors $i_c = i_q = i_\gamma = 1$

Shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >>> B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$ & $N_q = 1$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 2 of 3

$\therefore q_u = C N_{cm} + \gamma D$

$N_{cm} = N_c \times S_c$

$S_c = 1 + \left(\frac{B}{5L}\right) = 1 + \left(\frac{12.25}{5 \times 310}\right) = 1.008$

$\therefore N_{cm} = 5.14 \times 1.008 = 5.18$

Nominal bearing capacity

$q_u = (5.8 \times 1.5) + (0.12 \times 4.75)$

$= 7.77 + 0.57$

$= 8.34$ ksf

Service Limit State

$q_{all} = \frac{q_u}{FOS} = \frac{8.34}{3} = 2.7$ ksf $> q_{10}' = 1$ ksf

Strength Limit State

$q_{all} = \phi q_u = 0.55 \times 8.34 = 4.5$ ksf $> q_0 = 3.5$ ksf

(ϕ ← resistance factor)

Extreme Limit State

$q_{all} = \phi q_u = 1.0 \times 8.34 = 8.3$ ksf $> q_0 = 5.6$ ksf

$\Rightarrow$ Check Satisfied

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' = initial stress
$\Delta\sigma_v'$ = stress increase
H_i = layer thickness

* Assume 2' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	11	0.03	3.01	0.71	0.31
B	10	0.03	4.23	0.44	0.14
C	15	0.03	5.46	0.32	0.20

$\Sigma \Delta H_i = 0.65''$

⇒ Consider 2-ft of overexcavation for 18-ft high wall.

Similarly for wall 218R (Special Design)

Wall height 'H' (ft)	Reqd minimum overex (ft)	Estimated Settlement (in)
16	2	0.62
14	2	0.85
12	2	0.90
10	2	0.82

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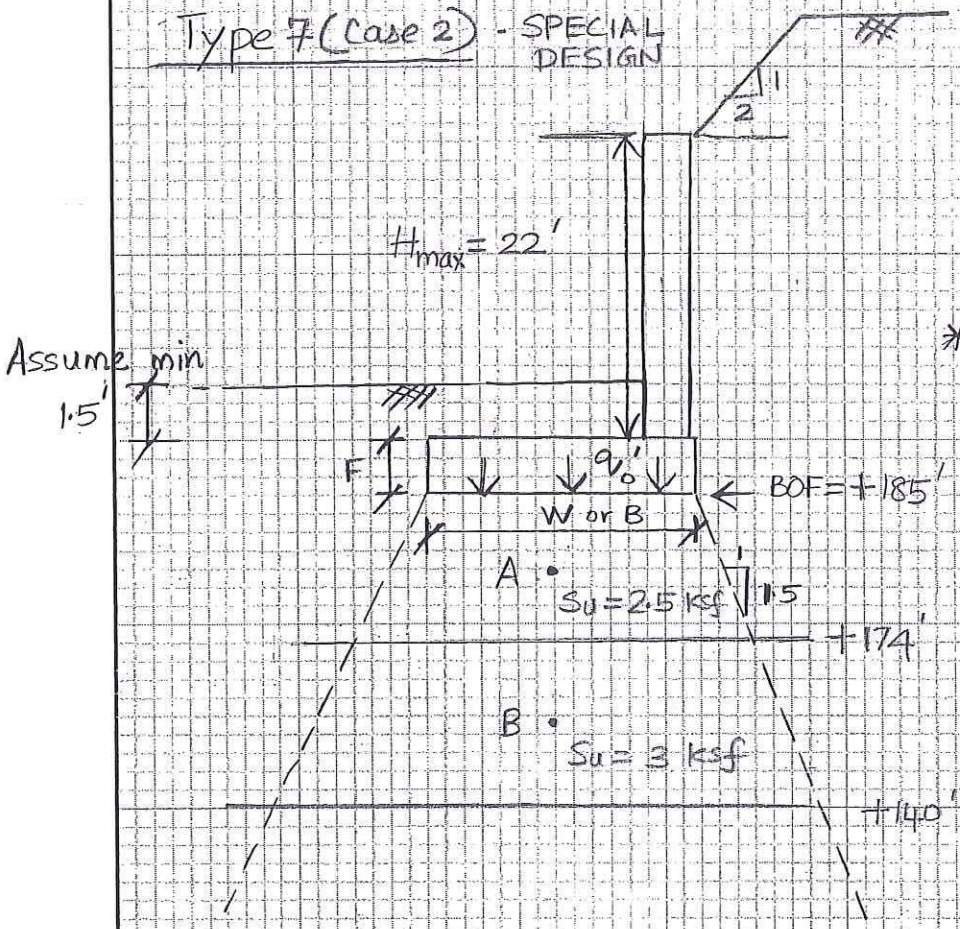
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 302R

Type 7 (Case 2) - SPECIAL DESIGN



* 'H' varies from 10' to 22'
* Footing Embedment
  D = 1.5' + 3.5'
  = 5'
* Based on the information provided by AECOM,
  W = 14.75'
  F = 3.5'
  Service q_o' = 1.6 ksf
  Service B' = 8.1 ft
  Strength q_o' = 4.6 ksf
  Strength B' = 13.6 ft
  Extreme q_o' = 7.6 ksf
  Extreme B' = 7.4 ft

Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{vu} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$

Shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >>> B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$ & $N_q = 1$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 2 of 3

$\therefore q_u = C N_{cm} + \gamma D$

$N_{cm} = N_c \times S_c$

$S_c = 1 + \left(\frac{B}{5L}\right) = 1.009$

$\therefore N_{cm} = 5.14 \times 1.009 = 5.18$

Nominal bearing capacity

$q_u = (5.18 \times 2.5) + (0.12 \times 5)$

$= 12.96 + 0.6$

$= 13.5$ ksf

Service Limit State

$q_{all} = \frac{q_u}{FOS} = \frac{13.5}{3} = 4.5$ ksf $> q'_0 = 1.6$ ksf

Strength Limit State

$q_{all} = \phi q_u = 0.55 \times 13.5 = 7.4$ ksf $> q_0 = 4.5$ ksf

(ϕ ← resistance factor)

Extreme Limit State

$q_{all} = \phi q_u = 1.0 \times 13.5 = 13.5$ ksf $> q_0 = 7.8$ ksf

$\Rightarrow$ Check Satisfied

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_0' + \Delta\sigma_v'}{\sigma_0'}\right)$$

σ_0' = initial stress
$\Delta\sigma_v'$ = stress increase
H_i = layer thickness

* Assume 2' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_0' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	9	0.03	3.60	1.09	0.50
B	34	0.02	5.81	0.50	0.25

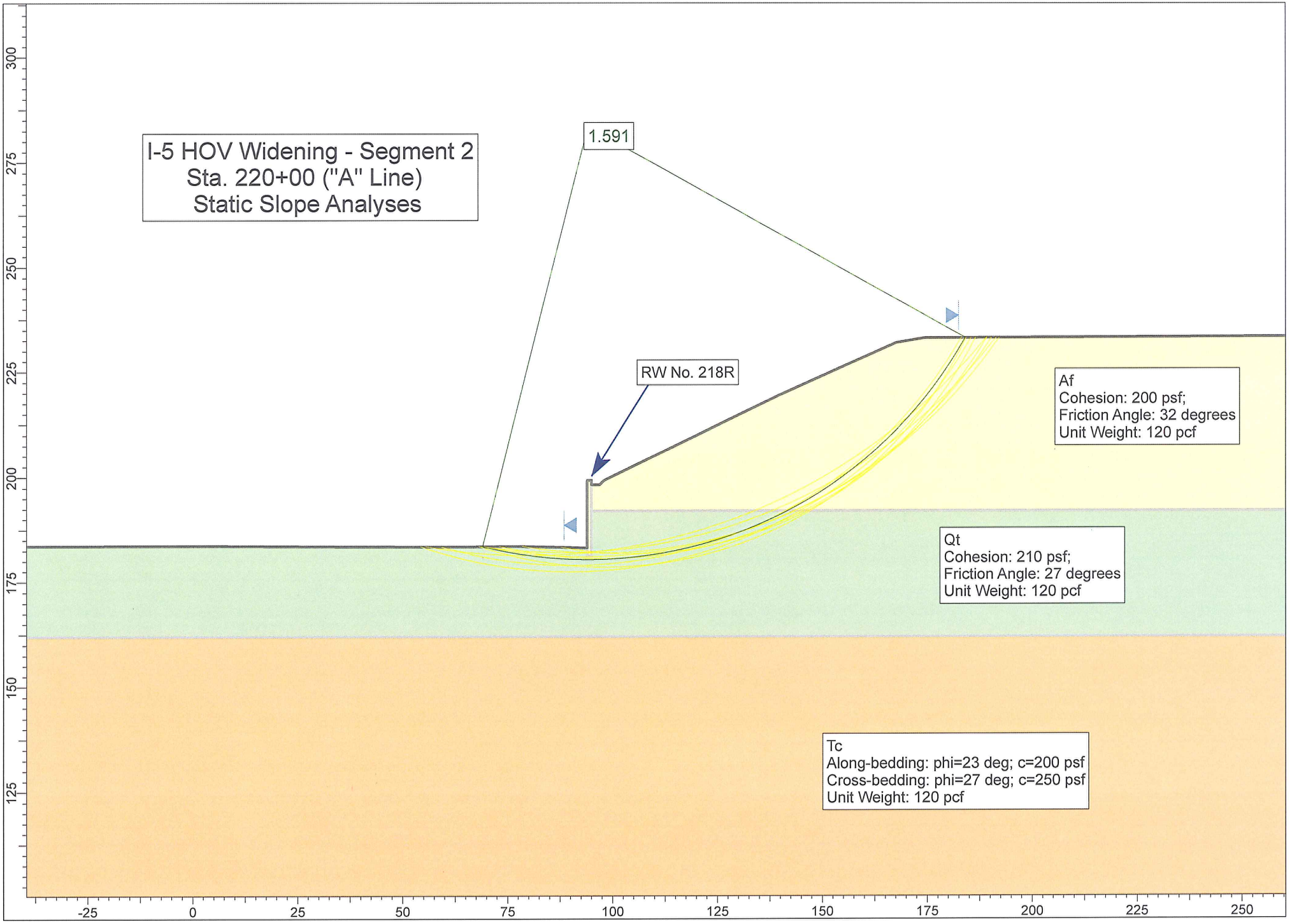
$\Sigma \Delta H_i = 0.75''$

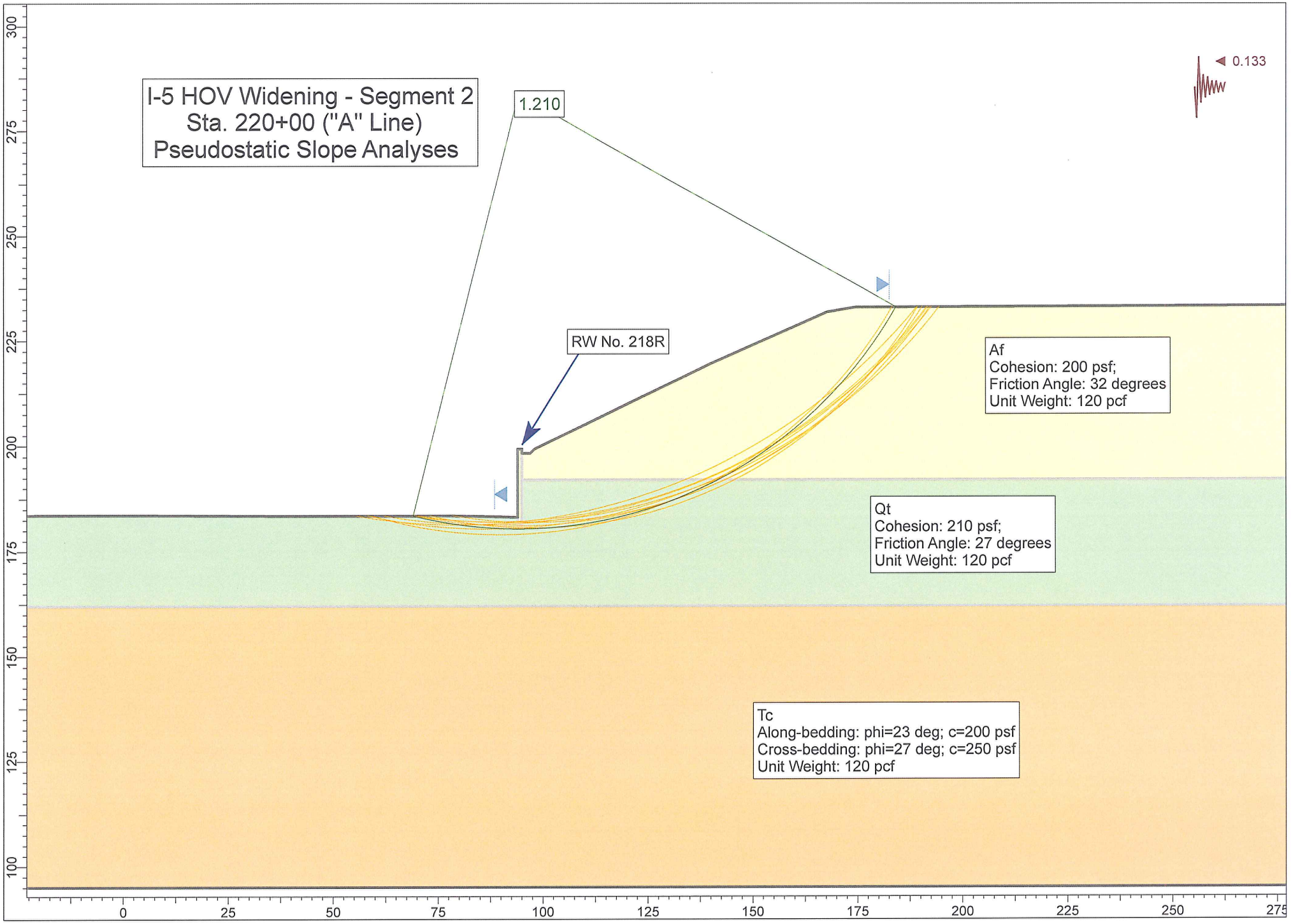
⇒ Consider 2-ft of overexcavation for 22-ft high wall.

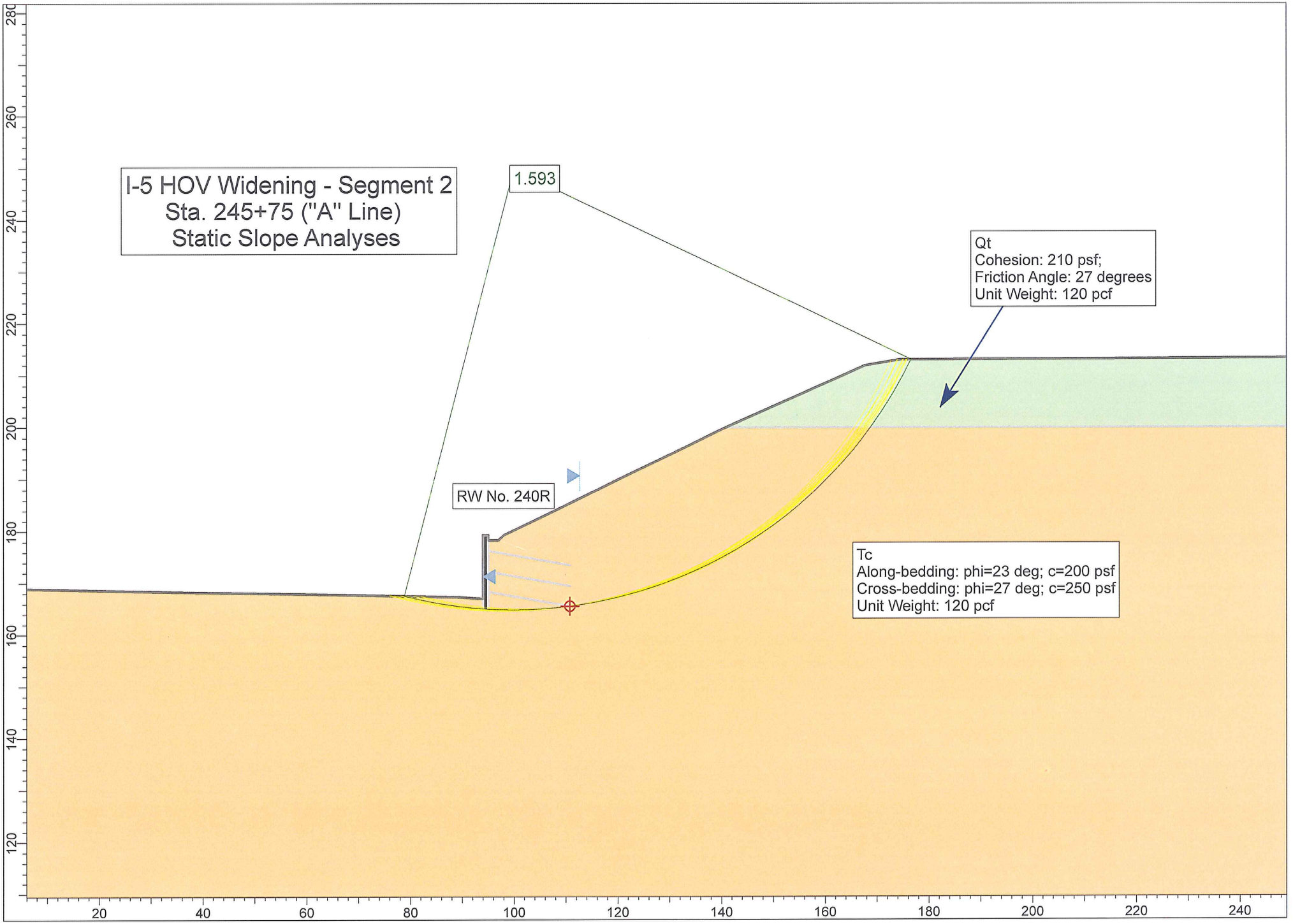
Similarly for wall 302R (Type 7 Case 2 - Special Design)

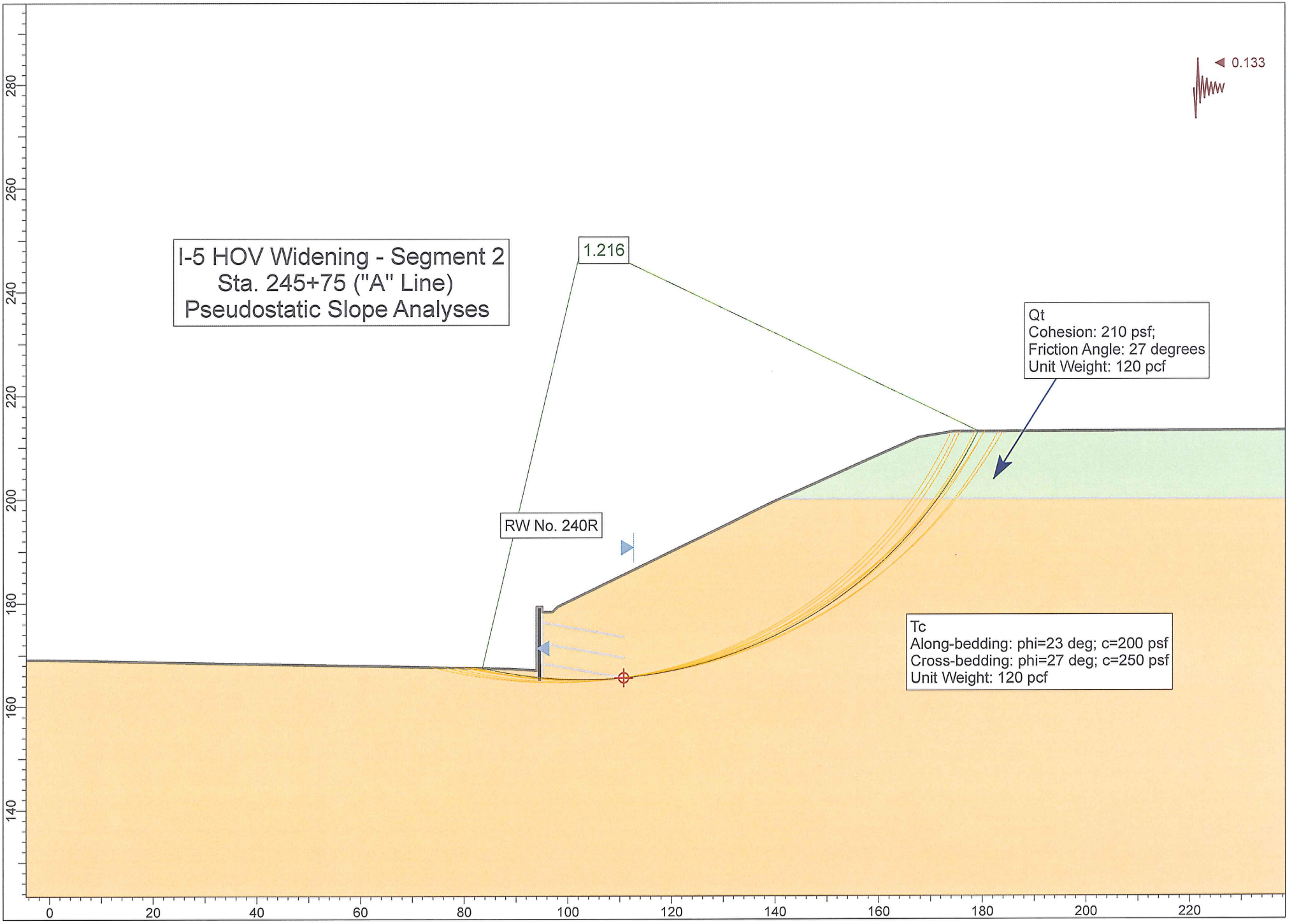
Wall height 'H' (ft)	Reqd minimum overex (ft)	Estimated Settlement (in)
20	2	0.66
18	2	0.65
16	2	0.61
14	2	0.80
10	2	0.75

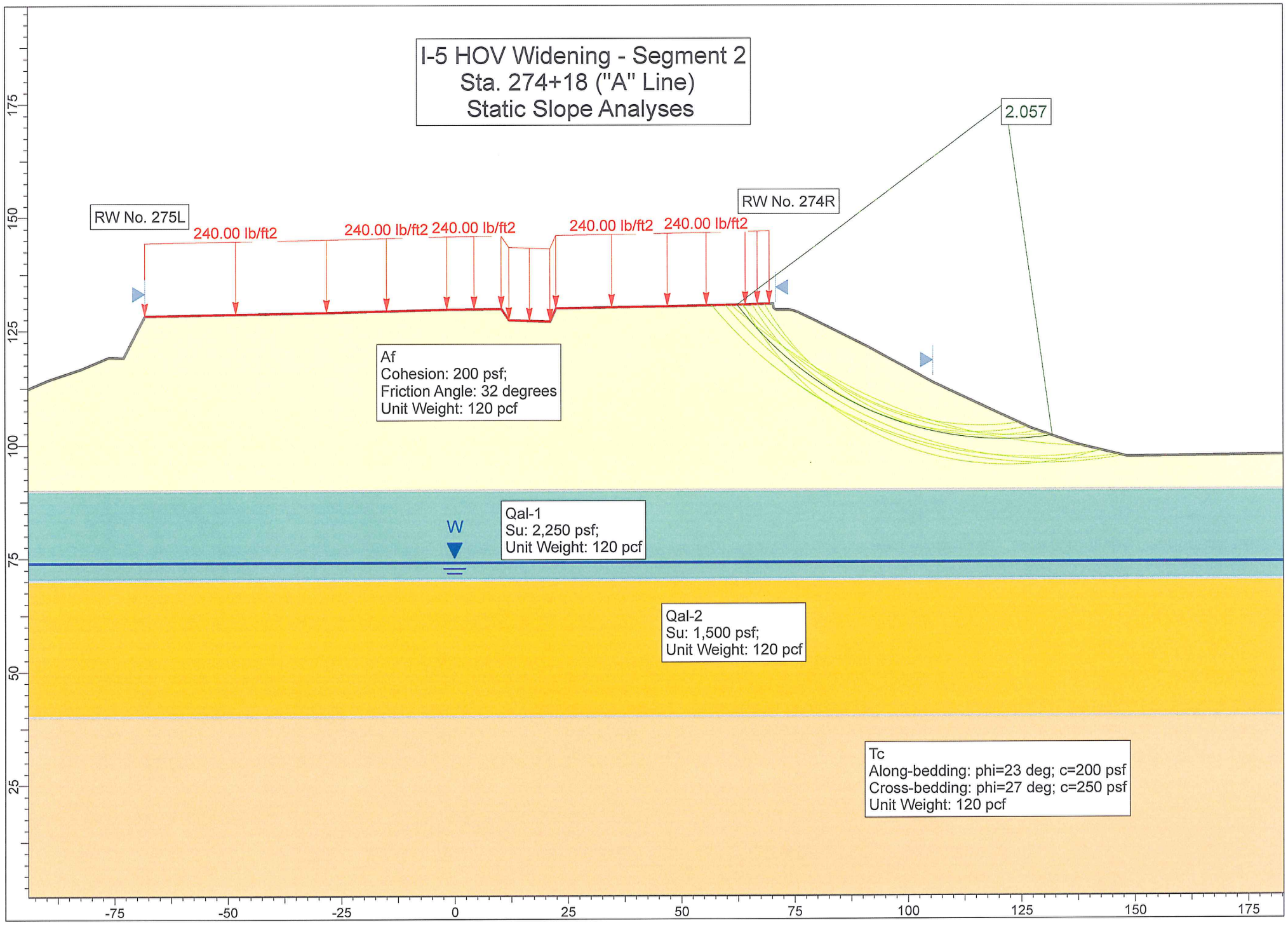
SLOPE STABILITY

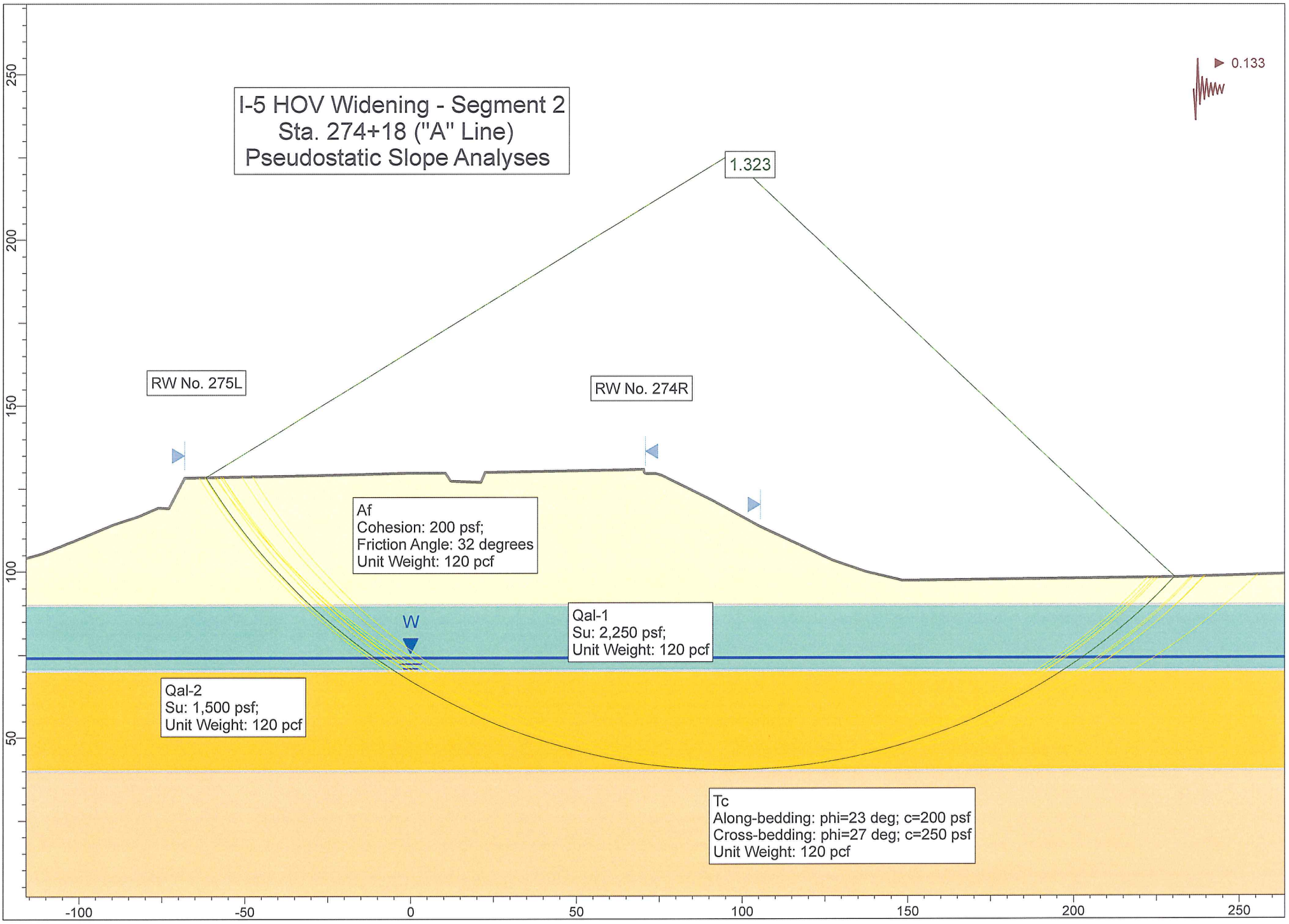

I-5 HOV Widening - Segment 2
Sta. 220+00 ("A" Line)
Static Slope Analyses
1.591
RW No. 218R
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
275
250
225
200
175
150
125
-25
0
25
50
75
100
125
150
175
200
225
250

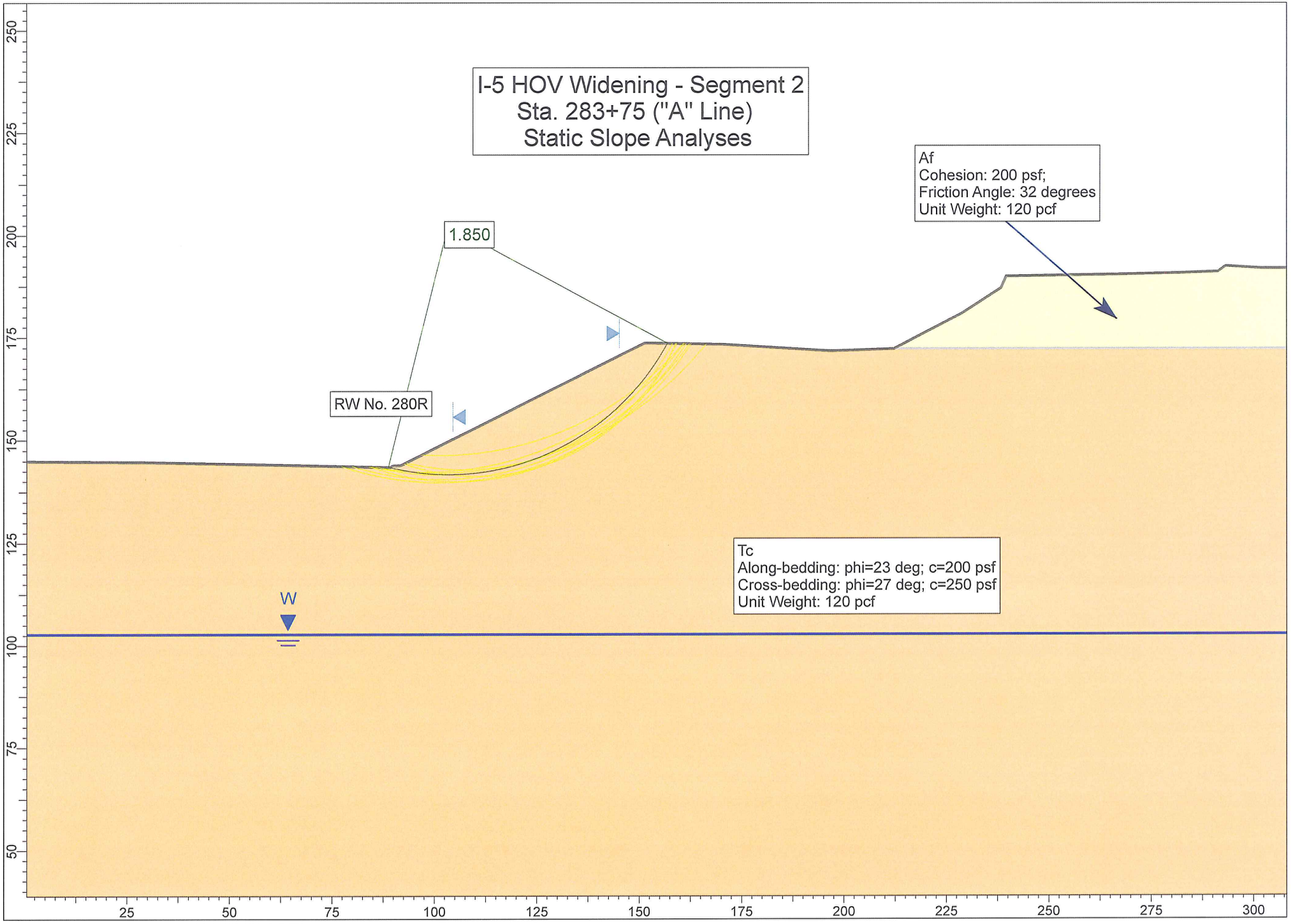

I-5 HOV Widening - Segment 2
Sta. 220+00 ("A" Line)
Pseudostatic Slope Analyses
1.210
0.133
RW No. 218R
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
275
250
225
200
175
150
125
100
0
25
50
75
100
125
150
175
200
225
250
275

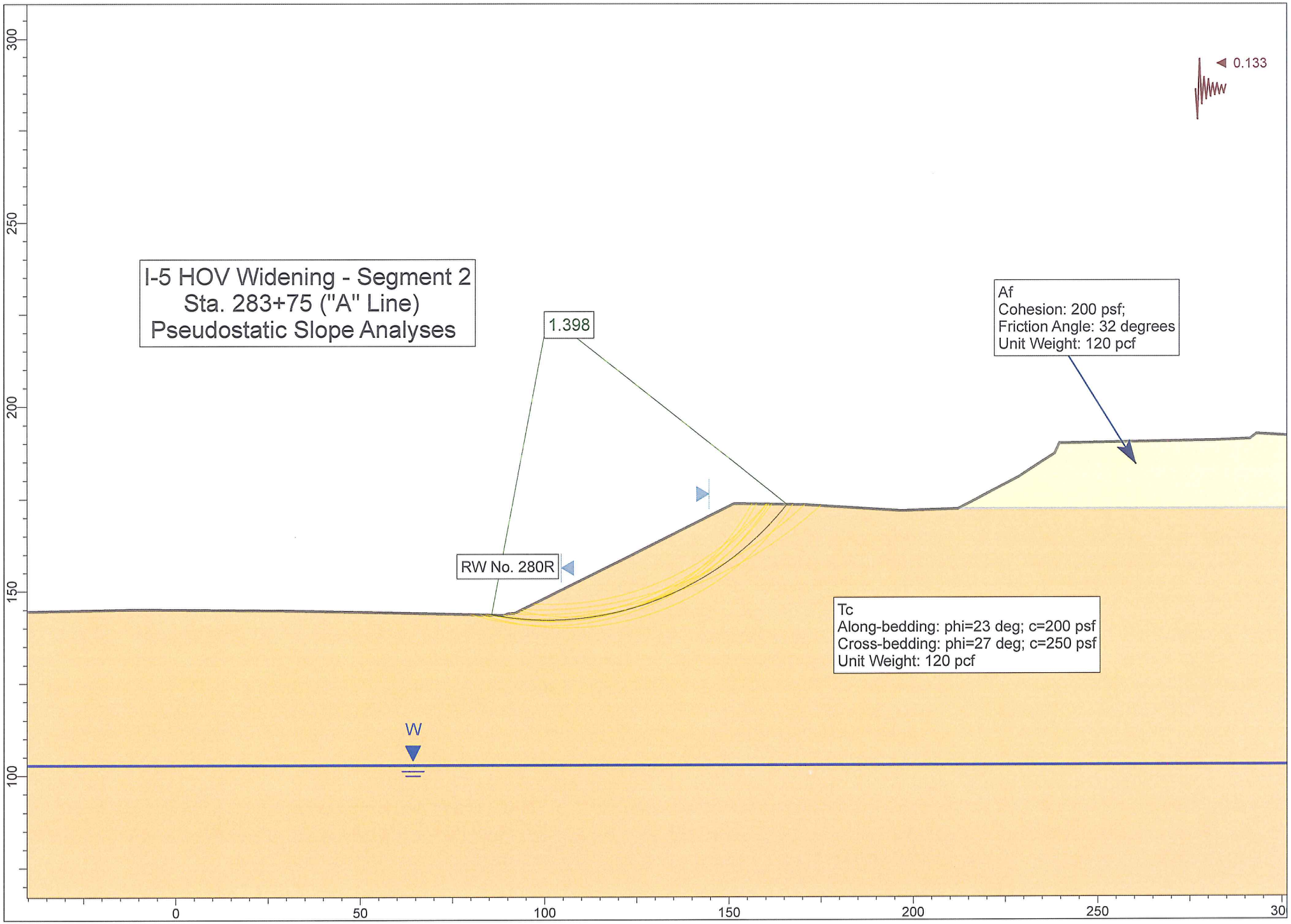

I-5 HOV Widening - Segment 2
Sta. 245+75 ("A" Line)
Static Slope Analyses
1.593
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
RW No. 240R
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
280
260
240
220
200
180
160
140
120
20
40
60
80
100
120
140
160
180
200
220
240

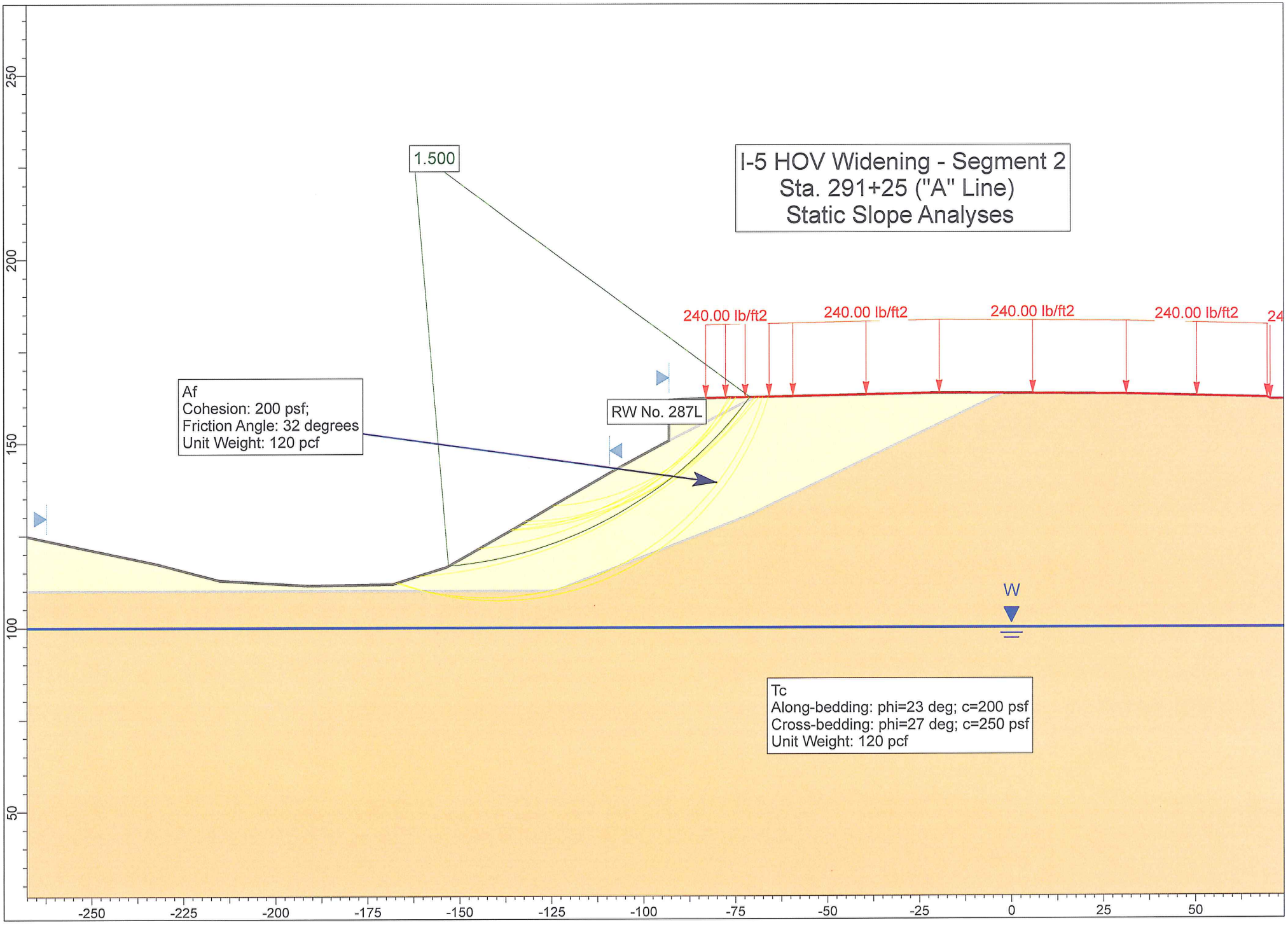

I-5 HOV Widening - Segment 2
Sta. 245+75 ("A" Line)
Pseudostatic Slope Analyses
1.216
0.133
RW No. 240R
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
280
260
240
220
200
180
160
140
0
20
40
60
80
100
120
140
160
180
200
220

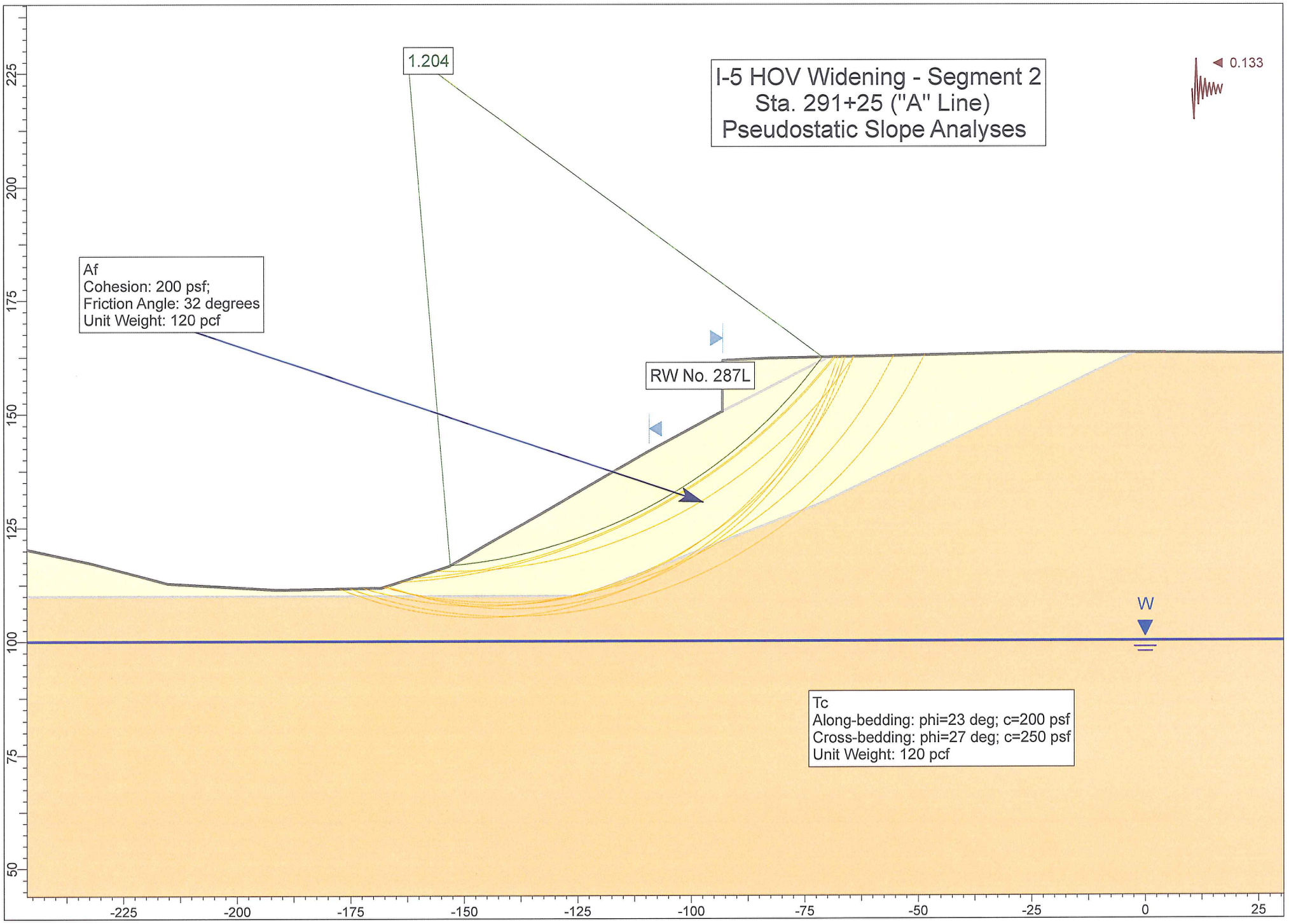

I-5 HOV Widening - Segment 2
Sta. 274+18 ("A" Line)
Static Slope Analyses
2.057
RW No. 275L
RW No. 274R
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
W
Qal-1
Su: 2,250 psf;
Unit Weight: 120 pcf
Qal-2
Su: 1,500 psf;
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
175
150
125
100
75
50
25
-75
-50
-25
0
25
50
75
100
125
150
175

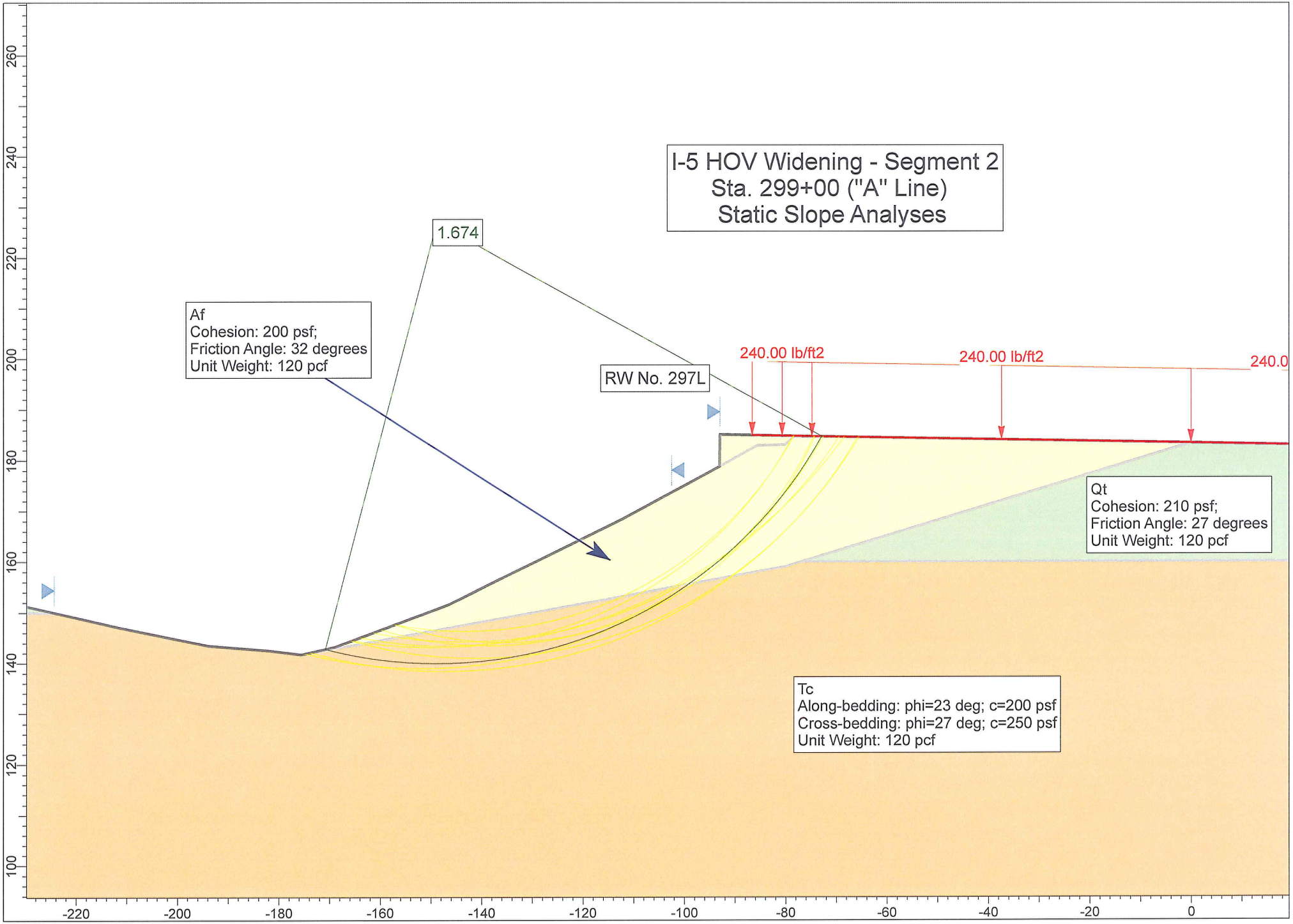

I-5 HOV Widening - Segment 2
Sta. 274+18 ("A" Line)
Pseudostatic Slope Analyses
0.133
1.323
RW No. 275L
RW No. 274R
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
W
Qal-1
Su: 2,250 psf;
Unit Weight: 120 pcf
Qal-2
Su: 1,500 psf;
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
250
200
150
100
50
-100
-50
0
50
100
150
200
250

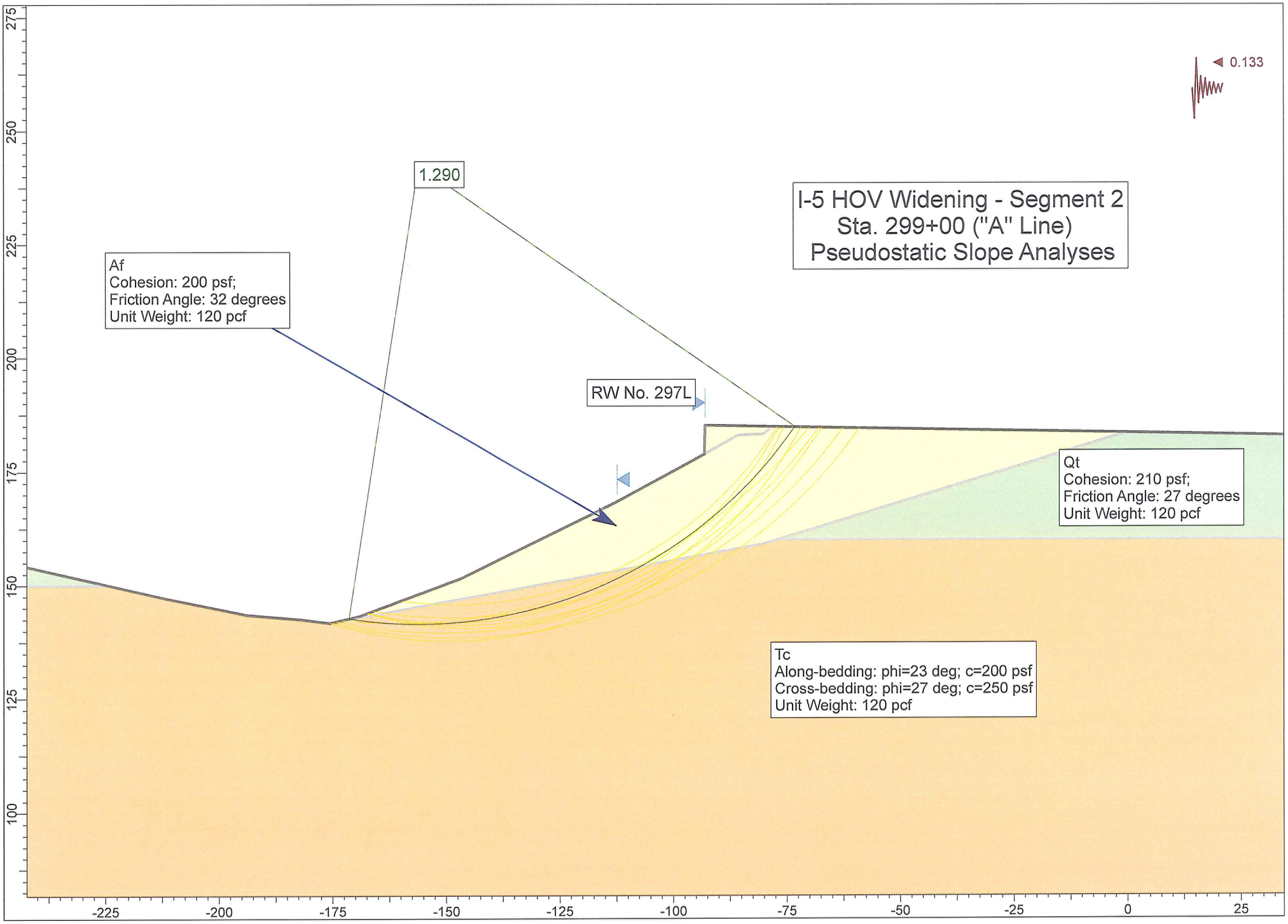

I-5 HOV Widening - Segment 2
Sta. 283+75 ("A" Line)
Static Slope Analyses
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
1.850
RW No. 280R
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
W
250
225
200
175
150
125
100
75
50
25
50
75
100
125
150
175
200
225
250
275
300

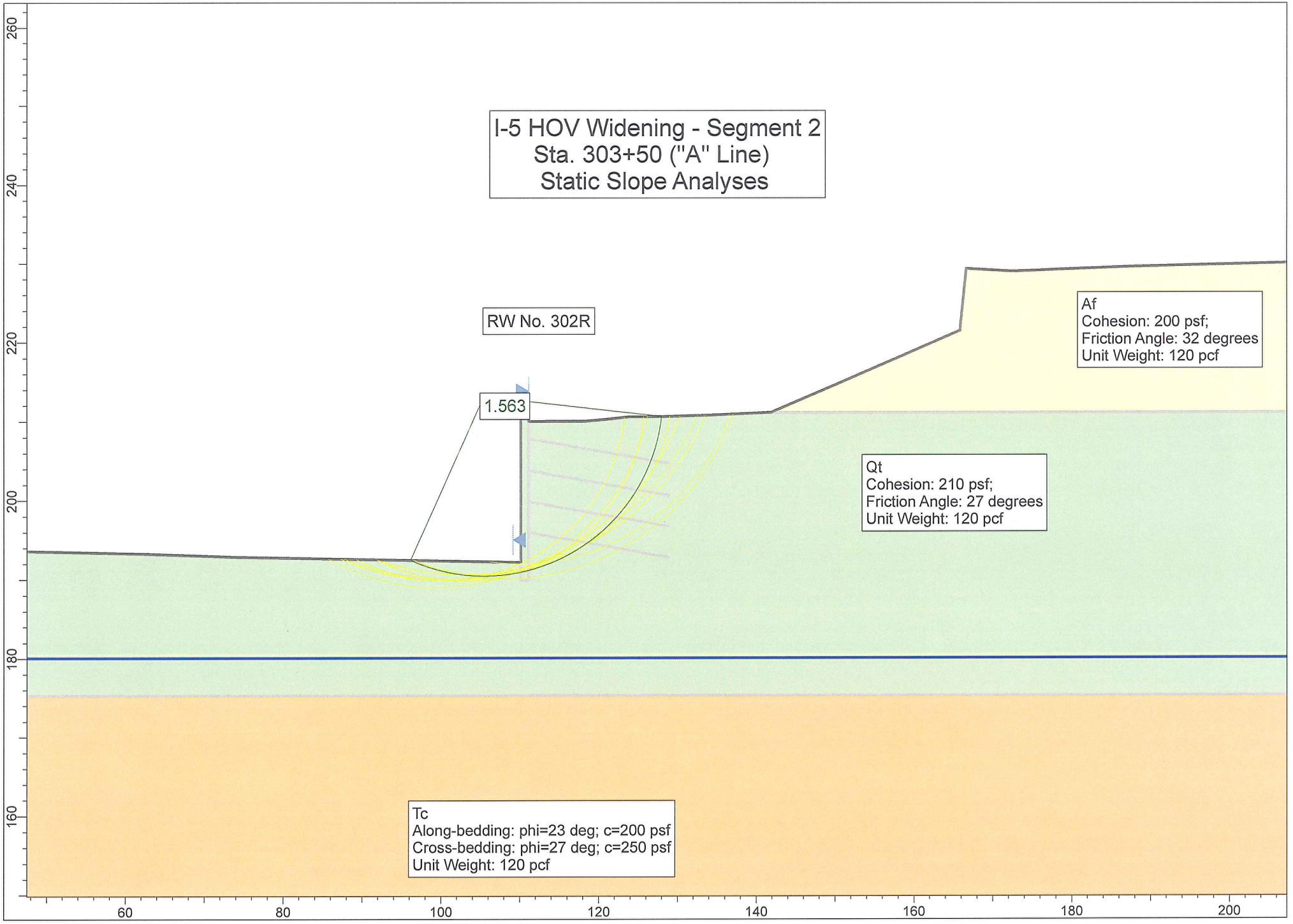

I-5 HOV Widening - Segment 2
Sta. 283+75 ("A" Line)
Pseudostatic Slope Analyses
0.133
1.398
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 280R
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
W
300
250
200
150
100
0
50
100
150
200
250
30

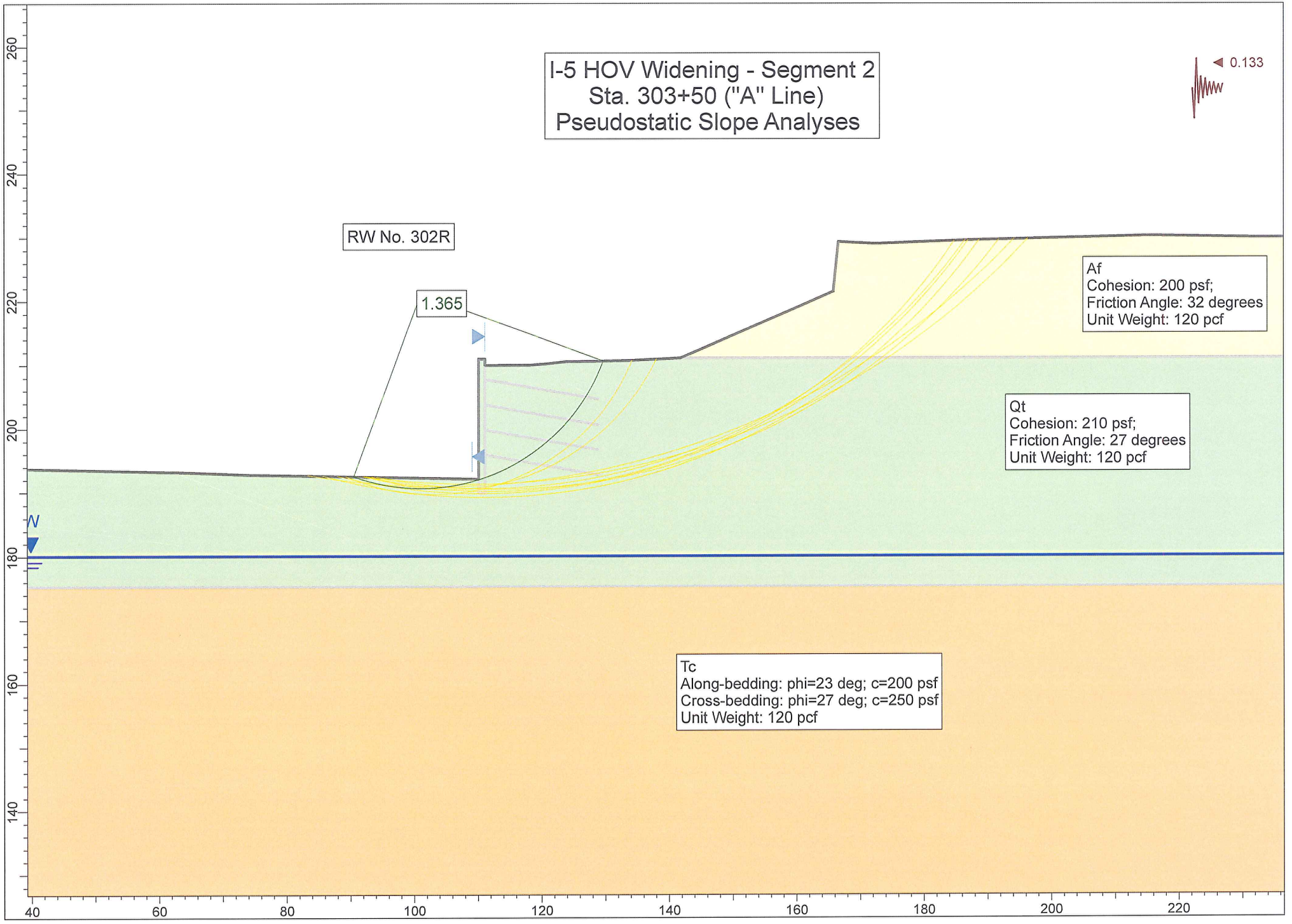

I-5 HOV Widening - Segment 2
Sta. 291+25 ("A" Line)
Static Slope Analyses
1.500
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 287L
W
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
250
200
150
100
50
-250
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25
50

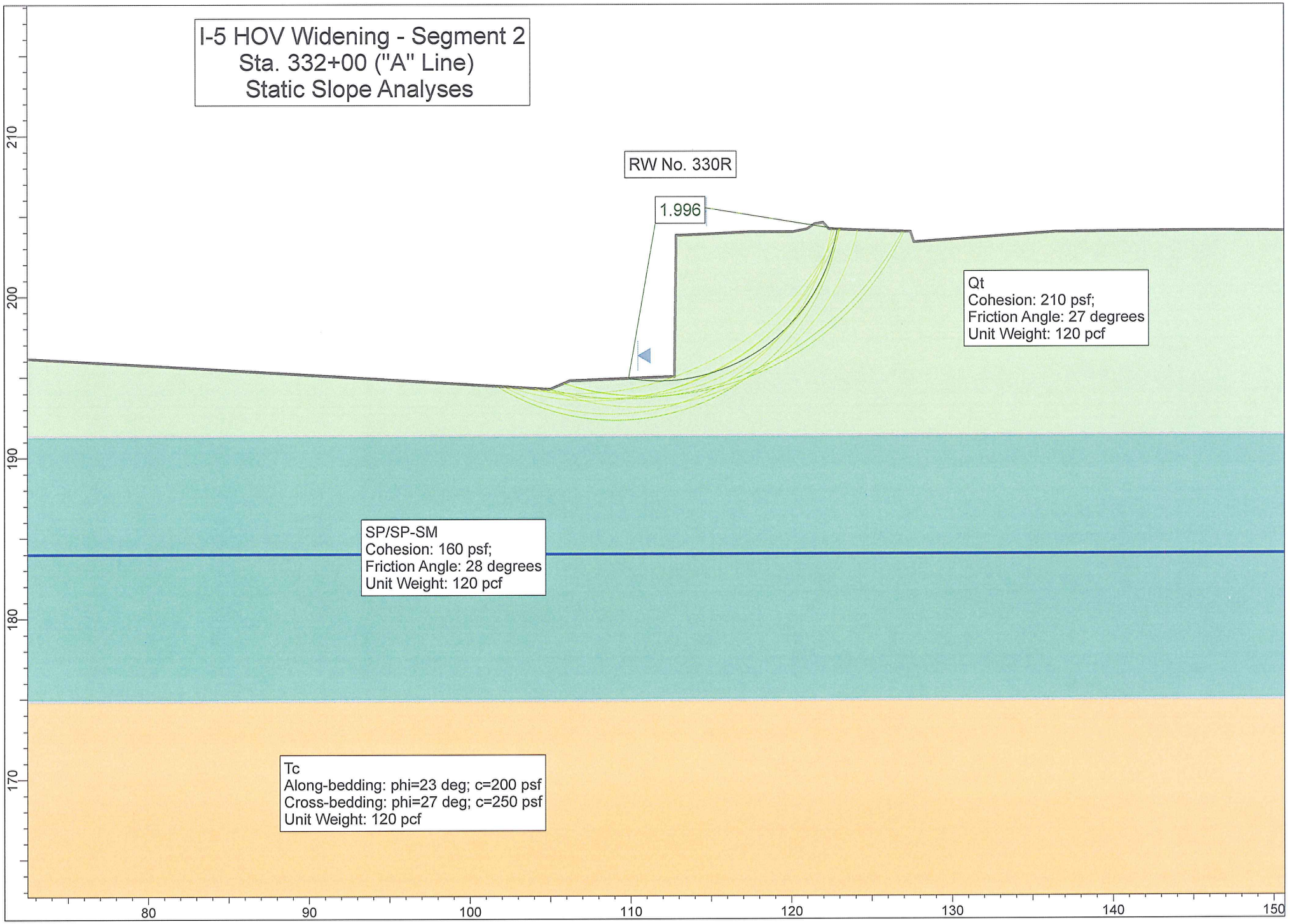

I-5 HOV Widening - Segment 2
Sta. 291+25 ("A" Line)
Pseudostatic Slope Analyses
1.204
0.133
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 287L
W
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
225
200
175
150
125
100
75
50
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25

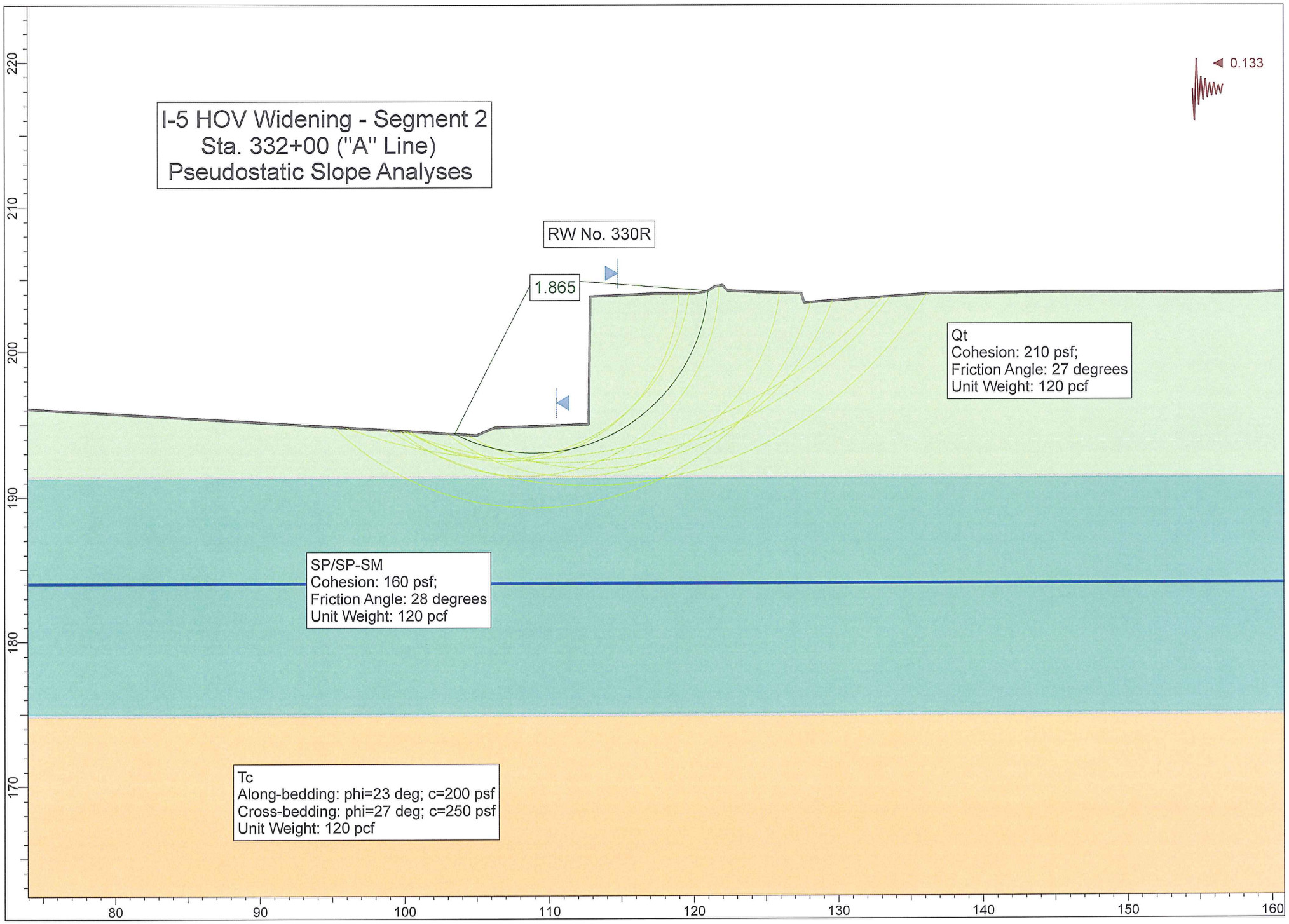

I-5 HOV Widening - Segment 2
Sta. 299+00 ("A" Line)
Static Slope Analyses
1.674
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 297L
240.00 lb/ft2
240.00 lb/ft2
240.0
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
260
240
220
200
180
160
140
120
100
-220
-200
-180
-160
-140
-120
-100
-80
-60
-40
-20
0


0.133
1.290
I-5 HOV Widening - Segment 2
Sta. 299+00 ("A" Line)
Pseudostatic Slope Analyses
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 297L
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
275
250
225
200
175
150
125
100
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25


I-5 HOV Widening - Segment 2
Sta. 303+50 ("A" Line)
Static Slope Analyses
RW No. 302R
1.563
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
260
240
220
200
180
160
60
80
100
120
140
160
180
200


I-5 HOV Widening - Segment 2
Sta. 303+50 ("A" Line)
Pseudostatic Slope Analyses
0.133
RW No. 302R
1.365
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
260
240
220
200
180
160
140
40
60
80
100
120
140
160
180
200
220


I-5 HOV Widening - Segment 2
Sta. 332+00 ("A" Line)
Static Slope Analyses
RW No. 330R
1.996
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
SP/SP-SM
Cohesion: 160 psf;
Friction Angle: 28 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
210
200
190
180
170
80
90
100
110
120
130
140
150


I-5 HOV Widening - Segment 2
Sta. 332+00 ("A" Line)
Pseudostatic Slope Analyses
0.133
RW No. 330R
1.865
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
SP/SP-SM
Cohesion: 160 psf;
Friction Angle: 28 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
220
210
200
190
180
170
80
90
100
110
120
130
140
150
160

APPENDIX D

CALTRANS REVIEW COMMENTS AND EMI RESPONSES

Ranjan Gunaranjan

From: Andrew Korkos
Sent: Tuesday, September 18, 2012 10:08 AM
To: Ranjan Gunaranjan
Subject: FW: I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report
Attachments: EA12-0F96C_Review Comments_FR for RWs218R-330R_ I-5 HOV_8-13-12 EMI RESPONSES_REV 9-11-12.xls; EA0F96C_Review Comments_GDR for I-5 HOV Segment 2 _PM3.8-6.2_7-24-12 WITH RESPONSES REV_9-11-12.xls

EARTH MECHANICS, INC.
17800 Newhope Street, Suite B, Fountain Valley, California 92708
Tel: (714) 751-3826
Fax: (714) 751-3928
www.earthmech.com
****

-----Original Message-----
From: Haitao Liu [mailto:haitao_liu@dot.ca.gov]
Sent: Tuesday, September 11, 2012 2:46 PM
To: Andrew Korkos
Cc: Luqi Yang (luqi_yang@dot.ca.gov); casey.weber@aecom.com; Deh-Jeng Jang; Sungro Cho
Subject: Re: I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report

Andrew,

We've reviewed the response attached based on our previous discussion, and concur with you for the proposed revisions on applicable items.

Please let us know if you have any question.

Best Regards,

Haitao Liu, P.E.

Transportation Engineer - Civil
Office of Geotechnical Design South - 1
Division of Engineering Services
Department of Transportation, California

5900 Folsom Blvd.
Sacramento, CA 95819
Office phone: (916) 227-0992
Cell phone: (916) 704-6519

Andrew Korkos
<A.Korkos@earthmech.com>
09/11/2012 02:26 PM

To
"haitao_liu@dot.ca.gov"
<haitao_liu@dot.ca.gov>
cc
"Luqi Yang (luqi_yang@dot.ca.gov)"
<luqi_yang@dot.ca.gov>,
"casey.weber@aecom.com"
<casey.weber@aecom.com>
Subject
I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report

Haitao,

Attached are the revised comment/response tables for the GDR and the Non-Standard Walls Foundation Report. A few of the responses were revised, per our telephone conversation this morning. We will incorporate the responses into the Final version of the reports.

Please let me know if the responses are ok.

Thanks,
Andy
EARTH MECHANICS, INC.
17800 Newhope Street, Suite B, Fountain Valley, California 92708
Tel: (714) 751-3826
Fax: (714) 751-3928
www.earthmech.com
****

(See attached file: EA12-0F96C_Review Comments_FR for RWs218R-330R_ I-5 HOV_8-13-12 EMI RESPONSES_REV 9-11-12.xls)(See attached file: EA0F96C_Review Comments_GDR for I-5 HOV Segment 2_PM3.8-6.2_7-24-12 WITH RESPONSES REV_9-11-12.xls)

EXTERNAL SUBMITTAL REVIEW

PROJECT: INTERSTATE 5 HOV IMPROVEMENT PROJECT No. 1200020278

EA No.: 12-0F96C	
Agency: CalTrans	
Submittal No.	Title: FR for RW218R, 240R, 249L, 274R, 275L, 280R, 287L, 297L, 302R and 330R, I-5 HOV (ORA) Segment 2. By EMI, 4/27/2012

Lead:	Date: 8/13/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING			For RFC Use	
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
1	Figure 1, Section 1.2	H.Liu	1	Please show limits of project site on Site Location Map	RI		The limits of the project area will be shown on the the Site Location Map.					
2	Section 2.2, Figures 3 to 15	H.Liu	2	Please specify the proposed wall number on Boring Location Maps	RI		The identification numbers of the proposed walls will be shown on the boring location maps.					
3	Page 38, Section 5.10	H.Liu	3	Factor of safety of 1.3 for static, 1.0 for for seismic conditions should be adequate for general global stability consideration, per Section 5.2.2.3 of Caltrans' BDS (2003).	RI		Proposed retaining walls in cut areas will provide support for existing adjacent developments, at the top of slopes, including residential and commercial properties and related infrastructure. Therefore, factors-of-safety of 1.5 and 1.1 for static and pseudo-static conditions, respectively, are suitable requirements for long-term stability of proposed walls. For consistency, EMI is using the same factors-of-safety for long-term stability of proposed retaining walls in fill areas.					
4	Appendix A LOTBS.	H.Liu	4	A-11-203: Rock description of "weathering" was used for soil (CL) from Elev +188' to +170'. Please revise it.	RI		Boring log A-11-203 will be revised.					
5	Appendix A LOTBS.	H.Liu	5	A-11-211, A-11-261 and A-11-212. RW240R should be used as the wall name to be consistent with those in the rest of the report. Please revise the wall name on Plan and the title block.	RI		The LOTB will be revised to show RW 240R.					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

EA No.: 12-0F96C	
Agency: CalTrans	
Submittal No.	Title: FR for RW218R, 240R, 249L, 274R, 275L, 280R, 287L, 297L, 302R and 330R, I-5 HOV (ORA) Segment 2. By EMI, 4/27/2012

Lead:	Date: 8/13/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING			For RFC Use	
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
6	Appendix A LOTBS.	H.Liu	6	RW#330R: As Type 7 (reversed "L") wall is proposed for this cut wall, soils will be retained away from the highway. Please revise the wall symbol on Plan based on the wall recommendations.	RI		The wall symbol will be revised to show retained earth on the opposite side of the freeway.					
7	Appendix C Calculations	H. Liu	7	A 1 : 2 (Horizontal: Vertical) downward projection, instead of 1:1.5, is generally used for pressure distribution below the bottom of spread footing for settlement analysis. Please use it for future work (BDS 4.12.3.2.3a, for equivalent footing).	RI		Acknowledged. EMI will use a 1H:2V downward projection, instead of a 1H:1.5V projection, on future projects.					
8	Appendix C Calculations	H. Liu	8	Based on CA Amendment to AASHTO LRFD (2010), the bearing capacity resistance factor for RW footing under strength limit state is 0.55 (0.65 for MSE). Please update this factor in calculations.	RI		Table 10.5.5.2.2-1 in the CA Amendments (2011) shows a resistance factor of 0.45 for spread footings when using the Meyerhof semi-empirical method, which was used for our evaluation. However, we will revise the resistance factor to 0.55, based on Table 11.5.6-1, per the reviewer's request.					
9	Appendix C Calculations	H.Liu	9	For all stability calcs, please specify the exact shear parameter (not a range) used for Capistrano formation (Tc) to reach the FOS shown on the graphs of the analyses.	RI		To clarify, a range for Tc was not used for stability analysis. Two different sets of shear strengths were used, one for along-bedding and one for cross-bedding, to account for anisotropic strength of the bedded formation (refer to Table 3 in the GDR). The slope stability plots will be revised to show along-bedding and cross-bedding strengths.					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

EA No.: 12-0F96C	
Agency: CalTrans	
Submittal No.	Title: FR for RW218R, 240R, 249L, 274R, 275L, 280R, 287L, 297L, 302R and 330R, I-5 HOV (ORA) Segment 2. By EMI, 4/27/2012

Lead:	Date: 8/13/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING			For RFC Use	
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
10	General Comment	H.Liu	10	Although differential settlement control is required depending on wall type and its strucutral details, "one" inch settlement limit is unnecessary for general wall application (wall without supporting other structures or being close to facilities with very low deflection tolerance). Over-excavation and re-compaction for that purpose, in some cut wall cases, may introduce excessive construction cost. Please consider a partial reduction of sub-excavation, unless it is warranted for bearing capacity purpose.	RI		For some proposed walls such as RW 274R, RW 275L, and RW 287L, the recommended overexcavation up to 5 feet deep is needed for improving bearing capacity, and for other walls the overexcavation is for reducing settlement (especially taller walls). Allowing substantial settlement of the footing would result in tilting of the wall which can allow additional lateral movement of the retained soil behind the wall. Since the proposed walls will support ground that is the foundation for existing and proposed improvements including human occupancy structures, we believe that limiting the settlement of footings (and lateral movement of walls) is reasonable. In evaluating shallow foundations for walls, we do consider the impacts of settlement of footings on existing and proposed improvements near the walls. EMI will eliminate referencing "1-inch" settlement in the report - In Sections 5.5.2, 5.6.2, 5.7.2, and 5.8.2 of the report, EMI will replace the first sentence of the second paragraph as follows: "Due to the presence of compressible materials beneath the footings, remedial overexcavation immediately below the wall footings is recommended to limit footing settlement."					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

EA No.: 12-0F96C	
Agency: CalTrans	
Submittal No.	Title: FR for RW218R, 240R, 249L, 274R, 275L, 280R, 287L, 297L, 302R and 330R, I-5 HOV (ORA) Segment 2. By EMI, 4/27/2012

Lead:	Date: 8/13/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING			For RFC Use	
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
							In addition, EMI reevaluated the settlement calculations for cut walls RW 218R, RW 240R, RW 280R, RW 302R, and RW 330R in order to reduce the overexcavation depths. The revised overexcavation depths for walls RW 218R, RW 240R, RW 280R, RW 302R, and RW 330R are attached and will be included in the final report. In the future, if there is an opporunity to decrease overexcavations and allow for more settlement, EMI will consider doing so.					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

November 30, 2012

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Addendum No. 1 for Final Structure Foundation Report for Non-Standard Retaining Walls; Retaining Wall Nos. 218R, 240R, 274R, 275L, 280R, 287L, 297L, 302R and 330R;***
Interstate 5 HOV Widening, Segment 2 Project
Cities of San Clemente and Dana Point, Orange County, California
12-Ora-05, PM 3.7/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

Dear Mr. Montes:

Attached is Addendum No. 1 to the Final Structure Foundation Report (reference report) for the non-standard retaining walls proposed for the Interstate 5 HOV Widening Segment 2 Project. This addendum amends some of the language given in the reference report based on comments by a reviewer from the Caltrans Specifications Branch. The review comments (shown in italics) and our responses are presented below.

Comments from Specifications Branch:

Comment 26: *The Caltrans Seismic Design criteria should be referred to by the version number, not the year. Plans use v 1.6, FR reports should all match. The FR report for the tieback walls and Non-standard retaining walls lists 2009 version, FR report for the bridge lists 2010. All FR reports need to match plans.*

Response: As indicated by the reviewer, Version 1.6 is the applicable Seismic Design Criteria for the project. The revision to the reference does not change any design recommendations given in the Final Structure Foundation Report. The 2009 SDC reference in the reference section of the Final report should be disregarded. The reference section of the Final Structure Foundation Report is amended to include the following reference:

California Department of Transportation, 2010. Seismic Design Criteria (SDC), Version 1.6, November.

Comment 27: *All references in the FR's to "Caltrans BDS" are erroneous. The design standard should "AASHTO LRFD Bridge Design Specifications, 4th Edition with California Amendments" with the table and section references used updated accordingly.*

Response: The only mention of Caltrans BDS in the Final Structure Foundation Report is in Section 5.3 ("Soil Corrosivity") related to minimum concrete cover. The reference to Caltrans BDS Table 8.22.1 is amended to California Amendments to AASHTO LRFD Bridge Design Specifications (4th Edition) Table 5.12.3-1. The references

to Caltrans BDS Section 8.22 and Table 8.22.2 in the Final Structure Foundation Report should be disregarded. Cement type should be selected by the structural engineer based on LRFD and ACI requirements (using the corrosivity information provided in the Final Structure Foundation Report.

REFERENCE: Earth Mechanics, Inc., 2012. Final Structure Foundation Report for Non-Standard Retaining Walls; Retaining Wall Nos. 218R, 240R, 274R, 275L, 280R, 287L, 297L, 302R, and 330R; Interstate 5 HOV Widening, Segment 2; Cities of San Clemente and Dana Point, Orange County, California; 12-Ora-05, PM 3.7/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C1); September 21.

If you have any questions regarding the above information, please call our office.

Sincerely,
EARTH MECHANICS, INC.

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

January 11, 2013

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Addendum No. 2 for Final Structure Foundation Report for Non-Standard Retaining Walls; Retaining Wall Nos. 218R, 240R, 274R, 275L, 280R, 287L, 297L, 302R and 330R;***
Interstate 5 HOV Widening, Segment 2 Project
Cities of San Clemente and Dana Point, Orange County, California
12-Ora-05, PM 3.7/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

Dear Mr. Montes:

Earth Mechanics, Inc. (EMI) prepared the Final Structure Foundation Report, dated September 21, 2012, for the non-standard retaining walls proposed for the Interstate 5 (I-5) HOV Widening Project, Segment 2 (EMI, 2012a). The report was reviewed and approved on October 22, 2012 by the Caltrans Office of Geotechnical Design South 1 (OGDS-1), Division of Engineering Services. A copy of the approval email from Caltrans OGDS-1 is provided in Attachment 1. After the review and approval of the Final Structure Foundation Report, Addendum No. 1 (EMI, 2012b), to the Final Structure Foundation Report, was prepared by EMI to amend a few references (based on two review comments received from the Caltrans Specifications Branch).

This addendum is intended to amend geotechnical information for three retaining walls based on recent information provided by AECOM. We understand that "SoundSorb" panels were added on three retaining walls: RW Nos. 275L, 287L, and 297L. These retaining walls are now identified as "Type 1SWB (Mod)" on the project plans. Using the new bearing pressure values due to the SoundSorb loading provided by AECOM (Attachment 2), the foundations for RW Nos. 275L, 287L, and 297L were reevaluated. The foundation design recommendations for RW No. 274R remain unchanged since SoundSorb material was not added to this wall.

This addendum is a supplement to the Final Structure Foundation Report and should be attached to the front of the Final Structure Foundation Report.

Sections 5.5, 5.5.1, and 5.5.2, and Table 5 of the Final Structure Foundation Report (EMI, 2012a) are amended as follows.

5.5 Foundation Design for Type 1SWB and Type 1SWB (Mod) Retaining Walls

Four Sound Wall-on-Barrier-on-Retaining Walls (Type 1SWB), supported on spread footings, are proposed for the project. Three of the walls (RW Nos. 275L, 287L, and 297L) are located along the south side of the I-5 mainline, where fill is proposed on the descending slopes. One wall (RW No. 274R) is located along the north side of the mainline, immediately west of the

Avenida Vaquero UC, to widen the existing westerly approach embankment. Based on recent information provided by AECOM, SoundSorb panels (sound absorptive material) will be placed on RW Nos. 275L, 287L, and 297L which are now identified as "Type 1SWB (Mod)" walls on the plans. SoundSorb panels will not be placed on RW No. 274R which is identified as a Type 1SWB wall. General information for each wall is provided in Table 1.

5.5.1 Bearing Pressures

For the three Type 1SWB (Mod) walls (Nos. 275L, 287L, and 297L), foundation information including footing width, footing thickness, and bearing pressure was provided by AECOM and are provided in Attachment 2. For the Type 1SWB wall (RW No. 274R), footing dimensions and bearing pressures, which were originally provided on the Caltrans XS sheet 14-220-1 (approval date of July 2011) and XS sheet 14-220-2 (approval date of January 2012), remain the same and are also provided in Attachment 2.

5.5.2 Bearing Capacity and Settlement

Per Caltrans LRFD design guidelines given in the latest Caltrans Memo To Designers (Caltrans, 2008), the Service-I Limit State bearing pressures must be less than the allowable bearing capacity of the foundation materials. The Service-I Limit State bearing pressures were also used to determine the anticipated settlement of the Type 1SWB and Type 1SWB (Mod) walls. The Strength Limit State and Extreme Event Limit State bearing pressures were used to compare with the factored bearing capacity and ultimate bearing capacity of the foundation materials, respectively. Based on the analyses, the bearing capacities of the Type 1SWB and Type 1SWB (Mod) wall spread footings, under the service limit, strength limit, and extreme limit states are greater than the bearing pressures shown on the XS sheets and the foundation table provided by AECOM, respectively. Settlement and bearing capacity calculations are given in Attachment 2.

Due to the presence of compressible materials beneath the footings, remedial overexcavation immediately below the wall footings is recommended to limit footing settlement. The horizontal extent of the overexcavation and backfill and compaction requirements are described in Section 5.9 of the reference report (EMI, 2012a). Minimum overexcavation depth and associated settlement for each Type 1SWB (Mod) wall and the Type 1SWB wall are presented in Table 5. As shown in Table 5, the estimated settlement with overexcavation ranges between 0.6-inch and about 1.4 inches.

Earthwork and construction recommendations in the Final Foundation Report (EMI, 2012a) are applicable to the Type 1SWB and Type 1SWB (Mod) walls unless specifically superseded by recommendations herein.

Table 5. Overexcavation Depth and Settlement Estimates for Type 1SWB and Type 1SWB (Mod) Walls

Retaining Wall No.	Wall Height (feet)	Bottom of Footing Elevation (feet)	Recommended Minimum Overexcavation Depth Below Wall Footing (feet)	Estimated Settlement With Overexcavation (inch)
274R [Type 1SWB]	8	+121.61	2	0.68
	10	+119.28 to +120.28	2	0.82
	16	+114.90	5	1.05
275L [Type 1SWB (Mod)]	6	+120.87	2	0.60
	8	+117.20 to +118.53	2	0.72
	10	+115.70 to +117.20	2	0.86
	12	+114.32	3	0.96
	14	+112.15	4	0.99
287L [Type 1SWB (Mod)]	8	+146.60	2	0.88
	10	+144.89 to +156.37	3	0.93
	12	+143.64 to +153.60	4	0.98
	14	+141.64 to +151.23	4	0.99
	16	+141.39 to +146.98	4	1.14
	18	+141.39 to +145.14	4	1.34
297L [Type 1SWB (Mod)]	6	+188.06	2	< 0.87
	8	+174.30 to +186.81	2	0.87
	10	+180.31	3	0.92
	12	+170.30 to +177.43	4	0.98

Notes:
1. *For Type 1SWB wall, wall information, provided by AECOM, is based on Caltrans XS sheets 14-220-1 (Approval Date of July 2011) and 14-220-2 (Approval Date of January 2012).*
2. *For Type 1SWB (Mod) walls, wall information including footing widths, footing thicknesses, and bearing pressures were provided by AECOM.*

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions please call us.

Sincerely,
EARTH MECHANICS, INC.

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

Attachments:

Attachment 1. Approval Email from Caltrans Office of Geotechnical South 1 (OGDS-1) on October 22, 2012 for the Final Structure Foundation Report for Non-Standard Retaining Walls, Dated September 21, 2012.

Attachment 2 – Revised Design Calculations.

References:

Earth Mechanics, Inc., 2012a. Final Structure Foundation Report for Non-Standard Retaining Walls; Retaining Wall Nos. 218R, 240R, 274R, 275L, 280R, 287L, 297L, 302R, and 330R; Interstate 5 HOV Widening, Segment 2; Cities of San Clemente and Dana Point, Orange County, California; 12-Ora-05, PM 3.7/6.2; Caltrans Project No. 1200020278 (EA No. 12-0F96C1); September 21.

Earth Mechanics, Inc., 2012b. Addendum No. 1 to Final Structure Foundation Report for Non-Standard Retaining Walls; Retaining Wall Nos. 218R, 240R, 274R, 275L, 280R, 287L, 297L, 302R, and 330R; Interstate 5 HOV Widening, Segment 2; Cities of San Clemente and Dana Point, Orange County, California; 12-Ora-05, PM 3.7/6.2; Caltrans Project No. 1200020278 (EA No. 12-0F96C1), November 30.

ATTACHMENT 1

APPROVAL EMAIL FROM CALTRANS OFFICE OF GEOTECHNICAL SOUTH 1 (OGDS-1) ON OCTOBER 22, 2012 FOR THE FINAL STRUCTURE FOUNDATION REPORT FOR NON-STANDARD RETAINING WALLS, DATED SEPTEMBER 21, 2012

Haitao
Liu/HQ/Caltrans/CAGov
10/22/2012 11:05 AM

To Luqi Yang/HQ/Caltrans/CAGov@DOT, Bob Bazargan/D12/Caltrans/CAGov@DOT
cc Deh-Jeng Jang/HQ/Caltrans/CAGov@DOT, Sungro Cho/HQ/Caltrans/CAGov@DOT
bcc
Subject FFR Review for RWs at Segment 2 of I-5 HOV Widening_EA12-0F96C0

Luqi,

The Final Foundation Report for ground anchor walls RW#315L/316R, and Final Foundation Report for Non-Standard retaining walls for the subject project, prepared by EMI, dated 9/21/2012, are accepted without further comment.

Please let us know if you have any question.

Best regards,

Haitao Liu, P.E.

Transportation Engineer - Civil
Office of Geotechnical Design South - 1
Division of Engineering Services
Department of Transportation, California

5900 Folsom Blvd.
Sacramento, CA 95819
Office phone: (916) 227-0992
Cell phone: (916) 704-6519

ATTACHMENT 2

REVISED DESIGN CALCULATIONS

BEARING CAPACITY & SETTLEMENT ESTIMATES

TYPE 1SWB (MOD) RETAINING WALLS

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	ORA	5	3.7/6.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

Mohan S. Char, No. 57894, Exp. 6/30/2012, CIVIL, STATE OF CALIFORNIA, REGISTERED PROFESSIONAL ENGINEER

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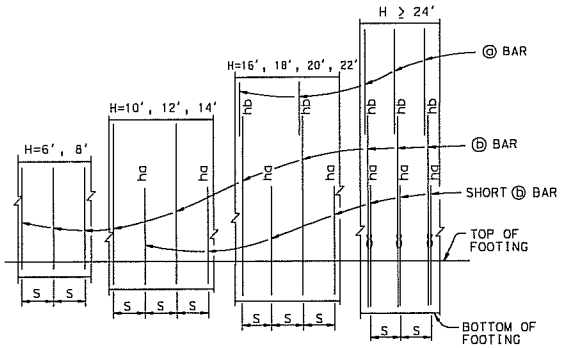
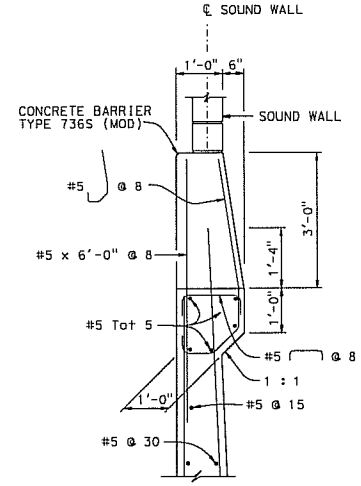


ELEVATION
No Scale

NOTES:
"ha" and "hb" above ⓑ bars indicate distance from top of footing to upper end of ⓑ bars, see table.
"S" is ⓑ bar spacing, see table.
∅ : 2 bar bundle



② DETAIL A
¾ = 1'-0"

DESIGN DATA

Design: AASHTO LRFD Bridge Design Specifications, 4th edition with California Amendments

WS: 33 psf on Sound Wall and Barrier

LS: Varied surcharge on level ground surface

CT: 54 kip maximum traffic impact loading evenly distributed over 10 feet at top of the barrier and 1:1 distribution down and outward

EQE: Mononabe-Okabe Method
K_h = 0.3
K_v = 0.0

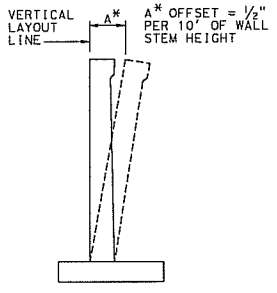
Soil: ∅ = 34°
γ = 120 pcf

Reinforced Concrete: f'c = 3600 psi
fy = 60,000 psi

Load Combinations and Limit States

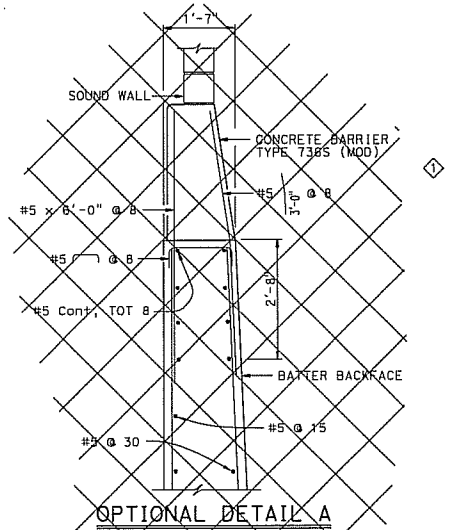
Service I	Q=1.00DC+1.00EV+1.00EH+1.00LS+0.30WS
Service II	Q=1.00DC+1.00EV+1.00EH+1.00WS
Strength I	Q=αDC+βEV+1.50EH+1.75LS
Strength III	Q=αDC+βEV+1.50EH+1.40WS
Strength V	Q=αDC+βEV+1.50EH+1.35LS+0.40WS
Extreme I	Q=1.00DC+1.00EV+1.00EH+1.00EQD+1.00EQE
Extreme II	Q=1.00DC+1.00EV+1.00EH+1.00CT

Where: Q: Force Effects
α: 1.25 or 0.90, Which ever Controls Design
β: 1.35 or 1.00, which ever Controls Design
DC: Dead Load of Structure Components
EV: Vertical Earth Fill Pressure
LS: Live Load Surcharge
EQE: Seismic Earth Pressure
EQD: Soil and Structure Components Inertia. Soil inertia ignored for stem design
WS: Wind Load on Sound Wall and Barrier
CT: Vehicular Collision Force



WALL OFFSET
No Scale

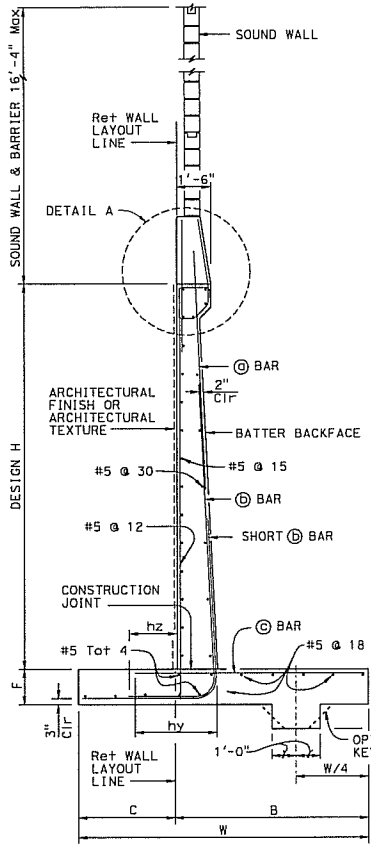
Values for offsetting forms to be determined by the Engineer



OPTIONAL DETAIL A
¾ = 1'-0"

For Details not shown, see "DETAIL A"

NOTES:
1. For sound wall and retaining wall Architectural finish or texture see details elsewhere in Project Plans.
2. For details not shown and drainage notes see B3-5
3. Footing cover, 1'-6" minimum.
③ 4. For sound wall and barrier reinforcement details, see "MASONRY BLOCK SOUND WALL WITH BARRIER ON RETAINING WALL DETAILS NO. 1" sheet.
5. For H = 6' through 14', extend ⓑ bars into Barrier for stem with haunch.
6. For H ≥ 16', extend ⓐ bars into Barrier for stem with haunch.



SPREAD FOOTING SECTION ②
No Scale

SPECIAL DETAILS

REVISED STANDARD DRAWING	① DOES NOT APPLY ③ REVISED NOTE	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES	BRIDGE NO. / POST MILE
FILE NO. xs14-220-1 APPROVAL DATE July 2011	② MODIFIED DETAIL			RETAINING WALL TYPE 1SWB DETAILS NO. 1

DS 05D 2141A (ENGLISH STANDARD DRAWING "XS" BORDER REV. 102-02-11)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 1200020278 CONTRACT NO.:

FILE => RA999-g-rwd101.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES	SHEET	OF

IMF PLOTTED => 13:41 11-APR-2012

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5	3.7/6.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER — CIVIL — STATE OF CALIFORNIA — No. 57894 — Exp. 6/30/2012

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

DESIGN H	6'	8'	10'	12'	14'	16'	18'	20'	22'	24'	26'	28'	30'	32'
W	6'-9"	7'-3"	8'-0"	8'-9"	10'-0"	11'-6"	12'-9"	14'-0"	15'-9"	18'-0"	19'-9"	21'-9"	23'-3"	25'-3"
C	2'-3"	2'-5"	2'-8"	2'-11"	3'-4"	3'-10"	4'-3"	4'-8"	5'-3"	6'-0"	6'-7"	7'-3"	7'-9"	8'-5"
B	4'-6"	4'-10"	5'-4"	5'-10"	6'-8"	7'-8"	8'-6"	9'-4"	10'-6"	12'-0"	13'-2"	14'-6"	15'-6"	16'-10"
F SPREAD FOOTING	1'-3"	1'-3"	1'-3"	1'-3"	1'-6"	1'-9"	1'-9"	2'-3"	2'-6"	2'-6"	2'-9"	3'-0"	3'-6"	3'-9"
STEM WITH HAUNCH, BATTER	0	½:12	½:12	½:12	½:12	½:12	½:12	½:12	½:12	⅝:12	¾:12	⅞:12	1:12	1:12
STEM WITHOUT HAUNCH, BATTER	0	0	0	0	0	0	0	0	¼:12	¼:12	½:12	¾:12	¾:12	¾:12
(a) BARS						#7 @ 15	#7 @ 12	#7 @ 12	#8 @ 12	#6 @ 6	#6 @ 6	#6 @ 6	#9 @ 9	#9 @ 9
(b) BARS	#8 @ 12	#8 @ 12	#7 @ 6	#7 @ 6	#7 @ 6	#9 @ 7.5	#9 @ 6	#10 @ 6	#10 @ 6	#8 @ 6 ∞	#8 @ 6 ∞	#8 @ 6 ∞	#10 @ 9 ∞	#11 @ 9 ∞
ha			5'-0"	6'-0"	7'-0"	7'-0"	6'-0"	7'-0"	7'-6"	7'-6"	8'-6"	9'-3"	15'-0"	11'-3"
hb						11'-6"	12'-0"	13'-3"	16'-0"	15'-6"	17'-6"	18'-9"	21'-0"	20'-9"
hy	2'-0"	2'-4"	1'-8"	2'-0"	2'-4"	2'-10"	2'-10"	3'-7"	3'-7"	4'-6"	5'-6"	2'-10"	4'-6"	5'-6"
hz			0	0	3'-1"	3'-7"	4'-0"	4'-5"	5'-0"	3'-0"	3'-0"	3'-6"	5'-6"	3'-0"
(c) BARS	#6 @ 12	#7 @ 12	#5 @ 6	#6 @ 6	#7 @ 6	#8 @ 7.5	#8 @ 6	#9 @ 6	#9 @ 6	#10 @ 6	#11 @ 6	#8 @ 6 ∞	#10 @ 9 ∞	#11 @ 9 ∞
SER I: B'(ft), q_n'(ksf)	5.9, 1.2	6.0, 1.4	6.5, 1.6	7.0, 1.8	8.1, 1.9	9.7, 2.0	11.0, 2.1	12.1, 2.3	13.8, 2.4	16.6, 2.4	18.5, 2.6	20.7, 2.7	22.1, 2.9	24.3, 3.0
STR Ia: B'(ft), q_n(ksf)	6.3, 1.9	6.3, 2.3	6.7, 2.5	7.0, 2.9	8.1, 3.1	9.5, 3.2	10.8, 3.4	11.8, 3.7	13.4, 4.0	16.2, 4.0	18.0, 4.2	20.2, 4.4	21.5, 5.0	23.7, 5.0
STR, Ib: B'(ft), q_n(ksf)	4.3, 1.6	4.3, 2.0	4.3, 2.4	4.3, 2.8	4.3, 2.9	4.3, 2.9	4.3, 3.0	4.3, 3.4	4.3, 3.5	4.3, 3.4	4.3, 3.5	4.3, 3.6	4.3, 3.9	4.3, 4.1
STR, IIIa: B'(ft), q_n(ksf)	4.3, 2.1	4.3, 2.4	4.3, 2.5	4.3, 2.8	4.3, 2.9	4.3, 3.0	4.3, 3.2	4.3, 3.7	4.3, 3.7	4.3, 3.8	4.3, 4.0	4.3, 4.2	4.3, 4.6	4.3, 4.9
STR, IIIb: B'(ft), q_n(ksf)	3.2, 2.1	3.2, 2.3	3.2, 2.4	3.2, 2.6	3.2, 2.7	3.2, 2.7	3.2, 2.8	3.2, 3.1	3.2, 3.0	3.2, 3.2	3.2, 3.8	3.2, 3.4	3.2, 3.7	3.2, 3.9
STR, Va: B'(ft), q_n(ksf)	5.9, 2.0	5.9, 2.3	5.9, 2.6	5.9, 2.9	5.9, 3.1	5.9, 3.2	5.9, 3.4	5.9, 3.9	5.9, 3.9	5.9, 4.0	5.9, 4.2	5.9, 4.5	5.9, 4.9	5.9, 5.1
STR, Vb: B'(ft), q_n(ksf)	3.8, 1.7	3.8, 2.1	3.8, 2.5	3.8, 2.8	3.8, 2.9	3.8, 2.9	3.8, 3.0	3.8, 3.3	3.8, 3.4	3.8, 3.3	3.8, 3.5	3.8, 3.6	3.8, 3.9	3.8, 4.0
Ext I: B'(ft), q_n(ksf)	2.5, 2.8	2.5, 4.3	2.5, 6.4	2.5, 10.9	2.5, 13.3	2.5, 12.4	2.5, 13.2	2.5, 17.6	2.5, 15.0	2.5, 10.2	2.5, 10.0	2.5, 9.6	2.5, 10.9	2.5, 10.5
Ext II: B'(ft), q_n(ksf)	1.4, 4.9	1.4, 3.5	1.4, 2.8	1.4, 2.7	1.4, 2.5	1.4, 2.5	1.4, 2.5	1.4, 2.6	1.4, 2.8	1.4, 2.8	1.4, 2.9	1.4, 3.1	1.4, 3.3	1.4, 3.5

LEGEND:

SER: service limit state
STR: strength limit state
EXT: extreme event limit state
B': effective footing width (ft)
q_n': net bearing stress (ksf)

q_n: gross uniform bearing stress (ksf)

∞: 2 bar bundle

STANDARD DRAWING

FILE No. xs14-220-2 APPROVAL DATE January 2012

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES

BRIDGE NO. POST MILE

RETAINING WALL TYPE 1SWB

DETAILS NO. 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020278 CONTRACT NO.:

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES SHEET OF

FILE => RW999-q-rwd+02.dgn

RS 050 21474 (ENGLISH STANDARD DRAWING "RS" BORDER REV. 102-02-11)

TYPE 1 SWB (MOD)

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

Design H	6'	8'	10'	12'	14'	16'	18'
W	6' - 9"	7' - 3"	8' - 0"	8' - 9"	10' - 0"	11' - 6"	12' - 9"
C	2' - 3"	2' - 5"	2' - 8"	2' - 11"	3' - 4"	3' - 10"	4' - 3"
B	4' - 6"	4' - 10"	5' - 4"	5' - 10"	6' - 8"	7' - 8"	8' - 6"
F	1' - 3"	1' - 3"	1' - 3"	1' - 3"	1' - 6"	1' - 9"	1' - 9"
Batter - stem with haunch	0	1/2 : 12	1/2 : 12	1/2 : 12	1/2 : 12	1/2 : 12	1/2 : 12
Batter - stem without haunch	0	0	0	0	0	0	0
"a" Bars						#7 @15"	#7 @12"
"b" Bars	#8 @ 12"	#8 @ 12"	#7 @ 6"	#7 @ 6"	#7 @ 6"	#9 @ 7.5"	#9 @ 6"
ha			5' - 0"	6' - 0"	7' - 0"	7' - 0"	6' - 0"
hb						11' - 6"	12' - 0"
hy	2' - 0"	2' - 4"	1' - 8"	2' - 0"	2' - 4"	2' - 10"	2' - 10"
hz					3' - 6"	4' - 0"	4' - 6"
"c" bars	#6 @ 12"	#7 @ 12"	#5 @ 6"	#6 @ 6"	#7 @ 6"	#8 @ 7.5"	#8 @ 6"
Service I: B' (ft), q'_0 (ksf)	5.3, 1.0	5.8, 1.3	6.5, 1.5	7.2, 1.7	8.4, 1.8	9.9, 1.9	11.2, 2.0
Strength Ia: B' (ft), q_0 (ksf)	5.8, 1.8	6.2, 2.1	6.7, 2.4	7.2, 2.7	8.3, 3.0	9.7, 3.1	10.9, 3.3
Strength Ib: B' (ft), q_0 (ksf)	4.7, 1.4	4.5, 1.8	4.6, 2.2	4.7, 2.6	5.7, 2.8	7.1, 2.8	8.3, 2.9
Strength IIIa: B' (ft), q_0 (ksf)	4.3, 2.2	5.0, 2.3	5.7, 2.4	6.3, 2.6	7.5, 2.8	9.1, 2.9	10.4, 3.1
Strength IIIb: B' (ft), q_0 (ksf)	3.4, 2.1	3.9, 2.2	4.5, 2.2	5.0, 2.5	6.1, 2.6	7.6, 2.6	8.7, 2.8
Strength Va: B' (ft), q_0 (ksf)	5.3, 1.8	5.8, 2.1	6.4, 2.4	6.9, 2.7	8.0, 2.9	9.4, 3.1	10.6, 3.3
Strength Vb: B' (ft), q_0 (ksf)	4.3, 1.5	4.2, 1.9	4.5, 2.2	4.7, 2.6	5.7, 2.8	7.1, 2.8	8.3, 2.9
Extreme I: B' (ft), q_0 (ksf)	4.1, 1.8	3.9, 2.2	3.7, 2.8	3.4, 3.6	3.8, 4.2	4.5, 4.5	5.0, 5.0
Extreme II: B' (ft), q_0 (ksf)	1.7, 4.3	2.7, 3.1	3.8, 2.8	5.2, 2.5	6.9, 2.4	8.8, 2.4	10.3, 2.4

Provided by the AECOM Designers on 1-4-2013.

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering
17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

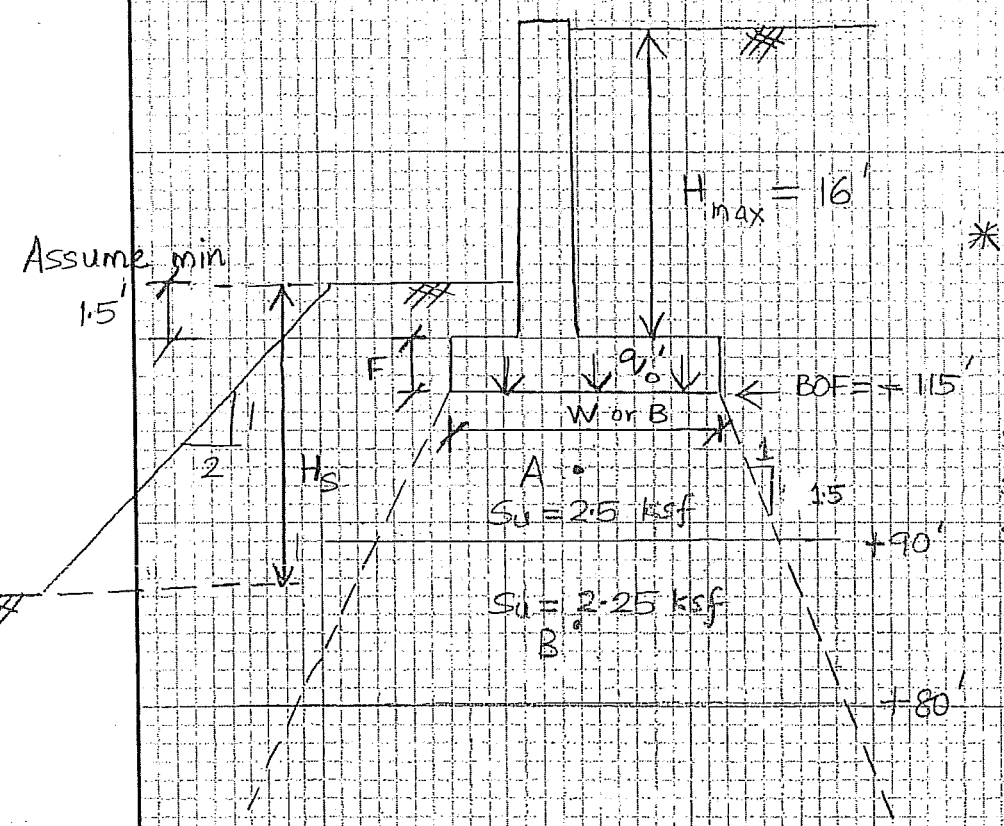
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 274R

Type I SWB

* 'H' varies from 8' to 16'
* Footing Embedment
  D = 1.5' + 1.75'
  = 3.25'
* Based on the Standard XS plan sheet; (2010)
  W = 11.5'
  F = 1.75'
  Service q_o' = 2 ksf
  Service B' = 9.7 ft
  Strength q_o' = 3.2 ksf
  Strength B' = 9.5 ft
  Extreme q_o' = 12.2 ksf
  Extreme B' = 2.5 ft



Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{vu} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$$N_{cm} = N_c s_c i_c \; ; \; N_{qm} = N_q s_q i_q d_q \; ; \; N_{\gamma m} = N_\gamma s_\gamma i_\gamma$$

load inclination factors $i_c = i_q = i_\gamma = 1$

Shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >>> B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

Earth Mechanics, Inc.
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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/ /12 Sheet 2 of 3

$^{\circ}_{\circ}$ $q_{\circ 2} = C N_{cq}$

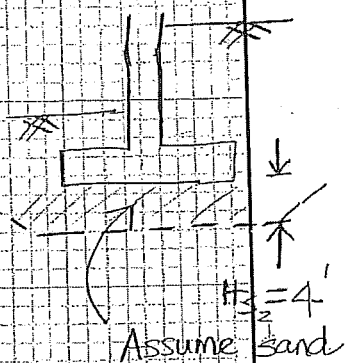
For footing in cohesive soils and on or adjacent to slopes,

For $H_s > W$; $N_s = 0$

From Figure 10.6.3.1.2C-1, $N_{cq} = 4.75$ ($^{\circ}_{\circ}$ $D/B = 0.28$ & $i = 26^{\circ}$)

$^{\circ}_{\circ}$ $q_{\circ 2} = 4.75 \times 2.25$

$= 10.7$ ksf



For Extreme Limit,

$q_{all} = \phi q_{\circ 2} = 10.7$ ksf $< q_{\circ} = 12.4$ ksf

CHECK NOT SATISFIED //

⇒ Consider 4-ft of removal & recompaction below footing

$q_{\circ n} = q_{\circ 2} e^{0.67 \left[1 + (B/L)\right] \frac{H_{s_2}}{B}}$ (C10.6.3.1.2f-1)

For $B = 11.5'$; $L = 190'$; $H_{s_2} = 4'$

$q_{\circ n} = 10.7 \times 1.28 = 13.7$ ksf

LRFD Limit state Check

Strength Limit State

$q_{all} = \phi q_{\circ n} = 0.55 \times 13.7 = 7.5$ ksf $> q_{\circ} = 3.2$ ksf

Extreme Limit State

$q_{all} = \phi q_{\circ n} = 1 \times 13.7 = 13.7$ ksf $> q_{\circ} = 12.4$ ksf

Service Limit State

$q_{all} = \frac{q_{\circ n}}{FOS} = \frac{13.7}{3} = 4.5$ ksf $> q_{\circ}' =$ [illegible] ksf

⇒ CHECK SATISFIED //

Consider 4-ft of overexcavation //

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering
17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 4/5/12 Checked By Andy Date 4/7/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{re} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth

Layer	H_i (ft)	C_{re}	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	21	0.03	2.13	0.75	0.99
B	10	0.03	3.99	0.45	0.17

$\sum \Delta H_i = 1.16$"

For 5' overex, estimated settlement = 1.05"

⇒ Consider 5-ft of overexcavation for 15-ft high wall.

Similarly for wall 2"4R,

Wall height H (ft)	Req'd minimum overex (ft)	Estimated Settlement (in)
10	2	0.82
8	2	0.68

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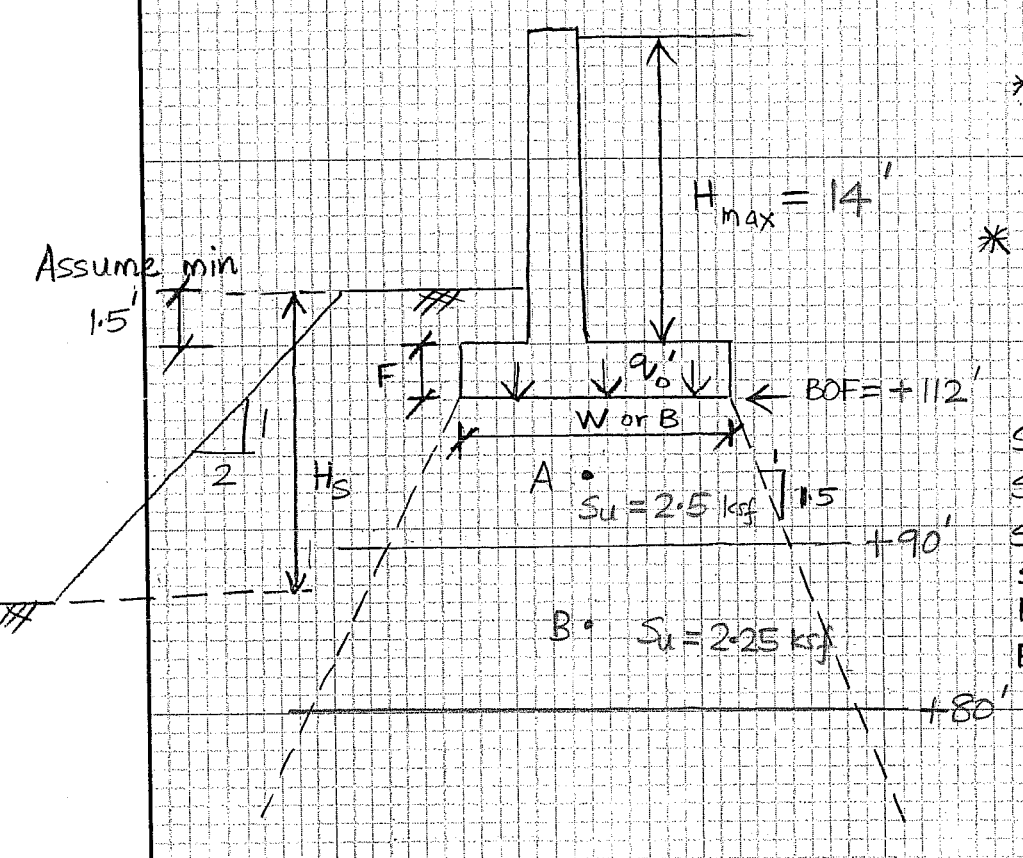
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 275 L

Type 1 SWB (Mod)

* 'H' varies from 6' to 14'
* Footing Embedment
  D = 1.5' + 1.5'
  = 3'
* Based on the Standard XS plan sheet;
  W = 10 ft
  F = 1.5 ft
  Service q_o' = 1.8 ksf
  Service B' = 8.4 ft
  Strength q_o' = 2.9 ksf
  Strength B' = 8.0 ft
  Extreme q_o' = 4.2 ksf
  Extreme B' = 3.8 ft



Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{ru} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$

shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L \gg B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

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Project AECOM / I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 2 of 3

$q_2 = C N_{cq}$

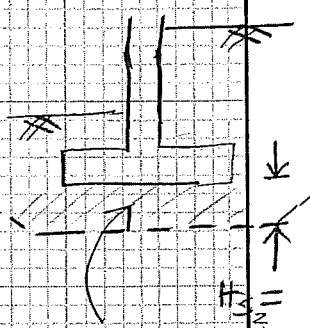
For footing in cohesive soils and on or adjacent to slopes,

For $H_s > W$; $N_s = 0$

From Figure 10.6.3.1.2C-1, $N_{cq} = 4.75$ ($D/B = 0.3$ & $i = 26°$)

$\therefore q_2 = 4.75 \times 2.25$

$= 10.7$ ksf



For Extreme Limit,

$q_{all} = \phi q_2 = 10.7 > q_0 = 4.2$ ksf

CHECK IS SATISFIED //

⇒ Consider 4-ft of removal & recompaction below footing

$q_n = q_2 e^{0.67 \left[1 + (B/L)\right] \frac{H_{s_2}}{B}}$ (C10.6.3.1.2f-1)

For $B = 10$ ft ; $L = 300$ ft ; $H_{s_2} = 4$ ft

$q_n = 10.7 \times 1.32 = 14.1$ ksf

Strength Limit State

$q_{all} = \phi q_n = 0.55 \times 14.1 = 7.7$ ksf $> q_0 = 2.9$ ksf

Extreme Limit State

$q_{all} = \phi q_n = 1 \times 14.1 = 14.1$ ksf $> q_0 = 4.2$ ksf

Service Limit State

$q_{all} = \frac{q_n}{FOS} = \frac{14.1}{3} = 4.7$ ksf $> q_0' = 1.8$ ksf

⇒ CHECK SATISFIED //
Consider 4-ft of overexcavation //

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	18	0.03	1.92	0.66	0.83
B	10	0.03	3.60	0.39	0.16

$\sum \Delta H_i = 0.99"$

⇒ Consider 4-ft of overexcavation for 14-ft high wall.

Similarly for wall 275 L

Wall height 'H' (ft)	Req'd minimum overex (ft)	Estimated Settlement (in)
12	3	0.96
10	2	0.86
8	2	0.72
6	2	0.60

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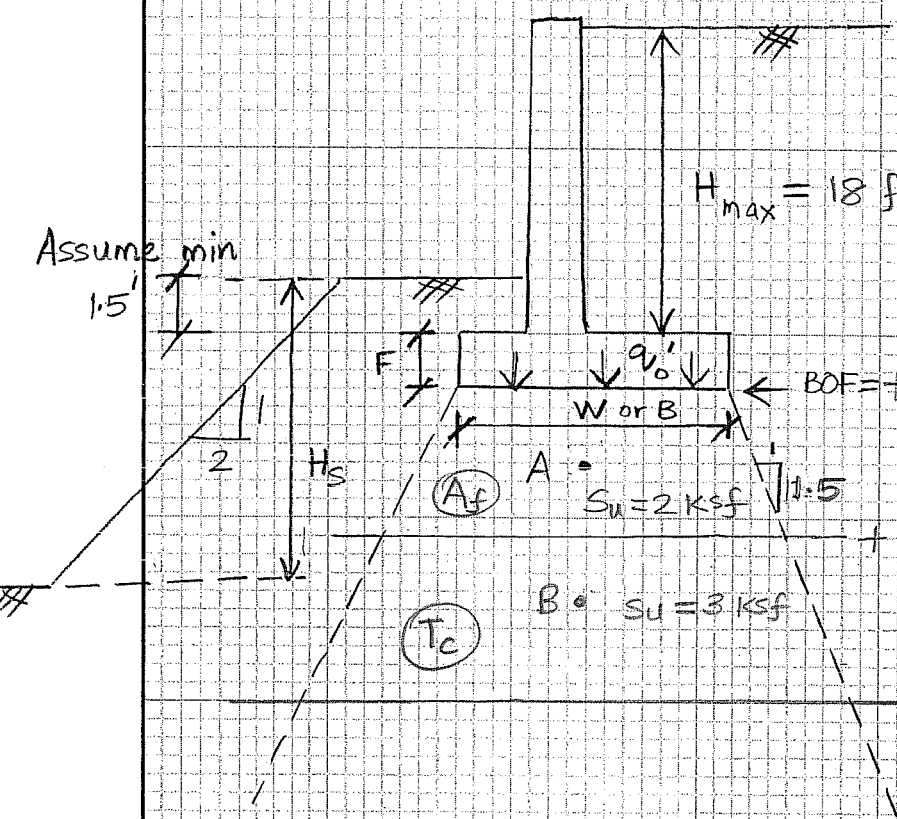
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 287L

Type I SWB (Mod)



* 'H' varies from 8 ft to 18 ft
* Footing Embedment
  D = 1.5' + 1.75
  = 3.25 ft
* Based on the Standard XS plan sheet; (2010)

W = 12.75 ft
F = 1.75 ft
Service q_o' = 2.0 ksf
Service B' = 11.2 ft
Strength q_o' = 3.3 ksf
Strength B' = 10.6 ft
Extreme q_o' = 5.0 ksf
Extreme B' = 5.0 ft

Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_{ult} = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$N_{cm} = N_c s_c i_c$; $N_{qm} = N_q s_q i_q d_q$; $N_{\gamma m} = N_\gamma s_\gamma i_\gamma$

load inclination factors $i_c = i_q = i_\gamma = 1$

Shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L \gg B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 2 of 3

$\therefore q_2 = C N_{cq}$

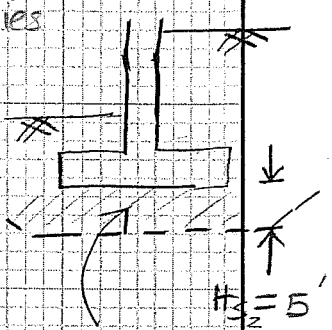
For footing in cohesive soils and on or adjacent to slopes,

For $H_s > W$; $N_s = 0$

From Figure 10.6.3.1.2C-1, $N_{cq} = 4.8$ ($\because D/B = 0.25$ & $i = 26^\circ$)

$\therefore q_2 = 5.14 \times 2$ (For bearing stratum overlies stiffer cohesive soil, $N_m \leq N_c = 5.14$)

$= 10.3$ ksf



For Extreme Limit,

$q_{all} = \phi q_2 = 10.3$ ksf $> q_0 = 5.0$ ksf

CHECK IS SATISFIED //

$\Rightarrow$ Consider 4-ft of removal & recompaction below footing

$q_n = q_2 e^{0.67\left[1 + (B/L)\right]\frac{H_{s_2}}{B}}$ (C10.6.3.1.2f-1)

For $B = 12.75'$; $L = 500'$; $H_{s_2} = 4'$

$q_n = 10.3 \times 1.24 = 12.7$ ksf

Strength Limit State

$q_{all} = \phi q_n = 0.55 \times 12.7 = 6.9$ ksf $> q_0 = 3.3$ ksf

Extreme Limit State

$q_{all} = \phi q_n = 1 \times 12.7 = 12.7$ ksf $> q_0 = 5.0$ ksf

Service Limit State

$q_{all} = \frac{q_n}{FOS} = \frac{12.7}{3} = 4.2$ ksf $> q_0' = 2.0$ ksf

$\Rightarrow$ CHECK SATISFIED //
Consider 4-ft of overexcavation //

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{r\varepsilon} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth

Layer	H_i (ft)	$C_{r\varepsilon}$	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	6	0.03	1.35	1.12	0.66
B	28	0.03	3.39	0.55	0.66

$$\Sigma \Delta H_i = 1.34''$$

⇒ Consider 4-ft of overexcavation for 18-ft high wall.

Similarly for wall 287L,

Wall height 'H' (ft)	Req'd minimum overex (ft)	Estimated Settlement (in)
16	4	1.14
14	4	0.99
12	4	0.98
10	3	0.93
8	2	0.88

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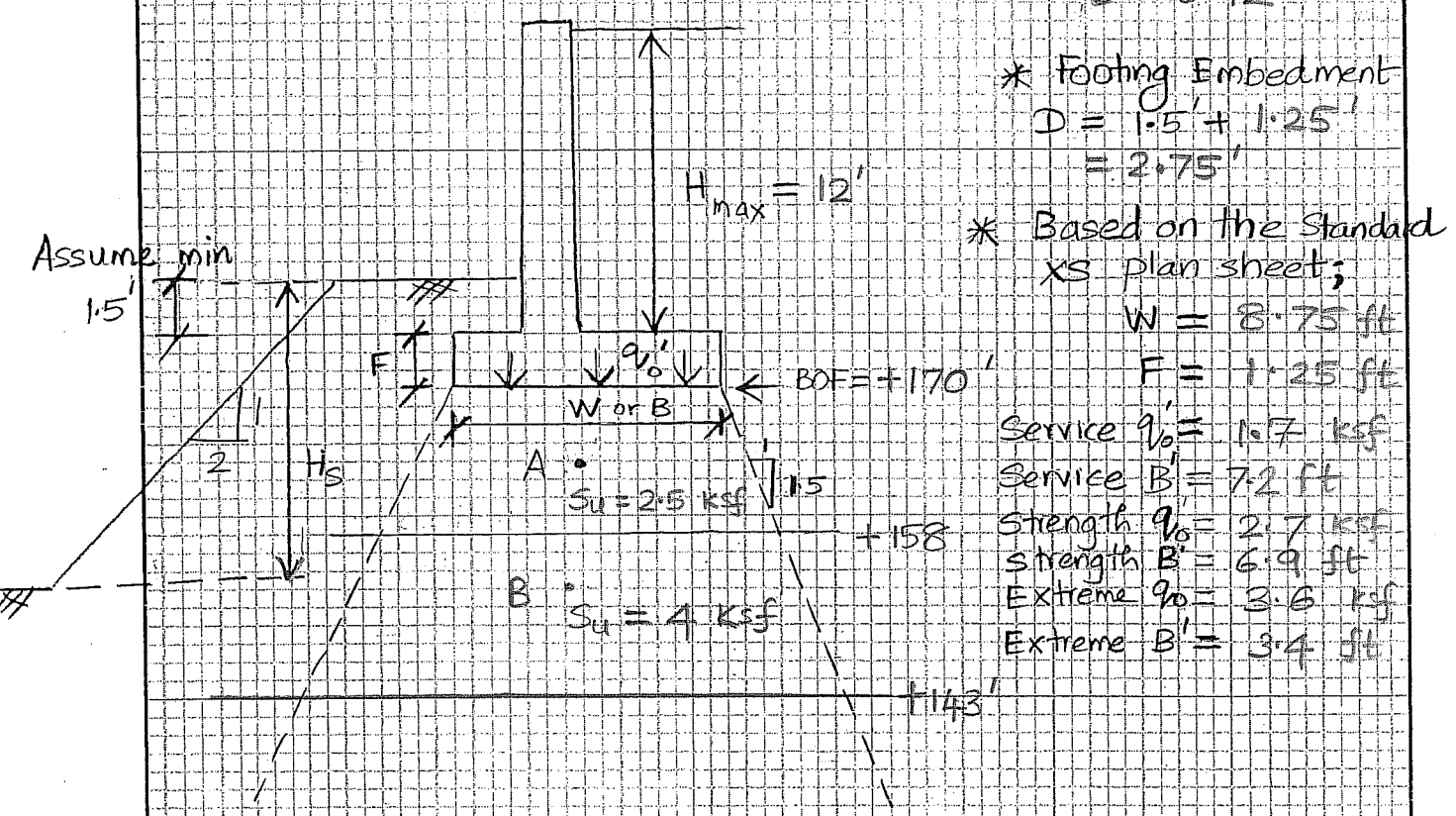
Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 1 of 3

Bearing Capacity Calculations - RW 297L

Type 1 SWB (Mod)

* 'H' varies from 6' to 12'
* Footing Embedment D = 1.5' + 1.25' = 2.75'
* Based on the Standard xs plan sheet;
  W = 8.75 ft
  F = 1.25 ft
  Service q_o' = 1.7 ksf
  Service B' = 7.2 ft
  Strength q_o' = 2.7 ksf
  Strength B' = 6.9 ft
  Extreme q_o' = 3.6 ksf
  Extreme B' = 3.4 ft



Bearing Capacity Equation (AASHTO LRFD 10.6.3.1.2a-1)

$$q_u = c N_{cm} + \gamma D N_{qm} + \frac{1}{2}\gamma B N_{\gamma m}$$

$$N_{cm} = N_c s_c i_c \; ; \; N_{qm} = N_q s_q i_q d_q \; ; \; N_{\gamma m} = N_\gamma s_\gamma i_\gamma$$

load inclination factors $i_c = i_q = i_\gamma = 1$

shape factors $s_c = s_q = s_\gamma = 1$ ($\phi = 0$ & $L >>> B$)

depth factor $d_q = 1$

For $\phi = 0 \Rightarrow N_{\gamma m} = 0$

For footing on or near slopes $\Rightarrow N_{qm} = 0$

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Project AECOM/ I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 2 of 3

$\therefore q_u = C N_{cq}$

For footing in cohesive soils and on or adjacent to slopes

For $H_s > W$; $N_s = 0$

$D/B = 0.31$ & slope '2' $= 26^\circ$

From Figure 10.6.3.1.2c-1 (AASHTO LRFD)

$N_{cq} = 4.75$

$\therefore$ nominal bearing capacity $q_u = 2.5 \times 4.75$

$= 11.9$ ksf

Service Limit State

$$q_{all} = \frac{q_u}{FOS} = \frac{11.9}{3} = 3.9 \text{ ksf} > q_o' = 1.7 \text{ ksf}$$

Strength Limit State

$$q_{all} = \phi q_u = 0.55 \times 11.9 = 6.5 \text{ ksf} > q_o = 2.7 \text{ ksf}$$

(ϕ: resistance factor)

Extreme Limit State

$$q_{all} = \phi q_u = 1.0 \times 11.9 = 11.9 > q_o = 3.6 \text{ ksf}$$

$\Rightarrow$ Check Satisfied

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Project AECOM/I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 12/11/12 Checked By Andy Date 12/13/12 Sheet 3 of 3

Settlement Estimates

$$\Delta H_i = C_{re} H_i \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

σ_o' - initial stress
$\Delta\sigma_v'$ - stress increase
H_i - layer thickness

* Assume 4' overexcavation depth

Layer	H_i (ft)	C_{re}	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
A	8	0.03	1.29	0.81	0.61
B	15	0.03	2.57	0.45	0.37

$\Sigma \Delta H_i = 0.98$"

$\Rightarrow$ Consider 4-ft of overexcavation for 12-ft high wall.

Similarly for wall 297L,

Wall height 'H' (ft)	Reqd minimum overex (ft)	Estimated settlement (in)
10	3	0.92
8	2	0.87
6	2	< 0.87

FINAL STRUCTURE FOUNDATION REPORT

Proposed Tieback Walls (RW Nos. 315L and 316R)
Interstate 5 HOV Widening, Segment 2
Orange County, California
12-Ora-5, PM 5.8
Caltrans Project No. 1200020278
(EA No. 12-0F96C01)
EMI Project No. 11-136
Date: September 21, 2012

EARTH MECHANICS, INC.

Geotechnical and Earthquake Engineering

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

September 21, 2012

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Final Structure Foundation Report, Tieback Walls (RW Nos. 315L and 316R) at Camino de Estrella Overcrossing (Bridge No. 55-0224)***
I-5 HOV Widening, Segment 2 Project,
City of San Clemente, Orange County, California
12-Ora-05, PM 5.8, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

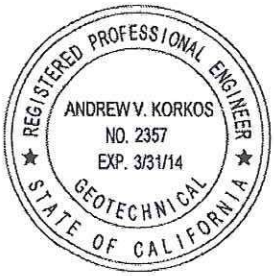
Dear Mr. Montes:

Attached is our Final Structure Foundation Report for the tieback walls proposed at the existing Camino de Estrella Overcrossing (OC) structure at the I-5 freeway. The tieback walls will be used to retain the abutment end slopes of the existing OC structure. This report presents findings and conclusions of our geotechnical investigation, and presents our recommendations intended to aid AECOM in preparing the project plans, specifications, and cost estimates.

A Structure Foundation Report for the tieback walls, dated April 24, 2012, was submitted to Caltrans for review. The Caltrans Office of Geotechnical Design South 1 (OGDS-1) reviewed the report and provided their comments in a spreadsheet dated August 8, 2012. EMI prepared responses to the OGDS-1 review comments, which were reviewed and concurred with by the OGDS-1 reviewer. Responses to Caltrans comments have been incorporated into this Final Foundation Report. Caltrans review comments and EMI responses are provided in Appendix D.

We appreciate the opportunity to provide geotechnical services for the project. If you have any questions please call us.

Sincerely,
EARTH MECHANICS, INC.



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Senior Staff Engineer

Andrew Korkos, GE 2357
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Senior Geologist
AVK:gjg

FINAL STRUCTURE FOUNDATION REPORT
PROPOSED TIEBACK WALLS (RW NOS. 315L AND 316R)
AT CAMINO DE ESTRELLA OVERCROSSING (BRIDGE NO. 55-0224)
I-5 HOV WIDENING, SEGMENT 2 PROJECT
CITY OF SAN CLEMENTE
ORANGE COUNTY, CALIFORNIA
12-ORA-05, PM 5.8
CALTRANS PROJECT NO. 1200020278 (EA NO. 12-0F96C01)

Prepared for:

AECOM
999 Town & Country Road
Orange, California 92868

Prepared by:

Earth Mechanics, Inc.
17800 Newhope Street, Suite B
Fountain Valley, California 92708

EMI Project Number: 11-136

September 21, 2012

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APPENDICES

Appendix A. Log-of-Test-Borings (LOTB) and Log of CPT Sounding
Appendix B. Laboratory Soil Test Results
Appendix C. Design Calculations
Appendix D. California Department of Transportation Review Comments and EMI Responses

1.0 INTRODUCTION

1.1 Purpose

Earth Mechanics, Inc. (EMI) performed a geotechnical study for the tieback walls proposed at the abutments of the existing Camino de Estrella Overcrossing (OC), Bridge No. 55-0224. The purpose of the geotechnical study was to obtain subsurface information and develop design and construction recommendations to aid AECOM in preparing the project plans, specifications, and cost estimates.

1.2 Scope of Work

Geotechnical tasks performed for the proposed tieback wall included:

- Field investigation including excavating and logging five exploratory boreholes and conducting one Cone Penetration Test (CPT) sounding.
- Collecting representative samples of subsurface materials.
- Laboratory soil tests on selected soil and bedrock samples.
- Geotechnical engineering analyses and development of lateral pressures.
- Preparing this report presenting our findings, conclusions, and recommendations.

1.3 Project Description

The Orange County Transportation Authority (OCTA), in cooperation with Caltrans, and the Cities of Dana Point, San Clemente, and San Juan Capistrano, is proposing to widen the I-5 mainline between Avenida Pico and San Juan Creek Road. The project will add one HOV lane in each direction of the I-5 freeway, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. EMI is responsible for preparing the geotechnical and foundation reports for improvements proposed within the overall project. This report is for the proposed tieback walls at the Camino de Estrella OC, which is in Segment 2 that extends along the I-5 mainline from about 1,600 feet southeast of Avenida Vista Hermosa to about 2,400 feet northwest of Camino de Estrella. The location of the project is shown on Figure 1.

To accommodate the two additional HOV lanes, the I-5 mainline will be widened in the northbound (NB) and southbound (SB) directions. Major improvements proposed in Segment 2 include widening the Avenida Vaquero Undercrossing (UC), ramp improvements at the Avenida Vista Hermosa and Camino de Estrella interchanges, several earth retaining walls, sound walls, and new pavement. Other improvements include sign structures, utility lines, drainage structures, lighting, landscaping, and roadway striping.

In order to widen the I-5 mainline underneath the existing Camino de Estrella OC, tieback walls will be constructed at the abutment end slopes of the existing OC structure. The tieback walls will be used to retain the abutment end slopes which will be trimmed back to accommodate the roadway widening.

INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

SITE LOCATION MAP

Figure 1

Project No. 11-136

Date: 03-19-12

Retaining Wall (RW) No. 315L will be constructed by cutting into the existing Abutment 1 end slope (which has an inclination of about 2H:1V). This proposed tieback wall is about 229 feet long, ranges in height from about 5 to 12 feet, and is located about 15 feet north of the existing spread footing at Abutment 1. RW No. 316R will be constructed by cutting into the existing Abutment 3 end slope (which has an inclination of about 1.5H:1V). RW No. 316R is about 262 feet long, ranges in height from 5 to 13 feet, and is located about 20 feet south of the existing spread footing at Abutment 3.

1.4 Review of Existing Data

Based on our understanding, no previous geotechnical studies were performed specifically for the proposed improvements described in this report. The Log-of-Test-Boring (LOTB) sheet, included with the as-built plans, for the existing Camino de Estrella OC was reviewed by EMI for the project; however, since specific information on the hammer used for the drive sampler is unknown and the blowcount-shear strength correlation is unknown, the information on the as-built LOTB was not used for the analysis or design of the walls.

2.0 FIELD INVESTIGATION AND LABORATORY TESTING

2.1 Field Investigation

A geotechnical field investigation was conducted between September 26 and October 10, 2011. Five (5) exploratory boreholes and one (1) Cone Penetration Test (CPT) sounding were conducted specifically for the two proposed tieback walls. The boreholes were conducted for the purpose of collecting samples of subsurface earth materials and logging subsurface conditions where the tieback walls are proposed. The CPT sounding was conducted to obtain continuous subsurface information. The boreholes were excavated using a truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers. Subsurface earth materials and conditions were logged and samples of subsurface materials were collected. Small soil/bedrock samples were collected from borings generally at 5-foot vertical intervals by means of split-spoon drive samplers; the Standard Penetration Test (SPT) sampler and the Modified California Drive (MCD) sampler were used to collect small disturbed and relatively undisturbed samples, respectively. The SPT sampler (1.4-inch ID) and MCD sampler (2.5-inch ID) were driven a total depth of 18 inches or until refusal, using a 140-pound automatic hammer falling 30 inches. The blowcounts for the last 12 inches of penetration were recorded on the boring logs. The MCD is a split-barrel sampler with a tapered cutting tip and lined with a series of 1-inch tall brass rings. Log-of-Test-Boring (LOTB) sheets are presented in Appendix A.

The CPT sounding was performed using an electronic cone penetrometer in general accordance with current ASTM Standards (ASTM D5778 and ASTM D3441). CPT equipment consisted of a cone penetrometer assembly mounted at the end of a series of hollow sounding rods. The cone penetrometer assembly consists of a conical tip with a 60° apex angle and a projected cross sectional area of 1.55 in² and a cylindrical friction sleeve with a surface area of 23.25 in². The interior of the penetrometer is instrumented with strain gauges that allow simultaneous measurements of cone tip resistance and sleeve friction during penetration. The cone penetrometer assembly is continuously pushed into the soil by a set of hydraulic rams at a standard rate of 0.79 inch per second while the cone tip resistance and sleeve friction are recorded every 1.967 inches and digitally stored. A

specially designed 25-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the testing equipment. The computer generated log includes tip resistance, friction resistance, and friction ratio. Soil behavior type interpretations are based on guidelines by Robertson and Campanella (1989). The CPT sounding log is provided in Appendix A.

EMI borehole and CPT information is summarized in Table 1. The approximate locations of the boreholes and CPT are shown on Figure 2 and Figure 3.

Table 1. Borehole and CPT Exploration Information

Borehole Number	Easting	Northing	Station	Offset (feet)	GSE (feet)	GWE (feet)	Boring/ CPT Depth (ft)	Method	Figure No.
A-11-244	6,132,930	2,113,518	316+65	85.2 RT	+207.9	NE	31.5	HSA	3
CPT-11-245	6,132,743	2,113,667	319+02	93.8 RT	+215.6	--	58.2	CPT	3
A-11-246	6,132,919	2,113,331	315+62	72.5 LT	+206.7	NE	31.5	HSA	2
A-11-247	6,132,675	2,113,509	318+66	73.8 LT	+209.8	NE	51.5	HSA	2
A-11-258	6,132,809	2,113,348	316+61	123.6 LT	+227.0	NE	31.5	HSA	2
A-11-259	6,132,899	2,113,643	317+64	166.2 RT	+236.6	NE	31.5	HSA	3

Notes: 1. Easting and Northing coordinates, and Stations and offsets, were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevation (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Elevation (approximate); NE = Groundwater Table Not Encountered.
4. HSA = Hollow-stem auger boring; CPT = Cone Penetration Test Sounding.

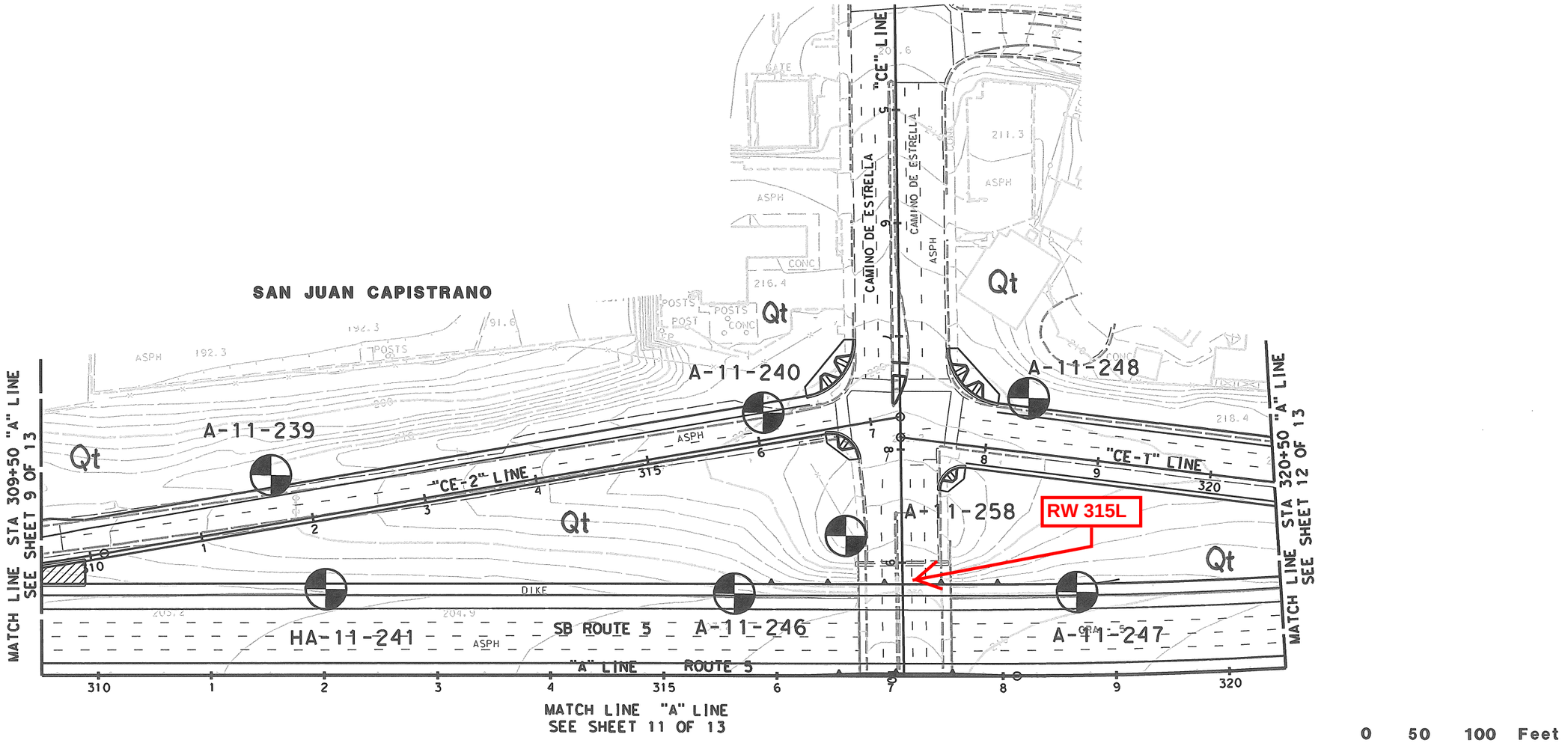
Charts published by Winterkorn and Fang (1975) can be used to determine a reduction factor used to convert blowcounts recorded using the California Drive sampler into SPT blowcounts. Using those charts, we obtained a reduction factor of 0.5 which was used for this project.

2.2 Laboratory Testing

Laboratory tests were performed on representative samples of soil and bedrock to determine or derive relevant physical and engineering properties. Selected samples were tested to determine soil/bedrock classification, shear strength parameters, consolidation characteristics, and corrosion potential. The following laboratory tests were conducted to supplement the observations recorded during the field investigation:

- In-situ Moisture Content and Unit Weight
- Percent Passing No. 200 Sieve
- Grain Size Distribution
- Consolidation
- Corrosivity
- Direct Shear
- Atterberg Limits
- Unconsolidated-Undrained Triaxial Tests

The laboratory tests were conducted in general accordance with California Test (CT) methods or American Society for Testing and Materials (ASTM) standards. The laboratory test results are presented in Appendix B.



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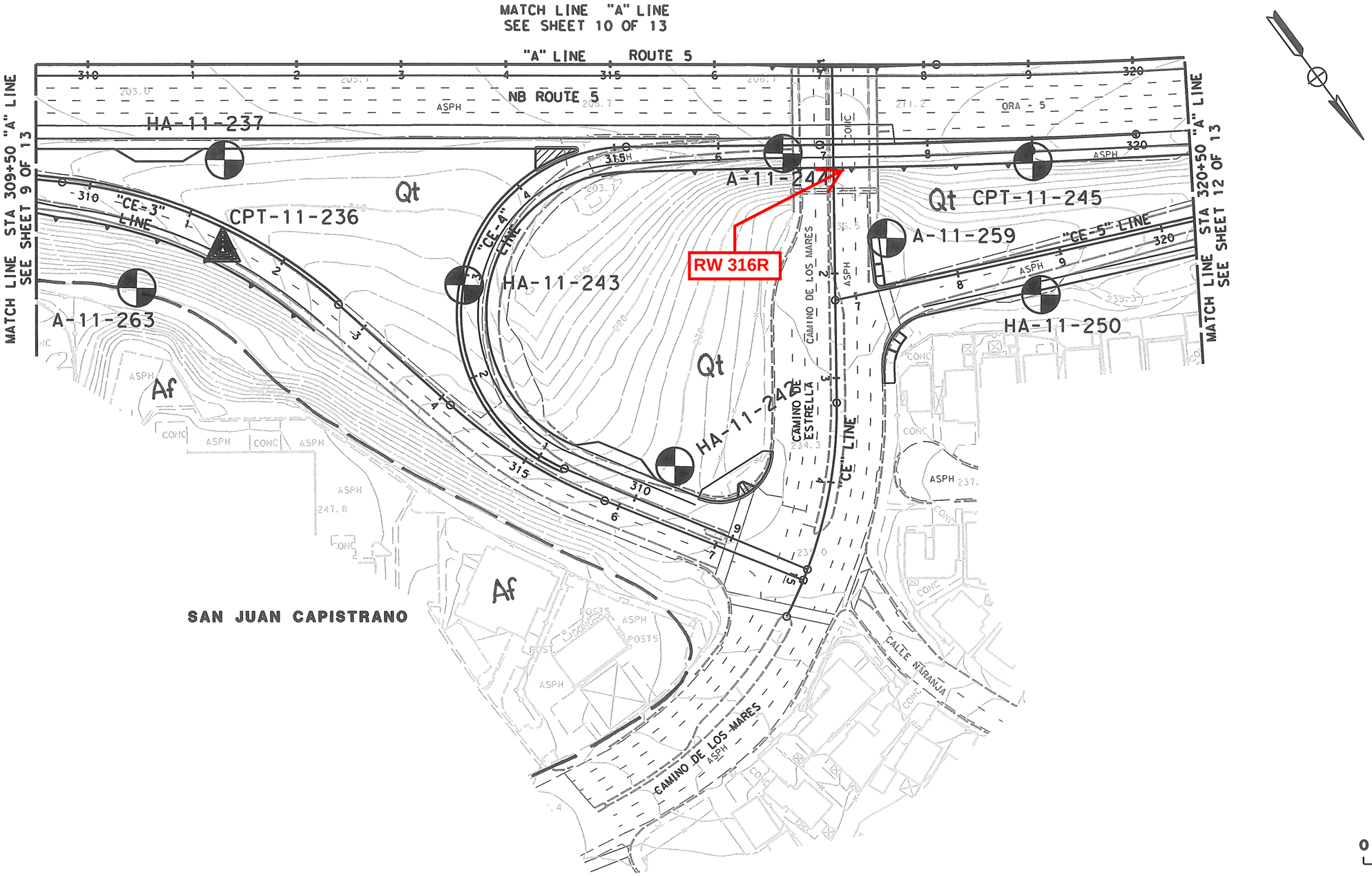
Exploratory Boring Location Map (1 of 2)

Figure 2



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Exploratory Boring Location Map (2 of 2)

Figure 3

3.0 GEOLOGY AND SEISMICITY

3.1 Physiography

The project area is located in the northwestern part of the Peninsular Ranges physiographic province. The Peninsular Ranges comprise a northwest-southeast trending group of fault-bounded ranges between the Salton Trough and the Pacific Ocean. The Santa Ana Mountains, Puente Hills, and San Joaquin Hills are ranges within the Peninsular Ranges.

The project site is located on the low lying rolling hills westerly of the Santa Ana Mountains at the southerly end of the San Joaquin Hills in an area referred to as the Capistrano Embayment.

3.2 Stratigraphy

The geologic units encountered in the project area are described below. The distribution and location of geologic units, at the bridge site, are shown on the Boring Location Maps (Figures 2 and 3).

- Capistrano Formation (Tc): These marine sedimentary deposits generally consist of brown to gray silty claystone, claystone, and siltstone. Secondary gypsum is commonly found deposited along joints, fractures and shears. The formation is generally soft when moist and has engineering properties similar to stiff to very stiff soils. The formation consists generally of soft, weakly cemented to uncemented material that can be disaggregated with finger pressure. A few hard beds occur throughout the formation.

  Within the project area, the Capistrano formation consists of an oxidized (weathered) zone defined by a light brown to brown color with a mottled appearance, underlain by an unoxidized zone that is generally dark brown to dark gray with a greater degree of induration.

- Undifferentiated Marine and Non-marine Terrace Deposits (Qt): Portions of the project area, mostly southerly of Camino Las Ramblas, are capped by terrace deposits. Shell fragments were found associated with the marine terrace deposits. The terrace deposits were observed to unconformably overlie bedrock units of the Capistrano formation directly. These Pleistocene terrace deposits are characterized by a basal cobble sequence fining upward to light brown and yellow brown fine to coarse grained sands, silty sand, sandy silt and clayey silt.

- Alluvium (Qal): The drainages and canyons crossing the project corridor are mantled by a relatively thin cover of alluvium. These deposits are generally derived from the surrounding bedrock units and terrace deposits and are located in the lower elevations of the site. Where encountered in the borings the alluvium was observed to consist of silty sand to sandy clay.

- Artificial Fill (Af): Artificial fill placed during construction of the I-5 freeway and adjacent residential and commercial developments is located along the project corridor. Fill materials were most likely derived from excavation of the Capistrano formation bedrock and local surficial deposits. Little or no documentation of the limits of fills or the observation and testing of the fill placement were examined.

3.3 Geologic Structure

The Peninsular Ranges are characterized by northwest-southeast trending mountains and valleys that have been faulted and uplifted by northwest-southwest trending faults. The Capistrano Embayment is a relatively flat structural trough of Miocene to Pliocene age. The trough is bordered on the east by the Cristianitos Fault. The California Geological Survey does not show any active faults at the site (Jennings, 2010). The nearest known major active faults are the Newport-Inglewood Structural Zone about 5 miles southwest of the site in the offshore area, the Palos Verdes fault about 19 miles to the west, also in the offshore area, and the Elsinore fault about 35 miles to the northeast. A subsurface fault, the San Joaquin Hills blind thrust, is postulated west of the site at a depth of about 2.5 to 3 miles. Other nearby faults such as the Cristianitos fault and Mission Viejo faults are about 3.5 to 7 miles east of the site but are not believed to be active.

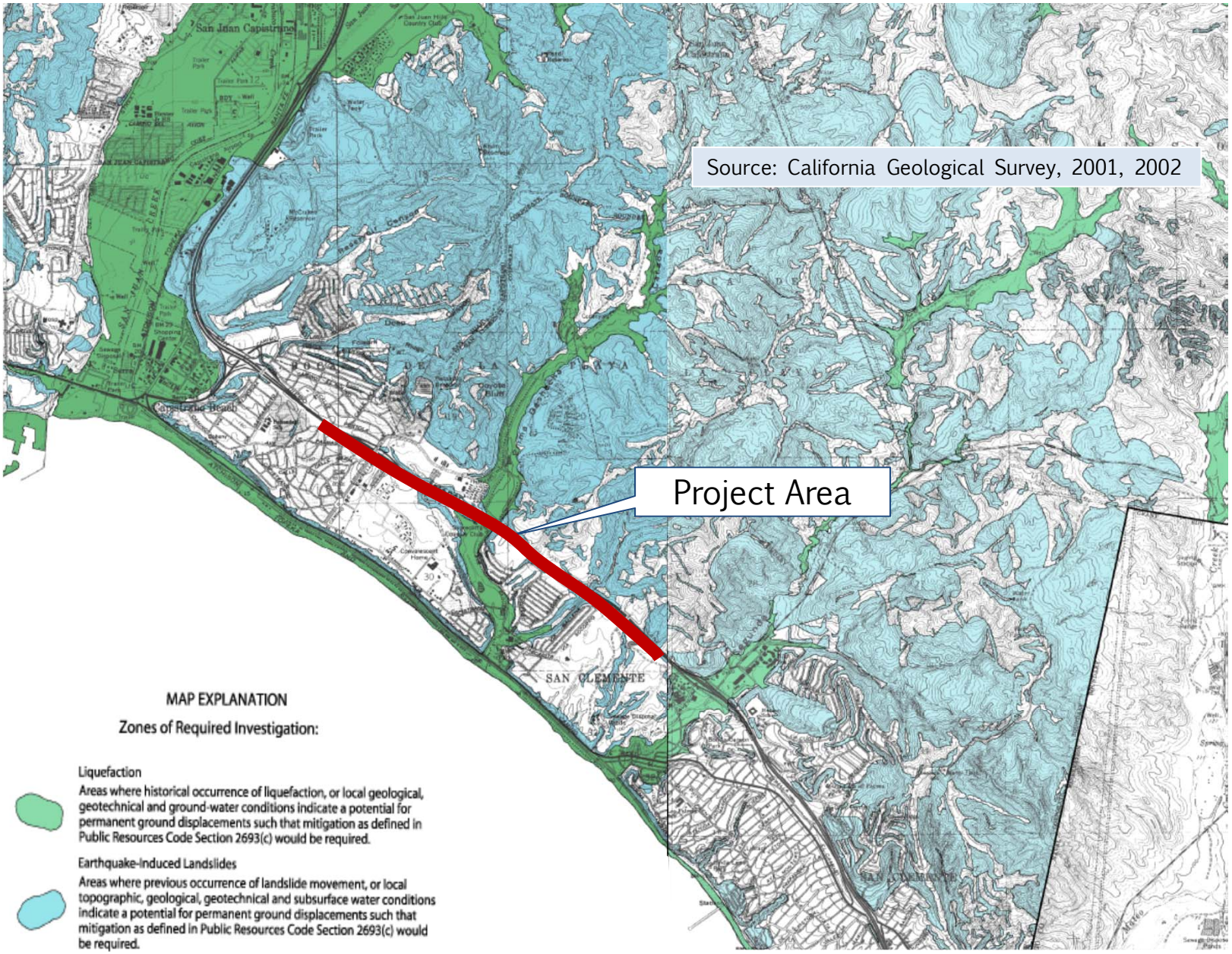
3.4 Geologic Hazards

The geological hazard present at the site is earthquake shaking. The seismic hazard map published by the California Geological Survey (2002) does not show known landslides and a liquefaction hazard within the area of the existing bridge (Figure 4). The site lies outside identified tsunami inundation zones (CGS, 2009), and there are no large bodies of water within the project area that could generate a seiche. There are no volcanos in the region and there are no known active surface faults within the project area so ground rupture is not a design issue.

3.5 Seismicity

The project is located in seismically active southern California. The present-day seismotectonic stress field in the Los Angeles region is one of north-northeasterly compression. This is indicated by geologic structures, by earthquake focal-mechanism solutions, and by geodetic measurements. The data suggests crustal shortening of between 0.2 and 0.35 inch/year across the greater Los Angeles area (Argus et al., 1999).

Historic earthquake epicenter maps show widespread seismicity throughout the region. Although historical earthquakes occur in proximity to known faults, they are difficult to directly associate with mapped faults. Part of this difficulty is due to the fact that the basin is underlain by several poorly known subsurface thrust faults, generally referred to as blind thrust faults. Ward (1994) estimated that about 40 percent of seismic moment cannot be associated with known faults. Earthquakes occur primarily as loose clusters along the Newport-Inglewood Structural Zone, the southern margin of the Santa Monica Mountains, the margin between the Santa Susana-San Fernando Valley and the southern margin of the San Gabriel Mountains, and in the Coyote Hills-Puente Hills area. There is no clustering or alignment of earthquakes in proximity to the site. There are fewer earthquakes in the site region than anywhere else in the Los Angeles Basin area. This apparent lack of earthquake activity suggests that the site area is tectonically stable and suggests that there are no unrecognized active faults at the site.



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	Project No. 11-136 / Date: 03-08-12	

The largest historical earthquake within the Los Angeles Basin was the 1933 Long Beach event which had a magnitude of about $M_W = 6.4$ ($M_L = 6.3$). This earthquake did not rupture the surface but is believed to have been associated with the Newport-Inglewood Structural Zone (Benioff, 1938). The association was based on abundant ground failures along the NISZ trend but no unequivocal surface rupture was identified. Reevaluation of the seismicity data by Hauksson and Gross (1991) relocated the 1933 earthquake hypocenter to a depth of about 6 miles below the Huntington Beach-Newport Beach city boundary.

Other major earthquakes in the region include the 1994 Northridge and the 1971 San Fernando earthquake both of which occurred in the San Fernando Valley region. The 1994 earthquake had a moment magnitude (M_W) of about 6.7 ($M_S = 6.8$, $M_L = 6.4$), and occurred on a southerly dipping subsurface fault which was unknown prior to the earthquake. The main shock occurred at a depth of about 19 km. Earthquake aftershocks clearly defined the rupture surface dipping about 35 degrees southerly from a depth of about 2 or 3 km to 23 km (Hauksson et al, 1995). The causative fault was never identified with certainty. The event may have occurred on an eastern extension of the Oakridge fault (Yeats and Huftile, 1995), a southerly dipping feature fault bounding the Ventura Basin and the Santa Susana Mountains.

The 1971 San Fernando earthquake was of similar size ($M_W = 6.7$, $M_S = 6.4$, $M_L = 6.4$) to the 1994 event but did involve surface rupture. The 1971 event occurred on a northerly dipping thrust fault that dips from the northern side of the San Fernando Valley to a depth of about 15 km under the San Gabriel Mountains. Several mapped surface faults were involved such as the Sylmar fault, Tujunga fault, and Lakeview fault. These faults are commonly considered to be part of the Sierra Madre fault system which extends easterly from the San Fernando Valley, along the base of the San Gabriel Mountains on the north side of the San Gabriel Valley, and to the Cucamonga fault in the San Bernardino area.

The 1987 Whittier earthquake ($M_L = 5.9$, $M_W = 5.9$) occurred on a subsurface fault dipping under the Puente Hills to about 10 miles beneath the San Gabriel Basin (Shaw and Shearer, 1999; Shaw et al., 2002). This event did not rupture the ground surface.

A magnitude 5.4 earthquake occurred at a depth of about 9 miles (15 km) on 29 July 2008. The epicenter was in the Chino Hills area between the Chino fault and the Whittier fault. Preliminary data were inconclusive with regard to the causative fault. Detailed analysis by Shao and Hauksson (2009) indicated a rupture plane striking N71°W, dipping 62° northeast. They suggested a preference for the Whittier fault being the causative fault but were uncertain, primarily because the Whittier fault is supposed to dip much steeper (~ 80°). The aftershock pattern formed a subhorizontal alignment indicating the possibility that the event could have been associated with a subsurface thrust fault such as one of the blind faults of the Puente Hills Blind Thrust Fault System or with a blind fault under the Peralta Hills.

Another significant earthquake was the 1812 earthquake which caused damage at the San Juan Capistrano Mission. The location and magnitude of the 1812 earthquake are unknown because of the sparse population at the time, but geological studies (Jacoby et al., 1988; Fumal et al., 1993; Weldon et al., 2004) postulate that it did not occur in the Capistrano area, but rather was a large ($M > 7.0$) distant event on the San Andreas fault in the Wrightwood area of the San Gabriel Mountains.

The earliest documented earthquake in the region was reported by the Portola' expedition as they camped near the Santa Ana River in 1769. This event has been attributed by various geoscientists to just about every fault in the Los Angeles area but it could just as well have been a distant event that shook a wide area as did the 1971 San Fernando, the 1987 Whittier, and the 1994 Northridge events, as well as many other more-distant events (for example, 1992 Landers event).

3.6 Hydrology

The Segment 2 project area is located within the San Juan Valley hydrologic area. No indication of a static groundwater table was observed within the depths explored during the recent investigation for the overall project. However, perched groundwater was encountered in seven of the thirty-four deep boreholes, drilled for Segment 2, at elevations ranging from about +74 to +184 feet.

With respect to the bridge site, groundwater was not encountered in any the five boreholes drilled at the bridge location.

The as-built LOTB sheet for the existing Camino de Estrella OC indicates that groundwater was not encountered in borings that were drilled down to elevations of about +180 ft and +187 ft in 1966.

Soil moisture content and groundwater elevation can fluctuate due to variations in seasonal rainfall, nearby irrigation, changes in or addition of flood control improvements, groundwater injection or extraction activities, construction activities, or numerous other man-made or natural conditions.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Soil/Bedrock Conditions

Stratigraphy at the abutments of the existing OC structure, where the tieback walls are proposed, consists of terrace deposits overlying sedimentary bedrock of the Capistrano formation. It is presumed that artificial fills exist immediately behind the existing abutment walls; however, the materials below the bottom of the existing footings is presumed to be predominantly terrace deposits.

4.2 Idealized Subsurface Profile and Engineering Parameters

Idealized soil profiles were developed for each tieback wall based on the information collected from the exploratory boreholes and CPT sounding. Table 2 shows the idealized profiles and the estimated shear strength parameters of the earth materials. Shear strength parameters were determined based on laboratory direct shear tests.

4.3 Groundwater Conditions

During the recent geotechnical field investigation conducted at the location of the proposed tieback walls, between September 26 and October 10, 2011, groundwater was not encountered in any of the exploratory boreholes. The boreholes were advanced to elevations ranging between about +158 ft and +205 ft.

Table 2. Idealized Subsurface Profiles

Approximate Elevation (ft)	Predominant Soil Type	Range of SPT Blowcounts* (blows per ft)	Total Unit Weight (pcf)	Friction Angle (degrees)	Cohesion (psf)
Retaining Wall No. 315L (Borings A-11-246, A-11-247, A-11-258)					
+227 to +192	Clay and Silt (Terrace Deposits)	9 to (21) Average = 14	120	27	210
+192 to +176	Sand and Sand w/ Silt (Terrace Deposits)	19 to >70/11" Average = 43	120	28	160
+176 to +158	Capistrano formation (siltstone/claystone)	(24) to (36) Average = 31	120	23 – 27	200 – 250
Retaining Wall No. 316R (Borings A-11-244, CPT-11-245, A-11-259)					
+236 to +224	Clay (Terrace Deposits)	57 to (50/4") Average = 66	120	27	210
+224 to +197	Clay and Silt (Terrace Deposits)	12 to 24 Average = 18	120	27	210
+197 to +182	Sand and Sand w/ Silt (Terrace Deposites)	28 to 100 Average = 59	120	28	160
+182 to +157	Capistrano formation (siltstone/claystone)	28	120	23 – 27	200 – 250

** Values in (parentheses) are converted Standard Penetration Test (SPT) blowcounts corrected for sampler size; correction factor from California sampler blowcounts to SPT blowcounts is 0.5.*

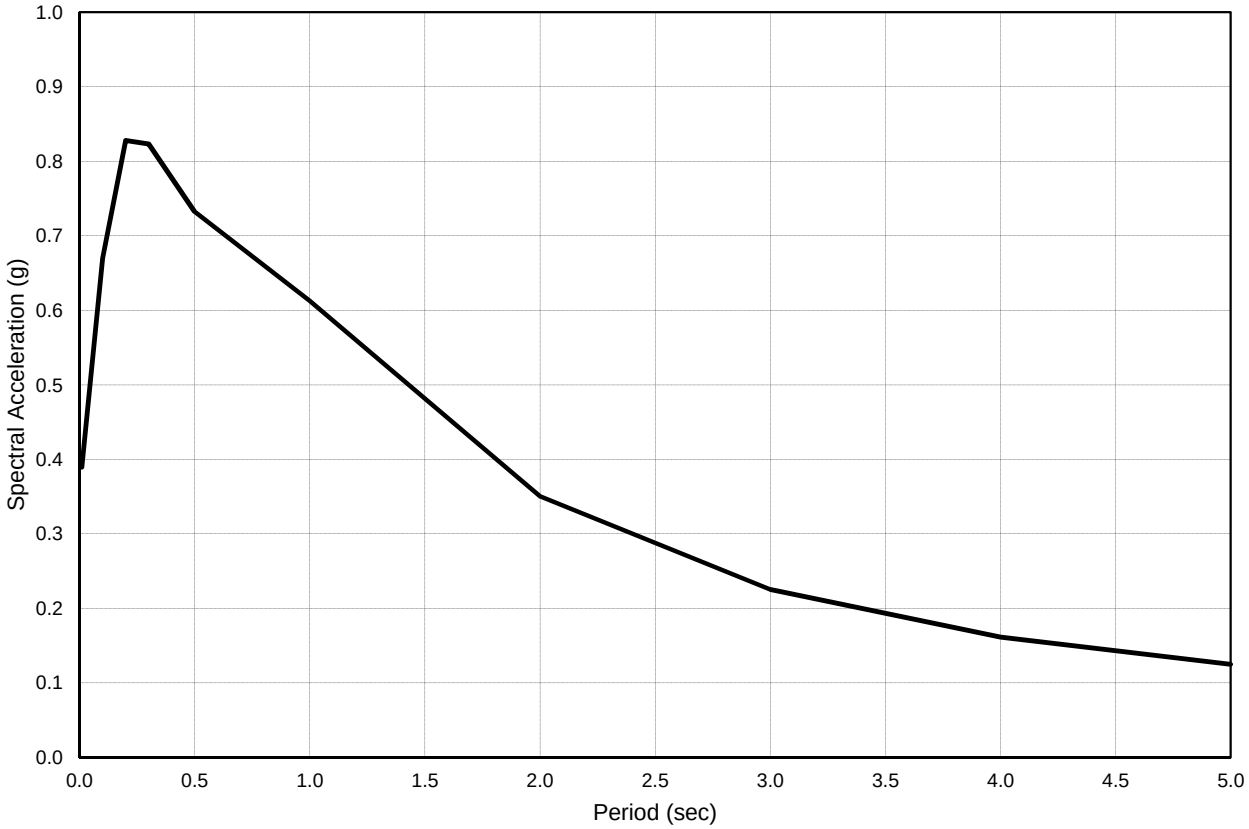
5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Design Ground Motion

Deterministic and probabilistic ARS curves were developed based on the 2009 Caltrans Seismic Design Criteria (SDC) (2009a and 2009b). The controlling ARS curve is shown on Figure 5. A design PGA (spectral acceleration at zero period) of 0.39g is recommended for the tieback walls.

5.2 Soil Liquefaction

Liquefaction is the loss of shear strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. Primary factors influencing the potential for liquefaction include: groundwater elevation, soil type and grain-size characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. Soils most susceptible to liquefaction are saturated low-density sands and silty sands situated within 50 feet of the ground surface.



Latitude = 33.4528 ^{o}
Longitude = -117.6437 ^{o}
Damping Ratio = 5%

Spectral Coordinates	
Period (sec)	Acc. (g)
	Design
0.010	0.390
0.100	0.670
0.200	0.828
0.300	0.823
0.500	0.733
1.000	0.613
2.000	0.350
3.000	0.225
4.000	0.162
5.000	0.125

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Design ARS Curve

Figure 5

Since the project area is composed of predominantly medium to high plasticity fine-grained terrace deposits, very dense sandy terrace deposits, and sedimentary bedrock, and due to the absence of a shallow static groundwater table, liquefaction is unlikely and is not considered a design issue.

5.3 Tieback Wall Design

To widen the I-5 mainline, the bottom portion of the existing end slopes of the north and south abutments, at the Camino de Estrella OC, must be removed. Removing the bottom portion of the end slopes requires constructing tieback walls to retain the remaining portions of the approach embankments. The tieback walls will extend beyond the footprint of the existing OC structure.

Current plans show RW No. 315L and 316R to be 229 feet and 262 feet long, respectively, with the height ranging from about 5 feet to 12 or 13 feet. The bottom elevation of RW No 315L varies from about +204.1 ft to about +206.4 ft, and the top-of-wall elevation varies from about +209.1 ft to about +217.1 ft. The bottom elevation of RW No 316R varies from about +202.7 ft to about +210.4 ft, and the top-of-wall elevation varies from about +209.7 ft to about +220.9 ft. Two rows of tieback anchors will be used to provide lateral resistance for the portion of the walls beneath the existing OC structure; the two rows of anchors will extend some distance beyond the bridge footprint. Because the wall height decreases in the directions away from the bridge structure, and there is no surcharge loading from structures, the tiebacks will reduce from two rows to a single row. The inclination of the slopes behind the proposed walls varies from about 1.5H:1V to flatter than 2H:1V.

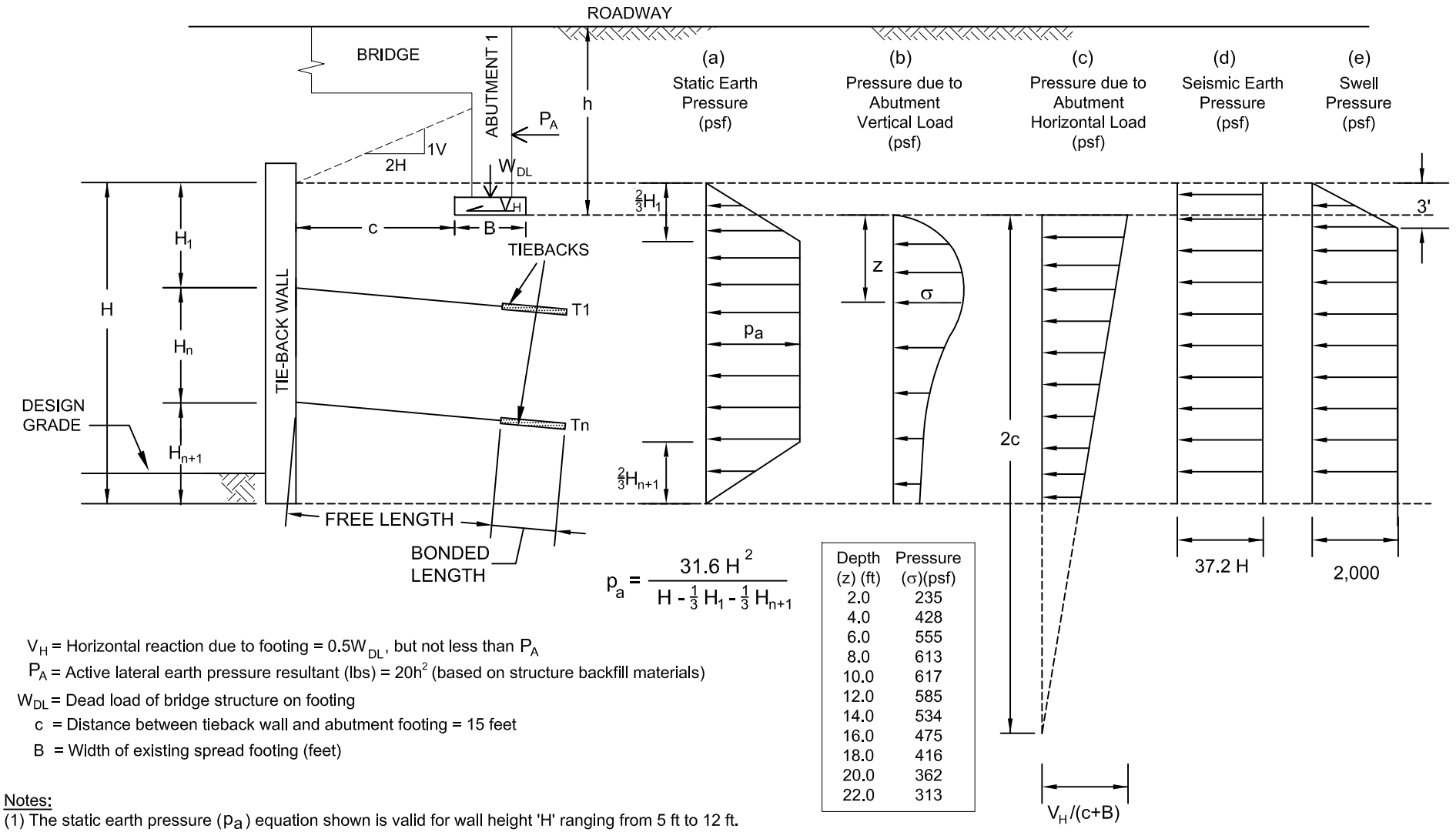
5.3.1 Lateral Pressures

Lateral Pressures. Tieback anchors should be designed to resist all lateral pressures against the back of the tieback walls including earth pressures and surcharge pressures. The existing foundations of the Camino De Estrella OC will impact the proposed tieback walls. The existing OC abutments are supported on rectangular spread footings which are close enough to the proposed tieback walls to impose additional surcharge loads. Information on the existing spread footings, which are shown on the as-built plans, is summarized in Table 3.

Table 3. Existing OC Spread Footing Information

Support Location	Foundation Type	Approximate Footing Bottom Elevation (feet)	Footing Width (feet)	Approximate Horizontal Distance Between Footing and Tieback Wall (feet)	Allowable Footing Pressure (tsf)
Abutment 1	Spread Footing	+216	4	20.8	3.0
Abutment 3		+222	5	15.0	2.5

Lateral pressures that should be applied against the tieback walls are shown on Figure 6 through Figure 11 and include: (a) the static active earth pressure; (b) lateral pressure due to vertical load of existing OC footings, (c) lateral pressure due to horizontal load of existing OC footings, (d) seismic lateral earth pressure, and (e) lateral swell pressure due to expansive earth material. The static active earth pressure and the lateral pressures due to the vertical and horizontal loads of the existing OC footings were developed in accordance with Caltrans Memo to Designers 5-12 (2012).



Depth (z) (ft)	Pressure (σ)(psf)
2.0	235
4.0	428
6.0	555
8.0	613
10.0	617
12.0	585
14.0	534
16.0	475
18.0	416
20.0	362
22.0	313

V_H = Horizontal reaction due to footing = $0.5W_{DL}$, but not less than P_A

P_A = Active lateral earth pressure resultant (lbs) = $20h^2$ (based on structure backfill materials)

W_{DL} = Dead load of bridge structure on footing

c = Distance between tieback wall and abutment footing = 15 feet

B = Width of existing spread footing (feet)

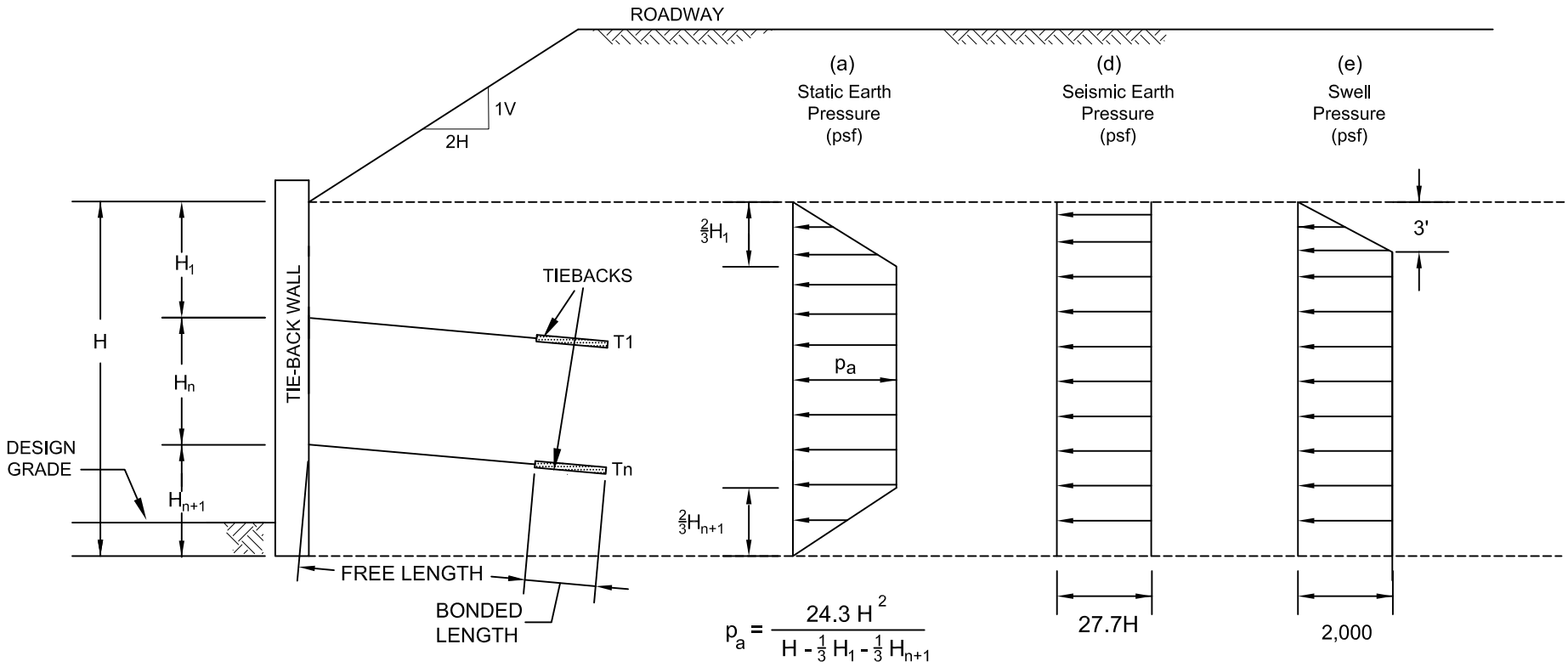
Notes:

(1) The static earth pressure (p_a) equation shown is valid for wall height 'H' ranging from 5 ft to 12 ft.

(2) The swell pressure (2,000 psf) is due to expansion of the earth materials behind the tie-back wall.

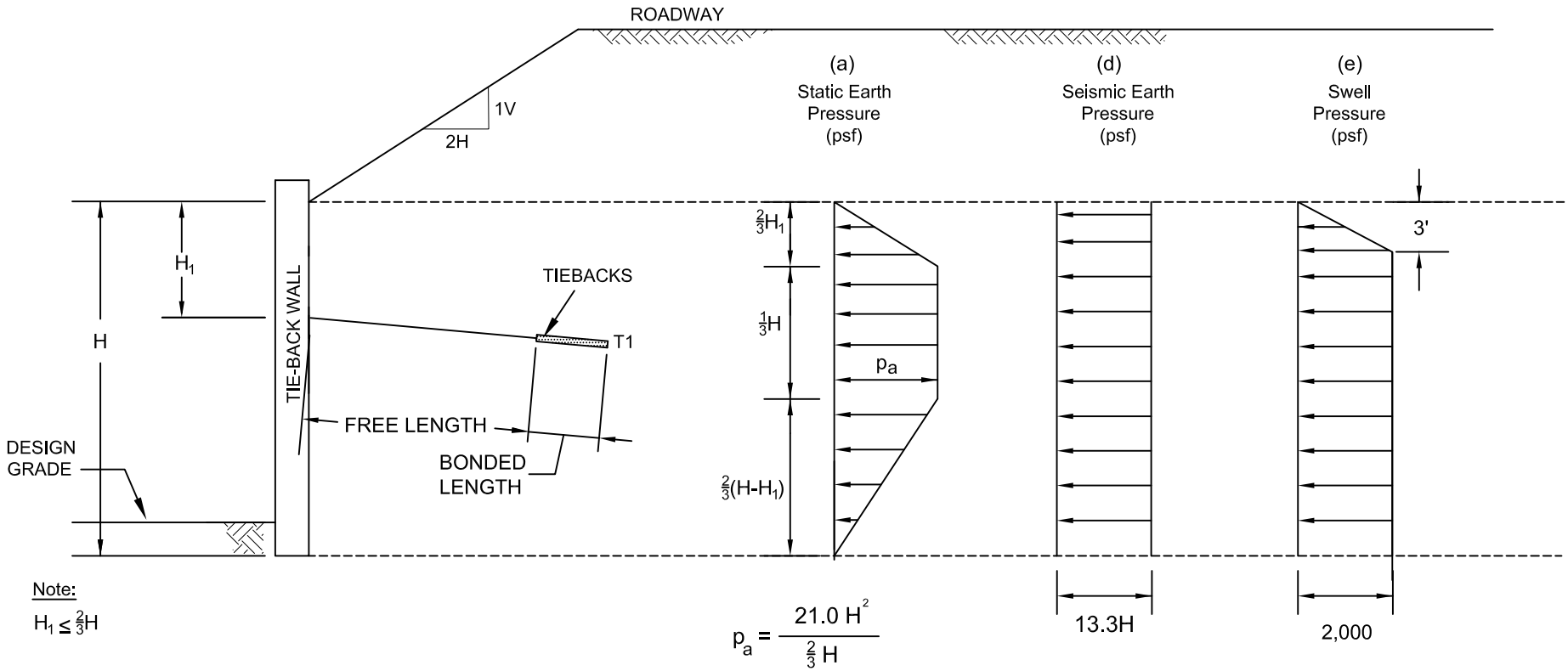
(3) Lateral pressures due to bridge load should be applied to wall at least 20 feet horizontal distance beyond the abutment footprint on both sides of bridge.

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Interstate 5 HOV Widening Project, Segment 2	LATERAL PRESSURES FOR RW NO. 315L MULTIPLE ROWS OF ANCHORS WITH BRIDGE LOADS
	Project No. 11-136 / Date: 09-18-12	FIGURE 6



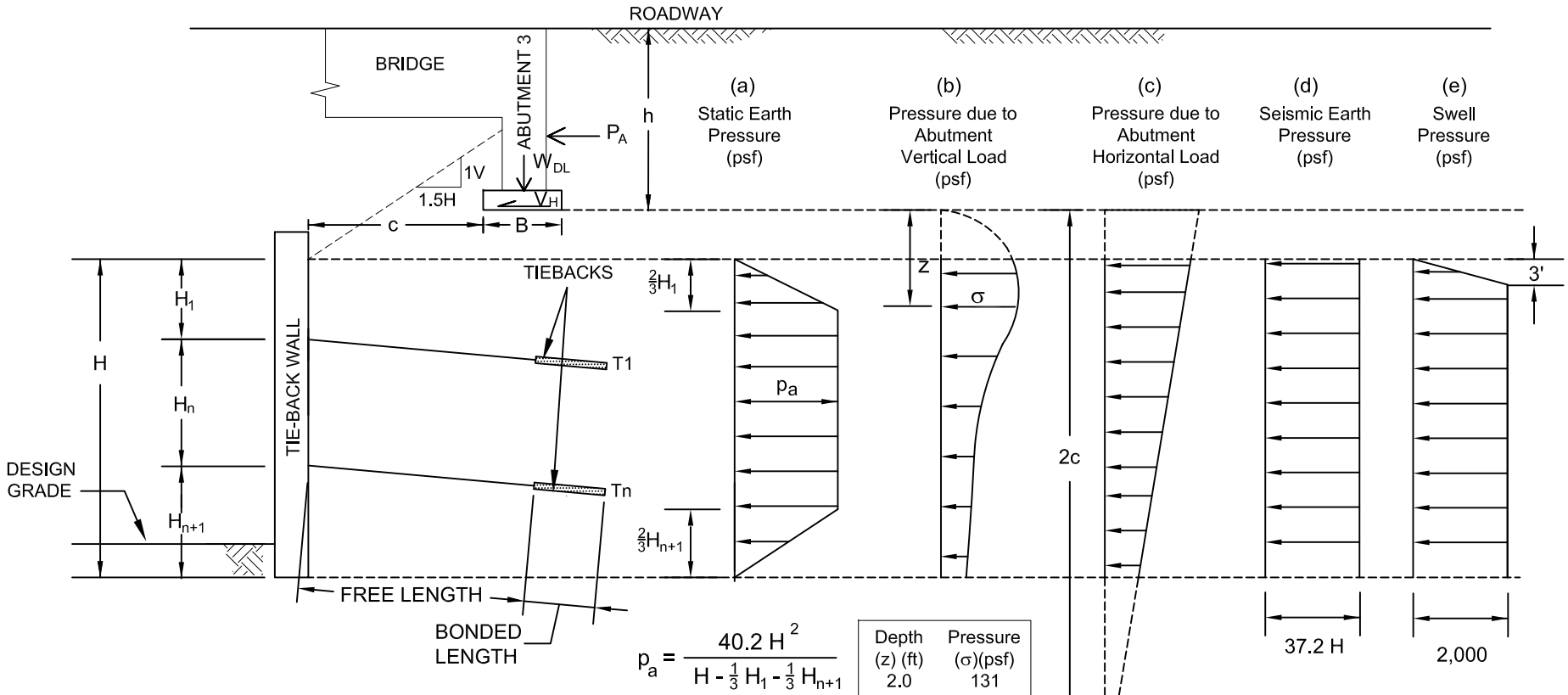
Notes:
(1) The static and seismic earth pressures (p_a and P_E) are valid for wall height 'H' of 12 ft or less.
(2) The swell pressure (2,000 psf) is due to expansion of the earth materials behind the tie-back wall.

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Interstate 5 HOV Widening Project, Segment 2	LATERAL PRESSURES FOR RW NO. 315L MULTIPLE ROWS OF ANCHORS NO BRIDGE LOADS
	Project No. 11-136 / Date: 09-18-12	FIGURE 7



Notes:
(1) The static and seismic earth pressures (p_a and P_E) are valid for wall height 'H' of 12 ft or less.
(2) The swell pressure (2,000 psf) is due to expansion of the earth materials behind the tie-back wall.

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Interstate 5 HOV Widening Project, Segment 2	LATERAL PRESSURES FOR RW NO. 315L SINGLE ANCHOR ROW NO BRIDGE LOADS
	Project No. 11-136 / Date: 09-18-12	FIGURE 8



$$p_a = \frac{40.2\,H^2}{H - \frac{1}{3}H_1 - \frac{1}{3}H_{n+1}}$$

Depth (z) (ft)	Pressure (σ)(psf)
2.0	131
4.0	249
6.0	345
8.0	413
10.0	454
12.0	470
14.0	466
16.0	449
18.0	423
20.0	393
22.0	360

V_H = Horizontal reaction due to footing = $0.5W_{DL}$, but not less than P_A

P_A = Active lateral earth pressure resultant (lbs) = $20h^2$ (based on structure backfill materials)

W_{DL} = Dead load of bridge structure on footing

c = Distance between tieback wall and abutment footing (feet)

B = Width of existing spread footing (feet)

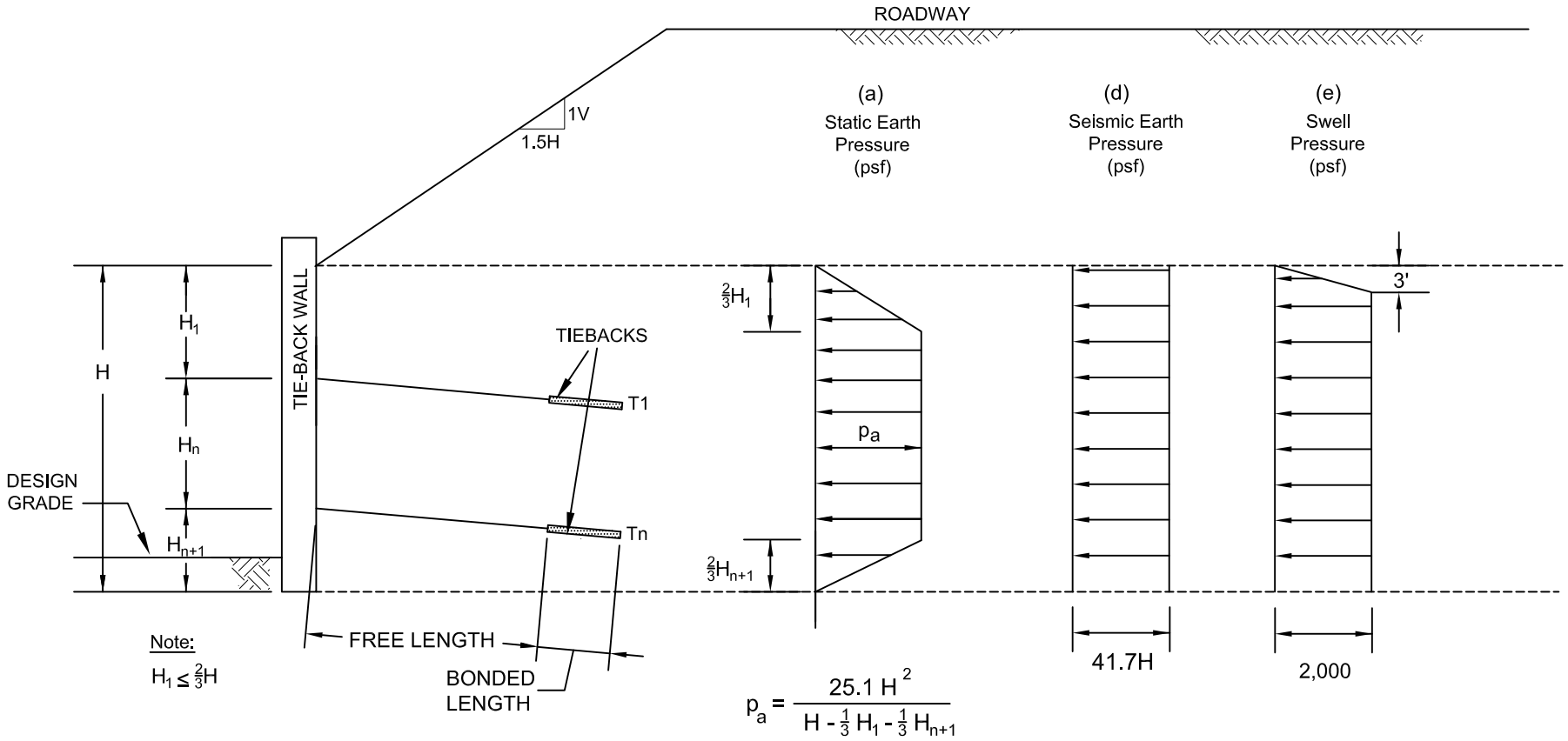
Notes:

(1) The static earth pressure (p_a) equation shown is valid for wall height 'H' ranging from 5 ft to 13 ft.

(2) The swell pressure (2,000 psf) is due to expansion of the earth materials behind the tie-back wall.

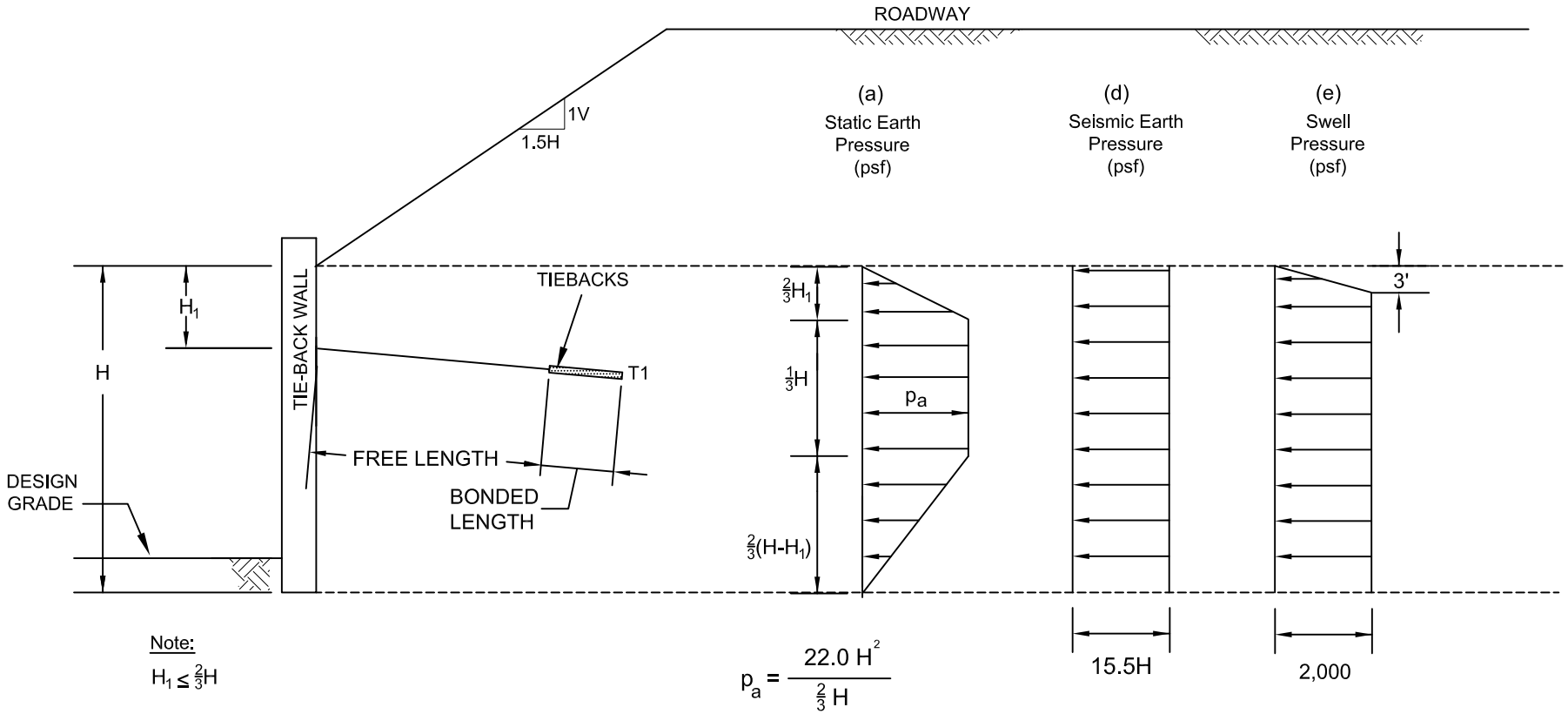
(3) Lateral pressures due to bridge load should be applied to wall at least 20 feet horizontal distance beyond the abutment footprint on both sides of bridge.

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Interstate 5 HOV Widening Project, Segment 2	LATERAL PRESSURES FOR RW NO. 316R MULTIPLE ROWS OF ANCHORS WITH BRIDGE LOADS
	Project No. 11-136 / Date: 09-18-12	FIGURE 9



Notes:
(1) The static and seismic earth pressures (p_a and P_E) are valid for wall height 'H' of 13 ft or less.
(2) The swell pressure (2,000 psf) is due to expansion of the earth materials behind the tie-back wall.

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Interstate 5 HOV Widening Project, Segment 2	LATERAL PRESSURES FOR RW NO. 316R MULTIPLE ROWS OF ANCHORS NO BRIDGE LOADS
	Project No. 11-136 / Date: 09-18-12	FIGURE 10



Notes:
(1) The static and seismic earth pressures (p_a and P_E) are valid for wall height 'H' of 13 ft or less.
(2) The swell pressure (2,000 psf) is due to expansion of the earth materials behind the tie-back wall.

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Interstate 5 HOV Widening Project, Segment 2	LATERAL PRESSURES FOR RW NO. 316R SINGLE ANCHOR ROW NO BRIDGE LOADS
	Project No. 11-136 / Date: 09-18-12	FIGURE 11

The recommended lateral swell pressure is based on results of swell tests which ranged from about 2 ksf to greater than 4 ksf. The swell tests were conducted to determine the overburden necessary to counteract the swell pressure, resulting in zero soil volume change. Based on correlations between the swell test results and Plasticity Index (PI) values of the tested earth materials, and considering increased surface and subsurface drainage improvements, a lateral swell pressure of 2 ksf is adequate for design of the proposed tieback walls.

The recommended passive earth pressure, of soil on the front side of the tieback walls, is a uniform pressure of 3,000 psf. The upper one-foot, measured from the finish ground surface, should be neglected in determining the passive lateral resistance.

5.3.2 Unbonded Length

The un-bonded length ("free length") of the anchor is that portion of the anchor which is not grouted. The un-bonded length should fall outside the Rankine wedge, which is defined by the ground surface, the tieback wall, and an assumed failure plane. This failure plane extends from the bottom of the tieback wall clockwise at an angle of 60° measured from the vertical. The un-bonded length should be extended a minimum distance of H/5 or 5 feet, whichever is greater, behind the critical failure surface. The un-bonded length should not be less than 15 feet.

The assumed general bearing capacity failure surface for spread footings extends to an approximate vertical distance equal to the width of the footing. Therefore, for tieback anchors located within the vertical distance equal to width (B) of existing abutment footings (at the footing centerline), the un-bonded length should extend beyond the imaginary vertical plane coinciding with the centerline of existing abutment footings. Based on the existing footing and proposed wall elevations and the footing widths and anchor locations, the anchors are not expected to be within a vertical depth B below the bottom of the existing footings.

The angle of inclination of the anchors should be at least 10° to facilitate tendon installation and grouting.

5.3.3 Bonded Length

The bonded length of tieback anchors is that portion which is grouted and provides the lateral resistance due to friction between the soil and concrete. Based on the approximate tieback anchor elevations and the subsurface profile of earth materials, the bonded length of the anchors is expected to be embedded in the clayey and silty terrace deposits.

The maximum allowable anchor design load is computed by multiplying the bonded length by the ultimate transfer load and dividing by a factor of safety. Based on information provided in ground anchor manuals by FHWA (1999) and the Post-Tensioning Institute, the recommended ultimate transfer loads are summarized in Table 4. The ultimate transfer loads provided in Table 4 are based on small diameter anchor holes (6-inch to 8-inch diameter).

A factor of safety of 2.0 (FHWA, 1999) can be applied to the ultimate transfer loads to obtain the allowable transfer loads. The contractor is responsible for determining the bonded length of the tieback anchors; however, the bonded length of the anchors should not be less than 15 feet.

Table 4. Recommended Ultimate Transfer Loads for Ground Anchors

Anchor Type	Ultimate Transfer Load (kips/foot)
Gravity Grouted, 6-inch and 8-inch diameter (Straight Shaft)	3 to 4
Pressure Grouted, 6-inch diameter (Straight Shaft)	4 to 5
Pressure Grouted, 8-inch diameter (Straight Shaft)	5 to 6

5.3.4 Spacing of Tieback Anchors

Tieback anchors should not be spaced closer than five diameters of the bonded (grouted) zone or 5 feet, whichever is greater. The tieback anchors should be located to maximize their distance from any existing foundation.

5.3.5 Bearing Capacity and Wall Friction

The allowable bearing capacity for the footing (or leveling pad) at the bottom of the tieback walls is 2 kips per square foot (ksf), which is based on a minimum embedment depth and footing width of 2 feet and 1.5 feet, respectively. A friction coefficient of 0.25 can be used between the vertical concrete wall and the soil behind the wall for the permanent condition. It should be noted that the frictional coefficient is applicable only when the concrete wall is in full contact with the earth behind the wall.

5.4 Slope Stability

Global stability of the tieback wall was evaluated for static and pseudo-static loading conditions using the computer program, SLIDE (Rocscience, 2006). Results of this analysis are presented in Appendix C.

For each tieback wall, the critical cross-section with the tallest wall height was selected for the analysis together with the shear strength parameters presented in Table 2. Tieback loads and configurations were provided by the structural designer. As shown in Appendix C, the calculated factor-of-safety for a deep-seated failure is greater than the minimum required value of 1.5 for the static condition with a 2-foot soil surcharge (to represent traffic loading). Global stability analysis under the pseudo-static condition was performed using a seismic coefficient equal to 0.133g (which is the smaller of either one-third the horizontal PGA or 0.2g) in accordance with guidelines provided in Section 3.12 of the Caltrans Guidelines for Structures Foundation Reports (Caltrans, 2009c). Analysis indicates that the calculated factor-of-safety is greater than the minimum required value of 1.1 for the pseudo-static condition.

5.5 Soil Corrosivity

Four samples of earth materials, collected from the boreholes drilled at the tieback wall locations, were tested for minimum resistivity, pH, soluble sulfate content, and soluble chloride content. The minimum resistivities were found to range from 300 to 900 ohm-cm. The pH was found to range

from 6.2 to 7.6. And, the soluble sulfate content ranged from 220 to 1,840 parts per million (ppm), and soluble chloride ranged from 402 to 1,561 ppm.

According to Caltrans Corrosion Guidelines (2003), soils are considered corrosive if the pH is 5.5 or less, or the sulfate concentration is 2,000 ppm or greater, or the chloride concentration is 500 ppm or greater. Based on the test results and the Caltrans criteria, the on-site earth materials are corrosive. Consequently, mitigation measures considering a corrosive environment should be applied to the tieback walls and ground anchors.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 General Earthwork

Earthwork performed for the project should be conducted in accordance with Caltrans Standard Specifications (2010).

Qualified geotechnical personnel should monitor earthwork operations on a full-time basis. Any compacted fill placed in association with the construction of the tieback walls should be observed, monitored, and tested by qualified geotechnical personnel during construction. Field and laboratory tests should be conducted in accordance with California Test methods and any other applicable testing requirements.

Areas that are disturbed by construction activities should be overexcavated to a depth where undisturbed material is exposed. Finish grades should be reestablished using fill properly compacted to the required minimum relative compaction per Caltrans Standard Specifications (2010).

6.2 Temporary Excavations

Temporary excavations must be properly sloped or shored in accordance with all applicable codes and regulations including OSHA standards.

To maintain stability of the existing abutment foundations, the tieback walls should be constructed in segments (slot cuts) to minimize the length of temporary excavations. Construction of the portion of tieback walls located immediately adjacent to existing bridge foundations (within the footprint of existing bridge structure), EMI recommends that the maximum length of tieback wall, constructed at any given time, not exceed one-quarter of the length of the existing bridge foundation (spread footing).

"Wall Zones" will be defined as segments of a wall that have different subsurface stratigraphy (for example, three different earth materials along a wall alignment would define three different wall zones). Based on the geologic mapping and information collected from the exploratory boreholes, RW No. 315L and RW No. 316R have one wall zone each. Stability tests for temporary excavations during wall construction should be performed in accordance with Section 19-3.01A(3)(b) of the Caltrans Standard Specification (2010).

Qualified geotechnical personnel should inspect temporary slopes for erosion and sloughing, and should inspect temporary shoring for signs of instability and deformations, during construction on a daily basis.

Soil or other construction materials should not be stockpiled adjacent to excavations. Stockpiles should be set back a minimum distance which is equal to the height of the excavation. Shoring should be designed for site specific conditions using input from qualified geotechnical personnel during construction.

The contractor is responsible for worker safety in the field during construction. The contractor should conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California. Also, other state, county, or municipal agency requirements may supercede recommendations presented in this report. If a trench shoring design plan is required, the geotechnical consultant should review the plan to confirm that recommendations presented herein were used for design or provide additional recommendations.

6.3 Tieback Installation

Tieback anchors should be constructed and proof-tested in the field in accordance with Caltrans procedures and specifications. The contractor is responsible for determining the bonded length of tieback anchors. The minimum bonded length is 15 feet. The unbonded length should not be less than 15 feet. In addition, the unbonded length should be extended a minimum distance of H/5 or 5 feet, whichever is greater, behind the critical failure surface. This failure plane extends from the bottom of the tieback wall clockwise at an angle of 60° measured from the vertical.

The anchors should be inclined at least 10° to facilitate tendon installation and grouting. Tieback anchors should not be spaced closer than five diameters of the bonded zone or 5 feet, whichever is greater.

The contractor should exercise care to minimize impact to the existing abutment foundations due to the installation of tieback anchors and construction of the tieback wall. We recommend that a monitoring program be implemented during construction to monitor movement of the abutment. If the measured vertical or lateral movement is excessive, construction should be stopped immediately and measures to mitigate the movement should be implemented.

6.4 Surface and Subsurface Drainage

Since the earth materials throughout the project area are highly expansive, controlling surface water and groundwater is important for minimizing the expansion of the materials. For the tieback walls, surface and subsurface drainage is important to minimize the amount of water entering the earth materials behind the back of the walls. It is anticipated that upon saturation, the earth materials behind the back of the walls can swell and exert pressure against the walls. A minimum 5-foot length of the slope face behind the walls, measured upslope and from the back of wall, should be paved with an impermeable material. The finish slopes behind the tieback walls, beneath the existing bridge structure, should be fully paved (i.e. paved from back of wall to top-of-slope).

Prefabricated geocomposite drains ("drainage board") connected to gravel galleries or slotted pipes or weepholes should be placed behind the proposed tieback walls. The number of drainage board strips and weepholes should be increased to improve the discharge of water from behind the walls. The backdrainage pipes or weepholes should outlet to approved surface drainage collection devices.

6.5 Corrosion Mitigation for Tieback Anchors

Based on low pH and minimum resistivity values, and high chloride and sulfate content determined by tests conducted on samples collected from throughout the project area, EMI describes the corrosion environment as "aggressive." Consequently, corrosion mitigation should be provided for the proposed tieback walls and ground anchors. Requirements for corrosion mitigation provided in Section 46-2.03A of the Caltrans Standard Specifications (2010) should be applied to the proposed ground anchors. All steel components of the tieback anchors and walls should be protected against corrosion. Type V cement should be used in concrete that is in contact with the earth materials.

6.6 Geotechnical Review of Construction Plans

Recommendations contained herein are based on preliminary plans. Final construction plans should be reviewed by EMI to verify that the general intent of the recommendations has been applied to the design. Recommendations contained herein may require modification or additional recommendations may be necessary based on the final design.

6.7 Geotechnical Observation and Testing

Qualified geotechnical personnel should perform inspections and testing during:

- Grading operations – temporary and permanent excavations and compacted fill placement.
- Drilling of holes for and installation of tieback anchors.
- Removal or support of buried utilities or structures.
- Installation of temporary shoring.
- When any unusual conditions are observed.

7.0 LIMITATIONS

This report is intended for use by AECOM, the Orange County Transportation Authority, the California Department of Transportation, and the City of San Clemente, for the proposed tieback walls RW No. 315L and RW No. 316R at the abutments of the existing Camino de Estrella OC. This report is based on the project as described herein and the information obtained from the exploratory boreholes and Cone Penetration Test (CPT) sounding at the approximate locations shown on the enclosed plans. The findings and recommendations contained herein are based on the results of the field investigation, laboratory tests, and the geotechnical engineering analyses. Earth materials and subsurface conditions encountered in the exploratory borings and CPT sounding are presumed to be representative of the project area. However, subsurface conditions and characteristics of subsurface materials between exploratory borings and CPT sounding can vary. Findings reflect an interpretation of the direct evidence obtained. Recommendations presented herein are based on the assumption that

an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. EMI should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Modifications to the project plans or subsurface variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained herein are applicable to the specific design elements and locations that are the subject of this report. Data, opinions, and recommendations contained herein have no applicability to any other design elements or to any other locations, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of EMI.

EMI is not responsible for construction means, methods, techniques, sequences, procedures, or safety programs in connection with the construction, for the acts or omissions of the Contractor, or any other person performing any of the design or construction, or for the failure of any worker to carry out the construction in accordance with Final construction drawings and specifications.

Services performed by EMI have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee are included or intended.

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Appendix A

Log-of-Test-Borings (LOTB) and Log of CPT Sounding

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

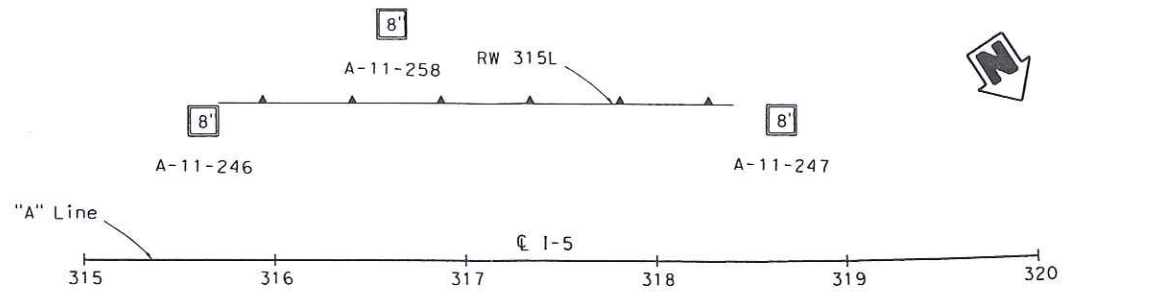
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

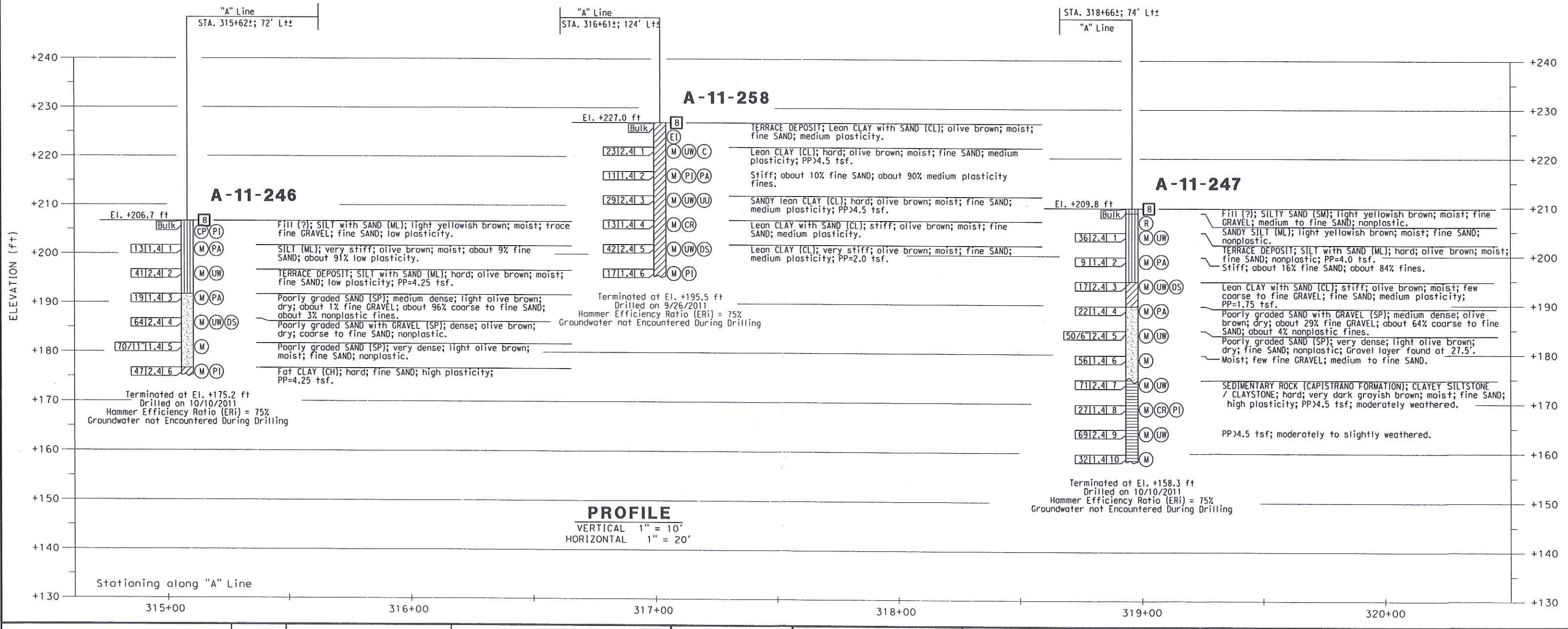
(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. 55-0224	TIEBACK WALLS 315L & 316R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES 5.8	LOG OF TEST BORINGS 1 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: -
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

USERNAME => #USER DATE PLOTTED => #DATE TIME PLOTTED => #TIME

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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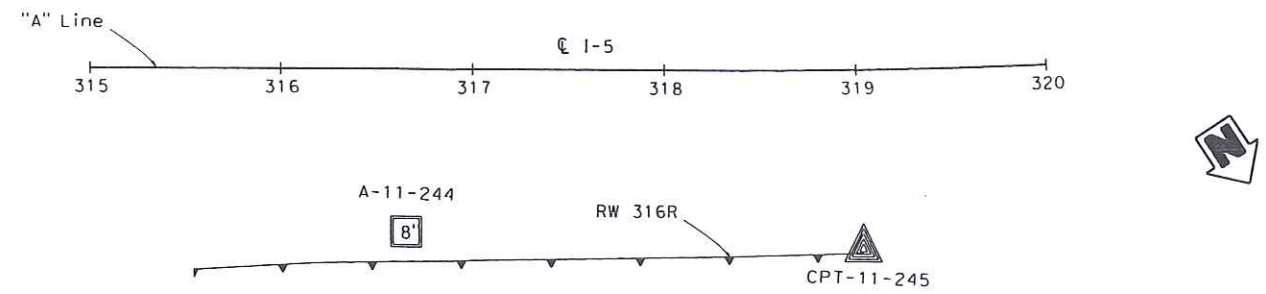

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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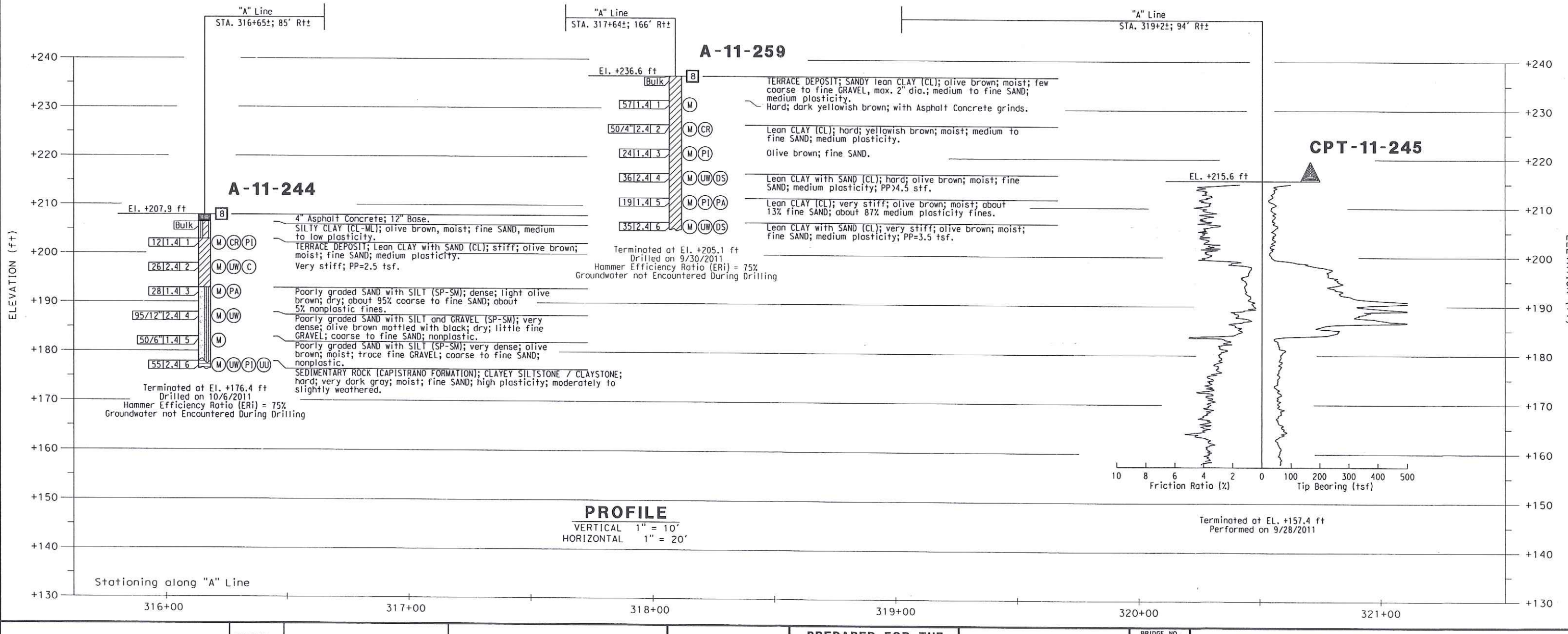
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. 55-0224	TIEBACK WALLS 315L & 316R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES 5.8	LOG OF TEST BORINGS 2 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

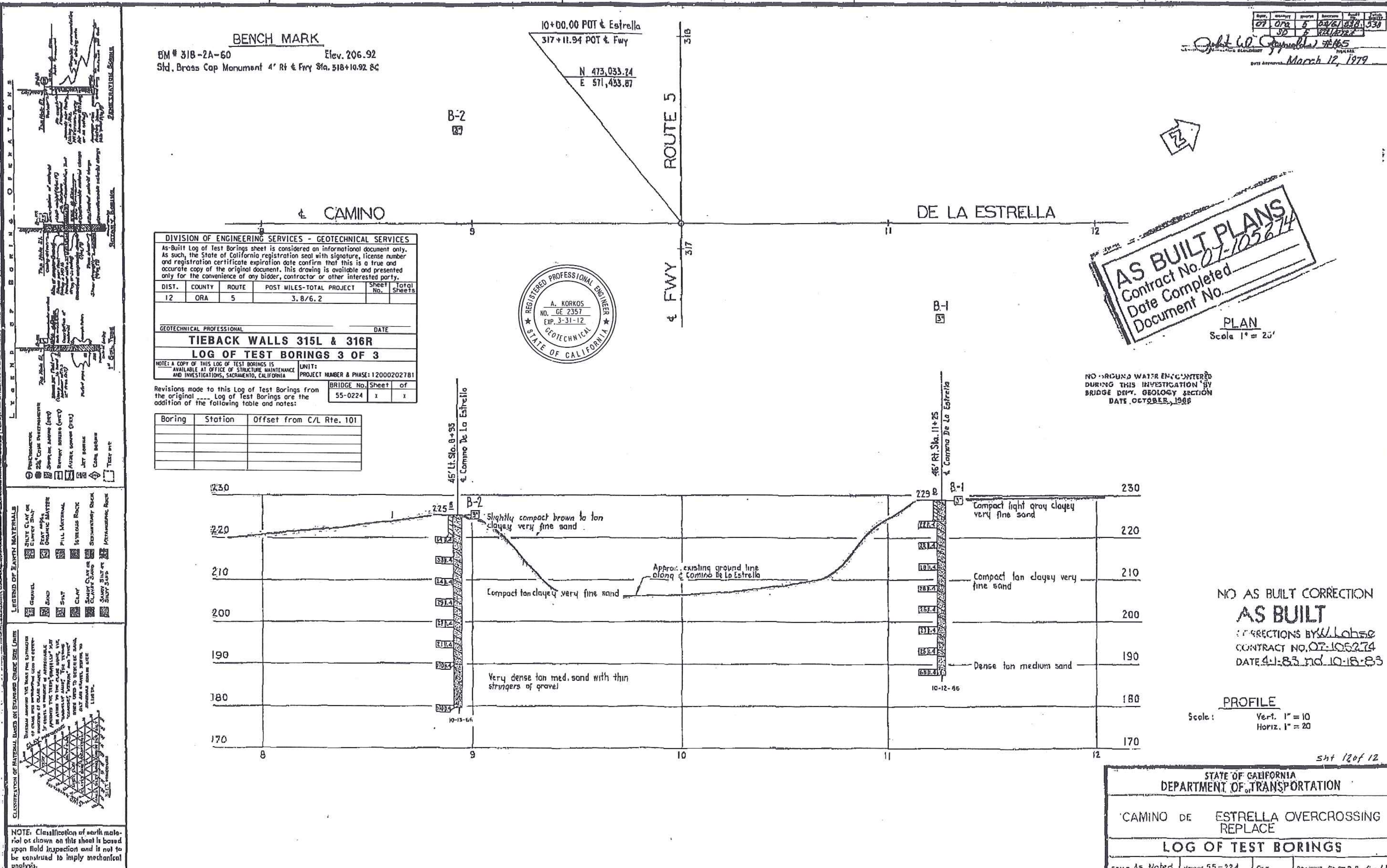
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: -
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME



DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
12	ORA	5	3.8/6.2		

GEOTECHNICAL PROFESSIONAL — DATE

TIEBACK WALLS 315L & 316R
LOG OF TEST BORINGS 3 OF 3

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA — UNIT: — PROJECT NUMBER & PHASE: 12000202781

BRIDGE No.	Sheet	of
55-0224	x	x

Revisions made to this Log of Test Borings from the original ____ Log of Test Borings are the addition of the following table and notes:

Boring	Station	Offset from C/L Rte. 101

Dist.	County	Route	Section	Sheet No.	Total Sheets
07	Ora	5	0.4/6.1	838	538
	SD	5	R71/R72.8		

Robert W. Reynolds #165 — Geologist
Date Approved March 12, 1979

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY: G. MINES 10-17-66
DRAWN: V. V. SESTORAS 11-18-66
CHECKED: G. MINES 11-23-66

sht 12 of 12

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CAMINO DE ESTRELLA OVERCROSSING REPLACE

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 55-224 | FILE | DRAWING 55224-11

Charge 07209
W.A. 105271

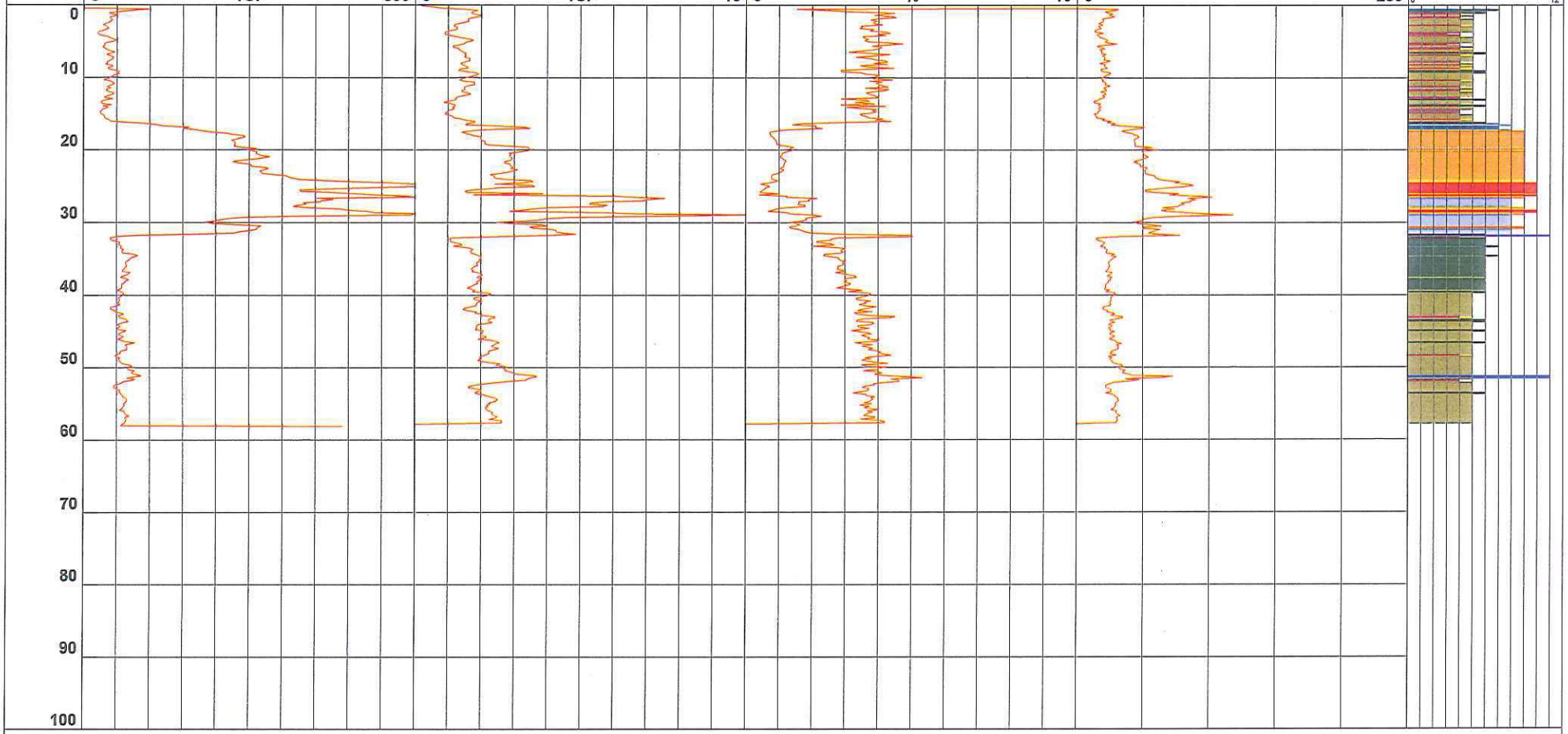
PREL. DRAWING No. PR-

538

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JB	Filename	SDF(535).cpt
Job Number	11-136	Cone Number	DSG1104	GPS	
Hole Number	CPT-11-245	Date and Time	9/28/2011 12:46:01 PM	Maximum Depth	58.23 ft
Water Table Depth		>58.23 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
0.33	1.1	0.6	-	0.6	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.49	1.1	1.3	-	0.8	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.66	98.1	157.3	186.3	1.5	-0.1	1.5	6	clean SAND to silty SAND	125	5.0	20	31	82	48	-	-	10	16	N/A	0.00	N/A	N/A
0.82	73.6	118.1	182.9	1.9	-0.2	2.6	5	silty SAND to sandy SILT	120	4.0	18	30	72	48	-	-	17	16	N/A	0.00	N/A	N/A
0.98	54.0	86.6	171.3	1.7	-0.3	3.2	5	silty SAND to sandy SILT	120	4.0	14	22	62	48	-	-	23	16	N/A	0.00	N/A	N/A
1.15	38.1	61.2	174.8	1.7	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	31	15	N/A	0.00	N/A	N/A
1.31	41.8	67.1	176.2	1.8	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	29	15	N/A	0.00	N/A	N/A
1.48	51.1	81.9	185.0	2.0	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	26	15	N/A	0.00	N/A	N/A
1.64	43.9	70.4	185.5	1.9	-0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	29	15	N/A	0.00	N/A	N/A
1.80	38.9	62.3	177.7	1.8	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	31	15	N/A	0.00	N/A	N/A
1.97	40.5	64.9	167.6	1.6	0.0	4.0	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.9	9.9	29	15	N/A	0.00	N/A	N/A
2.13	42.8	68.6	167.2	1.6	-0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	28	15	N/A	0.00	N/A	N/A
2.30	41.2	66.1	169.0	1.6	0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	29	15	N/A	0.00	N/A	N/A
2.46	38.3	61.5	160.6	1.5	0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	29	15	N/A	0.00	N/A	N/A
2.62	33.9	54.4	152.4	1.3	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	31	15	N/A	0.00	N/A	N/A
2.79	29.1	46.7	147.9	1.2	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	15	23	-	-	2.0	9.9	34	15	N/A	0.00	N/A	N/A
2.95	33.6	53.9	142.9	1.2	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	30	15	N/A	0.00	N/A	N/A
3.12	35.6	57.1	148.0	1.3	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	N/A	0.00	N/A	N/A
3.28	37.4	60.0	149.3	1.3	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	28	15	0.17	-	0.10	0.4
3.45	32.2	51.7	149.0	1.2	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	32	15	0.18	-	0.10	0.3
3.61	28.1	45.0	138.0	1.0	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	14	22	-	-	2.0	9.9	33	15	0.37	-	0.10	1.0
3.77	22.2	35.6	-	0.9	0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	39	15	-	-	0.10	-
3.94	20.5	32.8	-	0.9	0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	41	15	-	-	0.10	-
4.10	22.9	36.6	-	0.9	0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	37	15	-	-	0.10	-
4.27	25.2	40.3	-	1.1	0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	37	15	-	-	0.10	-
4.43	35.4	56.7	147.8	1.2	0.1	3.5	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	29	15	0.27	-	0.10	1.0
4.59	39.7	63.7	157.3	1.4	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.17	-	0.10	0.5
4.76	44.9	72.0	169.8	1.7	0.0	3.7	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.2	9.9	27	15	0.00	-	0.10	0.0
4.92	49.0	78.6	174.1	1.8	-0.1	3.6	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	25	15	0.00	-	0.10	0.0
5.09	44.1	70.7	168.1	1.6	0.0	3.7	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	27	15	0.00	-	0.10	0.0
5.25	35.7	57.2	165.5	1.5	0.1	4.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	32	15	0.00	-	0.10	0.0
5.41	31.2	50.0	166.2	1.5	0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	35	15	0.00	-	0.10	0.0
5.58	31.8	51.0	156.0	1.3	0.0	4.2	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	33	15	0.23	-	0.10	0.7
5.74	30.4	48.8	145.2	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	32	15	0.50	-	0.10	2.3
5.91	28.4	45.5	147.0	1.2	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	35	15	0.45	-	0.10	1.8
6.07	32.5	52.1	154.5	1.3	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	32	15	0.29	-	0.10	1.0
6.23	34.9	55.9	154.8	1.3	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	31	15	0.29	-	0.10	1.2
6.40	39.8	63.9	156.4	1.4	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.28	-	0.10	1.2
6.56	46.9	74.4	156.7	1.5	0.0	3.1	5	silty SAND to sandy SILT	120	4.0	12	19	57	43	-	-	24	16	0.28	-	0.10	1.4
6.73	40.7	63.7	164.1	1.6	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.9	9.9	29	15	0.00	-	0.10	0.0
6.89	34.5	53.3	163.0	1.5	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	33	15	0.00	-	0.10	0.0
7.05	39.6	60.5	162.7	1.6	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.8	9.9	30	15	0.00	-	0.10	0.0
7.22	44.7	67.5	155.7	1.5	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.1	9.9	26	15	0.34	-	0.10	1.7
7.38	44.3	66.1	165.1	1.7	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	22	33	-	-	3.1	9.9	28	15	0.00	-	0.10	0.0
7.55	41.9	62.0	164.3	1.6	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	21	31	-	-	2.9	9.9	30	15	0.00	-	0.10	0.0
7.71	39.5	57.8	165.9	1.7	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	20	29	-	-	2.8	9.9	32	15	0.00	-	0.10	0.0
7.87	35.1	50.8	158.5	1.5	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	34	15	0.31	-	0.10	1.1
8.04	35.8	51.2	149.6	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.5	9.9	32	15	0.57	-	0.10	3.2
8.20	33.0	46.7	152.5	1.4	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	23	-	-	2.3	9.9	35	15	0.48	-	0.09	2.2
8.37	43.1	60.5	151.3	1.5	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	22	30	-	-	3.0	9.9	28	15	0.53	-	0.09	3.3
8.53	43.2	60.0	155.7	1.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	22	30	-	-	3.0	9.9	29	15	0.41	-	0.09	2.2
8.69	36.2	49.9	161.0	1.6	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	35	15	0.00	-	0.09	0.0
8.86	38.1	52.0	144.2	1.4	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	31	15	0.88	-	0.09	27.6
9.02	46.1	62.2	138.1	1.3	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	12	16	51	42	-	-	25	16	1.21	-	0.09	14.0
9.19	53.6	71.7	148.6	1.5	-0.4	2.9	5	silty SAND to sandy SILT	120	4.0	13	18	56	43	-	-	24	16	0.69	-	0.09	4.5
9.35	52.5	69.7	161.6	1.8	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.7	9.9	26	15	0.00	-	0.09	0.0
9.51	53.2	69.9	166.2	1.9	-0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	27	35	-	-	3.7	9.9	27	15	0.00	-	0.09	0.0
9.68	45.6	59.4	164.4	1.8	-0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	23	30	-	-	3.2	9.9	31	15	0.00	-	0.09	0.0
9.84	43.8	56.7	157.5	1.7	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	22	28	-	-	3.1	9.9	31	15	0.42	-	0.09	2.2
10.01	40.1	51.4	152.7	1.6	-0.2	4.0	4	clayy SILT to silty CLAY	115	2.0	20	26	-	-	2.8	9.9	32	15	0.57	-	0.09	3.4
10.17	37.0	47.0	144.2	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.6	9.9	33	15	0.97	-	0.09	42.5
10.34	30.6	43.3	-	1.3	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	15	22	-	-	2.1	9.9	37	15	-	-	0.08	-
10.50	39.1	48.9	144.6	1.5	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.7	9.9	32	15	0.96	-	0.08	37.0
10.66	43.4	53.9	159.6	1.8	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	22	27	-	-	3.0	9.9	32	15	0.39	-	0.08	1.9
10.83	45.8	56.5	158.0	1.8	-0.4	4.0	4	clayy SILT to silty CLAY	115	2.0	23	28	-	-	3.2	9.9	31	15	0.44	-	0.08	2.4
10.99	44.8	54.8	158.6	1.8	-0.4	4.1	4	clayy SILT to silty CLAY	115	2.0	22	27	-	-	3.1	9.9	32	15	0.43	-	0.08	2.3
11.16	38.9	47.3	150.8	1.6	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	34	15	0.71	-	0.08	40.9
11.32	35.1	46.7	153.7	1.5	-0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	0.59	-	0.08	3.5
11.48	41.4	49.5	142.4	1.5	-0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	2.9	9.9	32	15	1.12	-	0.08	37.0
11.65	35.2	45.8	-	1.5	-0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	-	-	0.08	-
11.81	33.9	43.7	-	1.4	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	17	22	-	-	2.4	9.9	36	15	-	-	0.07	-
11.98	37.3	43.7	139.8	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	34	15	1.27	-	0.07	51.2
12.14	44.3	51.5	145.6	1.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	22	26	-	-	3.1	9.9	31	15	0.99	-	0.07	30.6
12.30	45.3	52.4	148.7	1.7	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	23	26	-	-	3.2	9.9	31	15	0.85	-	0.07	26.7
12.47	38.8	44.5	142.0	1.5	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	34	15	1.18	-	0.07	50.3
12.63	33.2	40.9	-	1.3	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.07	-
12.80	31.0	42.2	-	1.2	-0.2	4.1	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.2	9.9	36	15	-	-	0.06	-
12.96	43.4	48.9	125.4	1.2	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	22	24	-	-	3.0	9.9	29	15	1.92	-	0.06	45.5
13.12	32.8	39.2	-	1.2	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.3	9.9	35	15	-	-	0.06	-
13.29	27.3	35.8	-	1.0	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	37	15	-	-	0.06	-
13.45	26.6	34.4	-	0.9	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	13	17	-	-	1.8	9.9	36	15	-	-	0.06	-
13.62	28.1	36.0	-	1.1	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	2.0	9.9	38	15	-	-	0.06	-
13.78	41.8	45.7	122.0	1.2	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	2.9	9.9	30	15	1.99	-	0.06	49.3
13.94	28.9	36.1	-	1.2	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	2.0	9.9	39	15	-	-	0.05	-
14.11	37.1	40.0	119.4	1.1	-0.1	3.1	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.6	9.9	33	15	2.02	-	0.05	51.2
14.27	33.6	38.0	-	1.2	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	35	15	-	-	0.05	-
14.44	28.8	34.7	-	1.1	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	2.0	9.9	39	15	-	-	0.05	-
14.60	26.6	31.7	-	1.0	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	13	16	-	-	1.8	9.9	40	15	-	-	0.05	-
14.76	24.8	29.2	-	1.0	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	12	15	-	-	1.7	9.9	42	15	-	-	0.05	-
14.93	24.7	28.8	-	0.9	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	12	14	-	-	1.7	9.9	41	15	-	-	0.05	-
15.09	26.4	30.5	-	0.9	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	13	15	-	-	1.8	9.9	39	15	-	-	0.05	-
15.26	30.1	34.3	-	1.0	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	15	17	-	-	2.1	9.9	37	15	-	-	0.05	-
15.42	31.5	35.5	-	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	18	-	-	2.2	9.9	37	15	-	-	0.05	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic -	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
15.58	31.9	35.6	-	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	18	-	-	2.2	9.9	37	15	-	-	0.05	-
15.75	33.5	37.0	-	1.4	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	38	15	-	-	0.05	-
15.91	38.6	40.4	-	1.5	0.0	4.0	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	36	15	-	-	0.05	-
16.08	41.0	44.4	-	1.8	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	21	22	-	-	2.9	9.9	36	15	-	-	0.05	-
16.24	59.9	60.2	141.4	1.8	0.0	3.1	4	clayy SILT to silty CLAY	115	2.0	30	30	-	-	4.2	9.9	27	15	1.31	-	0.05	22.3
16.40	91.8	91.9	134.3	1.6	-0.1	1.8	5	silty SAND to sandy SILT	120	4.0	23	23	64	43	-	-	16	16	1.65	-	0.04	15.2
16.57	109.1	108.6	139.4	1.5	-0.1	1.4	6	clean SAND to silty SAND	125	5.0	22	22	70	44	-	-	13	16	1.42	-	0.04	7.7
16.73	119.8	118.6	169.8	2.5	-0.3	2.1	5	silty SAND to sandy SILT	120	4.0	30	30	73	45	-	-	15	16	0.00	-	0.04	0.0
16.90	159.4	157.0	204.6	3.3	0.0	2.1	5	silty SAND to sandy SILT	120	4.0	40	39	82	46	-	-	13	16	0.00	-	0.04	0.0
17.06	150.7	147.7	203.2	3.5	0.2	2.3	5	silty SAND to sandy SILT	120	4.0	38	37	80	46	-	-	14	16	0.00	-	0.04	0.0
17.23	165.8	161.7	183.4	2.1	0.1	1.3	6	clean SAND to silty SAND	125	5.0	33	32	83	46	-	-	9	16	0.00	-	0.04	0.0
17.39	178.9	173.6	182.2	1.7	0.1	0.9	6	clean SAND to silty SAND	125	5.0	36	35	85	46	-	-	6	16	0.00	-	0.04	0.0
17.55	193.2	186.4	186.4	1.4	0.1	0.7	6	clean SAND to silty SAND	125	5.0	39	37	88	47	-	-	5	16	0.00	-	0.04	0.0
17.72	217.8	209.2	209.2	1.6	0.1	0.7	6	clean SAND to silty SAND	125	5.0	44	42	91	47	-	-	5	16	0.00	-	0.04	0.0
17.88	223.2	213.3	213.3	1.7	0.2	0.8	6	clean SAND to silty SAND	125	5.0	45	43	92	47	-	-	5	16	0.00	-	0.04	0.0
18.05	241.8	229.9	229.9	1.8	0.2	0.7	6	clean SAND to silty SAND	125	5.0	48	46	94	47	-	-	5	16	0.00	-	0.04	0.0
18.21	244.0	230.9	230.9	2.0	0.3	0.8	6	clean SAND to silty SAND	125	5.0	49	46	95	47	-	-	5	16	0.00	-	0.04	0.0
18.37	238.1	224.2	224.2	2.0	0.3	0.8	6	clean SAND to silty SAND	125	5.0	48	45	94	47	-	-	5	16	0.00	-	0.04	0.0
18.54	231.5	216.9	216.9	2.0	0.3	0.9	6	clean SAND to silty SAND	125	5.0	46	43	93	47	-	-	5	16	0.00	-	0.04	0.0
18.70	223.7	208.7	209.5	2.0	0.2	0.9	6	clean SAND to silty SAND	125	5.0	45	42	91	47	-	-	5	16	0.00	-	0.04	0.0
18.87	227.7	211.4	212.5	2.1	0.3	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.03	229.3	211.8	212.8	2.1	0.4	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.19	228.9	210.5	211.6	2.1	0.4	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.36	228.7	209.4	214.3	2.3	0.4	1.0	6	clean SAND to silty SAND	125	5.0	46	42	91	47	-	-	6	16	0.00	-	0.04	0.0
19.52	227.1	207.0	222.6	2.9	0.4	1.3	6	clean SAND to silty SAND	125	5.0	45	41	91	47	-	-	7	16	0.00	-	0.04	0.0
19.69	238.3	216.2	237.4	3.4	0.7	1.4	6	clean SAND to silty SAND	125	5.0	48	43	92	47	-	-	8	16	0.00	-	0.04	0.0
19.85	261.6	236.3	250.7	3.5	0.3	1.3	6	clean SAND to silty SAND	125	5.0	52	47	95	47	-	-	7	16	0.00	-	0.04	0.0
20.01	249.1	224.1	243.4	3.5	0.1	1.4	6	clean SAND to silty SAND	125	5.0	50	45	94	47	-	-	8	16	0.00	-	0.04	0.0
20.18	256.1	229.3	243.5	3.3	0.0	1.3	6	clean SAND to silty SAND	125	5.0	51	46	94	47	-	-	7	16	0.00	-	0.04	0.0
20.34	262.3	233.9	243.2	3.1	0.0	1.2	6	clean SAND to silty SAND	125	5.0	52	47	95	47	-	-	6	16	0.00	-	0.04	0.0
20.51	260.2	231.0	236.6	2.9	0.0	1.1	6	clean SAND to silty SAND	125	5.0	52	46	95	47	-	-	6	16	0.00	-	0.04	0.0
20.67	264.0	233.4	238.8	2.9	0.1	1.1	6	clean SAND to silty SAND	125	5.0	53	47	95	47	-	-	6	16	0.00	-	0.04	0.0
20.83	270.0	237.6	240.2	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	54	48	95	47	-	-	5	16	0.00	-	0.04	0.0
21.00	280.2	245.6	245.3	2.9	-0.2	1.0	6	clean SAND to silty SAND	125	5.0	56	49	95	47	-	-	5	16	0.00	-	0.04	0.0
21.16	270.1	235.8	240.2	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	54	47	95	47	-	-	6	16	0.00	-	0.04	0.0
21.33	258.7	224.9	233.1	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	52	45	94	47	-	-	6	16	0.00	-	0.04	0.0
21.49	239.7	207.5	221.2	2.9	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	48	42	91	47	-	-	7	16	0.00	-	0.04	0.0
21.65	225.4	194.4	209.8	2.7	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	45	39	89	46	-	-	7	16	0.00	-	0.04	0.0
21.82	234.4	201.3	214.0	2.7	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	47	40	90	46	-	-	7	16	0.00	-	0.04	0.0
21.98	248.7	212.7	223.9	2.9	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	50	43	92	47	-	-	7	16	0.00	-	0.04	0.0
22.15	253.2	215.7	225.8	2.9	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	51	43	92	47	-	-	6	16	0.00	-	0.04	0.0
22.31	252.8	214.6	225.0	2.9	-0.3	1.2	6	clean SAND to silty SAND	125	5.0	51	43	92	47	-	-	6	16	0.00	-	0.04	0.0
22.47	274.9	232.4	237.0	3.0	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	55	46	95	47	-	-	6	16	0.00	-	0.04	0.0
22.64	279.0	234.9	236.8	2.9	-0.3	1.0	6	clean SAND to silty SAND	125	5.0	56	47	95	47	-	-	5	16	0.00	-	0.04	0.0
22.80	272.9	228.9	236.7	3.1	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	55	46	94	47	-	-	6	16	0.00	-	0.04	0.0
22.97	265.8	222.1	229.6	2.9	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	53	44	93	47	-	-	6	16	0.00	-	0.04	0.0
23.13	269.1	224.0	228.0	2.8	-0.4	1.0	6	clean SAND to silty SAND	125	5.0	54	45	94	47	-	-	6	16	0.00	-	0.04	0.0
23.30	270.6	224.5	224.5	2.5	-0.4	0.9	6	clean SAND to silty SAND	125	5.0	54	45	94	47	-	-	5	16	0.00	-	0.04	0.0
23.46	285.7	236.1	236.1	2.3	-0.4	0.8	6	clean SAND to silty SAND	125	5.0	57	47	95	47	-	-	5	16	0.00	-	0.04	0.0
23.62	306.0	251.9	251.9	2.4	-0.5	0.8	6	clean SAND to silty SAND	125	5.0	61	50	95	47	-	-	5	16	0.00	-	0.04	0.0
23.79	310.2	254.4	254.4	2.4	-0.7	0.8	6	clean SAND to silty SAND	125	5.0	62	51	95	47	-	-	5	16	0.00	-	0.04	0.0
23.95	316.5	258.6	258.6	2.4	-0.7	0.8	6	clean SAND to silty SAND	125	5.0	63	52	95	47	-	-	5	16	0.00	-	0.04	0.0
24.12	328.6	267.6	267.6	2.8	-0.7	0.9	6	clean SAND to silty SAND	125	5.0	66	54	95	47	-	-	5	16	0.00	-	0.04	0.0
24.28	362.6	294.2	294.2	3.5	-0.8	1.0	6	clean SAND to silty SAND	125	5.0	73	59	95	48	-	-	5	16	0.00	-	0.04	0.0
24.44	406.0	328.3	328.3	3.6	-0.8	0.9	6	clean SAND to silty SAND	125	5.0	81	66	95	48	-	-	5	16	0.00	-	0.04	0.0
24.61	463.9	373.8	373.8	3.2	-0.9	0.7	6	clean SAND to silty SAND	125	5.0	93	75	95	48	-	-	5	16	0.00	-	0.04	0.0
24.77	528.6	424.4	424.4	2.4	-0.9	0.5	7	grvly SAND to dense SAND	130	6.0	88	71	95	48	-	-	5	16	0.00	-	0.04	0.0
24.94	550.5	440.3	440.3	3.5	-0.9	0.6	7	grvly SAND to dense SAND	130	6.0	92	73	95	48	-	-	5	16	0.00	-	0.04	0.0
25.10	505.4	402.8	402.8	3.6	-0.4	0.7	6	clean SAND to silty SAND	125	5.0	100	81	95	48	-	-	5	16	0.00	-	0.04	0.0
25.26	432.6	343.6	343.6	2.6	-0.6	0.6	6	clean SAND to silty SAND	125	5.0	87	69	95	48	-	-	5	16	0.00	-	0.04	0.0
25.43	364.3	288.4	288.4	2.1	-0.2	0.6	6	clean SAND to silty SAND	125	5.0	73	58	95	48	-	-	5	16	0.00	-	0.04	0.0
25.59	326.5	257.6	257.6	1.7	-0.3	0.5	6	clean SAND to silty SAND	125	5.0	65	52	95	47	-	-	5	16	0.00	-	0.04	0.0
25.76	328.3	258.1	258.1	1.5	-0.3	0.5	6	clean SAND to silty SAND	125	5.0	66	52	95	47	-	-	5	16	0.00	-	0.04	0.0
25.92	369.8	289.8	289.8	1.6	-0.3	0.4	7	grvly SAND to dense SAND	130	6.0	62	48	95	48	-	-	5	16	0.00	-	0.04	0.0
26.08	403.2	314.8	314.8	3.9	-0.3	1.0	6	clean SAND to silty SAND	125	5.0	81	63	95	48	-	-	5	16	0.00	-	0.04	0.0
26.25	438.6	341.4	341.4	1.8	-0.6	0.4	7	grvly SAND to dense SAND	130	6.0	73	57	95	48	-	-	5	16	0.00	-	0.04	0.0
26.41	487.1	377.8	377.8	6.0	-0.8	1.2	6	clean SAND to silty SAND	125	5.0	97	76	95	48	-	-	5	16	0.00	-	0.04	0.0
26.58	533.3	412.4	412.4	6.5	-1.1	1.2	6	clean SAND to silty SAND	125	5.0	100	82	95	48	-	-	5	16	0.00	-	0.04	0.0
26.74	352.1	271.3	314.9	7.5	-1.0	2.2	6	clean SAND to silty SAND	125	5.0	70	54	95	47	-	-	10	16	0.00	-	0.04	0.0
26.90	376.7	289.4	321.0	7.0	-1.0	1.9	6	clean SAND to silty SAND	125	5.0	75	58	95	48	-	-	8	16	0.00	-	0.04	0.0
27.07	359.0	274.9	309.3	6.9	-0.9	1.9	6	clean SAND to silty SAND	125	5.0	72	55	95	47	-	-	9	16	0.00	-	0.04	0.0
27.23	358.0	273.3	295.4	5.8	-0.9	1.6	6	clean SAND to silty SAND	125	5.0	72	55	95	47	-	-	7	16	0.00	-	0.04	0.0
27.40	331.7	252.4	276.4	5.3	-1.2	1.6	6	clean SAND to silty SAND	125	5.0	66	50	95	47	-	-	8	16	0.00	-	0.04	0.0
27.56	336.4	255.2	277.7	5.3	-1.3	1.6	6	clean SAND to silty SAND	125	5.0	67	51	95	47	-	-	8	16	0.00	-	0.04	0.0
27.72	324.6	245.4	277.1	5.8	-1.2	1.8	6	clean SAND to silty SAND	125	5.0	65	49	95	47	-	-	9	16	0.00	-	0.04	0.0
27.89	316.9	238.9	271.1	5.7	-1.2	1.8	6	clean SAND to silty SAND	125	5.0	63	48	95	47	-	-	9	16	0.00	-	0.04	0.0
28.05	339.2	254.9	260.5	4.0	-1.2	1.2	6	clean SAND to silty SAND	125	5.0	68	51	95	47	-	-	6	16	0.00	-	0.04	0.0
28.22	388.3	290.9	290.9	3.5	-1.2	0.9	6	clean SAND to silty SAND	125	5.0	78	58	95	48	-	-	5	16	0.00	-	0.04	0.0
28.38	399.1	298.1	298.1	3.2	-1.3	0.8	6	clean SAND to silty SAND	125	5.0	80	60	95	48	-	-	5	16	0.00	-	0.04	0.0
28.54	426.3	317.5	317.5	2.9	-1.4	0.7	6	clean SAND to silty SAND	125	5.0	85	63	95	48	-	-	5	16	0.00	-	0.04	0.0
28.71	440.0	326.7	325.7	5.7	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	88	65	95	48	-	-	5	16	0.00	-	0.04	0.0
28.87	501.8	371.5	371.5	6.5	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	100	74	95	48	-	-	5	16	0.00	-	0.04	0.0
29.04	494.6	365.0	398.0	10.0	-1.4	2.0	6	clean SAND to silty SAND	125	5.0	99	73	95	48	-	-	8	16	0.00	-	0.04	0.0
29.20	326.6	240.4	290.8	7.5	-1.3	2.3	6	clean SAND to silty SAND	125	5.0	65	48	95	47	-	-	11	16	0.00	-	0.04	0.0
29.36	241.4	177.1	218.1	4.6	-0.5	1.9	6	clean SAND to silty SAND	125	5.0	48	35	86	45	-	-	11	16	0.00	-	0.04	0.0
29.53	218.9	160.2	198.6	4.0	-1.3	1.8	6	clean SAND to silty SAND	125	5.0	44	32	83	45	-	-	12	16	0.00	-	0.04	0.0
29.69	208.1	151.8	192.0	3.8	-1.4	1.9	6	clean SAND to silty SAND	125	5.0	42	30	81	44	-	-	12	16	0.00	-	0.04	0.0
29.86	200.0	145.5	181.2	3.4	-1.6	1.7	6	clean SAND to silty SAND	125	5.0	40	29	79	44	-	-	12	16	0.00	-	0.04	0.0
30.02	185.6	134.6	161.7	2.5	-1.8	1.4	6	clean SAND to silty SAND	125	5.0	37	27	77	44	-	-	11	16	0.00	-	0.04	0.0
30.19	195.7	141.6	172.4	3.0	-1.9	1.5	6	clean SAND to silty SAND	125	5.0	39	28	78	44	-	-	11	16	0.00	-	0.04	0.0
30.35	234.0	168.8	201.1	3.8	-2.9	1.7	6	clean SAND to silty SAND	125	5.0	47	34	84	45	-	-	10	16	0.00	-	0.04	0.0
30.51	268.0	192.7	218.3	4.0	-3.1	1.5	6	clean SAND to silty SAND	125	5.0	54	39	89	46	-	-	9	16	0.00	-	0.04	0.0
30.68	263.9	189.3	209.2	3.5	-3.1	1.3	6	clean SAND to silty SAND	125	5.0	53	38	88	45	-	-	8	16	0.00	-	0.04	0.0
30.84	262.2	187.5	209.5	3.6	-3.1	1.4	6	clean SAND to silty SAND	125	5.0	52	38	88	45	-	-	8	16	0.00	-	0.04	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn ½
31.01	261.2	186.3	215.4	4.1	-3.0	1.6	6	clean SAND to silty SAND	125	5.0	52	37	88	45	-	-	10	16	0.00	-	0.04	0.0
31.17	250.8	178.4	212.1	4.3	-3.0	1.7	6	clean SAND to silty SAND	125	5.0	50	36	86	45	-	-	10	16	0.00	-	0.04	0.0
31.33	236.4	167.7	205.6	4.3	-3.0	1.8	6	clean SAND to silty SAND	125	5.0	47	34	84	45	-	-	11	16	0.00	-	0.04	0.0
31.50	227.6	161.0	204.6	4.5	-3.0	2.0	6	clean SAND to silty SAND	125	5.0	46	32	83	45	-	-	12	16	0.00	-	0.04	0.0
31.66	161.5	113.9	194.8	4.9	-2.8	3.0	5	silty SAND to sandy SILT	120	4.0	40	28	71	43	-	-	20	16	0.00	-	0.04	0.0
31.83	81.0	42.5	-	4.0	-2.6	5.1	3	silty CLAY to CLAY	115	1.5	54	28	-	-	5.6	9.9	39	15	-	-	0.04	-
31.99	49.9	26.1	-	2.5	-2.6	5.2	3	silty CLAY to CLAY	115	1.5	33	17	-	-	3.5	9.9	48	15	-	-	0.04	-
32.15	41.3	21.5	-	1.1	-2.5	2.9	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	2.8	9.9	43	15	-	-	0.04	-
32.32	40.4	20.9	-	1.0	-2.3	2.7	4	clayy SILT to silty CLAY	115	2.0	20	10	-	-	2.8	9.9	42	15	-	-	0.04	-
32.48	42.3	21.7	-	1.1	-2.2	2.7	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	2.9	9.9	41	15	-	-	0.04	-
32.65	50.4	25.8	-	1.1	-2.0	2.2	4	clayy SILT to silty CLAY	115	2.0	25	13	-	-	3.5	9.9	36	15	-	-	0.04	-
32.81	55.0	38.2	99.3	1.2	-1.9	2.2	5	silty SAND to sandy SILT	120	4.0	14	10	35	37	-	-	29	16	2.35	-	0.04	51.2
32.97	54.0	27.4	-	1.4	-1.9	2.7	4	clayy SILT to silty CLAY	115	2.0	27	14	-	-	3.7	9.9	37	15	-	-	0.03	-
33.14	53.4	27.0	-	1.4	-1.9	2.8	4	clayy SILT to silty CLAY	115	2.0	27	13	-	-	3.7	9.9	38	15	-	-	0.03	-
33.30	57.3	39.5	98.1	1.2	-1.9	2.1	5	silty SAND to sandy SILT	120	4.0	14	10	36	37	-	-	28	16	2.37	-	0.03	51.2
33.47	57.2	28.6	-	1.5	-1.8	2.8	4	clayy SILT to silty CLAY	115	2.0	29	14	-	-	4.0	9.9	36	15	-	-	0.03	-
33.63	55.7	27.7	-	1.7	-1.9	3.1	4	clayy SILT to silty CLAY	115	2.0	28	14	-	-	3.9	9.9	39	15	-	-	0.03	-
33.79	60.8	30.1	-	1.8	-1.9	3.0	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.2	9.9	37	15	-	-	0.03	-
33.96	59.0	29.1	-	1.7	-1.9	3.0	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.1	9.9	37	15	-	-	0.03	-
34.12	58.1	28.5	-	1.7	-1.8	3.1	4	clayy SILT to silty CLAY	115	2.0	29	14	-	-	4.0	9.9	38	15	-	-	0.03	-
34.29	60.4	29.5	-	1.7	-1.7	3.0	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.2	9.9	37	15	-	-	0.03	-
34.45	76.9	52.1	118.1	1.8	-1.7	2.5	5	silty SAND to sandy SILT	120	4.0	19	13	45	39	-	-	26	16	2.04	-	0.03	41.9
34.61	81.9	55.3	120.2	1.9	-1.6	2.4	5	silty SAND to sandy SILT	120	4.0	20	14	47	39	-	-	25	16	2.01	-	0.03	38.5
34.78	77.9	52.5	123.2	2.0	-1.6	2.6	5	silty SAND to sandy SILT	120	4.0	19	13	46	39	-	-	27	16	1.97	-	0.02	41.4
34.94	72.0	48.4	124.8	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	36	24	-	-	5.0	9.9	29	15	1.95	-	0.02	45.9
35.11	70.2	47.1	123.6	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	35	24	-	-	4.9	9.9	29	15	1.96	-	0.02	47.6
35.27	68.6	45.9	123.4	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.8	9.9	30	15	1.97	-	0.01	49.0
35.43	64.9	30.7	-	2.0	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.5	9.9	37	15	-	-	0.01	-
35.60	63.9	30.1	-	1.9	-1.6	3.0	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.4	9.9	37	15	-	-	0.01	-
35.76	64.0	30.0	-	1.9	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.4	9.9	37	15	-	-	0.01	-
35.93	65.5	30.6	-	1.9	-1.6	3.0	4	clayy SILT to silty CLAY	115	2.0	33	15	-	-	4.5	9.9	37	15	-	-	0.01	-
36.09	65.4	30.4	-	1.8	-1.5	2.9	4	clayy SILT to silty CLAY	115	2.0	33	15	-	-	4.5	9.9	36	15	-	-	0.01	-
36.26	62.7	29.0	-	1.8	-1.5	2.9	4	clayy SILT to silty CLAY	115	2.0	31	15	-	-	4.4	9.9	37	15	-	-	0.01	-
36.42	62.0	28.6	-	1.7	-1.4	2.9	4	clayy SILT to silty CLAY	115	2.0	31	14	-	-	4.3	9.9	37	15	-	-	0.01	-
36.58	59.6	27.3	-	1.8	-1.4	3.1	4	clayy SILT to silty CLAY	115	2.0	30	14	-	-	4.1	9.9	39	15	-	-	0.01	-
36.75	58.6	26.8	-	1.7	-1.5	3.1	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.1	9.9	39	15	-	-	0.01	-
36.91	70.3	46.1	120.3	1.9	-1.4	2.8	4	clayy SILT to silty CLAY	115	2.0	35	23	-	-	4.9	9.9	29	15	2.01	-	0.01	48.8
37.08	68.0	30.8	-	2.0	-1.4	3.1	4	clayy SILT to silty CLAY	115	2.0	34	15	-	-	4.7	9.9	37	15	-	-	0.01	-
37.24	64.7	29.2	-	2.0	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.5	9.9	39	15	-	-	0.01	-
37.40	60.2	27.0	-	2.0	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	41	15	-	-	0.01	-
37.57	56.3	25.1	-	1.9	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	28	13	-	-	3.9	9.9	42	15	-	-	0.01	-
37.73	64.8	28.9	-	2.0	-1.2	3.1	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.5	9.9	38	15	-	-	0.01	-
37.90	68.3	30.2	-	2.0	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	34	15	-	-	4.7	9.9	37	15	-	-	0.01	-
38.06	63.1	27.8	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.4	9.9	39	15	-	-	0.01	-
38.22	63.1	27.7	-	1.9	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.4	9.9	39	15	-	-	0.01	-
38.39	60.4	26.4	-	1.9	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	40	15	-	-	0.01	-
38.55	57.3	24.9	-	1.8	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.0	9.9	41	15	-	-	0.01	-
38.72	58.2	25.3	-	1.8	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.0	9.9	41	15	-	-	0.01	-
38.88	57.4	24.8	-	1.7	-1.2	3.0	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.0	9.9	40	15	-	-	0.01	-
39.04	58.2	25.0	-	1.6	-1.1	2.9	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.0	9.9	39	15	-	-	0.01	-
39.21	55.0	23.6	-	1.7	-1.1	3.3	4	clayy SILT to silty CLAY	115	2.0	27	12	-	-	3.8	9.9	42	15	-	-	0.01	-
39.37	51.8	22.1	-	1.8	-1.2	3.7	3	silty CLAY to CLAY	115	1.5	35	15	-	-	3.6	9.9	46	15	-	-	0.01	-
39.54	56.1	23.9	-	1.7	-1.1	3.2	4	clayy SILT to silty CLAY	115	2.0	28	12	-	-	3.9	9.9	42	15	-	-	0.01	-
39.70	59.9	25.4	-	2.2	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.1	9.9	43	15	-	-	0.01	-
39.86	60.9	25.7	-	2.3	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	44	15	-	-	0.01	-
40.03	59.4	24.9	-	2.2	-0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	30	12	-	-	4.1	9.9	44	15	-	-	0.01	-
40.19	56.3	23.6	-	2.0	-0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	28	12	-	-	3.9	9.9	45	15	-	-	0.01	-
40.36	53.6	22.3	-	1.8	-0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	45	15	-	-	0.01	-
40.52	53.4	22.2	-	1.8	-0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	45	15	-	-	0.01	-
40.68	55.0	22.7	-	1.9	-0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	44	15	-	-	0.01	-
40.85	53.9	22.2	-	2.0	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	36	15	-	-	3.7	9.9	47	15	-	-	0.01	-
41.01	53.2	21.8	-	1.9	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	35	15	-	-	3.7	9.9	46	15	-	-	0.01	-
41.18	51.5	21.0	-	1.9	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	47	15	-	-	0.01	-
41.34	54.7	22.3	-	1.9	-0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	45	15	-	-	0.01	-
41.50	51.5	20.9	-	1.8	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	47	15	-	-	0.01	-
41.67	43.0	17.4	-	1.7	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	29	12	-	-	2.9	9.9	53	15	-	-	0.01	-
41.83	40.9	16.5	-	1.5	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	27	11	-	-	2.8	9.9	53	15	-	-	0.01	-
42.00	41.5	16.7	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.9	52	15	-	-	0.01	-
42.16	47.6	19.0	-	1.6	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	48	15	-	-	0.01	-
42.32	48.5	19.3	-	1.9	-0.3	4.0	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	50	15	-	-	0.01	-
42.49	55.6	22.0	-	1.8	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.8	9.9	45	15	-	-	0.01	-
42.65	60.6	23.9	-	2.0	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	30	12	-	-	4.2	9.9	43	15	-	-	0.01	-
42.82	54.0	21.2	-	2.0	-0.3	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	47	15	-	-	0.01	-
42.98	53.4	21.0	-	2.4	-0.2	4.7	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	51	15	-	-	0.01	-
43.15	55.4	21.7	-	2.4	-0.2	4.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	50	15	-	-	0.01	-
43.31	63.6	24.8	-	2.3	4.1	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	43	15	-	-	0.01	-
43.47	65.4	25.4	-	2.2	4.4	3.5	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.5	9.9	42	15	-	-	0.01	-
43.64	67.7	26.2	-	2.3	4.5	3.5	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	41	15	-	-	0.01	-
43.80	61.1	23.5	-	2.3	4.6	4.0	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	46	15	-	-	0.01	-
43.97	54.7	21.0	-	2.1	4.6	4.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	48	15	-	-	0.01	-
44.13	50.7	19.4	-	1.9	4.6	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.9	49	15	-	-	0.01	-
44.29	55.5	21.2	-	1.9	4.7	3.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	46	15	-	-	0.01	-
44.46	54.4	20.7	-	1.8	4.8	3.6	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	46	15	-	-	0.01	-
44.62	50.7	19.2	-	1.9	4.8	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.9	50	15	-	-	0.01	-
44.79	53.4	20.1	-	1.8	4.8	3.6	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.7	9.9	47	15	-	-	0.01	-
44.95	64.7	24.4	-	2.1	5.0	3.3	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	42	15	-	-	0.01	-
45.11	59.8	22.6	-	2.1	5.2	3.6	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	45	15	-	-	0.01	-
45.28	54.8	20.7	-	2.0	5.2	3.9	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	48	15	-	-	0.01	-
45.44	52.9	19.9	-	2.0	5.4	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
45.61	56.6	21.4	-	2.0	5.6	3.7	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	46	15	-	-	0.01	-
45.77	60.2	22.7	-	2.2	5.8	3.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	45	15	-	-	0.01	-
45.93	56.9	21.5	-	2.1	5.8	3.9	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	47	15	-	-	0.01	-
46.10	52.2	19.7	-	1.9	5.9	3.9	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
46.26	56.8	21.5	-	2.3	6.1	4.2	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	48	15	-	-	0.01	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic -	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
46.43	62.5	23.6	-	2.5	6.1	4.1	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
46.59	77.4	29.2	-	2.6	6.5	3.4	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	39	15	-	-	0.01	-
46.75	70.3	26.5	-	2.5	6.8	3.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.9	9.9	42	15	-	-	0.01	-
46.92	62.8	23.7	-	2.4	6.9	4.0	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
47.08	65.9	24.9	-	2.3	7.1	3.7	4	clayy SILT to silty CLAY	115	2.0	33	12	-	-	4.6	9.9	43	15	-	-	0.01	-
47.25	64.8	24.4	-	2.4	7.3	3.9	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
47.41	66.3	25.0	-	2.5	7.4	4.0	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	44	15	-	-	0.01	-
47.57	65.3	24.6	-	2.4	7.5	3.9	4	clayy SILT to silty CLAY	115	2.0	33	12	-	-	4.5	9.9	44	15	-	-	0.01	-
47.74	57.4	21.7	-	2.3	7.5	4.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	4.0	9.9	48	15	-	-	0.01	-
47.90	54.7	20.7	-	2.2	7.5	4.3	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	50	15	-	-	0.01	-
48.07	56.2	21.2	-	2.2	7.6	4.2	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.9	9.9	49	15	-	-	0.01	-
48.23	53.0	20.0	-	2.2	7.7	4.4	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	51	15	-	-	0.01	-
48.39	47.6	18.0	-	2.1	7.8	4.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	54	15	-	-	0.01	-
48.56	49.9	18.8	-	2.0	8.0	4.2	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	9.9	51	15	-	-	0.01	-
48.72	55.3	20.9	-	2.0	8.1	3.8	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	47	15	-	-	0.01	-
48.89	52.7	19.9	-	2.0	8.3	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
49.05	54.6	20.6	-	1.9	8.6	3.7	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	47	15	-	-	0.01	-
49.22	55.8	21.1	-	2.1	8.7	3.9	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	47	15	-	-	0.01	-
49.38	56.6	21.4	-	2.2	8.8	4.2	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	48	15	-	-	0.01	-
49.54	60.2	22.7	-	2.6	9.0	4.5	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	48	15	-	-	0.01	-
49.71	70.0	26.4	-	2.4	9.2	3.7	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	42	15	-	-	0.01	-
49.87	73.7	27.8	-	2.7	9.8	3.8	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.01	-
50.04	66.3	25.0	-	2.8	10.1	4.4	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	46	15	-	-	0.01	-
50.20	66.7	25.2	-	2.7	10.5	4.2	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	45	15	-	-	0.01	-
50.36	69.8	26.3	-	2.8	10.9	4.1	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.8	9.9	44	15	-	-	0.01	-
50.53	77.1	29.1	-	2.7	11.2	3.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.9	40	15	-	-	0.01	-
50.69	73.5	27.7	-	2.9	11.4	4.1	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	43	15	-	-	0.01	-
50.86	73.0	27.6	-	3.0	11.5	4.3	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	44	15	-	-	0.01	-
51.02	80.8	30.5	-	3.1	11.7	4.0	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	41	15	-	-	0.01	-
51.18	87.2	32.9	-	3.6	11.9	4.3	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	41	15	-	-	0.01	-
51.35	76.5	28.9	-	3.7	12.1	5.0	3	silty CLAY to CLAY	115	1.5	51	19	-	-	5.3	9.9	46	15	-	-	0.01	-
51.51	65.5	24.7	-	3.5	12.2	5.6	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	50	15	-	-	0.01	-
51.68	77.4	29.2	-	3.4	12.5	4.6	3	silty CLAY to CLAY	115	1.5	52	19	-	-	5.4	9.9	44	15	-	-	0.01	-
51.84	72.6	27.4	-	3.3	12.7	4.8	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	46	15	-	-	0.01	-
52.00	60.4	22.8	-	2.8	13.0	4.9	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	50	15	-	-	0.01	-
52.17	57.9	21.8	-	2.4	13.3	4.4	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	49	15	-	-	0.01	-
52.33	53.7	20.3	-	2.1	13.6	4.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	49	15	-	-	0.01	-
52.50	47.8	18.0	-	1.9	13.8	4.2	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.5	52	15	-	-	0.01	-
52.66	45.9	17.3	-	1.7	14.1	3.9	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	9.1	52	15	-	-	0.01	-
52.82	46.0	17.4	-	1.6	14.3	3.8	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	9.1	51	15	-	-	0.01	-
52.99	50.3	19.0	-	1.9	14.6	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	9.9	50	15	-	-	0.01	-
53.15	54.2	20.5	-	2.0	14.7	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	48	15	-	-	0.01	-
53.32	54.3	20.5	-	2.0	16.2	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	48	15	-	-	0.01	-
53.48	53.6	20.2	-	1.8	16.6	3.6	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.7	9.9	47	15	-	-	0.01	-
53.64	56.8	21.4	-	1.8	17.1	3.4	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	45	15	-	-	0.01	-
53.81	57.1	21.5	-	2.1	17.4	3.8	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	47	15	-	-	0.01	-
53.97	59.9	22.6	-	2.2	17.6	3.9	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
54.14	59.6	22.5	-	2.3	17.8	4.1	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.01	-
54.30	64.1	24.2	-	2.4	18.1	4.0	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	45	15	-	-	0.01	-
54.46	65.1	24.6	-	2.5	18.3	4.0	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.5	9.9	45	15	-	-	0.01	-
54.63	65.5	24.7	-	2.5	18.5	4.0	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	45	15	-	-	0.01	-
54.79	64.2	24.2	-	2.4	18.8	3.9	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	45	15	-	-	0.01	-
54.96	62.6	23.6	-	2.2	19.1	3.8	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	45	15	-	-	0.01	-
55.12	60.2	22.7	-	2.3	19.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.01	-
55.28	62.5	23.6	-	2.2	19.6	3.6	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	44	15	-	-	0.01	-
55.45	59.9	22.6	-	2.2	20.0	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
55.61	59.5	22.5	-	2.1	20.5	3.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
55.78	57.9	21.8	-	2.2	23.5	4.0	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	47	15	-	-	0.01	-
55.94	54.6	20.6	-	2.2	24.1	4.3	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	50	15	-	-	0.01	-
56.11	62.1	23.4	-	2.3	24.6	3.9	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	45	15	-	-	0.01	-
56.27	61.7	23.3	-	2.4	25.1	4.0	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	46	15	-	-	0.01	-
56.43	63.1	23.8	-	2.3	25.4	3.9	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	45	15	-	-	0.01	-
56.60	64.9	24.5	-	2.4	26.0	3.8	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
56.76	68.4	25.8	-	2.4	26.5	3.7	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	43	15	-	-	0.01	-
56.93	64.2	24.2	-	2.5	26.8	4.1	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	46	15	-	-	0.01	-
57.09	62.5	23.6	-	2.4	27.2	4.1	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
57.25	64.8	24.4	-	2.2	27.8	3.6	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
57.42	64.6	24.4	-	2.6	28.1	4.3	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	46	15	-	-	0.01	-
57.58	62.9	23.7	-	2.6	28.6	4.4	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	47	15	-	-	0.01	-
57.75	62.0	23.4	-	2.6	29.7	4.4	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	48	15	-	-	0.01	-
57.91	58.8	30.9	41.2	0.0	30.1	0.1	6	clean SAND to silty SAND	125	5.0	12	6	28	34	-	-	14	16	4.84	-	0.01	51.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Appendix B

Laboratory Soil Test Results

TABLE SUMMARY OF LABORATORY TEST RESULTS FOR TIEBACK WALLS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-244	S-1	5	CL	18.5						41/21/20	388	6.2	530	1392
A-11-244	D-2	10	CL	23.0	121.9	2.5								
A-11-244	S-3	15	SP-SM	2.0				0:95:5						
A-11-244	D-4	20	SP-SM	1.6	124.5									
A-11-244	S-5	25	SP-SM	21.1										
A-11-244	D-6	30	MH	28.5	118.4	>4.5				61/33/28				
A-11-246	S-1	5	ML	18.0				0:9:91						
A-11-246	D-2	10	ML	24.5	121.2	4.25								
A-11-246	S-3	15	SP	1.1				1:96:3						
A-11-246	D-4	20	SP	1.4	110.4									
A-11-246	S-5	25	SP	5.7										
A-11-246	D-6	30	CH	30.9		4.25				57/27/30				
A-11-247	D-1	5	ML	20.5	124.9	4.0								
A-11-247	S-2	10	ML	21.9				0:16:84						
A-11-247	D-3	15	CL	23.2	123.1	1.75								
A-11-247	S-4	20	SP	2.0				29:67:4						
A-11-247	D-5	25	SP	2.7	101.6									
A-11-247	S-6	30	SP	21.1										
A-11-247	D-7	35	MH	30.1	115.6	>4.5								
A-11-247	S-8	40	MH	33.4						71/39/32	300	6.5	1840	1561
A-11-247	D-9	45	MH	30.2	117.4	>4.5								
A-11-247	S-10	50	MH	26.4										
A-11-258	D-1	5	CL	20.3	118.0	>4.5								
A-11-258	S-2	10	CL	16.7				0:10:90		43/19/24				
A-11-258	D-3	15	CL	11.3	116.2	>4.5								
A-11-258	S-4	20	CL	16.0							390	7.6	220	1239
A-11-258	D-5	25	CL	13.5	115.2	2.0								
A-11-258	S-6	30	CL	23.1						41/22/19				
A-11-259	S-1	5	CL	4.6										
A-11-259	D-2	10	CL	13.8										
A-11-259	S-3	15	CL	13.0						36/19/17	900	7.2	430	402
A-11-259	D-4	20	CL	13.7	127.8	>4.5								
A-11-259	S-5	25	CL	20.4				0:13:87		35/21/14				
A-11-259	D-6	30	CL	22.8	113.1	3.50								

MAXIMUM DENSITY, OPTIMUM MOISTURE, WASH, & ATTERBERG LIMITS

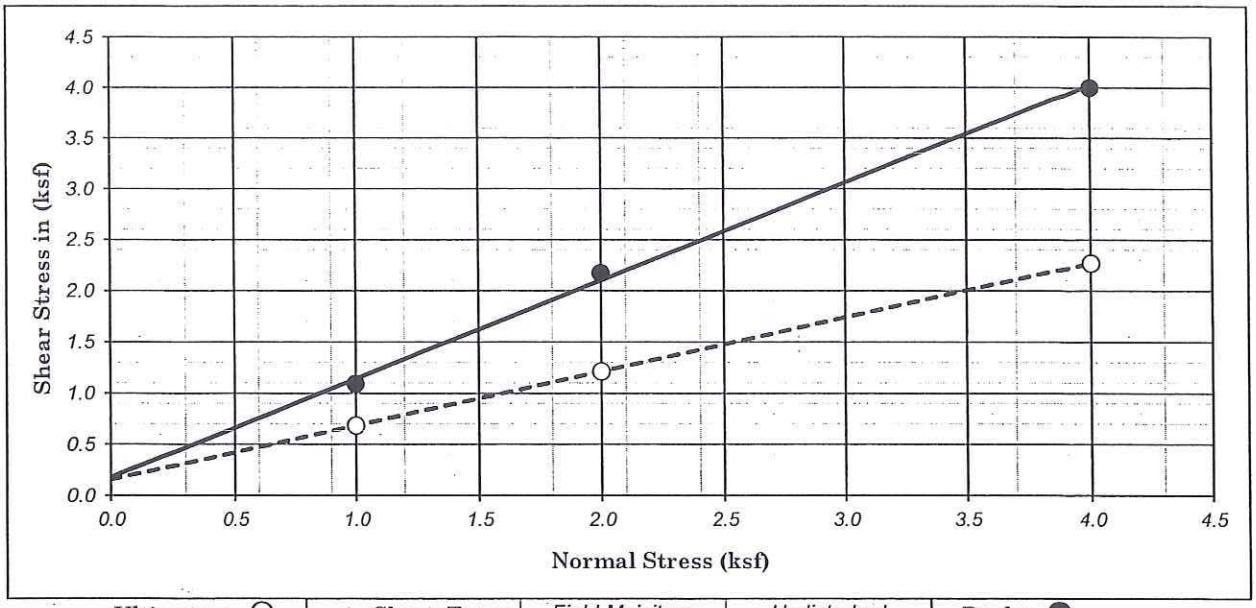
Borehole No.	Sample No.	Depth (feet)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
A-11-246	B-0	0 – 5	115.0	13.0

EXPANSION INDEX

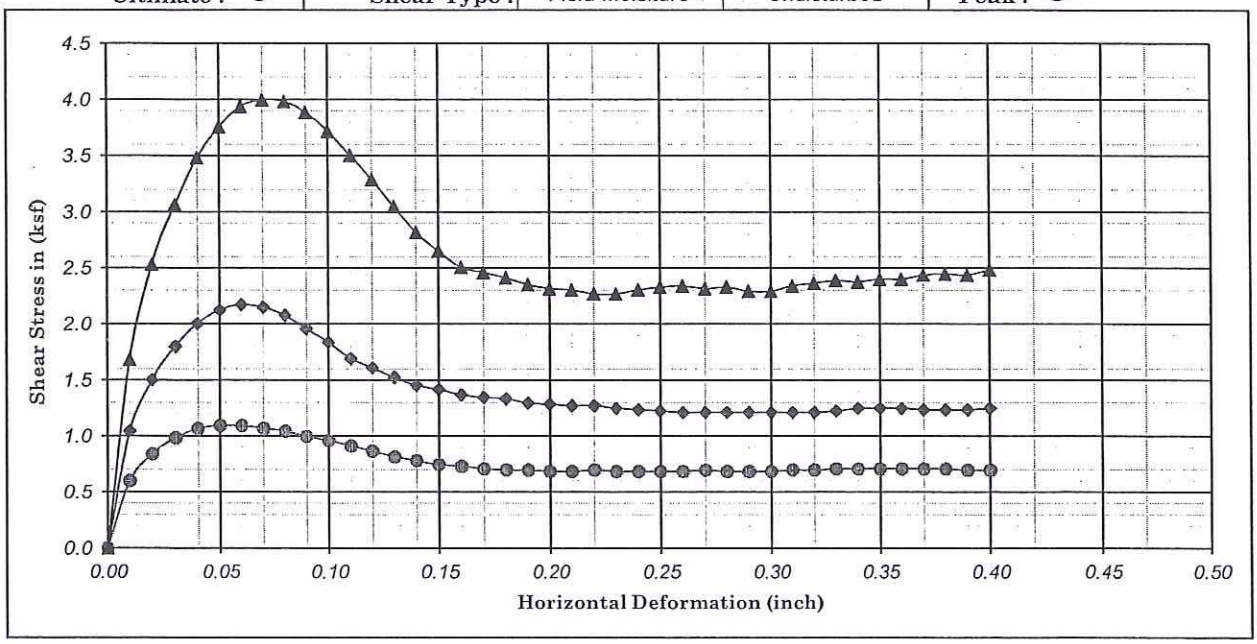
Borehole No.	Depth (feet)	Description	Expansion Index	Expansion Potential
A-11-258	0 – 5	Lean Clay with Sand (CL)	99	High

SOIL CORROSION TEST RESULTS

Borehole No.	Sample Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
A-11-244	5	CL	380	6.2	530	1,392
A-11-247	40	MH	300	6.5	1,840	1,561
A-11-258	20	CL	390	7.6	220	1,239
A-11-259	15	CL	900	7.2	430	402



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-246		Strength Intercept (C) :	0.18	(ksf)	Peak	0.16	(ksf)	Ultimate	
Sample No. : D-4			8.62	(kPa)		7.47	(kPa)		
Depth (ft/m) : 20.0	0.00	Friction Angle (ϕ) :	43.83	Degree		27.83	Degree		
Description : Olive-brown, Poorly graded SAND (SP)						Shear Rate (inch/minute) :		0.02	

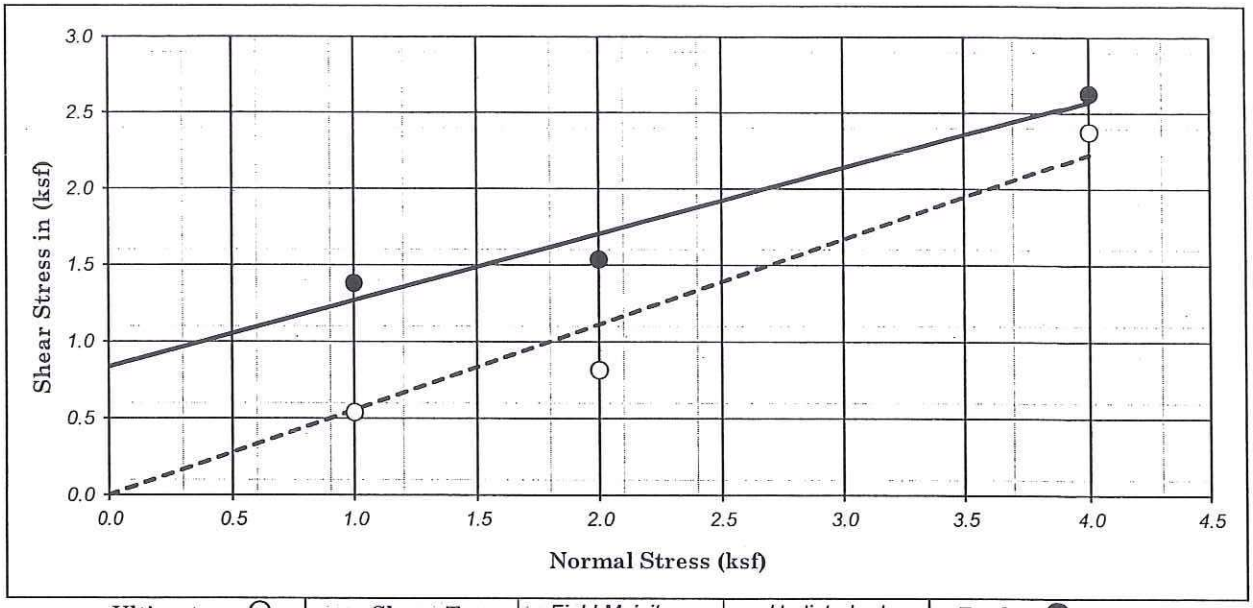
SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.95	112.27	17.67	0.50	1.00	47.88	1.09	52.28	0.68	32.75
◆	0.78	104.25	16.41	0.62	2.00	95.76	2.17	104.00	1.21	58.03
▲	0.79	105.22	16.56	0.60	4.00	191.52	4.00	191.33	2.27	108.59

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

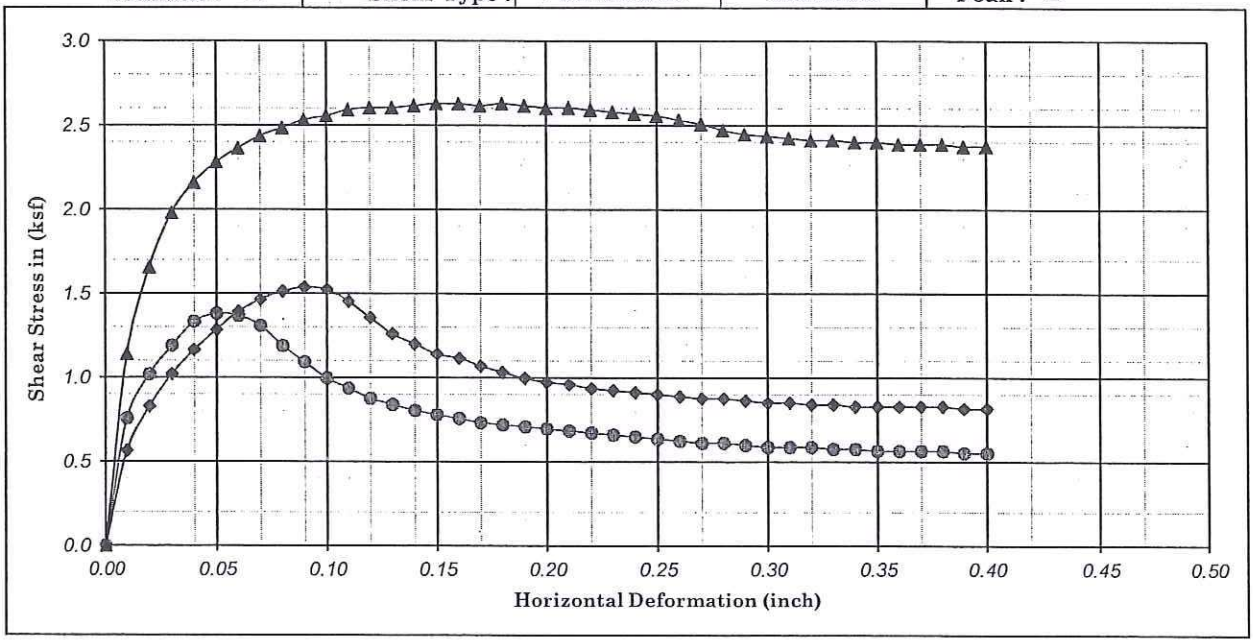
AECOM/I-5 HOV Widening Segment 2

DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/15/11 | Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-247		Strength Intercept (C) :	0.83	(ksf)	Peak	0.00	(ksf)	Ultimate	
Sample No. : D-3			39.93	(kPa)		0.00	(kPa)		
Depth (ft/m) : 15.0	0.00	Friction Angle (ϕ) :	23.49	Degree		29.07	Degree		
Description : Olive-brown, Lean CLAY with SAND (CL)					Shear Rate (inch/minute) :		0.02		

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	23.36	99.67	15.69	0.69	1.00	47.88	1.38	66.07	0.54	25.86
◆	27.60	95.82	15.08	0.76	2.00	95.76	1.54	73.54	0.82	39.07
▲	20.32	106.03	16.69	0.59	4.00	191.52	2.63	125.83	2.38	113.76

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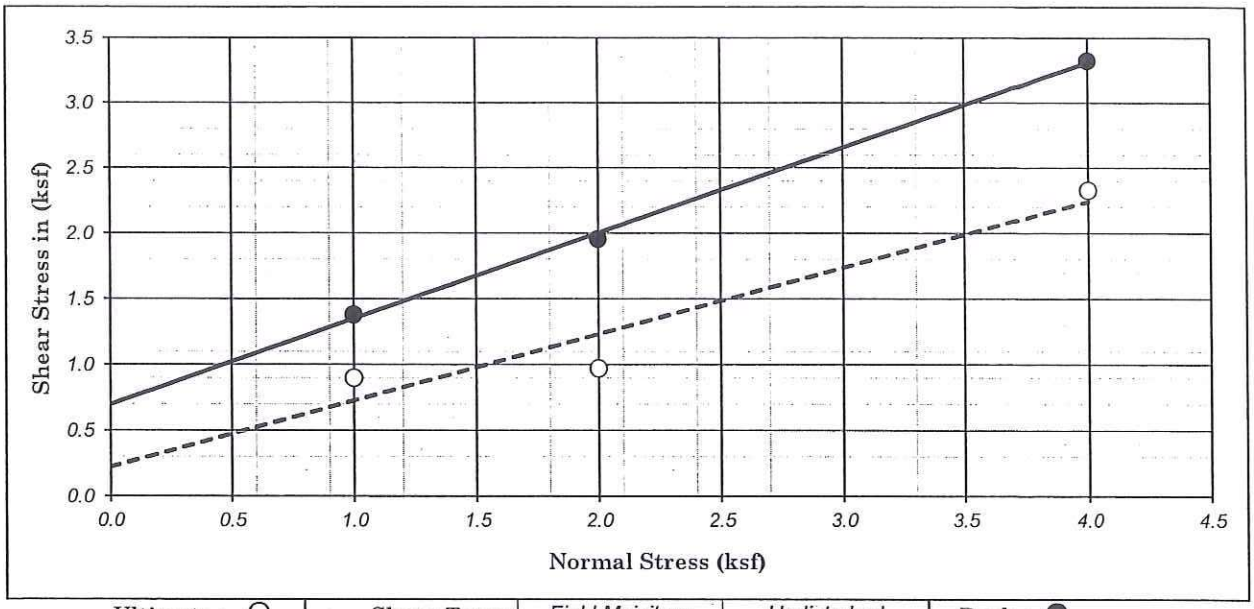
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

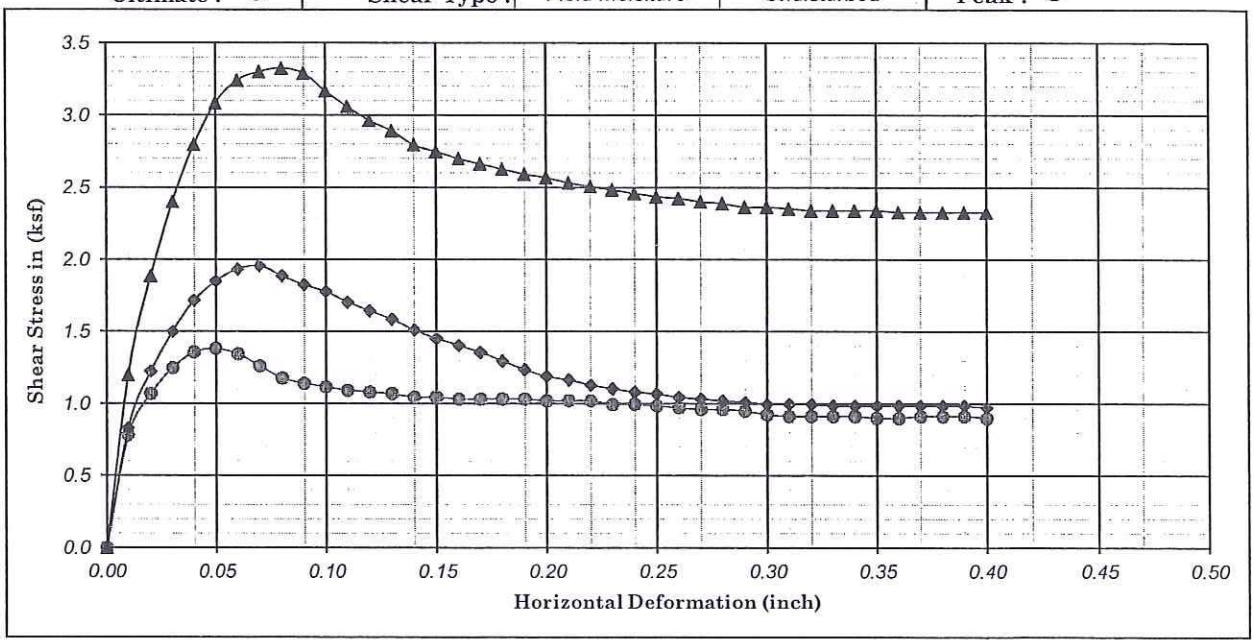
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-258		Strength Intercept (C) :	0.70	(ksf)	Peak	0.22	(ksf)	Ultimate	
Sample No. : D-5			33.32	(kPa)		10.63	(kPa)		
Depth (ft/m) : 25.0	0.00	Friction Angle (ϕ) :	33.15	Degree		26.79	Degree		
Description : Olive-brown, SILTY CLAY (CL-ML)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	15.07	103.44	16.28	0.63	1.00	47.88	1.38	66.07	0.90	43.09
◆	17.59	104.17	16.40	0.62	2.00	95.76	1.96	93.65	0.97	46.54
▲	15.42	100.50	15.82	0.68	4.00	191.52	3.32	159.15	2.33	111.46

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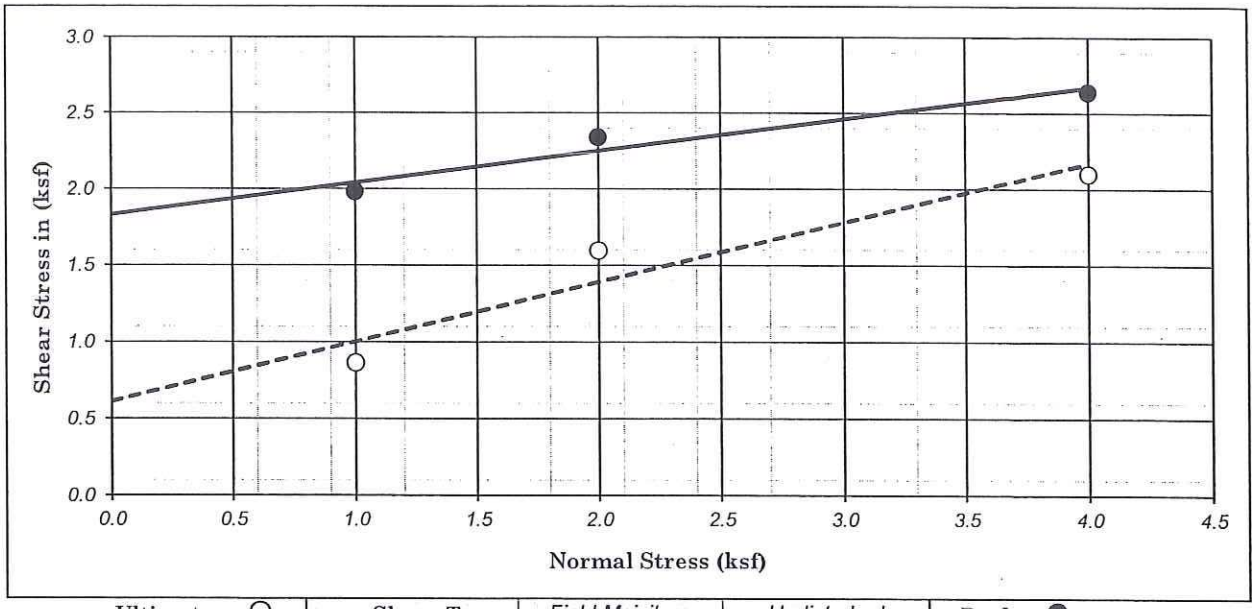
Geotechnical and Earthquake Engineering

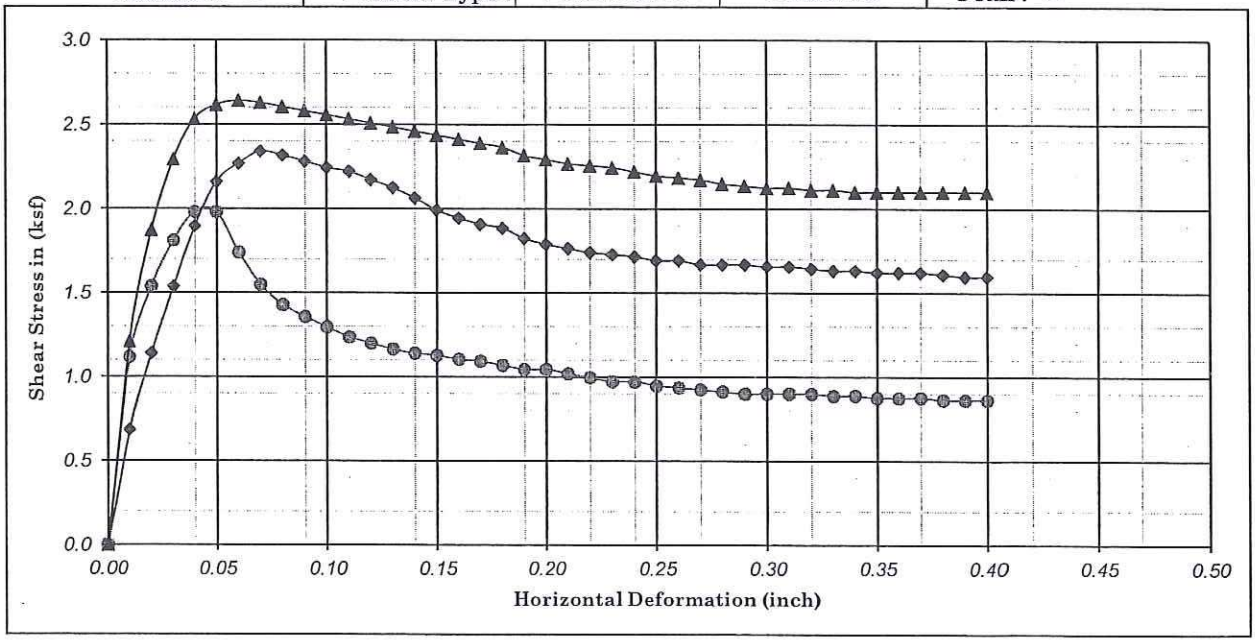
AECOM/I-5 HOV Widening Segment 2

DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/15/11 | Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-259		Strength Intercept (C) :	1.83	(ksf)	Peak	0.61	(ksf)	Ultimate	
Sample No. : D-4			87.62	(kPa)		29.30	(kPa)		
Depth (ft/m) : 20.0	0.00	Friction Angle (ϕ) :	11.86	Degree		21.26	Degree		
Description : Olive-brown, Lean CLAY with SAND (CL)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	38.60	90.32	14.22	0.87	1.00	47.88	1.98	94.80	0.86	41.37
◆	13.07	111.62	17.57	0.51	2.00	95.76	2.34	112.04	1.60	76.42
▲	17.03	110.17	17.34	0.53	4.00	191.52	2.64	126.40	2.10	100.55

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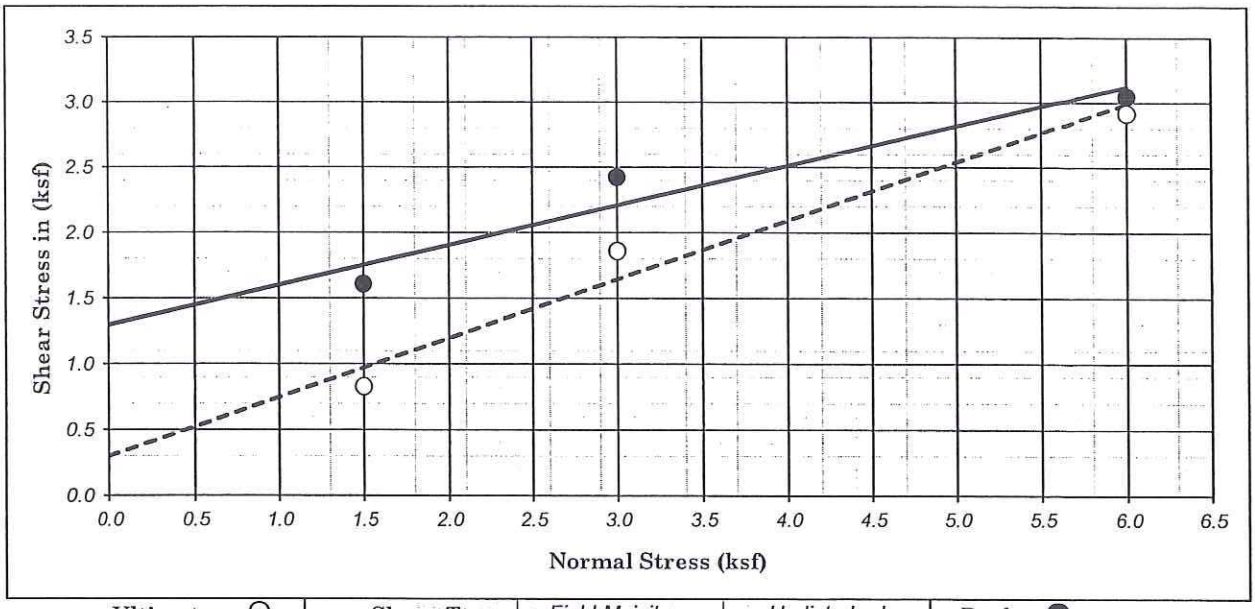
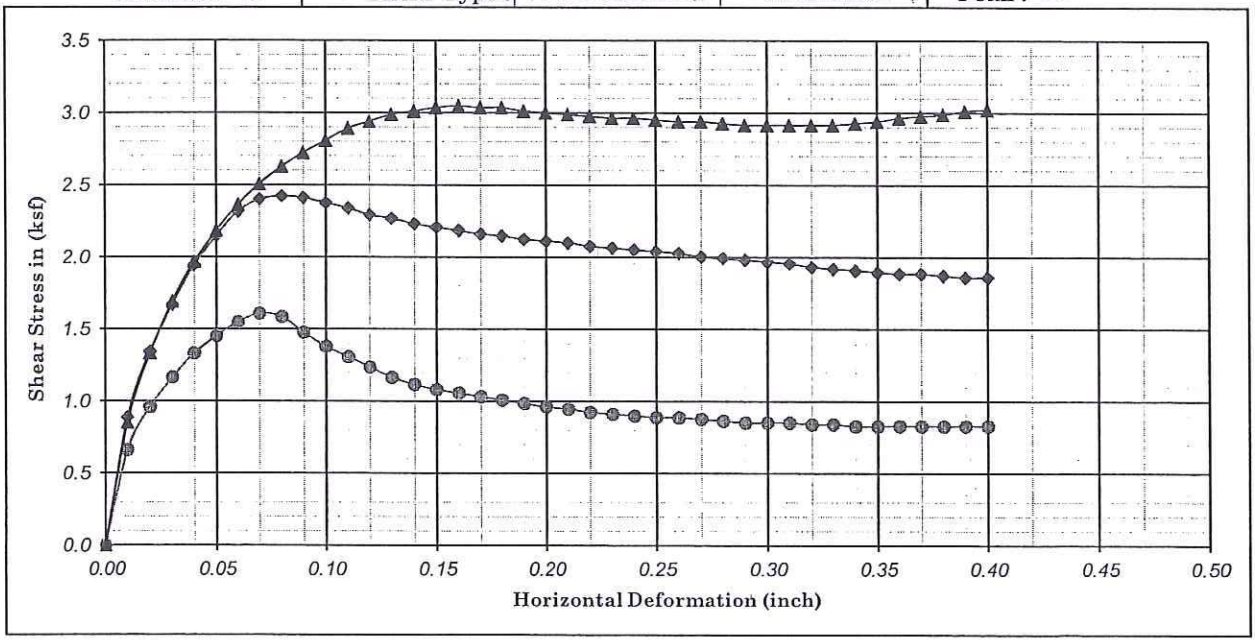
AECOM/I-5 HOV Widening Segment 2

DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/17/11 | Figure No. :



Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-259	Strength Intercept (C) :	1.30	(ksf)	Peak	0.30	(ksf)	Ultimate
Sample No. : D-6		62.05	(kPa)		14.36	(kPa)	
Depth (ft/m) : 30.0 | 0.00	Friction Angle (ϕ) :	16.91	Degree		24.13	Degree	

Description : Olive-brown, Lean CLAY with SAND (CL) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	24.75	97.00	15.27	0.74	1.50	71.82	1.61	76.99	0.83	39.64
◆	20.10	97.38	15.33	0.73	3.00	143.64	2.42	116.06	1.86	89.06
▲	23.48	98.20	15.46	0.72	6.00	287.28	3.05	145.94	2.92	139.62

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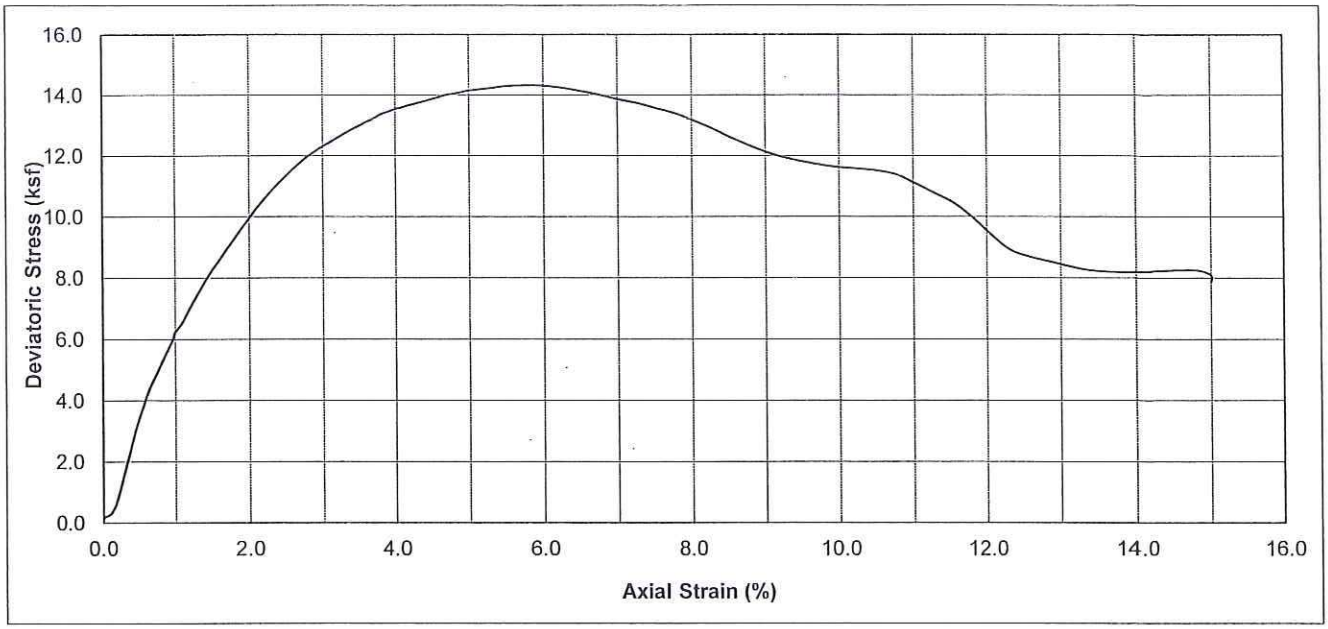
Geotechnical and Earthquake Engineering

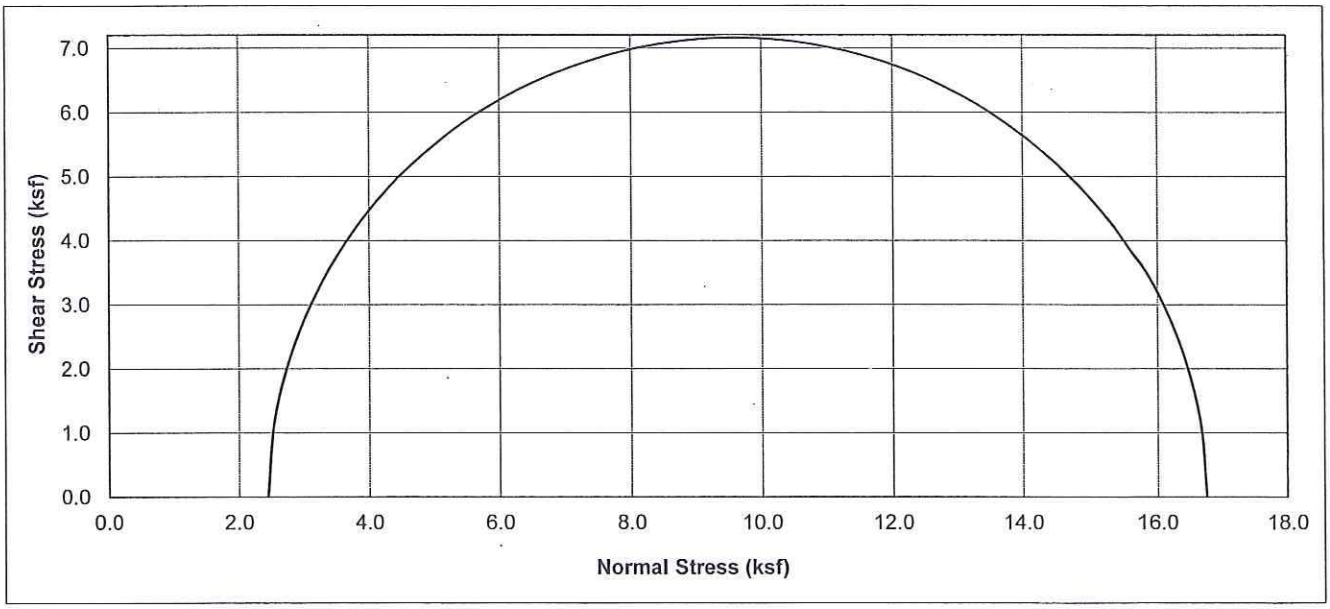
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 | Date : 11/15/11

DIRECT SHEAR TEST (ASTM D-3080)

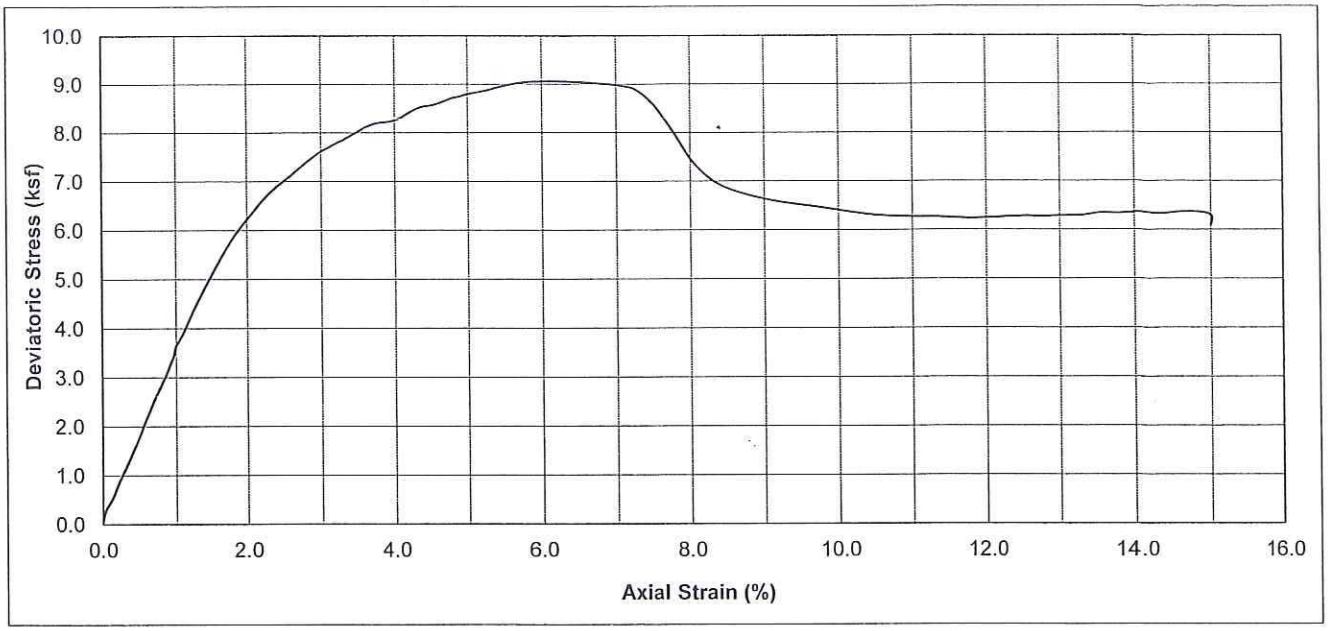
Figure No. :

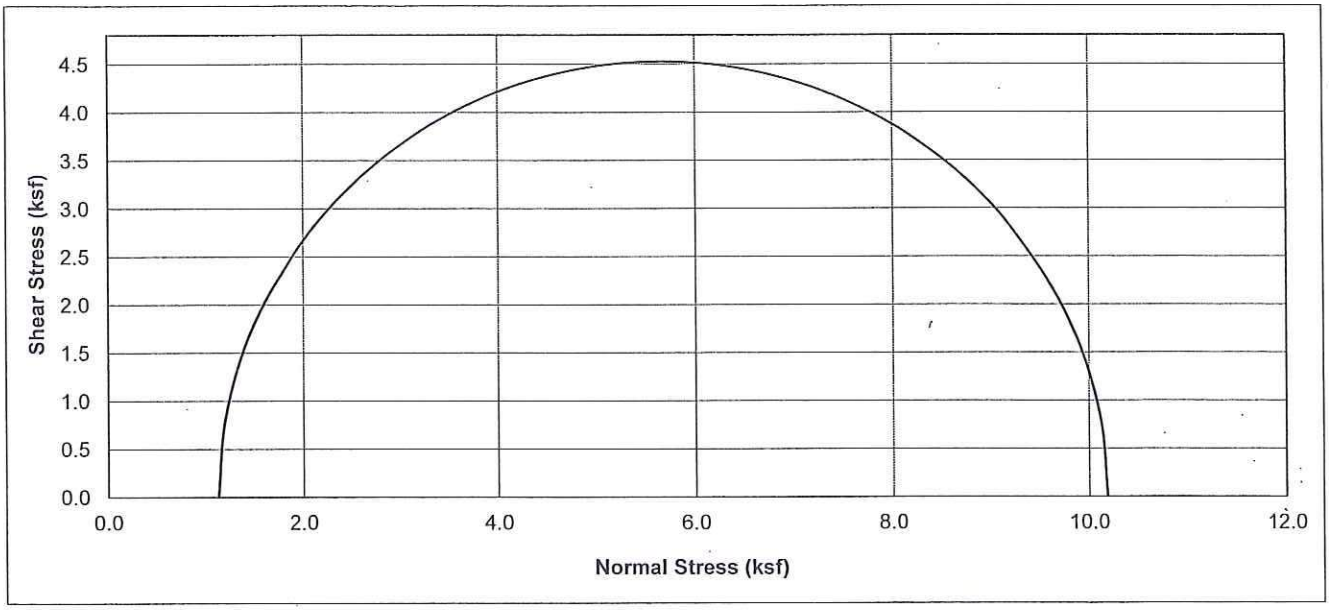




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-244	D-8	30	Very dark gray , Elastic SILT (MH)	92.8	28.48	2.44	14.32	94.3

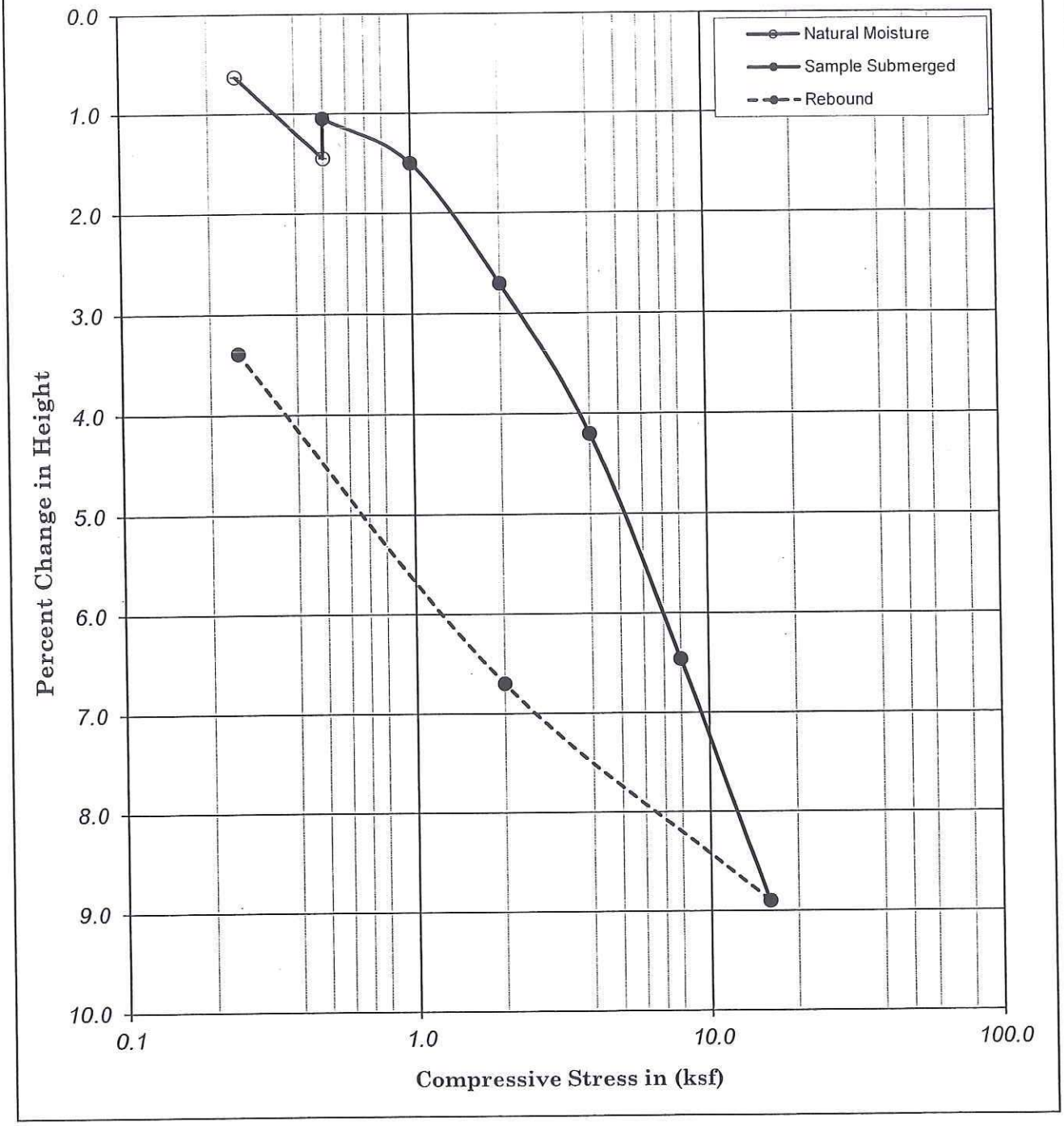
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	**AECOM/I-5 HOV Widening Segment 2**
	UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136 **Date :** 11/09/11	**(ASTM D2850)** Figure No. :





Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-258	D-3	15	Olive-brown , SANDY lean CLAY (CL)	105.6	11.26	1.13	9.06	51.1

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	**AECOM/I-5 HOV Widening Segment 2**
Project No. : 11-136 **Date :** 11/10/11	**UNCONSOLIDATED UNDRAINED TEST** **(ASTM D2850)** Figure No. :



Boring No. : A-11-244			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-2			Plastic Limit :	-						
Depth	(ft) : 5.0	6.5	Plastic Index :	-	Initial	22.16	100.26	15.78	87.84	0.68
	(m) : 1.53	1.98	Specific Gravity :	2.70	Final	22.81	103.85	16.35	98.83	0.62
Description : Olive-brown, Lean CLAY with SAND (CL)										

Earth Mechanics, Inc.
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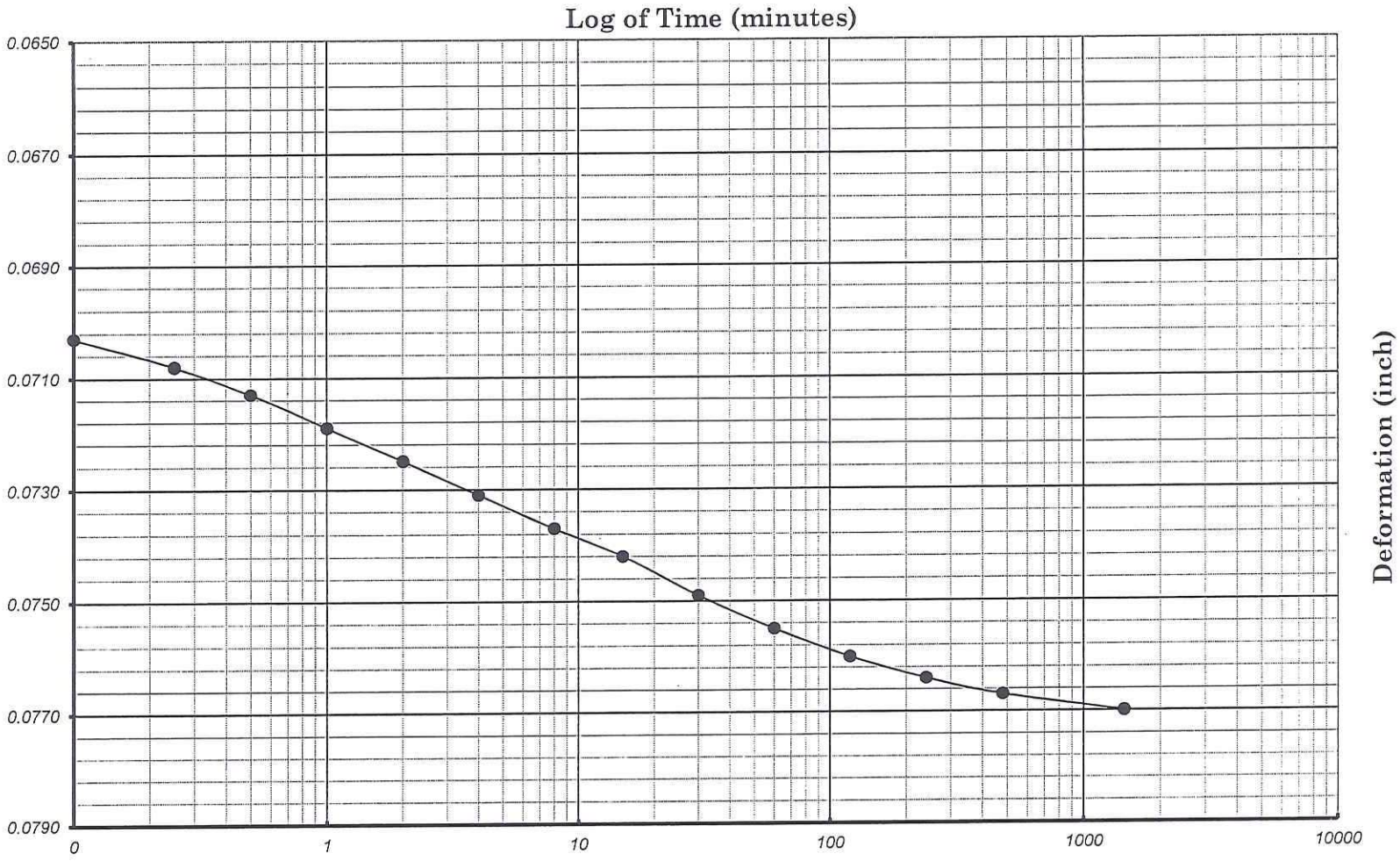
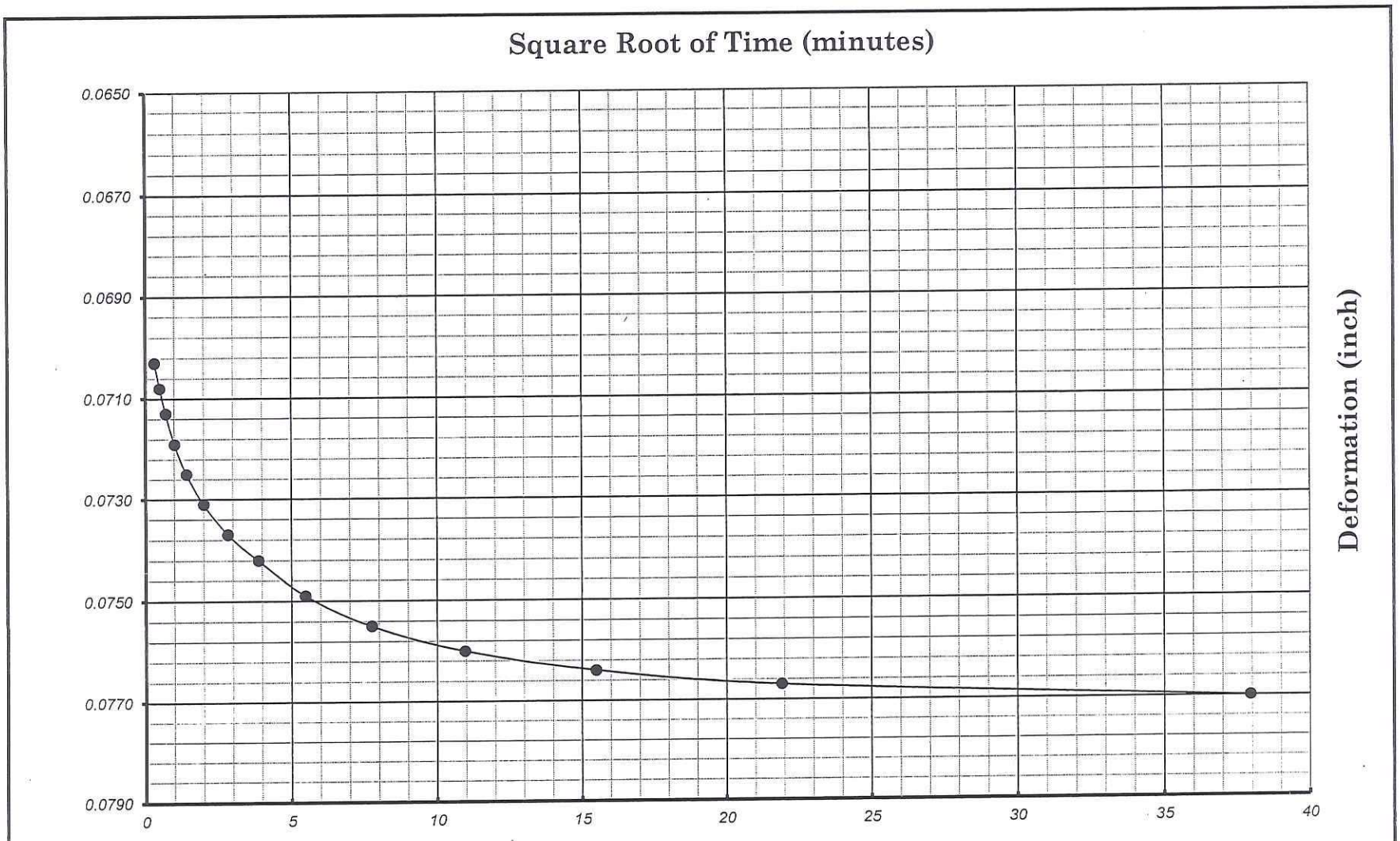
AECOM/I-5 HOV Widening Segment 2

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

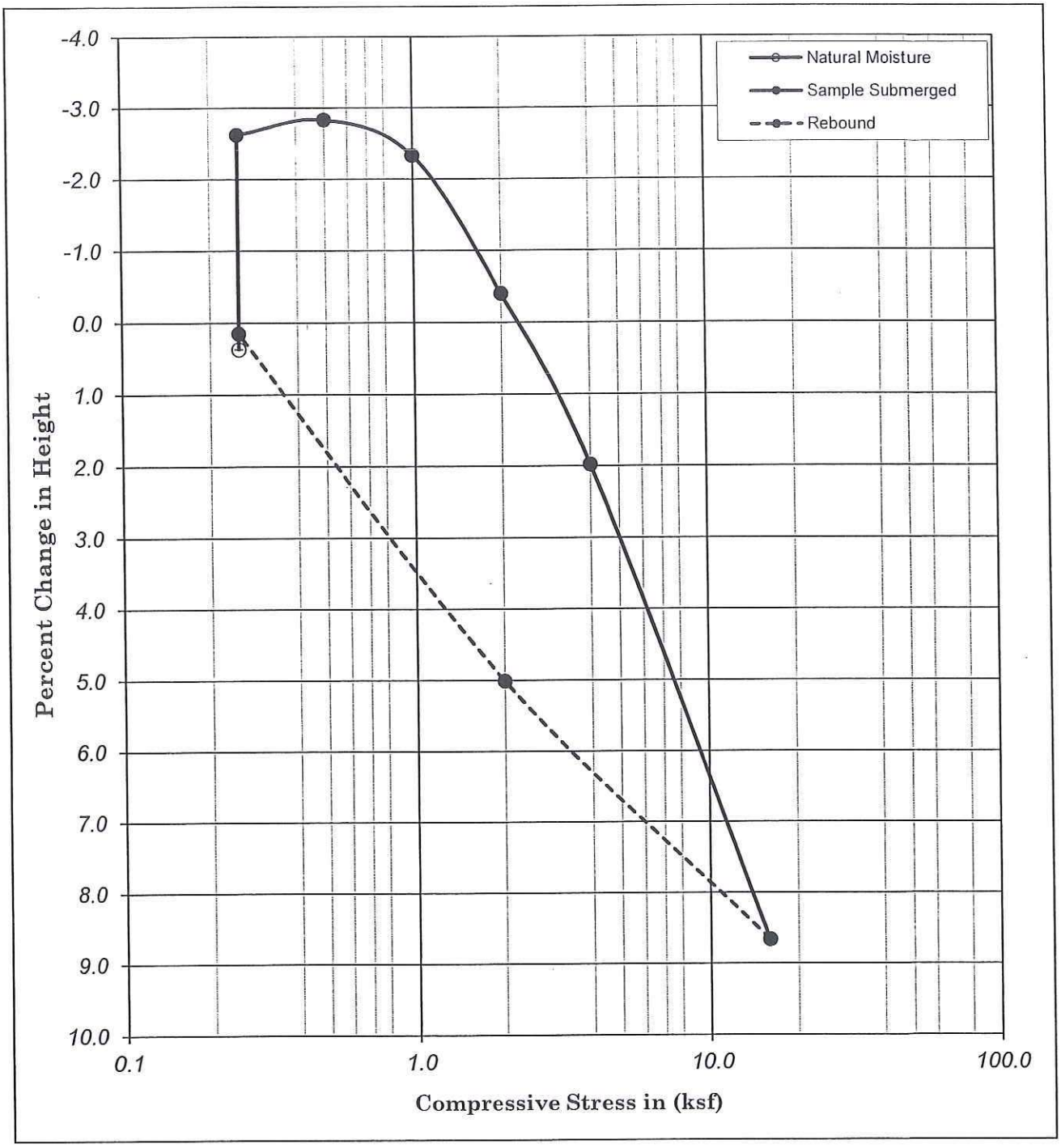
Project No. : *11-136* *12/14/11*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-244	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 / 1.5	Veritcal Load (ksf/kpa) : 2.00 / 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-244	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Vertical Load (ksf/kpa) : 2.0 95.8



Boring No.	: A-11-258		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-1		Plastic Limit :	-						
Depth (ft)	: 5.0	6.5	Plastic Index :	-	Initial	22.02	98.48	15.50	83.54	0.71
Depth (m)	: 1.53	1.98	Specific Gravity :	2.70	Final	28.57	98.69	15.53	108.95	0.71

Description : *Dark olive-brown, Lean CLAY (CL)*

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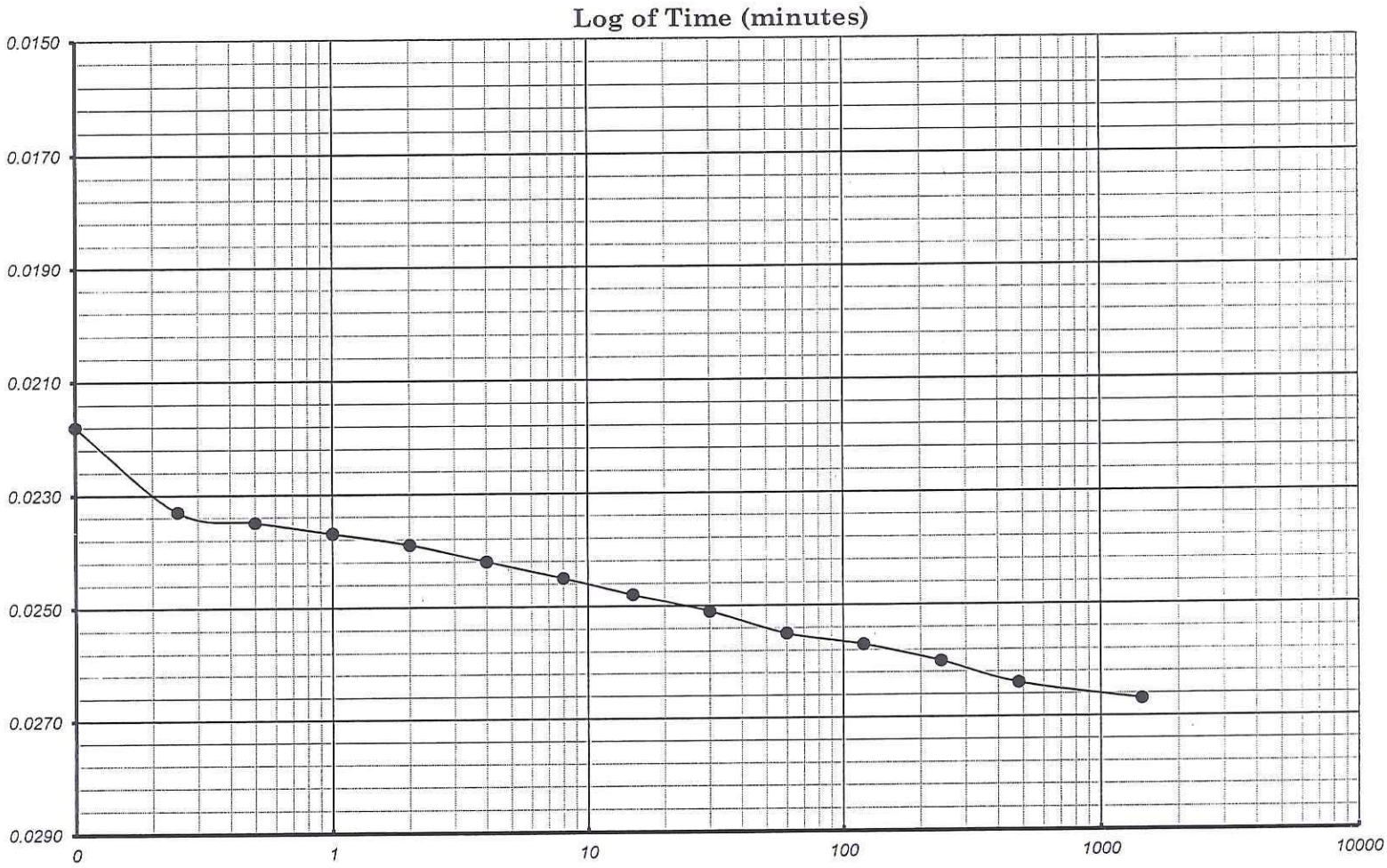
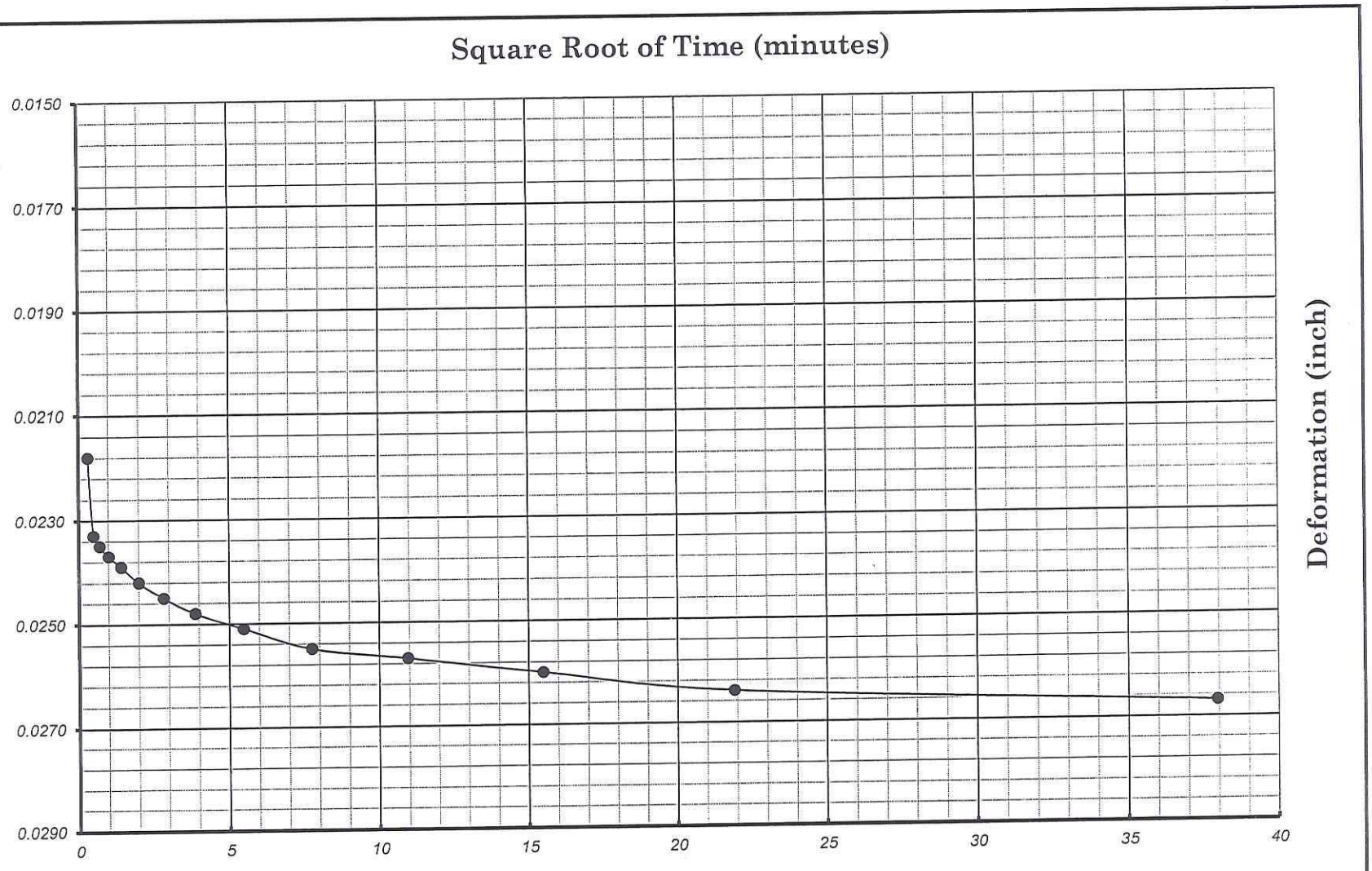
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-258	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-1	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 1.00 47.9



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-258*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-1*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *1.0* *47.9*

Appendix C

Design Calculations

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(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV, Segment 2. Project No. 11-136

By AK Date 2/20/12 Checked By Ranjan Date 2/21/12 Sheet 1 of 1

Retaining Walls at Camino Capistrano

Bond strength / stress for Anchors:

From FHWA "Permanent Ground Anchors" (1999)

Silt/clay mixtures (Chart) = 4 kips/ft

From Post-Tensioning Institute:

grout / ground = 10 psi

10 psi × 144 in²/ft² = 1,440 psf

6" diameter: C = πd
= π(0.5') = 1.57'

1,440 kips/ft² × 1.57' = 2.3 kips/ft

8" diam: C = π(8"/12) = 2.1'

1,440 kips/ft² × 2.1' = 3 kips/ft

for pressure-grouted anchor: 15-20 psi

6" dia: 15 psi × 144 = 2,160 psf × 1.57' = 3.39 k/ft
20 psi × 144 = 2,880 psf × 1.57' = 4.5 k/ft

8" dia: 15 psi × 144 = 2,160 psf × 2.1' = 4.5 k/ft
20 psi × 144 = 2,880 psf × 2.1' = 6.0 k/ft

Summary:

Use: gravity grouted anchors = 4 kips/ft

pressure-grouted 6" diam. = 4.5 kips/ft

pressure-grouted 8" diam. = 5.6 kips/ft

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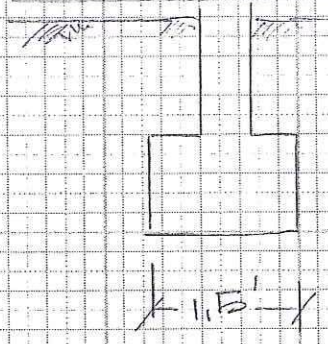
Project I-5 HOV Widening, Segment 2 Project No. 11-136

By AK Date 2/20/12 Checked By Ranjan Date 2/21/12 Sheet 1 of 1

TIEBACK WALLS AT CAMINO DE ESTRELLA

BEARING CAPACITY OF LEVELING PAD/FOOTING:



$q_u = cN_c + qN_q + 0.5\gamma BN_\gamma$

For $\phi = 27°$, $c = 210$ psf:

$N_c = 23$

$N_q = 13$

$N_\gamma = 14$

$q_u = (210\text{ psf})(23) + (2' \times 120)(13) + 0.5(120)(1.5')(14)$

$= 4830 + 3120 + 1260$

$= 9{,}210$ psf

$q_{ALLOW} = \frac{9{,}210}{3} = 3{,}070$ psf

For $\phi = 28°$, $c = 160$ psf: $N_c = 25$, $N_q = 14$, $N_\gamma = 16$

$q_u = (160)(25) + (2 \times 120)(14) + 0.5(120)(1.5')(16)$

$= 7{,}120$ psf

$q_{ALLOW} = \frac{7{,}120}{3} = 2{,}373$ psf

Use $q_A = 2{,}000$ psf

COEFFICIENT OF FRICTION (μ)

For clay, $\delta = 17° - 22°$; $\mu = \tan\delta = \tan 17° = 0.30$

For $\phi = 27°$; $\delta = \frac{2}{3}(27°) = 18°$; $\mu = \tan 18° = 0.32$

Use $\mu = 0.25$

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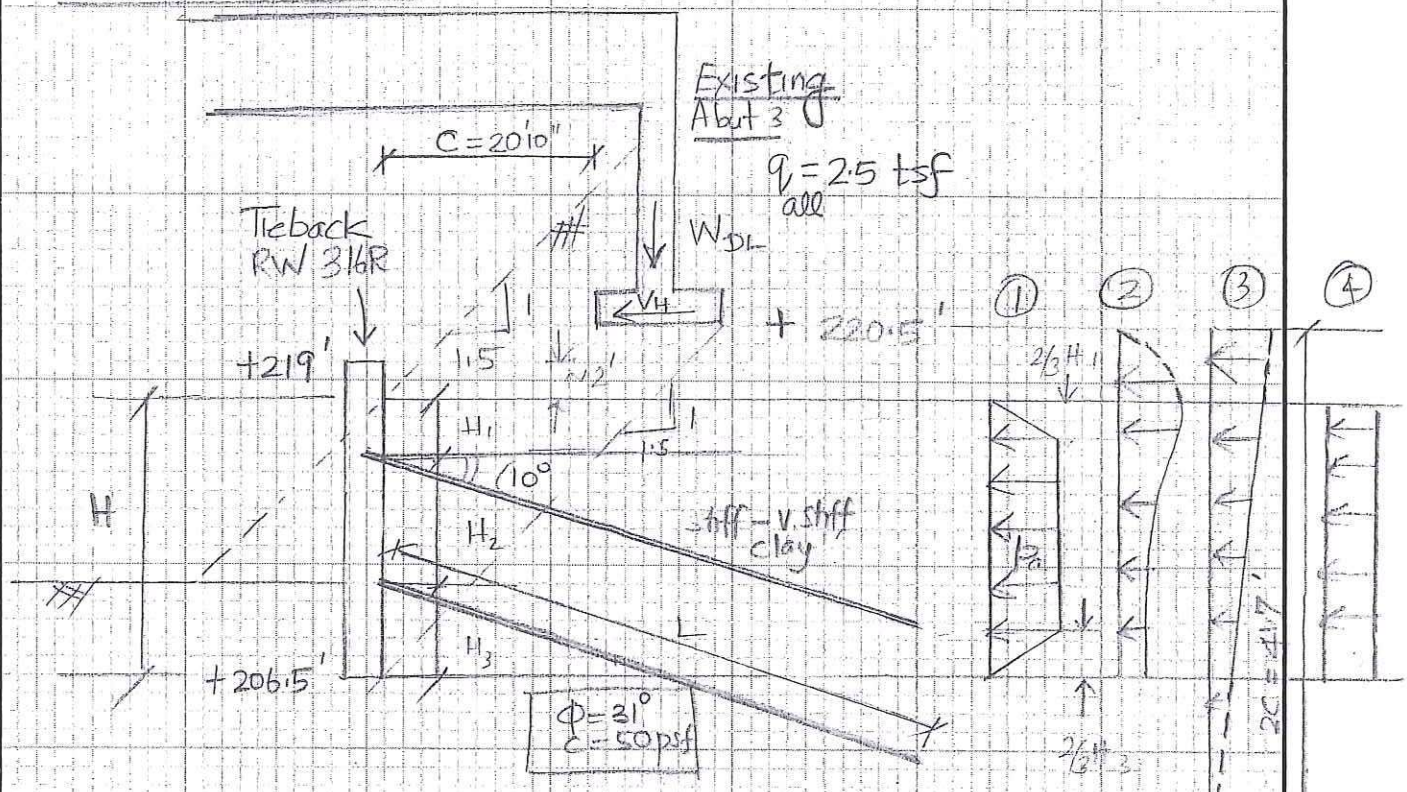
Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 1/17/12 Checked By Andy Date 2/8/12 Sheet 1 of 4

TIEBACK WALLS 315L and 316R

TIEBACK WALL 316R



① ⇒ Static Earth Pressure (Cohesionless soils)

Using Eq^n 5.5.5.7.1-2 from LRFD BDS, "Conservative"

max ordinate of pressure diagram $p_a = \dfrac{P_{Total}}{(H - \frac{1}{3}H_1 - \frac{1}{3}H_3)}$

$P_{TOTAL} \geq 1.44 P_a$ ← Active Resultant

$\geq \frac{1.44}{0.72} \times \frac{1}{2} K_a \gamma H^2$

$\therefore P_{TOTAL} \geq 0.72 K_a \gamma H^2$ (P_a)

$\therefore p_a \geq \dfrac{0.72 K_a \gamma H^2}{H - \frac{1}{3}H_1 - \frac{1}{3}H_3}$

For stiff-hard cohesive soils, $p_a = 0.2 - 0.4 \cdot 0.11$

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Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 1/17/12 Checked By Andy Date 2/8/12 Sheet 2 of 4

For 1.5:1, $H = 10.5'$, $L_s = 20'$

$K_a = 0.465$ using trial wedge method

Assume $H_1 = 2'$; $H_3 = 2'$

$$p_a = \frac{0.72 \times 0.465 \times 120 \times 10.5^2}{9.167}$$

$p_a \approx 483$ psf using cohesionless equation

Comparison

Using cohesive soils,

$$N_s = \frac{\gamma_s H}{S_u} = \frac{0.12 \times 10.5}{1.5} = 0.84 \ (< 4)$$

$\Rightarrow$ Stiff to hard

$\therefore$ $p_a = 0.2\gamma_s H$ to $0.4\gamma_s H$ (5.5.5, 7.2a-1)

Select Avg $p_{a_{max}} = 0.3\gamma_s H = 378$ psf for V. stiff to hard soils

$\Rightarrow$ use cohesionless equation //

$(0.72 \times 0.465 \times 120)$

USE $p_a = \frac{40.2 H^2}{H - \frac{1}{3}H_1 - \frac{1}{3}H_2}$ for wall stem //

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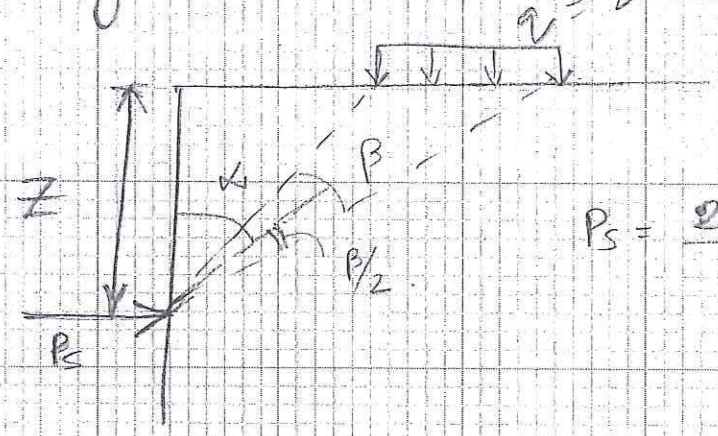
Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 1/17/12 Checked By Andy Date 2/8/12 Sheet 3 of 4

② ⇒ Abutment Vertical Reaction

Using Boussinesq Eq^n,



$$P_s = \frac{2q}{\pi}\left(\beta - \sin\beta \cdot \cos 2\alpha\right)$$

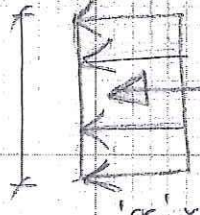
④ ⇒ Incremental EQ Surcharge (using trial wedge method attached)

P_{AE} = 3073 lb under static (K_a = 0.195)

Using ½ PGA = ½ x 0.396 = 0.198

TOTAL P_{AE} = 7,195 lb under seismic condition

∴ Incremental = 7195 - 3073 = 4122 lb



$(x \times \gamma \times H) \times H = 4122$

$x = 0.31$ //

$\Rightarrow x\gamma = 0.31 \times 120$

$= 37.2$ //

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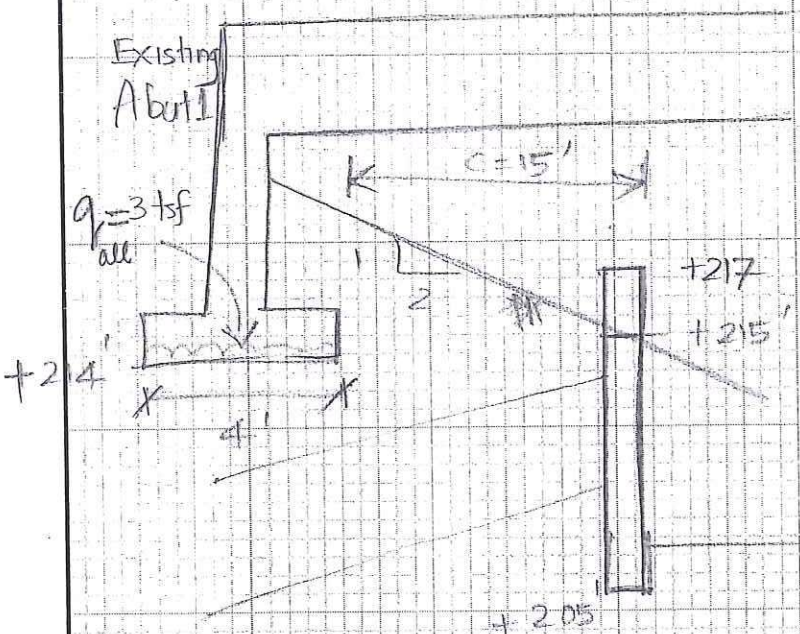
Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 1/17/12 Checked By Andy Date 2/8/12 Sheet 4 of 4

TIEBACK WALL 315L



* Pressure diagram is similar to the ones for 316R.

① ② ④

① ⇒ $P_a = \frac{0.72 k_0 \gamma H^2}{H - \frac{1}{2}H_1 - \frac{1}{2}H_2} = \frac{3.6 H^2}{H - \frac{1}{2}H_1 - \frac{1}{3}H_2}$ for wall 315L

② & ④ can be computed using similar approach as shown in 316R

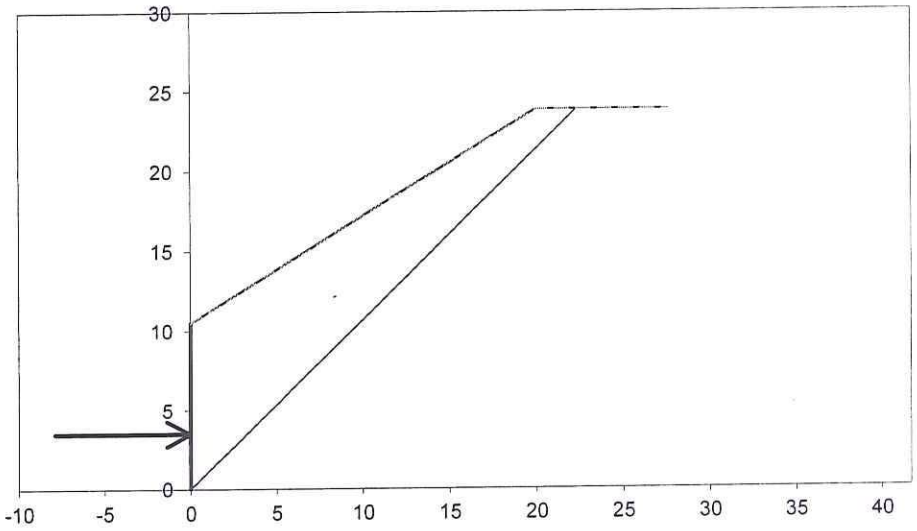
Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.040
T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0				loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	20.0	ft
i =	33.69	deg =	0.588	radians	tension crack depth =	0.00	ft
H =	10.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	46.8536	deg	0.81775	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	15,945	lbs/ft		
θ =	0.000	deg =	0	radians
L =	32.666	ft		
criteria:	0.64			



Solution: Update!

P_{AEH} =	3,073	lbs (horizontal active force)
K_{AEH} =	0.465	horizontal active force coefficient
P_{AE} =	3,073	lbs (total active force)
K_{AE} =	0.465	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

RW 316R - Static @ Bridge

3/13/2012

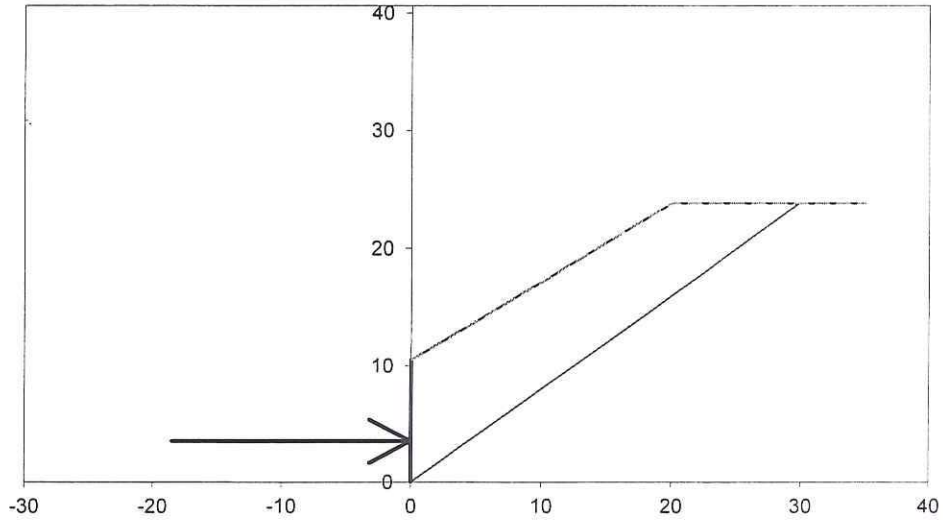
Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.040

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	20.0	ft
i =	33.69	deg =	0.588	radians	tension crack depth =	0.00	ft
H =	10.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		
α_{AE} =	38.5981	deg	0.67366	radians			
ΔW_{load} =	0	lbs/ft					
ΔW_{Tc} =	0	lbs/ft					
W =	26,696	lbs/ft					
θ =	11.200	deg =	0.19547	radians			
L =	38.203	ft					
criteria:	0.44						



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	7,195	lbs (horizontal active force)
K_{AEH} =	1.088	horizontal active force coefficient
P_{AE} =	7,195	lbs (total active force)
K_{AE} =	1.088	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

RW 316R - Seismic @ Bridge

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

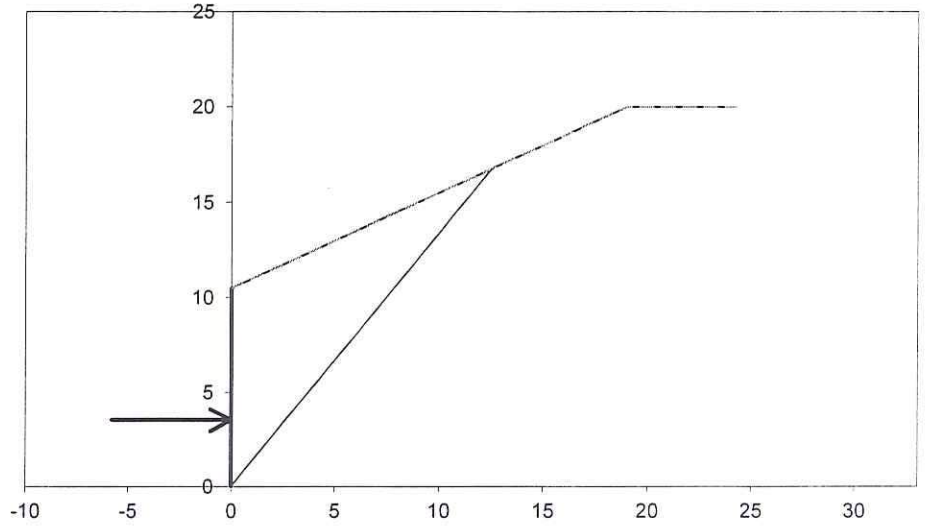
c/γh= 0.040

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0				loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	19.0	ft
i =	26.56	deg =	0.46356	radians	tension crack depth =	0.00	ft
H =	10.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	53.2460	deg	0.92932	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	7,884	ibs/ft		
θ =	0.000	deg =	0	radians
L =	20.913	ft		
criteria:	0.64			



Solution: Update!

P_{AEH} =	2,256	lbs (horizontal active force)
K_{AEH} =	0.341	horizontal active force coefficient
P_{AE} =	2,256	lbs (total active force)
K_{AE} =	0.341	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

RW 315L - Static @ Bridge

3/13/2012

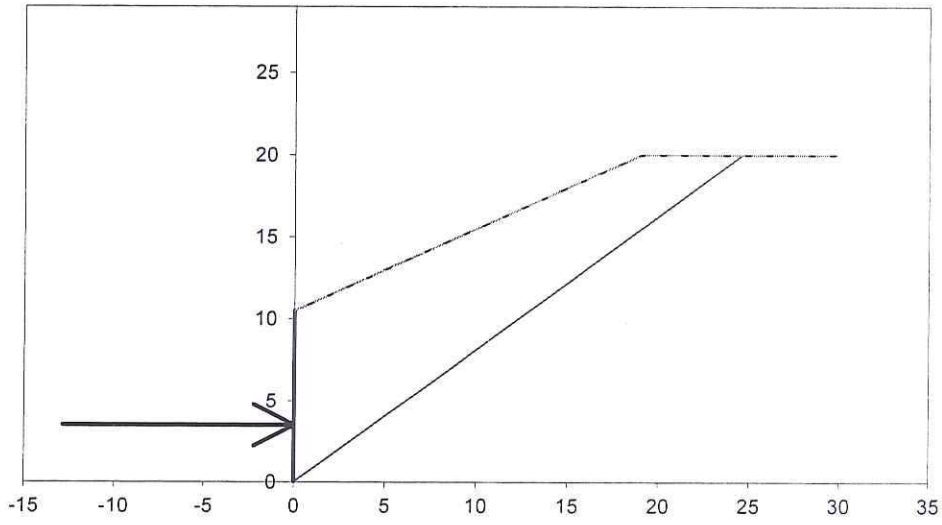
Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	19.0	ft
i =	26.56	deg =	0.46356	radians	tension crack depth =	0.00	ft
H =	10.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		
α_{AE} =	39.1314	deg	0.68297	radians			
ΔW_{load} =	0	lbs/ft					
ΔW_{Tc} =	0	lbs/ft					
W =	18,665	lbs/ft					
θ =	11.200	deg =	0.19547	radians			
L =	31.687	ft					
criteria:	0.44						

c/γh= 0.040

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	4,991	lbs (horizontal active force)
K_{AEH} =	0.754	horizontal active force coefficient
P_{AE} =	4,991	lbs (total active force)
K_{AE} =	0.754	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

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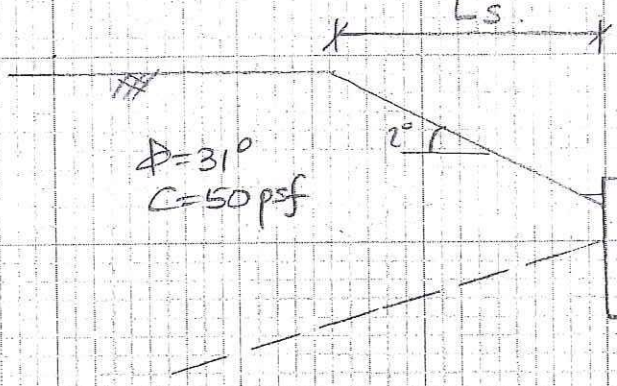
Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 2/17/12 Checked By Andy Date 2/21/12 Sheet 1 of 2

Tieback Walls with a single level of anchors



$$P_a = \frac{P_{Total}}{2/3 H}$$

$$P_{Total} \geq 1.44\, P_a$$

$$\geq 0.72 K_a \gamma H^2$$

$$\geq 86.4\, K_a H^2$$

$H_{max} = 7.5'$

Tieback Wall 316R

Sections 16+30, 16+60, 18+50, and 19+00 were provided

Sta.	i	Ls	Static		Seismic		x
			Ka	PA (lb)	Kae	PAE (lb)	
16+30	21.3°	56'	0.255	860	0.513	1730	0.13
16+60	27.5°	34'	0.290	980	0.984	2343	0.35
18+50	20°	60'	0.249	841	0.488	1647	0.12
19+00	15.7°	78'	0.233	787	0.429	1449	0.10

Seismic Incremented pressure $= \left[x \times (\gamma H) \right] \times H$

Note: ① $H_{max} = 7.5'$ was used in the analyses.

② $K_h = \frac{1}{2}$ PGA was used in seismic analyses

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

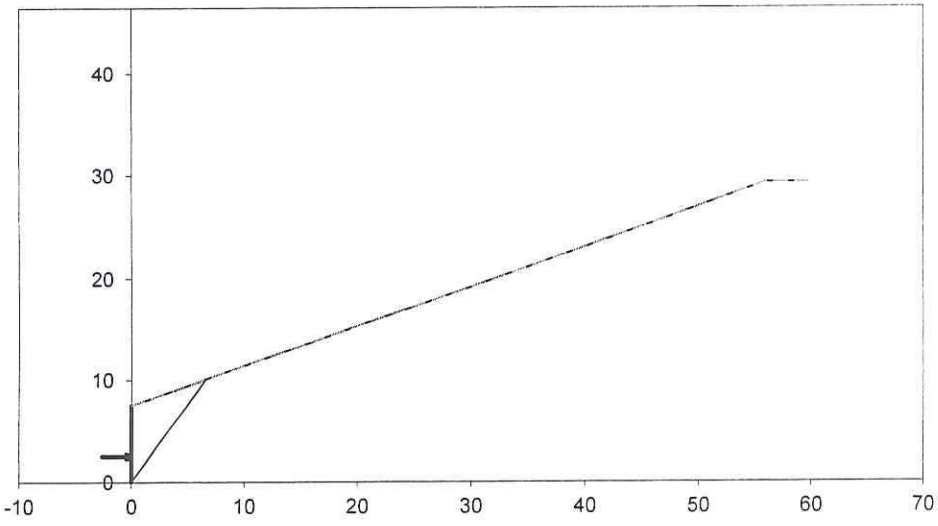
c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0				loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	56.0	ft
i =	21.26	deg =	0.37106	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	56.7112	deg	0.9898	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	2,976	lbs/ft		
θ =	0.000	deg =	0	radians
L =	12.051	ft		
criteria:	0.66			



Solution: Update!

P_{AEH} =	860	lbs (horizontal active force)
K_{AEH} =	0.255	horizontal active force coefficient
P_{AE} =	860	lbs (total active force)
K_{AE} =	0.255	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

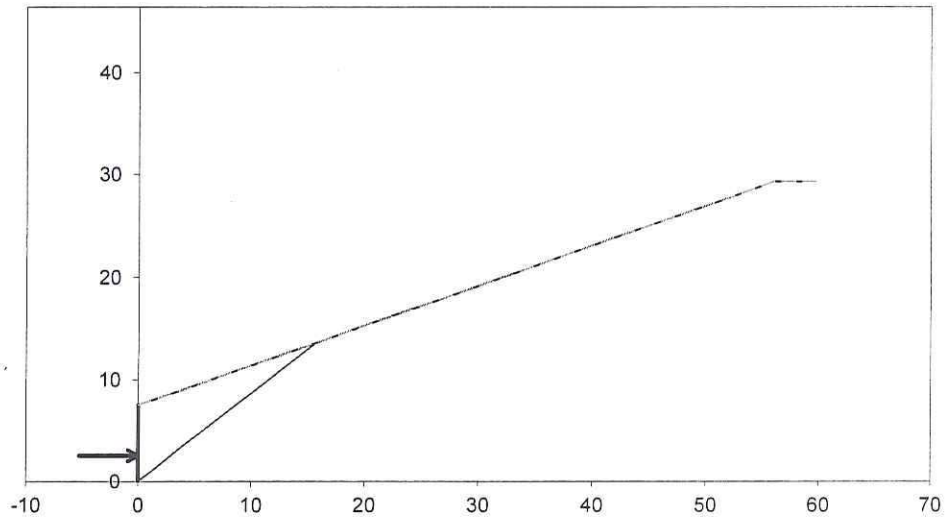
Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	56.0	ft
i =	21.26	deg =	0.37106	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		
α_{AE} =	40.8996	deg	0.71383	radians			
ΔW_{load} =	0	lbs/ft					
ΔW_{Tc} =	0	lbs/ft					
W =	7,073	lbs/ft					
θ =	11.200	deg =	0.19547	radians			
L =	20.796	ft					
criteria:	0.46						



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	1,730	lbs (horizontal active force)
K_{AEH} =	0.513	horizontal active force coefficient
P_{AE} =	1,730	lbs (total active force)
K_{AE} =	0.513	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

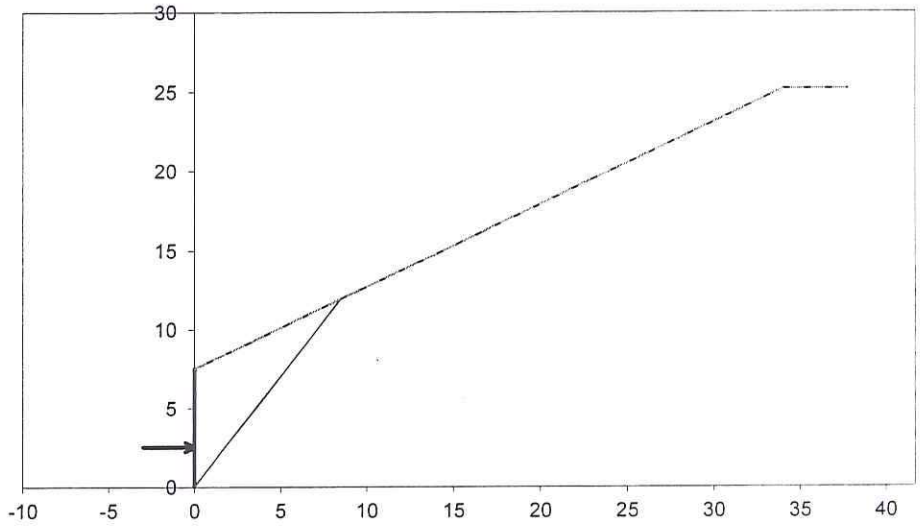
c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0				loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	34.0	ft
i =	27.5	deg =	0.47997	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	54.4862	deg	0.95096	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	3,832	lbs/ft		
θ =	0.000	deg =	0	radians
L =	14.660	ft		
criteria:	0.66			



Solution: Update!

P_{AEH} =	980	lbs (horizontal active force)
K_{AEH} =	0.290	horizontal active force coefficient
P_{AE} =	980	lbs (total active force)
K_{AE} =	0.290	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	34.0	ft
i =	27.5	deg =	0.47997	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians			

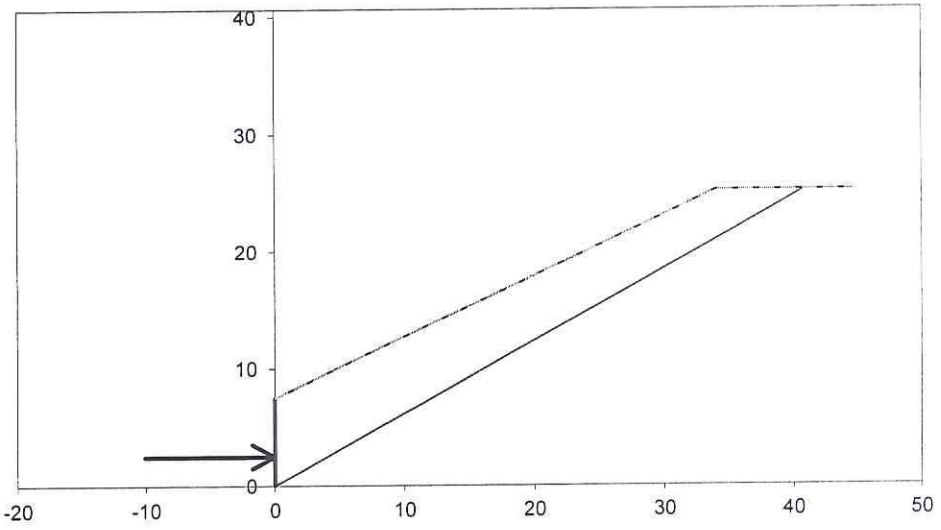
Note: distances for loading and slope measured horizontally from top of wall.

c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

α_{AE} =	31.6659	deg	0.55267	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	25,665	lbs/ft		
θ =	11.200	deg =	0.19547	radians
L =	48.002	ft		
criteria:	0.46			



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	3,323	lbs (horizontal active force)
K_{AEH} =	0.984	horizontal active force coefficient
P_{AE} =	3,323	lbs (total active force)
K_{AE} =	0.984	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

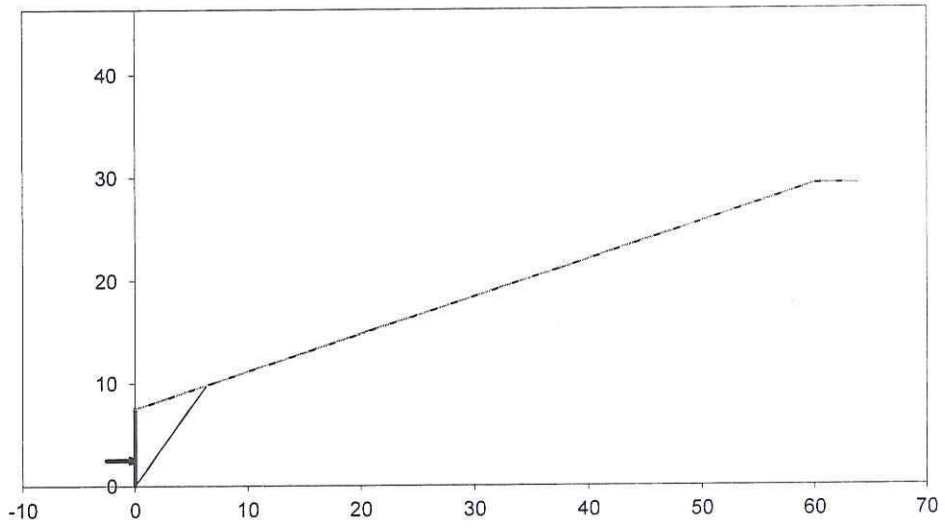
c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0				loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	60.0	ft
i =	20	deg =	0.34907	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	57.0537	deg	0.99577	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	2,862	lbs/ft		
θ =	0.000	deg =	0	radians
L =	11.696	ft		
criteria:	0.66			



Solution: Update!

P_{AEH} =	841	lbs (horizontal active force)
K_{AEH} =	0.249	horizontal active force coefficient
P_{AE} =	841	lbs (total active force)
K_{AE} =	0.249	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

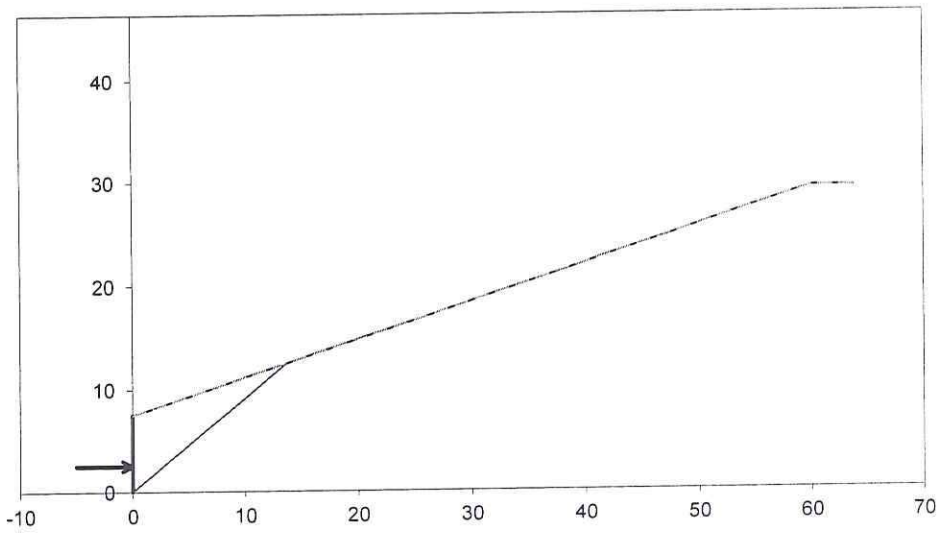
Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056
T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	60.0	ft
i =	20	deg =	0.34907	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	42.3618	deg	0.73935	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	6,159	lbs/ft		
θ =	11.200	deg =	0.19547	radians
L =	18.524	ft		
criteria:	0.46			



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	1,647	lbs (horizontal active force)
K_{AEH} =	0.488	horizontal active force coefficient
P_{AE} =	1,647	lbs (total active force)
K_{AE} =	0.488	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056
T_c (ft) 1.473

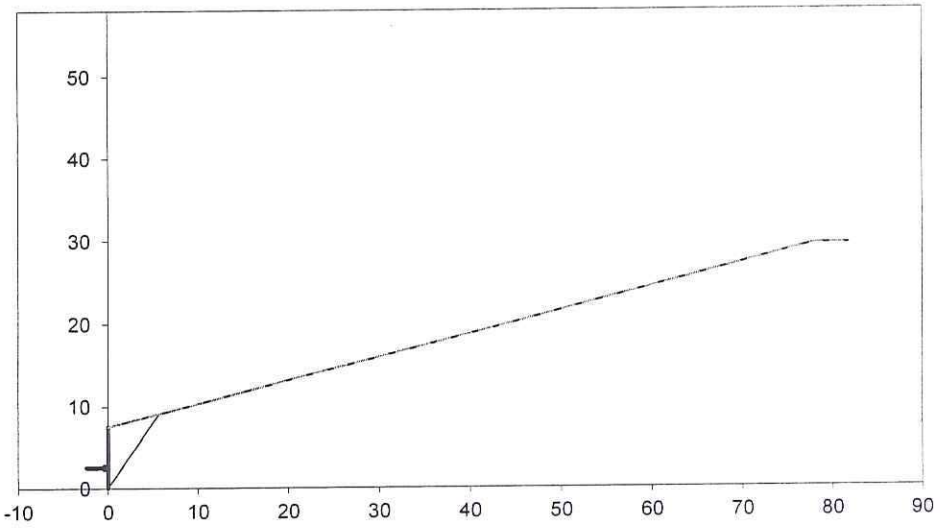
$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians
c =	50	psf		
k_h =	0			
k_v =	0			
β =	0	deg =	0	radians
i =	15.7	deg =	0.27402	radians
H =	7.5	ft		
γ =	120	pcf		
δ =	0	deg =	0	radians

adhesion (c_a):	0	psf
loading, start:	0	ft
loading, end:	0	ft
loading, magnitude:	0	psf
slope length, L_s =	78.0	ft
tension crack depth =	0.00	ft
water-filled tension crack?	no	
unit weight of water:	62.4	psf

Note: distances for loading and slope measured horizontally from top of wall.

α_{AE} =	58.0553	deg	1.01326	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	2,552	lbs/ft		
θ =	0.000	deg =	0	radians
L =	10.717	ft		
criteria:	0.66			



Solution: Update!

P_{AEH} =	787	lbs (horizontal active force)
K_{AEH} =	0.233	horizontal active force coefficient
P_{AE} =	787	lbs (total active force)
K_{AE} =	0.233	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

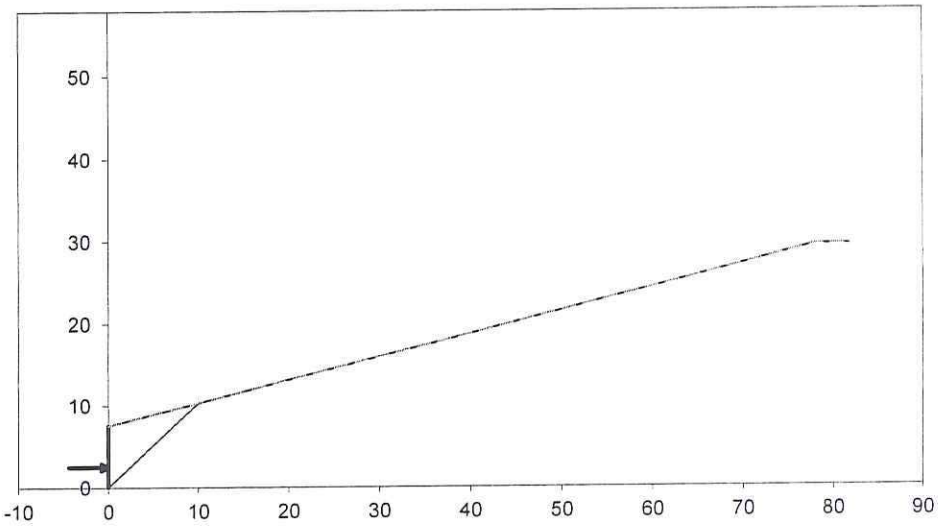
Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	78.0	ft
i =	15.7	deg =	0.27402	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		
α_{AE} =	45.9053	deg	0.8012	radians			
ΔW_{load} =	0	lbs/ft					
ΔW_{Tc} =	0	lbs/ft					
W =	4,494	lbs/ft					
θ =	11.200	deg =	0.19547	radians			
L =	14.351	ft					
criteria:	0.46						



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	1,449	lbs (horizontal active force)
K_{AEH} =	0.429	horizontal active force coefficient
P_{AE} =	1,449	lbs (total active force)
K_{AE} =	0.429	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 2/17/12 Checked By Andy Date 2/21/12 Sheet 2 of 2

Tieback Wall 315L

Sections 15+30, 15+60, 17+10, and 17+40 were provided.

Sta.	i	Ls	Static		Seismic		α
			Ka	P_A (lb)	Kae	P_{AE} (lb)	
15+30	18.5°	30'	0.243	821	0.464	1567	0.11
15+60	21.7°	23'	0.257	867	0.523	1764	0.13
17+10	26.2°	22'	0.281	950	0.743	2509	0.23
17+40	15.4°	39'	0.232	784	0.426	1439	0.10

Note: H_{max} = 7.5' was used in the analyses.

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

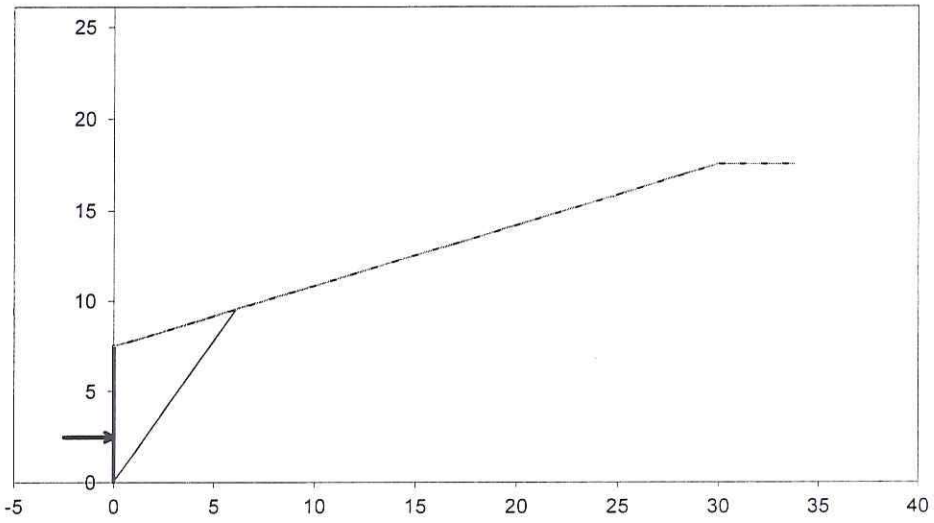
ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0				loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	30.0	ft
i =	18.5	deg =	0.32289	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	57.4296	deg	1.00234	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	2,742	lbs/ft		
θ =	0.000	deg =	0	radians
L =	11.319	ft		
criteria:	0.66			

Solution: Update!

P_{AEH} =	821	lbs (horizontal active force)
K_{AEH} =	0.243	horizontal active force coefficient
P_{AE} =	821	lbs (total active force)
K_{AE} =	0.243	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$



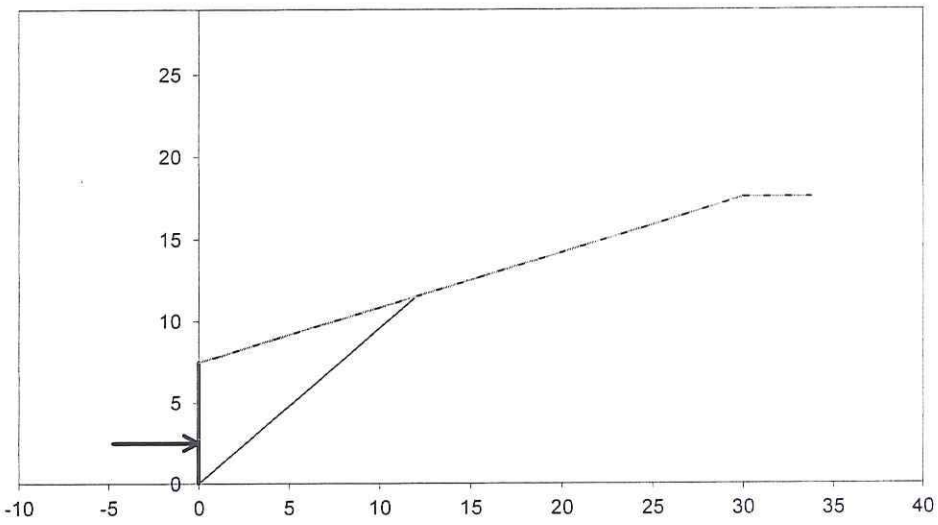
Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	30.0	ft
i =	18.5	deg =	0.32289	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		
α_{AE} =	43.7966	deg	0.76439	radians			
ΔW_{load} =	0	lbs/ft					
ΔW_{Tc} =	0	lbs/ft					
W =	5,406	lbs/ft					
θ =	11.200	deg =	0.19547	radians			
L =	16.645	ft					
criteria:	0.46						



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	1,567	lbs (horizontal active force)
K_{AEH} =	0.464	horizontal active force coefficient
P_{AE} =	1,567	lbs (total active force)
K_{AE} =	0.464	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056
T_c (ft) 1.473

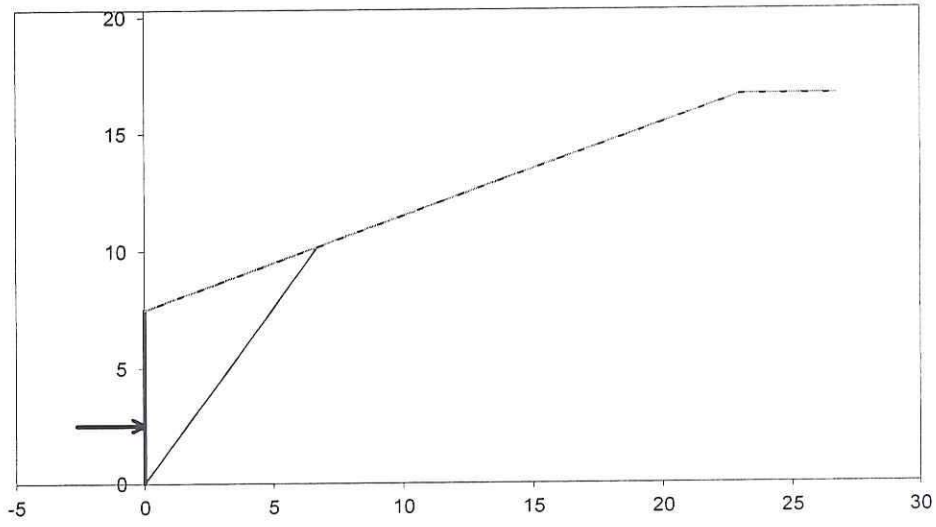
$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians
c =	50	psf		
k_h =	0			
k_v =	0			
β =	0	deg =	0	radians
i =	21.7	deg =	0.37874	radians
H =	7.5	ft		
γ =	120	pcf		
δ =	0	deg =	0	radians

adhesion (c_a):	0	psf
loading, start:	0	ft
loading, end:	0	ft
loading, magnitude:	0	psf
slope length, L_s =	23.0	ft
tension crack depth =	0.00	ft
water-filled tension crack?	no	
unit weight of water:	62.4	psf

Note: distances for loading and slope measured horizontally from top of wall.

α_{AE} =	56.5852	deg	0.9876	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	3,019	lbs/ft		
θ =	0.000	deg =	0	radians
L =	12.184	ft		
criteria:	0.66			



Solution: Update!

P_{AEH} =	867	lbs (horizontal active force)
K_{AEH} =	0.257	horizontal active force coefficient
P_{AE} =	867	lbs (total active force)
K_{AE} =	0.257	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

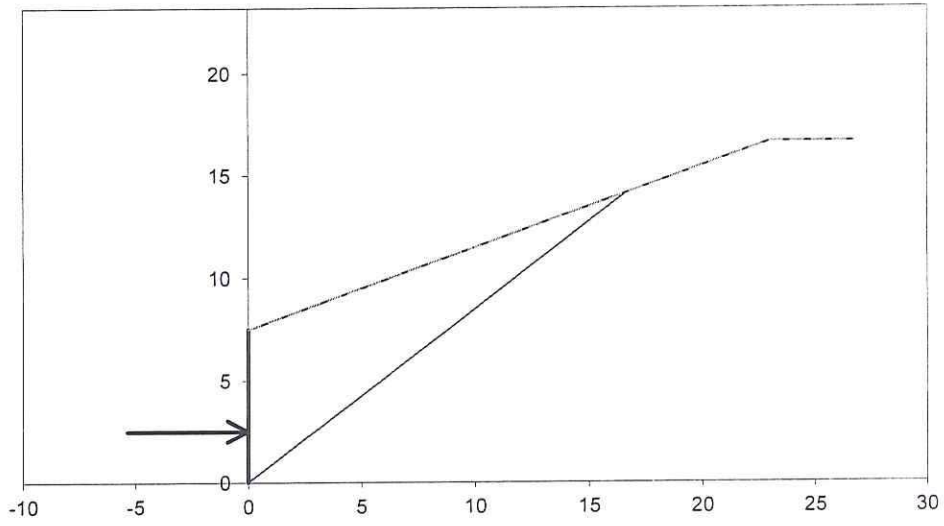
c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	23.0	ft
i =	21.7	deg =	0.37874	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	40.3130	deg	0.70359	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	7,492	lbs/ft		
θ =	11.200	deg =	0.19547	radians
L =	21.833	ft		
criteria:	0.46			



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	1,764	lbs (horizontal active force)
K_{AEH} =	0.523	horizontal active force coefficient
P_{AE} =	1,764	lbs (total active force)
K_{AE} =	0.523	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056
T_c (ft) 1.473

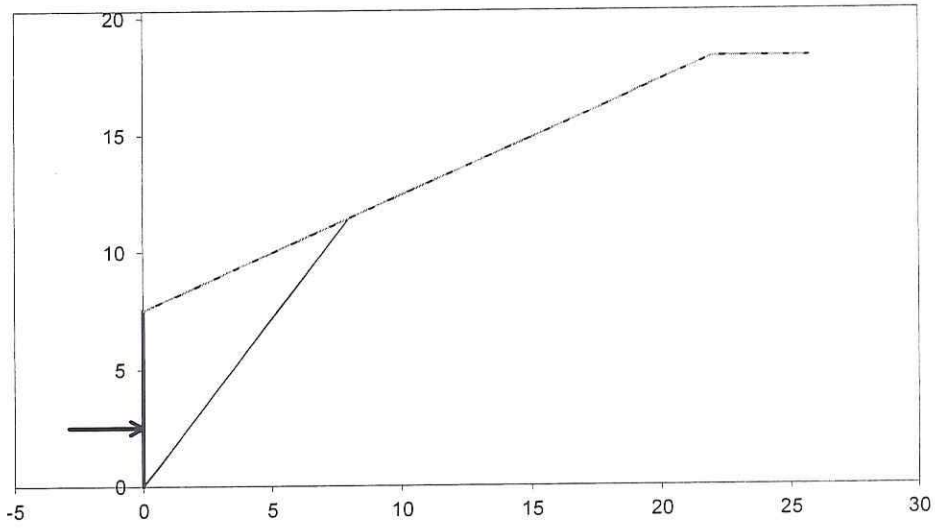
$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians
c =	50	psf		
k_h =	0			
k_v =	0			
β =	0	deg =	0	radians
i =	26.2	deg =	0.45728	radians
H =	7.5	ft		
γ =	120	pcf		
δ =	0	deg =	0	radians

adhesion (c_a):	0	psf
loading, start:	0	ft
loading, end:	0	ft
loading, magnitude:	0	psf
slope length, L_s =	22.0	ft
tension crack depth =	0.00	ft
water-filled tension crack?	no	
unit weight of water:	62.4	psf

Note: distances for loading and slope measured horizontally from top of wall.

α_{AE} =	55.0452	deg	0.96072	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	3,596	lbs/ft		
θ =	0.000	deg =	0	radians
L =	13.949	ft		
criteria:	0.66			



Solution: Update!

P_{AEH} =	950	lbs (horizontal active force)
K_{AEH} =	0.281	horizontal active force coefficient
P_{AE} =	950	lbs (total active force)
K_{AE} =	0.281	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

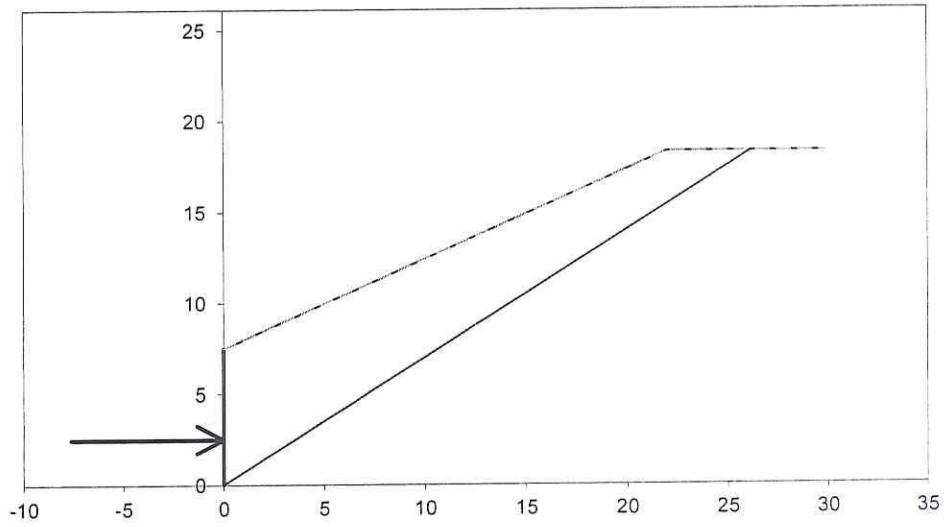
Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056
T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0.198	**(Use 0.5 PGA or higher)**			loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	22.0	ft
i =	26.2	deg =	0.45728	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	35.0086	deg	0.61102	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	14,477	lbs/ft		
θ =	11.200	deg =	0.19547	radians
L =	31.942	ft		
criteria:	0.46			



Solution: Update!

These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	2,509	lbs (horizontal active force)
K_{AEH} =	0.743	horizontal active force coefficient
P_{AE} =	2,509	lbs (total active force)
K_{AE} =	0.743	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$

Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

c/γh= 0.056

T_c (ft) 1.473

$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

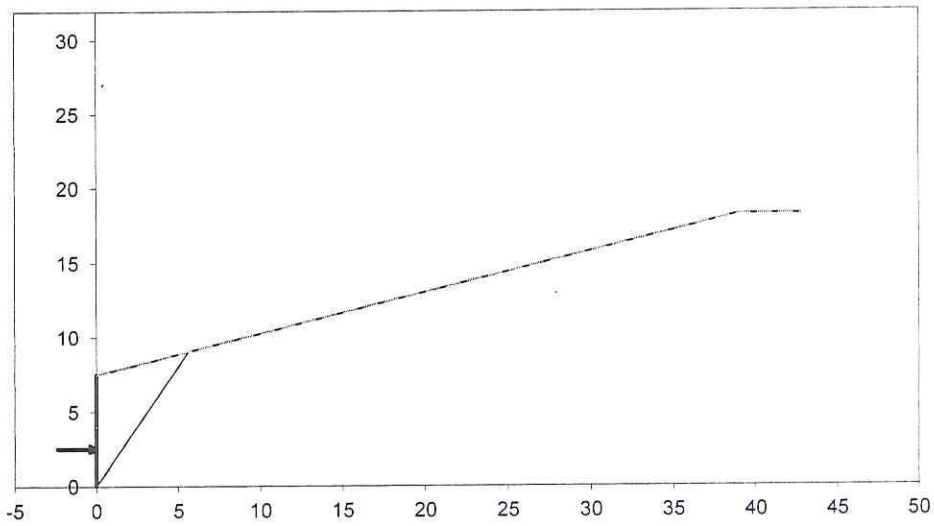
ϕ =	31	deg =	0.54105	radians	adhesion (c_a):	0	psf
c =	50	psf			loading, start:	0	ft
k_h =	0				loading, end:	0	ft
k_v =	0				loading, magnitude:	0	psf
β =	0	deg =	0	radians	slope length, L_s =	39.0	ft
i =	15.4	deg =	0.26878	radians	tension crack depth =	0.00	ft
H =	7.5	ft			water-filled tension crack?	no	
γ =	120	pcf			unit weight of water:	62.4	psf
δ =	0	deg =	0	radians	Note: distances for loading and slope measured horizontally from top of wall.		

α_{AE} =	58.1173	deg	1.01434	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	2,533	lbs/ft		
θ =	0.000	deg =	0	radians
L =	10.659	ft		
criteria:	0.66			

Solution: Update!

P_{AEH} =	784	lbs (horizontal active force)
K_{AEH} =	0.232	horizontal active force coefficient
P_{AE} =	784	lbs (total active force)
K_{AE} =	0.232	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$



Seismic Earth Pressure, Trial wedge method, (c, ϕ) material

ϕ =	31	deg =	0.54105	radians
c =	50	psf		
k_h =	0.198	**(Use 0.5 PGA or higher)**		
k_v =	0			
β =	0	deg =	0	radians
i =	15.4	deg =	0.26878	radians
H =	7.5	ft		
γ =	120	pcf		
δ =	0	deg =	0	radians
α_{AE} =	46.0995	deg	0.80459	radians
ΔW_{load} =	0	lbs/ft		
ΔW_{Tc} =	0	lbs/ft		
W =	4,419	lbs/ft		
θ =	11.200	deg =	0.19547	radians
L =	14.163	ft		
criteria:	0.46			

adhesion (c_a):	0	psf
loading, start:	0	ft
loading, end:	0	ft
loading, magnitude:	0	psf
slope length, L_s =	39.0	ft
tension crack depth =	0.00	ft
water-filled tension crack?	no	
unit weight of water:	62.4	psf

Note: distances for loading and slope measured horizontally from top of wall.

c/γh= 0.056

T_c (ft) 1.473

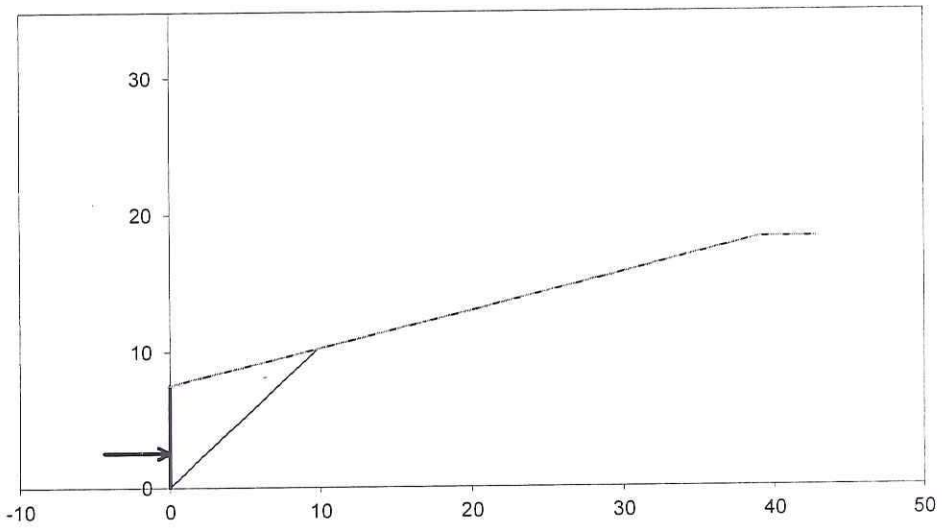
$$T_c = \frac{2c}{\gamma\sqrt{\tan^2\left(\frac{\pi}{4}-\frac{\phi}{2}\right)}}$$

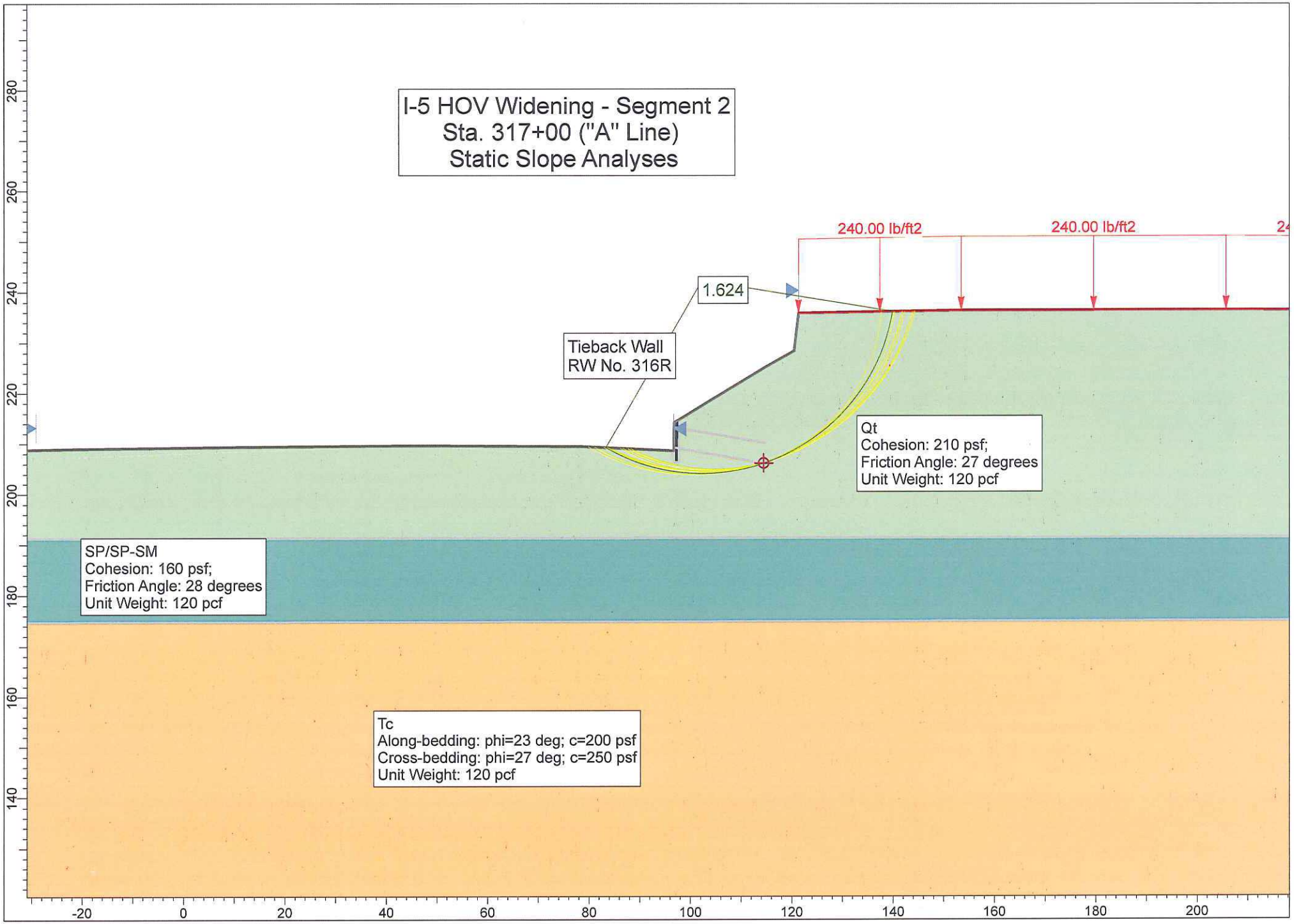
Solution: Update!

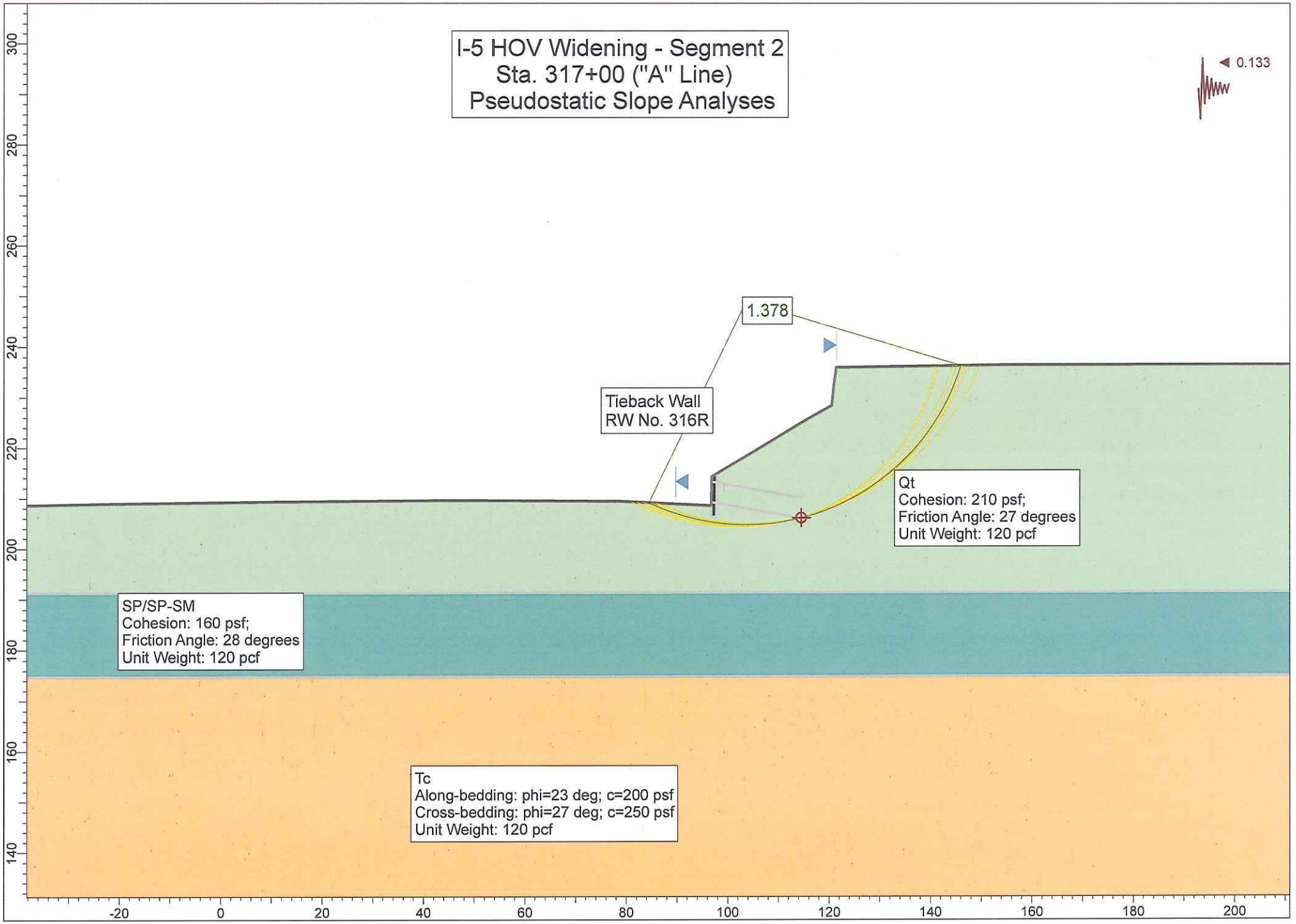
These are TOTAL seismic forces (NOT incremental)

P_{AEH} =	1,439	lbs (horizontal active force)
K_{AEH} =	0.426	horizontal active force coefficient
P_{AE} =	1,439	lbs (total active force)
K_{AE} =	0.426	total active force coefficient

Note: $P_{AE} = \frac{1}{2} K_{AE} \lambda H^2 (1 - k_v)$




I-5 HOV Widening - Segment 2
Sta. 317+00 ("A" Line)
Static Slope Analyses
240.00 lb/ft2
240.00 lb/ft2
1.624
Tieback Wall
RW No. 316R
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
SP/SP-SM
Cohesion: 160 psf;
Friction Angle: 28 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
280
260
240
220
200
180
160
140
-20
0
20
40
60
80
100
120
140
160
180
200


I-5 HOV Widening - Segment 2
Sta. 317+00 ("A" Line)
Pseudostatic Slope Analyses
0.133
1.378
Tieback Wall
RW No. 316R
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
SP/SP-SM
Cohesion: 160 psf;
Friction Angle: 28 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
280
260
240
220
200
180
160
140
-20
0
20
40
60
80
100
120
140
160
180
200

Appendix D

California Department of Transportation Review Comments and EMI Responses

EXTERNAL SUBMITTAL REVIEW

PROJECT: INTERSTATE 5 HOV IMPROVEMENT
PROJECT No. 1200020278

EA No.: 12-0F96C	
Agency: CalTrans	
Submittal No.	Title: FR for RW315L and RW316R (I-5 HOV, Segment 2) by EMI, 4/24/2012

Lead:	Date: 8/8/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review
30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only
CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal
FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER				For RFC Use Only	
								FILLED OUT AT RESOLUTION MEETING			
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
1	Page 13, Section 5.3	H.Liu	1	Please specify the top and bottom elevations of both tieback walls and other wall information in this section of the main report.	RI		The report text will be revised to include description of the top and bottom elevations of the walls.					
2	Page 13, Section 5.3.1, Table 3	H.Liu	2	Please specify the existing footing width and its horizontal distance to the proposed wall in the table, or Section 5.3.1 of the report	RI		The report will be revised to include a description of the existing footing including width and distance from the proposed tieback walls.					
3	Page 13, Section 5.3.1	H.Liu	3	Please attach swell pressure test results on related soil samples to the Appendix B of this report.	RI		The swell pressure test results will be provided in Appendix B of the Final report.					
4	PP 21, 24, Sections 5.3.2 and 6.3	H.Liu	4	Due to the existance of abutment footing, the critical failure plane may not follow the Rankine wedge that is 30 degrees from vertical. Please re-evaluate the critical failure surface considering additional driving force from existing foundation in dertermining the un-bonded length of ground anchor.	RI		We reevaluated the critical failure surface considering additional driving force from the existing foundation. The critical failure surface is 60 degrees from vertical.					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

EA No.: 12-0F96C	
Agency: CalTrans	
Submittal No.	Title: FR for RW315L and RW316R (I-5 HOV, Segment 2) by EMI, 4/24/2012

Lead:	Date: 8/8/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING			For RFC Use Only	
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
5	Page 21, Section 5.3.2.	H.Liu	5	Un-bonded length of the ground anchor should also be developed to certain distance beyond the potential shear plane (left wedge) for general bearing capacity failure of the existing footing. It can be specified in terms of horizontal distance from the edge of anchor zone to the existing footing, and presented in Section 5.3.2 of the report.	RI		As presented in NAVFAC design manual, the assumed general bearing capacity failure surface extends to an approximate vertical distance equal to the width of the footing. Therefore, for tiebacks located within this vertical distance equal to width (B) of the existing abutment footings (B = 4 feet for Abutment 1 and B = 5 feet for Abutment 3), the unbonded length should extend beyond an imaginary vertical plane coinciding with the centerline of the existing Abutment footings. This will extend the unbonded length beyond the left wedge. The report will be revised to include the above information.					
6	PP 22, 24Sections 5.3.4, and 6.3	H.Liu	6	The minimum spacing between ground anchor should be 5 feet based on Section 5.8.6.3 of Caltrans' BDS and MTD 5-12 (2012).	RI		The report will be revised to recommend a minimum spacing of 5 feet between anchors.					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

EA No.: 12-0F96C	
Agency: CalTrans	
Submittal No.	Title: FR for RW315L and RW316R (I-5 HOV, Segment 2) by EMI, 4/24/2012

Lead:	Date: 8/8/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

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FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING			For RFC Use Only	
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
7	Page 23, Section 6.2	H. Liu	7	Please define the wall zone for RW315L and RW316R as required by Caltrans' GDR Guidelines. This is fundamental for planning stability tests (Std Specs 19-3.01A(3)) for temporary excavation during wall construction.	RI		As mentioned in Section 6.2, the tieback walls should be constructed in segments (slot cuts). EMI recommends that the maximum length of tieback wall (i.e. wall zones), constructed at any given time, not exceed one-quarter of the length of the existing bridge foundation (for the portion of tieback wall underneath the bridge). Based on the geotechnical field investigation, the materials below the bottom of the existing footings are predominantly terrace deposits (lean clay). For the portion of tieback walls beyond the bridge footprint, the entire wall segment (in each quadrant) can be considered one wall zone. EMI will also include the following sentence in Section 6.2 of the report: "The stability tests for temporary excavation during wall construction should be performed in accordance with Caltrans Standard Specification Section 19-3.01A(3)(b)".					
8	Appendix A LOTBS	H. Liu	8	Please add route number for A-Line on boring location plans.	RI		The route number will be added to the LOTB sheets.					
9	Appendix B, Lab Test Results, Page 2 (B-1)	H.Liu	9	The sample soil for expansion index (E.I.) test was defined as CH, which is different from soil classification (CL) used in LOTB for the same soil (#A-11-258). Please verify and make it consistent.	RI		The soil classifications shown on the LOTB sheets are correct. The soil classification given in the EI table will be revised to show CL.					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

EA No.: 12-0F96C	
Agency: CalTrans	
Submittal No.	Title: FR for RW315L and RW316R (I-5 HOV, Segment 2) by EMI, 4/24/2012

Lead:	Date: 8/8/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER				For RFC Use Only	
								FILLED OUT AT RESOLUTION MEETING			
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
10	Appendix B, Lab Test Results, Page 2 (B-1)	H.Liu	10	Only the top soils above the top of proposed tieback wall were sampled for E.I. test. To justify the consideration of high swell pressure behind the wall, soil samples within future unbonded zone should be used for the E.I. test and subsequent swell pressure test.	RI		EMI evaluated the correlations between the swell test results and the Plasticity Index (PI) values of the tested earth materials. Based on our assessment of swell pressure versus PI, the recommended lateral swell pressure for the tieback walls will be reduced from 3 ksf to 2 ksf. Swell test results and PI values of the tested materials will be added to Appendix B.					
11	Appendix C Calculations	H.Liu	11	For global stability at STA 317+00 (tieback with bridge abutment), please include traffic loading on top of the slope for the analysis under static condition.	RI		Traffic loading will be included in the static stability analysis. The revised analysis will be provided in the Final report.					
12	General Comment	H.Liu	12	Please include structure/roadway plans (elevations and sections, showing bridge foundation) associated with the wall design in future submittal to assist our review.	RI		AECOM will send the project plans in future submittals.					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

November 30, 2012

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Addendum No. 1 for Final Structure Foundation Report, Tieback Walls (RW Nos. 315L and 316R) at Camino de Estrella Overcrossing (Bridge No. 55-0224); I-5 HOV Widening, Segment 2 Project City of San Clemente, Orange County, California 12-Ora-05, PM 5.8, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)***

Dear Mr. Montes:

Attached is Addendum No. 1 to the Final Structure Foundation Report (reference report) for the tieback walls proposed at the existing Camino de Estrella Overcrossing (OC) structure at the I-5 freeway. This addendum amends some of the language given in the reference report and provides some additional information on lateral pressures based on tieback wall review comments and Caltrans Specifications Branch review comments. This addendum is a supplement to the Final Structure Foundation Report and should be attached to the front of the Final Foundation Report. The review comments (shown in italics) and our responses are presented below.

Comments from Tieback Wall Review:

Comment 1: Couldn't find Ptotal calculated using stability analysis. I see the output of the seismic earth pressure Pae, by Trial wedge method.

Response: The output plot for determining P_{total} by stability analysis is attached. The stability analysis result shows that P_{total} determined by stability is less than 1.44Pa; so, use of P_{total} = 1.44Pa is appropriate.

Comment 2: Is the soil at the site cohesive? If so, why is the cohesionless equation used to calculate the pressure.

Response: The soils and terrace deposits at the site are cohesive however the soils and terrace deposits have long-term drained shear strengths that have friction angle and cohesion components. EMI used equations for both cohesive and cohesionless soils (as shown in the calculations given in the final report) and selected the larger value which happens to correspond with the cohesionless soil equation.

Comment 3: Please note that seismic soil pressures for anchor walls are trapezoidal.

Response: Acknowledged. EMI used a uniform distribution for lateral seismic pressure which is conservative and results in a slightly higher total lateral seismic force compared to a trapezoidal distribution.

Comments from Specifications Branch:

Comment 26: The Caltrans Seismic Design criteria should be referred to by the version number, not the year. Plans use v 1.6, FR reports should all match. The FR report for the tieback walls and Non-standard retaining walls lists 2009 version, FR report for the bridge lists 2010. All FR reports need to match plans.

Response: As indicated by the reviewer, Version 1.6 is the applicable Seismic Design Criteria for the project. The revision to the reference does not change any design recommendations given in the Final Structure Foundation Report. The 2009 SDC reference in the reference section of the Final report should be disregarded. The reference section of the Final Structure Foundation Report is amended to include the following reference:

California Department of Transportation, 2010. Seismic Design Criteria (SDC), Version 1.6, November.

Comment 27: All references in the FR's to "Caltrans BDS" are erroneous. The design standard should "AASHTO LRFD Bridge Design Specifications, 4th Edition with California Amendments" with the table and section references used updated accordingly.

Response: The Final Structure Foundation Report, for the proposed tieback walls, does not refer to Caltrans BDS. Therefore, the review comment is not applicable to the final report for the tieback walls.

REFERENCE: Earth Mechanics, Inc., 2012. Final Structure Foundation Report, Tieback Walls (RW Nos. 315L and 316R) at Camino de Estrella Overcrossing (Bridge No. 55-0224); I-5 HOV Widening, Segment 2 Project; City of San Clemente, Orange County, California; 12-Ora-05, PM 5.8, Caltrans Project No. 1200020278 (EA No. 12-0F96C01); September 21.

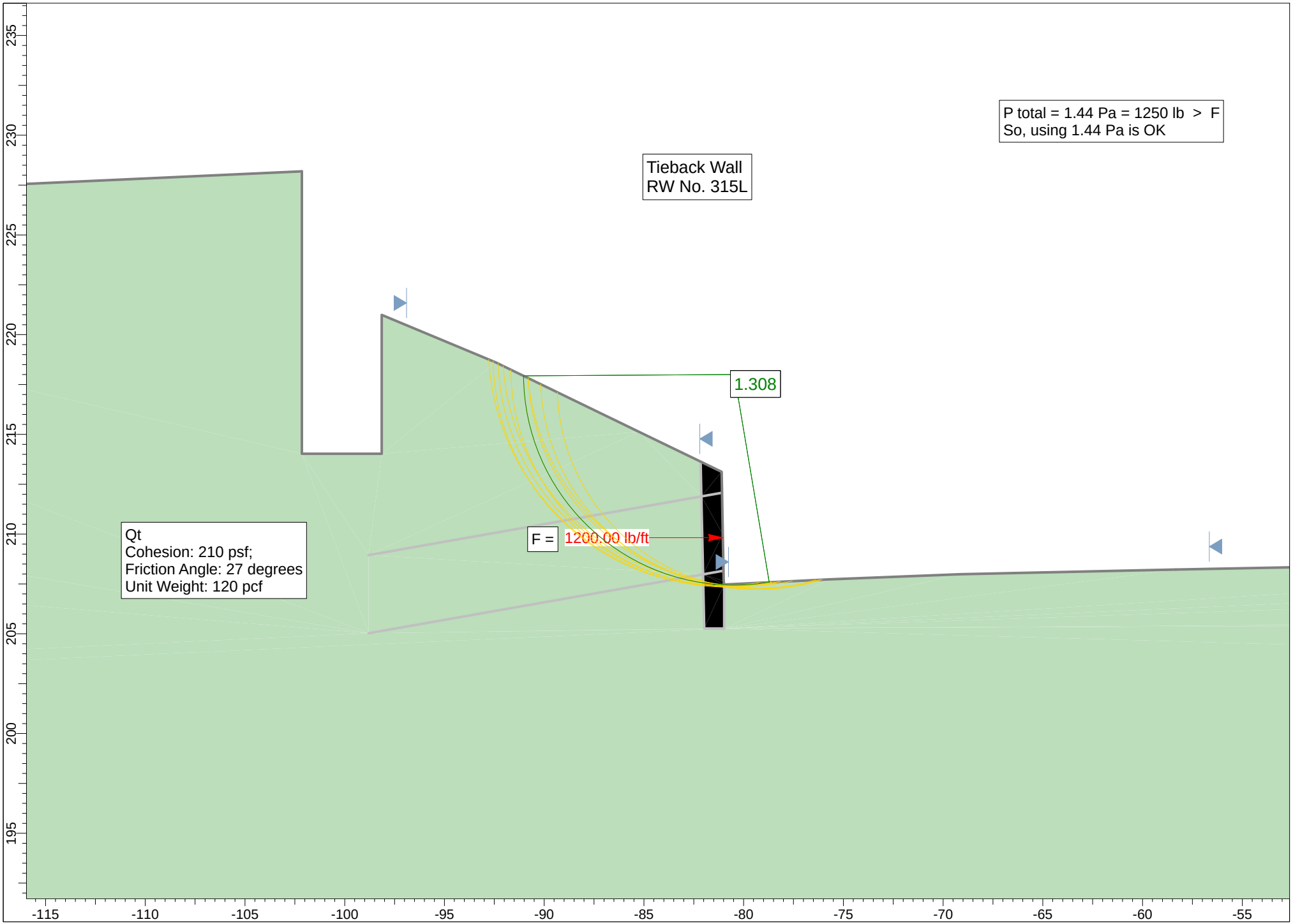
ATTACHMENT: Slope Stability Plot.

If you have any questions regarding the above information, please call our office.

Sincerely,
EARTH MECHANICS, INC.

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer


P total = 1.44 Pa = 1250 lb > F
So, using 1.44 Pa is OK
Tieback Wall
RW No. 315L
1.308
F =
1200.00 lb/ft
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
235
230
225
220
215
210
205
200
195
-115
-110
-105
-100
-95
-90
-85
-80
-75
-70
-65
-60
-55

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

April 5, 2013

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Addendum No. 2 for Final Structure Foundation Report, Tieback Walls (RW Nos. 315L and 316R) at Camino de Estrella Overcrossing (Bridge No. 55-0224); I-5 HOV Widening, Segment 2 Project City of San Clemente, Orange County, California 12-Ora-05, PM 5.8, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)***

Dear Mr. Montes:

This addendum is for the Approved Final Structure Foundation Report (reference report) for the tieback walls proposed at the existing Camino de Estrella Overcrossing (OC) structure at the I-5 freeway. This addendum provides additional geotechnical information for use by AECOM to evaluate the temporary sliding stability of shotcrete panels as the tieback walls are constructed.

Revised plans provided by AECOM (Attachment 1) show that the proposed structural shotcrete walls will include a small key above the tieback anchors (within each shotcrete lift). The plans shown the keys to be 6 inches tall and embedded 4 inches into the vertical face of the temporary cut; the keys should extend along the entire length of the walls. Based on a pressure of 1,500 psf (provided by AECOM) which will be induced against the back of the shotcrete walls due to the horizontal component of the anchor loads, an ultimate vertical resistance of 1,800 psf per foot of wall length is recommended for the proposed 4-inch deep keys; the resistance acts against the bottom of the keys. Calculations are provided in Attachment 2. The vertical resistance given above applies to both proposed tieback walls (RW Nos. 315L and 316R).

REFERENCE: Earth Mechanics, Inc., 2012. Final Structure Foundation Report, Tieback Walls (RW Nos. 315L and 316R) at Camino de Estrella Overcrossing (Bridge No. 55-0224); I-5 HOV Widening, Segment 2 Project; City of San Clemente, Orange County, California; 12-Ora-05, PM 5.8, Caltrans Project No. 1200020278 (EA No. 12-0F96C01); September 21.

ATTACHMENTS: 1. Revised plans showing shotcrete key for RW 315L (two sheets).
2. Calculation for key resistance.

If you have any questions regarding the above information, please call our office.

Sincerely,
EARTH MECHANICS, INC.

REGISTERED PROFESSIONAL ENGINEER
GNANAPRAGASAM J. GUNARANJAN
No. GE2970
Exp: 12-31-13
GEOTECHNICAL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ANDREW V. KORKOS
NO. 2357
EXP. 3/31/14
GEOTECHNICAL
STATE OF CALIFORNIA

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

17800 Newhope Street, Suite B, Fountain Valley, California 92708 Tel: (714) 751-3826 Fax: (714) 751-3928

ATTACHMENT 1

REVISED PLAN SHEETS

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	Ora	5			

Mchar 3/15/13
REGISTERED CIVIL ENGINEER DATE

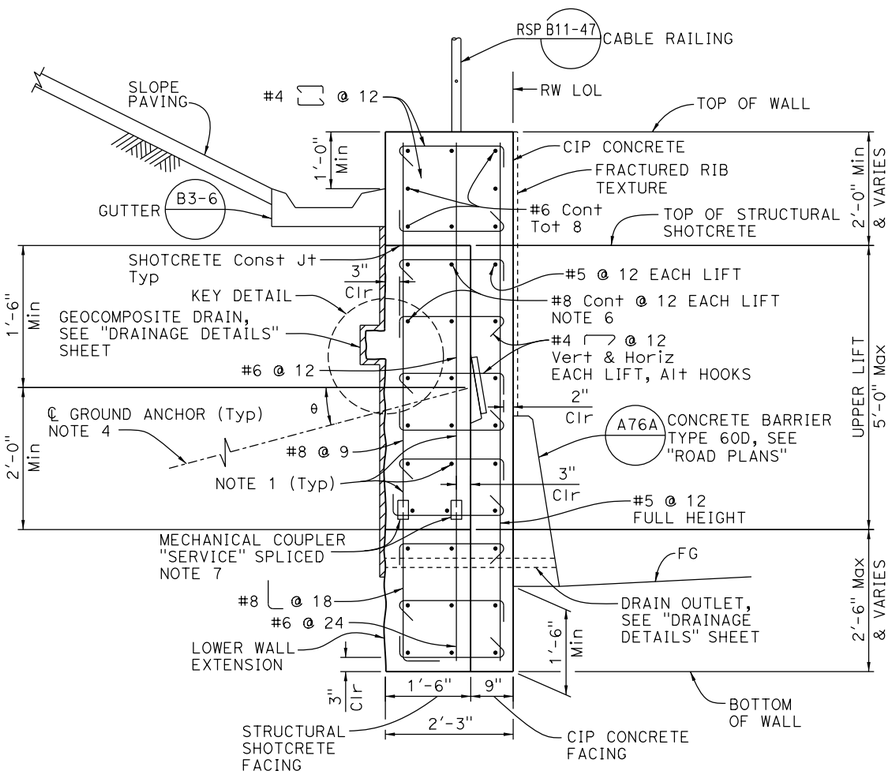
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — MOHAN S. CHAR No. 57894 Exp. 6/30/14 CIVIL — STATE OF CALIFORNIA

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

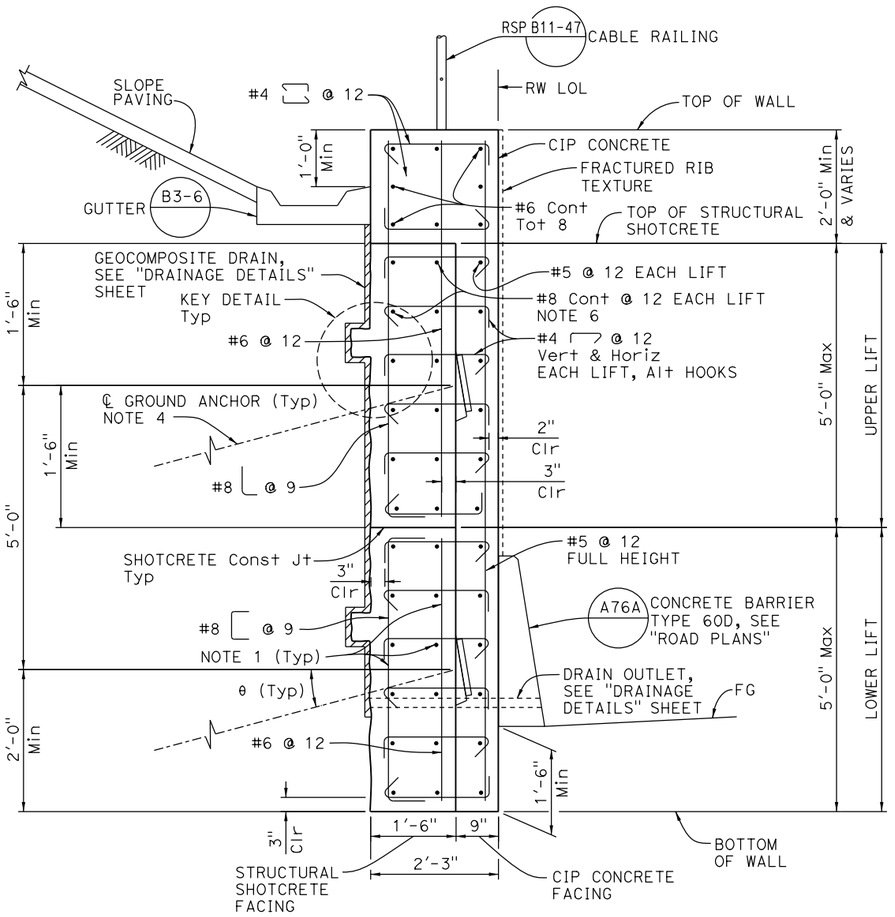
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 SOUTH MAIN STREET
ORANGE, CA 92863-1584

AECOM TECHNICAL SERVICES INC.
999 W. TOWN & COUNTRY ROAD
ORANGE, CALIFORNIA 92868



SECTION D-D

¾" = 1'-0



SECTION E-E

¾" = 1'-0

NOTES:

1. Adjust horizontal and vertical reinforcing spacing to avoid conflict with ground anchor assembly in structural shotcrete facing. Bars should not be shifted more than 6" from original position and the total number of bars must remain equal.
2. CIP concrete to be placed after completion of all structual shotcrete lifts.
3. Ground anchors shall be constructed and locked off one at a time beginning at the top and working down, in accordance with staging requirements.
4. For ground anchor inclination, see "STRUCTURE PLAN NO. 2" sheet.
5. All ground anchors within the upper lift shall be installed prior to commencing the lower lift excavations, in accordance with staging requirements.
6. #8 Cont @ 12 reinforcement shall be "Service" Spliced with mechanical couplers.
7. Where lower wall extensions are needed, extend reinforcing bars using mechanical couplers.
8. For "KEY DETAIL", see "RETAINING WALL DETAILS NO. 2" sheet.

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN DETAIL SHEET (ENGLISH) (REV.7/16/10)

	BY	CHECKED
DESIGN	M. Wise	D. Kim
DETAILS	H. Withers	D. Kim
QUANTITIES	M. Wise	D. Kim

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Mohan S. Char
PROJECT ENGINEER

BRIDGE NO. 55E0132
POST MILES 5.80

RETAINING WALL NO. 315L
RETAINING WALL DETAILS NO. 1

UNIT:
PROJECT NUMBER & PHASE: 1200020278 CONTRACT NO.: 12-0F96C1

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES				SHEET	OF
04-27-12	09-24-12	01-14-13	03-15-13	7	14

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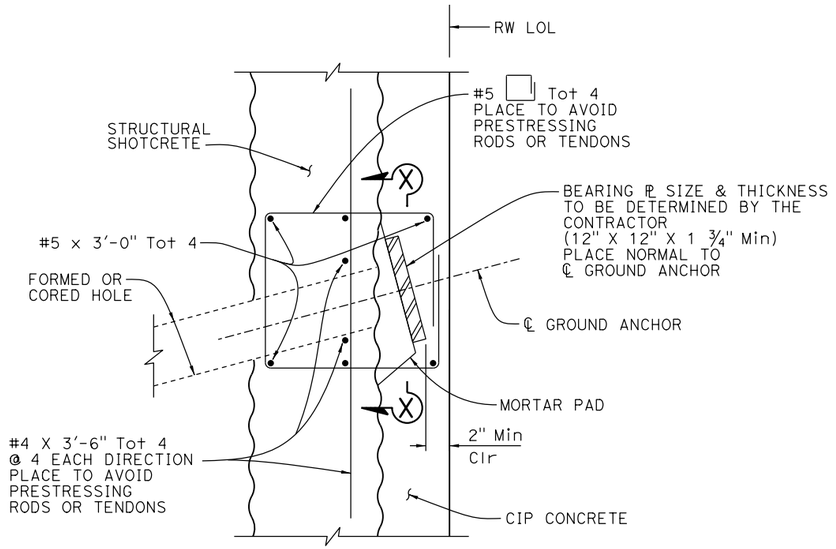
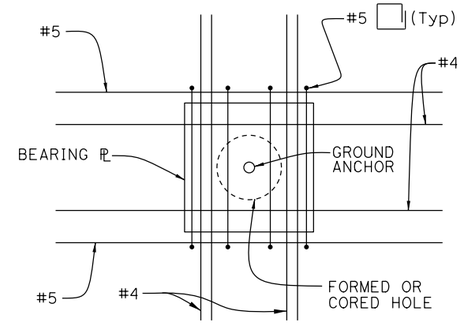
USERNAME => wwithersh DATE PLOTTED => 06-MAR-2013 TIME PLOTTED => 10:56



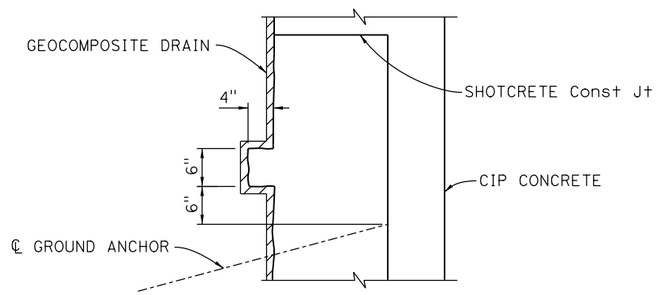
GROUND ANCHOR DETAILS

No Scale



SECTION X-X

No Scale

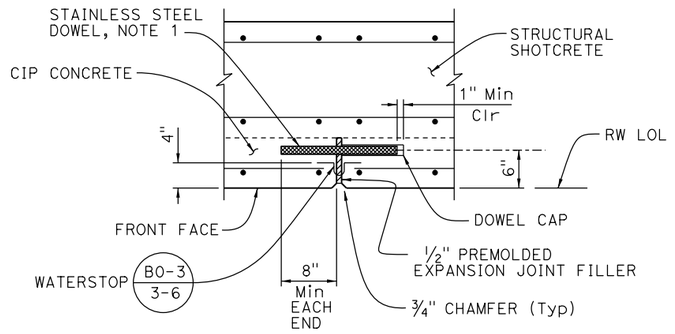


NOTE:

1. Reinforcing steel not shown for clarity.

KEY DETAIL

No Scale



NOTE:

1. Smooth stainless steel 1¼" Dia x 18" dowels @ 12" C-C after one end is cast into first pour debond full length of exposed dowel by coating with a debonding agent prior to the second pour. Provide cap for 1" minimum expansion.

EXPANSION JOINT DETAIL

No Scale

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	Ora	5			

Mkchar 3/15/13
REGISTERED CIVIL ENGINEER — DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — MOHAN S. CHAR — No. 57894 — Exp. 6/30/14 — CIVIL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 SOUTH MAIN STREET
ORANGE, CA 92863-1584

AECOM TECHNICAL SERVICES INC.
999 W. TOWN & COUNTRY ROAD
ORANGE, CALIFORNIA 92868

DESIGN	BY M. Wise	CHECKED D. Kim	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
DETAILS	BY H. Withers	CHECKED D. Kim	
QUANTITIES	BY M. Wise	CHECKED D. Kim	

DESIGN OVERSIGHT

SIGN OFF DATE

Mohan S. Char
PROJECT ENGINEER

BRIDGE NO. 55E0132
POST MILES 5.80

RETAINING WALL NO. 315L
RETAINING WALL DETAILS NO. 2

DESIGN DETAIL SHEET (ENGLISH) (REV.7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020278
CONTRACT NO.: 12-0F96C1

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES				SHEET	OF
04-27-12	09-24-12	01-14-13	03-15-13	8	14

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USERNAME => wthersh DATE PLOTTED => 06-MAR-2013 TIME PLOTTED => 10:56

ATTACHMENT 2

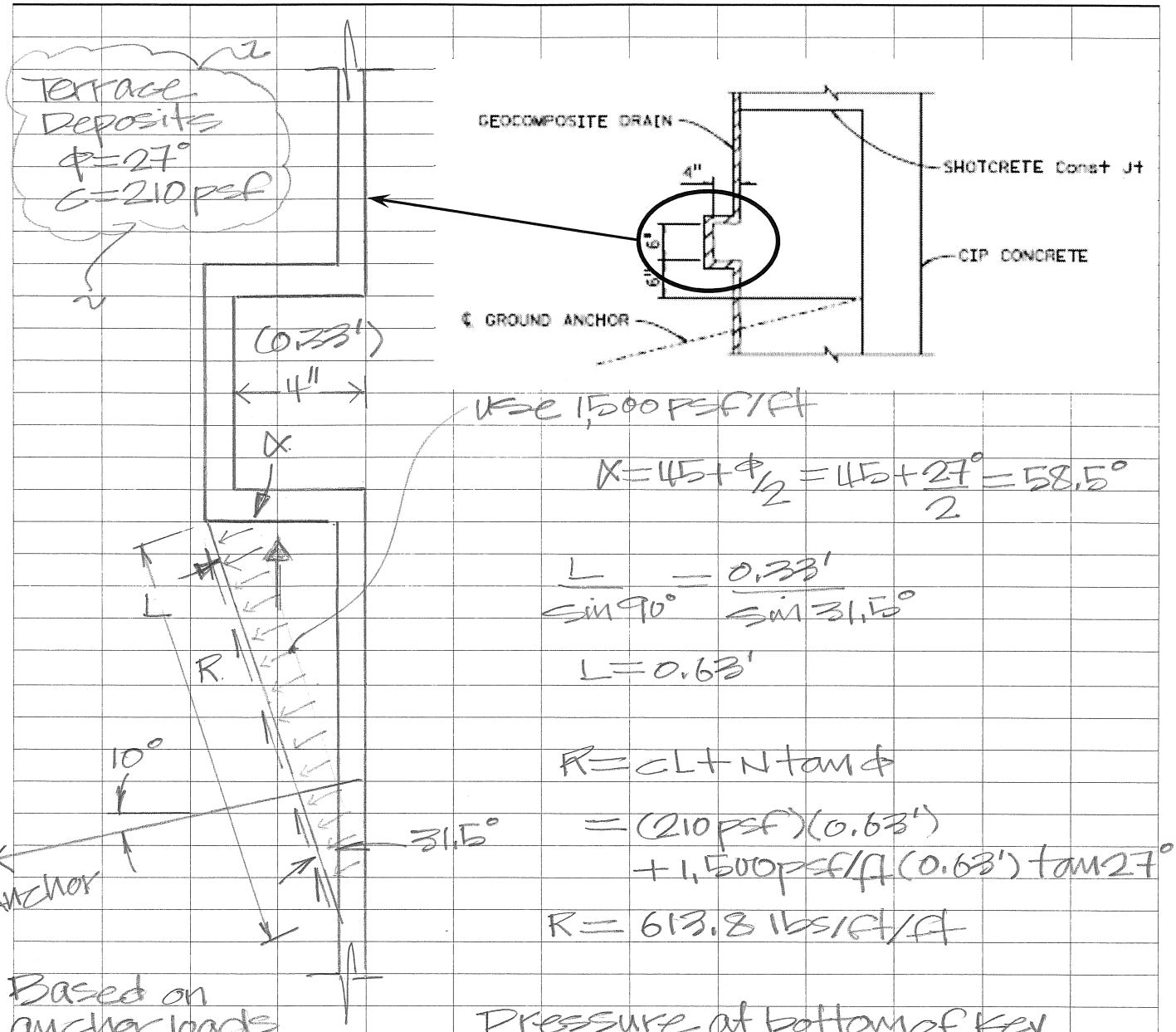
CALCULATION FOR KEY RESISTANCE

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
Phone: (714) 751-3826, Fax: (714) 751-3928

Project: **I-5 HOV Widening, Segment 2, Tieback Walls** Project No. **11-136**

By: AK Date: 3/27/13 Check by: RG Date: 3/28/13 Sheet 1 of 1



Use 1,500 psf/ft

$X = 45 + \phi/2 = 45 + \frac{27°}{2} = 58.5°$

$\frac{L}{\sin 90°} = \frac{0.33'}{\sin 31.5°}$

$L = 0.63'$

$R = cL + N \tan\phi$

$= (210 \text{ psf})(0.63') + 1{,}500 \text{ psf/ft}(0.63') \tan 27°$

$R = 613.8 \text{ lbs/ft/ft}$

Based on anchor loads and tributary areas, a horizontal pressure of 1,500 psf is induced against back of wall per AECOM.

Pressure at bottom of key

$= \frac{613.8 \text{ lbs/ft/ft}}{0.33'}$

$= 1{,}860 \text{ psf/ft}$

Use P = 1,800 psf/ft

REVISED FINAL STRUCTURE FOUNDATION REPORT

Avenida Vaquero Undercrossing (Widen)
Bridge No. 55-0223
Cities of San Clemente and Dana Point
Orange County, California
12-Ora-5, PM 4.97
Caltrans Project No. 1200020278 (12-0F96C01)
EMI Project No. 11-136
Date: April 1, 2013

EARTH MECHANICS, INC.

Geotechnical and Earthquake Engineering

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

April 1, 2013

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Revised Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen)***
Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project,
City of San Clemente, Orange County, California
12-Ora-5, PM 4.97, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

Dear Mr. Montes:

Attached please find the Revised Final Structure Foundation Report for the proposed widening of the Avenida Vaquero Undercrossing (UC). The report contains findings and conclusions of our field investigation and laboratory testing program. The report also contains our recommendations for the design and construction of the bridge foundations.

The previous version of the report dated March 18, 2013 was approved by Caltrans Office of Geotechnical Design South 1 (OGDS-1) and the approval memorandum dated March 25, 2013 is presented in Appendix D.

Earlier versions of this report, dated April 24, 2012 and September 28, 2012, were submitted to Caltrans for review. OGDS-1 review comments were provided in memoranda dated September 14, 2012 and November 5, 2012. EMI responses to OGDS-1 review comments were reviewed by the Caltrans Oversight Geo-Professional, Dr. Sharid Amiri, at the over-the-shoulder review meetings conducted at the EMI office on September 20, 2012 and January 9, 2013. The EMI oversight engineers, Mr. Lino Cheang and Mr. Raja Pirathiviraj on September 20, 2012, and Mr. Andrew Korkos, Mr. Mike Kapuskar, and Mr. Raja Pirathiviraj on January 9, 2013, were the attendees of the meetings. Responses to Caltrans comments have been incorporated into this Foundation Report. Caltrans review comments, EMI responses, and email correspondences are provided in Appendix D.

We appreciate the opportunity to provide geotechnical design services for this project.

Sincerely,
EARTH MECHANICS, INC.

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

Wendy A. Drummond, CEG 2049
Senior Geologist

GJG/gjg,avk,wad

17800 Newhope Street, Suite B, Fountain Valley, California 92708 Tel: (714) 751-3826 Fax: (714) 751-3928

REVISED FINAL STRUCTURE FOUNDATION REPORT

AVENIDA VAQUERO UNDERCROSSING (WIDEN)
BRIDGE NO. 55-0223
CITY OF SAN CLEMENTE, ORANGE COUNTY, CALIFORNIA
12-ORA-5, PM 4.97
CALTRANS PROJECT NO. 1200020278 (EA NO. 12-0F96C01)

Prepared for:

AECOM
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EMI Project No. 11-136

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1.0 INTRODUCTION

1.1 Purpose

This Final Structure Foundation Report presents the findings and conclusions of a geotechnical study conducted by Earth Mechanics, Inc. (EMI) for the proposed widening of the Avenida Vaquero Undercrossing (UC), Bridge No. 55-0223. The purpose of the geotechnical study was to obtain subsurface information and develop design and construction recommendations to aid AECOM in preparing the project plans, specifications, and cost estimates.

1.2 Scope of Work

The geotechnical tasks provided for the proposed bridge widening include:

- Collect and review existing geotechnical information available for the subject site.
- Perform site-specific field investigation including excavating and logging four exploratory boreholes and conducting one Cone Penetration Test (CPT) sounding.
- Collect representative samples of subsurface materials.
- Perform laboratory soil tests on selected soil and bedrock samples.
- Perform geotechnical engineering analyses and development of lateral pressures.
- Develop construction recommendations.
- Prepare this report presenting our findings, conclusions, and recommendations.

1.3 Project Description

The Orange County Transportation Authority (OCTA), in cooperation with Caltrans, and the Cities of Dana Point, San Clemente, and San Juan Capistrano, is proposing to widen the I-5 mainline between Avenida Pico and San Juan Creek Road. The project will add one HOV lane in each direction of the I-5 freeway, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. EMI is responsible for preparing the geotechnical and foundation reports for improvements proposed within the overall project. This report is for the proposed widening of the Avenida Vaquero UC, which is located in Segment 2; Segment 2 extends along the I-5 mainline from about 1,600 feet southeast of Avenida Vista Hermosa to about 2,400 feet northwest of Camino de Estrella. The location of the project is shown on Figure 1.

INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

SITE LOCATION MAP

Figure 1

Project No. 11-136

Date: 03-19-12

To accommodate the two additional HOV lanes, the I-5 mainline will be widened in the northbound (NB) and southbound (SB) directions. Major improvements proposed in Segment 2 include widening the Avenida Vaquero UC, ramp improvements at the Avenida Vista Hermosa and Camino de Estrella interchanges, several earth retaining walls, sound walls, and new pavement. Other improvements in Segment 2 include sign structures, utility lines, drainage structures, lighting, landscaping, and roadway striping. Several other bridge structures are proposed to be widened or replaced in Segments 1 and 3 as part of the subject project. The Avenida Pico UC structure (Bridge No. 55-0207) is proposed to be replaced in Segment 1, while the 5/N5-N1 Connector Separation (Bridge No. 55-0226), the Camino Capistrano UC (Bridge No. 55-0227), and the Route 5/1 Separation (Bridge No. 55-0510) are proposed to be widened in Segment 3. The subject foundation report addresses only the proposed widening of the Avenida Vaquero UC (Bridge No. 55-0223).

The existing Avenida Vaquero UC will be widened by about 12.5 feet on both sides. The new bridge structures that are proposed on each side of the existing Avenida Vaquero UC are single-span structures supported on diaphragm abutments (Abutments 1 & 2). The overall width of the completed bridge will be about 165 feet and the bridge length is about 174 feet.

1.4 Existing Bridge Information

This existing UC structure was constructed in 1983 to replace an older bridge. The existing UC is a single span structure, which has a total length of approximately 174 feet measured along the I-5 centerline and a width of approximately 140 feet. The existing bridge was constructed with cast-in-place pre-stressed concrete box girders. Based on the as-built plans, the existing UC is supported on 16-inch diameter Cast-in-Drilled-Hole (CIDH) piles. Pertinent foundation data as shown on the as-built plans is summarized Table 1.

Table 1. As-Built Foundation Data

Support	Pile Type	Design Vertical Load (tons)	Specified Pile Tip Elevation (feet)
Abutment 1	16-inch diameter CIDH piles	70	+93.0
Abutment 2			+85.0

2.0 GEOTECHNICAL FIELD INVESTIGATION AND LABORATORY TESTING

2.1 Existing Information

The as-Built Log-of-Test-Borings (LOTB) sheet for the original UC, which was used for the replacement in 1983, was reviewed as part of the preparation of this report. A copy of the LOTB sheet is provided in Appendix A.

The as-built LOTB sheet for the original UC construction shows that five penetrometer borings and two rotary borings were conducted in January 1968. The top-of-hole elevations vary from about +127 to +133 feet, and the deepest boring was advanced to an elevation of about +40 feet.

Prior to the original UC construction, the existing grade at the bridge location, along the freeway centerline, appeared to be relatively flat and gently sloped toward the northwest.

2.2 Field Investigation

To supplement existing subsurface information, a site-specific field investigation was conducted at the bridge site between October 10 and October 13, 2011. Four exploratory boreholes (A-11-219 through A-11-222) and one Cone Penetration Test (CPT) sounding (CPT-11-222) were conducted specifically for the proposed UC widening. The exploration locations were field surveyed using California Coordinate System (CCS) 83 (1991.35) Zone 6 and vertical datum NAVD 1988 to obtain coordinates and elevations and establish stations and offsets. Exploration information, including Boring/CPT number, northing, easting, station, offset, ground surface elevation, exploration depth, and groundwater elevation are summarized in Table 2. The locations of the boreholes and the CPT soundings are shown on Figure 2 and on the LOTB sheets provided in Appendix A.

Table 2. Borehole and CPT Exploration Information

Boring / CPT Number	Easting	Northing	Station ("A" Line) (feet)	Offset (feet)	GSE (feet)	GWE (feet)	Boring/ CPT Depth (feet)	Method	Figure No.
A-11-219	6,136,646	2,111,089	272+09	64.2 LT	+133.5	NE	91.5	HSA	2
A-11-220	6,136,719	2,111,192	272+06	61.5 RT	+135.7	NE	90.5	HSA	2
A-11-221	6,136,532	2,111,317	274+29	62.2 RT	+130.5	NE	91.5	HSA	2
A-11-222	6,136,446	2,111,223	274+51	63.5 LT	+127.9	+73.9	90.3	HSA	2
CPT-11-222	6,136,441	2,111,226	274+57	63.6 LT	+127.8	NM	99.6	CPT	2

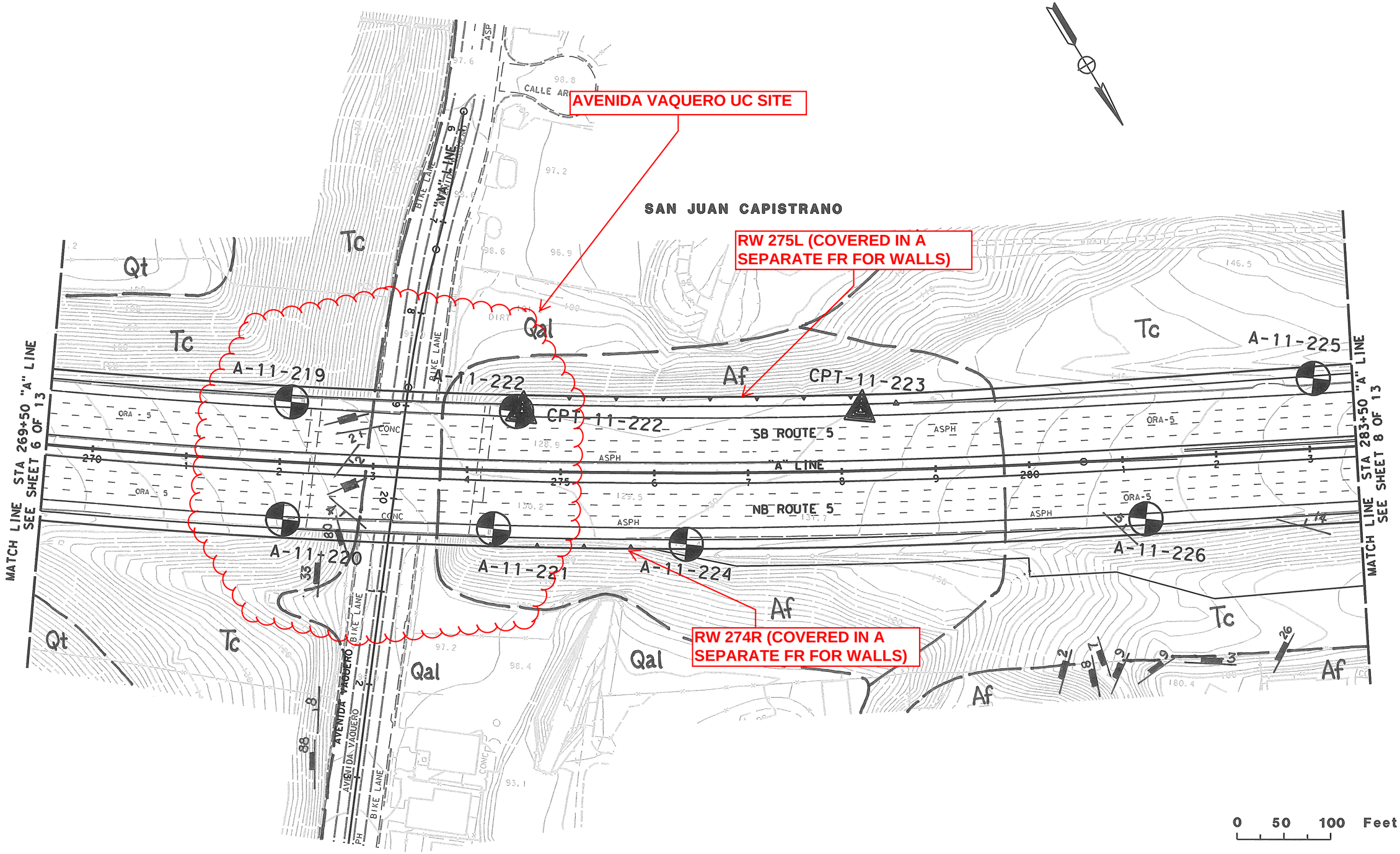
Notes:

(1) Exploration locations were field surveyed using California Coordinate System (CCS) 83 (1991.35) Zone 6 and vertical datum NAVD 1988; the survey information was provided to EMI by AECOM.

(2) GS E = Ground Surface Elevation (surveyed elevations were provided by AECOM).

(3) GWE = Gr oundwater Elevation (approximate); NE = Not Encountered; NM = Not Measured.

(4) *HSA = Hollow-Stem Auger Boring; CPT = Cone Penetration Test Sounding.*



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map**
	Project No.: 11-136 — **Date: 03-01-2012**	Figure 2

2.2.1 Exploratory Boreholes

Boreholes were conducted for the purpose of collecting samples of subsurface earth materials and logging subsurface conditions at the bridge location. The boreholes were excavated by 2R Drilling Inc. under subcontract with EMI, using a truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers. Subsurface materials and conditions were logged and samples of subsurface materials were collected. Small soil and bedrock samples were collected from borings generally at 5-foot vertical intervals by means of split-spoon drive samplers; the Standard Penetration Test (SPT) sampler and the Modified California Drive (MCD) sampler were used to collect small disturbed and relatively undisturbed samples, respectively. The SPT sampler (1.4-inch ID) and MCD sampler (2.5-inch ID) were driven a total depth of 18 inches or until refusal, using a 140-pound automatic hammer falling 30 inches. The blowcounts for the last 12 inches of penetration were recorded on the boring logs. The SPT hammer energy measurements for this drill rig were performed by SPT CAL under subcontract with 2R Drilling, Inc. on April 14, 2011. Results of the SPT hammer energy measurements indicate that the average SPT hammer efficiency [i.e., average energy transfer ratio (ETR)] is approximately 82%. The SPT hammer energy report is included in Appendix A.

Boring A-11-222 and sounding CPT-11-222 were performed immediately next to each other in order to correlate the CPT data and borehole information, and to adjust shear wave velocities determined by SPT correlations.

Charts published by Winterkorn and Fang (1975) can be used to determine a reduction factor used to convert blowcounts recorded using the California Drive sampler into SPT blowcounts. Using those charts, we obtained a reduction factor of 0.5 which was used for this project.

2.2.2 CPT Sounding

To obtain continuous subsurface information and estimate the shear wave velocity of the earth materials, a CPT sounding was performed using an electronic cone penetrometer in general accordance with current ASTM Standards (ASTM D5778 and ASTM D3441). CPT equipment consisted of a cone penetrometer assembly mounted at the end of a series of hollow sounding rods. The cone penetrometer assembly consists of a conical tip with a 60° apex angle and a projected cross sectional area of 1.55 in^2 and a cylindrical friction sleeve with a surface area of 23.25 in^2. The interior of the penetrometer is instrumented with strain gauges that allow simultaneous measurements of cone tip resistance and sleeve friction during penetration. The cone penetrometer assembly is continuously pushed into the soil by a set of hydraulic rams at a standard rate of 0.79 inch per second while the cone tip resistance and sleeve friction are recorded every 1.967 inches and digitally stored. A specially designed 25-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the testing equipment. The computer generated log includes tip resistance, friction resistance, and friction ratio. Soil behavior type interpretations are based on guidelines by Robertson and Campanella (1989). The CPT sounding log is provided in Appendix A.

The seismic cone penetrometer was used in performing CPT-11-222 to measure shear wave velocity (Vs^{30}). A small rugged velocity seismometer is contained within the electronic cone penetrometer. The penetrometer was pushed into the ground at the standard rate. The penetration was stopped at the desired depth and shear waves were generated at the ground surface by hitting

a beam with a sledge hammer. The time for the shear waves to reach the seismometer was measured and the Vs^{30} was calculated. The time measurement and the calculated Vs^{30} value are presented in Appendix A.

2.3 Laboratory Testing

Laboratory tests were performed on representative samples of soil and bedrock to determine or derive relevant physical and engineering properties. Selected samples were tested to determine soil/bedrock type, shear strength parameters, consolidation characteristics, and corrosion potential. The laboratory tests conducted to supplement the observations recorded during the field investigation and to obtain design parameters are presented in Table 3.

Table 3. Explanation of Laboratory Tests Performed

Type of Test	Applicable Test Method	Purpose
Unit Weight	ASTM D 4767	Estimate in-situ unit soil weight
Moisture Content	ASTM D 2216	Estimate in-situ soil moisture content
No. 200 Wash	ASTM D 1140	Determine the percentage of fine grained particles
Sieve Analysis	ASTM D 422	Determine particle size distribution of soil/bedrock
Atterberg Limits	ASTM D 4318	Determine plasticity of fine-grained soil/bedrock
Consolidation	ASTM D 2435	Determine compressibility of fine-grained soil/bedrock
Direct Shear	ASTM D 3080	Determine strength parameters of coarse-grained soil
Unconsolidated Undrained Triaxial	ASTM D 2850	Estimate strength parameters of fine-grained soil/bedrock
Compaction	CT 216	Determine maximum density and optimum moisture content
Soil pH	CT 532/643	Determine corrosion potential of soil/bedrock
Minimum Resistivity	CT 532/643	Determine corrosion potential of soil/bedrock
Sulfate Content	CT 417	Determine corrosion potential of soil/bedrock
Chloride Content	CT 422	Determine corrosion potential of soil/bedrock

Notes: 1. ASTM = American Society for Testing and Materials.
2. CT = California Test Method.

The laboratory tests were conducted in general accordance with California Test (CT) methods or American Society for Testing and Materials (ASTM) standards. The laboratory test results are presented in Appendix B.

3.0 GEOLOGY

3.1 Physiography

The project area is located in the northwestern part of the Peninsular Ranges physiographic province. The Peninsular Ranges comprise a northwest-southeast trending group of fault-bounded ranges between the Salton Trough and the Pacific Ocean. The Santa Ana Mountains, Puente Hills, and San Joaquin Hills are ranges within the Peninsular Ranges.

The project site is located on the low lying rolling hills westerly of the Santa Ana Mountains at the southerly end of the San Joaquin Hills in an area referred to as the Capistrano Embayment.

3.2 Stratigraphy

The geologic units encountered in the bridge site and near vicinity are described below. The distribution and location of geologic units, at the bridge site, are shown on the Exploratory Boring Location Map (Figure 2).

- Capistrano Formation (Tc): These marine sedimentary deposits generally consist of brown to gray silty claystone, claystone, and siltstone. Secondary gypsum is commonly found deposited along joints, fractures and shears. The formation is generally soft when moist and has engineering properties similar to stiff to very stiff soils. The formation consists generally of soft, weakly cemented to uncemented material that can be disaggregated with finger pressure. A few hard beds occur throughout the formation.

  Within the project area, the Capistrano formation consists of an oxidized (weathered) zone defined by a light brown to brown color with a mottled appearance, underlain by an unoxidized zone that is generally dark brown to dark gray with a greater degree of induration.

- Undifferentiated Marine and Non-marine Terrace Deposits (Qt): Portions of the project area, mostly southerly of Camino Las Ramblas, are capped by terrace deposits. Shell fragments were found associated with the marine terrace deposits. The terrace deposits were observed to unconformably overlie bedrock units of the Capistrano formation directly. These Pleistocene terrace deposits are characterized by a basal cobble sequence fining upward to light brown and yellow brown fine to coarse grained sands, silty sand, sandy silt and clayey silt.

- Alluvium (Qal): The drainages and canyons crossing the project corridor are mantled by a relatively thin cover of alluvium. These deposits are generally derived from the surrounding bedrock units and terrace deposits and are located in the lower elevations of the site. Where encountered in the borings the alluvium was observed to consist of silty sand to sandy clay.

- Artificial Fill (Af): Artificial fill placed during construction of the I-5 freeway and adjacent residential and commercial developments is located along the project corridor. Fill materials were most likely derived from excavation of the Capistrano formation bedrock and local surficial deposits. Little or no documentation of the limits of fills or the observation and testing of the fill placement were examined.

3.3 Geologic Structure

The Peninsular Ranges are characterized by northwest-southeast trending mountains and valleys that have been faulted and uplifted by northwest-southwest trending faults. The Capistrano Embayment is a relatively flat structural trough of Miocene to Pliocene age. The trough is bordered on the east by the Cristianitos Fault. The California Geological Survey does not show any active faults at the site (Jennings, 2010). The nearest known major active faults are the Newport-Inglewood Structural Zone about 5 miles southwest of the site in the offshore area, the Palos Verdes fault about 19 miles to the west, also in the offshore area, and the Elsinore fault

about 35 miles to the northeast. A subsurface fault, the San Joaquin Hills blind thrust, is postulated west of the site at a depth of about 2.5 to 3 miles. Other nearby faults such as the Cristianitos fault and Mission Viejo faults are about 3.5 to 7 miles east of the site but are not believed to be active.

3.4 Geological Hazards

The geological hazard present at the site is earthquake shaking. The seismic hazard map published by the California Geological Survey (CGS, 2001 and 2002) does not show known landslides and a liquefaction hazard within the area of the existing bridge during a strong earthquake (Figure 3). The site lies outside identified tsunami inundation zones (CGS, 2009), and there are no large bodies of water within the project area that could generate a seiche. There are no volcanos in the region and there are no known active surface faults within the project area so ground rupture is not a design issue.

4.0 SUBSURFACE CONDITIONS

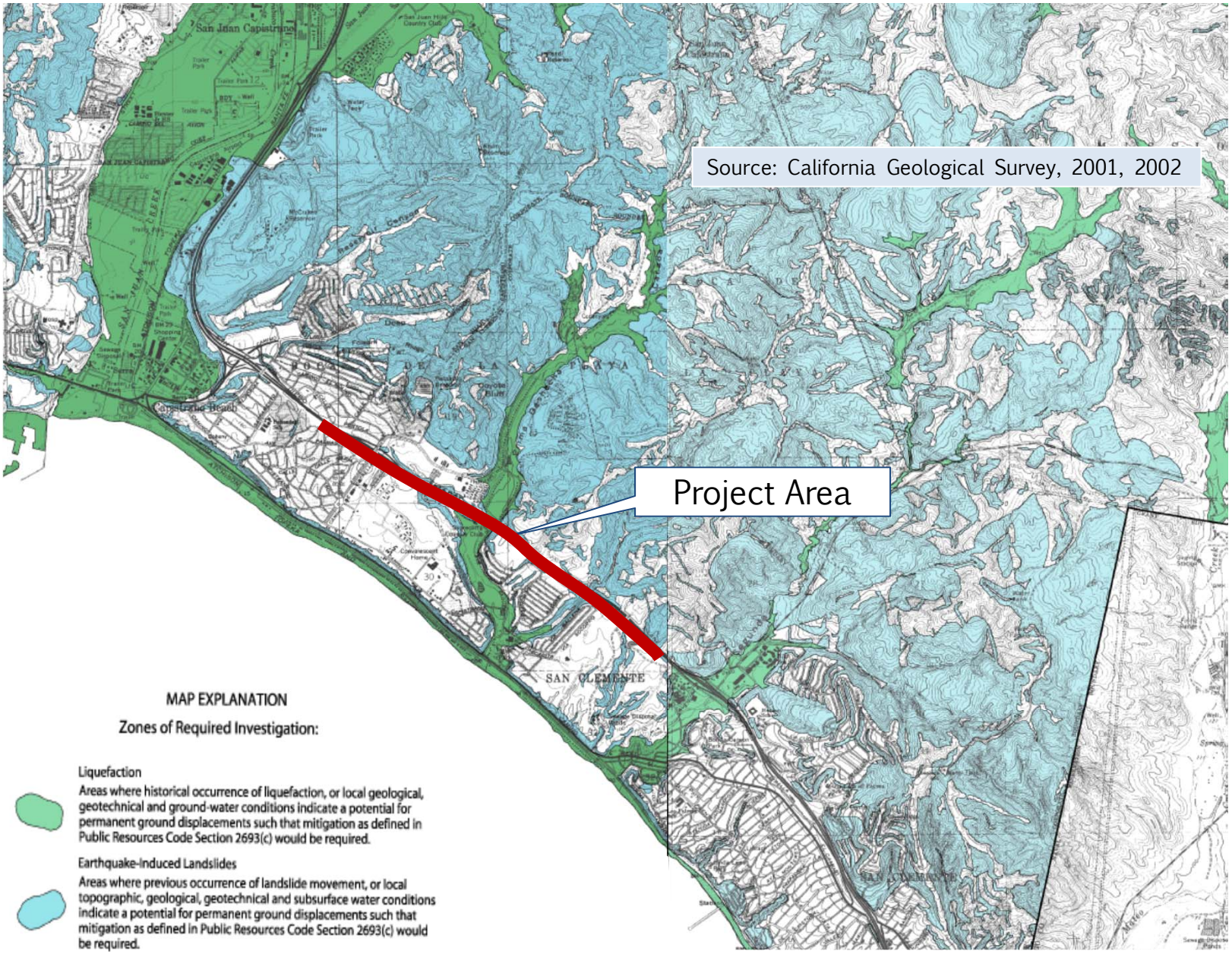
4.1 Subsurface Soil/Bedrock Conditions

The existing grade at the location of the subject bridge, along the freeway centerline, is gently sloped toward the northwest from about El. + 135 to +130 feet. Stratigraphy at the southern abutment (Abutment-1) area consists of 20 to 45 feet thick artificial fills overlying sedimentary bedrock of the Capistrano formation. At the northern abutment (Abutment-2) area, stratigraphy consists of about 40 feet thick artificial fills overlying medium stiff to very stiff fine-grained alluvium materials down to about El. +40 feet. This alluvium material is underlain by sedimentary bedrock of the Capistrano formation.

4.2 Groundwater Conditions

The as-built LOTB shows that groundwater was encountered at about elevation +92 feet in one of the two exploratory borings drilled for the original UC in 1968. During the recent 2011 geotechnical field investigation, groundwater was encountered at about elevation +74 feet in only one of the four boreholes drilled at the bridge site. Because groundwater was only encountered in one of four deep boreholes at the bridge site, the groundwater at the site is believed to be perched groundwater. The highest recorded groundwater elevation of +92 feet was used in our analyses.

The Segment 2 project area is located within the San Juan Valley hydrologic area. No indication of a static groundwater table was observed within the depths explored during the investigation for the overall project. However, perched groundwater was encountered in seven of the thirty-four deep boreholes (>30 feet deep), drilled for Segment 2, at elevations ranging from about +74 to +184 feet. The perched groundwater condition is validated by the fact that groundwater was found within a very wide range of elevation.



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Seismic Hazard Map Figure 3
	Project No. 11-136 / Date: 03-08-12	

Soil moisture content and groundwater elevation can fluctuate due to variations in seasonal rainfall, nearby irrigation, changes in or addition of flood control improvements, groundwater injection or extraction activities, construction activities, or numerous other man-made or natural conditions.

4.3 Idealized Soil Profile

Based on information collected from the four site-specific soil borings (A-11-219, A-11-220, A-11-221, and A-11-222) and one CPT sounding (CPT-11-222), an idealized soil profile for foundation analysis and design was developed along the proposed bridge alignment. The idealized subsurface profile and design shear strength parameters used for geotechnical analyses are presented in Table 4 and shown graphically in Figure 4.

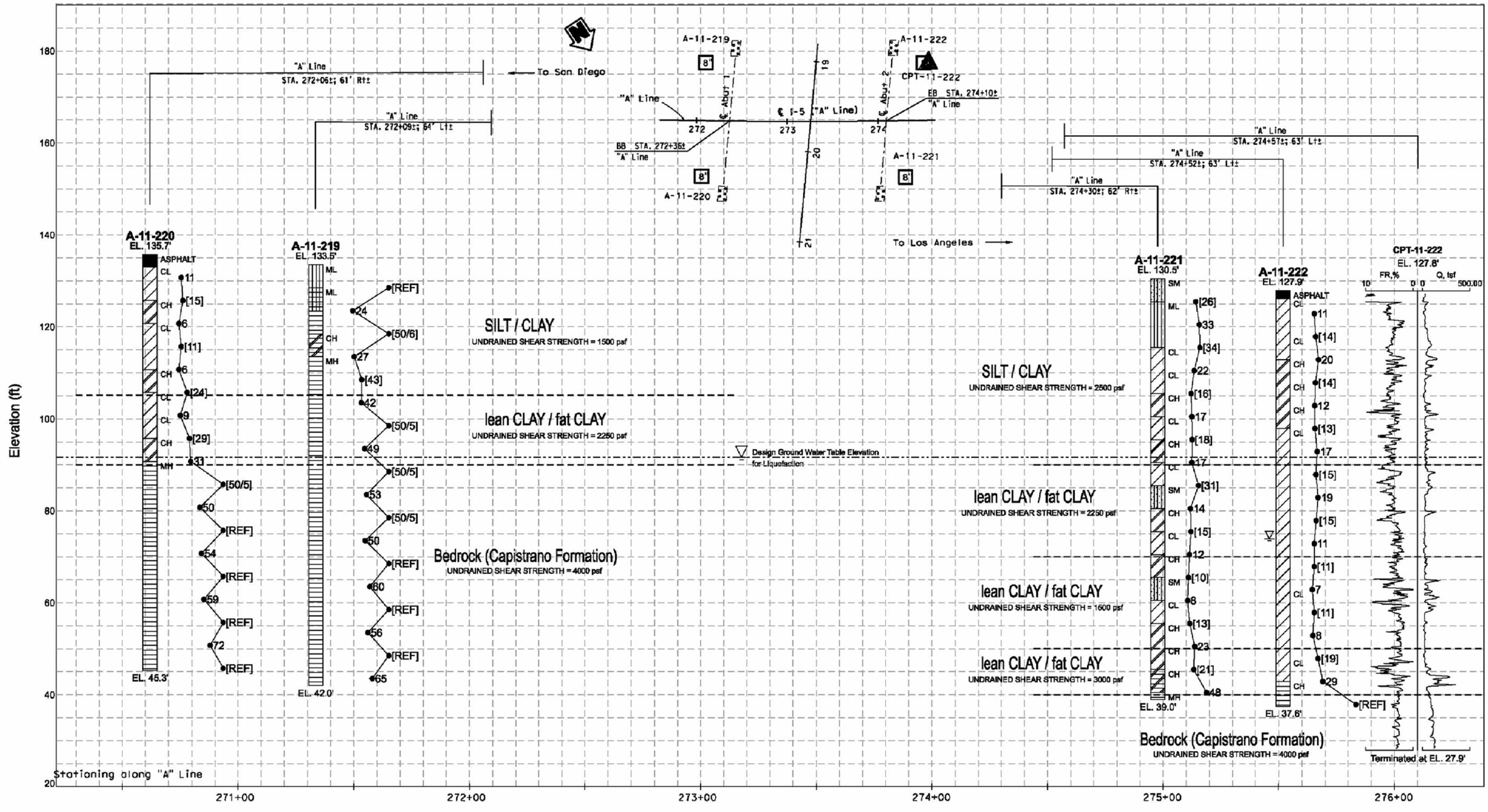
Table 4. Idealized Subsurface Profile and Strength Parameters

Approximate Elevation (feet)	Predominant Soil/Bedrock Type	Equivalent SPT Blowcount [1] (blows/foot)	Total Unit Weight (pcf)	Friction Angle [3] (degree)	Cohesion [3] (psf)	Undrained Shear Strength [3] (Su) (psf)
Abutment 1 (Borings A-11-219 and A-11-220)						
+136 to +105	Sandy Silt, Silt, Lean Clay, Fat Clay (Artificial Fills)	6 to (REF [2]) Average = 17	120	-	-	1,500
+105 to +90	Lean Clay, Fat Clay, Siltstone/Claystone (Artificial Fills / Intensely Weathered Capistrano Formation)	9 to (50/5") Average = 31	120	-	-	2,250
+90 to +42	Siltstone/Claystone (Capistrano Formation)	50 to (REF) Average = 58	120	23 – 27	200 – 250	4,000
Abutment 2 (Borings A-11-221 and A-11-222 and CPT Sounding CPT-11-222)						
+130 to +90	Silt, Sandy Lean Clay, Lean Clay, Fat Clay (Artificial Fills)	11 to (34) Average = 19	120	32	200	2,500
+90 to +70	Sandy Lean Clay, Lean Clay, Fat Clay (Alluvium)	11 to (31) Average = 17	120	-	-	2,250
+70 to +50	Sandy Lean Clay, Lean Clay, Fat Clay (Alluvium)	7 to (13) Average = 10	120	-	-	1,500
+50 to +40	Lean Clay, Fat Clay (Alluvium / Intensely Weathered Capistrano Formation)	(19) to 29 Average = 23	120	-	-	3,000
+40 to +38	Siltstone/Claystone (Capistrano Formation)	48 and (REF)	120	23 – 27	200 – 250	4,000

(1) Values in ( ) are converted SPT blowcounts corrected for sampler size; correction factor from California sampler blowcounts to SPT blowcounts is 0.5.

(2) REF – Refusal; refusal blowcounts were not used for estimating average equivalent SPT blowcounts.

(3) Friction angle and cohesion were used for global stability analyses and Su was used for pile calculations.



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Idealized Soil Profile
	EMI Project No. 11-136 / Date: 02-15-2013	Figure 4

In Table 4, the drained soil strength parameters (friction angle and cohesion) are based on the database of results obtained from all direct shear tests performed for the overall Segment 2 project. The design friction angle and cohesion are based on the ultimate shear strength parameters obtained from the direct shear tests. The undrained shear strength parameters, shown in Table 4, are based on the results of unconsolidated-undrained triaxial tests. It should be noted that the design strength parameters obtained from the direct shear and unconsolidated-undrained triaxial tests are lower than shear strength values that would be estimated using SPT or CPT correlations.

5.0 SEISMICITY AND GEO-SEISMIC HAZARDS

5.1 Seismicity

The project is located in seismically active southern California. The present-day seismotectonic stress field in the Los Angeles region is one of north-northeasterly compression. This is indicated by geologic structures, by earthquake focal-mechanism solutions, and by geodetic measurements. The data suggests crustal shortening of between 0.2 and 0.35 inch/year across the greater Los Angeles area (Argus et al., 1999).

Historic earthquake epicenter maps show widespread seismicity throughout the region. Although historical earthquakes occur in proximity to known faults, they are difficult to directly associate with mapped faults. Part of this difficulty is due to the fact that the basin is underlain by several poorly known subsurface thrust faults, generally referred to as blind thrust faults. Ward (1994) estimated that about 40 percent of seismic moment cannot be associated with known faults.

Earthquakes occur primarily as loose clusters along the Newport-Inglewood Structural Zone, the southern margin of the Santa Monica Mountains, the margin between the Santa Susana-San Fernando Valley and the southern margin of the San Gabriel Mountains, and in the Coyote Hills-Puente Hills area. There is no clustering or alignment of earthquakes in proximity to the site. There are fewer earthquakes in the site region than anywhere else in the Los Angeles Basin area. This apparent lack of earthquake activity suggests that the site area is tectonically stable and suggests that there are no unrecognized active faults at the site.

The largest historical earthquake within the Los Angeles Basin was the 1933 Long Beach event which had a magnitude of about M_W = 6.4 (M_L = 6.3). This earthquake did not rupture the surface but is believed to have been associated with the Newport-Inglewood Structural Zone (Benioff, 1938). The association was based on abundant ground failures along the NISZ trend but no unequivocal surface rupture was identified. Reevaluation of the seismicity data by Hauksson and Gross (1991) relocated the 1933 earthquake hypocenter to a depth of about 6 miles below the Huntington Beach-Newport Beach city boundary.

Other major earthquakes in the region include the 1994 Northridge and the 1971 San Fernando earthquake both of which occurred in the San Fernando Valley region. The 1994 earthquake had a moment magnitude (M_W) of about 6.7 (M_S = 6.8, M_L = 6.4), and occurred on a southerly dipping subsurface fault which was unknown prior to the earthquake. The main shock occurred at a depth of about 11.8 miles (19 km). Earthquake aftershocks clearly defined the rupture surface dipping about 35 degrees southerly from a depth of about 1.2 or 1.9 miles (2 or 3 km) to 14.3 miles (23 km) (Hauksson et al, 1995). The causative fault was never identified with

certainty. The event may have occurred on an eastern extension of the Oakridge fault (Yeats and Huftile, 1995), a southerly dipping feature fault bounding the Ventura Basin and the Santa Susana Mountains.

The 1971 San Fernando earthquake was of similar size (M_W = 6.7, M_S = 6.4, M_L = 6.4) to the 1994 event but did involve surface rupture. The 1971 event occurred on a northerly dipping thrust fault that dips from the northern side of the San Fernando Valley to a depth of about 9.3 miles (15 km) under the San Gabriel Mountains. Several mapped surface faults were involved such as the Sylmar fault, Tujunga fault, and Lakeview fault. These faults are commonly considered to be part of the Sierra Madre fault system which extends easterly from the San Fernando Valley, along the base of the San Gabriel Mountains on the north side of the San Gabriel Valley, and to the Cucamonga fault in the San Bernardino area.

The 1987 Whittier earthquake (M_L = 5.9, M_W = 5.9) occurred on a subsurface fault dipping under the Puente Hills to about 10 miles beneath the San Gabriel Basin (Shaw and Shearer, 1999; Shaw et al., 2002). This event did not rupture the ground surface.

A magnitude 5.4 earthquake occurred at a depth of about 9 miles (15 km) on 29 July 2008. The epicenter was in the Chino Hills area between the Chino fault and the Whittier fault. Preliminary data were inconclusive with regard to the causative fault. Detailed analysis by Shao and Hauksson (2009) indicated a rupture plane striking N71°W, dipping 62° northeast. They suggested a preference for the Whittier fault being the causative fault but were uncertain, primarily because the Whittier fault is supposed to dip much steeper (~ 80°). The aftershock pattern formed a subhorizontal alignment indicating the possibility that the event could have been associated with a subsurface thrust fault such as one of the blind faults of the Puente Hills Blind Thrust Fault System or with a blind fault under the Peralta Hills.

Another significant earthquake was the 1812 earthquake which caused damage at the San Juan Capistrano Mission. The location and magnitude of the 1812 earthquake are unknown because of the sparse population at the time, but geological studies (Jacoby et al., 1988; Fumal et al., 1993; Weldon et al., 2004) postulate that it did not occur in the Capistrano area, but rather was a large (M > 7.0) distant event on the San Andreas fault in the Wrightwood area of the San Gabriel Mountains.

The earliest documented earthquake in the region was reported by the Portola′ expedition as they camped near the Santa Ana River in 1769. This event has been attributed by various geoscientists to just about every fault in the Los Angeles area but it could just as well have been a distant event that shook a wide area as did the 1971 San Fernando, the 1987 Whittier, and the 1994 Northridge events, as well as many other more-distant events (for example, 1992 Landers event).

5.2 Ground Rupture

No known active faults traverse the project area. The California Division of Mines and Geology has not identified Alquist-Priolo Fault Zones through or in the proximity of the site. Therefore, the risk of ground surface rupture and related hazards is considered low.

5.3 Caltrans ARS Curve

5.3.1 Development of V_s^{30}

A small-strain shear wave velocity (V_s^{30}) of 830 feet per seconds (ft/sec) was measured, for the upper 100 feet of subsurface materials, by the seismic cone penetrometer used in Sounding CPT-11-222. A V_s^{30} of 781 ft/sec was calculated using correlations with SPT blowcounts (Caltrans, 2009e) for the upper 100 feet of subsurface materials obtained from Boring A-11-222, which was drilled immediately next to CPT-11-222. The calculated V_s^{30} obtained from Boring A-11-222 and the three other borings, drilled at the bridge site, were normalized using the ratio of (830/781). The calculated and normalized V_s^{30} values are presented in Table 5.

Table 5. Small Strain Shear-Wave Velocity V_S^{30}

Boring/CPT	Source of Shear-Wave Velocity	Small Strain Shear-Wave Velocity V_S^{30} (feet/sec)	
		Calculated	Normalized
A-11-219	SPT Correlations	1,270	1,350
A-11-220	SPT Correlations	922	980
A-11-221	SPT Correlations	846	900
A-11-222	SPT Correlations	781	830
CPT-11-222	Field Measurement	830	830

5.3.2 Development of Caltrans ARS Curve

To develop the ARS curves in accordance with the 2010 Seismic Design Criteria (SDC) (Caltrans, 2010) and Geotechnical Services Design Manual (Caltrans, 2009e) procedures, we considered the following response spectra. The resulting ARS curve is the envelop of all the following spectra:

- Deterministic Criteria based on late-Quaternary faults in the 2007 fault database (Shantz and Merriam, 2009 and Caltrans, 2009a and 2009c).
- Probabilistic Criteria based on 5% in 50 years probability of exceedance ground motion.
- Minimum Deterministic Spectrum based on a Mw = 6.5 strike-slip event occurring at a distance of 7.5 miles (12 km) from the site.

We used the Caltrans Deterministic Response Spectrum Spreadsheet as recommended by the Geotechnical Services Design Manual (Caltrans, 2009e) to develop the deterministic ARS curves. The spreadsheet uses the arithmetic average of two Next Generation Attenuation (NGA) relationships developed by Chiou-Youngs (2008) and Campbell-Bozorgnia (2008) with user-provided input parameters as listed in Table 6. Results obtained from the spreadsheet were then verified with the Caltrans online web tool (Caltrans, 2009b).

The probabilistic response spectrum is based on data from the 2008 United States Geological Survey (USGS, 2008a) National Seismic Hazard Map for the 5% in 50 years probability of exceedance (975-year return period) ground motion. To develop the probabilistic spectrum, the Caltrans Probabilistic Response Spectrum Spreadsheet and the USGS Interactive Deaggregation

Tool (USGS, 2008b) were used. Results obtained from both the spreadsheet and deaggregation tool were then verified with the Caltrans online web tool (Caltrans, 2009b).

ARS curves were developed for each normalized V_s^{30} presented in Table 5. The recommended design ARS curve is the mathematical mean of all the ARS curves, which is presented in Figure 5 together with the digitized coordinates. As shown in Figure 5, a peak ground acceleration (PGA) of 0.39g is obtained from the design ARS curve.

Table 6. Site Characteristics and Deterministic Controlling Fault Parameters

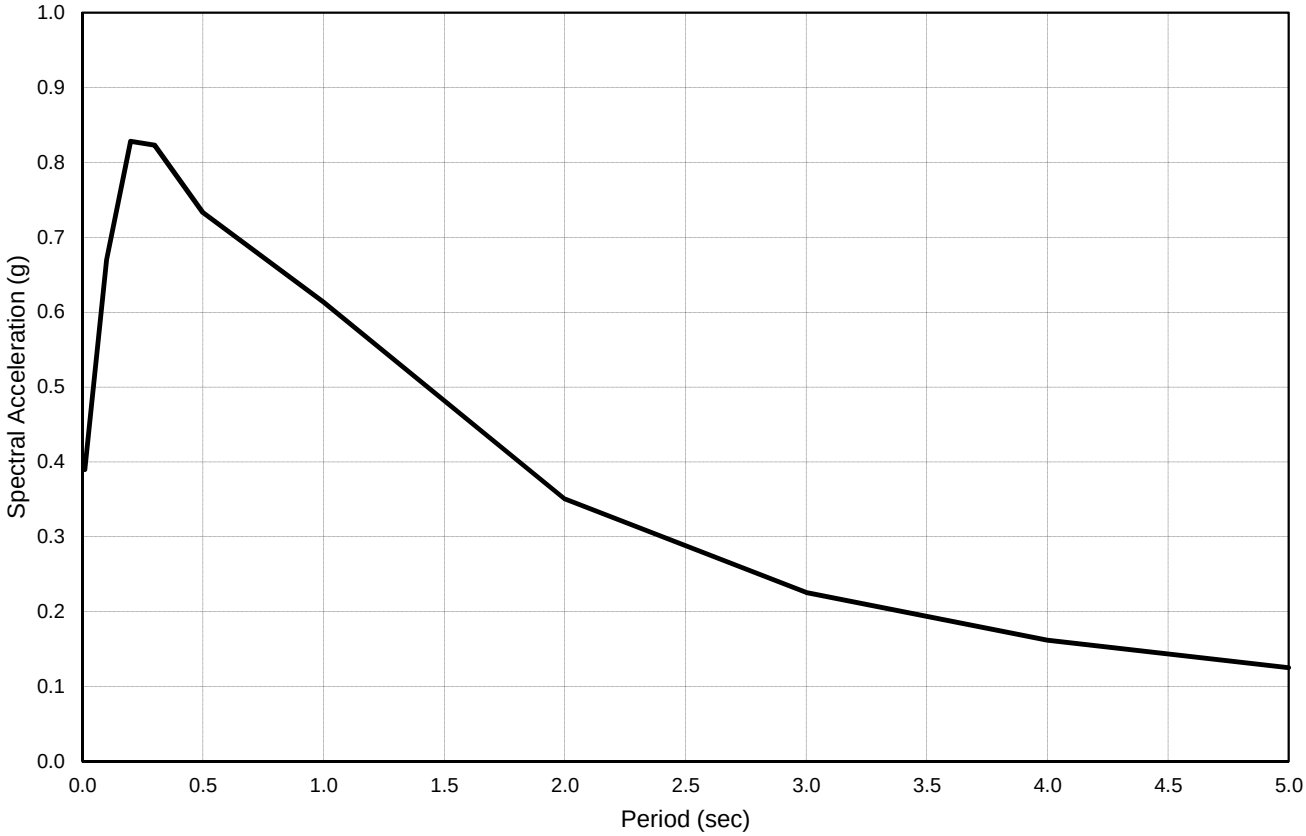
Site Characteristics	
Site Coordinates	Latitude = 33.4528 degrees Longitude = -117.6437 degrees
Depth to V_s=1.0 km/s, $Z_{1.0}$	Site is not in deep sedimentary basin, therefore basin amplification factors = 1
Depth to V_s=2.5 km/s, $Z_{2.5}$	
Deterministic Controlling Fault Parameters	
Fault Name	Newport-Inglewood-Rose Canyon Fault (Offshore or Dana Point)
Fault ID	222
Fault Type	Right Lateral Strike Slip (RLSS)
Fault Dip	90 degrees
Dip Direction	Vertical
Top of Rupture Plane	0 miles (0 km)
Bottom of Rupture Plane	8.12 miles (13 km)
R_{RUP}[1]	4.35 miles (7 km)
R_{JB}[2]	4.35 miles (7 km)
R_X[3]	4.35 miles (7 km)
F_{rv} (1 for reverse, 0 for others)	0
F_{nm} (1 for normal, 0 for others)	0
Hanging Wall	No
Near-Field Factor Required	Yes, up to 1.2

Note:

1. *R_{RUP} = closest distance from the site to the fault rupture plane.*
2. *R_{JB} = Joyner-Boore distance; the shortest horizontal distance to the surface projection of the rupture area.*
3. *R_X = horizontal distance from the site to the fault trace or surface projection of the top of the rupture plane.*

5.1 Liquefaction

Liquefaction is the loss of shear strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. Primary factors influencing the potential for liquefaction include: groundwater elevation, soil type and grain-size characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. Soils that are most susceptible to liquefaction are saturated low-density sands and silty sands situated within 50 feet of the ground surface.



Latitude = 33.4528 °
Longitude = -117.6437 °
Damping Ratio = 5%

Spectral Coordinates	
Period (sec)	Acc. (g)
	Design
0.010	0.390
0.100	0.670
0.200	0.828
0.300	0.823
0.500	0.733
1.000	0.613
2.000	0.350
3.000	0.225
4.000	0.162
5.000	0.125

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Design ARS Curve

Figure 5

Liquefaction analysis was performed using the site-specific soil boring information and the highest recorded groundwater elevation of +92 feet at the bridge site as discussed in Section 4.2. The liquefaction potential of saturated, granular materials below the groundwater table was evaluated using the procedures outlined by Seed et al., (1983), Seed and Harder (1990), and updated by NCEER (1997). Results of the liquefaction analyses are included in Appendix C and they show the site is not expected to be susceptible to liquefaction since the site is composed of predominantly medium to high plasticity fine-grained soils (elastic silts and lean and fat clays) and sedimentary bedrock, and due to the absence of a shallow static groundwater table. Furthermore, as discussed in Section 3.4, the California Geological Survey (CGS, 2001 and 2002) has also indicated that the project alignment has a low susceptibility to liquefaction during a strong earthquake.

5.2 Lateral Spread

Since the analysis shows that earth materials at the project site are not susceptible to liquefaction, then liquefaction-induced lateral spreading is considered unlikely. Therefore, lateral spreading is not considered a design issue.

5.3 Seismic Settlement

The liquefaction potential at the project site is low since the site is composed of predominantly medium to high plasticity fine-grained soils (elastic silts and lean and fat clays) and sedimentary bedrock, and due to the absence of a shallow static groundwater table. As a result, seismically-induced settlement is anticipated to be small and not expected to adversely impact the bridge widening.

6.0 SOIL CORROSIVITY

Five samples of earth materials, collected from the boreholes drilled at the bridge location, were tested to determine minimum resistivity, pH, soluble sulfate content, and soluble chloride content. Minimum resistivities were determined to range between 300 and 909 ohm-cm. The pH values range between 6.8 and 8.1. The soluble sulfate measurements range from 380 to 636 parts per million (ppm), and the soluble chloride measurements range from 120 to 1,011 ppm.

Additional soil and bedrock samples, collected from throughout Segment 2, were tested to determine their corrosivity. The minimum resistivities ranged from 122 to 2,260 ohm-cm with the average value equal to 459 ohm-cm. The pH ranged from 3.5 to 8.1 with the average equal to 6.8. The soluble sulfate ranged from 220 to 8,636 parts per million (ppm) with the average value equal to 1,308 ppm. And, the soluble chloride ranged from 120 to 4,642 ppm with the average equal to 1,474 ppm. Test results are summarized in the Materials Report (EMI, 2012b) for this project.

According to Caltrans Corrosion Guidelines (2003c), soils are considered corrosive if the pH is 5.5 or less, or the sulfate concentration is 2,000 ppm or greater, or the chloride concentration is 500 ppm or greater. Based on the test results and the Caltrans criteria, the on-site earth materials are corrosive. Consequently, proposed structures in contact with the on-site earth materials should be designed for the corrosive environment.

Based on the project-wide chloride concentrations, the minimum concrete cover over reinforcement should be in accordance with Table 8.22.1 of the Caltrans BDS (Caltrans, 2003a) for "Corrosive soil above MLLW level with chloride concentration between 500 and 5,000 ppm." Based on the project-wide sulfate concentrations, cement type should be in accordance with Table 8.22.2 of the Caltrans BDS (Caltrans, 2003a) for "Sulfate Concentration from 2,000 to 15,000 ppm." Additional corrosion protection requirements for concrete structural members are presented in Section 8.22 of the Caltrans BDS (Caltrans, 2003b).

7.0 SCOUR

This site is located within an area that is presently improved; roadway surfaces are paved and drainage is controlled by engineered facilities. The proposed bridge does not cross a river, creek, or unlined channel; therefore, scour is not considered a design issue.

8.0 FOUNDATION RECOMMENDATIONS

8.1 Pile Foundation Design

8.1.1 Foundation Type

According to the as-built plans, the existing Avenida Vaquero UC is supported by 16-inch diameter Cast-in-Drilled-Hole (CIDH) piles. Spread footings were not recommended because of possible differential settlement due to significantly different subsurface conditions between the two abutments, and, non-uniform subsurface conditions at Abutment 1. The spread footing settlement calculation using the AASHTO LRFD Equation 10.6.2.4.2-3 is provided in Appendix C. A deep foundation system is recommended for the proposed widening due to higher footing pressures and lateral demand at the abutments. Both driven and CIDH piles are feasible. However, hard pile driving is anticipated because of shallow bedrock. Therefore, we recommend CIDH piles for the proposed bridge widening. Twenty-four-inch diameter CIDH piles are recommended for the following reasons: (1) to limit pile length / diameter ratio to less than 30, and (2) the possibility of encountering groundwater during pile construction. According to Caltrans Memo To Designers (Caltrans, 2008), the minimum CIDH pile diameter required for wet construction is 24 inches.

8.1.2 Foundation Data Provided by Structural Designers

In accordance with Caltrans policy, Working Stress Design (WSD) method provided in the Caltrans Bridge Design Specifications (2003b) is used for design of the abutment foundations.

The foundation design data sheet is presented in Table 7. Foundation loads were provided by the structural designers following the latest Caltrans Memo To Designers (Caltrans, 2008) and these loads are presented in Table 8.

Table 7. Foundation Design Data Sheet

Support No.	Design Method	Pile Type	Finished Grade Elevation (feet)	Cut-off Elevation (feet)	Pile Cap Size (feet)		Permissible Settlement under Service Load (inch)	Number of Pile per Support
					B	L		
Abut 1 Right	WSD	24" CIDH	124.1	118.1	9.5	17.0	1	5
Abut 1 Left	WSD	24" CIDH	121.7	114.9	9.5	17.0	1	5
Abut 2 Right	WSD	24" CIDH	117.0	114.4	9.5	17.0	1	5
Abut 2 Left	WSD	24" CIDH	116.0	111.4	9.5	17.0	1	5

Table 8. Foundation Design Loads

Support No.	Service-I Limit State (kips)			Strength Limit State (Controlling Group, kips)				Extreme Event Limit State (Controlling Group, kips)			
	Total Load		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Max. Per Pile	Per Support	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1 Right	940	188	765	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Abut 1 Left	937	187	762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Abut 2 Right	940	188	765	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Abut 2 Left	937	187	762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

8.1.3 Axial Pile Capacity

Abutments 1 and 2 foundation design recommendations are presented in Table 9. The Pile Data Table for the contract plans is presented in Table 10. The abutment pile nominal resistance in Table 10 is controlled by the Service-I Limit State "Load per Pile" and a geotechnical factor of safety of 2.0.

Table 9. Abutments Foundation Design Recommendations

Support	Pile	Cut-off Elevation (feet)	LRFD Service-I Limit State Load per Support (kips)		LRFD Service-I Limit State Total Load per Pile (Compression) (kips)	Nominal Resistance (kips)	Design Tip Elevations (feet)	Specified Tip Elevation (feet)
			Total	Permanent				
Abut 1 Right	24" CIDH	118.1	940	765	188	380	+72 (a) +92 (c) +88 (d)	+72
Abut 1 Left	24" CIDH	114.9	937	762	187	380	+68 (a) +88 (c) +85 (d)	+68
Abut 2 Right	24" CIDH	114.4	940	765	188	380	+58 (a) +74 (c) +79 (d)	+58
Abut 2 Left	24" CIDH	111.4	937	762	187	380	+55 (a) +71 (c) +76 (d)	+55

Notes.
1. Design tip elevations are controlled by the following demands: (a) Compression, (c) Settlement, and (d) Lateral Load.
2. There are no design tip elevations for Tension at Abutments 1 and 2.
3. The specified tip elevation for Abutments 1 and 2 shall not be raised above the design tip elevation for Settlement and Lateral Load.

Table 10. Pile Data Table

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevations (feet)	Specified Tip Elevation (feet)
		Compression	Tension		
Abut 1 Right	24" CIDH	380	0	+72 (a) +92 (c) +88 (d)	+72
Abut 1 Left	24" CIDH	380	0	+68 (a) +88 (c) +85 (d)	+68
Abut 2 Right	24" CIDH	380	0	+58 (a) +74 (c) +79 (d)	+58
Abut 2 Left	24" CIDH	380	0	+55 (a) +71 (c) +76 (d)	+55

Notes:
1. Design tip elevations are controlled by the following demands: (a) Compression, (b) Tension, (c) Settlement, and (d) Lateral Load.
2. There is no design tip elevation for Tension at Abutments 1 and 2.
3. The specified tip elevations shall not be raised above the design tip elevation for Settlement and Lateral Load.

For pile groups in clay, the nominal axial resistance of the pile group shall be taken as the lesser of: (1) the sum of the individual nominal resistance of each pile in the group, or (2) the nominal resistance of an equivalent pier of the piles and the block of soil within the area bounded by the piles (Section 10.8.3.6.2, AASHTO, 2007). Based on the layout provided by the structural designers, the nominal resistance of the pile group is greater than the sum of the individual

nominal resistance. Therefore, the block type failure mechanism will not prevail for the abutments piles.

Axial capacity of a single CIDH pile is estimated using the computer program SHAFT Version 6.0 (Ensoft, 2007). The pile capacity calculations are presented in Appendix C. The pile capacity is also based on soil resistance only and may be further limited by the pile-head connection details and the strength of the pile materials.

8.1.4 Lateral Pile Capacity

8.1.4.1 Lateral Pile Solutions

Lateral pile capacity analyses were performed using the computer program LPILE (Ensoft, 2010). Results of lateral pile analysis in terms of pile-head shear and lateral deflection for a free-head condition are presented for abutments in Table 11. The maximum bending moment and the location of maximum moment are also presented.

Table 11. Lateral Pile Solutions for Abutments 1 and 2

Support Location	Pile Head Deflection (in)	Pile Head Shear (k)	Maximum Moment (k-in)	Depth to Max. Moment from Pile Top (feet)
Abutment-1 (24-in CIDH)	¼	20.6	810	6.5
	½	29.5	1,315	7.0
	1	42.3	2,137	8.0
	3	74.7	4,612	9.5
	5	96.0	6,611	10.5
Abutment-2 (24-in CIDH)	¼	27.5	970	6.0
	½	39.3	1,571	6.5
	1	56.3	2,541	7.5
	3	98.7	5,475	8.5
	5	121.8	7,777	9.5

Based on the pile layout provided by the structural designers and the procedures outlined in the Ensoft Group 7.0 software Technical Manual (Ensoft, 2006), a group reduction factor (P-multiplier in the LPILE input) of 0.7 is incorporated in the analyses for the abutment piles.

Solutions presented in Table 11 are entirely based on soil resistance and linear pile properties. Therefore, these values may be limited by structural capacity of the piles and other connection details. Linear interpolation can be used to determine lateral solutions for pile-head deflections between those deflections given in Table 11.

8.1.4.2 Lateral Load Resistance of Abutment Footings

Passive earth pressure against the face of the buried pile cap can be used to resist a portion of the lateral loads transferred to the soil. For static design, the passive soil resistance against the embedded face of the abutment pile cap should be neglected. Under earthquake loading, the

ultimate passive soil resistance should be added to the pile group capacity to determine the total lateral resistance of the pile footing. At the abutments, the ultimate passive soil resistance against the pile footing is estimated to be equal to a maximum equivalent fluid pressure of 390 psf per foot of depth. Note that development of full passive earth pressure requires a lateral pile cap displacement equal to approximately 2 percent of the embedded height (measured from the nearest and lowest ground surface to the bottom of the pile cap). For displacement magnitudes smaller than what is required to mobilize full resistance, the actual resistance can be determined by linearly interpolating between zero and the full resistance.

8.2 Approach Embankments

Embankment fill will be placed to widen the existing approaches to the bridge. At Abutment 1, the widening will occur on the north side of the mainline and will include placing a sliver fill up to 20 feet wide and 8 feet thick at the tallest point of the embankment. The widening on the south side of the mainline at Abutment 1 involves cutting into the existing ascending slopes. About 20-foot long cantilevered wing walls will be constructed on both sides of the approach embankment adjacent to Abutment 1. Beyond the abutment wing walls, the finished embankment side slopes will be graded at an inclination of 2H:1V (Horizontal:Vertical).

At Abutment 2, the widened approach embankment will be retained by Caltrans Standard Type-1 SWB Retaining Walls on the northern and southern faces of the embankment (Retaining Wall Nos. 274R and 275L, respectively). Recommendations for the Caltrans Standard Type-1 SWB Retaining Walls are provided in the Geotechnical Design Report (EMI, 2012a).

Based on the plans provided by AECOM, end slopes at the Abutments 1 and 2 will be graded at an inclination of 1.75H:1V and 1.5H:1V, respectively, with full slope paving.

8.2.1 Settlement and Settlement Period

Based on cross-sections provided, the existing embankment is about 30 feet high, approximately 140 feet wide at the crest, with 2H:1V side slopes. Due to the widening of the structure, a sliver fill up to 14 feet wide and 6 feet high will be placed on top of the existing embankment to construct the approaches to Abutments 1 and 2. Based on the relatively small width and thickness of the sliver fill, the resulting ground settlement at Abutments 1 and 2 is expected to be negligible. Therefore, a settlement period for pile construction is not required.

8.2.2 Slope Stability

Global stability analyses were conducted for both static and pseudo-static conditions for the bridge approach embankment slopes. The analysis was performed using the computer program SLIDE 5.0 (Rocscience, 2006). The soil strength parameters in Table 4 were used in the static and pseudo-static analysis and the results are presented in Appendix C.

Results of our analysis show that the calculated factor-of-safety is greater than the minimum required 1.5 under the static condition including a 2-foot soil surcharge to represent traffic loading. Slope stability analysis under the pseudo-static condition was performed using a seismic coefficient equal to 0.133g (which is the smaller value of one-third the horizontal peak ground acceleration or 0.2g) in accordance Section 3.12 of the Caltrans Guidelines for Structures

Foundation Reports (Caltrans, 2009d). Analysis indicates that the calculated factor-of-safety is greater than the required minimum of 1.1 under the pseudo-static condition.

For embankment slopes with a gradient of 2H:1V or flatter, and composed of the on-site earth materials, surficial stability is not a design concern. For slopes steeper than 2H:1V, slope paving should be used. For all graded slopes, proper maintenance with erosion protection and drainage control in accordance with Section 21 of Caltrans Standard Specifications (Caltrans, 2010b) are also recommended.

8.2.3 Structure Approach Slabs

Selecting the approach type (if required) will be performed by the structural engineer following the flowchart in Caltrans Memo to Designers 5-3, Attachment A, dated May 1996.

8.3 Bridge Abutment Wall Design

8.3.1 Active Earth Pressures for Abutment and Wing Walls

If abutment walls are free to move laterally at the top, a static active lateral earth pressure of 36 psf per foot of depth is recommended for a free draining, level and compacted backfill. If lateral movement at the top of abutment walls is restrained, the lateral earth pressure for a free draining, level and compacted backfill should follow Section 5.5.5.11 of the Caltrans BDS dated August 2004. For this condition, we recommend a coefficient of at-rest lateral earth pressure of 0.46 and a soil unit weight of 120 lb/ft3. If applicable, a uniform lateral pressure of at least 72 psf due to vehicle loads should be added to the above lateral earth pressure.

Caltrans current practice is to design abutment elements using the WSD methodology (Caltrans, 2008). Therefore, abutment and wing walls are not designed for seismic earth pressures.

8.3.2 Passive Resistance of Abutment Wall Backfill

Under seismic loading, an ultimate passive earth pressure of 5 ksf may be used for the approach backfill and abutment walls with a height equal to or greater than 5.5 feet. For abutment walls with heights less than 5.5 feet, the passive pressure may be calculated proportionally (e.g., for a 4-foot high wall, the passive pressure is [4/5.5]x 5 ksf = 3.64 ksf. The horizontal movement at which the maximum passive pressure is expected to be fully mobilized can be determined following the procedure outlined in Section 7.8.1 of the Caltrans SDC (2010c).

9.0 CONSTRUCTION RECOMMENDATIONS

9.1 Earthwork

Earthwork activities should be performed in accordance with Section 19 of the Caltrans Standard Specifications (2010b). Appropriate measures should be taken to prevent damage to existing adjacent structures and utilities. Any design and construction of temporary slopes, sheeting, or shoring should be made the contractor's responsibility. It is the responsibility of the contractor to oversee the safety of workers in the field during construction. The contractor shall conform to all

applicable occupational and health standards, rules, regulations, and orders established by the State of California. In addition, other State, County, or Municipal regulations may supersede the recommendations presented in this section. If a trench shoring design plan is required, the geotechnical consultant should review the plan to confirm that recommendations presented in this report have been applied to the design. Because of the short-term use of temporary shoring, lateral loads due to swell pressures from expansive soils can be neglected for temporary shoring.

Groundwater was encountered at about elevation +92 feet in one of the two as-built exploratory borings drilled in 1968. During the recent 2011 geotechnical field investigation, groundwater was encountered at about elevation +74 feet in only one of the four boreholes drilled at the bridge site. Based on the aforementioned observations, shallow groundwater is not expected to be encountered; however, groundwater might be encountered during pile construction at the abutments. If groundwater is encountered, it should be controlled in accordance with Section 19-3.03D of the Caltrans Standard Specifications (2010b).

9.2 Pile Construction

The CIDH piles should be constructed in accordance with Section 49-3, "Cast-in-Place Concrete Piling" of the Caltrans Standard Specifications (2010b). It is recommended that the latest version of the Caltrans Standard Special Provisions for CIDH pile construction be used for this project. Due to corrosive environment (See Section 6), Type V cement should be used in the concrete mix for CIDH piles.

Careful drilling, and placement of steel reinforcement and concrete, is essential to avoid disturbance of CIDH excavations. The Contractor should be required to use a clean-out bucket at the bottom of the CIDH holes to ensure adequate removal of loose materials from the bottom of holes. Clean-out and concrete placement should be addressed in the specifications. The CIDH excavations should be inspected and approved by the Resident Engineer prior to installing steel reinforcement. In accordance with the latest Caltrans requirement, 3-inch of concrete cover over reinforcement should be provided to improve the construction of the diameter CIDH piles.

Specifications should require that sufficient space be provided in the reinforcement cage during fabrication to allow insertion of a tremie tube for concrete placement. The steel reinforcement cage should be installed and the concrete pumped immediately after each CIDH excavation is completed. Concrete placement by tremie pipe is recommended. No CIDH excavation should be left open overnight. No CIDH excavation should be accomplished immediately adjacent to another CIDH pile until the concrete of the constructed pile has attained its initial set.

Based on groundwater measurements recorded on current and as-built soil borings, "wet" construction is anticipated. The Contractor should be fully prepared to implement the Caltrans Standard Specifications and Special Provisions for wet construction. As a standard Caltrans practice for wet construction, PVC tubes should be installed within the reinforcement cage for gamma-ray testing.

On-site earth materials are generally fine-grained and contain a few thin layers of granular soil. Granular soils are susceptible to caving. The use of temporary casing is left to the contractor's discretion. If temporary casing is used, vibratory and oversized predrilling techniques for casing installation are not allowed. Temporary casing should be placed tight in the borehole. The casing

should be pulled as the concrete is being poured while always maintaining at least a 5-foot head of concrete inside the casing. If any boring becomes bell-shaped and cannot be advanced due to severe caving, all loose material should be removed from the bottom of the boring and the caved region filled with low strength sand-cement slurry. Drilling may continue when the slurry has reached its initial set.

9.3 Backfill and Backdrain Requirements For Abutment Walls and Wing Walls

Caltrans Structure Backfill should be used as backfill material behind the bridge abutment walls as shown in Figure 6. Backfill should be compacted in accordance with Section 19-5 of the Caltrans Standard Specifications (2010b). Backfill should be placed in loose lifts not exceeding 8 inches thick, moisture-conditioned to near optimum moisture content, and compacted to at least 95 percent relative compaction. Relative compaction should be based on the maximum density determined by California Test Method 216. Jetting or flooding to compact backfill is not recommended. Heavy compaction equipment, such as rollers, dozers, or loaders, should not be used adjacent to abutment walls and wing walls to avoid damaging the walls due to large lateral pressures.

Backdrains should be installed behind abutment and wing walls to relieve hydrostatic pressure. Backdrains should be constructed in accordance with Bridge Detail 3-1 on Sheet B0-3 of the Caltrans Standard Plans (2010a) or the geocomposite drain shown in Section 6 of the Caltrans Bridge Design Details (1992).

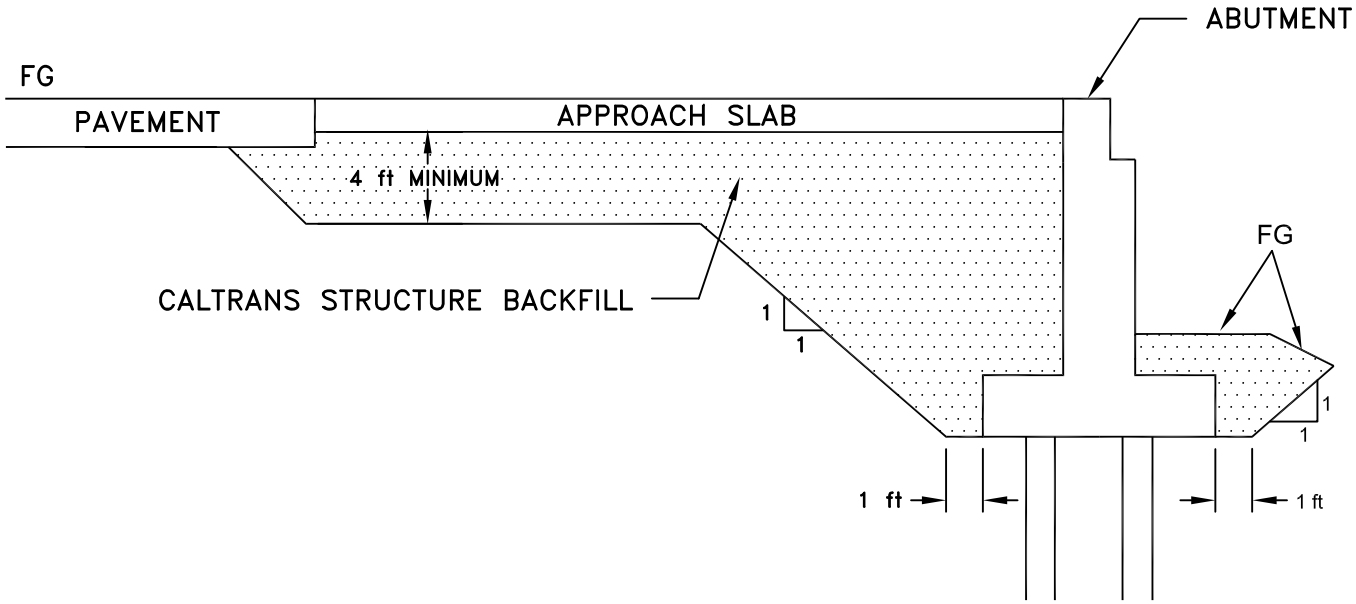
9.4 Review of Construction Plans

Recommendations contained in this report are based on preliminary plans. The geotechnical consultant should review the final construction plans and specifications in order to confirm that the general intent of the recommendations contained in this report have been incorporated into the final construction documents. Recommendations contained in this report may require modification or additional recommendations may be necessary based on the final design.

9.5 Geotechnical Observation and Testing

It is recommended that inspections and testing be performed by qualified geotechnical personnel during the following stages of construction:

- Grading operations, including excavations and placement of compacted fill.
- Shoring installation.
- Footing excavations and pile construction.
- Backdrain installation and backfilling behind bridge abutment walls and wing walls.
- Removal or installation of support of buried utilities or structures.
- When any unusual subsurface conditions are encountered.



NO SCALE

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Interstate 5 HOV Widening Project, Segment 2 Project No. 11-136 Date: 02-15-2013	BRIDGE ABUTMENT WALL BACKFILL AVENIDA VAQUERO UC (WIDEN) FIGURE 6

10.0 LIMITATIONS

This report is intended for the use of AECOM, the Orange County Transportation Authority, the California Department of Transportation, and the City of San Clemente, for proposed widening of the Avenida Vaquero UC which is part of the I-5 HOV Widening Segment 2 Project. This report is based on the project as described and the information obtained from the exploratory boreholes and CPT sounding at the approximate locations indicated on the attached plans. The findings and recommendations contained in this report are based on the results of the field investigation, laboratory tests, and engineering analyses. In addition, earth materials and subsurface conditions encountered in the exploratory borings and CPT sounding are presumed to be representative of the project site. However, subsurface conditions and characteristics of soils and bedrock between exploratory locations can vary. The findings reflect an interpretation of the direct evidence obtained. The recommendations presented in this report are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. EMI should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained herein are applicable to the specific design elements and locations which are the subject of this report. Data, opinions, and recommendations have no applicability to any other design elements or to any other locations and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of EMI.

EMI has no responsibility for construction means, methods, techniques, sequences, or procedures; for safety precautions or programs in connection with the construction; for the acts or omissions of the CONTRACTOR or any other person performing any of the construction; or for the failure of any worker to carry out the construction in accordance with the Final Construction Drawings and Specifications.

Services performed by EMI have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

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Appendix A

LOG OF TEST BORINGS AND LOG OF CPT SOUNDING

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

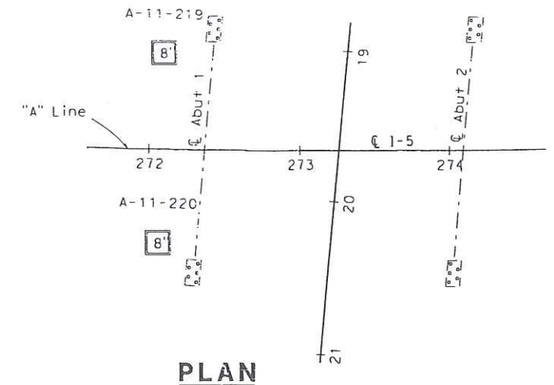
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

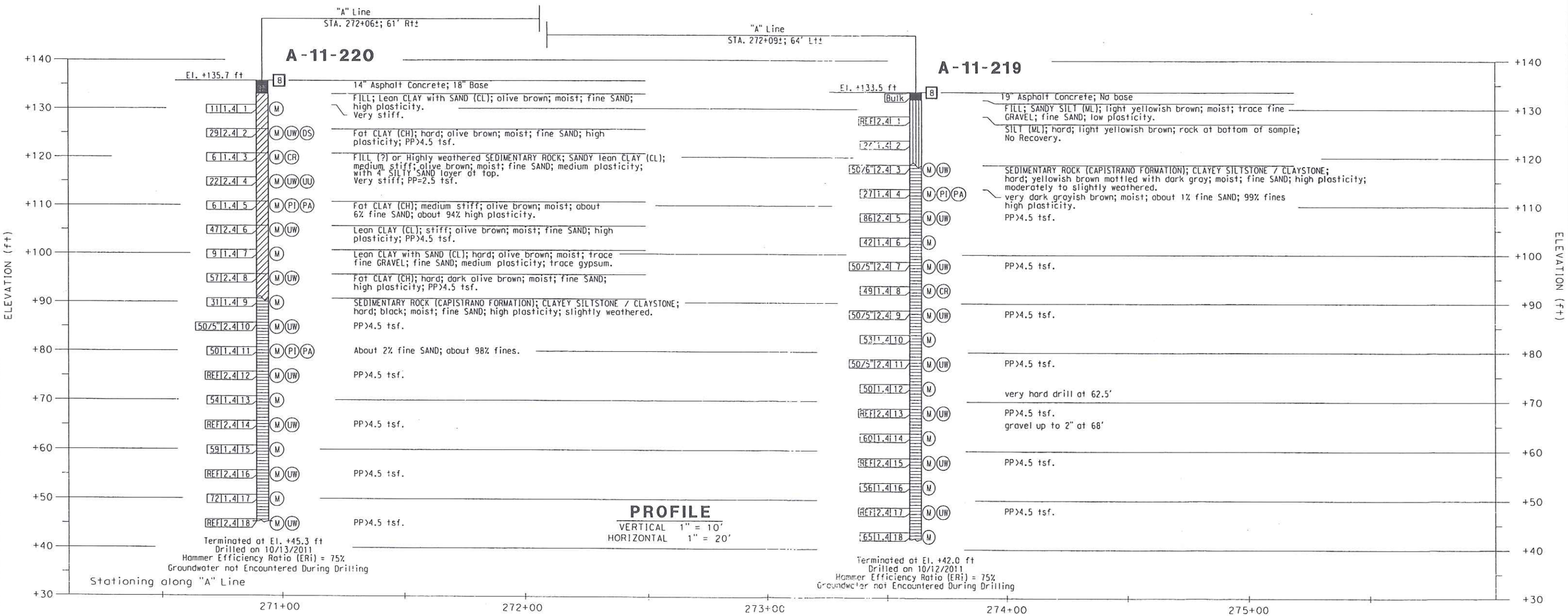
REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. 55-0223	AVENIDA VAQUERO UC (WIDEN)
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES 4.97	LOG OF TEST BORINGS 1 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

IFILE => $REQUEST

CONTRACT NO.: 12-0F96C1 PROJECT ID: 1200020278

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER * A. KORKOS NO. GE 2357 EXP. 3-31-14 GEOTECHNICAL * STATE OF CALIFORNIA

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BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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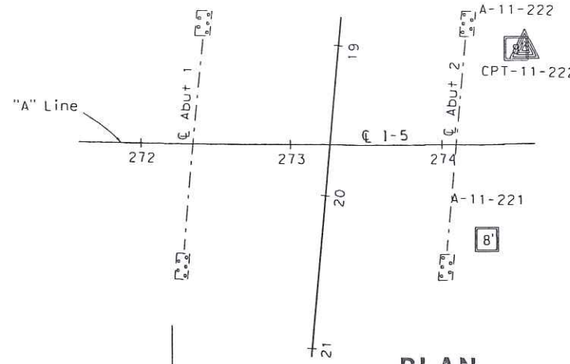
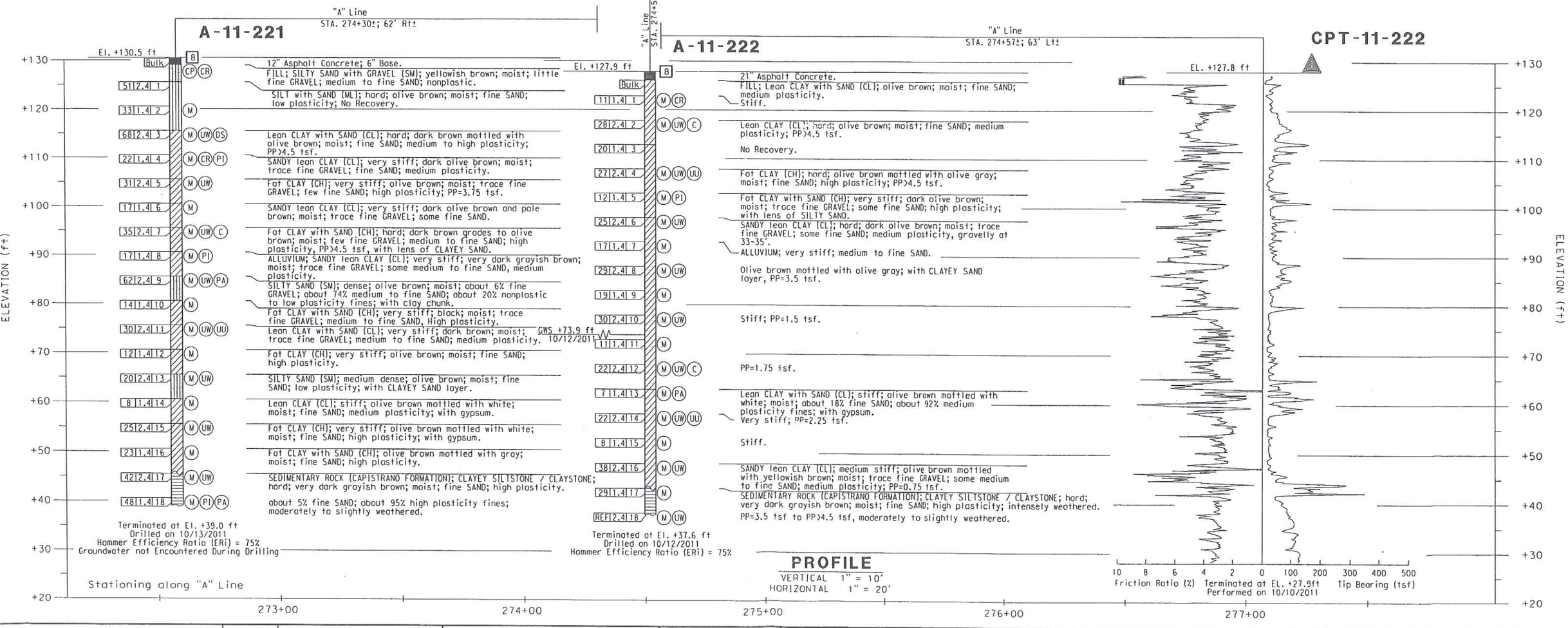


PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. 55-0223	AVENIDA VAQUERO UC (WIDEN)
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES 4.97	LOG OF TEST BORINGS 2 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

CONTRACT NO.: 12-0F86C1 PROJECT ID: 12000202781

BENCH MARK

#271-2A-80 — Elev. 131.79
Set std. brass cap monument 4' Rt ℄ Fwy
Sta. 271+04.30 M.P.C.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.					
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
12	ORA	5	3.8/6.2		

GEOTECHNICAL PROFESSIONAL — DATE

AVENIDA VAQUERO UC (WIDEN)

LOG OF TEST BORINGS 3 OF 3

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

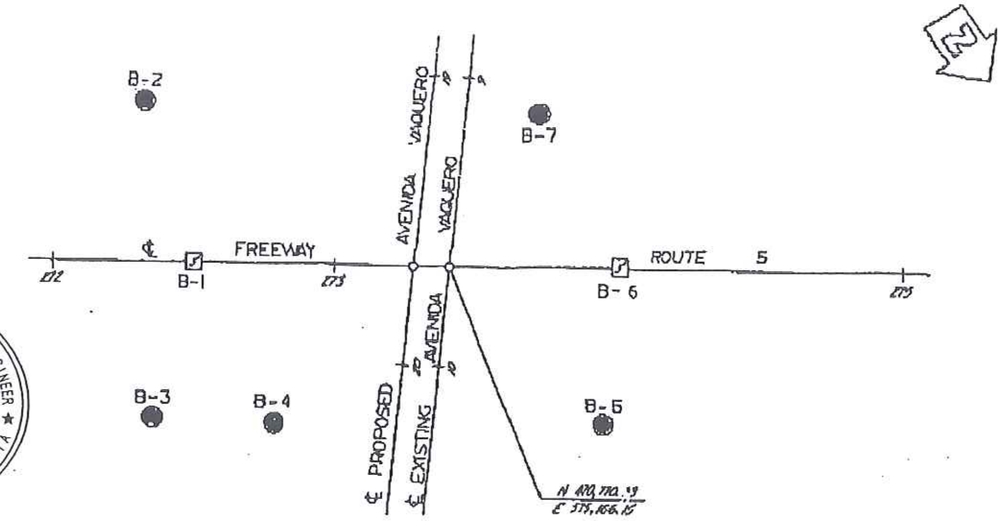
UNIT:
PROJECT NUMBER & PHASE: 12000202781

BRIDGE No.	Sheet	of
55-0223	1	1

Revisions made to this Log of Test Borings from the original ____ Log of Test Borings are the addition of the following table and notes:

Boring	Station	Offset from C/L Rte. 101

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA



PLAN
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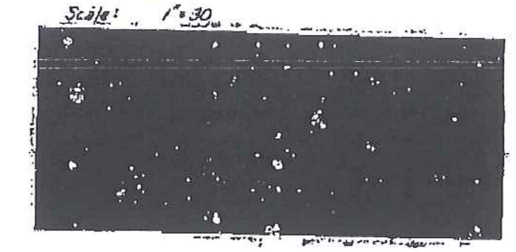

PROFILE
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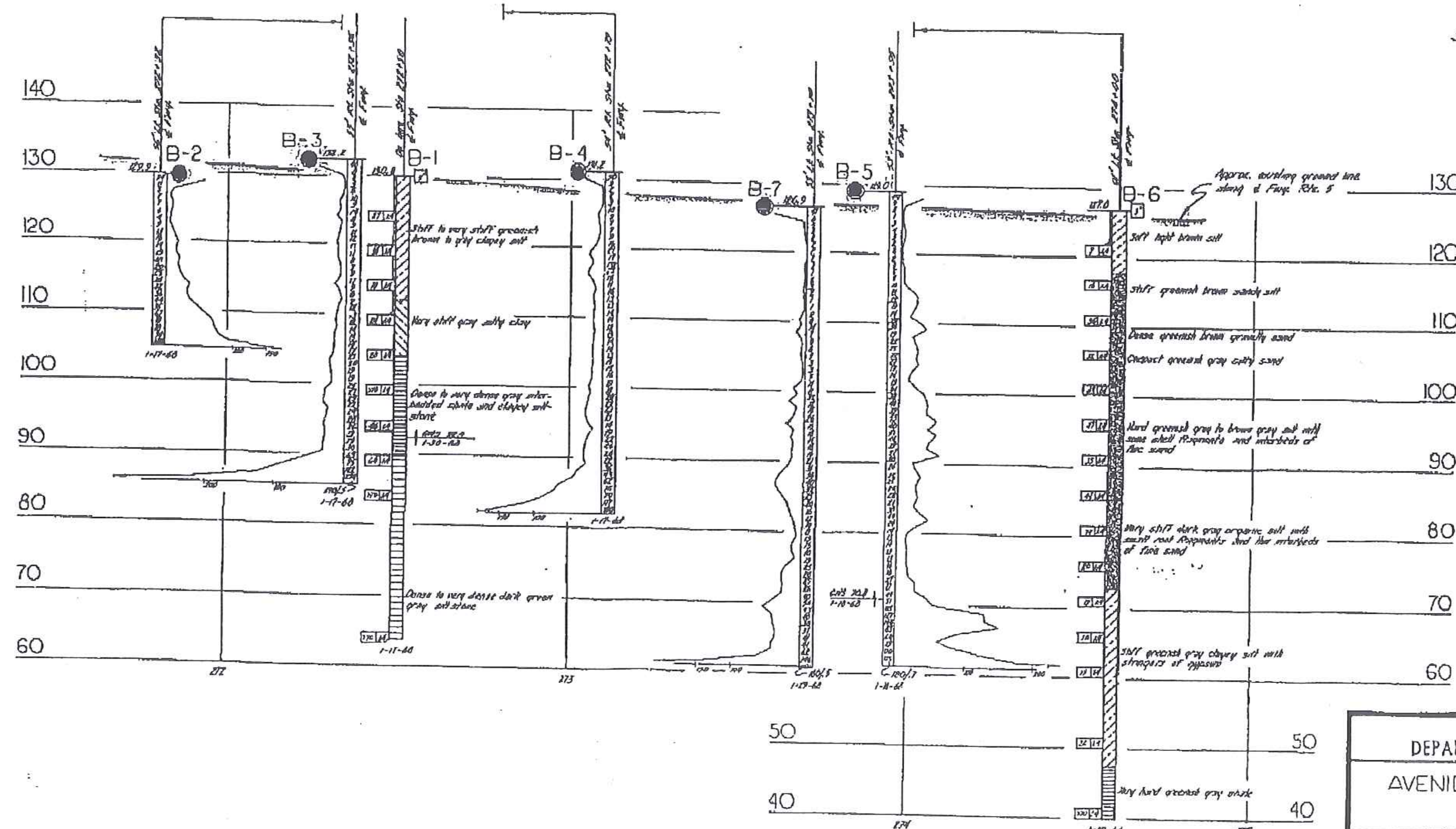

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AS BUILT
CORRECTIONS BY S&L Lohse
CONTRACT NO. 07-105274
DATE 4-1-85 and 10-18-85

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
07	Ora	5	99/61	526	538

March 12, 1972

FIELD STUDY / DRAWN / CHECKED

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

LEGEND OF EARTH MATERIALS

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.

526

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

AVENIDA VAQUERO UNDERCROSSING

LOG OF TEST BORINGS

SCALE As Noted — BRIDGE 55-223 — FILE — DRAWING 55223-7

Sheet 11 of 11

PREL. DRAWING No. PR-

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

CERTIFIED ENGINEERING GEOLOGIST

May 20, 2011
PLANS APPROVAL DATE

REGISTERED GEOLOGIST — THOMAS G. WITTHAR — CERTIFIED ENGINEERING GEOLOGIST — No. 2155 — STATE OF CALIFORNIA

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CEMENTATION

DESCRIPTION	CRITERIA
WEAK	CRUMBLES OR BREAKS WITH HANDLING OR LITTLE FINGER PRESSURE.
MODERATE	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE.
STRONG	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE.

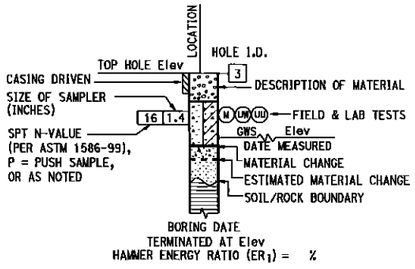
BOREHOLE IDENTIFICATION

SYMBOL	HOLE TYPE	DESCRIPTION
Size	A	AUGER BORING (HOLLOW OR SOLID STEM BUCKET)
Size	R RW RC P	ROTARY DRILLED BORING (CONVENTIONAL) ROTARY DRILLED WITH SELF-CASING WIRE-LINE ROTARY CORE WITH CONTINUOUSLY-SAMPLED, SELF-CASING WIRE-LINE ROTARY PERCUSSION BORING (AIR)
Size	R	ROTARY DRILLED DIAMOND CORE
Size	HD HA	HAND DRIVEN (1-INCH SOIL TUBE) HAND AUGER
●	D	DYNAMIC CONE PENETRATION BORING
▲	CPT	CONE PENETRATION TEST (ASTM D 5778)
[ ]	O	OTHER (NOTE ON LOTB)

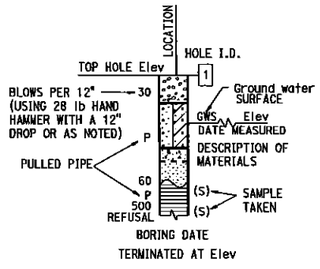
Note: Size in inches.

CONSISTENCY OF COHESIVE SOILS

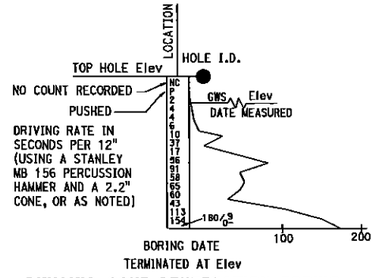
DESCRIPTION	SHEAR STRENGTH (tsf)	POCKET PENETROMETER MEASUREMENT, PP, (tsf)	TORVANE MEASUREMENT, TV, (tsf)	VANE SHEAR MEASUREMENT, VS, (tsf)
VERY SOFT	LESS THAN 0.12	LESS THAN 0.25	LESS THAN 0.12	LESS THAN 0.12
SOFT	0.12 - 0.25	0.25 - 0.5	0.12 - 0.25	0.12 - 0.25
MEDIUM STIFF	0.25 - 0.5	0.5 - 1	0.25 - 0.5	0.25 - 0.5
STIFF	0.5 - 1	1 - 2	0.5 - 1	0.5 - 1
VERY STIFF	1 - 2	2 - 4	1 - 2	1 - 2
HARD	GREATER THAN 2	GREATER THAN 4	GREATER THAN 2	GREATER THAN 2



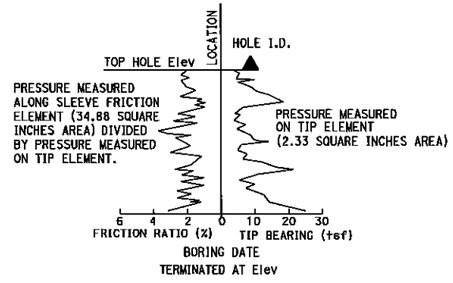
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) BORING

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LEGEND - SOIL (SHEET 1 OF 2)

NO SCALE

A10F

2010 STANDARD PLAN A10F

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5-24-10

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

GROUP SYMBOLS AND NAMES

GRAPHIC/SYMBOL	GROUP NAMES
GW	WELL-GRADED GRAVEL WELL-GRADED GRAVEL WITH SAND
GP	POORLY-GRADED GRAVEL POORLY-GRADED GRAVEL WITH SAND
GW-GM	WELL-GRADED GRAVEL WITH SILT WELL-GRADED GRAVEL WITH SILT AND SAND
GW-GC	WELL-GRADED GRAVEL WITH CLAY (OR SILTY CLAY) WELL-GRADED GRAVEL WITH CLAY AND SAND (OR SILTY CLAY AND SAND)
GP-GM	POORLY-GRADED GRAVEL WITH SILT POORLY-GRADED GRAVEL WITH SILT AND SAND
GP-GC	POORLY-GRADED GRAVEL WITH CLAY (OR SILTY CLAY) POORLY-GRADED GRAVEL WITH CLAY AND SAND (OR SILTY CLAY AND SAND)
GM	SILTY GRAVEL SILTY GRAVEL WITH SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL WITH SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL WITH SAND
SW	WELL-GRADED SAND WELL-GRADED SAND WITH GRAVEL
SP	POORLY-GRADED SAND POORLY-GRADED SAND WITH GRAVEL
SW-SM	WELL-GRADED SAND WITH SILT WELL-GRADED SAND WITH SILT AND GRAVEL
SW-SC	WELL-GRADED SAND WITH CLAY (OR SILTY CLAY) WELL-GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
SP-SM	POORLY-GRADED SAND WITH SILT POORLY-GRADED SAND WITH SILT AND GRAVEL
SP-SC	POORLY-GRADED SAND WITH CLAY (OR SILTY CLAY) POORLY-GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
SM	SILTY SAND SILTY SAND WITH GRAVEL
SC	CLAYEY SAND CLAYEY SAND WITH GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND WITH GRAVEL
PT	PEAT
	COBBLES COBBLES AND BOULDERS BOULDERS

GRAPHIC/SYMBOL	GROUP NAMES
CL	LEAN CLAY LEAN CLAY WITH SAND LEAN CLAY WITH GRAVEL SANDY LEAN CLAY SANDY LEAN CLAY WITH GRAVEL GRAVELLY LEAN CLAY GRAVELLY LEAN CLAY WITH SAND
CL-ML	SILTY CLAY SILTY CLAY WITH SAND SILTY CLAY WITH GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY WITH GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY WITH SAND
ML	SILT SILT WITH SAND SILT WITH GRAVEL SANDY SILT SANDY SILT WITH GRAVEL GRAVELLY SILT GRAVELLY SILT WITH SAND
OL	ORGANIC LEAN CLAY ORGANIC LEAN CLAY WITH SAND ORGANIC LEAN CLAY WITH GRAVEL SANDY ORGANIC LEAN CLAY SANDY ORGANIC LEAN CLAY WITH GRAVEL GRAVELLY ORGANIC LEAN CLAY GRAVELLY ORGANIC LEAN CLAY WITH SAND
OL	ORGANIC SILT ORGANIC SILT WITH SAND ORGANIC SILT WITH GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT WITH GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT WITH SAND
CH	FAT CLAY FAT CLAY WITH SAND FAT CLAY WITH GRAVEL SANDY FAT CLAY SANDY FAT CLAY WITH GRAVEL GRAVELLY FAT CLAY GRAVELLY FAT CLAY WITH SAND
MH	ELASTIC SILT ELASTIC SILT WITH SAND ELASTIC SILT WITH GRAVEL SANDY ELASTIC SILT SANDY ELASTIC SILT WITH GRAVEL GRAVELLY ELASTIC SILT GRAVELLY ELASTIC SILT WITH SAND
OH	ORGANIC FAT CLAY ORGANIC FAT CLAY WITH SAND ORGANIC FAT CLAY WITH GRAVEL SANDY ORGANIC FAT CLAY SANDY ORGANIC FAT CLAY WITH GRAVEL GRAVELLY ORGANIC FAT CLAY GRAVELLY ORGANIC FAT CLAY WITH SAND
OH	ORGANIC ELASTIC SILT ORGANIC ELASTIC SILT WITH SAND ORGANIC ELASTIC SILT WITH GRAVEL SANDY ORGANIC ELASTIC SILT SANDY ORGANIC ELASTIC SILT WITH GRAVEL GRAVELLY ORGANIC ELASTIC SILT GRAVELLY ORGANIC ELASTIC SILT WITH SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL WITH SAND ORGANIC SOIL WITH GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL WITH GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL WITH SAND

FIELD AND LABORATORY TESTING

- (C) CONSOLIDATION (ASTM D 2435)
- (CL) COLLAPSE POTENTIAL (ASTM D 5333)
- (CP) COMPACTION CURVE (CTM 216)
- (CR) CORROSIVITY TESTING (CTM 643, CTM 422, CTM 417)
- (CU) CONSOLIDATED UNDRAINED TRIAXIAL (ASTM D 4767)
- (DS) DIRECT SHEAR (ASTM D 3080)
- (EI) EXPANSION INDEX (ASTM D 4829)
- (M) MOISTURE CONTENT (ASTM D 2216)
- (OC) ORGANIC CONTENT-% (ASTM D 2974)
- (P) PERMEABILITY (CTM 220)
- (PA) PARTICLE SIZE ANALYSIS (ASTM D 422)
- (PI) PLASTICITY INDEX (AASHTO T 90) LIQUID LIMIT (AASHTO T 89)
- (PL) POINT LOAD INDEX (ASTM D 5731)
- (PM) PRESSURE METER
- (R) R-VALUE (CTM 301)
- (SE) SAND EQUIVALENT (CTM 217)
- (SG) SPECIFIC GRAVITY (AASHTO T 100)
- (SL) SHRINKAGE LIMIT (ASTM D 427)
- (SW) SWELL POTENTIAL (ASTM D 4546)
- (UC) UNCONFINED COMPRESSION-SOIL (ASTM D 2166) UNCONFINED COMPRESSION-ROCK (ASTM D 2938)
- (UU) UNCONSOLIDATED UNDRAINED TRIAXIAL (ASTM D 2850)
- (UW) UNIT WEIGHT (ASTM D 4767)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

CERTIFIED ENGINEERING GEOLOGIST

May 20, 2011
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

REGISTERED GEOLOGIST THOMAS G. WITHAM CERTIFIED ENGINEERING GEOLOGIST No. 2155 EXPIRES 08-31-12 STATE OF CALIFORNIA

APPARENT DENSITY OF COHESIONLESS SOILS

DESCRIPTION	SPT N_{60} (BLOWS / 12 INCHES)
VERY LOOSE	0 - 5
LOOSE	5 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	GREATER THAN 50

MOISTURE

DESCRIPTION	CRITERIA
DRY	NO DISCERNABLE MOISTURE
MOIST	MOISTURE PRESENT, BUT NO FREE WATER
WET	VISIBLE FREE WATER

PERCENT OR PROPORTION OF SOILS

DESCRIPTION	CRITERIA
TRACE	PARTICLES ARE PRESENT BUT ESTIMATED TO BE LESS THAN 5%
FEW	5% - 10%
LITTLE	15% - 25%
SOME	30% - 45%
MOSTLY	50% - 100%

PARTICLE SIZE

DESCRIPTION		SIZE
BOULDER		GREATER THAN 12"
COBBLE		3" - 12"
GRAVEL	COARSE	3/4" - 3"
	FINE	1/5" - 3/4"
SAND	COARSE	1/16" - 1/5"
	MEDIUM	1/64" - 1/16"
	FINE	1/300" - 1/64"
SILT AND CLAY		LESS THAN 1/300"

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LEGEND - SOIL (SHEET 2 OF 2)

NO SCALE

A10G

2010 STANDARD PLAN A10G

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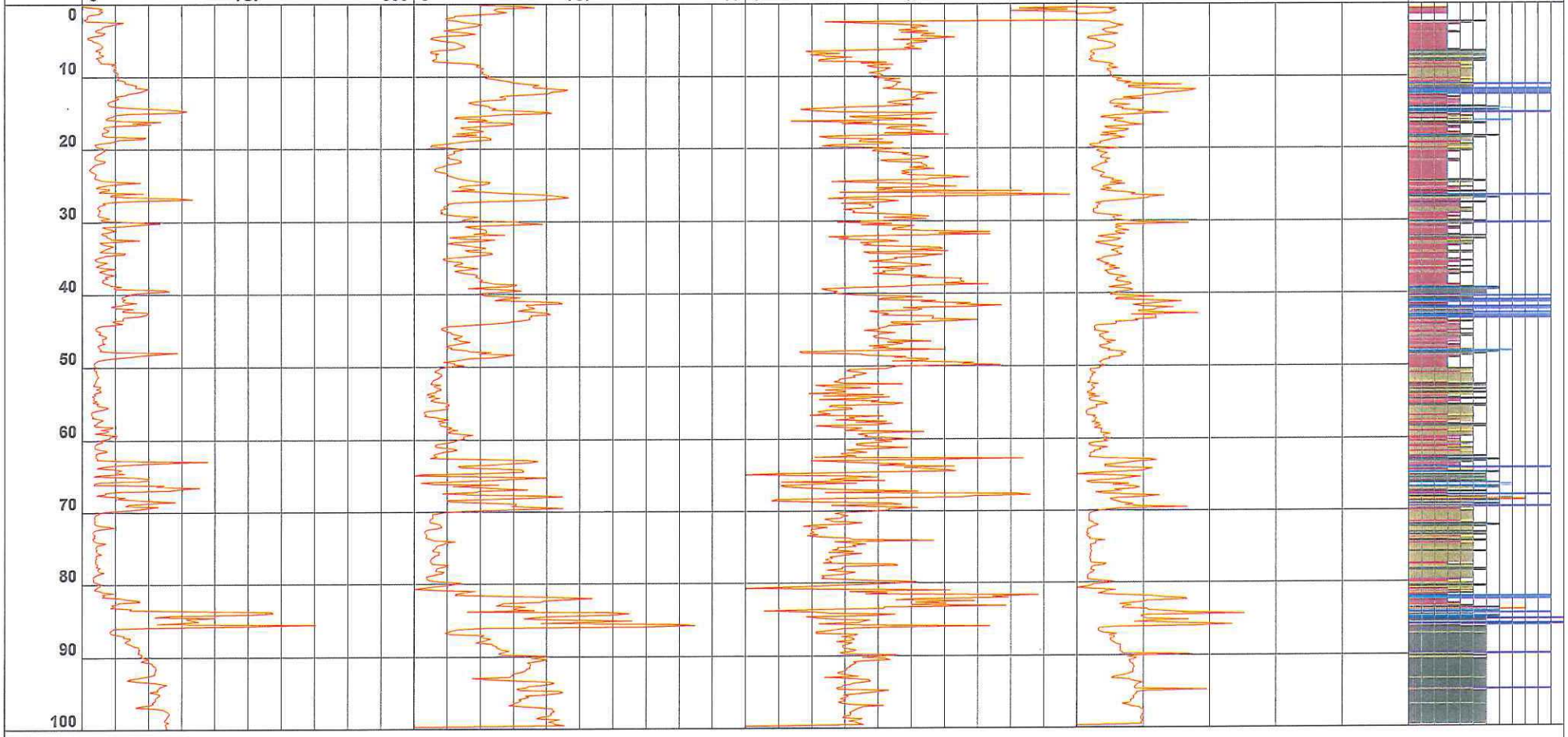
5-5-10

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(568).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-222	Date and Time	10/10/2011 12:58:35 AM	Maximum Depth	99.90 ft
Water Table Depth		>99.90 ft			

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Depth Increment

(*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
0.33	3.1	4.9	-	3.2	0.1	9.9	2	Organic SOILS - Peats	100	1.0	3	5	-	-	0.3	9.9	95	10	N/A	0.00	N/A	N/A
0.49	22.8	36.5	-	3.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	54	15	N/A	0.00	N/A	N/A
0.66	30.5	48.9	-	2.5	0.3	8.3	3	silty CLAY to CLAY	115	1.5	20	33	-	-	2.2	9.9	45	15	N/A	0.00	N/A	N/A
0.82	24.8	39.8	-	2.4	0.3	9.7	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	52	15	N/A	0.00	N/A	N/A
0.98	31.0	49.7	-	2.5	0.3	8.1	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	44	15	N/A	0.00	N/A	N/A
1.15	28.0	44.9	-	2.8	0.3	10.0	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	50	15	N/A	0.00	N/A	N/A
1.31	25.6	41.1	-	2.6	0.4	9.9	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	51	15	N/A	0.00	N/A	N/A
1.48	11.3	18.2	-	1.9	0.4	9.9	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	68	15	N/A	0.00	N/A	N/A
1.64	8.3	13.4	-	1.2	0.5	9.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	75	15	N/A	0.00	N/A	N/A
1.80	7.8	12.6	-	1.2	0.5	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.97	8.8	14.2	-	1.0	0.5	9.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	74	15	N/A	0.00	N/A	N/A
2.13	2.7	4.4	-	1.0	0.5	9.9	2	Organic SOILS - Peats	100	1.0	3	4	-	-	0.3	7.3	95	10	N/A	0.00	N/A	N/A
2.30	6.6	10.6	-	1.3	0.6	9.9	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.5	9.9	82	15	N/A	0.00	N/A	N/A
2.46	62.1	99.7	160.1	1.5	0.7	2.4	5	silty SAND to sandy SILT	120	4.0	16	25	67	48	-	-	18	16	N/A	0.00	N/A	N/A
2.62	54.8	87.8	175.2	1.8	0.8	3.3	5	silty SAND to sandy SILT	120	4.0	14	22	63	47	-	-	23	16	N/A	0.00	N/A	N/A
2.79	45.9	73.6	191.4	2.1	0.8	4.5	4	clayy SILT to silty CLAY	115	2.0	23	37	-	-	3.2	9.9	29	15	N/A	0.00	N/A	N/A
2.95	36.5	58.5	189.6	1.9	0.6	5.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	35	15	N/A	0.00	N/A	N/A
3.12	31.5	50.5	-	1.7	0.5	5.5	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.2	9.9	37	15	N/A	0.00	N/A	N/A
3.28	30.2	48.5	-	1.5	0.5	5.0	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	36	15	-	-	0.24	-
3.45	23.5	37.6	-	1.2	0.5	5.2	3	silty CLAY to CLAY	115	1.5	16	25	-	-	1.6	9.9	41	15	-	-	0.24	-
3.61	19.6	31.4	-	0.9	0.5	4.7	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	42	15	-	-	0.24	-
3.77	21.7	34.8	-	1.2	0.4	5.6	3	silty CLAY to CLAY	115	1.5	14	23	-	-	1.5	9.9	44	15	-	-	0.24	-
3.94	34.4	55.1	172.3	1.6	0.4	4.7	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	34	15	0.00	-	0.24	0.0
4.10	32.5	52.1	-	1.9	0.4	5.7	3	silty CLAY to CLAY	115	1.5	22	35	-	-	2.3	9.9	38	15	-	-	0.24	-
4.27	28.2	45.2	-	1.5	0.4	5.4	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	39	15	-	-	0.24	-
4.43	15.8	25.4	-	0.8	0.5	5.4	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	49	15	-	-	0.24	-
4.59	9.2	14.7	-	0.6	0.4	6.5	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	9.9	64	15	-	-	0.24	-
4.76	8.9	14.2	-	0.5	0.4	5.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	63	15	-	-	0.24	-
4.92	15.5	24.9	-	0.7	0.4	4.6	3	silty CLAY to CLAY	115	1.5	10	17	-	-	1.1	9.9	46	15	-	-	0.24	-
5.09	16.9	27.1	-	0.9	0.3	5.6	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	48	15	-	-	0.24	-
5.25	22.6	36.2	-	1.2	0.3	5.5	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	43	15	-	-	0.24	-
5.41	26.7	42.8	-	1.3	0.3	5.1	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	39	15	-	-	0.24	-
5.58	28.8	46.1	-	1.4	0.3	4.9	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.24	-
5.74	30.7	49.2	-	1.5	0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	36	15	-	-	0.24	-
5.91	30.4	48.8	-	1.5	0.3	5.2	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	37	15	-	-	0.24	-
6.07	28.7	46.0	-	1.4	0.3	4.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.24	-
6.23	22.9	36.8	-	1.2	0.3	5.4	3	silty CLAY to CLAY	115	1.5	15	25	-	-	1.6	9.9	42	15	-	-	0.24	-
6.40	20.3	32.5	-	0.7	0.4	3.8	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	39	15	-	-	0.24	-
6.56	28.0	44.4	95.2	0.5	0.4	1.8	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	25	16	2.43	-	0.24	50.8
6.73	25.3	39.7	96.0	0.5	0.4	2.1	5	silty SAND to sandy SILT	120	4.0	6	10	36	40	-	-	27	16	2.42	-	0.24	51.2
6.89	26.3	40.7	115.2	0.7	0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	31	15	2.08	-	0.23	51.2
7.05	32.6	49.9	103.5	0.6	0.2	2.0	5	silty SAND to sandy SILT	120	4.0	8	12	44	41	-	-	24	16	2.27	-	0.23	44.3
7.22	29.1	44.0	108.3	0.7	0.3	2.4	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	28	16	2.19	-	0.23	51.2
7.38	21.1	33.8	-	0.7	0.4	3.3	4	clayy SILT to silty CLAY	115	2.0	11	17	-	-	1.5	9.9	36	15	-	-	0.22	-
7.55	25.6	37.8	107.1	0.7	0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	13	19	-	-	1.8	9.9	31	15	2.21	-	0.22	51.2
7.71	24.4	35.7	97.1	0.5	0.4	2.3	4	clayy SILT to silty CLAY	115	2.0	12	18	-	-	1.7	9.9	30	15	2.39	-	0.22	51.2
7.87	28.2	40.7	100.9	0.6	0.4	2.2	5	silty SAND to sandy SILT	120	4.0	7	10	37	40	-	-	28	16	2.32	-	0.21	51.2
8.04	28.3	45.5	151.1	1.2	0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	35	15	0.52	-	0.21	2.4
8.20	50.3	71.2	163.9	1.8	0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	25	36	-	-	3.5	9.9	26	15	0.00	-	0.21	0.0
8.37	44.2	62.0	177.3	2.0	0.4	4.5	4	clayy SILT to silty CLAY	115	2.0	22	31	-	-	3.1	9.9	31	15	0.00	-	0.21	0.0
8.53	51.0	70.8	168.6	1.9	0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.6	9.9	27	15	0.00	-	0.21	0.0
8.69	51.5	70.9	172.3	2.0	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.6	9.9	28	15	0.00	-	0.21	0.0
8.86	48.4	66.0	180.4	2.1	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	24	33	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.02	47.8	64.5	175.2	2.0	0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.19	48.2	64.5	174.0	2.0	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.35	52.2	69.2	175.7	2.1	0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.7	9.9	29	15	0.00	-	0.21	0.0
9.51	54.5	71.6	170.9	2.0	0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	27	36	-	-	3.8	9.9	27	15	0.00	-	0.21	0.0
9.68	52.8	68.7	176.3	2.1	0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	29	15	0.00	-	0.21	0.0
9.84	54.4	70.3	180.6	2.3	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	27	35	-	-	3.8	9.9	29	15	0.00	-	0.21	0.0
10.01	56.4	72.3	180.3	2.3	0.4	4.1	4	clayy SILT to silty CLAY	115	2.0	28	36	-	-	4.0	9.9	28	15	0.00	-	0.21	0.0
10.17	55.7	70.8	173.8	2.2	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	28	35	-	-	3.9	9.9	28	15	0.00	-	0.21	0.0
10.34	52.8	66.5	188.6	2.5	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	26	33	-	-	3.7	9.9	31	15	0.00	-	0.21	0.0
10.50	63.7	79.6	192.9	2.7	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	32	40	-	-	4.5	9.9	27	15	0.00	-	0.21	0.0
10.66	65.0	80.7	200.2	2.9	0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	33	40	-	-	4.6	9.9	28	15	0.00	-	0.21	0.0
10.83	64.4	79.3	205.8	3.0	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	32	40	-	-	4.5	9.9	29	15	0.00	-	0.21	0.0
10.99	74.4	90.9	216.2	3.4	0.3	4.6	9	very stiff fine SOIL	120	2.0	37	45	64	44	-	-	27	30	0.00	-	0.21	0.0
11.16	82.7	100.4	228.1	3.8	0.3	4.6	9	very stiff fine SOIL	120	2.0	41	50	67	44	-	-	26	30	0.00	-	0.21	0.0
11.32	80.6	97.0	220.8	3.6	0.4	4.5	9	very stiff fine SOIL	120	2.0	40	48	66	44	-	-	26	30	0.00	-	0.21	0.0
11.48	81.1	97.0	220.9	3.6	0.3	4.5	9	very stiff fine SOIL	120	2.0	41	48	66	44	-	-	26	30	0.00	-	0.21	0.0
11.65	99.6	118.2	235.4	4.1	0.3	4.2	9	very stiff fine SOIL	120	2.0	50	59	73	45	-	-	23	30	0.00	-	0.21	0.0
11.81	94.1	110.8	252.0	4.6	0.3	5.0	9	very stiff fine SOIL	120	2.0	47	55	70	45	-	-	26	30	0.00	-	0.21	0.0
11.98	91.1	106.5	247.8	4.5	0.3	5.0	9	very stiff fine SOIL	120	2.0	46	53	69	44	-	-	27	30	0.00	-	0.21	0.0
12.14	82.8	96.1	235.9	4.1	0.3	5.1	9	very stiff fine SOIL	120	2.0	41	48	66	44	-	-	28	30	0.00	-	0.21	0.0
12.30	70.4	81.2	236.7	4.1	0.3	5.8	9	very stiff fine SOIL	120	2.0	35	41	60	43	-	-	32	30	0.00	-	0.21	0.0
12.47	65.5	75.0	215.2	3.5	0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	33	37	-	-	4.6	9.9	32	15	0.00	-	0.21	0.0
12.63	53.0	60.3	191.5	2.7	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	27	30	-	-	3.7	9.9	34	15	0.00	-	0.21	0.0
12.80	50.1	56.7	186.5	2.6	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	25	28	-	-	3.5	9.9	35	15	0.00	-	0.21	0.0
12.96	55.4	62.2	190.7	2.8	0.4	5.1	4	clayy SILT to silty CLAY	115	2.0	28	31	-	-	3.9	9.9	33	15	0.00	-	0.21	0.0
13.12	51.5	61.5	198.5	2.8	0.4	5.5	4	clayy SILT to silty CLAY	115	2.0	26	31	-	-	3.6	9.9	35	15	0.00	-	0.21	0.0
13.29	45.4	53.7	177.5	2.2	0.4	5.0	4	clayy SILT to silty CLAY	115	2.0	23	27	-	-	3.2	9.9	35	15	0.00	-	0.21	0.0
13.45	40.5	47.5	-	1.8	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.8	9.9	36	15	-	-	0.21	-
13.62	38.5	44.8	-	1.6	0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	36	15	-	-	0.21	-
13.78	39.6	45.7	-	1.8	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	20	23	-	-	2.8	9.9	36	15	-	-	0.21	-
13.94	41.4	51.4	-	2.1	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	21	26	-	-	2.9	9.9	36	15	-	-	0.21	-
14.11	50.7	54.6	168.8	2.3	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	25	27	-	-	3.6	9.9	33	15	0.00	-	0.21	0.0
14.27	73.5	78.7	162.2	2.3	0.4	3.1	5	silty SAND to sandy SILT	120	4.0	18	20	59	43	-	-	24	16	0.00	-	0.21	0.0
14.44	108.1	115.0	172.2	2.5	0.3	2.3	5	silty SAND to sandy SILT	120	4.0	27	29	72	45	-	-	17	16	0.00	-	0.21	0.0
14.60	141.0	149.1	183.8	2.4	0.3	1.7	6	clean SAND to silty SAND	125	5.0	28	30	80	46	-	-	11	16	0.00	-	0.21	0.0
14.76	158.0	166.1	213.8	3.3	0.2	2.1	5	silty SAND to sandy SILT	120	4.0	40	42	84	46	-	-	13	16	0.00	-	0.21	0.0
14.93	145.4	152.0	223.6	4.1	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	36	38	81	46	-	-	16	16	0.00	-	0.21	0.0
15.09	72.0	74.9	227.8	4.2	0.3	5.8	9	very stiff fine SOIL	120	2.0	36	37	57	42	-	-	33	30	0.00	-	0.21	0.0
15.26	49.1	55.6	-	2.7	0.3	5.5	4	clayy SILT to silty CLAY	115	2.0	25	28	-	-	3.4	9.9	36	15	-	-	0.21	-
15.42	47.7	50.7	167.2	2.2	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	24	25	-	-	3.3	9.9	35	15	0.00	-	0.21	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
15.58	41.3	42.3	124.4	1.3	0.3	3.2	4	clayy SILT to silty CLAY	115	2.0	21	21	-	-	2.9	9.9	32	15	1.95	-	0.21	51.2
15.75	37.3	37.9	122.4	1.2	0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	19	19	-	-	2.6	9.9	35	15	1.98	-	0.20	51.2
15.91	36.8	40.0	-	2.1	0.3	5.8	3	silty CLAY to CLAY	115	1.5	25	27	-	-	2.6	9.9	42	15	-	-	0.20	-
16.08	59.5	59.9	158.5	2.2	0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	30	30	-	-	4.2	9.9	30	15	0.55	-	0.20	3.8
16.24	118.8	119.1	147.6	1.6	0.2	1.4	6	clean SAND to silty SAND	125	5.0	24	24	73	45	-	-	12	16	1.00	-	0.20	4.9
16.40	76.0	75.8	178.9	2.9	0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	38	38	-	-	5.3	9.9	27	15	0.00	-	0.20	0.0
16.57	104.0	103.1	180.6	3.0	0.1	2.9	5	silty SAND to sandy SILT	120	4.0	26	26	68	44	-	-	20	16	0.00	-	0.20	0.0
16.73	51.4	53.0	-	2.7	0.2	5.3	4	clayy SILT to silty CLAY	115	2.0	26	27	-	-	3.6	9.9	36	15	-	-	0.20	-
16.90	35.0	35.8	-	1.9	0.2	5.6	3	silty CLAY to CLAY	115	1.5	23	24	-	-	2.4	9.9	44	15	-	-	0.20	-
17.06	32.4	32.8	-	1.4	0.2	4.5	3	silty CLAY to CLAY	115	1.5	22	22	-	-	2.3	9.9	41	15	-	-	0.20	-
17.23	35.7	35.8	-	1.5	0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	39	15	-	-	0.20	-
17.39	40.3	40.0	-	2.0	0.1	5.0	3	silty CLAY to CLAY	115	1.5	27	27	-	-	2.8	9.9	40	15	-	-	0.20	-
17.55	38.8	38.2	-	2.1	0.2	5.6	3	silty CLAY to CLAY	115	1.5	26	25	-	-	2.7	9.9	42	15	-	-	0.20	-
17.72	30.5	29.8	-	1.7	0.2	5.9	3	silty CLAY to CLAY	115	1.5	20	20	-	-	2.1	9.9	48	15	-	-	0.20	-
17.88	30.4	29.4	-	1.3	0.0	4.3	3	silty CLAY to CLAY	115	1.5	20	20	-	-	2.1	9.9	43	15	-	-	0.20	-
18.05	30.9	29.6	-	1.9	-2.1	6.3	3	silty CLAY to CLAY	115	1.5	21	20	-	-	2.1	9.9	49	15	-	-	0.20	-
18.21	37.4	35.4	116.1	1.2	-4.3	3.2	4	clayy SILT to silty CLAY	115	2.0	19	18	-	-	2.6	9.9	35	15	2.07	-	0.20	51.2
18.37	96.4	90.8	148.4	2.2	-4.3	2.3	5	silty SAND to sandy SILT	120	4.0	24	23	64	43	-	-	19	16	1.01	-	0.20	6.5
18.54	93.1	87.3	152.8	2.3	-4.3	2.5	5	silty SAND to sandy SILT	120	4.0	23	22	63	43	-	-	20	16	0.81	-	0.19	5.1
18.70	56.0	52.3	158.7	2.3	-4.2	4.2	4	clayy SILT to silty CLAY	115	2.0	28	26	-	-	3.9	9.9	33	15	0.59	-	0.19	25.1
18.87	50.2	46.6	137.4	1.8	-3.0	3.6	4	clayy SILT to silty CLAY	115	2.0	25	23	-	-	3.5	9.9	32	15	1.55	-	0.19	48.1
19.03	41.5	38.4	126.0	1.4	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	2.9	9.9	35	15	1.93	-	0.19	51.2
19.19	26.2	23.6	-	1.2	-1.0	4.6	3	silty CLAY to CLAY	115	1.5	17	16	-	-	1.8	9.9	48	15	-	-	0.19	-
19.36	19.2	17.1	-	0.8	-1.0	4.7	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.7	55	15	-	-	0.19	-
19.52	20.5	18.1	-	0.6	-0.9	2.9	4	clayy SILT to silty CLAY	115	2.0	10	9	-	-	1.4	9.9	46	15	-	-	0.19	-
19.69	21.9	19.2	-	0.5	-0.9	2.4	4	clayy SILT to silty CLAY	115	2.0	11	10	-	-	1.5	9.9	42	15	-	-	0.19	-
19.85	32.1	28.0	-	1.1	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	16	14	-	-	2.2	9.9	40	15	-	-	0.19	-
20.01	32.9	28.4	-	1.5	-0.8	4.9	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	45	15	-	-	0.19	-
20.18	34.8	29.8	-	1.4	-0.8	4.1	4	clayy SILT to silty CLAY	115	2.0	17	15	-	-	2.4	9.9	41	15	-	-	0.19	-
20.34	31.0	26.4	-	1.2	-0.8	4.0	4	clayy SILT to silty CLAY	115	2.0	16	13	-	-	2.1	9.9	43	15	-	-	0.19	-
20.51	28.8	24.3	-	1.2	-0.8	4.5	3	silty CLAY to CLAY	115	1.5	19	16	-	-	2.0	9.9	47	15	-	-	0.19	-
20.67	24.2	20.2	-	1.2	-0.8	5.2	3	silty CLAY to CLAY	115	1.5	16	13	-	-	1.7	9.9	53	15	-	-	0.19	-
20.83	22.2	18.4	-	1.0	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	9.9	55	15	-	-	0.19	-
21.00	19.6	16.1	-	1.0	-0.8	5.4	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.2	59	15	-	-	0.19	-
21.16	19.2	15.7	-	1.1	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	9.0	62	15	-	-	0.19	-
21.33	19.2	15.6	-	1.1	-0.8	5.8	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	8.9	61	15	-	-	0.19	-
21.49	25.7	20.6	-	1.3	-0.8	5.4	3	silty CLAY to CLAY	115	1.5	17	14	-	-	1.8	9.9	54	15	-	-	0.19	-
21.65	34.9	27.8	-	1.4	-0.8	4.2	3	silty CLAY to CLAY	115	1.5	23	19	-	-	2.4	9.9	43	15	-	-	0.19	-
21.82	33.5	26.5	-	1.4	-0.8	4.5	3	silty CLAY to CLAY	115	1.5	22	18	-	-	2.3	9.9	45	15	-	-	0.19	-
21.98	23.8	18.7	-	1.3	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	16	12	-	-	1.6	9.9	56	15	-	-	0.19	-
22.15	19.5	15.2	-	1.0	-0.8	5.7	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	8.8	61	15	-	-	0.19	-
22.31	17.4	13.5	-	0.9	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.7	65	15	-	-	0.19	-
22.47	15.2	11.7	-	0.8	-0.8	6.0	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.6	70	15	-	-	0.19	-
22.64	13.7	10.5	-	0.7	-0.8	5.5	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.8	71	15	-	-	0.19	-
22.80	11.2	8.5	-	0.6	-0.7	6.4	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.6	80	15	-	-	0.19	-
22.97	12.6	9.5	-	0.6	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	5.3	74	15	-	-	0.19	-
23.13	16.5	12.3	-	0.8	-0.8	5.1	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	7.0	65	15	-	-	0.19	-
23.30	20.3	15.1	-	1.0	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.7	60	15	-	-	0.19	-
23.46	21.6	15.9	-	1.0	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	14	11	-	-	1.5	9.2	58	15	-	-	0.19	-
23.62	20.8	15.2	-	1.0	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.8	60	15	-	-	0.19	-
23.79	18.8	13.7	-	1.2	-0.8	6.6	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	7.9	67	15	-	-	0.19	-
23.95	18.9	13.7	-	1.3	-0.8	7.3	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	7.9	69	15	-	-	0.19	-
24.12	25.8	18.5	-	1.4	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.8	9.9	58	15	-	-	0.19	-
24.28	29.1	20.8	-	1.6	-0.8	5.7	3	silty CLAY to CLAY	115	1.5	19	14	-	-	2.0	9.9	54	15	-	-	0.19	-
24.44	54.5	44.5	134.2	1.9	-0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	27	22	-	-	3.8	9.9	33	15	1.79	-	0.19	50.7
24.61	88.3	71.9	141.8	2.3	-0.9	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	41	-	-	23	16	1.54	-	0.18	24.9
24.77	52.6	36.7	-	2.3	-0.8	4.4	4	clayy SILT to silty CLAY	115	2.0	26	18	-	-	3.7	9.9	39	15	-	-	0.18	-
24.94	37.1	25.7	-	2.0	-1.2	5.7	3	silty CLAY to CLAY	115	1.5	25	17	-	-	2.6	9.9	50	15	-	-	0.18	-
25.10	26.1	18.0	-	1.4	-1.2	5.9	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.8	9.9	58	15	-	-	0.18	-
25.26	21.2	14.5	-	1.3	-1.2	6.8	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.5	66	15	-	-	0.18	-
25.43	41.2	28.0	-	1.6	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	21	14	-	-	2.9	9.9	43	15	-	-	0.18	-
25.59	41.2	27.9	-	1.8	-1.2	4.6	3	silty CLAY to CLAY	115	1.5	27	19	-	-	2.9	9.9	45	15	-	-	0.18	-
25.76	28.8	19.3	-	1.1	-1.2	4.2	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	9.9	50	15	-	-	0.18	-
25.92	25.5	17.0	-	2.1	-1.2	8.9	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	9.9	68	15	-	-	0.18	-
26.08	92.7	73.3	150.0	2.6	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	24	16	1.21	-	0.18	15.4
26.25	45.9	30.3	-	3.6	-1.6	8.2	3	silty CLAY to CLAY	115	1.5	31	20	-	-	3.2	9.9	54	15	-	-	0.18	-
26.41	42.5	27.8	-	4.2	-1.6	9.9	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	59	15	-	-	0.18	-
26.58	69.4	45.2	-	4.4	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	46	30	-	-	4.8	9.9	42	15	-	-	0.18	-
26.74	143.8	112.3	200.5	4.7	-1.5	3.3	5	silty SAND to sandy SILT	120	4.0	36	28	71	43	-	-	21	16	0.00	-	0.18	0.0
26.90	166.4	129.6	192.6	4.1	-1.5	2.5	5	silty SAND to sandy SILT	120	4.0	42	32	76	44	-	-	16	16	0.00	-	0.18	0.0
27.07	84.6	65.7	177.9	3.6	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	42	33	-	-	5.9	9.9	30	15	0.00	-	0.18	0.0
27.23	48.5	30.8	-	2.2	-1.4	4.8	3	silty CLAY to CLAY	115	1.5	32	21	-	-	3.4	9.9	43	15	-	-	0.18	-
27.40	31.0	19.6	-	1.3	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.1	9.9	51	15	-	-	0.18	-
27.56	35.6	22.3	-	1.0	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	18	11	-	-	2.5	9.9	42	15	-	-	0.18	-
27.72	27.5	17.2	-	1.0	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	18	11	-	-	1.9	9.9	52	15	-	-	0.18	-
27.89	24.9	15.4	-	0.9	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.1	55	15	-	-	0.18	-
28.05	23.3	14.3	-	0.9	-1.2	4.2	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.6	8.5	57	15	-	-	0.18	-
28.22	25.5	15.6	-	1.0	-1.3	4.1	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.3	55	15	-	-	0.18	-
28.38	27.8	16.9	-	0.8	-2.2	3.1	3	silty CLAY to CLAY	115	1.5	19	11	-	-	1.9	9.9	49	15	-	-	0.18	-
28.54	25.1	15.2	-	0.8	-2.4	3.4	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	53	15	-	-	0.18	-
28.71	26.2	15.8	-	0.9	-2.5	3.5	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.8	9.4	52	15	-	-	0.18	-
28.87	25.2	15.1	-	0.8	-2.7	3.5	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	53	15	-	-	0.18	-
29.04	23.4	14.0	-	1.0	-3.0	4.5	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	8.2	59	15	-	-	0.18	-
29.20	25.5	15.1	-	1.3	-3.2	5.3	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	60	15	-	-	0.18	-
29.36	35.1	20.7	-	1.9	-3.3	5.8	3	silty CLAY to CLAY	115	1.5	23	14	-	-	2.4	9.9	55	15	-	-	0.18	-
29.53	41.9	24.5	-	1.7	-4.2	4.3	3	silty CLAY to CLAY	115	1.5	28	16	-	-	2.9	9.9	46	15	-	-	0.18	-
29.69	28.9	16.8	-	1.6	-5.6	5.8	3	silty CLAY to CLAY	115	1.5	19	11	-	-	2.0	9.9	59	15	-	-	0.18	-
29.86	30.2	17.5	-	1.5	-5.9	5.1	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	56	15	-	-	0.18	-
30.02	77.2	56.9	161.6	3.1	-5.9	4.1	4	clayy SILT to silty CLAY	115	2.0	39	28	-	-	5.4	9.9	31	15	0.00	-	0.18	0.0
30.19	117.4	86.3	160.6	3.3	-5.8	2.8	5	silty SAND to sandy SILT	120	4.0	29	22	62	42	-	-	21	16	0.00	-	0.18	0.0
30.35	88.0	64.6	181.6	3.9	-5.8	4.5	4	clayy SILT to silty CLAY	115	2.0	44	32	-	-	6.2	9.9	31	15	0.00	-	0.18	0.0
30.51	64.8	36.8	-	2.3	-5.0	3.6	4	clayy SILT to silty CLAY	115	2.0	32	18	-	-	4.5	9.9	36	15	-	-	0.18	-
30.68	30.5	17.2	-	1.6	-2.5	5.4	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.1	9.9	58	15	-	-	0.18	-
30.84	35.8	20.1	-	1.7	-1.5	5.1	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	53	15	-	-	0.18	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
31.01	44.9	25.1	-	2.0	-1.6	4.7	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	47	15	-	-	0.18	-
31.17	49.3	27.3	-	2.2	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	33	18	-	-	3.4	9.9	45	15	-	-	0.18	-
31.33	40.6	22.4	-	2.2	-1.5	5.7	3	silty CLAY to CLAY	115	1.5	27	15	-	-	2.8	9.9	53	15	-	-	0.18	-
31.50	29.8	16.4	-	2.2	-1.7	7.8	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.0	9.9	66	15	-	-	0.18	-
31.66	30.9	16.9	-	1.8	-1.7	6.2	3	silty CLAY to CLAY	115	1.5	21	11	-	-	2.1	9.9	61	15	-	-	0.18	-
31.83	37.1	20.2	-	2.7	-1.8	7.8	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.6	9.9	61	15	-	-	0.18	-
31.99	37.4	20.2	-	1.6	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.6	9.9	51	15	-	-	0.18	-
32.15	42.7	23.0	-	1.1	-3.0	2.6	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	3.0	9.9	40	15	-	-	0.18	-
32.32	44.0	23.5	-	1.4	0.3	3.3	4	clayy SILT to silty CLAY	115	2.0	22	12	-	-	3.0	9.9	42	15	-	-	0.18	-
32.48	86.2	61.1	137.8	2.4	0.3	2.9	5	silty SAND to sandy SILT	120	4.0	22	15	51	40	-	-	26	16	1.78	-	0.18	33.2
32.65	48.4	25.6	-	2.1	0.4	4.5	3	silty CLAY to CLAY	115	1.5	32	17	-	-	3.4	9.9	46	15	-	-	0.18	-
32.81	27.3	14.4	-	1.3	0.4	5.0	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	8.6	60	15	-	-	0.18	-
32.97	29.7	15.6	-	1.0	0.4	3.7	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.0	9.4	53	15	-	-	0.18	-
33.14	36.0	18.8	-	1.4	0.4	4.0	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	50	15	-	-	0.18	-
33.30	47.2	24.5	-	1.7	0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	24	12	-	-	3.3	9.9	44	15	-	-	0.18	-
33.47	42.0	21.7	-	2.0	0.4	4.9	3	silty CLAY to CLAY	115	1.5	28	14	-	-	2.9	9.9	51	15	-	-	0.18	-
33.63	37.0	19.1	-	2.2	0.4	6.2	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.5	9.9	58	15	-	-	0.18	-
33.79	34.2	17.5	-	2.0	0.4	6.3	3	silty CLAY to CLAY	115	1.5	23	12	-	-	2.3	9.9	60	15	-	-	0.18	-
33.96	30.7	15.7	-	1.5	0.4	5.4	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	9.5	60	15	-	-	0.18	-
34.12	27.3	13.8	-	1.7	0.4	6.6	3	silty CLAY to CLAY	115	1.5	18	9	-	-	1.9	8.3	67	15	-	-	0.18	-
34.29	65.1	32.8	-	2.3	0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	33	16	-	-	4.5	9.9	38	15	-	-	0.18	-
34.45	63.5	31.9	-	2.4	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	32	16	-	-	4.4	9.9	39	15	-	-	0.18	-
34.61	35.4	17.7	-	2.1	0.3	6.3	3	silty CLAY to CLAY	115	1.5	24	12	-	-	2.4	9.9	60	15	-	-	0.18	-
34.78	32.5	16.2	-	1.8	0.3	5.9	3	silty CLAY to CLAY	115	1.5	22	11	-	-	2.2	9.8	61	15	-	-	0.18	-
34.94	24.7	12.2	-	1.3	0.3	5.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.7	7.3	67	15	-	-	0.18	-
35.11	19.8	9.7	-	0.9	0.2	5.0	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.7	71	15	-	-	0.18	-
35.27	19.8	9.7	-	0.9	0.2	5.1	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.7	71	15	-	-	0.18	-
35.43	23.7	11.6	-	1.0	0.2	4.7	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.9	65	15	-	-	0.18	-
35.60	38.1	18.5	-	1.4	0.2	3.9	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.6	9.9	50	15	-	-	0.18	-
35.76	32.0	15.5	-	1.5	0.2	4.9	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.2	9.4	58	15	-	-	0.18	-
35.93	25.4	12.2	-	1.3	0.2	5.4	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.7	7.3	66	15	-	-	0.18	-
36.09	21.6	10.3	-	1.2	0.2	6.2	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.5	6.1	74	15	-	-	0.18	-
36.26	30.6	14.6	-	1.6	0.2	5.5	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	8.9	62	15	-	-	0.18	-
36.42	50.3	23.9	-	1.9	0.2	4.0	3	silty CLAY to CLAY	115	1.5	34	16	-	-	3.5	9.9	45	15	-	-	0.18	-
36.58	33.0	15.6	-	1.6	0.2	5.1	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.3	9.5	59	15	-	-	0.18	-
36.75	25.9	12.2	-	1.2	0.2	5.1	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.8	7.3	65	15	-	-	0.18	-
36.91	32.7	15.3	-	1.3	0.2	4.4	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.2	9.4	57	15	-	-	0.18	-
37.08	36.5	17.0	-	1.5	0.2	4.5	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	54	15	-	-	0.18	-
37.24	48.5	22.5	-	1.9	0.2	4.0	3	silty CLAY to CLAY	115	1.5	32	15	-	-	3.3	9.9	47	15	-	-	0.18	-
37.40	40.8	18.9	-	1.9	0.2	5.0	3	silty CLAY to CLAY	115	1.5	27	13	-	-	2.8	9.9	54	15	-	-	0.18	-
37.57	34.1	15.7	-	1.9	0.2	5.8	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.3	9.6	61	15	-	-	0.18	-
37.73	38.7	17.7	-	1.9	0.1	5.3	3	silty CLAY to CLAY	115	1.5	26	12	-	-	2.7	9.9	57	15	-	-	0.18	-
37.90	31.0	14.2	-	2.0	0.1	7.0	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.6	68	15	-	-	0.18	-
38.06	31.9	14.5	-	2.1	0.1	6.9	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.2	8.8	67	15	-	-	0.18	-
38.22	30.4	13.8	-	2.0	0.0	7.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.1	8.4	68	15	-	-	0.18	-
38.39	34.2	15.4	-	2.3	0.0	7.1	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.3	9.4	66	15	-	-	0.18	-
38.55	41.2	18.5	-	2.5	0.0	6.3	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	59	15	-	-	0.18	-
38.72	42.3	18.9	-	3.1	0.0	7.7	3	silty CLAY to CLAY	115	1.5	28	13	-	-	2.9	9.9	63	15	-	-	0.18	-
38.88	59.8	26.6	-	3.1	0.0	5.3	3	silty CLAY to CLAY	115	1.5	40	18	-	-	4.1	9.9	48	15	-	-	0.18	-
39.04	47.6	21.1	-	2.3	0.1	5.0	3	silty CLAY to CLAY	115	1.5	32	14	-	-	3.3	9.9	52	15	-	-	0.18	-
39.21	50.8	22.4	-	1.6	0.1	3.4	4	clayy SILT to silty CLAY	115	2.0	25	11	-	-	3.5	9.9	44	15	-	-	0.18	-
39.37	123.4	79.5	140.4	2.8	0.0	2.3	5	silty SAND to sandy SILT	120	4.0	31	20	59	41	-	-	20	16	1.75	-	0.18	23.4
39.54	131.6	84.6	149.8	3.2	0.1	2.5	5	silty SAND to sandy SILT	120	4.0	33	21	61	41	-	-	20	16	1.38	-	0.17	15.8
39.70	96.2	61.7	137.5	2.7	0.1	2.8	5	silty SAND to sandy SILT	120	4.0	24	15	51	40	-	-	26	16	1.80	-	0.17	32.9
39.86	78.5	50.2	122.9	2.1	0.1	2.7	5	silty SAND to sandy SILT	120	4.0	20	13	44	38	-	-	28	16	1.97	-	0.17	43.9
40.03	71.4	30.9	-	2.0	0.1	2.9	4	clayy SILT to silty CLAY	115	2.0	36	15	-	-	5.0	9.9	36	15	-	-	0.16	-
40.19	65.1	28.0	-	2.2	0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	33	14	-	-	4.5	9.9	40	15	-	-	0.16	-
40.36	60.7	26.0	-	2.7	0.2	4.7	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	46	15	-	-	0.16	-
40.52	60.1	25.6	-	3.2	0.2	5.6	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	50	15	-	-	0.16	-
40.68	65.5	27.8	-	2.7	0.2	4.3	3	silty CLAY to CLAY	115	1.5	44	19	-	-	4.5	9.9	43	15	-	-	0.16	-
40.85	60.6	25.7	-	2.4	0.2	4.2	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	45	15	-	-	0.16	-
41.01	64.0	27.0	-	3.7	0.1	6.0	3	silty CLAY to CLAY	115	1.5	43	18	-	-	4.4	9.9	50	15	-	-	0.16	-
41.18	82.2	34.6	-	4.4	0.2	5.5	3	silty CLAY to CLAY	115	1.5	55	23	-	-	5.7	9.9	44	15	-	-	0.16	-
41.34	66.0	27.6	-	4.5	0.2	7.0	3	silty CLAY to CLAY	115	1.5	44	18	-	-	4.6	9.9	52	15	-	-	0.16	-
41.50	53.6	22.4	-	3.4	0.0	6.6	3	silty CLAY to CLAY	115	1.5	36	15	-	-	3.7	9.9	56	15	-	-	0.16	-
41.67	44.0	18.3	-	3.4	0.0	8.2	3	silty CLAY to CLAY	115	1.5	29	12	-	-	3.0	9.9	65	15	-	-	0.16	-
41.83	51.9	21.5	-	3.5	0.0	7.1	3	silty CLAY to CLAY	115	1.5	35	14	-	-	3.6	9.9	58	15	-	-	0.16	-
42.00	76.5	31.5	-	3.6	0.0	4.9	3	silty CLAY to CLAY	115	1.5	51	21	-	-	5.3	9.9	44	15	-	-	0.16	-
42.16	62.7	25.7	-	3.3	0.0	5.5	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.3	9.9	49	15	-	-	0.16	-
42.32	60.5	24.7	-	3.1	0.0	5.4	3	silty CLAY to CLAY	115	1.5	40	16	-	-	4.2	9.9	50	15	-	-	0.16	-
42.49	96.8	39.4	-	3.6	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.8	9.9	36	15	-	-	0.16	-
42.65	101.0	41.0	-	4.0	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	50	20	-	-	7.0	9.9	36	15	-	-	0.16	-
42.82	95.3	38.5	-	4.1	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	48	19	-	-	6.6	9.9	38	15	-	-	0.16	-
42.98	85.7	34.5	-	3.5	0.0	4.2	4	clayy SILT to silty CLAY	115	2.0	43	17	-	-	6.0	9.9	39	15	-	-	0.16	-
43.15	63.1	25.3	-	3.6	0.0	5.9	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.4	9.9	51	15	-	-	0.16	-
43.31	61.2	24.5	-	3.5	0.0	5.9	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	52	15	-	-	0.16	-
43.47	62.6	24.9	-	3.5	0.1	5.8	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.3	9.9	51	15	-	-	0.16	-
43.64	46.4	18.4	-	3.2	0.1	7.4	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.9	62	15	-	-	0.16	-
43.80	47.9	18.9	-	3.0	0.1	6.6	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	59	15	-	-	0.16	-
43.97	61.0	24.0	-	2.7	0.1	4.6	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	47	15	-	-	0.16	-
44.13	47.5	18.7	-	2.1	0.1	4.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	53	15	-	-	0.16	-
44.29	30.7	12.0	-	1.6	0.1	5.8	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	7.3	68	15	-	-	0.16	-
44.46	24.0	9.3	-	1.0	0.1	4.8	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.5	72	15	-	-	0.16	-
44.62	20.6	8.0	-	0.9	0.0	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	76	15	-	-	0.16	-
44.79	20.5	7.9	-	0.8	0.0	4.6	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	75	15	-	-	0.16	-
44.95	21.9	8.4	-	0.9	0.0	4.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.9	74	15	-	-	0.16	-
45.11	28.0	10.7	-	1.0	0.7	3.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.5	64	15	-	-	0.16	-
45.28	27.7	10.6	-	1.1	0.7	4.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.9	6.4	66	15	-	-	0.16	-
45.44	24.9	9.5	-	1.1	0.7	5.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.6	72	15	-	-	0.16	-
45.61	31.4	11.9	-	1.3	0.7	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	7.3	63	15	-	-	0.16	-
45.77	36.4	13.8	-	1.5	0.7	4.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	8.5	59	15	-	-	0.16	-
45.93	36.4	13.7	-	1.4	0.7	4.2	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	8.5	58	15	-	-	0.16	-
46.10	30.4	11.5	-	1.2	0.7	4.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.9	64	15	-	-	0.16	-
46.26	30.7	11.6	-	1.3	0.7	4.7	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	7.0	65	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
46.43	32.1	12.1	-	1.4	0.7	4.7	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	7.3	64	15	-	-	0.16	-
46.59	30.1	11.3	-	1.7	0.7	6.1	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	6.8	71	15	-	-	0.16	-
46.75	34.4	13.0	-	1.5	0.7	4.6	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.8	62	15	-	-	0.16	-
46.92	27.3	10.3	-	1.3	0.7	5.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.0	70	15	-	-	0.16	-
47.08	23.4	8.8	-	1.0	0.7	5.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.1	74	15	-	-	0.16	-
47.25	26.2	9.9	-	1.0	0.7	4.2	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.8	5.7	67	15	-	-	0.16	-
47.41	26.4	10.0	-	1.1	0.7	4.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.8	70	15	-	-	0.16	-
47.57	29.2	11.0	-	1.1	0.7	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	2.0	6.4	64	15	-	-	0.16	-
47.74	26.3	9.9	-	1.6	0.7	6.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.7	77	15	-	-	0.16	-
47.90	48.7	18.4	-	1.7	0.7	3.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	50	15	-	-	0.16	-
48.07	143.6	83.7	124.7	2.3	0.6	1.7	5	silty SAND to sandy SILT	120	4.0	36	21	61	41	-	-	16	16	1.95	-	0.16	21.8
48.23	114.6	66.7	112.9	2.0	0.7	1.8	5	silty SAND to sandy SILT	120	4.0	29	17	54	40	-	-	19	16	2.11	-	0.16	30.0
48.39	87.0	32.8	-	3.0	0.7	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	38	15	-	-	0.16	-
48.56	72.6	27.4	-	2.7	0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	42	15	-	-	0.16	-
48.72	49.4	18.6	-	2.4	0.7	5.1	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.9	55	15	-	-	0.16	-
48.89	37.0	14.0	-	1.7	0.8	4.9	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	8.1	61	15	-	-	0.16	-
49.05	26.0	9.8	-	1.4	0.5	6.2	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.5	75	15	-	-	0.16	-
49.22	21.1	8.0	-	1.2	-0.8	6.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.3	83	15	-	-	0.16	-
49.38	20.2	7.6	-	0.9	-1.3	5.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.1	80	15	-	-	0.16	-
49.54	18.0	6.8	-	1.2	-1.6	8.2	2	Organic SOILS - Peats	100	1.0	18	7	-	-	1.8	3.5	95	10	-	-	0.16	-
49.71	18.6	7.0	-	1.2	-1.7	7.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.7	92	15	-	-	0.16	-
49.87	19.8	7.5	-	1.5	-1.7	9.0	2	Organic SOILS - Peats	100	1.0	20	7	-	-	1.9	3.9	93	10	-	-	0.16	-
50.04	22.2	8.4	-	1.0	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	77	15	-	-	0.16	-
50.20	18.1	6.8	-	0.8	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	84	15	-	-	0.16	-
50.36	18.2	6.9	-	0.8	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	83	15	-	-	0.16	-
50.53	21.9	8.3	-	0.7	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.4	70	15	-	-	0.16	-
50.69	20.5	7.7	-	0.6	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	4.0	72	15	-	-	0.16	-
50.86	22.2	8.4	-	0.7	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.4	71	15	-	-	0.16	-
51.02	22.5	8.5	-	0.8	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	72	15	-	-	0.16	-
51.18	23.9	9.0	-	0.8	-1.8	4.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.8	69	15	-	-	0.16	-
51.35	24.8	9.4	-	0.8	-1.8	3.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.0	67	15	-	-	0.16	-
51.51	22.7	8.6	-	0.8	-1.8	3.8	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	70	15	-	-	0.16	-
51.68	21.9	8.3	-	0.7	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.3	70	15	-	-	0.16	-
51.84	21.2	8.0	-	0.6	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.1	70	15	-	-	0.16	-
52.00	19.9	7.5	-	0.6	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.8	72	15	-	-	0.16	-
52.17	20.0	7.5	-	0.5	-1.8	3.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.8	71	15	-	-	0.16	-
52.33	17.5	6.6	-	0.5	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	3.2	77	15	-	-	0.16	-
52.50	17.1	6.4	-	0.8	-1.8	5.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.1	88	15	-	-	0.16	-
52.66	28.1	10.6	-	0.6	-1.8	2.4	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.5	56	15	-	-	0.16	-
52.82	27.5	10.4	-	0.7	-1.8	2.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.4	59	15	-	-	0.16	-
52.99	21.2	8.0	-	0.8	-1.8	4.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.0	75	15	-	-	0.16	-
53.15	27.4	10.3	-	0.8	-1.8	3.4	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.3	62	15	-	-	0.16	-
53.32	28.5	10.8	-	0.7	-1.8	2.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.6	57	15	-	-	0.16	-
53.48	22.0	8.3	-	0.7	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.1	70	15	-	-	0.16	-
53.64	17.5	6.6	-	0.5	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	3.1	78	15	-	-	0.16	-
53.81	20.7	7.8	-	0.4	-1.7	2.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.8	64	15	-	-	0.16	-
53.97	15.0	5.7	-	0.6	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.6	92	15	-	-	0.16	-
54.14	18.9	7.1	-	0.4	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.4	71	15	-	-	0.16	-
54.30	18.2	6.9	-	0.8	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.2	84	15	-	-	0.16	-
54.46	16.4	6.2	-	0.6	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.8	85	15	-	-	0.16	-
54.63	22.7	8.6	-	0.5	-1.7	2.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.2	63	15	-	-	0.16	-
54.79	16.1	6.1	-	0.6	-1.7	4.9	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.7	88	15	-	-	0.16	-
54.96	25.3	9.5	-	1.0	-1.8	4.3	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.7	69	15	-	-	0.16	-
55.12	21.8	8.2	-	1.0	-1.7	5.6	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	3.9	79	15	-	-	0.16	-
55.28	23.9	9.0	-	1.1	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.4	75	15	-	-	0.16	-
55.45	36.1	13.6	-	0.9	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	52	15	-	-	0.16	-
55.61	39.2	14.8	-	1.0	-1.7	2.7	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.6	50	15	-	-	0.16	-
55.78	32.3	12.2	-	1.0	-1.7	3.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.1	59	15	-	-	0.16	-
55.94	23.3	8.8	-	0.8	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	4.2	69	15	-	-	0.16	-
56.11	15.7	5.9	-	0.4	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.6	79	15	-	-	0.16	-
56.27	13.7	5.2	-	0.3	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.2	83	15	-	-	0.16	-
56.43	14.1	5.3	-	0.3	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.2	83	15	-	-	0.16	-
56.60	14.7	5.6	-	0.4	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.4	83	15	-	-	0.16	-
56.76	16.5	6.2	-	0.3	-1.7	2.4	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	2.7	73	15	-	-	0.16	-
56.93	14.9	5.6	-	0.6	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.4	93	15	-	-	0.16	-
57.09	26.1	9.8	-	0.8	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.7	65	15	-	-	0.16	-
57.25	31.4	11.8	-	1.0	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.7	60	15	-	-	0.16	-
57.42	26.7	10.1	-	0.7	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	62	15	-	-	0.16	-
57.58	22.3	8.4	-	0.9	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	3.9	76	15	-	-	0.16	-
57.75	23.1	8.7	-	0.8	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.0	70	15	-	-	0.16	-
57.91	17.8	6.7	-	0.8	-1.7	5.4	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.9	86	15	-	-	0.16	-
58.07	20.3	7.7	-	0.8	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.4	79	15	-	-	0.16	-
58.24	46.6	17.6	-	1.0	-1.7	2.3	4	clayy SILT to silty CLAY	115	2.0	23	9	-	-	3.2	8.7	43	15	-	-	0.16	-
58.40	42.7	16.1	-	1.1	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	7.9	49	15	-	-	0.16	-
58.57	28.1	10.6	-	1.0	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	4.9	65	15	-	-	0.16	-
58.73	39.9	15.1	-	1.3	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.3	54	15	-	-	0.16	-
58.89	36.6	13.8	-	1.1	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.6	55	15	-	-	0.16	-
59.06	19.2	7.2	-	1.0	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.1	88	15	-	-	0.16	-
59.22	36.8	13.9	-	1.4	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.6	59	15	-	-	0.16	-
59.39	52.4	19.8	-	1.8	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	48	15	-	-	0.16	-
59.55	41.5	15.6	-	1.5	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	7.5	55	15	-	-	0.16	-
59.71	41.6	15.7	-	1.5	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	7.5	54	15	-	-	0.16	-
59.88	34.7	13.1	-	1.5	-1.6	4.9	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.1	63	15	-	-	0.16	-
60.04	26.3	9.9	-	1.3	-1.6	5.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.5	74	15	-	-	0.16	-
60.21	31.3	11.8	-	1.2	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.4	64	15	-	-	0.16	-
60.37	23.9	9.0	-	1.1	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.0	75	15	-	-	0.16	-
60.53	20.5	7.7	-	0.8	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.3	78	15	-	-	0.16	-
60.70	19.4	7.3	-	0.7	-1.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.1	77	15	-	-	0.16	-
60.86	19.2	7.2	-	0.6	-1.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.0	78	15	-	-	0.16	-
61.03	19.2	7.2	-	0.7	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.0	81	15	-	-	0.16	-
61.19	24.0	9.1	-	1.2	-1.7	5.7	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	3.9	77	15	-	-	0.16	-
61.35	35.6	13.4	-	1.3	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.1	59	15	-	-	0.16	-
61.52	37.9	14.3	-	1.2	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	6.6	54	15	-	-	0.16	-
61.68	26.2	9.9	-	0.9	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.3	67	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qc1n PS -	qincs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
61.85	20.5	7.7	-	0.7	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.2	77	15	-	-	0.16	-
62.01	21.5	8.1	-	0.6	-1.7	3.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.4	71	15	-	-	0.16	-
62.17	20.2	7.6	-	0.6	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.1	74	15	-	-	0.16	-
62.34	20.9	7.9	-	0.7	-1.6	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.3	75	15	-	-	0.16	-
62.50	23.5	8.9	-	0.5	-1.6	2.5	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	3.8	62	15	-	-	0.16	-
62.67	22.7	8.6	-	1.9	-1.6	10.0	2	Organic SOILS - Peats	100	1.0	23	9	-	-	2.2	3.6	92	10	-	-	0.16	-
62.83	57.9	21.9	-	3.4	-1.7	6.3	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	55	15	-	-	0.16	-
63.00	189.2	96.4	146.7	3.7	-1.6	2.0	5	silty SAND to sandy SILT	120	4.0	47	24	66	41	-	-	17	16	1.42	-	0.16	12.3
63.16	117.9	60.0	141.7	3.5	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	59	30	-	-	8.2	9.9	27	15	1.46	-	0.16	33.8
63.32	81.8	30.9	-	2.9	-1.6	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.15	-
63.49	48.0	18.1	-	2.3	-1.6	5.2	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.2	56	15	-	-	0.15	-
63.65	32.7	12.3	-	1.3	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.4	64	15	-	-	0.15	-
63.82	22.3	8.4	-	1.4	-1.5	7.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	3.4	86	15	-	-	0.15	-
63.98	46.9	17.7	-	2.2	-1.6	5.2	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.0	57	15	-	-	0.15	-
64.14	59.3	22.4	-	3.2	-2.6	5.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	53	15	-	-	0.15	-
64.31	54.1	20.4	-	3.3	-5.1	6.5	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.2	58	15	-	-	0.15	-
64.47	52.2	19.7	-	3.3	-8.2	6.8	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	8.9	60	15	-	-	0.15	-
64.64	64.2	24.2	-	2.3	-8.2	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	44	15	-	-	0.15	-
64.80	27.5	10.4	-	0.2	-8.2	1.0	4	clayy SILT to silty CLAY	115	2.0	14	5	-	-	1.8	4.3	46	15	-	-	0.15	-
64.96	17.9	6.8	-	0.0	-8.2	0.1	1	sensitive fine SOIL	115	2.0	9	3	-	-	1.1	2.6	43	15	-	-	0.15	-
65.13	79.2	29.9	-	2.4	-8.3	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.15	-
65.29	100.7	38.0	-	4.0	-8.3	4.1	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	38	15	-	-	0.15	-
65.46	100.5	50.2	131.5	3.0	-8.3	3.1	4	clayy SILT to silty CLAY	115	2.0	50	25	-	-	7.0	9.9	29	15	1.79	-	0.15	43.9
65.62	86.8	43.3	115.2	2.2	-8.4	2.7	4	clayy SILT to silty CLAY	115	2.0	43	22	-	-	6.0	9.9	30	15	2.08	-	0.15	51.2
65.78	27.3	10.3	-	1.1	-8.5	4.9	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.2	70	15	-	-	0.15	-
65.95	19.1	7.2	-	0.2	-8.5	1.3	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.7	60	15	-	-	0.15	-
66.11	17.5	6.6	-	0.6	-8.6	4.3	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.4	83	15	-	-	0.15	-
66.28	123.6	61.4	119.1	2.6	-8.7	2.1	5	silty SAND to sandy SILT	120	4.0	31	15	51	38	-	-	22	16	2.02	-	0.15	33.0
66.44	111.5	55.3	85.8	1.2	-8.6	1.1	5	silty SAND to sandy SILT	120	4.0	28	14	47	38	-	-	17	16	2.65	-	0.14	38.4
66.60	176.8	87.7	115.3	2.1	-8.6	1.2	6	clean SAND to silty SAND	125	5.0	35	18	63	40	-	-	13	16	2.08	-	0.14	20.5
66.77	147.1	72.8	120.7	2.6	-8.6	1.8	5	silty SAND to sandy SILT	120	4.0	37	18	57	39	-	-	19	16	2.00	-	0.14	26.7
66.93	132.4	65.5	137.0	3.4	-8.5	2.7	5	silty SAND to sandy SILT	120	4.0	33	16	53	39	-	-	24	16	1.64	-	0.13	30.1
67.10	57.7	21.8	-	2.0	-8.5	3.8	3	silty CLAY to CLAY	115	1.5	38	15	-	-	3.9	9.5	47	15	-	-	0.13	-
67.26	35.1	13.3	-	1.8	-8.5	5.8	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	5.5	67	15	-	-	0.13	-
67.42	36.0	13.6	-	0.9	-8.7	2.7	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.6	52	15	-	-	0.13	-
67.59	21.4	8.1	-	1.8	-8.8	9.9	2	Organic SOILS - Peats	100	1.0	21	8	-	-	2.1	3.1	95	10	-	-	0.13	-
67.75	44.2	16.7	-	3.8	-8.8	9.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.0	71	15	-	-	0.13	-
67.92	64.8	24.4	-	4.5	-8.8	7.4	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	56	15	-	-	0.13	-
68.08	53.4	20.1	-	3.5	-8.9	7.0	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.6	8.6	60	15	-	-	0.13	-
68.24	79.2	29.9	-	2.1	-9.0	2.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	36	15	-	-	0.13	-
68.41	105.6	51.7	79.9	1.0	-9.0	1.0	5	silty SAND to sandy SILT	120	4.0	26	13	45	37	-	-	17	16	2.81	-	0.13	42.3
68.57	140.5	68.6	88.7	1.1	-9.0	0.8	6	clean SAND to silty SAND	125	5.0	28	14	55	39	-	-	13	16	2.58	-	0.13	28.9
68.74	97.7	47.7	110.9	2.2	-9.0	2.3	5	silty SAND to sandy SILT	120	4.0	24	12	43	37	-	-	27	16	2.15	-	0.12	46.9
68.90	70.6	26.6	-	3.1	-9.0	4.7	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.9	9.9	46	15	-	-	0.12	-
69.07	65.4	24.7	-	3.1	-9.0	5.0	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	49	15	-	-	0.12	-
69.23	114.0	55.4	127.8	3.0	-9.0	2.7	5	silty SAND to sandy SILT	120	4.0	29	14	48	38	-	-	26	16	1.89	-	0.12	38.3
69.39	99.0	37.4	-	3.8	-9.1	4.0	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	38	15	-	-	0.11	-
69.56	86.7	32.7	-	4.5	-9.1	5.4	3	silty CLAY to CLAY	115	1.5	58	22	-	-	6.0	9.9	45	15	-	-	0.11	-
69.72	66.0	24.9	-	2.8	-9.1	4.6	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.5	9.9	47	15	-	-	0.11	-
69.89	36.4	13.8	-	1.6	-9.1	4.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.5	62	15	-	-	0.11	-
70.05	25.1	9.5	-	1.0	-9.1	4.5	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.6	72	15	-	-	0.11	-
70.21	25.1	9.5	-	0.8	-9.2	3.6	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.6	67	15	-	-	0.11	-
70.38	20.4	7.7	-	0.5	-9.2	3.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.7	73	15	-	-	0.11	-
70.54	19.4	7.3	-	0.6	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.6	77	15	-	-	0.11	-
70.71	18.2	6.9	-	0.6	-9.2	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.4	80	15	-	-	0.11	-
70.87	19.8	7.5	-	0.6	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.6	76	15	-	-	0.11	-
71.03	18.1	6.8	-	0.5	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.3	79	15	-	-	0.11	-
71.20	19.8	7.5	-	0.5	-9.2	3.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.6	72	15	-	-	0.11	-
71.36	19.2	7.2	-	0.5	-9.2	3.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	74	15	-	-	0.11	-
71.53	18.5	7.0	-	0.5	-9.2	3.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.4	77	15	-	-	0.11	-
71.69	19.6	7.4	-	0.7	-9.2	4.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.6	80	15	-	-	0.11	-
71.85	25.2	9.5	-	0.8	-9.2	3.8	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.5	68	15	-	-	0.11	-
72.02	40.7	15.4	-	0.8	-9.1	2.2	4	clayy SILT to silty CLAY	115	2.0	20	8	-	-	2.7	6.0	46	15	-	-	0.11	-
72.18	48.0	18.1	-	0.8	-9.2	1.9	4	clayy SILT to silty CLAY	115	2.0	24	9	-	-	3.3	7.2	41	15	-	-	0.11	-
72.35	28.8	10.8	-	0.7	-9.2	2.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	4.0	59	15	-	-	0.11	-
72.51	20.4	7.7	-	0.4	-9.2	2.7	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.7	69	15	-	-	0.11	-
72.67	17.8	6.7	-	0.4	-9.2	2.6	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.2	73	15	-	-	0.11	-
72.84	16.2	6.1	-	0.3	-9.1	2.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	78	15	-	-	0.11	-
73.00	16.0	6.1	-	0.3	-9.2	2.8	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	79	15	-	-	0.11	-
73.17	19.4	7.3	-	0.4	-9.1	2.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	70	15	-	-	0.11	-
73.33	17.9	6.8	-	0.4	-9.1	2.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.2	75	15	-	-	0.11	-
73.49	19.5	7.4	-	0.4	-9.1	2.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	69	15	-	-	0.11	-
73.66	16.2	6.1	-	0.4	-9.1	3.1	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	81	15	-	-	0.11	-
73.82	16.0	6.0	-	0.5	-9.1	4.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	88	15	-	-	0.11	-
73.99	19.0	7.2	-	0.6	-9.1	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.4	80	15	-	-	0.11	-
74.15	21.8	8.2	-	1.2	-9.1	7.1	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.8	86	15	-	-	0.11	-
74.31	35.5	13.4	-	1.0	-9.1	3.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.0	55	15	-	-	0.11	-
74.48	29.0	11.0	-	0.9	-9.1	3.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	3.9	63	15	-	-	0.11	-
74.64	21.8	8.2	-	0.8	-9.1	4.5	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.8	77	15	-	-	0.11	-
74.81	21.3	8.1	-	0.7	-9.1	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	2.7	75	15	-	-	0.11	-
74.97	20.0	7.5	-	0.7	-9.1	4.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.5	79	15	-	-	0.11	-
75.13	22.6	8.5	-	0.6	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.9	70	15	-	-	0.11	-
75.30	20.9	7.9	-	0.6	-9.1	3.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.6	73	15	-	-	0.11	-
75.46	21.7	8.2	-	0.6	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	2.7	71	15	-	-	0.11	-
75.63	23.9	9.0	-	0.8	-9.0	4.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	3.1	71	15	-	-	0.11	-
75.79	29.0	11.0	-	0.7	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	3.9	60	15	-	-	0.11	-
75.96	21.9	8.2	-	0.8	-9.0	4.4	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.7	76	15	-	-	0.11	-
76.12	20.3	7.6	-	0.6	-9.0	3.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	77	15	-	-	0.11	-
76.28	21.9	8.2	-	0.6	-9.0	3.5	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.7	72	15	-	-	0.11	-
76.45	21.2	8.0	-	0.5	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.6	71	15	-	-	0.11	-
76.61	19.8	7.5	-	0.5	-9.0	3.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.4	75	15	-	-	0.11	-
76.78	20.5	7.7	-	0.5	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	72	15	-	-	0.11	-
76.94	20.1	7.6	-	0.5	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.4	73	15	-	-	0.11	-
77.10	20.8	7.8	-	0.5	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	72	15	-	-	0.11	-

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Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
77.27	23.3	8.8	-	0.5	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	66	15	-	-	0.11	-
77.43	23.0	8.7	-	1.0	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	2.8	79	15	-	-	0.11	-
77.60	21.0	7.9	-	1.0	-9.0	5.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	84	15	-	-	0.11	-
77.76	27.3	10.3	-	0.8	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	3.5	65	15	-	-	0.11	-
77.92	23.5	8.9	-	0.7	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	70	15	-	-	0.11	-
78.09	23.6	8.9	-	0.7	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	70	15	-	-	0.11	-
78.25	26.0	9.8	-	0.6	-9.0	3.0	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	3.3	63	15	-	-	0.11	-
78.42	32.8	12.4	-	0.9	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	4.3	58	15	-	-	0.11	-
78.58	25.8	9.7	-	0.9	-9.0	4.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	3.2	69	15	-	-	0.11	-
78.74	21.1	8.0	-	0.7	-9.0	3.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	76	15	-	-	0.11	-
78.91	18.7	7.1	-	0.5	-9.0	3.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.1	79	15	-	-	0.11	-
79.07	16.2	6.1	-	0.4	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	82	15	-	-	0.11	-
79.24	16.4	6.2	-	0.4	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	82	15	-	-	0.11	-
79.40	17.7	6.7	-	0.4	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.0	78	15	-	-	0.11	-
79.56	16.4	6.2	-	0.5	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	88	15	-	-	0.11	-
79.73	20.4	7.7	-	0.8	-9.0	5.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.4	82	15	-	-	0.11	-
79.89	27.6	10.4	-	1.4	-9.0	6.2	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	3.4	76	15	-	-	0.11	-
80.06	26.8	10.1	-	1.2	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	3.3	74	15	-	-	0.11	-
80.22	27.0	10.2	-	1.0	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	3.3	69	15	-	-	0.11	-
80.38	22.3	8.4	-	0.5	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.6	68	15	-	-	0.11	-
80.55	20.8	7.9	-	0.3	-9.0	1.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.4	63	15	-	-	0.11	-
80.71	18.3	6.9	-	0.0	-9.0	0.1	1	sensitive fine SOIL	115	2.0	9	3	-	-	1.1	2.0	44	15	-	-	0.11	-
80.88	27.8	10.5	-	1.0	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.8	3.4	68	15	-	-	0.11	-
81.04	30.1	11.4	-	1.9	-9.0	7.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	77	15	-	-	0.11	-
81.20	47.5	17.9	-	1.5	-9.0	3.5	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	6.3	50	15	-	-	0.11	-
81.37	30.0	11.3	-	1.3	-9.0	5.1	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	69	15	-	-	0.11	-
81.53	34.5	13.0	-	1.2	-9.0	4.2	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	4.4	61	15	-	-	0.11	-
81.70	30.2	11.4	-	2.7	-9.0	9.9	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	84	15	-	-	0.11	-
81.86	57.3	21.6	-	4.3	-9.0	8.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	7.7	61	15	-	-	0.11	-
82.02	67.8	25.6	-	5.4	-9.0	8.5	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.6	9.2	59	15	-	-	0.11	-
82.19	86.0	32.4	-	4.5	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	57	22	-	-	5.9	9.9	46	15	-	-	0.11	-
82.35	86.9	32.8	-	3.9	-9.0	4.8	3	silty CLAY to CLAY	115	1.5	58	22	-	-	6.0	9.9	43	15	-	-	0.11	-
82.52	55.2	20.8	-	3.8	-9.0	7.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.7	7.3	61	15	-	-	0.11	-
82.68	52.6	19.9	-	2.7	-9.0	5.6	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	6.9	56	15	-	-	0.11	-
82.85	43.6	16.4	-	2.6	-8.9	6.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	5.6	64	15	-	-	0.11	-
83.01	49.6	18.7	-	2.5	-8.9	5.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	6.4	57	15	-	-	0.11	-
83.17	42.9	16.2	-	3.4	-8.9	8.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	5.5	71	15	-	-	0.11	-
83.34	74.1	28.0	-	3.1	-8.9	4.5	3	silty CLAY to CLAY	115	1.5	49	19	-	-	5.1	9.9	45	15	-	-	0.11	-
83.50	71.5	27.0	-	3.0	-9.0	4.5	3	silty CLAY to CLAY	115	1.5	48	18	-	-	4.9	9.5	45	15	-	-	0.11	-
83.67	166.2	73.5	133.2	3.6	-9.0	2.2	5	silty SAND to sandy SILT	120	4.0	42	18	57	39	-	-	21	16	1.71	-	0.11	25.7
83.83	284.5	125.7	129.6	1.6	-9.0	0.6	6	clean SAND to silty SAND	125	5.0	57	25	75	42	-	-	6	16	1.89	-	0.11	12.5
83.99	287.5	126.9	176.7	5.9	-8.9	2.1	5	silty SAND to sandy SILT	120	4.0	72	32	75	42	-	-	15	16	0.00	-	0.11	0.0
84.16	257.1	113.4	179.5	6.5	-9.0	2.6	5	silty SAND to sandy SILT	120	4.0	64	28	71	41	-	-	18	16	0.00	-	0.11	0.0
84.32	131.7	49.7	-	5.9	-9.0	4.7	4	clayy SILT to silty CLAY	115	2.0	66	25	-	-	9.1	9.9	35	15	-	-	0.11	-
84.49	109.4	41.3	-	4.2	-9.2	4.0	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	36	15	-	-	0.11	-
84.65	200.4	88.1	135.1	3.7	-9.1	1.9	5	silty SAND to sandy SILT	120	4.0	50	22	63	40	-	-	17	16	1.70	-	0.11	19.3
84.81	156.2	68.6	127.3	3.3	-9.0	2.2	5	silty SAND to sandy SILT	120	4.0	39	17	55	38	-	-	21	16	1.89	-	0.11	28.9
84.98	164.5	72.2	145.6	4.4	-9.1	2.7	5	silty SAND to sandy SILT	120	4.0	41	18	56	39	-	-	23	16	1.12	-	0.10	11.1
85.14	175.3	76.8	181.1	6.6	-9.0	3.9	4	clayy SILT to silty CLAY	115	2.0	88	38	-	-	12.2	9.9	27	15	0.00	-	0.10	0.0
85.31	153.5	67.2	165.7	5.5	-9.2	3.7	4	clayy SILT to silty CLAY	115	2.0	77	34	-	-	10.7	9.9	28	15	0.00	-	0.10	0.0
85.47	112.6	49.2	142.2	3.8	-9.2	3.6	4	clayy SILT to silty CLAY	115	2.0	56	25	-	-	7.8	9.9	32	15	1.06	-	0.10	36.9
85.63	351.2	153.5	206.2	7.7	-8.9	2.2	5	silty SAND to sandy SILT	120	4.0	88	38	81	43	-	-	14	16	0.00	-	0.10	0.0
85.80	244.7	106.8	203.7	8.5	-8.9	3.5	5	silty SAND to sandy SILT	120	4.0	61	27	69	41	-	-	22	16	0.00	-	0.10	0.0
85.96	94.3	35.6	-	6.9	-9.0	7.8	3	silty CLAY to CLAY	115	1.5	63	24	-	-	6.5	9.9	50	15	-	-	0.10	-
86.13	48.3	18.2	-	2.1	-9.1	4.9	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	6.0	55	15	-	-	0.10	-
86.29	45.4	17.1	-	1.4	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	5.6	51	15	-	-	0.10	-
86.45	42.5	16.1	-	1.2	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	5.2	51	15	-	-	0.10	-
86.62	42.3	16.0	-	1.0	-9.0	2.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	5.2	49	15	-	-	0.10	-
86.78	43.7	16.5	-	0.9	-9.0	2.4	4	clayy SILT to silty CLAY	115	2.0	22	8	-	-	2.9	5.3	46	15	-	-	0.10	-
86.95	52.5	19.8	-	1.1	-9.1	2.3	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	6.5	42	15	-	-	0.10	-
87.11	63.0	23.8	-	2.1	-9.1	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.3	8.0	45	15	-	-	0.10	-
87.27	62.2	23.5	-	2.0	-9.1	3.5	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.2	7.8	45	15	-	-	0.10	-
87.44	72.2	27.2	-	2.1	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	9.2	40	15	-	-	0.10	-
87.60	72.4	27.3	-	2.3	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	9.2	41	15	-	-	0.10	-
87.77	66.4	25.1	-	2.2	-9.2	3.6	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.5	8.4	43	15	-	-	0.10	-
87.93	64.9	24.5	-	2.1	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	8.1	43	15	-	-	0.10	-
88.09	68.5	25.8	-	1.9	-9.2	3.0	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	8.6	40	15	-	-	0.10	-
88.26	73.5	27.7	-	2.4	-9.2	3.5	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.0	9.3	41	15	-	-	0.10	-
88.42	77.1	29.1	-	2.4	-9.2	3.3	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.7	39	15	-	-	0.10	-
88.59	85.1	32.1	-	2.5	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.8	9.9	37	15	-	-	0.10	-
88.75	84.8	32.0	-	2.5	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	37	15	-	-	0.10	-
88.92	87.3	32.9	-	2.6	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.0	9.9	36	15	-	-	0.10	-
89.08	84.7	32.0	-	2.6	-9.2	3.3	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	38	15	-	-	0.10	-
89.24	85.9	32.4	-	2.9	-9.2	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.10	-
89.41	83.8	31.6	-	2.7	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.7	9.9	38	15	-	-	0.10	-
89.57	89.7	38.3	118.1	2.6	-9.1	3.0	4	clayy SILT to silty CLAY	115	2.0	45	19	-	-	6.2	9.9	33	15	2.04	-	0.10	51.2
89.74	89.6	33.8	-	2.7	-9.2	3.2	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	36	15	-	-	0.10	-
89.90	88.8	33.5	-	4.0	-9.1	4.8	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	43	15	-	-	0.10	-
90.06	93.1	35.1	-	3.9	-9.1	4.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	40	15	-	-	0.10	-
90.23	100.5	37.9	-	3.5	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	36	15	-	-	0.10	-
90.39	94.2	35.5	-	4.0	-9.0	4.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	40	15	-	-	0.10	-
90.56	89.1	33.6	-	3.9	-9.0	4.6	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	42	15	-	-	0.10	-
90.72	100.9	38.1	-	3.6	-8.9	3.8	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	36	15	-	-	0.10	-
90.88	105.3	44.7	134.0	3.4	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	33	15	1.40	-	0.10	50.0
91.05	105.7	44.8	135.9	3.5	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	33	15	1.30	-	0.09	49.5
91.21	108.6	46.0	135.1	3.5	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	54	23	-	-	7.5	9.9	32	15	1.36	-	0.09	47.0
91.38	110.6	46.8	134.3	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	32	15	1.42	-	0.09	45.7
91.54	111.4	47.1	134.2	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.7	9.9	31	15	1.43	-	0.09	45.2
91.70	111.6	47.1	132.2	3.4	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.7	9.9	31	15	1.53	-	0.08	46.3
91.87	110.9	46.8	131.7	3.4	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.7	9.9	31	15	1.55	-	0.08	47.0
92.03	109.7	46.2	130.5	3.3	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.61	-	0.08	48.4
92.20	110.1	46.4	127.8	3.2	-8.9	3.1	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.75	-	0.08	48.4
92.36	109.0	45.8	124.0	3.0	-8.9	2.9	4	clayy SILT to silty CLAY	115	2.0	54	23	-	-	7.5	9.9	30	15	1.88	-	0.07	49.0
92.52	105.2	44.2	124.1	3.0	-8.9	3.0	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	31	15	1.87	-	0.07	51.1

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
92.69	95.6	36.1	-	2.9	-8.9	3.3	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	35	15	-	-	0.07	-
92.85	84.9	32.0	-	2.9	-8.9	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.07	-
93.02	74.0	27.9	-	1.8	-8.9	2.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	8.9	36	15	-	-	0.07	-
93.18	68.0	25.6	-	2.2	-8.9	3.6	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.6	8.1	43	15	-	-	0.07	-
93.34	82.6	31.2	-	3.1	-8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	41	15	-	-	0.07	-
93.51	108.1	40.8	-	4.1	-8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	54	20	-	-	7.5	9.9	36	15	-	-	0.07	-
93.67	119.5	49.9	146.5	4.2	-8.9	3.7	4	clayy SILT to silty CLAY	115	2.0	60	25	-	-	8.3	9.9	32	15	0.82	-	0.07	33.2
93.84	127.2	53.1	142.8	4.1	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	64	27	-	-	8.8	9.9	30	15	1.05	-	0.07	26.8
94.00	121.2	50.6	138.2	3.8	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	61	25	-	-	8.4	9.9	30	15	1.25	-	0.06	35.7
94.16	117.5	49.0	131.4	3.5	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	59	24	-	-	8.1	9.9	30	15	1.58	-	0.06	44.6
94.33	116.1	48.4	130.1	3.4	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.0	9.9	30	15	1.65	-	0.06	46.0
94.49	113.1	47.1	124.6	3.1	-9.0	2.9	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.8	9.9	30	15	1.86	-	0.06	47.6
94.66	114.8	47.7	126.3	3.2	-9.0	2.9	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.9	9.9	30	15	1.81	-	0.05	46.8
94.82	102.2	38.6	-	4.4	-9.0	4.6	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.0	9.9	39	15	-	-	0.05	-
94.98	110.7	41.8	-	4.5	-9.0	4.3	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	37	15	-	-	0.05	-
95.15	116.7	48.4	148.1	4.3	-9.0	3.9	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.1	9.9	33	15	0.72	-	0.05	37.3
95.31	116.9	48.4	139.8	3.9	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.1	9.9	32	15	1.13	-	0.05	39.5
95.48	114.0	47.2	129.7	3.4	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.9	9.9	31	15	1.65	-	0.05	47.4
95.64	112.0	46.3	132.3	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	56	23	-	-	7.7	9.9	31	15	1.49	-	0.05	47.2
95.81	110.0	45.4	129.4	3.3	-9.0	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.64	-	0.04	49.6
95.97	111.1	45.9	126.0	3.2	-9.0	3.0	4	clayy SILT to silty CLAY	115	2.0	56	23	-	-	7.7	9.9	30	15	1.80	-	0.04	49.0
96.13	109.4	45.1	127.9	3.2	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.5	9.9	31	15	1.72	-	0.04	49.9
96.30	105.7	43.6	127.2	3.2	-9.0	3.2	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	32	15	1.74	-	0.03	51.2
96.46	107.8	44.4	123.5	3.0	-9.0	3.0	4	clayy SILT to silty CLAY	115	2.0	54	22	-	-	7.4	9.9	31	15	1.88	-	0.03	50.9
96.63	102.2	42.0	124.3	3.0	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	51	21	-	-	7.0	9.9	32	15	1.85	-	0.03	51.2
96.79	89.2	33.7	-	2.9	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.1	9.9	37	15	-	-	0.03	-
96.95	80.9	30.5	-	3.4	-9.0	4.5	3	silty CLAY to CLAY	115	1.5	54	20	-	-	5.5	9.3	43	15	-	-	0.03	-
97.12	107.5	40.6	-	3.8	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	54	20	-	-	7.4	9.9	35	15	-	-	0.03	-
97.28	122.3	50.1	144.2	4.2	-9.1	3.6	4	clayy SILT to silty CLAY	115	2.0	61	25	-	-	8.5	9.9	32	15	0.92	-	0.03	33.2
97.45	125.1	51.2	143.5	4.2	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	63	26	-	-	8.6	9.9	31	15	0.97	-	0.02	30.6
97.61	129.3	52.9	143.8	4.2	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	65	26	-	-	9.0	9.9	30	15	0.97	-	0.02	26.2
97.77	130.9	53.6	142.2	4.2	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.1	9.9	30	15	1.06	-	0.02	25.9
97.94	131.8	53.9	141.0	4.1	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	66	27	-	-	9.1	9.9	29	15	1.13	-	0.02	26.2
98.10	130.2	53.2	141.8	4.2	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.0	9.9	30	15	1.07	-	0.02	27.0
98.27	128.6	52.5	140.3	4.1	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.9	9.9	30	15	1.14	-	0.02	29.7
98.43	128.3	52.3	135.4	3.8	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.9	9.9	29	15	1.37	-	0.01	34.4
98.59	126.4	51.5	133.7	3.7	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	63	26	-	-	8.7	9.9	29	15	1.46	-	0.01	37.8
98.76	124.9	50.8	147.2	4.4	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	32	15	0.76	-	0.01	30.1
98.92	124.4	50.6	144.5	4.2	-9.0	3.6	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	31	15	0.89	-	0.01	31.6
99.09	130.7	53.1	139.6	4.1	-9.1	3.2	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.0	9.9	29	15	1.17	-	0.01	28.6
99.25	127.1	51.6	143.8	4.2	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.8	9.9	31	15	0.94	-	0.00	29.3
99.41	124.9	50.7	144.4	4.2	-9.0	3.6	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	31	15	0.90	-	0.00	31.5
99.58	127.5	51.7	149.2	4.5	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.8	9.9	32	15	0.68	-	0.00	27.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	GPS	
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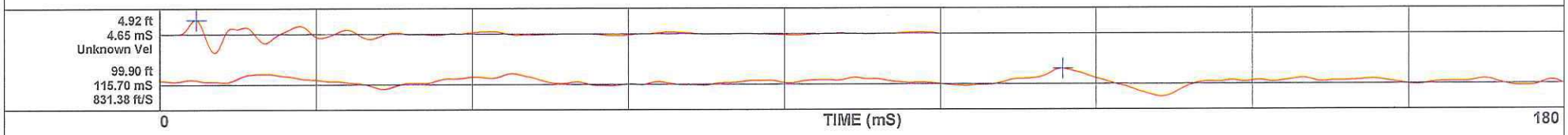
Hole Number	CPT-11-222	Date and Time	10/10/2011 12:58:35 AM		



SPT HAMMER ENERGY REPORT

SPT Hammer Energy Measurements

Hammer Calibration done on:
April 14, 2011
in Los Angeles, CA

CME 75LC Drill – 2R #7
Operator: Jeff Callaway

Prepared for:

2R Drilling Inc.
3968 Chino Ave.
Chino, CA 91710
909.465.1765

Prepared by:

Brian Serl
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TABLE OF CONTENTS

1 INTRODUCTION

2 FIELD EQUIPMENT & PROCEDURES

3 INSTRUMENTATION

4 OBSERVATIONS

5 RESULTS

TABLE 1

REFERENCES

Presentation of SPT Analyzer Test Data

1. Introduction

This report presents the results of SPT Hammer Energy Measurements recorded with an SPT Analyzer from Pile Dynamics carried out on April 14, 2011 in Los Angeles, CA.

2. Field Equipment and Procedures

The CME 75LC drill is known as 2R #7. The operator of this drill and attached hydraulic CME automatic trip hammer was Jeff Callaway of 2R Drilling Inc.

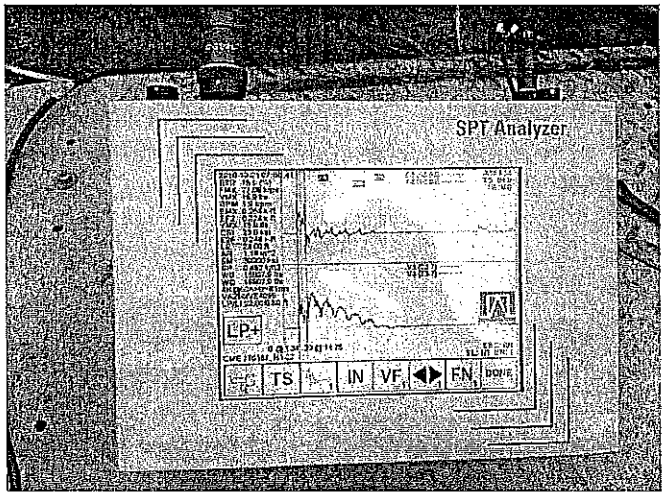
The CME Auto Hammer uses a 140 lb. weight and is dropped approximately 30" on to an anvil above the bore hole. AWJ drill rod connects the anvil to a split spoon type soil sampler inside an 8" o.d. hollow stem auger at the designated sample depth. After the sampler is lowered to the designated sample depth it is driven into the subsurface 18". The number of blows required to penetrate the last 12" is referred to as the "N value", which is related to soil strength.

The first sample that was recorded for this report was taken at 30' below ground surface and then every 5' to the final sample depth of 50'. We performed measurements conforming to ASTM D4633-05 which states that;

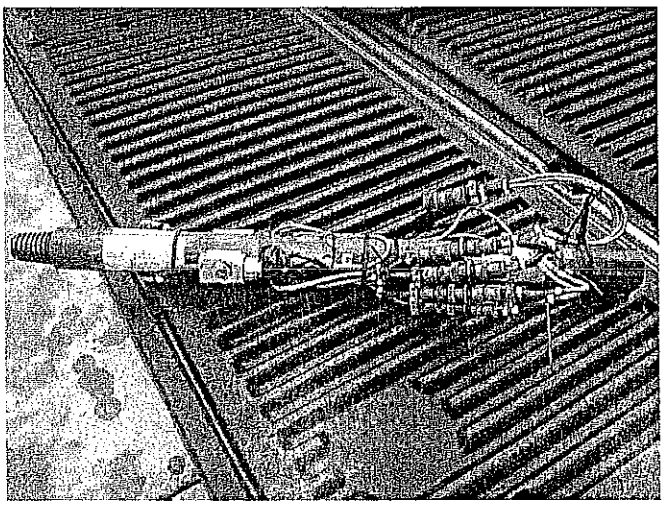
- Perform measurements for at least 3 depths of quality data, with 5 depths preferred
- Tests should be limited to moderate N-values ranges between 5 and 50
- Energy evaluation of the hammer system is more reliable when the length (LE) is (30 ft to 40 ft) or more

3. Instrumentation

An SPT Analyzer from Pile Dynamics was used to record and the process the data. The raw data was stored directly in the SPT Analyzer computer with subsequent analysis in the office with PDA-W and PDIPlot software. The measurements and analysis were conducted in general accordance with ASTM D4945 and ASTM D6066 test standards.



The SPT Analyzer is fully compliant with the minimum digital sampling frequency requirements of ASTM D4633-05 (50 kHz) and EN ISO 22476-3:2005 (100 kHz), as well as with the low pass filter, (cutoff frequency of 5000 Hz instead of 3000 Hz) requirements of ASTM D4633-05. All equipment and analysis also conform to ASTM D6066.



A 2' instrumented section of AWJ rod, with two sets of accelerometers and strain transducers mounted on opposite sides of the drill rod, was placed below the anvil. It measured strain and acceleration of every hammer blow. The SPT Analyzer then calculates the amount of energy transferred to the rod by force and velocity measurements.

4. Observations

The drill rig motor was operating around 1400 rpms during each sample interval. The motor is diesel fueled. The throttle control is electronic and digitally modulated. The rpms did not wander or adjust and that is reflected in the consistent 52 blows per minute at each sample interval. The drill and sample equipment looked to be well maintained and operated. The operator, Jeff Callaway, has used this type of drill and autohammer since 2001.

5. Results

Results from the SPT Hammer Energy Measurements are summarized in Table 1. It shows the Energy Transfer Ratio (ETR) at each sampling depth. ETR is the ratio of the measured maximum transferred energy to rated energy of the hammer which is the product of the weight of the hammer times the height of the fall. 140 lb x 30" = 4200 lb-in = 0.350 kip-ft.

The ETR for all of the blow counts measured averaged 82%

Table 1 – Summary of SPT Hammer Energy Measurements

Sample Depth	Average SPT Hammer Efficiency (ETR)
30'	79%
35'	81%
40'	84%
45'	83%
50'	83%
Average	**82%**

Please call or email me with any questions or if you need additional information.

Brian Serl
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Appendix B

LABORATORY TEST RESULTS

TABLE B1 SUMMARY OF LABORATORY TEST RESULTS FOR AVENIDA VAQUERO UC (1 OF 2)

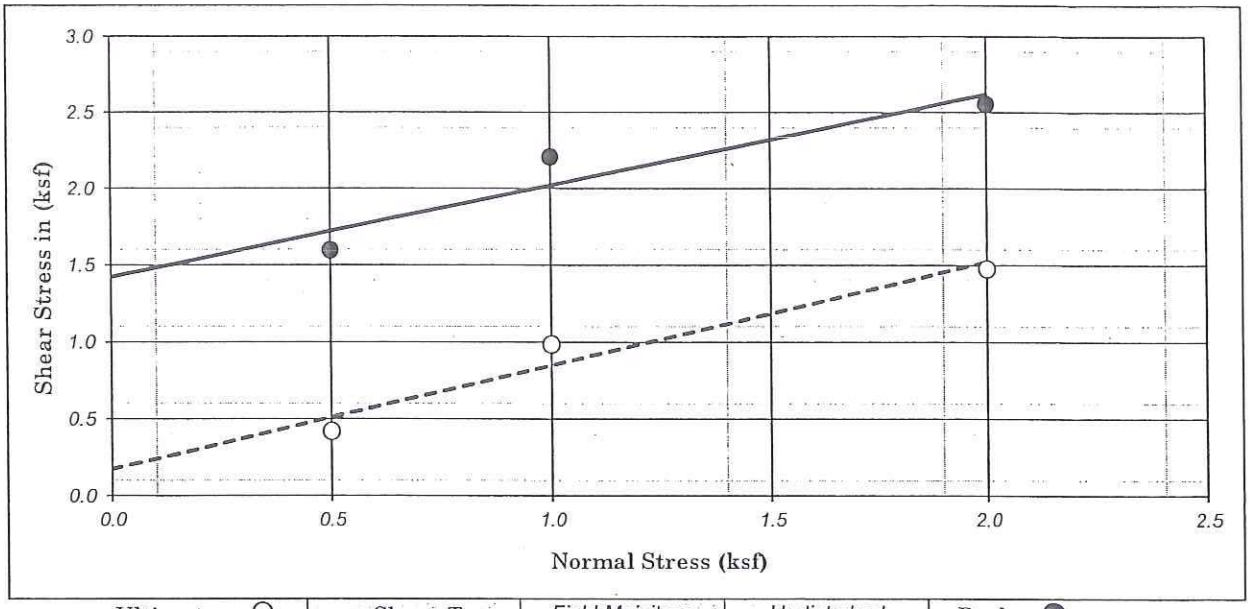
Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-219	D-3	15	CH	25.7	122.9	>4.5								
A-11-219	S-4	20	MH	27.3				0:1:99		71/36/35				
A-11-219	D-5	25	MH	28.6	118.9	>4.5								
A-11-219	S-6	30	MH	26.2										
A-11-219	D-7	35	MH	28.7	116.6	>4.5								
A-11-219	S-8	40	MH	23.8							300	8.1	550	768
A-11-219	D-9	45	MH	24.7	121.1	>4.5								
A-11-219	S-10	50	MH	24.2										
A-11-219	D-11	55	MH	30.9	114.4	>4.5								
A-11-219	S-12	60	MH	30.8										
A-11-219	D-13	65	MH	24.7	123.6	>4.5								
A-11-219	S-14	70	MH	21.7										
A-11-219	D-15	75	MH	23.9	122.9	>4.5								
A-11-219	S-16	80	MH	20.8										
A-11-219	D-17	85	MH	22.9	122.7	>4.5								
A-11-219	S-18	90	MH	25.3										
A-11-220	S-1	5	CL	28.9										
A-11-220	D-2	10	CH	30.6	119.4	>4.5								
A-11-220	S-3	15	CL	29.9							540	7.2	380	505
A-11-220	D-4	20	CL	17.8	126.4	2.5								
A-11-220	S-5	25	CH	31.7				0:6:94		80/27/53				
A-11-220	D-6	30	CL	26.3	121.5	>4.5								
A-11-220	S-7	35	CL	34.3										
A-11-220	D-8	40	CH	30.4	117.4	>4.5								
A-11-220	S-9	45	MH	27.8										
A-11-220	D-10	50	MH	27.1	122.2									
A-11-220	S-11	55	MH	31.8				0:2:98		78/45/33				
A-11-220	D-12	60	MH	36.6	112.8	>4.5								
A-11-220	S-13	65	MH	25.0										
A-11-220	D-14	70	MH	22.3	123.7	>4.5								
A-11-220	S-15	75	MH	24.2										
A-11-220	D-16	80	MH	20.8	124.7	>4.5								
A-11-220	S-17	85	MH	23.0										
A-11-220	D-18	90	MH	24.8	123.7	>4.5								
A-11-221	S-2	10	ML	12.3										
A-11-221	D-3	15	CL/CH	15.1	131.1	>4.5								
A-11-221	S-4	20	CL	14.2						43/18/25	440	7.5	390	845
A-11-221	D-5	25	CH	35.7	116.9	3.75								
A-11-221	S-6	30	CL	18.1										
A-11-221	D-7	35	CH	11.7	134.9	>4.5								

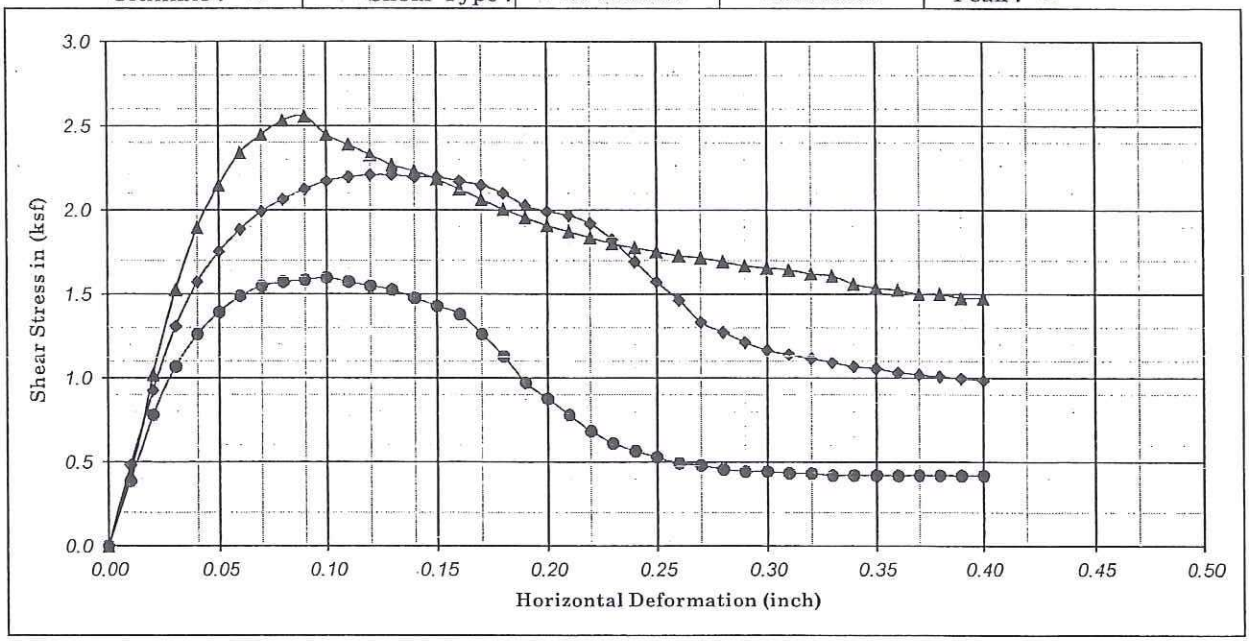
TABLE B1 SUMMARY OF LABORATORY TEST RESULTS FOR AVENIDA VAQUERO UC (2 OF 2)

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-221	S-8	40	CL	15.9						40/17/23				
A-11-221	D-9	45	SM	7.7	115.4			6:74:20						
A-11-221	S-10	50	CH	18.4										
A-11-221	D-11	55	CL	20.3	129.9	2.25								
A-11-221	S-12	60	CH	25.6										
A-11-221	D-13	65	SC to SM	12.2	121.7									
A-11-221	S-14	70	CL	26.7										
A-11-221	D-15	75	CH	24.9	123.7	2.5								
A-11-221	S-16	80	CH	37.9										
A-11-221	D-17	85	CH	33.9	117.7	4.5								
A-11-221	S-18	90	MH	26.0				0:5:95		64/34/30				
A-11-222	S-1	5	CL	14.0							400	6.8	510	1011
A-11-222	D-2	10	CL	14.8	122.2	>4.5								
A-11-222	D-4	20	CH	33.7	111.2	>4.5								
A-11-222	S-5	25	CH	11.4						84/37/47				
A-11-222	D-6	30	CL	14.1	130.3	>4.5								
A-11-222	S-7	35	CL	16.7										
A-11-222	D-8	40	SC to CL	12.6	131.4	3.5								
A-11-222	S-9	45	CL	16.8										
A-11-222	D-10	50	CL	23.5	118.5	1.5								
A-11-222	S-11	55	CL	25.5										
A-11-222	D-12	60	CL	24.4	124.8	1.75								
A-11-222	S-13	65	CL	26.7				0:18:82						
A-11-222	D-14	70	CL	24.5	128.1	2.25								
A-11-222	S-15	75	CL	28.0										
A-11-222	D-16	80	CL	27.4	123.5	0.75								
A-11-222	S-17	85	CH	33.1										
A-11-222	D-18	90	CH to MH	31.7	122.2	3.5 to >4.5								



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-220		Strength Intercept (C) :	1.42	(ksf)	Peak	0.17	(ksf)	Ultimate	
Sample No. : D-2			68.09	(kPa)		8.33	(kPa)		
Depth (ft/m) : 10.0	0.00	Friction Angle (ϕ) :	30.89	Degree		33.97	Degree		
Description : Olive-gray, Fat CLAY (CH)							Shear Rate (inch/minute) :	0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	27.16	94.91	14.94	0.78	0.50	23.94	1.60	76.42	0.42	20.11
◆	24.83	94.24	14.83	0.79	1.00	47.88	2.21	105.72	0.98	47.11
▲	28.91	93.53	14.72	0.80	2.00	95.76	2.56	122.38	1.48	70.67

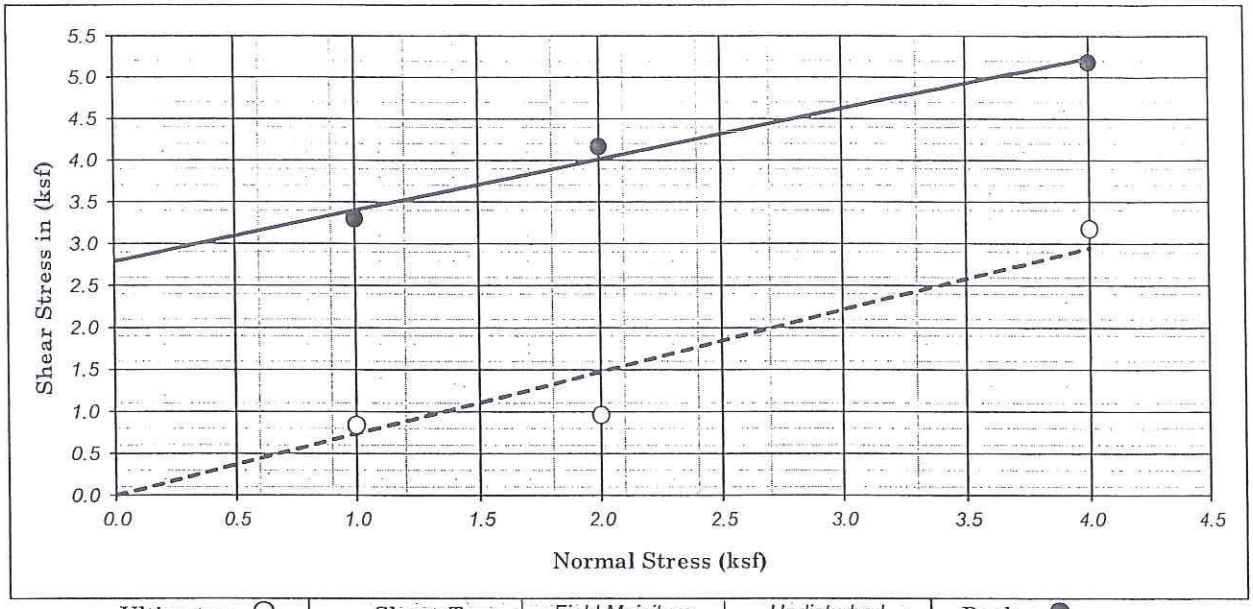
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

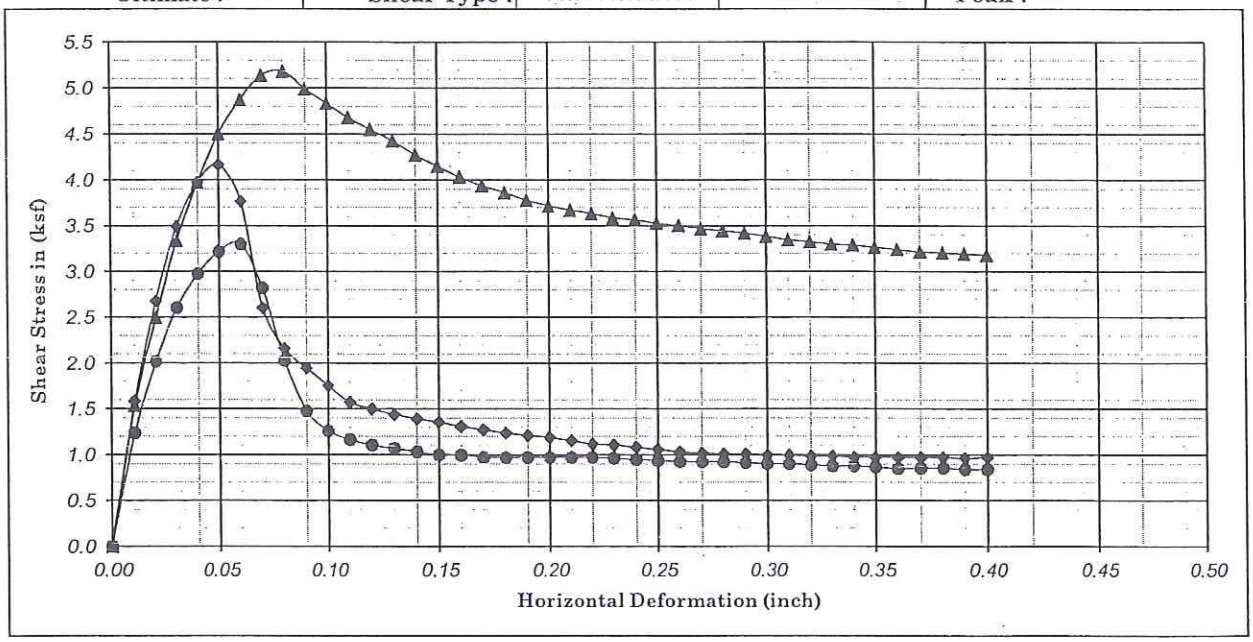
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-221		Strength Intercept (C) :	2.79	(ksf)		0.00	(ksf)		
Sample No. : D-3			133.59	(kPa)	Peak	0.00	(kPa)	Ultimate	
Depth (ft/m) : 15.0	0.00	Friction Angle (ϕ) :	31.43	Degree		36.40	Degree		
Description : Dark brown to olive-brown, Lean CLAY with SAND (CL)							Shear Rate (inch/minute) :	0.02	

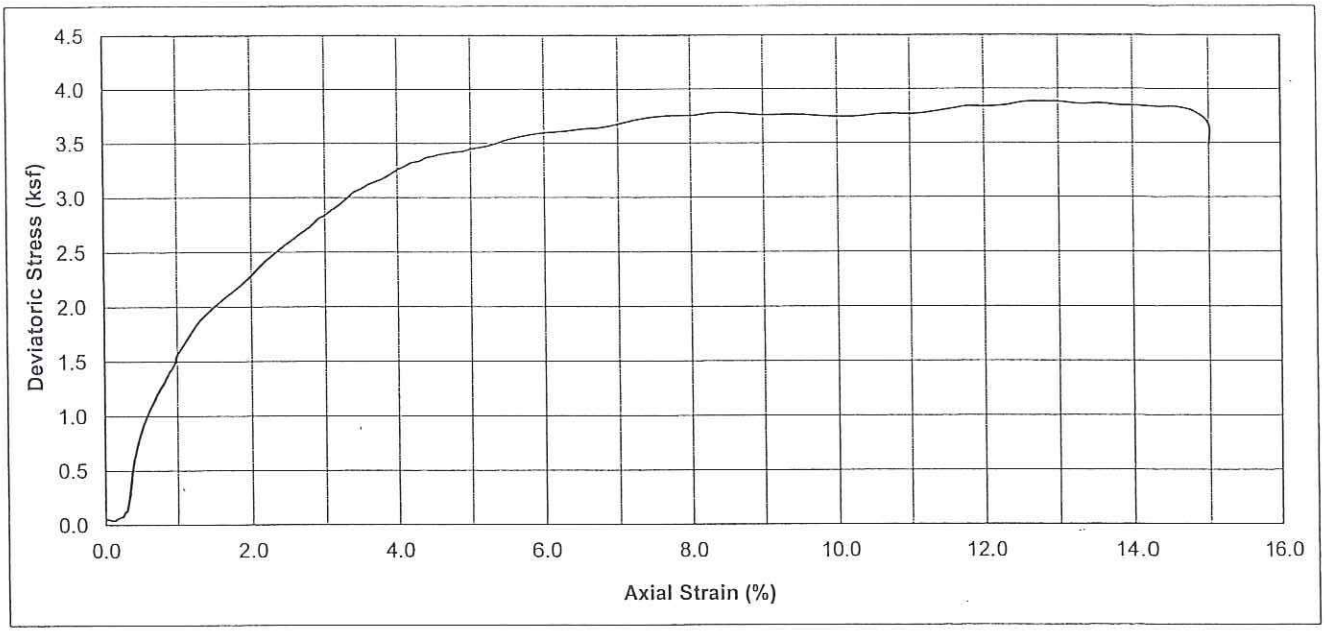
SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	15.08	116.33	18.31	0.45	1.00	47.88	3.30	158.00	0.84	40.22
◆	17.09	110.07	17.32	0.53	2.00	95.76	4.16	199.37	0.96	45.96
▲	13.85	113.84	17.92	0.48	4.00	191.52	5.18	248.21	3.18	152.26

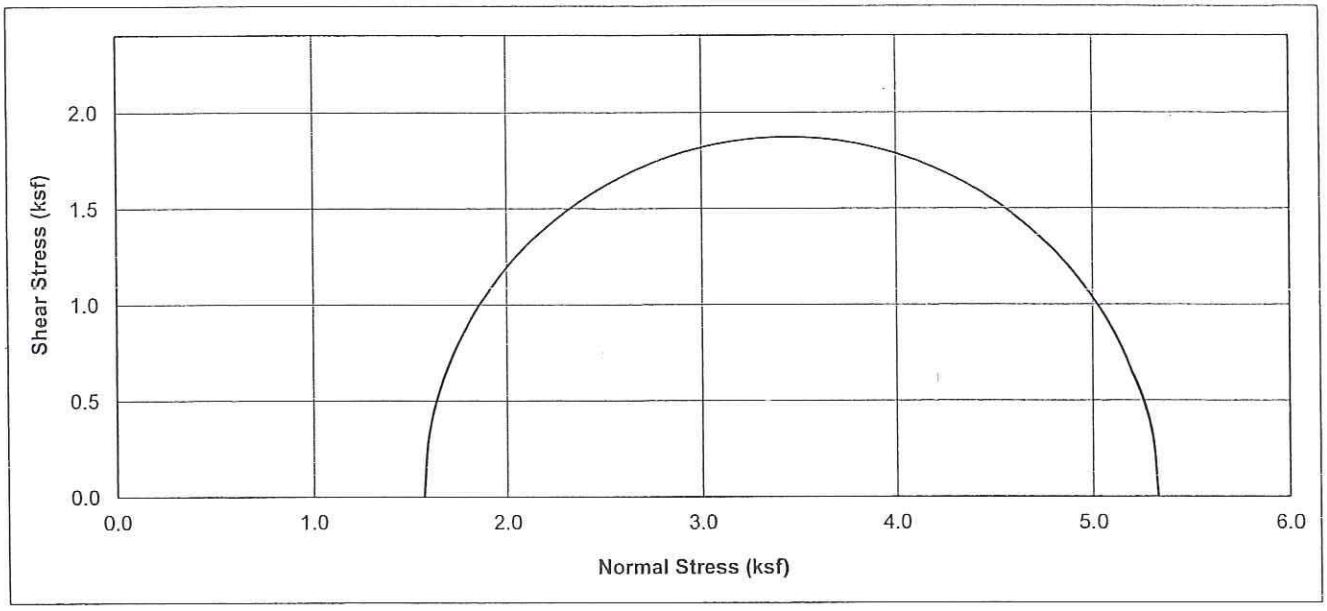
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

DIRECT SHEAR TEST (ASTM D-3080)

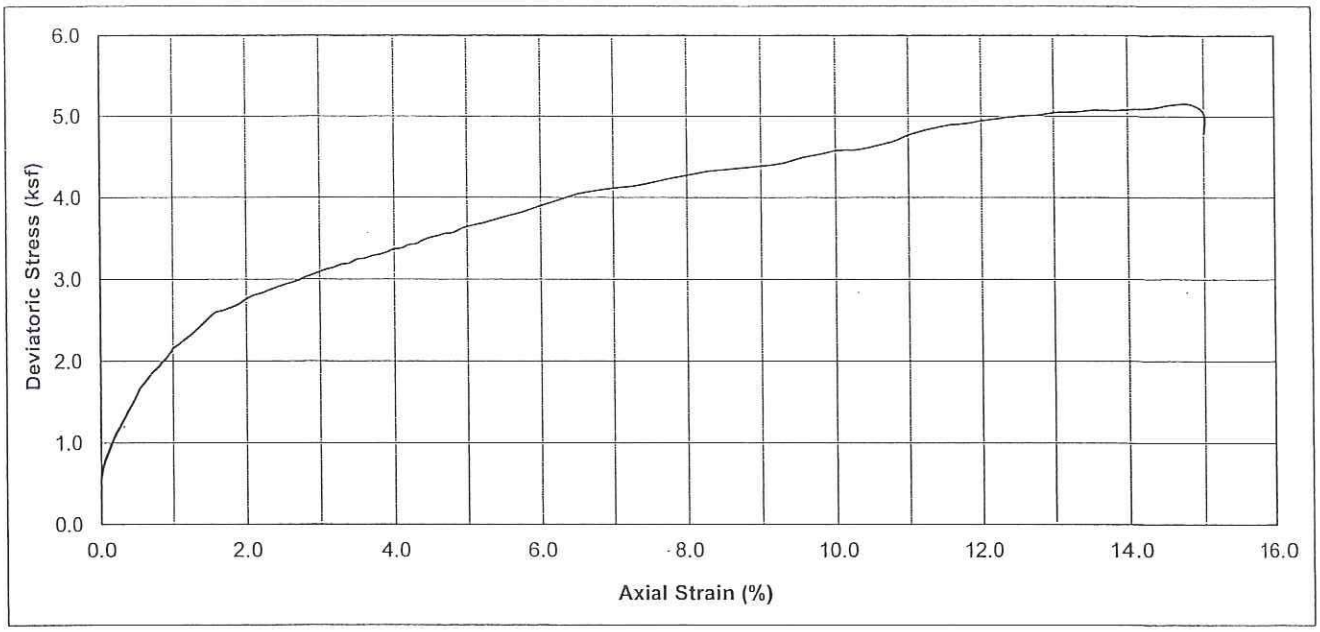
Project No. : 11-136 | Date : 11/11/11 | Figure No. :

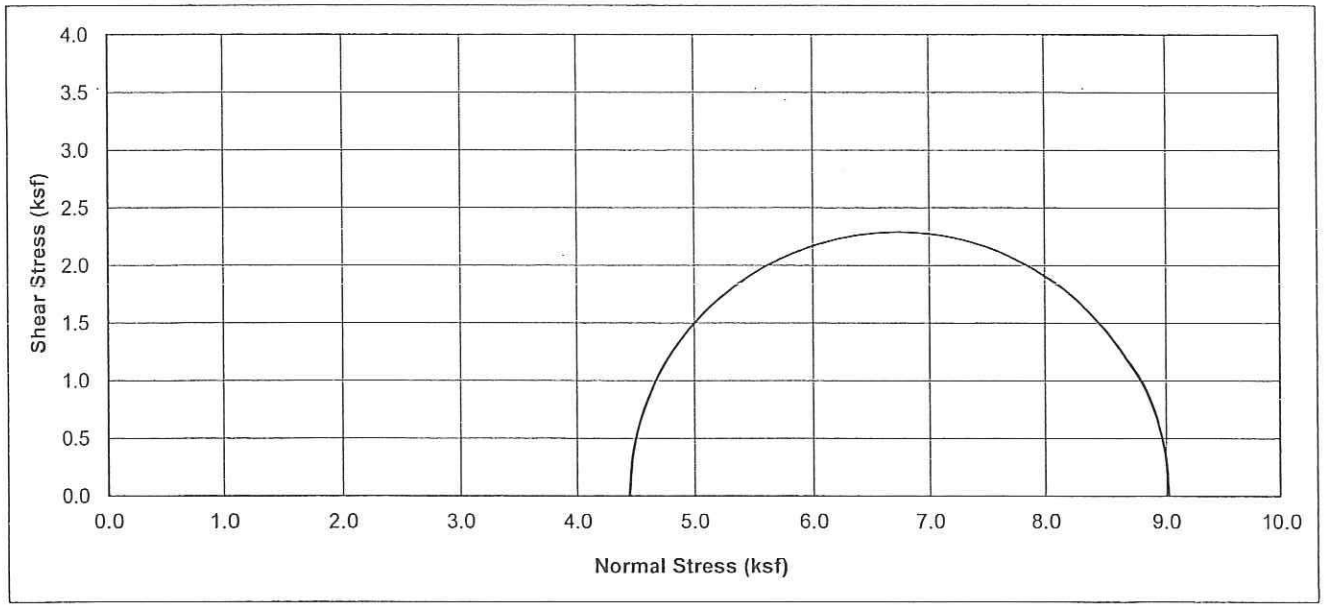




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-220	D-4	20	Olive-brown , SANDY lean CLAY (CL)	106.2	17.83	1.57	3.74	82.2

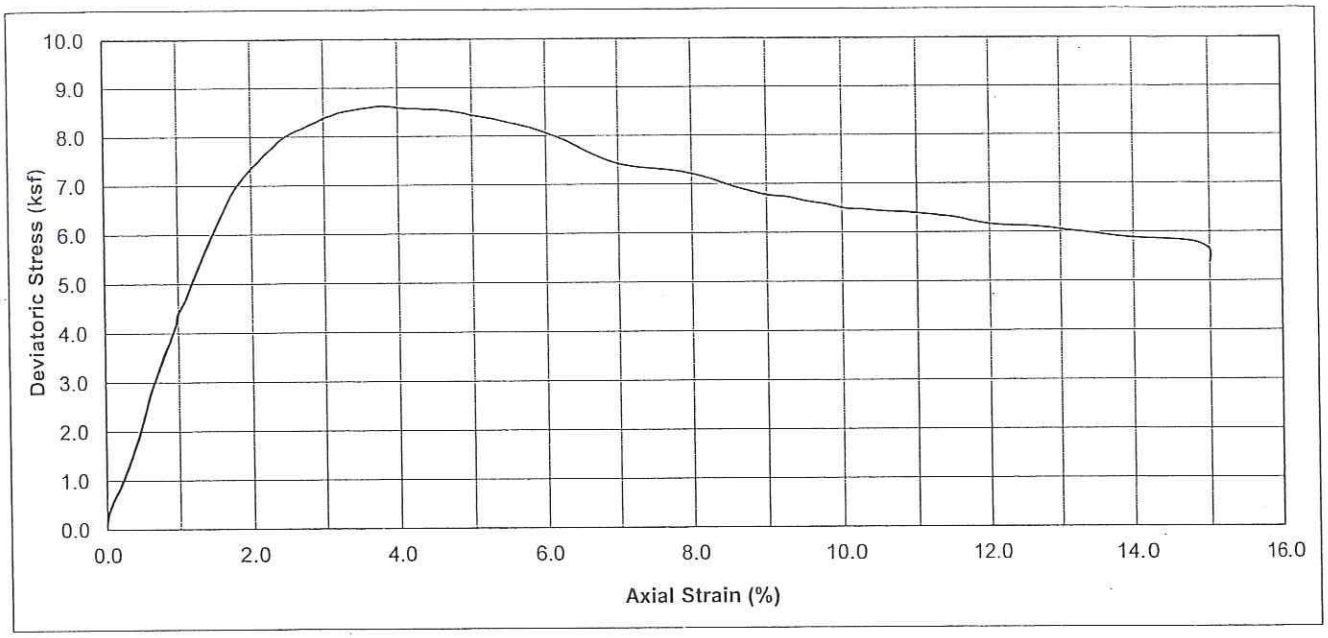
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136	Date : 11/07/11	(ASTM D2850) Figure No. :

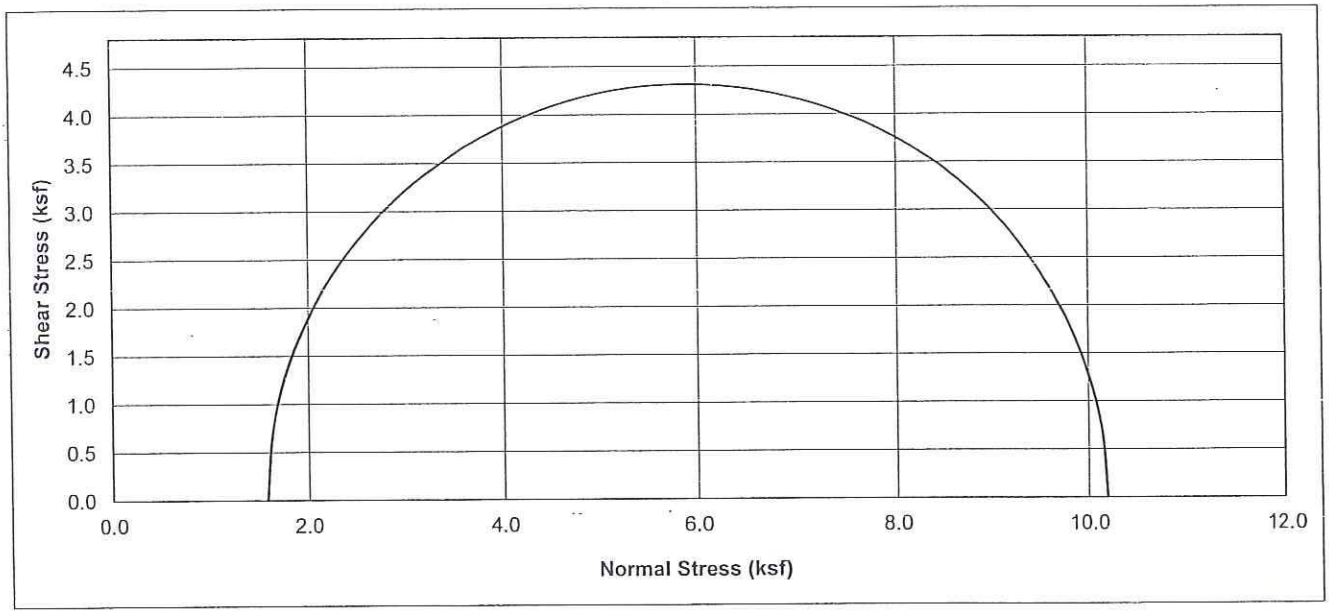




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-221	D-11	55	Dark brown , Lean CLAY (CL)	108.3	20.29	4.44	4.58	98.7

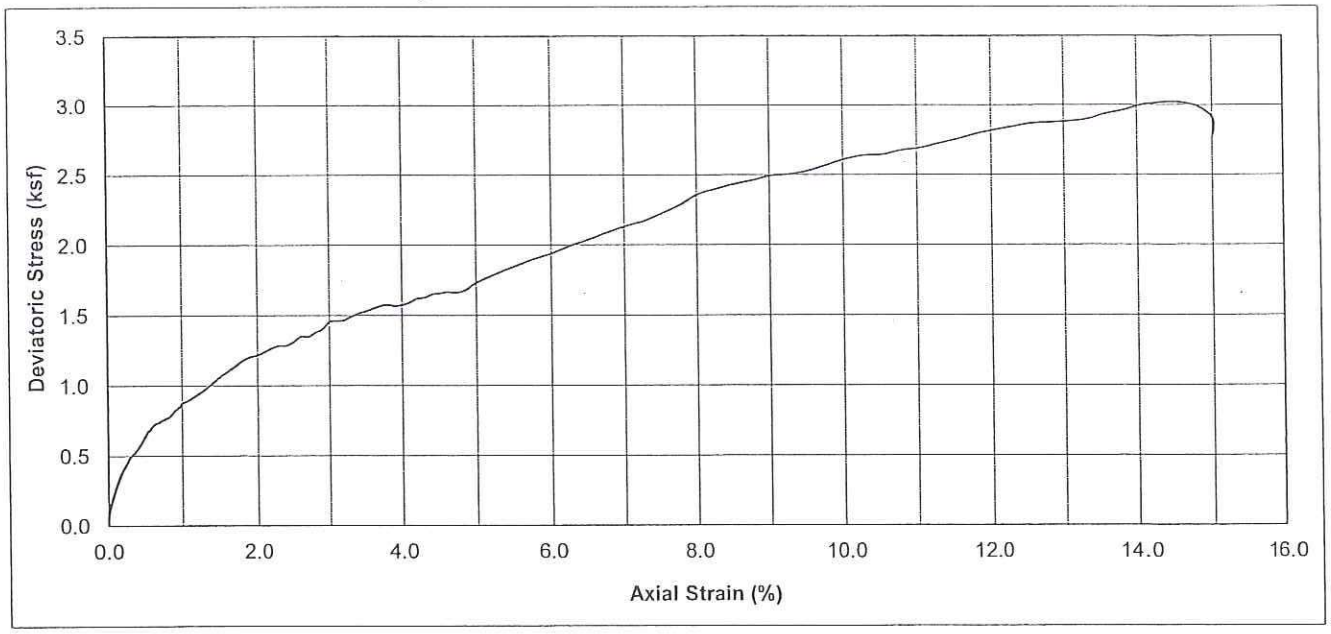
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :
Project No. : 11-136	Date : 11/07/11

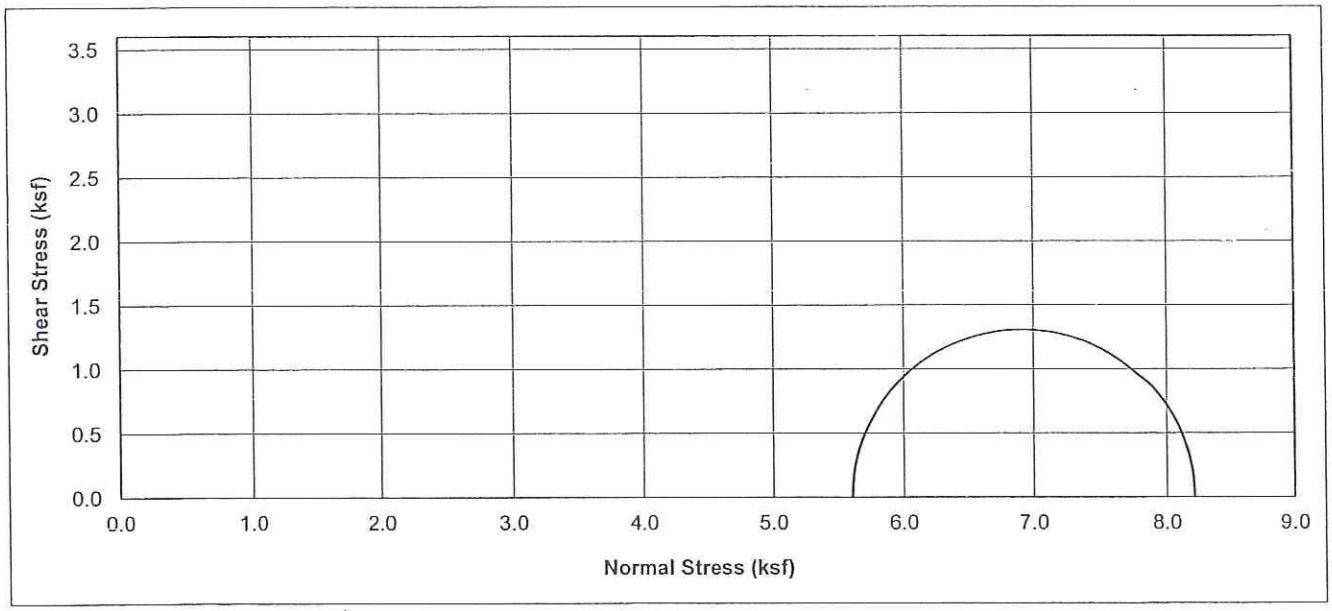




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-222	D-4	20	Dk. Olive-brown to Dk. gray, Elastic SILT (MH)	83.0	33.70	1.57	8.63	88.4

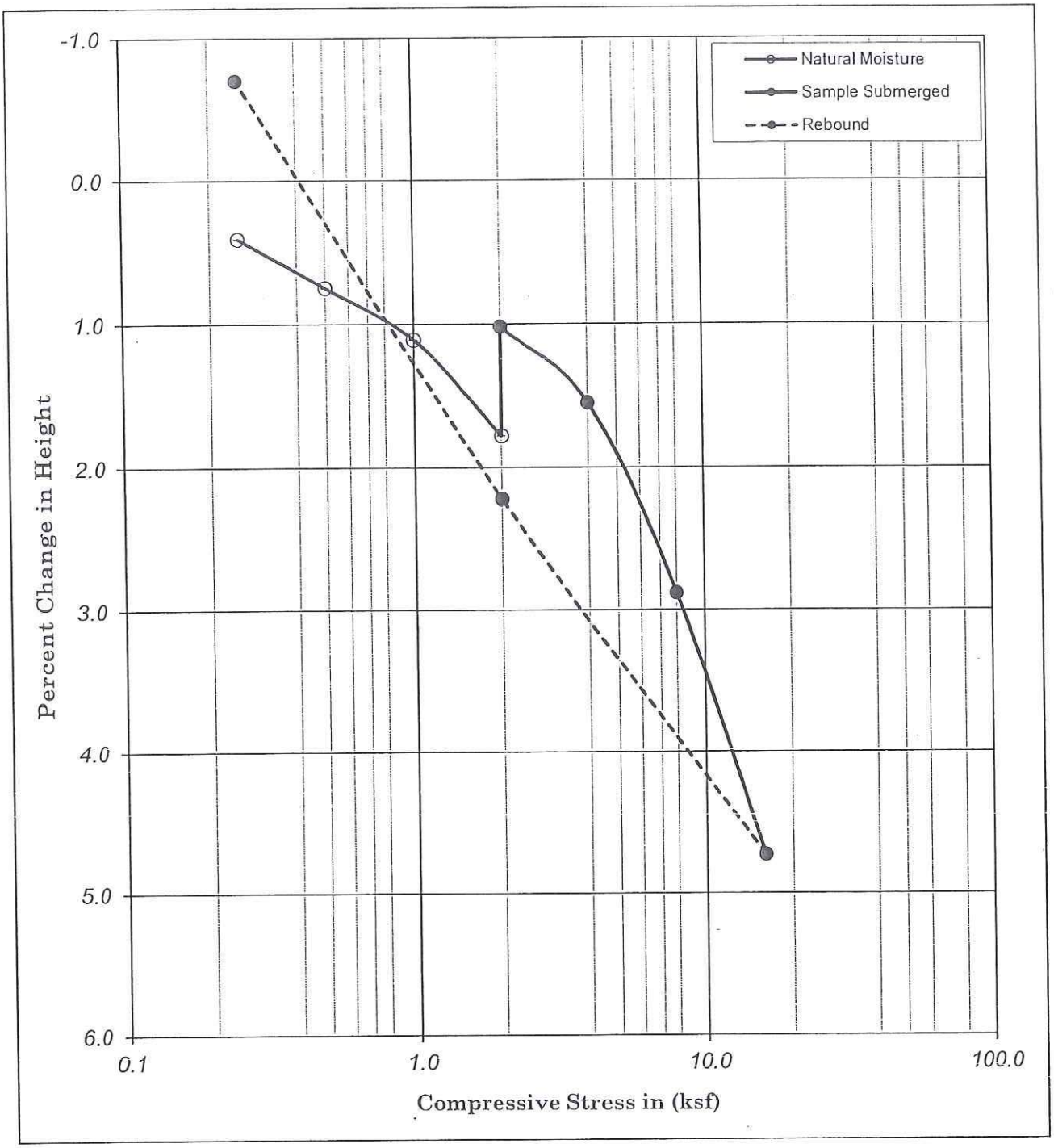
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :





Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-222	D-14	70	Olive-brown , Lean CLAY(CL)	99.8	24.54	5.60	2.61	96.2

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :



Boring No.	: A-11-221		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m^3)	Percent Saturation	Void Ratio
Sample No.	: D-7		Plastic Limit :	-						
Depth (ft)	: 35.0	36.5	Plastic Index :	-	Initial	20.34	107.64	16.94	97.05	0.57
Depth (m)	: 10.68	11.13	Specific Gravity :	2.70	Final	22.15	106.90	16.83	103.69	0.58

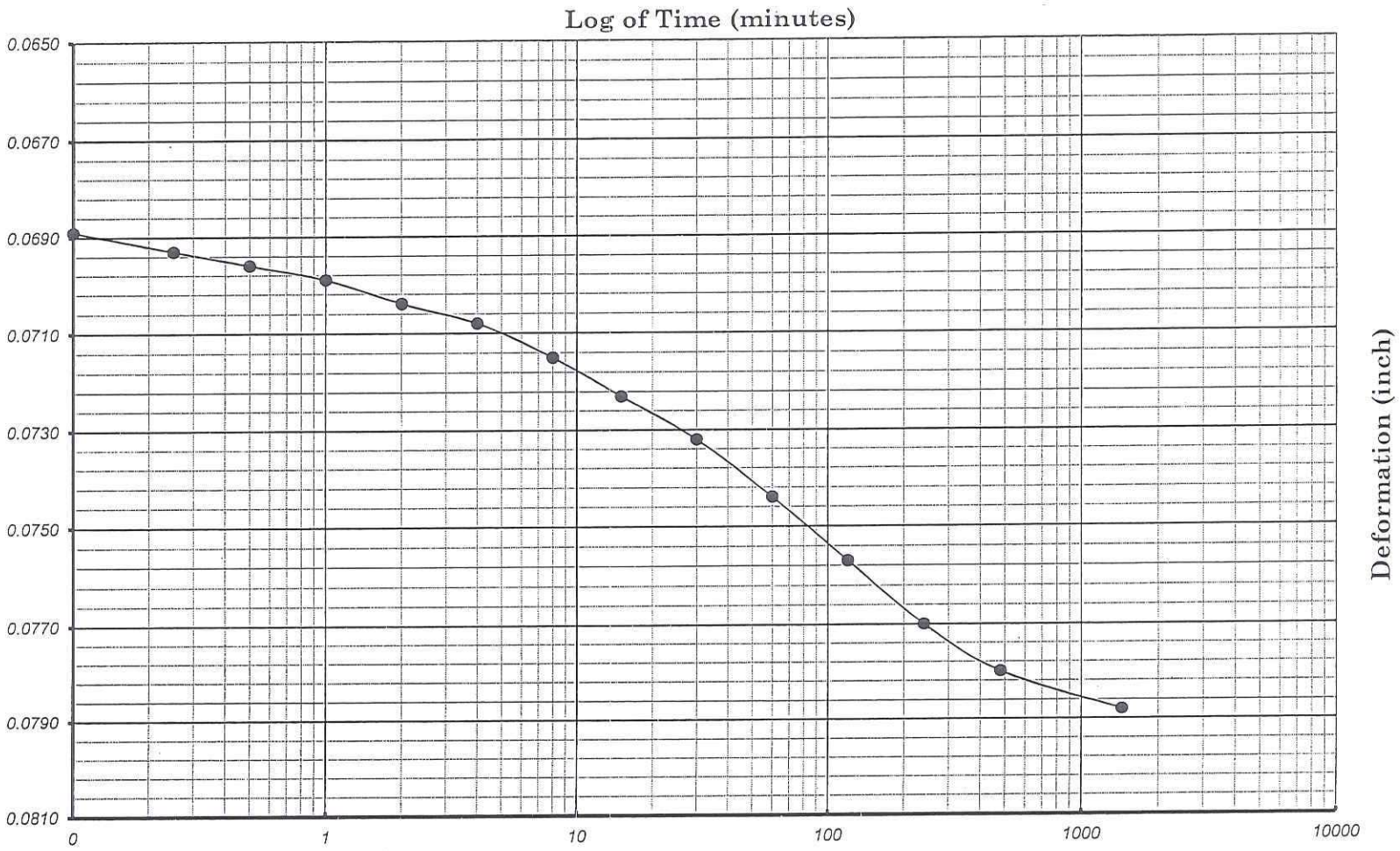
Description : Olive-brown, Fat CLAY (CH)

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

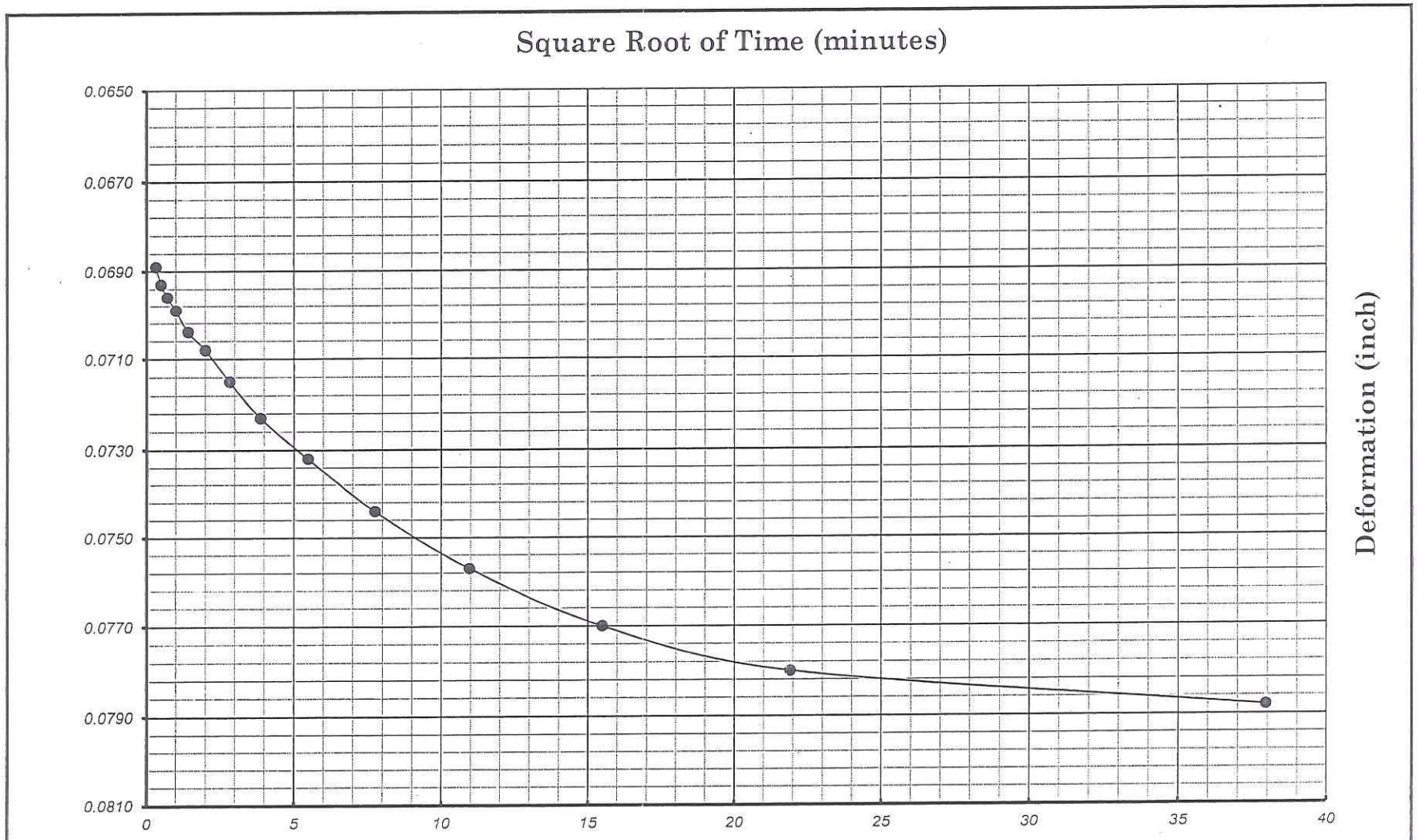
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

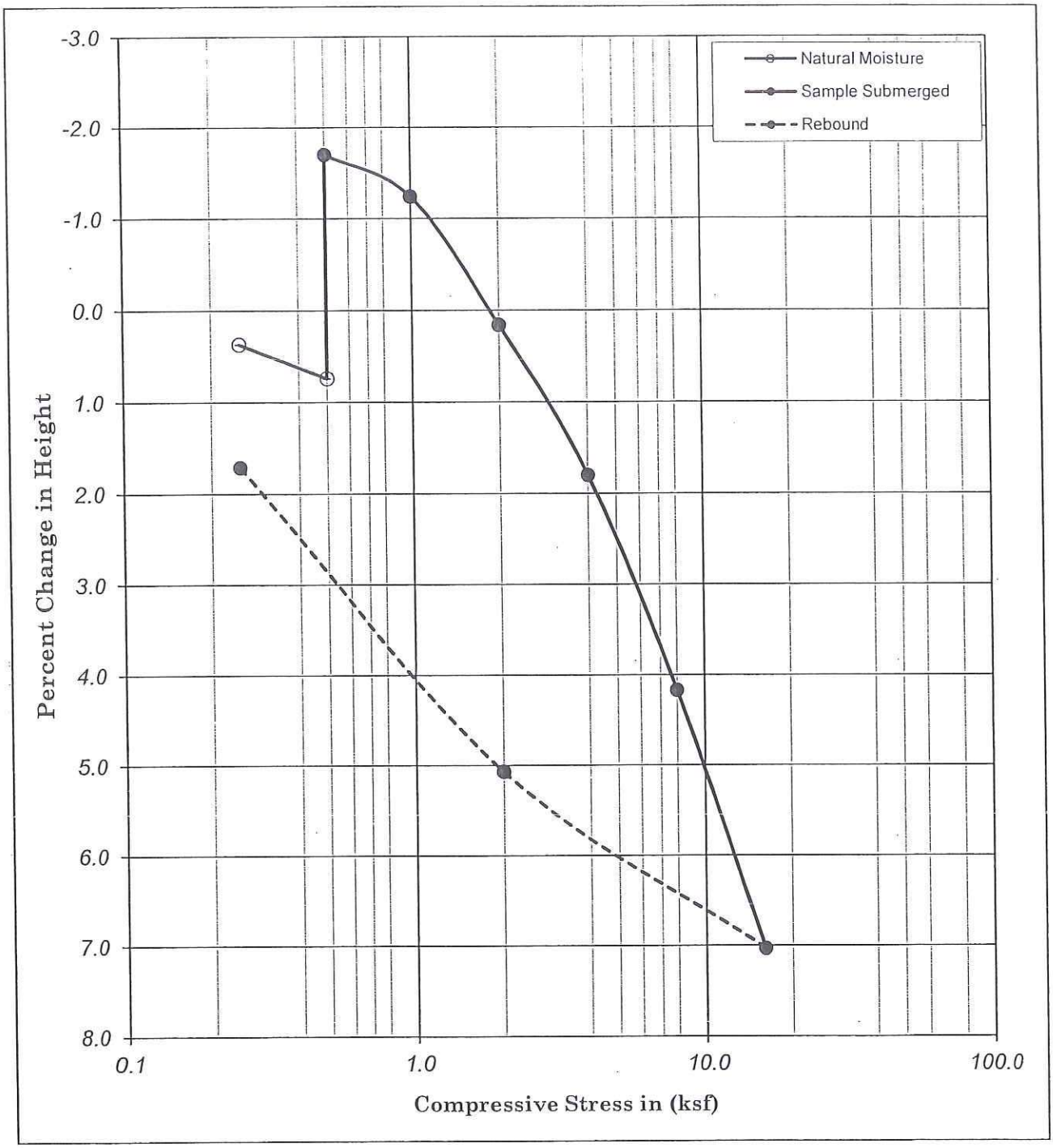
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-221	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-7	
EMI Project No. : 11-136		Depth (ft/m) : 35.0 10.7	Veritcal Load (ksf/kpa) : 8.00 383.0



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-221	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-7	
EMI Project No. : 11-136		Depth (ft/m) : 35.0 10.7	Veritcal Load (ksf/kpa) : 8.0 383.0



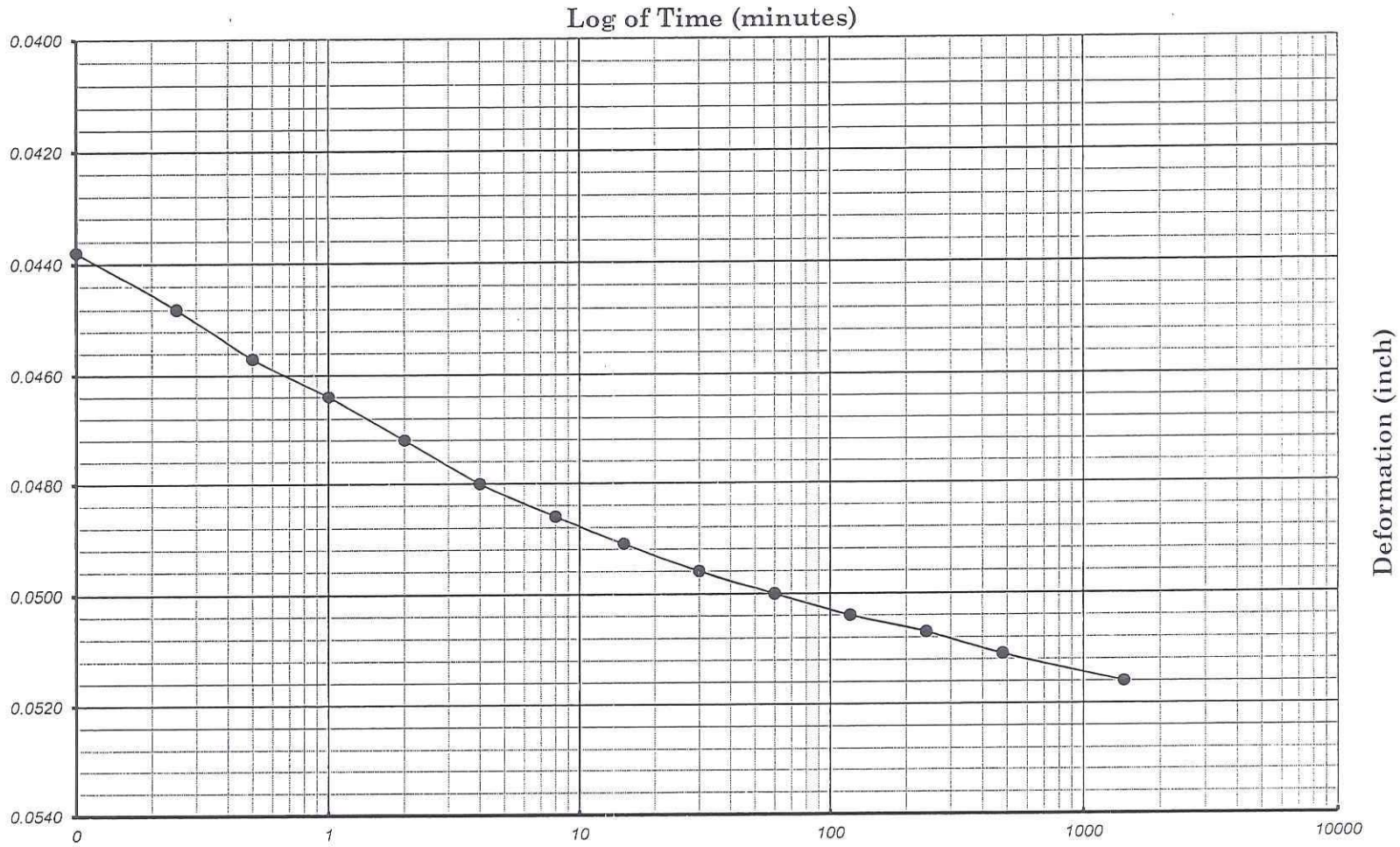
Boring No. : A-11-222				Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-2				Plastic Limit :	-						
Depth	(ft) :	10.0	11.5	Plastic Index :	-	Initial	15.04	102.99	16.21	63.77	0.64
	(m) :	3.05	3.51	Specific Gravity :	2.70	Final	22.36	104.79	16.49	99.19	0.61
Description : Olive-yellow with olive-brown, Lean CLAY (CL)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

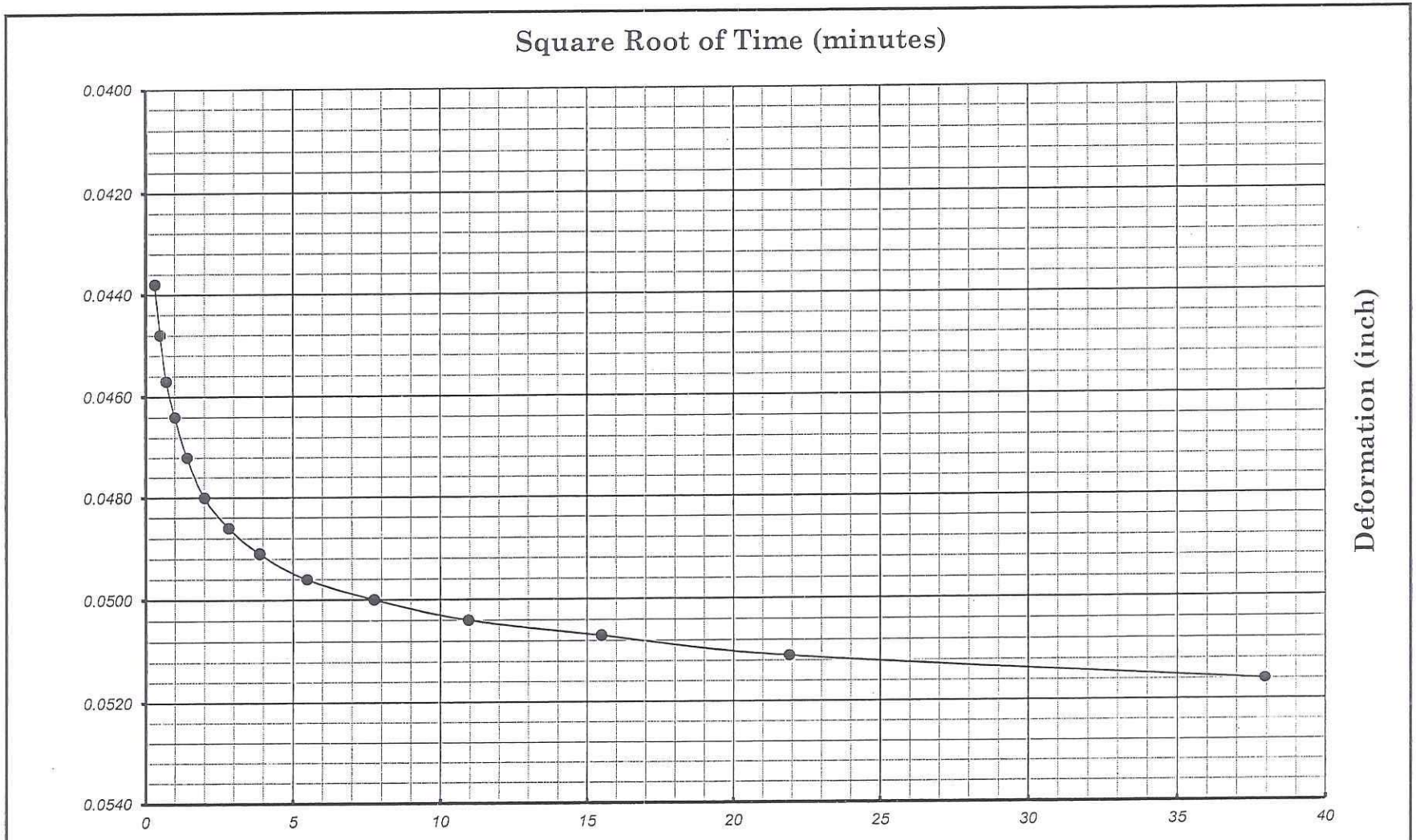
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

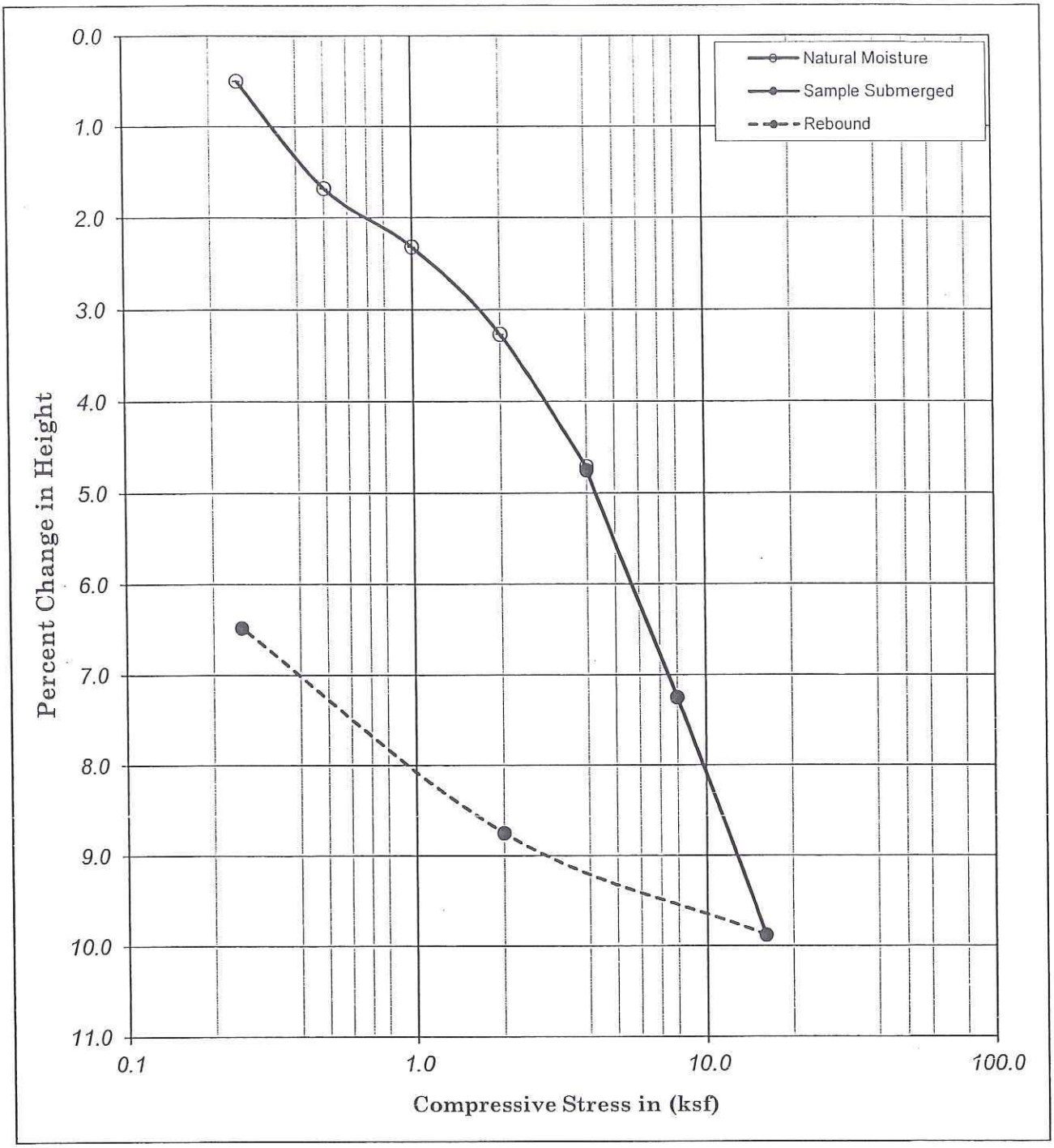
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-222	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 10.0 3.1	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-222	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 10.0 3.1	Veritcal Load (ksf/kpa) : 2.0 95.8



Boring No. : A-11-222				Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-12				Plastic Limit :	-						
Depth	(ft) :	60.0	61.5	Plastic Index :	-	Initial	24.48	100.83	15.87	98.39	0.67
	(m) :	18.30	18.76	Specific Gravity :	2.70	Final	21.87	107.83	16.97	104.85	0.56
Description : Olive-brown with white, Lean CLAY with SAND (CL)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

AP Engineering & Testing, Inc.

CAL 216 PART 2

LABORATORY COMPACTED TEST MAXIMUM WET DENSITY

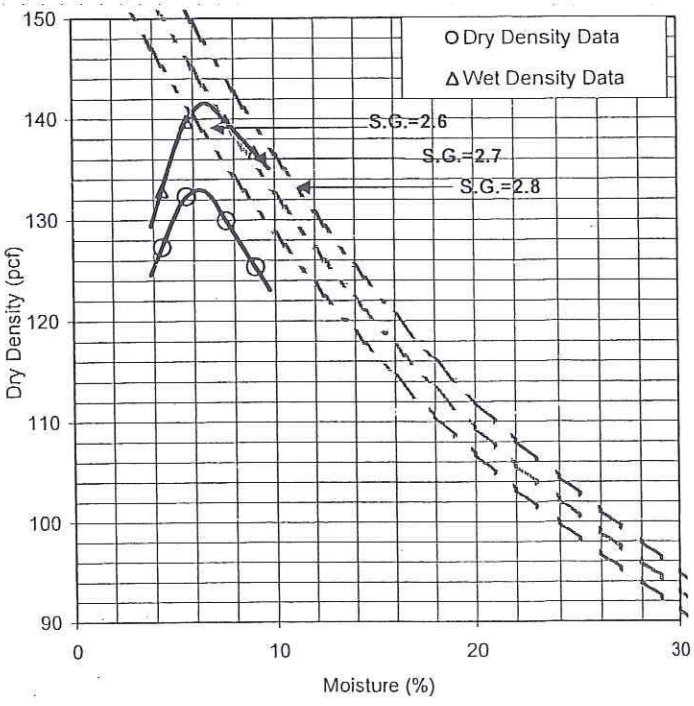
Client: Earth Mechanics, Inc.
Project Name: I-5 HOV Widening Segment 2
Project No. : 11-136
Boring No.: A-11-221
Sample No. : B-0
Visual Sample Description: Sand w/gravel

AP Number: 11-1058
Tested By: CC — Date: 11/28/11
Calculated By: KM — Date: 12/09/11
Checked By: AP — Date: 12/14/11
Depth (ft): 0-5

IMPACT TEST DATA							
I	Initial Wet Weight of Test Specimen (Grams)	2500					
	Increment No.	1	2	3	4	5	6
	Water Adjustment (grams)	0	50	100	150		
J	Tamper Reading	11.1	10.6	10.7	10.8		
K	Wet Density (gm/cc) from Table 1	2.13	2.24	2.24	2.19		
	Dry Density (gm/cc)	2.04	2.12	2.08	2.01		
	Dry Density (pcf)	**127.3**	**132.3**	**129.9**	**125.3**		
	Wt. of Container (gm.)	149.57	149.09	148.89	148.50		
	Wet Wt. of Soil + Cont. (gm.)	648.43	555.90	732.76	730.03		
	Dry Wt. of Soil + Cont. (gm.)	627.28	534.12	691.47	681.81		
	Moisture Content (%)	**4.43**	**5.66**	**7.61**	**9.04**		

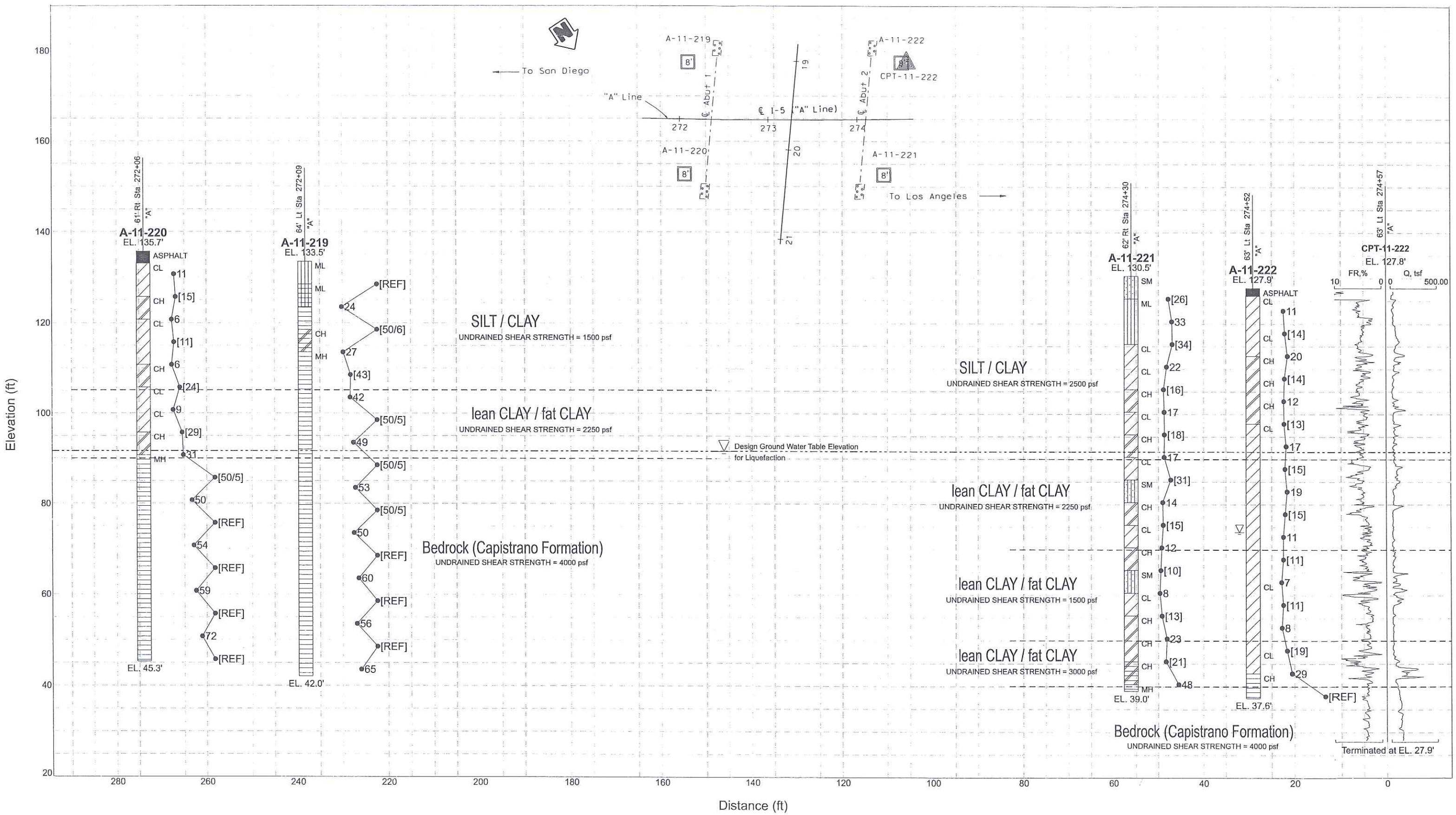
ROCK CORRECTION				
L	Total Sample Weight		(grams)	26589
M	+19 mm (¾") Weight in Air		(grams)	2454.1
N	+19 mm (¾") Weight in Water		(grams)	1471.5
O	+19 mm (¾") Volume		(M-N)	982.6
P	% +19 mm (¾")	100*	(M/L)	9.23
Q	% -19 mm (¾")		(100-P)	90.77
R	Density of +19 mm (¾")		(M/O)	2.50
S	(%+19 mm)/Density of +19 mm		(P/RY)	3.70
T	(%-19 mm)/Density of -19 mm		(Q/K)	40.52
U	Sum of S and T		(S+T)	44.22
V	Average Adjusted Density		(100/U)	2.26
Percent Relative* Compaction		Spec	Failed	or less
			Passed	
*(H/K) for 10% or less +19 mm; (H/V) for > 10% +19 mm				
Note: 62.4 x (gm/cc) = P.C.F.				

Maximum Dry Density (pcf)	133.0
Optimum Moisture Content (%)	6.5
Maximum Wet Density (pcf)	141.6



Appendix C

DESIGN CALCULATIONS



Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

Cross Section Identification				
DIST.	COUNTY	ROUTE	POSTMILE	EA
	Orange		D/D	11-136

PROJECT OR BRIDGE NAME
I-5 HOV Widening - Segment 2 - Avenida Vaquero UC

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
			1 of 0

LIQUEFACTION

I-5 HOV Widening Project - Segment 2 **EMI Project No. 11-136** Version - 12/05

LIQUEFACTION ANALYSIS, M = 7.5 ; ACC. = 0.39 g

Liquefaction analysis is performed following Seed's Procedure, outlined by Seed et al. (1985), Seed and Harder (1990), updated NCEER (1997), Martin et al. (1999) and Youd et al. (2001)

Emean/E60 = Energy Ratio to correct to standard 60% Energy
Surcharge = Any surcharge on top of the ground (psf)
acc. max = maximum peak acceleration at the ground surface (g's)
^1C_N = square root of (100 kPa or 1.04427 tsf/effective overburden)
The induced cyclic stress ratio (CSR i) by a given peak ground acceleration (acc. max) is:

CSR i = 0.65 x acc max. x total normal stress x rd / (effective normal stress x g)

The resisting cyclic stress ratio (CRR r) is equal to:
CRR r = $CRR_{7.5}$ x Cm x K sigma

where: Cm = Earthquake Magnitude Correction Factor (Blake, NCEER Table 3, Eq.4)
K sigma = Normalized resistance factor (Fig. 14 from NCEER Liquefaction workshop, Harder Boulanger)
$CRR_{7.5}$ = Resisting Cyclic Stress Ratio. It is a function of the content of fines
(Figure 2, NCEER Workshop, after Seed et al 1985))

Factor of Safety, F_L is:

F_L = CRR r / CSR i

A-11-219

Emean (%)	75			Present Ground El.	133.5	Borehole Dia. (in)	8	Tot. Unit Wt. (pcf)	41.5	=Design Water Table Depth	41.5	=Field Water Table Depth	Acc. max =	0.390	g			Earthq. M	7.5			
C_E	1.25			Future Ground El.	133.5	C_B	1.15	120	92	=Design Water El.	92	=Field Water El.						Cm=	1.00			

DEPTH OF SOIL SAMPLE (ft.)	EL. (ft.)	FIELD BLOW COUNT N	SOIL TYPE	EST. PERCENT OF FINES (%)	DESIGN TOTAL OVERBUR. PRESS. (tsf)	PRESENT EFFEC. OVERBUR. PRESS. (tsf)	C_N	C_R	C_S	C_{ST}	SAMPLER TYPE 1=SPT 2=CA.MOD	SAMPLER LINED 1=UNLINED 2=LINED	STRESS REDUC. COEFF. rd	DESIGN EFFEC. OVERBUR. PRESS. (tsf)	INDUCED CYCLIC STRESS RATIO	CORRECT BLOW COUNT N160	(N1)60cs	K sigma	RESIST. CYCLIC STRESS RATIO M=7.5	RESIST. CYCLIC STRESS RATIO Overburd Corr Mag Corr	FACTOR OF SAFETY (F_L)	WILL IT LIQUEFY?
5	129	100	ML	95.0	0.30	0.30	1.70	0.80	1.00	0.67	2	2	0.99	0.30	0.25	130	161	1.00	High N	0.00	LARGE	AboveWT
10	124	24	ML	95.0	0.60	0.60	1.32	0.85	1.20	1.00	1	1	0.98	0.60	0.25	46	61	1.00	High N	0.00	LARGE	AboveWT
15	119	80	CH	95.0	0.90	0.90	1.08	0.85	1.00	0.67	2	2	0.97	0.90	0.24	70	89	1.00	High N	0.00	LARGE	AboveWT
20	114	27	MH	99.0	1.20	1.20	0.93	0.95	1.20	1.00	1	1	0.95	1.20	0.24	41	55	0.97	High N	0.00	LARGE	AboveWT
25	109	86	MH	99.0	1.50	1.50	0.83	0.95	1.00	0.67	2	2	0.94	1.50	0.24	65	83	0.93	High N	0.00	LARGE	AboveWT
30	104	42	MH	99.0	1.80	1.80	0.76	1.00	1.20	1.00	1	1	0.93	1.80	0.24	55	71	0.89	High N	0.00	LARGE	AboveWT
35	98.5	80	MH	99.0	2.10	2.10	0.71	1.00	1.00	0.67	2	2	0.89	2.10	0.23	54	70	0.87	High N	0.00	LARGE	AboveWT
40	93.5	49	MH	99.0	2.40	2.40	0.66	1.00	1.20	1.00	1	1	0.85	2.40	0.22	56	72	0.85	High N	0.00	LARGE	AboveWT
45	88.5	60	MH	99.0	2.70	2.59	0.63	1.00	1.00	0.67	2	2	0.81	2.59	0.21	36	49	0.83	High N	0.00	LARGE	high N / Fines
50	83.5	53	MH	99.0	3.00	2.73	0.62	1.00	1.20	1.00	1	1	0.77	2.73	0.21	56	73	0.82	High N	0.00	LARGE	high N / Fines
55	78.5	60	MH	99.0	3.30	2.88	0.60	1.00	1.00	0.67	2	2	0.73	2.88	0.21	35	47	0.81	High N	0.00	LARGE	high N / Fines
60	73.5	50	MH	99.0	3.60	3.02	0.59	1.00	1.20	1.00	1	1	0.69	3.02	0.21	51	66	0.78	High N	0.00	LARGE	high N / Fines
65	68.5	100	MH	99.0	3.90	3.17	0.57	1.00	1.00	0.67	2	2	0.64	3.17	0.20	55	71	0.77	High N	0.00	LARGE	high N / Fines
70	63.5	62	MH	99.0	4.20	3.31	0.56	1.00	1.20	1.00	1	1	0.60	3.31	0.19	60	77	0.76	High N	0.00	LARGE	high N / Fines
75	58.5	80	MH	99.0	4.50	3.45	0.55	1.00	1.00	0.67	2	2	0.56	3.45	0.19	42	56	0.75	High N	0.00	LARGE	high N / Fines
80	53.5	56	MH	99.0	4.80	3.60	0.54	1.00	1.20	1.00	1	1	0.55	3.60	0.19	52	67	0.75	High N	0.00	LARGE	high N / Fines
85	48.5	80	MH	99.0	5.10	3.74	0.53	1.00	1.00	0.67	2	2	0.54	3.74	0.19	40	54	0.74	High N	0.00	LARGE	high N / Fines
90	43.5	65	MH	99.0	5.40	3.89	0.52	1.00	1.20	1.00	1	1	0.52	3.89	0.18	58	75	0.73	High N	0.00	LARGE	high N / Fines

I-5 HOV Widening Project - Segment 2 **EMI Project No. 11-136** Version - 12/05

LIQUEFACTION ANALYSIS, M = 7.5 ; ACC. = 0.39 g

Liquefaction analysis is performed following Seed's Procedure, outlined by Seed et al. (1985), Seed and Harder (1990), updated NCEER (1997), Martin et al. (1999) and Youd et al. (2001)

Emean/E60 = Energy Ratio to correct to standard 60% Energy
Surcharge = Any surcharge on top of the ground (psf)
acc. max = maximum peak acceleration at the ground surface (g's)
^1C_N = square root of (100 kPa or 1.04427 tsf/effective overburden)
The induced cyclic stress ratio (CSR i) by a given peak ground acceleration (acc. max) is:

CSR i = 0.65 x acc max. x total normal stress x rd / (effective normal stress x g)

The resisting cyclic stress ratio (CRR r) is equal to:
CRR r = $CRR_{7.5}$ x Cm x K sigma

where: Cm = Earthquake Magnitude Correction Factor (Blake, NCEER Table 3, Eq.4)
K sigma = Normalized resistance factor (Fig. 14 from NCEER Liquefaction workshop, Harder Boulanger)
$CRR_{7.5}$ = Resisting Cyclic Stress Ratio. It is a function of the content of fines (Figure 2, NCEER Workshop, after Seed et al 1985))

Factor of Safety, F_L is:

F_L = CRR r / CSR i

A-11-220

Emean (%)	75			Present Ground El.	135.7	Borehole Dia. (in)	8	Tot. Unit Wt. (pcf)	43.7	=Design Water Table Depth	43.7	=Field Water Table Depth	Acc. max =	0.390	g			Earthq. M=	7.5		
C_E	1.25			Future Ground El.	135.7	C_B	1.15	120	92	=Design Water El.	92	=Field Water El.						Cm=	1.00		

DEPTH OF SOIL SAMPLE (ft.)	EL. (ft.)	FIELD BLOW COUNT N	SOIL TYPE	EST. PERCENT OF FINES (%)	DESIGN TOTAL OVERBUR. PRESS. (tsf)	PRESENT EFFEC. OVERBUR. PRESS. (tsf)	C_N	C_R	C_S	C_{ST}	SAMPLER TYPE 1=SPT 2=CA.MOD	SAMPLER LINED 1=UNLINED 2=LINED	STRESS REDUC. COEFF. rd	DESIGN EFFEC. OVERBUR. PRESS. (tsf)	INDUCED CYCLIC STRESS RATIO	CORRECT BLOW COUNT N160	(N1)60cs	K sigma	RESIST. CYCLIC STRESS RATIO M=7.5	RESIST. CYCLIC STRESS RATIO Overburd Corr Mag Corr	FACTOR OF SAFETY (F_L)	WILL IT LIQUEFY?
5	131	11	CL	95.0	0.30	0.30	1.70	0.80	1.20	1.00	1	1	0.99	0.30	0.25	26	36	1.00	High N	0.00	LARGE	AboveWT
10	126	29	CH	95.0	0.60	0.60	1.32	0.85	1.00	0.67	2	2	0.98	0.60	0.25	31	42	1.00	High N	0.00	LARGE	AboveWT
15	121	6	CL	70.0	0.90	0.90	1.08	0.85	1.20	1.00	1	1	0.97	0.90	0.24	9	16	1.00	0.17	0.17	0.71	AboveWT
20	116	22	CL	85.0	1.20	1.20	0.93	0.95	1.00	0.67	2	2	0.95	1.20	0.24	19	27	0.97	0.35	0.34	1.41	AboveWT
25	111	6	CH	94.0	1.50	1.50	0.83	0.95	1.20	1.00	1	1	0.94	1.50	0.24	8	15	0.93	0.16	0.15	0.62	AboveWT
30	106	47	CL	90.0	1.80	1.80	0.76	1.00	1.00	0.67	2	2	0.93	1.80	0.24	34	46	0.89	High N	0.00	LARGE	AboveWT
35	101	9	CL	90.0	2.10	2.10	0.71	1.00	1.20	1.00	1	1	0.89	2.10	0.23	11	18	0.87	0.19	0.17	0.75	AboveWT
40	95.7	57	CH	80.0	2.40	2.40	0.66	1.00	1.00	0.67	2	2	0.85	2.40	0.22	36	48	0.85	High N	0.00	LARGE	AboveWT
45	90.7	31	MH	95.0	2.70	2.66	0.63	1.00	1.20	1.00	1	1	0.81	2.66	0.21	34	45	0.83	High N	0.00	LARGE	high N / Fines
50	85.7	60	MH	95.0	3.00	2.80	0.61	1.00	1.00	0.67	2	2	0.77	2.80	0.21	35	47	0.82	High N	0.00	LARGE	high N / Fines
55	80.7	50	MH	98.0	3.30	2.95	0.60	1.00	1.20	1.00	1	1	0.73	2.95	0.21	51	67	0.80	High N	0.00	LARGE	high N / Fines
60	75.7	100	MH	95.0	3.60	3.09	0.58	1.00	1.00	0.67	2	2	0.69	3.09	0.20	56	72	0.77	High N	0.00	LARGE	high N / Fines
65	70.7	54	MH	95.0	3.90	3.24	0.57	1.00	1.20	1.00	1	1	0.64	3.24	0.20	53	68	0.77	High N	0.00	LARGE	high N / Fines
70	65.7	100	MH	95.0	4.20	3.38	0.56	1.00	1.00	0.67	2	2	0.60	3.38	0.19	53	69	0.76	High N	0.00	LARGE	high N / Fines
75	60.7	59	MH	95.0	4.50	3.52	0.54	1.00	1.20	1.00	1	1	0.56	3.52	0.18	55	71	0.75	High N	0.00	LARGE	high N / Fines
80	55.7	80	MH	95.0	4.80	3.67	0.53	1.00	1.00	0.67	2	2	0.55	3.67	0.18	41	54	0.74	High N	0.00	LARGE	high N / Fines
85	50.7	72	MH	95.0	5.10	3.81	0.52	1.00	1.20	1.00	1	1	0.54	3.81	0.18	65	83	0.74	High N	0.00	LARGE	high N / Fines
90	45.7	80	MH	95.0	5.40	3.96	0.51	1.00	1.00	0.67	2	2	0.52	3.96	0.18	39	52	0.73	High N	0.00	LARGE	high N / Fines

I-5 HOV Widening Project - Segment 2 **EMI Project No. 11-136** Version - 12/05

LIQUEFACTION ANALYSIS, M = 7.5 ; ACC. = 0.39 g

Liquefaction analysis is performed following Seed's Procedure, outlined by Seed et al. (1985), Seed and Harder (1990), updated NCEER (1997), Martin et al. (1999) and Youd et al. (2001)

Emean/E60 = Energy Ratio to correct to standard 60% Energy
Surcharge = Any surcharge on top of the ground (psf)
acc. max = maximum peak acceleration at the ground surface (g's)
[1]C_N = square root of (100 kPa or 1.04427 tsf/effective overburden)
The induced cyclic stress ratio (CSR i) by a given peak ground acceleration (acc. max) is:

CSR i = 0.65 x acc max. x total normal stress x rd / (effective normal stress x g)

The resisting cyclic stress ratio (CRR r) is equal to:
CRR r = $CRR_{7.5}$ x Cm x K sigma

where: Cm = Earthquake Magnitude Correction Factor (Blake, NCEER Table 3, Eq.4)
K sigma = Normalized resistance factor (Fig. 14 from NCEER Liquefaction workshop, Harder Boulanger)
$CRR_{7.5}$ = Resisting Cyclic Stress Ratio. It is a function of the content of fines
(Figure 2, NCEER Workshop, after Seed et al 1985))

Factor of Safety, F_L is:

F_L = CRR r / CSR i

A-11-221

Emean (%)	75			Present Ground El.	130.5	Borehole Dia. (in)	8	Tot. Unit Wt. (pcf)	38.5	=Design Water Table Depth	38.5	=Field Water Table Depth		Acc. max =	0.390	g		Earthq. M	7.5
C_E	1.25			Future Ground El.	130.5	C_B	1.15	120	92	=Design Water El.	92	=Field Water El.						Cm=	1.00

DEPTH OF SOIL SAMPLE (ft.)	EL. (ft.)	FIELD BLOW COUNT N	SOIL TYPE	EST. PERCENT OF FINES (%)	DESIGN TOTAL OVERBUR. PRESS. (tsf)	PRESENT EFFEC. OVERBUR. PRESS. (tsf)	C_N	C_R	C_S	C_{ST}	SAMPLER TYPE 1=SPT 2=CA.MOD	SAMPLER LINED 1=UNLINED 2=LINED	STRESS REDUC. COEFF. rd	DESIGN EFFEC. OVERBUR. PRESS. (tsf)	INDUCED CYCLIC STRESS RATIO	CORRECT BLOW COUNT N160	(N1)60cs	K sigma	RESIST. CYCLIC STRESS RATIO M=7.5	RESIST. CYCLIC STRESS RATIO Overburd Corr Mag Corr	FACTOR OF SAFETY (F_L)	WILL IT LIQUEFY?
5	126	51	ML	60.0	0.30	0.30	1.70	0.80	1.00	0.67	2	2	0.99	0.30	0.25	66	85	1.00	High N	0.00	LARGE	AboveWT
10	121	33	ML	60.0	0.60	0.60	1.32	0.85	1.20	1.00	1	1	0.98	0.60	0.25	64	82	1.00	High N	0.00	LARGE	AboveWT
15	116	68	CL/CH	85.0	0.90	0.90	1.08	0.85	1.00	0.67	2	2	0.97	0.90	0.24	60	77	1.00	High N	0.00	LARGE	AboveWT
20	111	22	CL	85.0	1.20	1.20	0.93	0.95	1.20	1.00	1	1	0.95	1.20	0.24	34	45	0.97	High N	0.00	LARGE	AboveWT
25	106	31	CH	90.0	1.50	1.50	0.83	0.95	1.00	0.67	2	2	0.94	1.50	0.24	24	33	0.93	High N	0.00	LARGE	AboveWT
30	101	17	CL	95.0	1.80	1.80	0.76	1.00	1.20	1.00	1	1	0.93	1.80	0.24	22	32	0.89	High N	0.00	LARGE	AboveWT
35	95.5	35	CH	90.0	2.10	2.10	0.71	1.00	1.00	0.67	2	2	0.89	2.10	0.23	24	33	0.87	High N	0.00	LARGE	AboveWT
40	90.5	17	CL	90.0	2.40	2.35	0.67	1.00	1.20	1.00	1	1	0.85	2.35	0.22	20	28	0.85	0.39	0.33	1.50	Fines
45	85.5	62	SM	20.0	2.70	2.50	0.65	1.00	1.00	0.67	2	2	0.81	2.50	0.22	38	45	0.84	High N	0.00	LARGE	high N
50	80.5	14	CH	95.0	3.00	2.64	0.63	1.00	1.20	1.00	1	1	0.77	2.64	0.22	15	23	0.83	0.26	0.22	0.98	Fines
55	75.5	30	CL	95.0	3.30	2.79	0.61	1.00	1.00	0.67	2	2	0.73	2.79	0.22	18	26	0.82	0.32	0.26	1.18	Fines
60	70.5	12	CH	95.0	3.60	2.93	0.60	1.00	1.20	1.00	1	1	0.69	2.93	0.21	12	20	0.81	0.21	0.17	0.80	Fines
65	65.5	20	SC/SM/CL	50.0	3.90	3.07	0.58	1.00	1.00	0.67	2	2	0.64	3.07	0.21	11	18	0.78	0.20	0.15	0.73	Fines
70	60.5	8	CL	85.0	4.20	3.22	0.57	1.00	1.20	1.00	1	1	0.60	3.22	0.20	8	14	0.77	0.15	0.12	0.59	Fines
75	55.5	25	CH	90.0	4.50	3.36	0.56	1.00	1.00	0.67	2	2	0.56	3.36	0.19	13	21	0.76	0.23	0.17	0.91	Fines
80	50.5	23	CH	95.0	4.80	3.51	0.55	1.00	1.20	1.00	1	1	0.55	3.51	0.19	22	31	0.75	High N	0.00	LARGE	high N / Fines
85	45.5	42	CH	95.0	5.10	3.65	0.53	1.00	1.00	0.67	2	2	0.54	3.65	0.19	22	31	0.74	High N	0.00	LARGE	high N / Fines
90	40.5	48	MH	95.0	5.40	3.79	0.52	1.00	1.20	1.00	1	1	0.52	3.79	0.19	43	57	0.74	High N	0.00	LARGE	high N / Fines

I-5 HOV Widening Project - Segment 2 **EMI Project No. 11-136** Version - 12/05

LIQUEFACTION ANALYSIS, M = 7.5 ; ACC. = 0.39 g

Liquefaction analysis is performed following Seed's Procedure, outlined by Seed et al. (1985), Seed and Harder (1990), updated NCEER (1997), Martin et al. (1999) and Youd et al. (2001)

Emean/E60 = Energy Ratio to correct to standard 60% Energy
Surcharge = Any surcharge on top of the ground (psf)
acc. max = maximum peak acceleration at the ground surface (g's)
[1]C_N = square root of (100 kPa or 1.04427 tsf/effective overburden)
The induced cyclic stress ratio (CSR i) by a given peak ground acceleration (acc. max) is:

CSR i = 0.65 x acc max. x total normal stress x rd / (effective normal stress x g)

The resisting cyclic stress ratio (CRR r) is equal to:
CRR r = $CRR_{7.5}$ x Cm x K sigma

where: Cm = Earthquake Magnitude Correction Factor (Blake, NCEER Table 3, Eq.4)
K sigma = Normalized resistance factor (Fig. 14 from NCEER Liquefaction workshop, Harder Boulanger)
$CRR_{7.5}$ = Resisting Cyclic Stress Ratio. It is a function of the content of fines
(Figure 2, NCEER Workshop, after Seed et al 1985))

Factor of Safety, F_L is:

F_L = CRR r / CSR i

A-11-222

Emean (%)	75		Present Ground El.	127.9	Borehole Dia. (in)	8	Tot. Unit Wt. (pcf)	35.9	=Design Water Table Depth	35.9	=Field Water Table Depth	Acc. max =	0.390	g						Earthq. M=	7.5	
C_E	1.25		Future Ground El.	127.9	C_B	1.15	120	92	=Design Water El.	92	=Field Water El.									Cm=	1.00	

DEPTH OF SOIL SAMPLE (ft.)	EL. (ft.)	FIELD BLOW COUNT N	SOIL TYPE	EST. PERCENT OF FINES (%)	DESIGN TOTAL OVERBUR. PRESS. (tsf)	PRESENT EFFEC. OVERBUR. PRESS. (tsf)	C_N	C_R	C_S	C_{ST}	SAMPLER TYPE 1=SPT 2=CA.MOD	SAMPLER LINED 1=UNLINED 2=LINED	STRESS REDUC. COEFF. rd	DESIGN EFFEC. OVERBUR. PRESS. (tsf)	INDUCED CYCLIC STRESS RATIO	CORRECT BLOW COUNT N160	(N1)60cs	K sigma	RESIST. CYCLIC STRESS RATIO M=7.5	RESIST. CYCLIC STRESS RATIO Overburd Corr Mag Corr	FACTOR OF SAFETY (F_L)	WILL IT LIQUEFY?
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	123	11	CL	80.0	0.30	0.30	1.70	0.80	1.20	1.00	1	1	0.99	0.30	0.25	26	36	1.00	High N	0.00	LARGE	AboveWT
10	118	28	CL	80.0	0.60	0.60	1.32	0.85	1.00	0.67	2	2	0.98	0.60	0.25	30	41	1.00	High N	0.00	LARGE	AboveWT
15	113	20	CL	80.0	0.90	0.90	1.08	0.85	1.20	1.00	1	1	0.97	0.90	0.24	32	43	1.00	High N	0.00	LARGE	AboveWT
20	108	27	CH	80.0	1.20	1.20	0.93	0.95	1.00	0.67	2	2	0.95	1.20	0.24	23	32	0.97	High N	0.00	LARGE	AboveWT
25	103	12	CH	80.0	1.50	1.50	0.83	0.95	1.20	1.00	1	1	0.94	1.50	0.24	16	25	0.93	0.29	0.27	1.11	AboveWT
30	97.9	25	CL	70.0	1.80	1.80	0.76	1.00	1.00	0.67	2	2	0.93	1.80	0.24	18	27	0.89	0.33	0.30	1.26	AboveWT
35	92.9	17	CL	70.0	2.10	2.10	0.71	1.00	1.20	1.00	1	1	0.89	2.10	0.23	21	30	0.87	0.46	0.40	1.76	AboveWT
40	87.9	29	CL	75.0	2.40	2.27	0.68	1.00	1.00	0.67	2	2	0.85	2.27	0.23	19	28	0.86	0.36	0.31	1.34	Fines
45	82.9	19	CL	80.0	2.70	2.42	0.66	1.00	1.20	1.00	1	1	0.81	2.42	0.23	22	31	0.85	High N	0.00	LARGE	Fines
50	77.9	30	CL	80.0	3.00	2.56	0.64	1.00	1.00	0.67	2	2	0.77	2.56	0.23	18	27	0.84	0.34	0.28	1.24	Fines
55	72.9	11	CL	70.0	3.30	2.70	0.62	1.00	1.20	1.00	1	1	0.73	2.70	0.22	12	19	0.82	0.21	0.17	0.75	Fines
60	67.9	22	CL	80.0	3.60	2.85	0.61	1.00	1.00	0.67	2	2	0.69	2.85	0.22	13	20	0.81	0.22	0.18	0.81	Fines
65	62.9	7	CL	82.0	3.90	2.99	0.59	1.00	1.20	1.00	1	1	0.64	2.99	0.21	7	14	0.80	0.15	0.12	0.55	Fines
70	57.9	22	CL	70.0	4.20	3.14	0.58	1.00	1.00	0.67	2	2	0.60	3.14	0.21	12	20	0.77	0.21	0.16	0.79	Fines
75	52.9	8	CL	90.0	4.50	3.28	0.56	1.00	1.20	1.00	1	1	0.56	3.28	0.20	8	14	0.76	0.15	0.12	0.60	Fines
80	47.9	38	CL	80.0	4.80	3.42	0.55	1.00	1.00	0.67	2	2	0.55	3.42	0.20	20	29	0.76	0.42	0.31	1.61	Fines
85	42.9	29	CH	95.0	5.10	3.57	0.54	1.00	1.20	1.00	1	1	0.54	3.57	0.19	27	37	0.75	High N	0.00	LARGE	Fines
90	37.9	80	CH/MH	98.0	5.40	3.71	0.53	1.00	1.00	0.67	2	2	0.52	3.71	0.19	41	54	0.74	High N	0.00	LARGE	high N / Fines

SETTLEMENT CALCULATION FOR SPREAD FOOTING

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 9/18/12 Checked By Lino Date 9/19/12 Sheet 1 of 3

Avenida Vaquero UC - Abutments 1 & 2

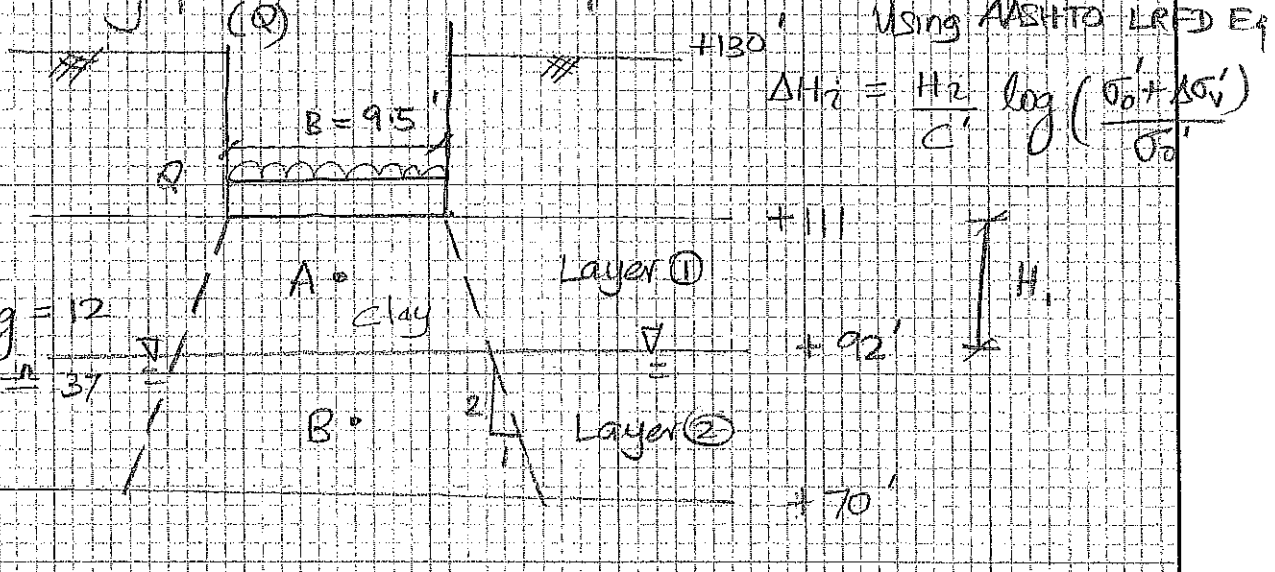
Foundation Type Selection

Settlement Calculation for Spread footing

Per Bridge Designers,

Footing size = 9.5' x 13.5'

Bearing pressure = 7500 psf



Using AASHTO LRFD Eq

$$\Delta H_i = \frac{H_i}{C'} \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

Layer	mid point	H(ft)	C'	Initial σ_o'(ksf)	$\Delta\sigma_{v_i}$(ksf)	ΔH_i(inch)
①	A	19	37	3.42	3.75	1.98
②	B	22	37	5.88	1.80	0.83

$\sum H_i$ = 2.8 inches

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Project I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 9/18/12 Checked By Lino Date 9/19/12 Sheet 2 of 3

Consider 5' of overexcavation below footing,

Layer	Mid Point	H_i (ft)	C'	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
①	A	14	37	3.72	3.31	1.26
②	B	22	37	5.88	1.80	0.83

$\Sigma \Delta H_i$ = 2.09" > 1"

⇒ Even with 5' overex, the total settlement is 2.09" > 1"

⇒ Spread footing for Abutment is not feasible.

Note: In order to get 1" of settlement, bearing pressure should be about 3.1 ksf with 5' of overexcavation.

⇒ CIDH Pile foundation is recommended.

σ'_o = initial vertical effective stress at the midpoint of layer i (ksf)

$\Delta\sigma_v$ = increase in vertical stress at the midpoint of layer i (ksf)

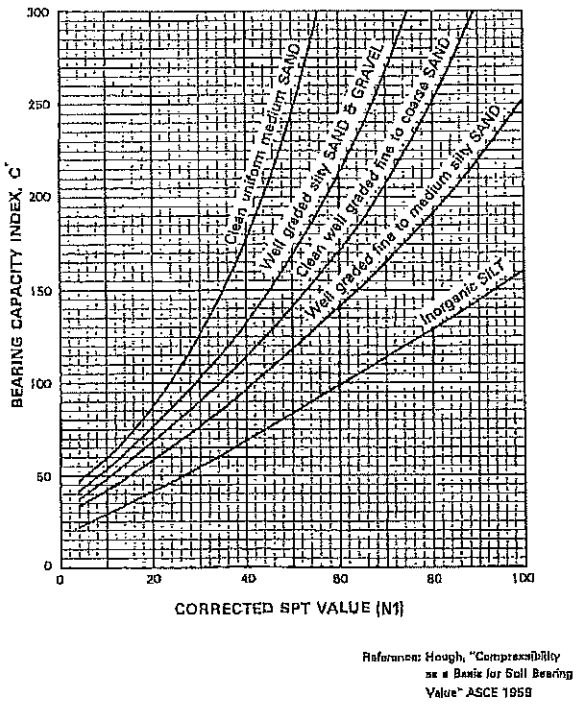

Figure 10.6.2.4.2-1—Bearing Capacity Index versus Corrected SPT (modified from Cheney and Chassie, 2000, after Hough, 1959)

10.6.2.4.3—Settlement of Footings on Cohesive Soils

Spread footings in which cohesive soils are located within the zone of stress influence shall be investigated for consolidation settlement. Elastic and secondary settlement shall also be investigated in consideration of the timing and sequence of construction loading and the tolerance of the structure to total and differential movements.

Where laboratory test results are expressed in terms of void ratio, e, the consolidation settlement of footings shall be taken as:

- For overconsolidated soils where $\sigma'_p > \sigma'_o$, see Figure 10.6.2.4.3-1:

$$S_c = \left[\frac{H_c}{1+e_o}\right]\left[C_r \log\left(\frac{\sigma'_p}{\sigma'_o}\right) + C_c \log\left(\frac{\sigma'_f}{\sigma'_p}\right)\right] \quad (10.6.2.4.3\text{-}1)$$

- For normally consolidated soils where $\sigma'_p = \sigma'_o$:

The Hough method is applicable to cohesionless soil deposits. The "Inorganic Silt" curve should generally not be applied to soils that exhibit plasticity. The settlement characteristics of cohesive soils that exhibit plasticity should be investigated using undisturbed samples and laboratory consolidation tests as prescribed in Article 10.6.2.4.3.

C10.6.2.4.3

In practice, footings on cohesive soils are most likely founded on overconsolidated clays, and settlements can be estimated using elastic theory (Baguelin et al., 1978), or the tangent modulus method (Janbu, 1963, 1967). Settlements of footings on overconsolidated clay usually occur at approximately one order of magnitude faster than soils without preconsolidation, and it is reasonable to assume that they take place as rapidly as the loads are applied. Infrequently, a layer of cohesive soil may exhibit a preconsolidation stress less than the calculated existing overburden stress. The soil is then said to be underconsolidated because a state of equilibrium has not yet been reached under the applied overburden stress. Such a condition may have been caused by a recent lowering of the groundwater table. In this case, consolidation settlement will occur due to the additional load of the structure and the settlement that is occurring to reach a state of equilibrium. The total consolidation settlement due to these two components can be estimated by Eq. 10.6.2.4.3-3 or Eq. 10.6.2.4.3-6.

AXIAL PILE CAPACITY

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

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(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 1/17/12 Checked By Andy Date 1/27/12 Sheet 1 of 5

AXIAL PILE CALCULATIONS - AVENIDA VAQUERO UC

Abutment-2 Left Widen (2 ft diameter CIDH Pile)

Using SHAFT 6.0,

Under Service-I Limit State,

Total load per pile = 187 kips
Total load per support = 937 kips

Pile Capacity Check

Using FOS = 2,

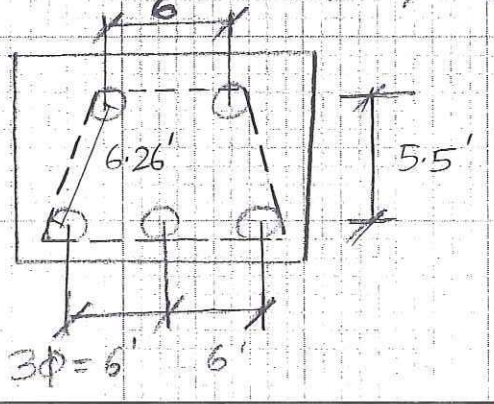
Ultimate Resistance Required = 2 × 187
= 374 kips

SELECT 380 kips

⇒ From SHAFT,
Required pile tip El. for service = +111' − 56' = +55' //

Group Check for Abut-2 Left

nominal resistance / pile = 380 kips
No. of piles / support = 5



Per AASHTO 10.8.3.6.2,
Select lesser of :

(1) Σ individual resistance

(2) nominal resistance of equivalent pier

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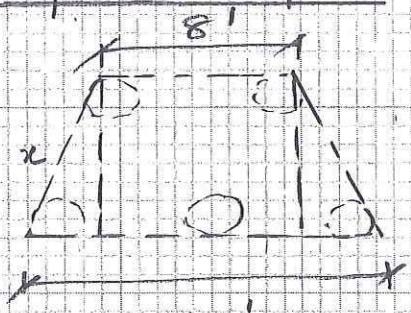
Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 2/29/12 Checked By Andy Date 1/27/12 Sheet 2 of 5

① Nominal resistance / support = 380 x 5
ΣQ = 1,900 kips

② Equivalent pier:



$x = 8.08'$

∴ perimeter = 38.2 ft

Pile length = 116.4' - 58'
= 58.4'

$\text{Avg } \bar{S}_u = \dfrac{(46.4' \times 2.25) + (12' \times 1.5)}{58.4'}$

= 2.09 ksf

nominal resistance for group Q_g
= 38.2' x 58.4' x $\bar{S}_u$
= 38.2 x 58.4 x 2.09
= 4662 kips

∴ Σ individual resistance (ΣQ) < group nominal resistance (Q_g)

⇒ Individual nominal resistance controls.

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Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

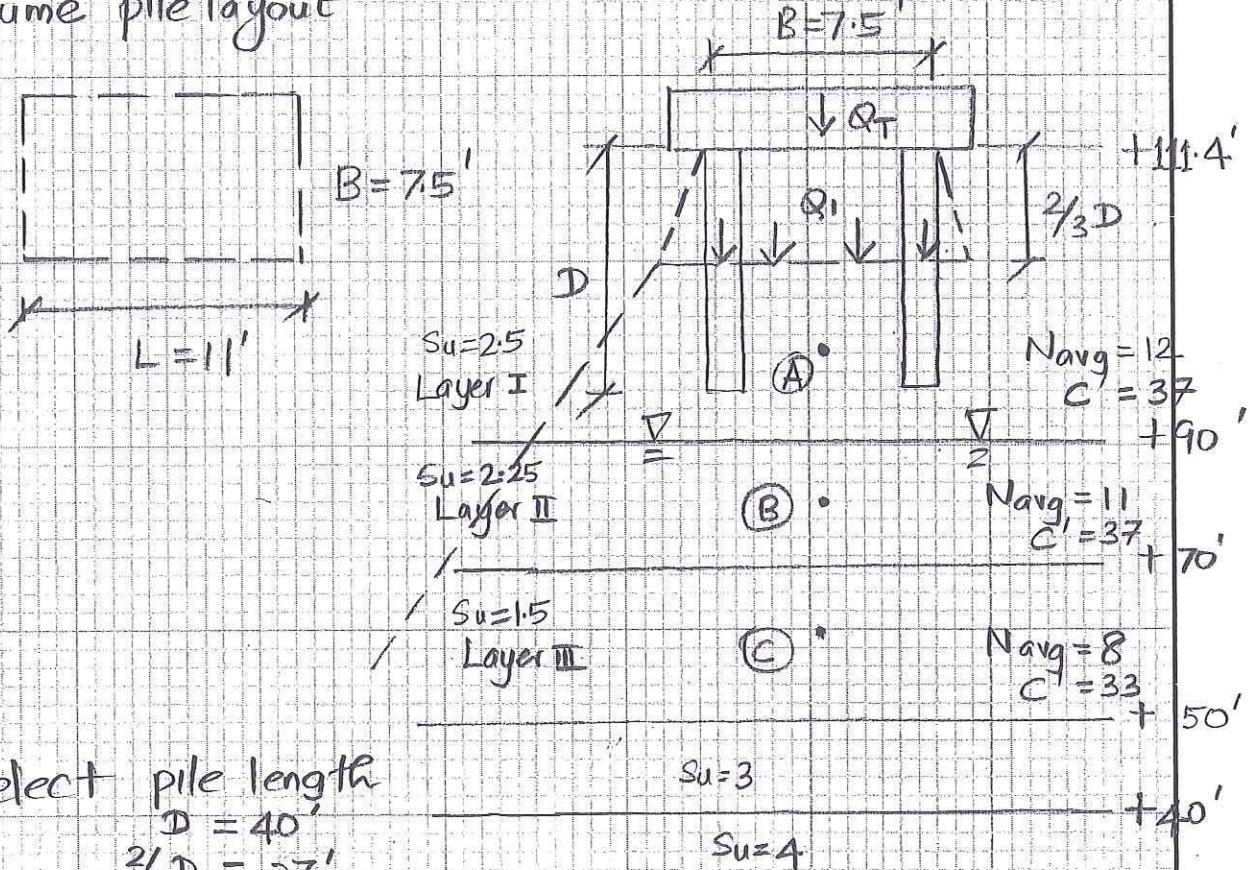
By Ranjan Date 2/29/12 Checked By Andy Date 1/27/12 Sheet 3 of 5

Group Settlement for Abut-2 Left

Permissible settlement under service load = 1"

Total load / support (Q_T) = 937 kips

Assume pile layout



Select pile length

D = 40'

2/3 D = 27'

Using $\Delta H_i = \frac{H_i}{C_i} \log\left(\frac{\sigma_o' + \Delta\sigma_{v_i}'}{\sigma_o'}\right)$ AASHTO Eq^n

Layer	Mid Point	H(ft)	C'	σ_o'(ksf)	$\Delta\sigma_{v_i}$(ksf)	ΔH_i (in)
I	A	5.1	37	2.57	1.82	-
II	B	20	35	3.30	1.03	0.60
III	C	30	33	4.58	0.34	0.34

$\Sigma \Delta H_i = 0.94" < 1"$

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∴ Required pile tip El. for settlement
$= +111.4' - 40'$
$= +71.4'$

⇒ Select El. +71 ft for settlement //

Abutment-2 Right

Nominal resistance = 380 kips

∴ Required pile tip for service $= +114.4' - 56'$
$= +58'$ //

For Settlement,
Required pile tip El. $= +114.4' - 40'$
$= +74.4'$

⇒ Select El. +74' for settlement //

Abutment-1 Left

Nominal resistance = 380 kips
Required pile tip El. for service $= +114.9' - 46'$
$= +68.9'$

⇒ SELECT EL. +68' //

For Settlement, Required minimum pile length = 26'
∴ pile tip El. for settlement $= +114.9' - 26'$
$= +88.9'$

SELECT El. +88' //

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Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 2/29/12 Checked By Andy Date 1/27/12 Sheet 5 of 5

Abutment-1 Right

Nominal Resistance = 380 kips

∴ Required pile tip for service = +118' − 46'
= +72'

SELECT El. +72' //

For settlement, Required pile tip El. = +118' − 26'
= +92' //

SUMMARY

Support No.	Nominal Resistance (kip)	Specified Tip for Service (ft)	Settlement Tip (ft)
Abut-1 Right	380	+72'	+92'
Abut-1 Left	380	+68'	+88'
Abut-2 Right	380	+58'	+74'
Abut-2 Left	380	+55'	+71'

For Lateral pile tip El. using LPILE results,

Required minimum pile length = 30' for Abutment-1
= 35' for Abutment-2

∴ Required pile tip El. for Lateral = +118' − 30' = +88' for Abut 1 Right
= +115' − 30' = +85 for Abut 1 Left
= +114' − 35' = +79' for Abut 2 Right
= +111' − 35' = +76' for Abut 2 Left

VERTICALLY LOADED DRILLED SHAFT ANALYSIS PROGRAM SHAFT
VERSION 6 (C)COPYRIGHT ENSOFT,INC.1989,1995,1998,2001,2003,2007

I-5 HOV Widening Project - Segment 2 — Abutment 2

TOTAL LOAD = 300.0 TONS

NUMBER OF LAYERS = 5

WATER TABLE DEPTH = 19.0 FT.

FACTOR OF SAFETY APPLIED TO THE TOTAL ULTIMATE CAPACITY = 1.00

FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 1.00

SOIL INFORMATION

LAYER NO 1----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.600E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.250E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.250E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.210E+02

LAYER NO 2----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.225E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.210E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.225E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.410E+02

LAYER NO 3----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.150E+04

INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.410E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.150E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.610E+02

LAYER NO 4----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.300E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.610E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.300E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.710E+02

LAYER NO 5----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.511E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.400E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.710E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.511E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.400E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.100E+03

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	=	2.000	FT.
DIAMETER OF BASE	=	2.000	FT.
END OF STEM TO BASE	=	0.000	FT.
ANGLE OF BELL	=	0.000	DEG.
IGNORED TOP PORTION	=	4.000	FT.
IGNORED BOTTOM PORTION	=	0.000	FT.
AREA OF ONE PERCENT STEEL	=	4.524	SQ.IN.
ELASTIC MODULUS, Ec	=	0.360E+07	LB/SQ IN
VOLUME OF UNDERREAM	=	0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
5.0	0.58	4.32	28.13	32.45	32.45	32.45	55.78
6.0	0.70	8.64	28.69	37.34	37.34	37.34	53.47
7.0	0.81	12.96	29.26	42.22	42.22	42.22	51.83
8.0	0.93	17.28	29.82	47.10	47.10	47.10	50.59
9.0	1.05	21.60	30.38	51.98	51.98	51.98	49.63
10.0	1.16	25.92	30.94	56.86	56.86	56.86	48.86
11.0	1.28	30.24	31.50	61.74	61.74	61.74	48.23
12.0	1.40	34.56	32.06	66.62	66.62	66.62	47.71
13.0	1.51	38.88	32.62	71.50	71.50	71.50	47.27
14.0	1.63	43.20	33.18	76.39	76.39	76.39	46.89
15.0	1.75	47.52	33.74	81.27	81.27	81.27	46.56
16.0	1.86	51.84	34.31	86.15	86.15	86.15	46.27
17.0	1.98	56.16	34.87	91.03	91.03	91.03	46.01
18.0	2.09	60.48	33.96	94.45	94.45	94.45	45.09
19.0	2.21	64.80	32.57	97.37	97.37	97.37	44.04
20.0	2.33	69.12	31.81	100.94	100.94	100.94	43.37
21.0	2.44	73.44	31.81	105.26	105.26	105.26	43.07
22.0	2.56	77.33	31.81	109.15	109.15	109.15	42.63
23.0	2.68	81.22	31.81	113.03	113.03	113.03	42.23
24.0	2.79	85.11	31.81	116.92	116.92	116.92	41.86
25.0	2.91	89.00	31.81	120.81	120.81	120.81	41.53
26.0	3.03	92.89	31.81	124.70	124.70	124.70	41.21
27.0	3.14	96.77	31.81	128.59	128.59	128.59	40.92
28.0	3.26	100.66	31.81	132.47	132.47	132.47	40.66
29.0	3.37	104.55	31.81	136.36	136.36	136.36	40.41
30.0	3.49	108.44	31.81	140.25	140.25	140.25	40.17
31.0	3.61	112.33	31.81	144.14	144.14	144.14	39.96
32.0	3.72	116.21	31.81	148.03	148.03	148.03	39.75
33.0	3.84	120.10	31.81	151.92	151.92	151.92	39.56
34.0	3.96	123.99	31.81	155.80	155.80	155.80	39.38
35.0	4.07	127.88	31.81	159.69	159.69	159.69	39.21
36.0	4.19	131.77	31.81	163.58	163.58	163.58	39.05
37.0	4.31	135.66	31.81	167.47	167.47	167.47	38.89
38.0	4.42	139.54	28.03	167.57	167.57	167.57	37.89
39.0	4.54	143.43	23.48	166.91	166.91	166.91	36.78
40.0	4.65	147.32	21.21	168.53	168.53	168.53	36.21
41.0	4.77	151.21	21.21	172.42	172.42	172.42	36.14
42.0	4.89	153.80	21.21	175.01	175.01	175.01	35.81
43.0	5.00	156.39	21.21	177.60	177.60	177.60	35.49
44.0	5.12	158.99	21.21	180.19	180.19	180.19	35.19
45.0	5.24	161.58	21.21	182.79	182.79	182.79	34.90
46.0	5.35	164.17	21.21	185.38	185.38	185.38	34.63
47.0	5.47	166.76	21.21	187.97	187.97	187.97	34.37
48.0	5.59	169.35	21.21	190.56	190.56	190.56	34.12
49.0	5.70	171.95	21.21	193.15	193.15	193.15	33.87
50.0	5.82	174.54	21.21	195.75	195.75	195.75	33.64
51.0	5.93	177.13	21.21	198.34	198.34	198.34	33.42
52.0	6.05	179.72	21.21	200.93	200.93	200.93	33.20
53.0	6.17	182.31	21.21	203.52	203.52	203.52	33.00
54.0	6.28	184.91	21.21	206.12	206.12	206.12	32.80
55.0	6.40	187.50	21.21	208.71	208.71	208.71	32.61
56.0	6.52	190.09	21.21	211.30	211.30	211.30	32.42
57.0	6.63	192.68	21.21	213.89	213.89	213.89	32.25
58.0	6.75	195.28	28.78	224.06	224.06	224.06	33.20
59.0	6.87	197.87	37.87	235.74	235.74	235.74	34.34
60.0	6.98	200.46	42.42	242.88	242.88	242.88	34.78
61.0	7.10	203.05	42.42	245.47	245.47	245.47	34.58
62.0	7.21	208.24	42.42	250.65	250.65	250.65	34.74
63.0	7.33	213.42	42.42	255.84	255.84	255.84	34.90
64.0	7.45	218.60	42.42	261.02	261.02	261.02	35.05
65.0	7.56	223.79	42.42	266.21	266.21	266.21	35.19
66.0	7.68	228.97	42.42	271.39	271.39	271.39	35.34
67.0	7.80	234.16	42.42	276.57	276.57	276.57	35.47
68.0	7.91	239.34	47.47	286.81	286.81	286.81	36.24
69.0	8.03	244.53	53.53	298.05	298.05	298.05	37.12
70.0	8.15	249.71	56.56	306.27	306.27	306.27	37.60

Service Tip for Abut 2

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TOP MOVEMENT TIP LOAD TIP MOVEMENT

ton	IN.	ton	IN.
0.1288E+00	0.5860E-04	0.1862E-02	0.1000E-04
0.6440E+00	0.2930E-03	0.9308E-02	0.5000E-04
0.1288E+01	0.5860E-03	0.1862E-01	0.1000E-03
0.6513E+02	0.2953E-01	0.9308E+00	0.5000E-02
0.9192E+02	0.4371E-01	0.1396E+01	0.7500E-02
0.1138E+03	0.5676E-01	0.1862E+01	0.1000E-01
0.1894E+03	0.1142E+00	0.4654E+01	0.2500E-01
0.2319E+03	0.1696E+00	0.9308E+01	0.5000E-01
0.2509E+03	0.2107E+00	0.1396E+02	0.7500E-01
0.2582E+03	0.2423E+00	0.1862E+02	0.1000E+00
0.2676E+03	0.4062E+00	0.3233E+02	0.2500E+00
0.2585E+03	0.6571E+00	0.4503E+02	0.5000E+00
0.2628E+03	0.7865E+00	0.4933E+02	0.6250E+00
0.2651E+03	0.9452E+00	0.5162E+02	0.7813E+00
0.2684E+03	0.1367E+01	0.5486E+02	0.1200E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.2545E+00	0.9639E-04	0.2781E-02	0.1000E-04
0.1273E+01	0.4820E-03	0.1390E-01	0.5000E-04
0.2545E+01	0.9639E-03	0.2781E-01	0.1000E-03
0.1173E+03	0.4764E-01	0.1390E+01	0.5000E-02
0.1513E+03	0.6733E-01	0.2086E+01	0.7500E-02
0.1753E+03	0.8395E-01	0.2781E+01	0.1000E-01
0.2388E+03	0.1452E+00	0.6952E+01	0.2500E-01
0.2648E+03	0.1917E+00	0.1390E+02	0.5000E-01
0.2772E+03	0.2281E+00	0.2086E+02	0.7500E-01
0.2865E+03	0.2622E+00	0.2781E+02	0.1000E+00
0.2951E+03	0.4264E+00	0.4294E+02	0.2500E+00
0.2872E+03	0.6755E+00	0.5194E+02	0.5000E+00
0.2898E+03	0.8032E+00	0.5453E+02	0.6250E+00
0.2909E+03	0.9606E+00	0.5564E+02	0.7813E+00
0.2915E+03	0.1380E+01	0.5627E+02	0.1200E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.5251E-01	0.3243E-04	0.9426E-03	0.1000E-04
0.2625E+00	0.1621E-03	0.4713E-02	0.5000E-04
0.5251E+00	0.3243E-03	0.9426E-02	0.1000E-03
0.2643E+02	0.1624E-01	0.4713E+00	0.5000E-02
0.3973E+02	0.2440E-01	0.7070E+00	0.7500E-02
0.5269E+02	0.3253E-01	0.9426E+00	0.1000E-01
0.1174E+03	0.7768E-01	0.2357E+01	0.2500E-01
0.1804E+03	0.1378E+00	0.4713E+01	0.5000E-01
0.2108E+03	0.1831E+00	0.7070E+01	0.7500E-01
0.2258E+03	0.2190E+00	0.9426E+01	0.1000E+00
0.2373E+03	0.3855E+00	0.2173E+02	0.2500E+00
0.2299E+03	0.6387E+00	0.3813E+02	0.5000E+00
0.2359E+03	0.7699E+00	0.4414E+02	0.6250E+00
0.2393E+03	0.9297E+00	0.4753E+02	0.7813E+00
0.2449E+03	0.1354E+01	0.5316E+02	0.1200E+01

VERTICALLY LOADED DRILLED SHAFT ANALYSIS PROGRAM SHAFT
VERSION 6 (C)COPYRIGHT ENSOFT,INC.1989,1995,1998,2001,2003,2007

I-5 HOV Widening Project - Segment 2 — Abutment 1

TOTAL LOAD = 300.0 TONS

NUMBER OF LAYERS = 3

WATER TABLE DEPTH = 26.0 FT.

FACTOR OF SAFETY APPLIED TO THE TOTAL ULTIMATE CAPACITY = 1.00

FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 1.00

SOIL INFORMATION

LAYER NO 1----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.600E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.150E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.150E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.130E+02

LAYER NO 2----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.225E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.130E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.550E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.225E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.280E+02

LAYER NO 3----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.511E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.400E+04

INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.280E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.511E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.400E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.100E+03

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	= 2.000	FT.
DIAMETER OF BASE	= 2.000	FT.
END OF STEM TO BASE	= 0.000	FT.
ANGLE OF BELL	= 0.000	DEG.
IGNORED TOP PORTION	= 5.000	FT.
IGNORED BOTTOM PORTION	= 0.000	FT.
AREA OF ONE PERCENT STEEL	= 4.524	SQ.IN.
ELASTIC MODULUS, Ec	= 0.360E+07	LB/SQ IN
VOLUME OF UNDERREAM	= 0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
6.0	0.70	2.59	19.11	21.70	21.70	21.70	31.08
7.0	0.81	5.18	19.65	24.84	24.84	24.84	30.49
8.0	0.93	7.78	20.20	27.98	27.98	27.98	30.05
9.0	1.05	10.37	20.74	31.11	31.11	31.11	29.70
10.0	1.16	12.96	24.88	37.84	37.84	37.84	32.52
11.0	1.28	15.55	29.54	45.09	45.09	45.09	35.23
12.0	1.40	18.15	31.81	49.96	49.96	49.96	35.77
13.0	1.51	20.74	31.81	52.55	52.55	52.55	34.74
14.0	1.63	24.63	31.81	56.44	56.44	56.44	34.64
15.0	1.75	28.51	31.81	60.33	60.33	60.33	34.56
16.0	1.86	32.40	31.81	64.21	64.21	64.21	34.49
17.0	1.98	36.29	31.81	68.10	68.10	68.10	34.42
18.0	2.09	40.18	31.81	71.99	71.99	71.99	34.37
19.0	2.21	44.07	31.81	75.88	75.88	75.88	34.32
20.0	2.33	47.95	31.81	79.77	79.77	79.77	34.27
21.0	2.44	51.84	31.81	83.66	83.66	83.66	34.23
22.0	2.56	55.73	31.81	87.54	87.54	87.54	34.19
23.0	2.68	59.62	31.81	91.43	91.43	91.43	34.16
24.0	2.79	63.51	31.81	95.32	95.32	95.32	34.13
25.0	2.91	67.40	40.65	108.05	108.05	108.05	37.14
26.0	3.03	71.28	51.25	122.54	122.54	122.54	40.50
27.0	3.14	75.17	56.56	131.73	131.73	131.73	41.92
28.0	3.26	79.06	56.56	135.62	135.62	135.62	41.62
29.0	3.37	85.48	56.56	142.04	142.04	142.04	42.09
30.0	3.49	91.91	56.56	148.46	148.46	148.46	42.53
31.0	3.61	98.33	56.56	154.88	154.88	154.88	42.93
32.0	3.72	104.75	56.56	161.31	161.31	161.31	43.32
33.0	3.84	111.17	56.56	167.73	167.73	167.73	43.68
34.0	3.96	117.60	56.56	174.15	174.15	174.15	44.02
35.0	4.07	124.02	56.56	180.58	180.58	180.58	44.34
36.0	4.19	130.44	56.56	187.00	187.00	187.00	44.64
37.0	4.31	136.86	56.56	193.42	193.42	193.42	44.92
38.0	4.42	143.29	56.56	199.84	199.84	199.84	45.19
39.0	4.54	149.71	56.56	206.27	206.27	206.27	45.45
40.0	4.65	156.13	56.56	212.69	212.69	212.69	45.69
41.0	4.77	162.56	56.56	219.11	219.11	219.11	45.92

42.0	4.89	168.98	56.56	225.53	225.53	225.53	46.14
43.0	5.00	175.40	56.56	231.96	231.96	231.96	46.36
44.0	5.12	181.82	56.56	238.38	238.38	238.38	46.56
45.0	5.24	188.25	56.56	244.80	244.80	244.80	46.75
46.0	5.35	194.67	56.56	251.23	251.23	251.23	46.93
47.0	5.47	201.09	56.56	257.65	257.65	257.65	47.11
48.0	5.59	207.51	56.56	264.07	264.07	264.07	47.28
49.0	5.70	213.94	56.56	270.49	270.49	270.49	47.44
50.0	5.82	220.36	56.56	276.92	276.92	276.92	47.59
51.0	5.93	226.78	56.56	283.34	283.34	283.34	47.74
52.0	6.05	233.21	56.56	289.76	289.76	289.76	47.88
53.0	6.17	239.63	56.56	296.18	296.18	296.18	48.02
54.0	6.28	246.05	56.56	302.61	302.61	302.61	48.16

Service Tip for Abut 1

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.9596E-01	0.4832E-04	0.1862E-02	0.1000E-04
0.4798E+00	0.2416E-03	0.9308E-02	0.5000E-04
0.9596E+00	0.4832E-03	0.1862E-01	0.1000E-03
0.4880E+02	0.2439E-01	0.9308E+00	0.5000E-02
0.7184E+02	0.3652E-01	0.1396E+01	0.7500E-02
0.9186E+02	0.4812E-01	0.1862E+01	0.1000E-01
0.1689E+03	0.1018E+00	0.4654E+01	0.2500E-01
0.2196E+03	0.1559E+00	0.9308E+01	0.5000E-01
0.2428E+03	0.1962E+00	0.1396E+02	0.7500E-01
0.2507E+03	0.2266E+00	0.1862E+02	0.1000E+00
0.2632E+03	0.3881E+00	0.3233E+02	0.2500E+00
0.2532E+03	0.6367E+00	0.4503E+02	0.5000E+00
0.2575E+03	0.7651E+00	0.4933E+02	0.6250E+00
0.2598E+03	0.9232E+00	0.5162E+02	0.7813E+00
0.2630E+03	0.1345E+01	0.5486E+02	0.1200E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.1739E+00	0.7452E-04	0.2781E-02	0.1000E-04
0.8697E+00	0.3726E-03	0.1390E-01	0.5000E-04
0.1739E+01	0.7452E-03	0.2781E-01	0.1000E-03
0.8671E+02	0.3772E-01	0.1390E+01	0.5000E-02
0.1197E+03	0.5511E-01	0.2086E+01	0.7500E-02
0.1458E+03	0.7069E-01	0.2781E+01	0.1000E-01
0.2237E+03	0.1312E+00	0.6952E+01	0.2500E-01
0.2550E+03	0.1763E+00	0.1390E+02	0.5000E-01
0.2689E+03	0.2110E+00	0.2086E+02	0.7500E-01
0.2795E+03	0.2437E+00	0.2781E+02	0.1000E+00
0.2911E+03	0.4051E+00	0.4294E+02	0.2500E+00
0.2813E+03	0.6525E+00	0.5194E+02	0.5000E+00
0.2839E+03	0.7795E+00	0.5453E+02	0.6250E+00
0.2850E+03	0.9367E+00	0.5564E+02	0.7813E+00
0.2856E+03	0.1356E+01	0.5627E+02	0.1200E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.4322E-01	0.2871E-04	0.9426E-03	0.1000E-04
0.2161E+00	0.1436E-03	0.4713E-02	0.5000E-04
0.4322E+00	0.2871E-03	0.9426E-02	0.1000E-03
0.2174E+02	0.1438E-01	0.4713E+00	0.5000E-02
0.3271E+02	0.2161E-01	0.7070E+00	0.7500E-02
0.4361E+02	0.2884E-01	0.9426E+00	0.1000E-01
0.1008E+03	0.6984E-01	0.2357E+01	0.2500E-01
0.1646E+03	0.1267E+00	0.4713E+01	0.5000E-01
0.1990E+03	0.1709E+00	0.7070E+01	0.7500E-01
0.2166E+03	0.2062E+00	0.9426E+01	0.1000E+00
0.2340E+03	0.3709E+00	0.2173E+02	0.2500E+00
0.2251E+03	0.6209E+00	0.3813E+02	0.5000E+00
0.2311E+03	0.7507E+00	0.4414E+02	0.6250E+00
0.2345E+03	0.9097E+00	0.4753E+02	0.7813E+00
0.2401E+03	0.1333E+01	0.5316E+02	0.1200E+01

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 9/18/12 Checked By Lino Date 9/19/12 Sheet 1 of 3

Avenida Vaquero UC - Abutments 1 & 2

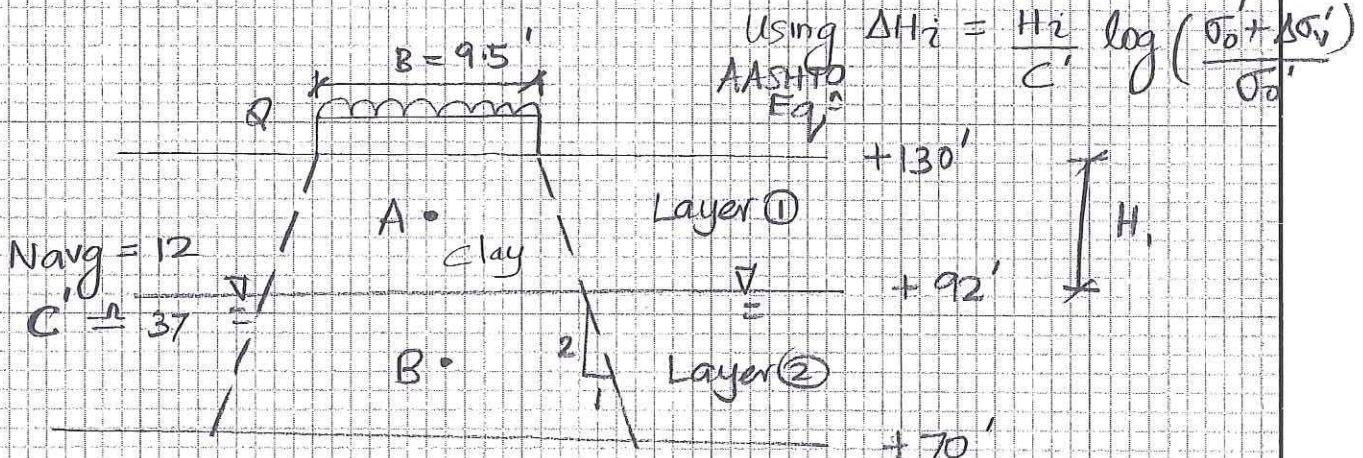
Foundation Type Selection

Settlement Calculation for spread footing

Per Bridge Designers,

Footing size = 9.5' × 13.5'

Bearing pressure = 7500 psf (Q)



Layer	mid pant	H(ft)	C'	Initial σ_o'(ksf)	$\Delta\sigma_{v_i}$(ksf)	ΔH_i(inch)
①	A	38	37	2.65	2.50	3.56
②	B	22	37	3.28	1.22	0.98

ΣH_i = 4.6 inches

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Project I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 9/18/12 Checked By Lino Date 9/19/12 Sheet 2 of 3

Consider 5' of overexcavation below footing,

Layer	Mid Point	H_i (ft)	C'	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
①	A	33	37	2.65	2.30	2.91
②	B	22	37	3.28	1.22	0.98

$\Sigma \Delta H_i = 3.9" > 1"$

$\Rightarrow$ Even with 5' overex, the total settlement is 3.9" > 1"

$\Rightarrow$ Spread footing for Abutments is not feasible.

Note: In order to get 1" of settlement, bearing pressure should be about 1.5 ksf with 5' of overexcavation.

$\Rightarrow$ CIDH Pile foundation is recommended.

σ'_o = initial vertical effective stress at the midpoint of layer *i* (ksf)

$\Delta\sigma_v$ = increase in vertical stress at the midpoint of layer *i* (ksf)

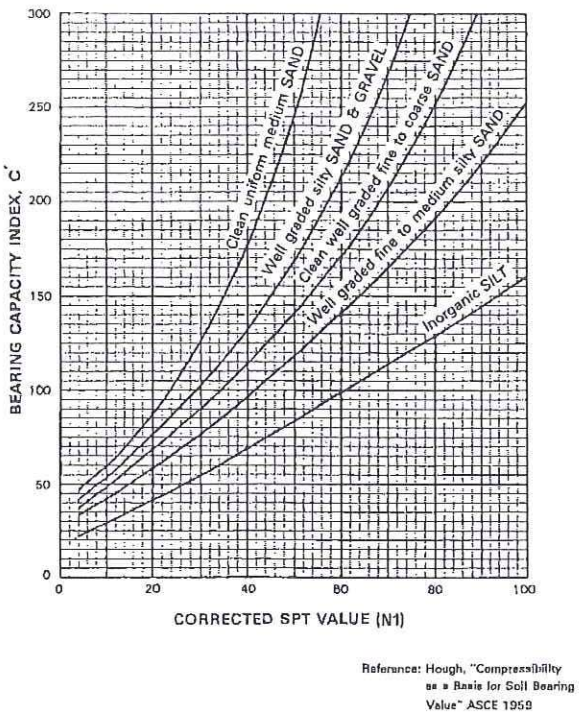


Figure 10.6.2.4.2-1—Bearing Capacity Index versus Corrected SPT (modified from Cheney and Chassie, 2000, after Hough, 1959)

10.6.2.4.3—Settlement of Footings on Cohesive Soils

Spread footings in which cohesive soils are located within the zone of stress influence shall be investigated for consolidation settlement. Elastic and secondary settlement shall also be investigated in consideration of the timing and sequence of construction loading and the tolerance of the structure to total and differential movements.

Where laboratory test results are expressed in terms of void ratio, e, the consolidation settlement of footings shall be taken as:

- For overconsolidated soils where $\sigma'_p > \sigma'_o$, see Figure 10.6.2.4.3-1:

$$S_c = \left[\frac{H_c}{1+e_o}\right]\left[C_r \log\left(\frac{\sigma'_p}{\sigma'_o}\right) + C_c \log\left(\frac{\sigma'_f}{\sigma'_p}\right)\right] \quad (10.6.2.4.3\text{-}1)$$

- For normally consolidated soils where $\sigma'_p = \sigma'_o$:

The Hough method is applicable to cohesionless soil deposits. The "Inorganic Silt" curve should generally not be applied to soils that exhibit plasticity. The settlement characteristics of cohesive soils that exhibit plasticity should be investigated using undisturbed samples and laboratory consolidation tests as prescribed in Article 10.6.2.4.3.

C10.6.2.4.3

In practice, footings on cohesive soils are most likely founded on overconsolidated clays, and settlements can be estimated using elastic theory (Baguelin et al., 1978), or the tangent modulus method (Janbu, 1963, 1967). Settlements of footings on overconsolidated clay usually occur at approximately one order of magnitude faster than soils without preconsolidation, and it is reasonable to assume that they take place as rapidly as the loads are applied. Infrequently, a layer of cohesive soil may exhibit a preconsolidation stress less than the calculated existing overburden stress. The soil is then said to be underconsolidated because a state of equilibrium has not yet been reached under the applied overburden stress. Such a condition may have been caused by a recent lowering of the groundwater table. In this case, consolidation settlement will occur due to the additional load of the structure and the settlement that is occurring to reach a state of equilibrium. The total consolidation settlement due to these two components can be estimated by Eq. 10.6.2.4.3-3 or Eq. 10.6.2.4.3-6.

LATERAL PILE CAPACITY

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 2/29/12 Checked By Andy Date 2/8/12 Sheet 1 of 1

LATERAL PILE CALCULATIONS - AVENIDA VAQUERO UC

Abutments 1 & 2 - 2 ft diameter CIDH Pile

CIDH

Area = 452.4 in^2

$I = \frac{\pi}{4} \times 12^4 = 16,286\ in^4$

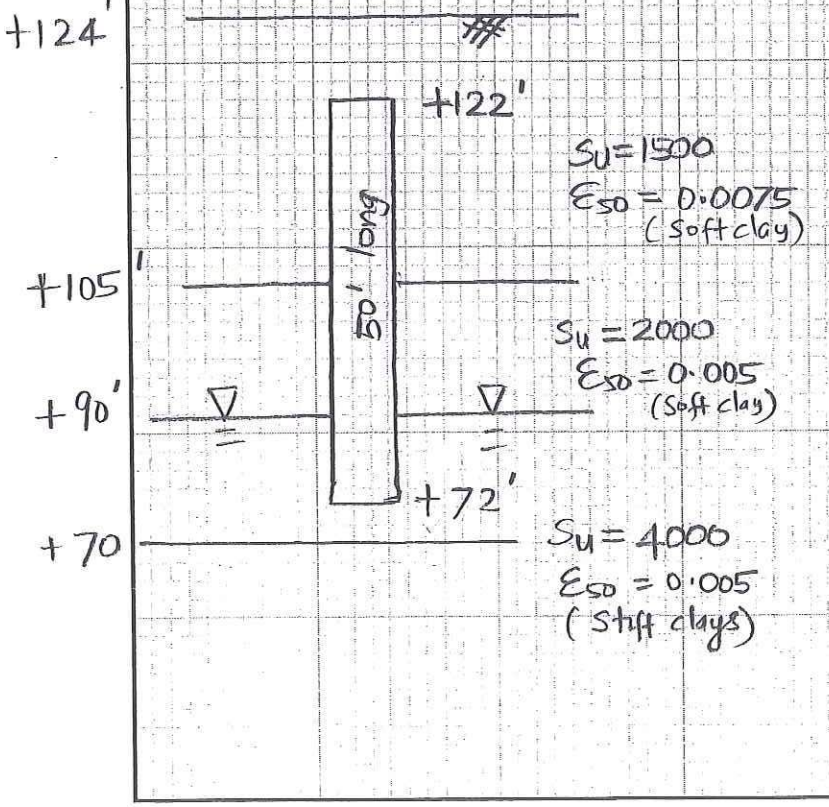
$E = 3.6 \times 10^6$ psi

USE 50% EI & Free-head condition.

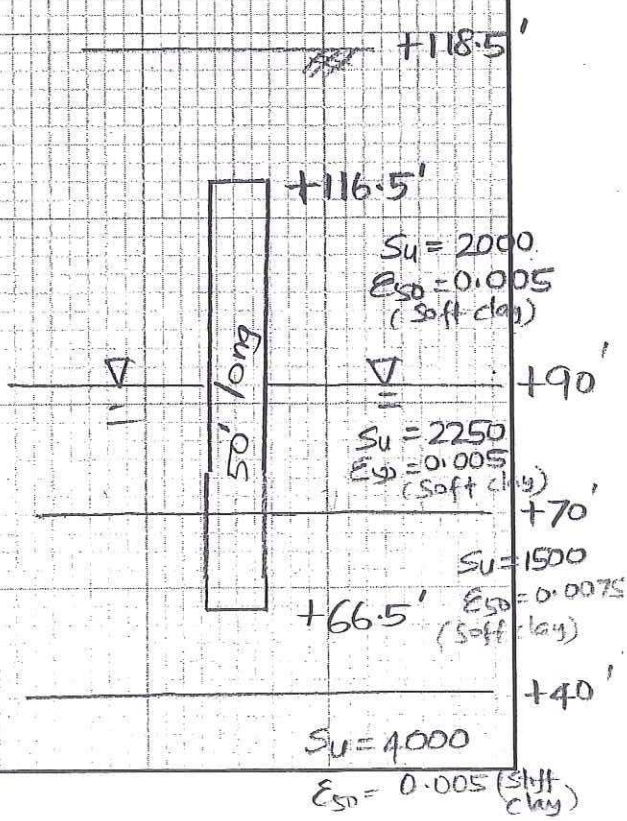
δ = 0.25", 0.5", 1", 3", 5"

Using Group 7.0, Avg η = 0.7

Abut-1



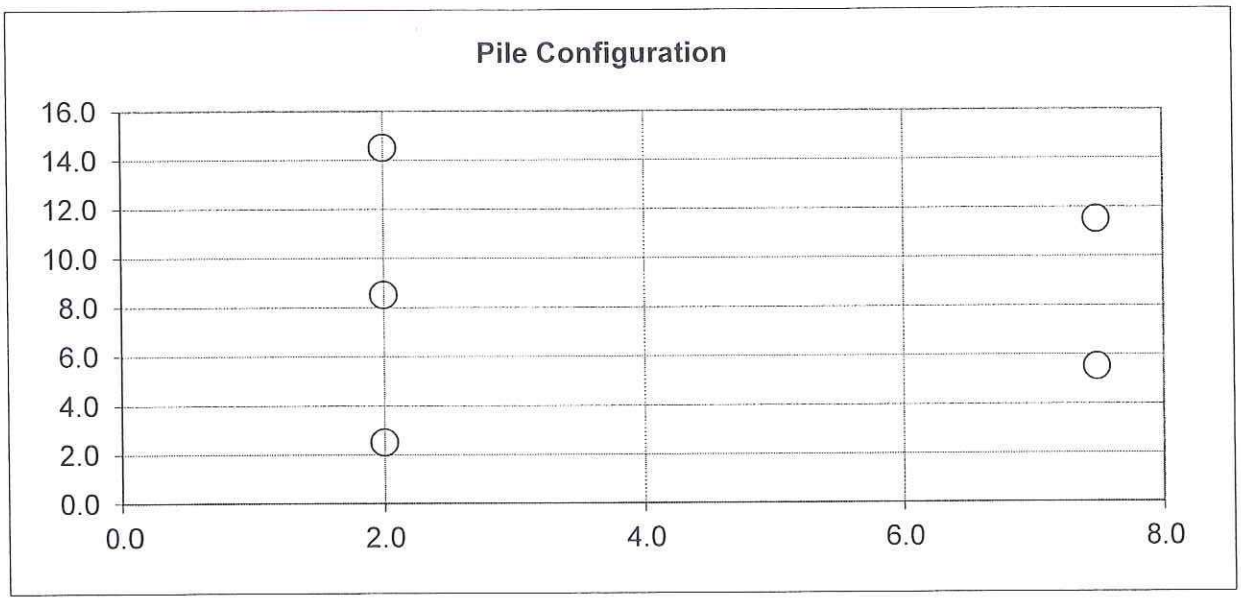
Abut-2



Project: I-5 HOV Widening - Segment 2

By: Ranjan 3/6/2012

Calculation of Pile Group Efficiency (using formula in Group 7.0 Technical Manual)



Pile Dia.: 2.000

No. of Piles: 5

Group Efficiency	X-Dir (Trans)	Y-Dir (Long)
	0.726	0.681

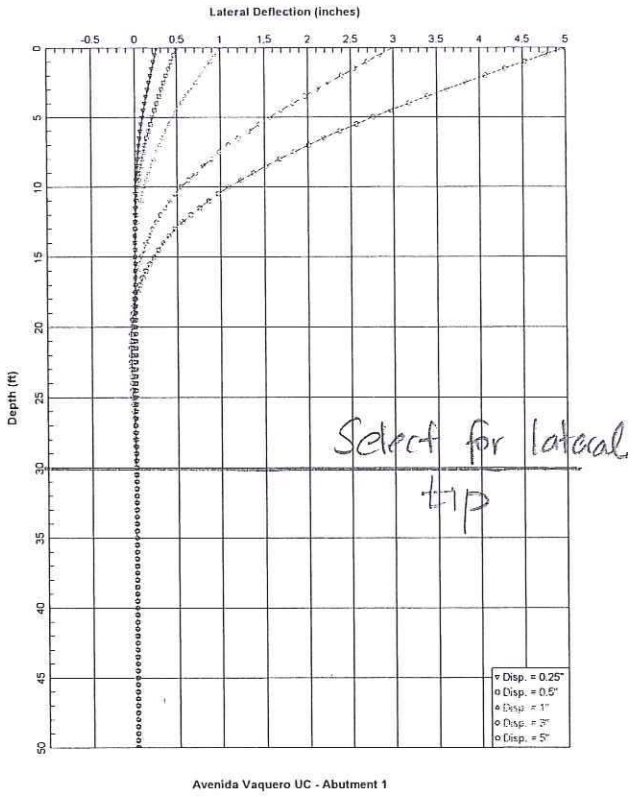
Pile No.	X (Transverse)	Y (Longitudinal)
1	2.000	2.50
2	2.000	8.50
3	2.000	14.50
4	7.500	5.50
5	7.500	11.50

Reduction Factors in X-dir	Reduction Factors in Y-dir
0.718	0.579
0.542	0.577
0.718	0.879
0.826	0.576
0.826	0.792

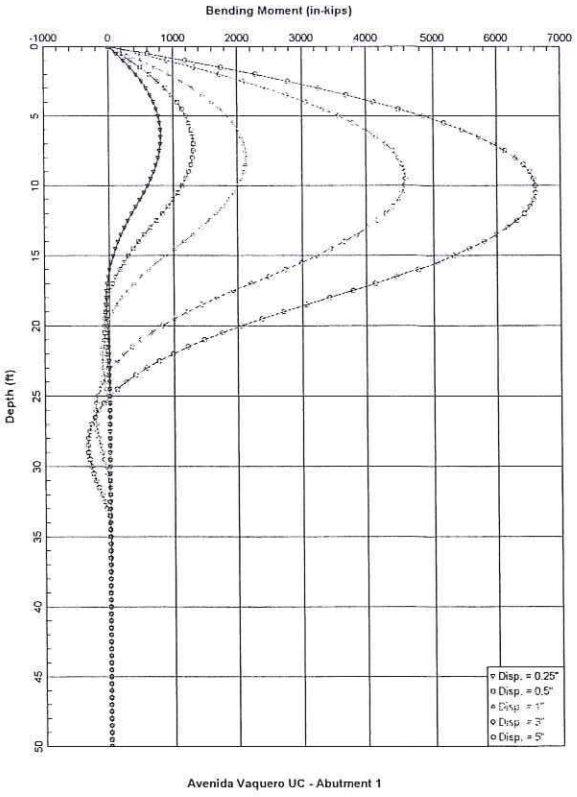
$$\text{Avg } \eta = \frac{0.726 + 0.681}{2}$$

$$= 0.703$$

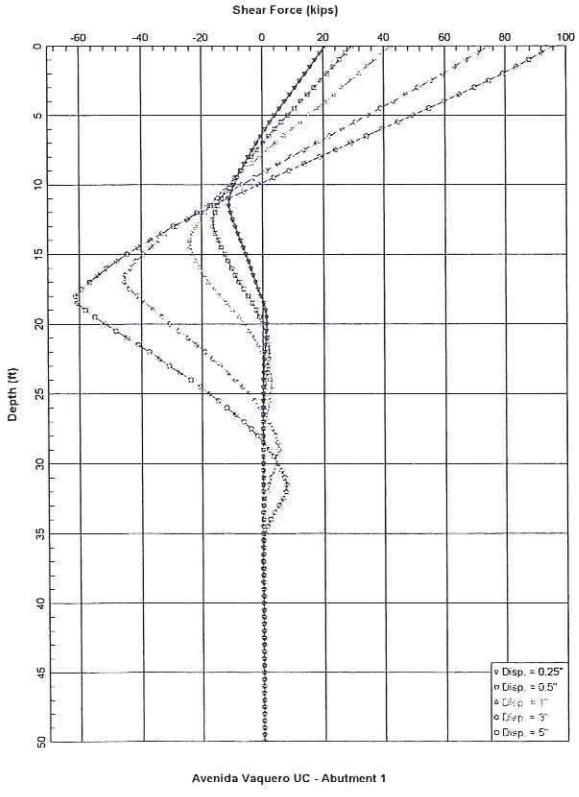
SELECT $\eta = 0.7$



Avenida Vaquero UC - Abutment 1



Avenida Vaquero UC - Abutment 1



Avenida Vaquero UC - Abutment 1

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================================================================================

                LPile Plus for Windows, Version 6.0 (6.0.09)

               Analysis of Individual Piles and Drilled Shafts
              Subjected to Lateral Loading Using the p-y Method

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                            All Rights Reserved

================================================================================

This program is licensed to:



--------------------------------------------------------------------------------
                            Files Used for Analysis
--------------------------------------------------------------------------------


Path to file locations:      X:\Projects\2011\11-136 - AECOM, I-5 HOV Widening - Segment 2\ANALYSIS\LPILE\Abut 1\
Name of input data file:     2 ft CIDH pile.lp6d
Name of output file:         2 ft CIDH pile.lp6o
Name of plot output file:    2 ft CIDH pile.lp6p
Name of runtime file:        2 ft CIDH pile.lp6r

--------------------------------------------------------------------------------
                           Date and Time of Analysis
--------------------------------------------------------------------------------

               Date:  March 12, 2012     Time:  10:45:36

--------------------------------------------------------------------------------
                                 Problem Title
--------------------------------------------------------------------------------

Project Name: I-5 HOV Widening - Avenida Vaquero UC

Job Number: 11-136

Client:

Engineer: GJG

Description: 2-ft CIDH at Abuts 1 & 2



--------------------------------------------------------------------------------
                                 Program Options
--------------------------------------------------------------------------------

Units Used - US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal Moment
  Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis uses p-y multipliers for group action
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:
- Number of pile increments                          =          100
- Maximum number of iterations allowed               =          300
- Deflection tolerance for convergence               =   1.0000E-05  in
- Maximum allowable deflection                       =     100.0000  in

Pile Response Output Options:
- Values of pile-head deflection, bending moment, shear force, and
  soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points)  = 1


--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
```

Total Number of Sections = 1

Total Pile Length = 50.00 ft

Depth of ground surface below top of pile = -2.00 ft

Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.
p-y curves are computed using values of pile diameter interpolated over the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	24.0000000
2	50.000000	24.0000000

Input Structural Properties:

Section No. 1:

Section Type	=	Elastic Pile
Cross-sectional Shape	=	Circular
Section Length	=	50.000 in
Top Width	=	24.000 in
Bottom Width	=	24.000 in
Top Area	=	452.389342 sq. in
Bottom Area	=	452.389342 sq. in
Moment of Inertia at Top	=	1.629E+04 in^4
Moment of Inertia at Bottom	=	1.629E+04 in^4
Elastic Modulus	=	1800000.000 lbs/in

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = -2.000 ft
Distance from top of pile to bottom of layer = 17.000 ft

Layer 2 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 17.000 ft
Distance from top of pile to bottom of layer = 32.000 ft

Layer 3 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 32.000 ft
Distance from top of pile to bottom of layer = 52.000 ft

(Depth of lowest layer extends 2.00 ft below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 6 points

Point No.	Depth X ft	Eff. Unit Weight pcf

1	-2.00	120.00000
2	17.00	120.00000
3	17.00	120.00000
4	32.00	120.00000
5	32.00	57.60000
6	52.00	57.60000

Summary of Soil Properties

Layer Num.	Soil Type (p-y Curve Criteria)	Depth ft	Eff. Unit Wt., pcf	Cohesion psf	Friction Ang., deg.	qu psi	RQD percent	Epsilon 50	kpy pci	Rock Emass psi	krm	Test Type	Test Prop.	Elas. Subgr. pci
1	Soft Clay	-2.000	120.000	1500.000	--	--	--	0.00750	--	--	--	--	--	--
		17.000	120.000	1500.000	--	--	--	0.00750	--	--	--	--	--	--
2	Soft Clay	17.000	120.000	2000.000	--	--	--	0.00500	--	--	--	--	--	--
		32.000	120.000	2000.000	--	--	--	0.00500	--	--	--	--	--	--
3	Soft Clay	32.000	57.600	4000.000	--	--	--	0.00500	--	--	--	--	--	--
		52.000	57.600	4000.000	--	--	--	0.00500	--	--	--	--	--	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	0.000	0.7000	1.0000
2	50.000	0.7000	1.0000

Loading Type

p-y criteria for static loading was used for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 5

Load No.	Load Type	Condition 1		Condition 2		Axial Thrust Force, lbs
1	4	y =	0.250 in	M =	0.000 in-lbs	185000.000
2	4	y =	0.500 in	M =	0.000 in-lbs	185000.000
3	4	y =	1.000 in	M =	0.000 in-lbs	185000.000
4	4	y =	3.000 in	M =	0.000 in-lbs	185000.000
5	4	y =	5.000 in	M =	0.000 in-lbs	185000.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust values were determined from pile-head loading conditions

Number of Sections = 1

Section No. 1:

Moment-Curvature properties derived from elastic section properties

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 0.250000 in
Moment at pile head = 0.000 in-lbs

Axial load at pile head = 185000.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	0.000	20561.	-0.003079	408.9398	2.931E+10	-263.2681	3159.2176	0.000
6.000	0.2315	122044.	18966.	-0.003067	498.8650	2.931E+10	-268.1847	6950.0952	0.000
12.000	0.2132	234405.	17345.	-0.003030	581.6559	2.931E+10	-272.1685	7659.6589	0.000
18.000	0.1952	336915.	15703.	-0.002972	657.1881	2.931E+10	-275.1937	8460.6738	0.000
24.000	0.1775	429441.	14046.	-0.002894	725.3641	2.931E+10	-277.2358	9369.6634	0.000
30.000	0.1604	511889.	12379.	-0.002797	786.1144	2.931E+10	-278.2717	10407.	0.000
36.000	0.1440	584204.	10710.	-0.002685	839.3975	2.931E+10	-278.2792	11598.	0.000
42.000	0.1282	646367.	9043.1823	-0.002559	885.2013	2.931E+10	-277.2367	12974.	0.000
48.000	0.1133	698403.	7386.1029	-0.002422	923.5430	2.931E+10	-275.1231	14575.	0.000
54.000	0.0992	740376.	5744.9813	-0.002274	954.4699	2.931E+10	-271.9174	16454.	0.000
60.000	0.0860	772392.	4126.4362	-0.002119	978.0600	2.931E+10	-267.5976	18678.	0.000
66.000	0.0737	794599.	2537.2227	-0.001959	994.4226	2.931E+10	-262.1402	21335.	0.000
72.000	0.0625	807188.	984.2465	-0.001795	1003.6986	2.931E+10	-255.5185	24548.	0.000
78.000	0.0522	810395.	-525.4110	-0.001630	1006.0617	2.931E+10	-247.7007	28483.	0.000
84.000	0.0429	804501.	-1984.4511	-0.001464	1001.7187	2.931E+10	-238.6460	33379.	0.000
90.000	0.0346	789832.	-3385.2887	-0.001301	990.9108	2.931E+10	-228.2998	39584.	0.000
96.000	0.0273	766766.	-4719.9384	-0.001142	973.9147	2.931E+10	-216.5834	47631.	0.000
102.000	0.0209	735728.	-5979.8194	-0.000988	951.0453	2.931E+10	-203.3769	58381.	0.000
108.000	0.0154	697202.	-7155.4087	-0.000842	922.6579	2.931E+10	-188.4861	73320.	0.000
114.000	0.0108	651732.	-8235.5786	-0.000703	889.1541	2.931E+10	-171.5705	95288.	0.000
120.000	0.006983	599937.	-9206.1908	-0.000575	850.9902	2.931E+10	-151.9669	130584.	0.000
126.000	0.003898	542535.	-10047.	-0.000458	808.6948	2.931E+10	-128.1452	197224.	0.000
132.000	0.001481	480396.	-10716.	-0.000354	762.9094	2.931E+10	-95.0715	385249.	0.000
138.000	-0.000347	414726.	-10795.	-0.000262	714.5217	2.931E+10	68.8641	1190174.	0.000
144.000	-0.001666	351441.	-10279.	-0.000184	667.8913	2.931E+10	102.9589	370867.	0.000
150.000	-0.002553	291782.	-9606.4031	-0.000118	623.9331	2.931E+10	121.3504	285234.	0.000
156.000	-0.003081	236426.	-8846.4279	-6.391E-05	583.1450	2.931E+10	131.9747	256987.	0.000
162.000	-0.003320	185767.	-8036.1629	-2.070E-05	545.8180	2.931E+10	138.1136	249636.	0.000
168.000	-0.003330	140038.	-7198.6090	1.264E-05	512.1236	2.931E+10	141.0710	254203.	0.000
174.000	-0.003168	99355.	-6350.8545	3.714E-05	482.1477	2.931E+10	141.5138	268027.	0.000
180.000	-0.002884	63745.	-5506.8154	5.383E-05	455.9089	2.931E+10	139.8325	290906.	0.000
186.000	-0.002522	33154.	-4678.4924	6.374E-05	433.3687	2.931E+10	136.2751	324212.	0.000
192.000	-0.002119	7461.6129	-3876.6463	6.790E-05	414.4377	2.931E+10	131.0069	370925.	0.000
198.000	-0.001707	-13516.	-3115.4989	6.728E-05	418.8990	2.931E+10	122.7090	431277.	0.000
204.000	-0.001312	-30074.	-2329.3837	6.282E-05	431.0990	2.931E+10	139.3294	637296.	0.000
210.000	-0.000953	-41608.	-1448.7946	5.549E-05	439.5981	2.931E+10	154.2003	970529.	0.000
216.000	-0.000646	-47582.	-579.9361	4.636E-05	443.9999	2.931E+10	135.4192	1257891.	0.000
222.000	-0.000397	-48671.	261.6413	3.651E-05	444.8016	2.931E+10	145.1066	2193014.	0.000
228.000	-0.000208	-44524.	924.8671	2.697E-05	441.7462	2.931E+10	75.9687	2193014.	0.000
234.000	-7.337E-05	-37632.	1233.2193	1.856E-05	436.6681	2.931E+10	26.8154	2193014.	0.000
240.000	1.490E-05	-29766.	1297.3257	1.167E-05	430.8725	2.931E+10	-5.4466	2193014.	0.000
246.000	6.661E-05	-22090.	1207.9425	6.358E-06	425.2163	2.931E+10	-24.3478	2193014.	0.000
252.000	9.120E-05	-15285.	1034.8977	2.533E-06	420.2023	2.931E+10	-33.3338	2193014.	0.000
258.000	9.701E-05	-9676.8816	828.5192	-2.123E-08	416.0700	2.931E+10	-35.4590	2193014.	0.000
264.000	9.095E-05	-5342.9054	622.4202	-1.558E-06	412.8766	2.931E+10	-33.2407	2193014.	0.000
270.000	7.831E-05	-2204.3802	436.8255	-2.331E-06	410.5640	2.931E+10	-28.6242	2193014.	0.000
276.000	6.298E-05	-95.8251	281.8982	-2.566E-06	409.0104	2.931E+10	-23.0182	2193014.	0.000
282.000	4.752E-05	1184.0947	160.7356	-2.455E-06	409.8123	2.931E+10	-17.3693	2193014.	0.000
288.000	3.352E-05	1838.4510	71.8722	-2.145E-06	410.2944	2.931E+10	-12.2518	2193014.	0.000
294.000	2.178E-05	2051.3239	11.2381	-1.747E-06	410.4513	2.931E+10	-7.9596	2193014.	0.000
300.000	1.255E-05	1977.1869	-26.4047	-1.335E-06	410.3966	2.931E+10	-4.5880	2193014.	0.000
306.000	5.756E-06	1737.4319	-46.4806	-9.549E-07	410.2200	2.931E+10	-2.1040	2193014.	0.000
312.000	1.094E-06	1421.5395	-53.9918	-6.316E-07	409.9872	2.931E+10	-0.3998	2193014.	0.000
318.000	-1.823E-06	1090.9328	-53.1919	-3.745E-07	409.7436	2.931E+10	0.6664	2193014.	0.000
324.000	-3.400E-06	784.0680	-47.4642	-1.826E-07	409.5175	2.931E+10	1.2429	2193014.	0.000
330.000	-4.015E-06	521.7680	-39.3334	-4.899E-08	409.3242	2.931E+10	1.4674	2193014.	0.000
336.000	-3.988E-06	312.1757	-30.5580	3.635E-08	409.1698	2.931E+10	1.4577	2193014.	0.000
342.000	-3.579E-06	154.9912	-22.2609	8.416E-08	409.0540	2.931E+10	1.3080	2193014.	0.000
348.000	-2.978E-06	44.8580	-15.0712	1.046E-07	408.9728	2.931E+10	1.0886	2193014.	0.000
354.000	-2.323E-06	-26.0954	-9.2580	1.065E-07	408.9590	2.931E+10	0.8491	2193014.	0.000
360.000	-1.700E-06	-66.4740	-4.8465	9.706E-08	408.9888	2.931E+10	0.6214	2193014.	0.000
366.000	-1.158E-06	-84.4685	-1.7121	8.161E-08	409.0020	2.931E+10	0.4234	2193014.	0.000
372.000	-7.207E-07	-87.2003	0.3484	6.404E-08	409.0040	2.931E+10	0.2634	2193014.	0.000
378.000	-3.900E-07	-80.4294	1.5663	4.689E-08	408.9990	2.931E+10	0.1425	2193014.	0.000
384.000	-1.580E-07	-68.5089	2.2538	3.165E-08	408.9903	2.931E+10	0.0866	3289520.	0.000
390.000	-1.021E-08	-53.4538	2.5361	1.917E-08	408.9792	2.931E+10	0.007467	4386027.	0.000
396.000	7.195E-08	-38.1178	2.4007	9.794E-09	408.9679	2.931E+10	-0.0526	4386027.	0.000
402.000	1.073E-07	-24.6667	2.0076	3.369E-09	408.9580	2.931E+10	-0.0784	4386027.	0.000
408.000	1.124E-07	-14.0340	1.5258	-5.918E-10	408.9501	2.931E+10	-0.0821	4386027.	0.000
414.000	1.002E-07	-6.3556	1.0596	-2.678E-09	408.9445	2.931E+10	-0.0733	4386027.	0.000
420.000	8.024E-08	-1.3129	0.6639	-3.463E-09	408.9408	2.931E+10	-0.0587	4386027.	0.000
426.000	5.865E-08	1.6186	0.3593	-3.432E-09	408.9410	2.931E+10	-0.0429	4386027.	0.000
432.000	3.906E-08	3.0061	0.1450	-2.959E-09	408.9420	2.931E+10	-0.0286	4386027.	0.000
438.000	2.315E-08	3.3651	0.008570	-2.307E-09	408.9423	2.931E+10	-0.0169	4386027.	0.000
444.000	1.138E-08	3.1140	-0.0672	-1.644E-09	408.9421	2.931E+10	-0.008318	4386027.	0.000
450.000	3.429E-09	2.5629	-0.0996	-1.063E-09	408.9417	2.931E+10	-0.002507	4386027.	0.000
456.000	-1.372E-09	1.9209	-0.1041	-6.037E-10	408.9412	2.931E+10	0.001003	4386027.	0.000
462.000	-3.815E-09	1.3146	-0.0928	-2.726E-10	408.9408	2.931E+10	0.002789	4386027.	0.000
468.000	-4.643E-09	0.8083	-0.0742	-5.533E-11	408.9404	2.931E+10	0.003394	4386027.	0.000
474.000	-4.479E-09	0.4241	-0.0542	7.080E-11	408.9401	2.931E+10	0.003274	4386027.	0.000
480.000	-3.794E-09	0.1577	-0.0361	1.303E-10	408.9399	2.931E+10	0.002773	4386027.	0.000
486.000	-2.915E-09	-0.008902	-0.0214	1.456E-10	408.9398	2.931E+10	0.002131	4386027.	0.000

492.000	-2.047E-09	-0.0988	-0.0105	1.345E-10	408.9399	2.931E+10	0.001496	4386027.	0.000
498.000	-1.300E-09	-0.1348	-0.003128	1.106E-10	408.9399	2.931E+10	0.000951	4386027.	0.000
504.000	-7.194E-10	-0.1366	0.001302	8.286E-11	408.9399	2.931E+10	0.000526	4386027.	0.000
510.000	-3.061E-10	-0.1194	0.003550	5.667E-11	408.9399	2.931E+10	0.000224	4386027.	0.000
516.000	-3.935E-11	-0.0941	0.004308	3.482E-11	408.9399	2.931E+10	2.877E-05	4386027.	0.000
522.000	1.118E-10	-0.0678	0.004149	1.825E-11	408.9398	2.931E+10	-8.171E-05	4386027.	0.000
528.000	1.797E-10	-0.0444	0.003510	6.778E-12	408.9398	2.931E+10	-0.000131	4386027.	0.000
534.000	1.931E-10	-0.0257	0.002692	0.000	408.9398	2.931E+10	-0.000141	4386027.	0.000
540.000	1.750E-10	-0.0120	0.001885	-4.247E-12	408.9398	2.931E+10	-0.000128	4386027.	0.000
546.000	1.422E-10	-0.003035	0.001189	-5.790E-12	408.9398	2.931E+10	-0.000104	4386027.	0.000
552.000	1.056E-10	0.002238	0.000646	-5.872E-12	408.9398	2.931E+10	-7.716E-05	4386027.	0.000
558.000	7.169E-11	0.004733	0.000258	-5.158E-12	408.9398	2.931E+10	-5.241E-05	4386027.	0.000
564.000	4.365E-11	0.005340	4.565E-06	-4.128E-12	408.9398	2.931E+10	-3.191E-05	4386027.	0.000
570.000	2.216E-11	0.004797	-0.000140	-3.090E-12	408.9398	2.931E+10	-1.620E-05	4386027.	0.000
576.000	6.568E-12	0.003670	-0.000203	-2.224E-12	408.9398	2.931E+10	-4.801E-06	4386027.	0.000
582.000	-4.521E-12	0.002369	-0.000207	-1.606E-12	408.9398	2.931E+10	3.305E-06	4386027.	0.000
588.000	-1.270E-11	0.001186	-0.000169	-1.242E-12	408.9398	2.931E+10	9.285E-06	4386027.	0.000
594.000	-1.943E-11	0.000337	-9.904E-05	-1.086E-12	408.9398	2.931E+10	1.420E-05	4386027.	0.000
600.000	-2.573E-11	0.000	0.000	-1.052E-12	408.9398	2.931E+10	1.881E-05	2193014.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
  The above values of total stress are computed for combined axial stress and do not equal the
  actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =      0.2500000 inches
Computed slope at pile head      =     -0.0030795 radians
Maximum bending moment           =        810395. inch-lbs
Maximum shear force              =         20561. lbs
Depth of maximum bending moment  =     78.0000000 inches below pile head
Depth of maximum shear force     =      0.000000 inches below pile head
Number of iterations             =             16
Number of zero deflection points =              7
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 0.500000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 185000.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	0.000	29486.	-0.005542	408.9398	2.931E+10	-331.6971	1990.1824	0.000
6.000	0.4667	177097.	27474.	-0.005524	539.4297	2.931E+10	-338.7891	4355.1117	0.000
12.000	0.4337	341957.	25423.	-0.005471	660.9033	2.931E+10	-344.8612	4770.8414	0.000
18.000	0.4011	494324.	23339.	-0.005385	773.1719	2.931E+10	-349.8849	5233.9407	0.000
24.000	0.3691	633983.	21228.	-0.005270	876.0768	2.931E+10	-353.8333	5752.0350	0.000
30.000	0.3379	760761.	19097.	-0.005127	969.4898	2.931E+10	-356.6805	6334.2927	0.000
36.000	0.3076	874524.	16951.	-0.004960	1053.3143	2.931E+10	-358.4016	6991.8213	0.000
42.000	0.2783	975187.	14799.	-0.004771	1127.4854	2.931E+10	-358.9730	7738.1862	0.000
48.000	0.2503	1062705.	12647.	-0.004562	1191.9713	2.931E+10	-358.3712	8590.1027	0.000
54.000	0.2236	1137081.	10502.	-0.004337	1246.7732	2.931E+10	-356.5735	9568.3671	0.000
60.000	0.1983	1198361.	8371.9342	-0.004098	1291.9263	2.931E+10	-353.5570	10699.	0.000
66.000	0.1744	1246641.	6263.3691	-0.003848	1327.5004	2.931E+10	-349.2981	12016.	0.000
72.000	0.1521	1282063.	4184.1586	-0.003589	1353.6004	2.931E+10	-343.7721	13561.	0.000
78.000	0.1314	1304818.	2141.9872	-0.003324	1370.3670	2.931E+10	-336.9517	15391.	0.000
84.000	0.1122	1315147.	144.7142	-0.003056	1377.9772	2.931E+10	-328.8059	17581.	0.000
90.000	0.0947	1313339.	-1799.5956	-0.002787	1376.6454	2.931E+10	-319.2973	20234.	0.000
96.000	0.0788	1299739.	-3682.6231	-0.002520	1366.6242	2.931E+10	-308.3786	23490.	0.000
102.000	0.0644	1274741.	-5495.7197	-0.002256	1348.2053	2.931E+10	-295.9870	27556.	0.000
108.000	0.0517	1238799.	-7229.7853	-0.001999	1321.7218	2.931E+10	-282.0349	32735.	0.000
114.000	0.0405	1192421.	-8875.0702	-0.001750	1287.5497	2.931E+10	-266.3934	39504.	0.000
120.000	0.0307	1136183.	-10421.	-0.001512	1246.1117	2.931E+10	-248.8625	48649.	0.000
126.000	0.0223	1070727.	-11855.	-0.001286	1197.8822	2.931E+10	-229.1105	61590.	0.000
132.000	0.0153	996781.	-13162.	-0.001074	1143.3961	2.931E+10	-206.5382	81200.	0.000
138.000	0.009427	915172.	-14321.	-0.000879	1083.2646	2.931E+10	-179.9154	114506.	0.000
144.000	0.004717	826879.	-15299.	-0.000700	1018.2074	2.931E+10	-146.0671	185788.	0.000
150.000	0.001022	733139.	-16007.	-0.000541	949.1373	2.931E+10	-89.9558	527878.	0.000
156.000	-0.001772	635994.	-15948.	-0.000401	877.5583	2.931E+10	109.5729	371021.	0.000
162.000	-0.003785	542650.	-15187.	-0.000280	808.7794	2.931E+10	144.2464	228638.	0.000
168.000	-0.005132	454375.	-14265.	-0.000178	743.7358	2.931E+10	162.9527	190500.	0.000
174.000	-0.005921	371863.	-13253.	-9.345E-05	682.9387	2.931E+10	174.3390	176654.	0.000
180.000	-0.006254	295542.	-12187.	-2.515E-05	626.7038	2.931E+10	181.0235	173679.	0.000
186.000	-0.006223	225672.	-11092.	2.819E-05	575.2212	2.931E+10	184.1984	177594.	0.000
192.000	-0.005915	162381.	-9985.3908	6.791E-05	528.5869	2.931E+10	184.5197	187159.	0.000

198.000	-0.005408	105696.	-8890.9586	9.534E-05	486.8199	2.931E+10	180.2910	200018.	0.000
204.000	-0.004771	55478.	-7706.9643	0.000112	449.8176	2.931E+10	214.3738	269580.	0.000
210.000	-0.004066	12965.	-6313.2015	0.000119	418.4925	2.931E+10	250.2138	369209.	0.000
216.000	-0.003345	-20544.	-4859.2197	0.000118	424.0773	2.931E+10	234.4468	420506.	0.000
222.000	-0.002649	-45608.	-3505.1606	0.000111	442.5452	2.931E+10	216.9062	491211.	0.000
228.000	-0.002010	-62853.	-2261.0215	0.000100	455.2518	2.931E+10	197.8068	590561.	0.000
234.000	-0.001447	-72963.	-1135.7482	8.630E-05	462.7009	2.931E+10	177.2842	735053.	0.000
240.000	-0.000974	-76674.	-137.8190	7.098E-05	465.4352	2.931E+10	155.3588	956896.	0.000
246.000	-0.000595	-74774.	723.7211	5.548E-05	464.0356	2.931E+10	131.8212	1328552.	0.000
252.000	-0.000308	-68112.	1457.2871	4.086E-05	459.1268	2.931E+10	112.7008	2193014.	0.000
258.000	-0.000105	-57378.	1910.5276	2.802E-05	451.2172	2.931E+10	38.3794	2193014.	0.000
264.000	2.787E-05	-45248.	1995.1022	1.752E-05	442.2799	2.931E+10	-10.1879	2193014.	0.000
270.000	0.000105	-33475.	1849.2028	9.459E-06	433.6053	2.931E+10	-38.4453	2193014.	0.000
276.000	0.000141	-23079.	1578.8351	3.672E-06	425.9448	2.931E+10	-51.6773	2193014.	0.000
282.000	0.000149	-14537.	1260.1524	-1.776E-07	419.6513	2.931E+10	-54.5503	2193014.	0.000
288.000	0.000139	-7956.4568	943.8070	-2.480E-06	414.8023	2.931E+10	-50.8982	2193014.	0.000
294.000	0.000119	-3206.1256	660.0882	-3.622E-06	411.3021	2.931E+10	-43.6748	2193014.	0.000
300.000	9.579E-05	-27.3574	424.0271	-3.953E-06	408.9599	2.931E+10	-35.0123	2193014.	0.000
306.000	7.206E-05	1890.9754	239.9778	-3.762E-06	410.3331	2.931E+10	-26.3375	2193014.	0.000
312.000	5.065E-05	2860.7287	105.4308	-3.276E-06	411.0477	2.931E+10	-18.5115	2193014.	0.000
318.000	3.275E-05	3163.4179	13.9877	-2.659E-06	411.2707	2.931E+10	-11.9696	2193014.	0.000
324.000	1.873E-05	3034.4847	-42.4635	-2.025E-06	411.1757	2.931E+10	-6.8475	2193014.	0.000
330.000	8.447E-06	2658.3514	-72.2686	-1.442E-06	410.8985	2.931E+10	-3.0875	2193014.	0.000
336.000	1.425E-06	2170.4633	-83.0934	-9.483E-07	410.5390	2.931E+10	-0.5207	2193014.	0.000
342.000	-2.932E-06	1663.3355	-81.4402	-5.560E-07	410.1654	2.931E+10	1.0718	2193014.	0.000
348.000	-5.247E-06	1194.4153	-72.4714	-2.635E-07	409.8199	2.931E+10	1.9178	2193014.	0.000
354.000	-6.095E-06	794.2640	-60.0351	-6.001E-08	409.5250	2.931E+10	2.2276	2193014.	0.000
360.000	-5.967E-06	474.1272	-46.8093	6.980E-08	409.2891	2.931E+10	2.1810	2193014.	0.000
366.000	-5.257E-06	232.3976	-34.5019	1.421E-07	409.1110	2.931E+10	1.9215	2193014.	0.000
372.000	-4.262E-06	59.7893	-24.0642	1.720E-07	408.9838	2.931E+10	1.5577	2193014.	0.000
378.000	-3.193E-06	-56.7551	-15.8898	1.723E-07	408.9816	2.931E+10	1.1671	2193014.	0.000
384.000	-2.194E-06	-131.2714	-8.7799	1.531E-07	409.0365	2.931E+10	1.2029	3289520.	0.000
390.000	-1.356E-06	-162.4533	-2.1969	1.230E-07	409.0595	2.931E+10	0.9914	4386027.	0.000
396.000	-7.179E-07	-157.9072	2.3518	9.023E-08	409.0561	2.931E+10	0.5248	4386027.	0.000
402.000	-2.735E-07	-134.4323	4.5260	6.031E-08	409.0388	2.931E+10	0.1999	4386027.	0.000
408.000	5.811E-09	-103.7292	5.1131	3.594E-08	409.0162	2.931E+10	-0.004248	4386027.	0.000
414.000	1.577E-07	-73.1554	4.7544	1.784E-08	408.9937	2.931E+10	-0.1153	4386027.	0.000
420.000	2.198E-07	-46.7164	3.9263	5.569E-09	408.9742	2.931E+10	-0.1607	4386027.	0.000
426.000	2.246E-07	-26.0521	2.9517	-1.878E-09	408.9590	2.931E+10	-0.1642	4386027.	0.000
432.000	1.973E-07	-11.2918	2.0265	-5.700E-09	408.9481	2.931E+10	-0.1442	4386027.	0.000
438.000	1.562E-07	-1.7212	1.2513	-7.032E-09	408.9411	2.931E+10	-0.1142	4386027.	0.000
444.000	1.129E-07	3.7400	0.6612	-6.825E-09	408.9425	2.931E+10	-0.0825	4386027.	0.000
450.000	7.427E-08	6.2285	0.2507	-5.805E-09	408.9444	2.931E+10	-0.0543	4386027.	0.000
456.000	4.327E-08	6.7611	-0.007071	-4.476E-09	408.9448	2.931E+10	-0.0316	4386027.	0.000
462.000	2.056E-08	6.1536	-0.1471	-3.154E-09	408.9443	2.931E+10	-0.0150	4386027.	0.000
468.000	5.419E-09	5.0035	-0.2040	-2.012E-09	408.9435	2.931E+10	-0.003962	4386027.	0.000
474.000	-3.581E-09	3.7097	-0.2081	-1.120E-09	408.9425	2.931E+10	0.002618	4386027.	0.000
480.000	-8.026E-09	2.5092	-0.1826	-4.840E-10	408.9416	2.931E+10	0.005867	4386027.	0.000
486.000	-9.389E-09	1.5194	-0.1444	-7.172E-11	408.9409	2.931E+10	0.006863	4386027.	0.000
492.000	-8.886E-09	0.7763	-0.1043	1.632E-10	408.9404	2.931E+10	0.006496	4386027.	0.000
498.000	-7.430E-09	0.2669	-0.0686	2.700E-10	408.9400	2.931E+10	0.005432	4386027.	0.000
504.000	-5.647E-09	-0.0471	-0.0399	2.925E-10	408.9398	2.931E+10	0.004128	4386027.	0.000
510.000	-3.921E-09	-0.2124	-0.0189	2.659E-10	408.9399	2.931E+10	0.002866	4386027.	0.000
516.000	-2.456E-09	-0.2745	-0.004920	2.161E-10	408.9400	2.931E+10	0.001795	4386027.	0.000
522.000	-1.328E-09	-0.2719	0.003379	1.601E-10	408.9400	2.931E+10	0.000971	4386027.	0.000
528.000	-5.343E-10	-0.2343	0.007464	1.083E-10	408.9400	2.931E+10	0.000391	4386027.	0.000
534.000	-2.828E-11	-0.1826	0.008698	6.566E-11	408.9399	2.931E+10	2.067E-05	4386027.	0.000
540.000	2.535E-10	-0.1301	0.008204	3.365E-11	408.9399	2.931E+10	-0.000185	4386027.	0.000
546.000	3.756E-10	-0.0842	0.006824	1.172E-11	408.9398	2.931E+10	-0.000275	4386027.	0.000
552.000	3.941E-10	-0.0482	0.005136	-1.844E-12	408.9398	2.931E+10	-0.000288	4386027.	0.000
558.000	3.534E-10	-0.0226	0.003497	-9.095E-12	408.9398	2.931E+10	-0.000258	4386027.	0.000
564.000	2.850E-10	-0.006268	0.002097	-1.205E-11	408.9398	2.931E+10	-0.000208	4386027.	0.000
570.000	2.088E-10	0.002577	0.001014	-1.243E-11	408.9398	2.931E+10	-0.000153	4386027.	0.000
576.000	1.358E-10	0.005925	0.000258	-1.156E-11	408.9398	2.931E+10	-9.930E-05	4386027.	0.000
582.000	7.013E-11	0.005698	-0.000194	-1.037E-11	408.9398	2.931E+10	-5.126E-05	4386027.	0.000
588.000	1.141E-11	0.003623	-0.000373	-9.415E-12	408.9398	2.931E+10	-8.342E-06	4386027.	0.000
594.000	-4.285E-11	0.001248	-0.000304	-8.916E-12	408.9398	2.931E+10	3.133E-05	4386027.	0.000
600.000	-9.558E-11	0.000	0.000	-8.789E-12	408.9398	2.931E+10	6.987E-05	2193014.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
  The above values of total stress are computed for combined axial stress and do not equal the
  actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2:

Pile-head deflection	=	0.5000000	inches
Computed slope at pile head	=	-0.0055422	radians
Maximum bending moment	=	1315147.	inch-lbs
Maximum shear force	=	29486.	lbs
Depth of maximum bending moment	=	84.0000000	inches below pile head
Depth of maximum shear force	=	0.000000	inches below pile head
Number of iterations	=	17	
Number of zero deflection points	=	7	

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 1.000000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 185000.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi^	Bending Stiffness lb-inA2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0000	0.000	42274.	-0.009971	408.9398	2.931E+10	-417.9121	1253.7364	0.000
6.000	0.9402	257191.	39737.	-0.009944	598.4457	2.931E+10	-427.8634	2730.5326	0.000
12.000	0.8807	498921.	37143.	-0.009867	776.5592	2.931E+10	-436.6978	2975.2291	0.000
18.000	0.8218	724817.	34500.	-0.009742	943.0053	2.931E+10	-444.3847	3244.5856	0.000
24.000	0.7638	934550.	31814.	-0.009572	1097.5425	2.931E+10	-450.8946	3542.1426	0.000
30.000	0.7069	1127838.	29093.	-0.009361	1239.9628	2.931E+10	-456.1996	3872.0704	0.000
36.000	0.6514	1304447.	26344.	-0.009112	1370.0933	2.931E+10	-460.2725	4239.3101	0.000
42.000	0.5976	1464190.	23574.	-0.008829	1487.7964	2.931E+10	-463.0876	4649.7535	0.000
48.000	0.5455	1606929.	20790.	-0.008514	1592.9705	2.931E+10	-464.6197	5110.4739	0.000
54.000	0.4954	1732576.	18002.	-0.008173	1685.5512	2.931E+10	-464.8446	5630.0250	0.000
60.000	0.4474	1841096.	15216.	-0.007807	1765.5115	2.931E+10	-463.7382	6218.8334	0.000
66.000	0.4017	1932502.	12441.	-0.007421	1832.8626	2.931E+10	-461.2770	6889.7200	0.000
72.000	0.3584	2006864.	9685.0601	-0.007018	1887.6544	2.931E+10	-457.4371	7658.6009	0.000
78.000	0.3175	2064302.	6956.1674	-0.006601	1929.9764	2.931E+10	-452.1938	8545.4456	0.000
84.000	0.2792	2104992.	4263.0222	-0.006174	1959.9580	2.931E+10	-445.5212	9575.6088	0.000
90.000	0.2434	2129165.	1614.2860	-0.005741	1977.7694	2.931E+10	-437.3909	10782.	0.000
96.000	0.2103	2137109.	-981.1986	-0.005304	1983.6222	2.931E+10	-427.7706	12206.	0.000
102.000	0.1798	2129167.	-3514.3779	-0.004868	1977.7703	2.931E+10	-416.6225	13906.	0.000
108.000	0.1519	2105742.	-5975.9441	-0.004434	1960.5107	2.931E+10	-403.8996	15959.	0.000
114.000	0.1265	2067300.	-8356.2680	-0.004007	1932.1849	2.931E+10	-389.5417	18470.	0.000
120.000	0.1038	2014363.	-10645.	-0.003590	1893.1801	2.931E+10	-373.4678	21594.	0.000
126.000	0.0835	1947525.	-12832.	-0.003184	1843.9315	2.931E+10	-355.5642	25560.	0.000
132.000	0.0656	1867444.	-14906.	-0.002794	1784.9253	2.931E+10	-335.6637	30721.	0.000
138.000	0.0499	1774854.	-16854.	-0.002421	1716.7028	2.931E+10	-313.5079	37664.	0.000
144.000	0.0365	1670575.	-18660.	-0.002068	1639.8670	2.931E+10	-288.6711	47445.	0.000
150.000	0.0251	1555524.	-20307.	-0.001738	1555.0944	2.931E+10	-260.3906	62191.	0.000
156.000	0.0156	1430746.	-21770.	-0.001433	1463.1543	2.931E+10	-227.1143	87088.	0.000
162.000	0.007930	1297467.	-23006.	-0.001153	1364.9503	2.931E+10	-184.8827	139887.	0.000
168.000	0.001806	1157237.	-23907.	-0.000902	1261.6250	2.931E+10	-115.4162	383449.	0.000
174.000	-0.002897	1012589.	-23841.	-0.000680	1155.0444	2.931E+10	137.2581	284289.	0.000
180.000	-0.006356	872653.	-22883.	-0.000487	1051.9352	2.931E+10	181.9940	171795.	0.000
186.000	-0.008744	739070.	-21718.	-0.000322	953.5074	2.931E+10	206.3266	141580.	0.000
192.000	-0.0102	612747.	-20435.	-0.000184	860.4290	2.931E+10	221.4728	129973.	0.000
198.000	-0.0110	494257.	-19086.	-7.068E-05	773.1227	2.931E+10	228.1373	124990.	0.000
204.000	-0.0111	383869.	-17550.	1.918E-05	691.7851	2.931E+10	283.8786	153834.	0.000
210.000	-0.0107	283612.	-15661.	8.749E-05	617.9135	2.931E+10	345.7582	193498.	0.000
216.000	-0.0100	195739.	-13610.	0.000137	553.1659	2.931E+10	338.0751	202396.	0.000
222.000	-0.009083	119992.	-11614.	0.000169	497.3532	2.931E+10	327.1628	216122.	0.000
228.000	-0.007996	55995.	-9691.9222	0.000187	450.1987	2.931E+10	313.5536	235285.	0.000
234.000	-0.006840	3273.9414	-7858.3028	0.000193	411.3521	2.931E+10	297.6529	261087.	0.000
240.000	-0.005681	-38733.	-6126.0127	0.000189	437.4791	2.931E+10	279.7772	295502.	0.000
246.000	-0.004569	-70658.	-4506.1561	0.000178	461.0030	2.931E+10	260.1750	341687.	0.000
252.000	-0.003543	-93202.	-3008.5220	0.000161	477.6136	2.931E+10	239.0364	404759.	0.000
258.000	-0.002633	-107119.	-1641.9459	0.000141	487.8680	2.931E+10	216.4890	493409.	0.000
264.000	-0.001853	-113218.	-414.7487	0.000118	492.3620	2.931E+10	192.5768	623462.	0.000
270.000	-0.001213	-112359.	664.5636	9.521E-05	491.7287	2.931E+10	167.1940	826968.	0.000
276.000	-0.000711	-105455.	1585.8250	7.292E-05	486.6417	2.931E+10	139.8932	1180848.	0.000
282.000	-0.000338	-93490.	2376.1911	5.256E-05	477.8262	2.931E+10	123.5622	2193014.	0.000
288.000	-8.012E-05	-77057.	2834.7329	3.510E-05	465.7175	2.931E+10	29.2851	2193014.	0.000
294.000	8.319E-05	-59552.	2831.3739	2.112E-05	452.8191	2.931E+10	-30.4047	2193014.	0.000
300.000	0.000173	-43127.	2550.0661	1.062E-05	440.7172	2.931E+10	-63.3646	2193014.	0.000
306.000	0.000211	-28974.	2129.0729	3.237E-06	430.2889	2.931E+10	-76.9665	2193014.	0.000
312.000	0.000212	-17586.	1665.4840	-1.528E-06	421.8974	2.931E+10	-77.5632	2193014.	0.000
318.000	0.000192	-8985.1876	1221.9952	-4.247E-06	415.5603	2.931E+10	-70.2664	2193014.	0.000
324.000	0.000161	-2912.2776	834.3859	-5.464E-06	411.0856	2.931E+10	-58.9367	2193014.	0.000
330.000	0.000127	1039.5740	518.6767	-5.656E-06	409.7058	2.931E+10	-46.2997	2193014.	0.000
336.000	9.338E-05	3324.3995	277.3894	-5.209E-06	411.3893	2.931E+10	-34.1294	2193014.	0.000
342.000	6.416E-05	4379.8119	104.6476	-4.421E-06	412.1670	2.931E+10	-23.4512	2193014.	0.000
348.000	4.033E-05	4589.9853	-9.9229	-3.503E-06	412.3218	2.931E+10	-14.7390	2193014.	0.000
354.000	2.213E-05	4268.5136	-78.4005	-2.596E-06	412.0849	2.931E+10	-8.0869	2193014.	0.000
360.000	9.168E-06	3654.9430	-112.7138	-1.786E-06	411.6329	2.931E+10	-3.3508	2193014.	0.000
366.000	6.984E-07	2919.9123	-123.5321	-1.113E-06	411.0913	2.931E+10	-0.2553	2193014.	0.000
372.000	-4.185E-06	2175.0285	-119.7089	-5.913E-07	410.5424	2.931E+10	1.5297	2193014.	0.000
378.000	-6.398E-06	1484.7188	-108.1048	-2.168E-07	410.0338	2.931E+10	2.3383	2193014.	0.000
384.000	-6.787E-06	878.2522	-89.9271	2.501E-08	409.5869	2.931E+10	3.7209	3289520.	0.000
390.000	-6.097E-06	405.5382	-65.3926	1.564E-07	409.2386	2.931E+10	4.4573	4386027.	0.000
396.000	-4.910E-06	93.1940	-41.2528	2.074E-07	409.0085	2.931E+10	3.5893	4386027.	0.000
402.000	-3.608E-06	-89.9563	-22.5719	2.078E-07	409.0061	2.931E+10	2.6377	4386027.	0.000
408.000	-2.417E-06	-178.1298	-9.3584	1.803E-07	409.0710	2.931E+10	1.7668	4386027.	0.000
414.000	-1.444E-06	-202.6579	-0.8905	1.414E-07	409.0891	2.931E+10	1.0558	4386027.	0.000
420.000	-7.206E-07	-189.1300	3.8574	1.013E-07	409.0791	2.931E+10	0.5268	4386027.	0.000
426.000	-2.292E-07	-156.5944	5.9404	6.588E-08	409.0552	2.931E+10	0.1675	4386027.	0.000

432.000	6.996E-08	-117.9919	6.2896	3.778E-08	409.0267	2.931E+10	-0.0511	4386027.	0.000
438.000	2.242E-07	-81.2036	5.6444	1.740E-08	408.9996	2.931E+10	-0.1639	4386027.	0.000
444.000	2.787E-07	-50.2971	4.5415	3.941E-09	408.9768	2.931E+10	-0.2038	4386027.	0.000
450.000	2.715E-07	-26.7146	3.3348	-3.940E-09	408.9595	2.931E+10	-0.1985	4386027.	0.000
456.000	2.315E-07	-10.2707	2.2318	-7.725E-09	408.9474	2.931E+10	-0.1692	4386027.	0.000
462.000	1.788E-07	0.0846	1.3322	-8.768E-09	408.9398	2.931E+10	-0.1307	4386027.	0.000
468.000	1.262E-07	5.7347	0.6632	-8.172E-09	408.9440	2.931E+10	-0.0923	4386027.	0.000
474.000	8.073E-08	8.0614	0.2094	-6.760E-09	408.9457	2.931E+10	-0.0590	4386027.	0.000
480.000	4.511E-08	8.2619	-0.0666	-5.090E-09	408.9459	2.931E+10	-0.0330	4386027.	0.000
486.000	1.965E-08	7.2734	-0.2086	-3.500E-09	408.9451	2.931E+10	-0.0144	4386027.	0.000
492.000	3.112E-09	5.7661	-0.2585	-2.166E-09	408.9440	2.931E+10	-0.002275	4386027.	0.000
498.000	-6.341E-09	4.1756	-0.2515	-1.148E-09	408.9429	2.931E+10	0.004635	4386027.	0.000
504.000	-1.067E-08	2.7511	-0.2142	-4.394E-10	408.9418	2.931E+10	0.007798	4386027.	0.000
510.000	-1.161E-08	1.6066	-0.1653	6.562E-12	408.9410	2.931E+10	0.008490	4386027.	0.000
516.000	-1.059E-08	0.7674	-0.1166	2.495E-10	408.9403	2.931E+10	0.007740	4386027.	0.000
522.000	-8.620E-09	0.2067	-0.0745	3.492E-10	408.9399	2.931E+10	0.006301	4386027.	0.000
528.000	-6.398E-09	-0.1272	-0.0416	3.573E-10	408.9399	2.931E+10	0.004677	4386027.	0.000
534.000	-4.332E-09	-0.2928	-0.0180	3.144E-10	408.9400	2.931E+10	0.003166	4386027.	0.000
540.000	-2.625E-09	-0.3443	-0.002770	2.492E-10	408.9400	2.931E+10	0.001919	4386027.	0.000
546.000	-1.342E-09	-0.3266	0.005929	1.805E-10	408.9400	2.931E+10	0.000981	4386027.	0.000
552.000	-4.591E-10	-0.2735	0.009878	1.191E-10	408.9400	2.931E+10	0.000336	4386027.	0.000
558.000	8.764E-11	-0.2083	0.0107	6.980E-11	408.9399	2.931E+10	-6.407E-05	4386027.	0.000
564.000	3.786E-10	-0.1453	0.009671	3.362E-11	408.9399	2.931E+10	-0.000277	4386027.	0.000
570.000	4.910E-10	-0.0923	0.007763	9.294E-12	408.9399	2.931E+10	-0.000359	4386027.	0.000
576.000	4.901E-10	-0.0522	0.005612	-5.495E-12	408.9398	2.931E+10	-0.000358	4386027.	0.000
582.000	4.251E-10	-0.0250	0.003605	-1.339E-11	408.9398	2.931E+10	-0.000311	4386027.	0.000
588.000	3.294E-10	-0.008910	0.001950	-1.686E-11	408.9398	2.931E+10	-0.000241	4386027.	0.000
594.000	2.228E-10	-0.001524	0.000739	-1.793E-11	408.9398	2.931E+10	-0.000163	4386027.	0.000
600.000	1.143E-10	0.000	0.000	-1.808E-11	408.9398	2.931E+10	-8.355E-05	2193014.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
  The above values of total stress are computed for combined axial stress and do not equal the
  actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =      1.0000000 inches
Computed slope at pile head      =     -0.0099707 radians
Maximum bending moment           =      2137109. inch-lbs
Maximum shear force              =        42274. lbs
Depth of maximum bending moment  =     96.0000000 inches below pile head
Depth of maximum shear force     =      0.000000 inches below pile head
Number of iterations             =             17
Number of zero deflection points =              6
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Moment (BC Type 4)

```
Deflection at pile head   =        3.000000 in
Moment at pile head       =           0.000 in-lbs
Axial load at pile head   =      185000.000 lbs
```

Depth x inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	3.0000	0.000	74708.	-0.0253	408.9398	2.931E+10	-602.7336	602.7336	0.000
6.000	2.8482	465490.	71043.	-0.0253	751.9261	2.931E+10	-619.0942	1304.1990	0.000
12.000	2.6969	908587.	67283.	-0.0251	1078.4126	2.931E+10	-634.1586	1410.8673	0.000
18.000	2.5467	1328648.	63437.	-0.0249	1387.9254	2.931E+10	-647.8925	1526.4079	0.000
24.000	2.3982	1725083.	59512.	-0.0246	1680.0299	2.931E+10	-660.2631	1651.8888	0.000
30.000	2.2518	2097356.	55518.	-0.0242	1954.3316	2.931E+10	-671.2388	1788.5335	0.000
36.000	2.1080	2444989.	51462.	-0.0237	2210.4770	2.931E+10	-680.7892	1937.7496	0.000
42.000	1.9672	2767557.	47353.	-0.0232	2448.1546	2.931E+10	-688.8850	2101.1635	0.000
48.000	1.8297	3064697.	43199.	-0.0226	2667.0957	2.931E+10	-695.4980	2280.6629	0.000
54.000	1.6961	3336103.	39011.	-0.0219	2867.0752	2.931E+10	-700.6008	2478.4496	0.000
60.000	1.5665	3581529.	34797.	-0.0212	3047.9121	2.931E+10	-704.1670	2697.1046	0.000
66.000	1.4413	3800791.	30566.	-0.0205	3209.4709	2.931E+10	-706.1711	2939.6704	0.000
72.000	1.3208	3993768.	26328.	-0.0197	3351.6617	2.931E+10	-706.5878	3209.7538	0.000
78.000	1.2052	4160400.	22092.	-0.0188	3474.4411	2.931E+10	-705.3926	3511.6583	0.000
84.000	1.0947	4300693.	17868.	-0.0180	3577.8129	2.931E+10	-702.5609	3850.5535	0.000
90.000	0.9895	4414717.	13666.	-0.0171	3661.8288	2.931E+10	-698.0681	4232.6956	0.000
96.000	0.8898	4502607.	9496.0284	-0.0162	3726.5889	2.931E+10	-691.8892	4665.7181	0.000
102.000	0.7955	4564567.	5368.3665	-0.0152	3772.2422	2.931E+10	-683.9981	5159.0182	0.000
108.000	0.7068	4600865.	1293.2722	-0.0143	3798.9879	2.931E+10	-674.3667	5724.2813	0.000
114.000	0.6238	4611841.	-2718.7220	-0.0134	3807.0752	2.931E+10	-662.9647	6376.1996	0.000
120.000	0.5465	4597902.	-6656.8885	-0.0124	3796.8049	2.931E+10	-649.7575	7133.4806	0.000
126.000	0.4748	4559528.	-10510.	-0.0115	3768.5295	2.931E+10	-634.7048	8020.2870	0.000
132.000	0.4087	4497268.	-14268.	-0.0106	3722.6548	2.931E+10	-617.7577	9068.3457	0.000

138.000	0.3482	4411747.	-17918.	-0.009643	3659.6407	2.931E+10	-598.8552	10320.	0.000
144.000	0.2930	4303666.	-21448.	-0.008751	3580.0030	2.931E+10	-577.9180	11834.	0.000
150.000	0.2432	4173801.	-24846.	-0.007884	3484.3150	2.931E+10	-554.8397	13691.	0.000
156.000	0.1984	4023014.	-28099.	-0.007045	3373.2108	2.931E+10	-529.4725	16011.	0.000
162.000	0.1586	3852252.	-31192.	-0.006239	3247.3885	2.931E+10	-501.6031	18974.	0.000
168.000	0.1236	3662557.	-34110.	-0.005470	3107.6159	2.931E+10	-470.9099	22869.	0.000
174.000	0.0930	3455077.	-36833.	-0.004741	2954.7388	2.931E+10	-436.8822	28192.	0.000
180.000	0.0667	3231085.	-39340.	-0.004057	2789.6948	2.931E+10	-398.6493	35885.	0.000
186.000	0.0443	2992007.	-41599.	-0.003420	2613.5354	2.931E+10	-354.5683	48027.	0.000
192.000	0.0256	2739484.	-43566.	-0.002834	2427.4698	2.931E+10	-300.9712	70508.	0.000
198.000	0.0103	2475505.	-45140.	-0.002300	2232.9622	2.931E+10	-223.6642	130398.	0.000
204.000	-0.001989	2202911.	-45332.	-0.001821	2032.1074	2.931E+10	159.7330	481959.	0.000
210.000	-0.0116	1935567.	-43789.	-0.001398	1835.1208	2.931E+10	354.5056	183947.	0.000
216.000	-0.0188	1680546.	-41476.	-0.001028	1647.2137	2.931E+10	416.6484	133249.	0.000
222.000	-0.0239	1440142.	-38871.	-0.000708	1470.0773	2.931E+10	451.6668	113413.	0.000
228.000	-0.0273	1215671.	-36100.	-0.000436	1304.6806	2.931E+10	471.9640	103879.	0.000
234.000	-0.0291	1007914.	-33236.	-0.000209	1151.5996	2.931E+10	482.5417	99381.	0.000
240.000	-0.0298	817300.	-30330.	-2.215E-05	1011.1498	2.931E+10	486.0268	97964.	0.000
246.000	-0.0294	643997.	-27420.	0.000127	883.4554	2.931E+10	484.0138	98783.	0.000
252.000	-0.0282	487973.	-24536.	0.000243	768.4920	2.931E+10	477.5648	101470.	0.000
258.000	-0.0265	349030.	-21701.	0.000329	666.1148	2.931E+10	467.4356	105915.	0.000
264.000	-0.0243	226835.	-18936.	0.000388	576.0782	2.931E+10	454.1905	112182.	0.000
270.000	-0.0218	120940.	-16258.	0.000423	498.0515	2.931E+10	438.2668	120481.	0.000
276.000	-0.0192	30794.	-13684.	0.000439	431.6299	2.931E+10	420.0134	131179.	0.000
282.000	-0.0166	-44237.	-11224.	0.000438	441.5352	2.931E+10	399.7142	144838.	0.000
288.000	-0.0140	-104869.	-8892.4125	0.000422	486.2106	2.931E+10	377.6035	162292.	0.000
294.000	-0.0115	-151884.	-6697.9780	0.000396	520.8522	2.931E+10	353.8746	184780.	0.000
300.000	-0.009208	-186124.	-4650.3024	0.000361	546.0816	2.931E+10	328.6839	214179.	0.000
306.000	-0.007153	-208490.	-2757.8010	0.000321	562.5611	2.931E+10	302.1499	253434.	0.000
312.000	-0.005355	-219931.	-1028.3204	0.000277	570.9910	2.931E+10	274.3437	307388.	0.000
318.000	-0.003827	-221445.	530.5081	0.000232	572.1069	2.931E+10	245.2658	384558.	0.000
324.000	-0.002570	-214080.	1910.6667	0.000187	566.6799	2.931E+10	214.7871	501372.	0.000
330.000	-0.001577	-198933.	3102.5141	0.000145	555.5196	2.931E+10	182.4954	694353.	0.000
336.000	-0.000828	-177172.	4091.5934	0.000107	539.4852	2.931E+10	147.1977	1066853.	0.000
342.000	-0.000296	-150071.	4858.0737	7.323E-05	519.5166	2.931E+10	108.2957	2193014.	0.000
348.000	5.096E-05	-119038.	5127.0804	4.569E-05	496.6502	2.931E+10	-18.6269	2193014.	0.000
354.000	0.000252	-88648.	4794.8432	2.444E-05	474.2580	2.931E+10	-92.1189	2193014.	0.000
360.000	0.000344	-61554.	4141.0238	9.069E-06	454.2944	2.931E+10	-125.8210	2193014.	0.000
366.000	0.000361	-38976.	3367.8779	-1.219E-06	437.6581	2.931E+10	-131.8943	2193014.	0.000
372.000	0.000330	-21137.	2610.7747	-7.371E-06	424.5139	2.931E+10	-120.4734	2193014.	0.000
378.000	0.000272	-7629.9278	1950.6590	-1.031E-05	414.5617	2.931E+10	-99.5652	2193014.	0.000
384.000	0.000206	2294.1695	1313.4186	-1.086E-05	410.6302	2.931E+10	-112.8483	3289520.	0.000
390.000	0.000142	8155.2064	663.2996	-9.792E-06	414.9488	2.931E+10	-103.8580	4386027.	0.000
396.000	8.833E-05	10276.	158.0078	-7.905E-06	416.5111	2.931E+10	-64.5726	4386027.	0.000
402.000	4.721E-05	10069.	-139.2447	-5.823E-06	416.3588	2.931E+10	-34.5116	4386027.	0.000
408.000	1.845E-05	8617.4935	-283.2479	-3.911E-06	415.2894	2.931E+10	-13.4895	4386027.	0.000
414.000	2.782E-07	6678.5584	-324.3263	-2.346E-06	413.8607	2.931E+10	-0.2033	4386027.	0.000
420.000	-9.695E-06	4730.7859	-303.6741	-1.178E-06	412.4256	2.931E+10	7.0874	4386027.	0.000
426.000	-1.386E-05	3037.0847	-252.0181	-3.832E-07	411.1776	2.931E+10	10.1313	4386027.	0.000
432.000	-1.429E-05	1707.4188	-190.2782	1.024E-07	410.1979	2.931E+10	10.4487	4386027.	0.000
438.000	-1.263E-05	753.5185	-131.2320	3.542E-07	409.4950	2.931E+10	9.2334	4386027.	0.000
444.000	-1.004E-05	131.8490	-81.5069	4.448E-07	409.0369	2.931E+10	7.3416	4386027.	0.000
450.000	-7.293E-06	-225.5515	-43.4874	4.352E-07	409.1060	2.931E+10	5.3315	4386027.	0.000
456.000	-4.821E-06	-390.9660	-16.9212	3.721E-07	409.2279	2.931E+10	3.5239	4386027.	0.000
462.000	-2.828E-06	-429.4320	-0.1479	2.882E-07	409.2562	2.931E+10	2.0672	4386027.	0.000
468.000	-1.363E-06	-393.3805	9.0419	2.040E-07	409.2296	2.931E+10	0.9961	4386027.	0.000
474.000	-3.804E-07	-321.3816	12.8642	1.308E-07	409.1766	2.931E+10	0.2780	4386027.	0.000
480.000	2.072E-07	-239.3002	13.2439	7.344E-08	409.1161	2.931E+10	-0.1515	4386027.	0.000
486.000	5.009E-07	-162.6174	11.6910	3.231E-08	409.0596	2.931E+10	-0.3662	4386027.	0.000
492.000	5.949E-07	-99.0794	9.2879	5.525E-09	409.0128	2.931E+10	-0.4349	4386027.	0.000
498.000	5.672E-07	-51.1743	6.7394	-9.851E-09	408.9775	2.931E+10	-0.4146	4386027.	0.000
504.000	4.767E-07	-18.1842	4.4502	-1.695E-08	408.9532	2.931E+10	-0.3485	4386027.	0.000
510.000	3.638E-07	2.2657	2.6070	-1.858E-08	408.9415	2.931E+10	-0.2660	4386027.	0.000
516.000	2.537E-07	13.1407	1.2527	-1.700E-08	408.9495	2.931E+10	-0.1855	4386027.	0.000
522.000	1.598E-07	17.3353	0.3458	-1.388E-08	408.9526	2.931E+10	-0.1168	4386027.	0.000
528.000	8.715E-08	17.3206	-0.1958	-1.034E-08	408.9525	2.931E+10	-0.0637	4386027.	0.000
534.000	3.577E-08	15.0086	-0.4654	-7.028E-09	408.9508	2.931E+10	-0.0261	4386027.	0.000
540.000	2.819E-09	11.7518	-0.5500	-4.289E-09	408.9484	2.931E+10	-0.002060	4386027.	0.000
546.000	-1.570E-08	8.4182	-0.5217	-2.225E-09	408.9460	2.931E+10	0.0115	4386027.	0.000
552.000	-2.388E-08	5.4958	-0.4349	-8.009E-10	408.9438	2.931E+10	0.0175	4386027.	0.000
558.000	-2.531E-08	3.2006	-0.3271	8.908E-11	408.9421	2.931E+10	0.0185	4386027.	0.000
564.000	-2.281E-08	1.5707	-0.2215	5.774E-10	408.9409	2.931E+10	0.0167	4386027.	0.000
570.000	-1.838E-08	0.5408	-0.1312	7.935E-10	408.9402	2.931E+10	0.0134	4386027.	0.000
576.000	-1.329E-08	-0.005577	-0.0618	8.482E-10	408.9398	2.931E+10	0.009714	4386027.	0.000
582.000	-8.203E-09	-0.2022	-0.0146	8.270E-10	408.9399	2.931E+10	0.005996	4386027.	0.000
588.000	-3.365E-09	-0.1829	0.0107	7.875E-10	408.9399	2.931E+10	0.002460	4386027.	0.000
594.000	1.248E-09	-0.0751	0.0154	7.611E-10	408.9398	2.931E+10	-0.000912	4386027.	0.000
600.000	5.768E-09	0.000	0.000	7.535E-10	408.9398	2.931E+10	-0.004217	2193014.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
  The above values of total stress are computed for combined axial stress and do not equal the
  actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =      3.0000000 inches
Computed slope at pile head      =     -0.0253069 radians
Maximum bending moment           =      4611841. inch-lbs
Maximum shear force              =        74708. lbs
Depth of maximum bending moment  =    114.0000000 inches below pile head
Depth of maximum shear force     =      0.000000 inches below pile head
Number of iterations             =             20
Number of zero deflection points =              6
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 5.000000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 185000.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	5.0000	0.000	95996.	-0.0391	408.9398	2.931E+10	-640.5000	384.3000	0.000
6.000	4.7654	607851.	92067.	-0.0390	856.8214	2.931E+10	-669.3751	842.7942	0.000
12.000	4.5315	1191466.	87964.	-0.0389	1286.8455	2.931E+10	-698.2501	924.5196	0.000
18.000	4.2992	1749673.	83688.	-0.0386	1698.1485	2.931E+10	-727.1252	1014.7936	0.000
24.000	4.0689	2281306.	79238.	-0.0381	2089.8710	2.931E+10	-756.0003	1114.7959	0.000
30.000	3.8415	2785205.	74616.	-0.0376	2461.1581	2.931E+10	-784.8755	1225.8998	0.000
36.000	3.6174	3260216.	69820.	-0.0370	2811.1595	2.931E+10	-813.7506	1349.7105	0.000
42.000	3.3974	3705191.	64899.	-0.0363	3139.0297	2.931E+10	-826.5146	1459.6595	0.000
48.000	3.1820	4119569.	59910.	-0.0355	3444.3557	2.931E+10	-836.3700	1577.0846	0.000
54.000	2.9716	4502903.	54868.	-0.0346	3726.8067	2.931E+10	-844.5994	1705.3704	0.000
60.000	2.7667	4854808.	49780.	-0.0336	3986.1002	2.931E+10	-851.1736	1845.9145	0.000
66.000	2.5678	5174967.	44658.	-0.0326	4222.0029	2.931E+10	-856.0645	2000.3406	0.000
72.000	2.3752	5463133.	39513.	-0.0315	4434.3315	2.931E+10	-859.2444	2170.5448	0.000
78.000	2.1893	5719125.	34353.	-0.0304	4622.9534	2.931E+10	-860.6860	2358.7525	0.000
84.000	2.0105	5942832.	29190.	-0.0292	4787.7876	2.931E+10	-860.3623	2567.5907	0.000
90.000	1.8390	6134217.	24034.	-0.0280	4928.8051	2.931E+10	-858.2462	2800.1790	0.000
96.000	1.6750	6293311.	18896.	-0.0267	5046.0301	2.931E+10	-854.3105	3060.2472	0.000
102.000	1.5187	6420220.	13788.	-0.0254	5139.5402	2.931E+10	-848.5271	3352.2859	0.000
108.000	1.3703	6515123.	8719.4279	-0.0241	5209.4678	2.931E+10	-840.8667	3681.7453	0.000
114.000	1.2299	6578275.	3702.9328	-0.0227	5256.0001	2.931E+10	-831.2983	4055.2982	0.000
120.000	1.0976	6610006.	-1250.3262	-0.0214	5279.3802	2.931E+10	-819.7880	4481.1930	0.000
126.000	0.9734	6610723.	-6128.5844	-0.0200	5279.9084	2.931E+10	-806.2980	4969.7372	0.000
132.000	0.8574	6580911.	-10920.	-0.0187	5257.9421	2.931E+10	-790.7851	5533.9699	0.000
138.000	0.7494	6521136.	-15612.	-0.0173	5213.8980	2.931E+10	-773.1982	6190.6158	0.000
144.000	0.6494	6432044.	-20192.	-0.0160	5148.2526	2.931E+10	-753.4753	6961.4731	0.000
150.000	0.5573	6314365.	-24647.	-0.0147	5061.5438	2.931E+10	-731.5390	7875.4845	0.000
156.000	0.4730	6168917.	-28963.	-0.0134	4954.3734	2.931E+10	-707.2896	8971.9302	0.000
162.000	0.3963	5996605.	-33127.	-0.0122	4827.4089	2.931E+10	-680.5949	10306.	0.000
168.000	0.3269	5798429.	-37123.	-0.0110	4681.3872	2.931E+10	-651.2743	11955.	0.000
174.000	0.2646	5575490.	-40934.	-0.009807	4517.1193	2.931E+10	-619.0721	14038.	0.000
180.000	0.2092	5328997.	-44542.	-0.008691	4335.4966	2.931E+10	-583.6114	16740.	0.000
186.000	0.1603	5060284.	-47925.	-0.007628	4137.5011	2.931E+10	-544.3097	20373.	0.000
192.000	0.1176	4770826.	-51059.	-0.006622	3924.2202	2.931E+10	-500.2054	25512.	0.000
198.000	0.0808	4462277.	-53893.	-0.005677	3696.8724	2.931E+10	-444.3748	32983.	0.000
204.000	0.0495	4136716.	-56630.	-0.004797	3456.9901	2.931E+10	-467.8979	56697.	0.000
210.000	0.0233	3793372.	-59377.	-0.003986	3204.0040	2.931E+10	-447.9260	115478.	0.000
216.000	0.001689	3433040.	-61283.	-0.003246	2938.5013	2.931E+10	-187.4169	665616.	0.000
222.000	-0.0157	3065181.	-60668.	-0.002581	2667.4525	2.931E+10	392.4364	150181.	0.000
228.000	-0.0293	2710754.	-58041.	-0.001990	2406.3003	2.931E+10	483.3633	99042.	0.000
234.000	-0.0396	2373112.	-54987.	-0.001470	2157.5160	2.931E+10	534.3619	81052.	0.000
240.000	-0.0469	2054167.	-51687.	-0.001017	1922.5087	2.931E+10	565.6526	72338.	0.000
246.000	-0.0518	1755120.	-48237.	-0.000627	1702.1620	2.931E+10	584.4706	67758.	0.000
252.000	-0.0544	1476715.	-44700.	-0.000296	1497.0251	2.931E+10	594.4039	65513.	0.000
258.000	-0.0553	1219372.	-41125.	-2.005E-05	1307.4080	2.931E+10	597.5536	64826.	0.000
264.000	-0.0547	983265.	-37546.	0.000205	1133.4374	2.931E+10	595.2841	65322.	0.000
270.000	-0.0528	768364.	-33995.	0.000385	975.0926	2.931E+10	588.5470	66826.	0.000
276.000	-0.0501	574477.	-30495.	0.000522	832.2308	2.931E+10	578.0424	69277.	0.000
282.000	-0.0466	401269.	-27068.	0.000622	704.6060	2.931E+10	564.3062	72691.	0.000
288.000	-0.0426	248284.	-23731.	0.000688	591.8826	2.931E+10	547.7621	77149.	0.000
294.000	-0.0383	114963.	-20502.	0.000726	493.6476	2.931E+10	528.7543	82795.	0.000
300.000	-0.0339	650.2808	-17393.	0.000737	409.4189	2.931E+10	507.5678	89851.	0.000
306.000	-0.0295	-95390.	-14417.	0.000728	479.2258	2.931E+10	484.4431	98633.	0.000
312.000	-0.0252	-173968.	-11585.	0.000700	537.1246	2.931E+10	459.5851	109590.	0.000
318.000	-0.0211	-235962.	-8906.5861	0.000658	582.8035	2.931E+10	433.1701	123362.	0.000
324.000	-0.0173	-282309.	-6391.0285	0.000605	616.9527	2.931E+10	405.3491	140876.	0.000
330.000	-0.0138	-313998.	-4046.2325	0.000544	640.3025	2.931E+10	376.2496	163507.	0.000
336.000	-0.0107	-332071.	-1879.5623	0.000478	653.6193	2.931E+10	345.9738	193372.	0.000
342.000	-0.008071	-337614.	102.1372	0.000409	657.7033	2.931E+10	314.5927	233870.	0.000
348.000	-0.005822	-331755.	1892.3064	0.000341	653.3860	2.931E+10	282.1304	290776.	0.000
354.000	-0.003980	-315663.	3484.2861	0.000275	641.5294	2.931E+10	248.5295	374701.	0.000
360.000	-0.002525	-290553.	4870.5659	0.000213	623.0274	2.931E+10	213.5638	507410.	0.000
366.000	-0.001428	-257688.	6041.0276	0.000157	598.8119	2.931E+10	176.5901	742057.	0.000

372.000	-0.000647	-218408.	6977.6326	0.000108	569.8691	2.931E+10	135.6115	1257992.	0.000
378.000	-0.000134	-174196.	7531.3691	6.764E-05	537.2925	2.931E+10	48.9673	2193014.	0.000
384.000	0.000165	-128182.	7406.9955	3.670E-05	503.3878	2.931E+10	-90.4252	3289520.	0.000
390.000	0.000306	-85394.	6463.7243	1.484E-05	471.8603	2.931E+10	-223.9985	4386027.	0.000
396.000	0.000343	-50650.	5039.4141	9.208E-07	446.2602	2.931E+10	-250.7715	4386027.	0.000
402.000	0.000317	-24923.	3590.8730	-6.813E-06	427.3036	2.931E+10	-232.0755	4386027.	0.000
408.000	0.000261	-7544.5208	2321.6284	-1.014E-05	414.4988	2.931E+10	-191.0060	4386027.	0.000
414.000	0.000196	2959.2486	1319.1188	-1.061E-05	411.1202	2.931E+10	-143.1638	4386027.	0.000
420.000	0.000134	8308.4477	595.6928	-9.452E-06	415.0617	2.931E+10	-97.9782	4386027.	0.000
426.000	8.242E-05	10129.	121.0052	-7.565E-06	416.4028	2.931E+10	-60.2510	4386027.	0.000
432.000	4.325E-05	9777.3051	-154.5971	-5.528E-06	416.1440	2.931E+10	-31.6164	4386027.	0.000
438.000	1.609E-05	8285.6527	-284.7231	-3.680E-06	415.0449	2.931E+10	-11.7589	4386027.	0.000
444.000	-9.035E-07	6368.7962	-318.0186	-2.180E-06	413.6325	2.931E+10	0.6604	4386027.	0.000
450.000	-1.007E-05	4474.2684	-293.9499	-1.070E-06	412.2366	2.931E+10	7.3625	4386027.	0.000
456.000	-1.375E-05	2843.7735	-241.7186	-3.213E-07	411.0352	2.931E+10	10.0479	4386027.	0.000
462.000	-1.393E-05	1574.3586	-181.0332	1.309E-07	410.0998	2.931E+10	10.1805	4386027.	0.000
468.000	-1.217E-05	671.0850	-123.7922	3.607E-07	409.4343	2.931E+10	8.8998	4386027.	0.000
474.000	-9.599E-06	88.0517	-76.0429	4.384E-07	409.0047	2.931E+10	7.0166	4386027.	0.000
480.000	-6.914E-06	-242.4030	-39.8298	4.226E-07	409.1184	2.931E+10	5.0544	4386027.	0.000
486.000	-4.528E-06	-390.8438	-14.7371	3.578E-07	409.2278	2.931E+10	3.3098	4386027.	0.000
492.000	-2.621E-06	-420.0429	0.9405	2.748E-07	409.2493	2.931E+10	1.9161	4386027.	0.000
498.000	-1.230E-06	-380.1683	9.3868	1.929E-07	409.2199	2.931E+10	0.8994	4386027.	0.000
504.000	-3.064E-07	-307.8292	12.7570	1.225E-07	409.1666	2.931E+10	0.2240	4386027.	0.000
510.000	2.395E-07	-227.3560	12.9039	6.771E-08	409.1073	2.931E+10	-0.1750	4386027.	0.000
516.000	5.061E-07	-153.1327	11.2688	2.878E-08	409.0526	2.931E+10	-0.3700	4386027.	0.000
522.000	5.848E-07	-92.1942	8.8764	3.670E-09	409.0077	2.931E+10	-0.4275	4386027.	0.000
528.000	5.502E-07	-46.6236	6.3875	-1.054E-08	408.9741	2.931E+10	-0.4022	4386027.	0.000
534.000	4.583E-07	-15.5210	4.1758	-1.690E-08	408.9512	2.931E+10	-0.3350	4386027.	0.000
540.000	3.474E-07	3.5234	2.4087	-1.812E-08	408.9424	2.931E+10	-0.2540	4386027.	0.000
546.000	2.409E-07	13.4239	1.1186	-1.639E-08	408.9497	2.931E+10	-0.1761	4386027.	0.000
552.000	1.508E-07	16.9830	0.2598	-1.328E-08	408.9523	2.931E+10	-0.1102	4386027.	0.000
558.000	8.152E-08	16.5709	-0.2496	-9.844E-09	408.9520	2.931E+10	-0.0596	4386027.	0.000
564.000	3.264E-08	14.0096	-0.5000	-6.714E-09	408.9501	2.931E+10	-0.0239	4386027.	0.000
570.000	9.540E-10	10.5863	-0.5736	-4.197E-09	408.9476	2.931E+10	-0.000697	4386027.	0.000
576.000	-1.773E-08	7.1354	-0.5368	-2.383E-09	408.9450	2.931E+10	0.0130	4386027.	0.000
582.000	-2.765E-08	4.1495	-0.4373	-1.229E-09	408.9428	2.931E+10	0.0202	4386027.	0.000
588.000	-3.247E-08	1.8901	-0.3055	-6.105E-10	408.9412	2.931E+10	0.0237	4386027.	0.000
594.000	-3.497E-08	0.4849	-0.1576	-3.675E-10	408.9401	2.931E+10	0.0256	4386027.	0.000
600.000	-3.688E-08	0.000	0.000	-3.179E-10	408.9398	2.931E+10	0.0270	2193014.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
  The above values of total stress are computed for combined axial stress and do not equal the
  actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =      5.0000000 inches
Computed slope at pile head      =     -0.0391003 radians
Maximum bending moment           =      6610723. inch-lbs
Maximum shear force              =        95996. lbs
Depth of maximum bending moment  =    126.0000000 inches below pile head
Depth of maximum shear force     =      0.000000 inches below pile head
Number of iterations             =             19
Number of zero deflection points =              5
```

Summary of Pile Response(s)

Definitions of Pile-Head Loading Conditions:

```
Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians
```

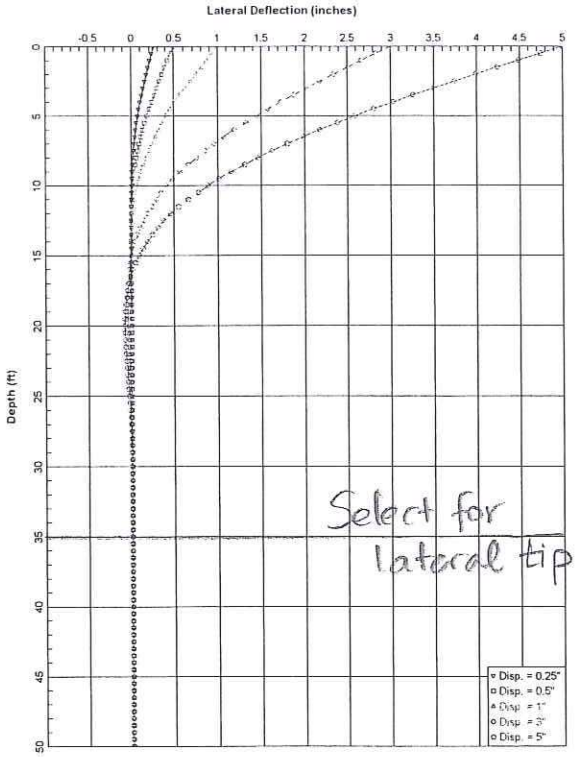
Load Case No.	Load Type No.	Condition 1 V(lbs) or y(inches)	Condition 2 in-lb, rad., or in-lb/rad.	Axial Load lbs	Pile-Head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-Head Rotation radians
1	4	y = 0.2500	M = 0.000	185000.	0.25000000	810395.	20561.	0.00000000
2	4	y = 0.5000	M = 0.000	185000.	0.50000000	1315147.	29486.	0.00000000
3	4	y = 1.0000	M = 0.000	185000.	1.00000000	2137109.	42274.	0.00000000
4	4	y = 3.0000	M = 0.000	185000.	3.00000000	4611841.	74708.	0.00000000
5	4	y = 5.0000	M = 0.000	185000.	5.00000000	6610723.	95996.	0.00000000

Summary of Warning Messages

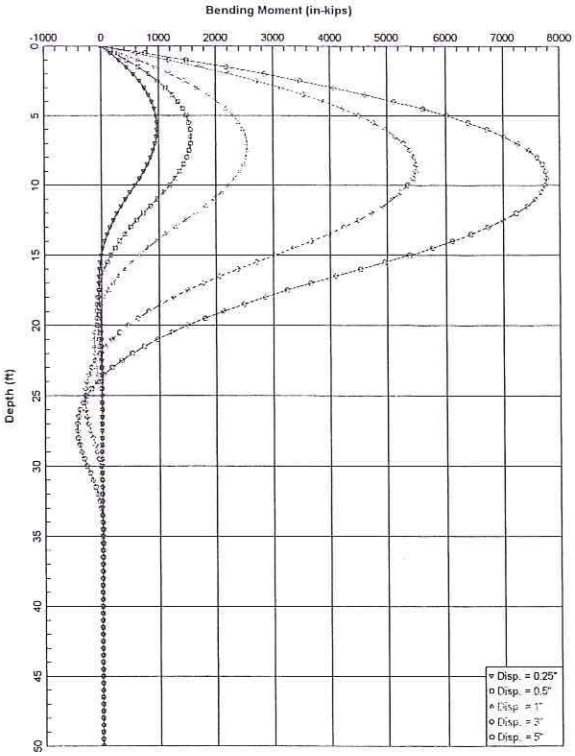
The following warning was reported 1782 times

**** Warning ****

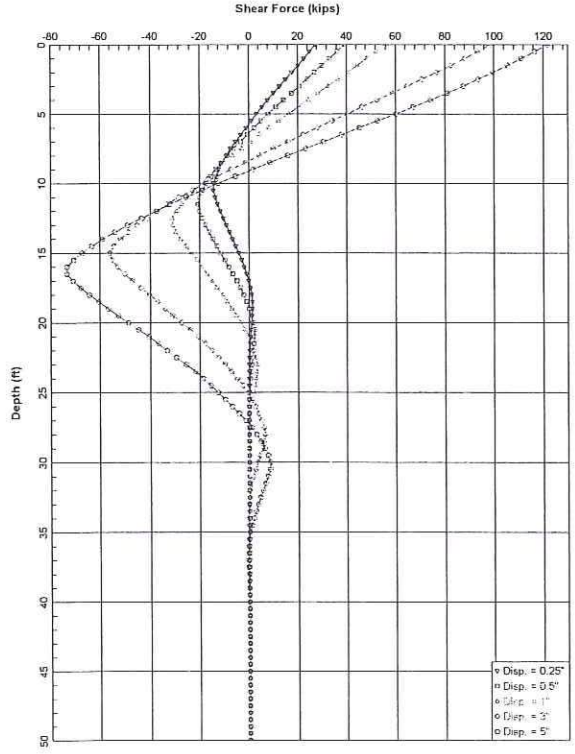
An unreasonable input value for shear strength has been specified for a soil defined using the soft clay criteria. The input value is greater than 8.68 psi (1,250 psf). You should check your input data for correctness.



Avenida Vaquero UC - Abutment 2



Avenida Vaquero UC - Abutment 2



Avenida Vaquero UC - Abutment 2

LPile Plus for Windows, Version 6.0 (6.0.09)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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This program is licensed to:

Files Used for Analysis

Path to file locations: X:\Projects\2011\11-136 - AECOM, I-5 HOV Widening - Segment 2\ANALYSIS\LPILE\Abut 2\
Name of input data file: 2 ft CIDH pile.lp6d
Name of output file: 2 ft CIDH pile.lp6o
Name of plot output file: 2 ft CIDH pile.lp6p
Name of runtime file: 2 ft CIDH pile.lp6r

Date and Time of Analysis

Date: March 12, 2012 Time: 10:47:57

Problem Title

Project Name: I-5 HOV Widening - Avenida Vaquero UC

Job Number: 11-136

Client:

Engineer: GJG

Description: 2-ft CIDH at Abuts 1 & 2

Program Options

Units Used - US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal Moment
Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis uses p-y multipliers for group action
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:

- Number of pile increments	=	100	
- Maximum number of iterations allowed	=	300	
- Deflection tolerance for convergence	=	1.0000E-05	in
- Maximum allowable deflection	=	100.0000	in

Pile Response Output Options:
- Values of pile-head deflection, bending moment, shear force, and
  soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total Number of Sections = 1

Total Pile Length = 50.00 ft

Depth of ground surface below top of pile = -2.00 ft

Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.
p-y curves are computed using values of pile diameter interpolated over
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	24.0000000
2	50.000000	24.0000000

Input Structural Properties:

Section No. 1:

Section Type	=	Elastic Pile
Cross-sectional Shape	=	Circular
Section Length	=	50.000 in
Top Width	=	24.000 in
Bottom Width	=	24.000 in
Top Area	=	452.389342 sq. in
Bottom Area	=	452.389342 sq. in
Moment of Inertia at Top	=	1.629E+04 in^4
Moment of Inertia at Bottom	=	1.629E+04 in^4
Elastic Modulus	=	1800000.000 lbs/in

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = -2.000 ft
Distance from top of pile to bottom of layer = 26.500 ft

Layer 2 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 26.500 ft
Distance from top of pile to bottom of layer = 46.500 ft

Layer 3 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 46.500 ft
Distance from top of pile to bottom of layer = 76.500 ft

(Depth of lowest layer extends 26.50 ft below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 6 points

Point No.	Depth X ft	Eff. Unit Weight pcf

1	-2.00	120.00000
2	26.50	120.00000
3	26.50	57.60000
4	46.50	57.60000
5	46.50	57.60000
6	76.50	57.60000

Summary of Soil Properties

Layer Num.	Soil Type (p-y Curve Criteria)	Depth ft	Eff. Unit Wt., pcf	Cohesion psf	Friction Ang., deg.	qu psi	RQD percent	Epsilon 50	kpy pci	Rock Emass psi	krm	Test Type	Test Prop.	Elas. Subgr. pci
1	Soft Clay	-2.000	120.000	2000.000	--	--	--	0.00500	--	--	--	--	--	--
		26.500	120.000	2000.000	--	--	--	0.00500	--	--	--	--	--	--
2	Soft Clay	26.500	57.600	2250.000	--	--	--	0.00500	--	--	--	--	--	--
		46.500	57.600	2250.000	--	--	--	0.00500	--	--	--	--	--	--
3	Soft Clay	46.500	57.600	1500.000	--	--	--	0.00750	--	--	--	--	--	--
		76.500	57.600	1500.000	--	--	--	0.00750	--	--	--	--	--	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	0.000	0.7000	1.0000
2	50.000	0.7000	1.0000

Loading Type

p-y criteria for static loading was used for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 5

Load No.	Load Type	Condition 1		Condition 2		Axial Thrust Force, lbs
1	4	y =	0.250 in	M =	0.000 in-lbs	185000.000
2	4	y =	0.500 in	M =	0.000 in-lbs	185000.000
3	4	y =	1.000 in	M =	0.000 in-lbs	185000.000
4	4	y =	3.000 in	M =	0.000 in-lbs	185000.000
5	4	y =	5.000 in	M =	0.000 in-lbs	185000.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust values were determined from pile-head loading conditions

Number of Sections = 1

Section No. 1:

Moment-Curvature properties derived from elastic section properties

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 0.250000 in
Moment at pile head = 0.000 in-lbs

Axial load at pile head = 185000.000 lbs

Depth x inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-inA2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	0.000	27486.	-0.003377	408.9398	2.931E+10	-397.4309	4769.1706	0.000
6.000	0.2297	161508.	25084.	-0.003360	527.9432	2.931E+10	-402.9365	10523.	0.000
12.000	0.2097	308473.	22655.	-0.003312	636.2315	2.931E+10	-406.8982	11643.	0.000
18.000	0.1900	440720.	20206.	-0.003235	733.6747	2.931E+10	-409.2764	12925.	0.000
24.000	0.1709	558133.	17749.	-0.003133	820.1878	2.931E+10	-410.0336	14399.	0.000
30.000	0.1524	660657.	15291.	-0.003008	895.7310	2.931E+10	-409.1343	16108.	0.000
36.000	0.1348	748303.	12844.	-0.002864	960.3109	2.931E+10	-406.5440	18101.	0.000
42.000	0.1180	821144.	10418.	-0.002704	1013.9817	2.931E+10	-402.2291	20447.	0.000
48.000	0.1023	879317.	8022.5024	-0.002530	1056.8456	2.931E+10	-396.1556	23232.	0.000
54.000	0.0877	923029.	5669.1718	-0.002345	1089.0539	2.931E+10	-388.2879	26572.	0.000
60.000	0.0742	952553.	3368.5487	-0.002153	1110.8080	2.931E+10	-378.5865	30625.	0.000
66.000	0.0618	968232.	1131.7732	-0.001957	1122.3604	2.931E+10	-367.0053	35609.	0.000
72.000	0.0507	970478.	-1029.7019	-0.001758	1124.0155	2.931E+10	-353.4864	41838.	0.000
78.000	0.0407	959778.	-3104.0160	-0.001561	1116.1317	2.931E+10	-337.9516	49771.	0.000
84.000	0.0320	936694.	-5078.7371	-0.001367	1099.1228	2.931E+10	-320.2888	60117.	0.000
90.000	0.0243	901867.	-6940.5789	-0.001178	1073.4612	2.931E+10	-300.3252	74024.	0.000
96.000	0.0178	856023.	-8674.8860	-0.000998	1039.6822	2.931E+10	-277.7772	93496.	0.000
102.000	0.0124	799985.	-10265.	-0.000829	998.3916	2.931E+10	-252.1392	122390.	0.000
108.000	0.007878	734688.	-11688.	-0.000672	950.2789	2.931E+10	-222.4078	169390.	0.000
114.000	0.004297	661218.	-12914.	-0.000529	896.1437	2.931E+10	-186.2051	259984.	0.000
120.000	0.001529	580893.	-13879.	-0.000402	836.9586	2.931E+10	-135.3002	531049.	0.000
126.000	-0.000527	495566.	-13997.	-0.000292	774.0872	2.931E+10	95.9758	1093539.	0.000
132.000	-0.001973	413582.	-13249.	-0.000199	713.6788	2.931E+10	153.3502	466278.	0.000
138.000	-0.002912	337024.	-12253.	-0.000122	657.2688	2.931E+10	178.5723	367927.	0.000
144.000	-0.003437	266819.	-11139.	-6.018E-05	605.5393	2.931E+10	192.8381	336640.	0.000
150.000	-0.003634	203494.	-9958.2133	-1.205E-05	558.8802	2.931E+10	200.6331	331238.	0.000
156.000	-0.003582	147347.	-8744.9092	2.385E-05	517.5090	2.931E+10	203.8016	341416.	0.000
162.000	-0.003348	98502.	-7523.5627	4.901E-05	481.5192	2.931E+10	203.3139	364364.	0.000
168.000	-0.002993	56955.	-6314.3481	6.492E-05	450.9060	2.931E+10	199.7576	400394.	0.000
174.000	-0.002569	22586.	-5134.5061	7.306E-05	425.5819	2.931E+10	193.5230	451998.	0.000
180.000	-0.002117	-4821.1238	-3999.2798	7.488E-05	412.4921	2.931E+10	184.8857	524090.	0.000
186.000	-0.001670	-25571.	-2922.4842	7.177E-05	427.7815	2.931E+10	174.0461	625195.	0.000
192.000	-0.001255	-40050.	-1916.9144	6.506E-05	438.4500	2.931E+10	161.1438	770166.	0.000
198.000	-0.000890	-48719.	-994.7307	5.597E-05	444.8372	2.931E+10	146.2508	986346.	0.000
204.000	-0.000584	-52111.	-168.0021	4.565E-05	447.3369	2.931E+10	129.3254	1329281.	0.000
210.000	-0.000342	-50836.	594.7824	3.512E-05	446.3973	2.931E+10	124.9361	2193014.	0.000
216.000	-0.000162	-45052.	1147.5877	2.530E-05	442.1353	2.931E+10	59.3324	2193014.	0.000
222.000	-3.817E-05	-37121.	1367.4360	1.689E-05	436.2918	2.931E+10	13.9504	2193014.	0.000
228.000	4.041E-05	-28680.	1364.9786	1.016E-05	430.0721	2.931E+10	-14.7695	2193014.	0.000
234.000	8.376E-05	-20764.	1228.8213	5.101E-06	424.2394	2.931E+10	-30.6163	2193014.	0.000
240.000	0.000102	-13946.	1025.5438	1.549E-06	419.2153	2.931E+10	-37.1429	2193014.	0.000
246.000	0.000102	-8461.0507	801.8850	-7.441E-07	415.1741	2.931E+10	-37.4100	2193014.	0.000
252.000	9.269E-05	-4321.3338	588.0169	-2.052E-06	412.1239	2.931E+10	-33.8794	2193014.	0.000
258.000	7.773E-05	-1400.2921	401.1517	-2.638E-06	409.9716	2.931E+10	-28.4090	2193014.	0.000
264.000	6.104E-05	498.3420	248.9939	-2.730E-06	409.3070	2.931E+10	-22.3102	2193014.	0.000
270.000	4.497E-05	1593.6955	132.7581	-2.516E-06	410.1141	2.931E+10	-16.4351	2193014.	0.000
276.000	3.085E-05	2097.0250	49.6273	-2.138E-06	410.4849	2.931E+10	-11.2752	2193014.	0.000
282.000	1.931E-05	2193.9698	-5.3684	-1.699E-06	410.5564	2.931E+10	-7.0567	2193014.	0.000
288.000	1.046E-05	2036.3759	-38.0071	-1.266E-06	410.4402	2.931E+10	-3.8229	2193014.	0.000
294.000	4.113E-06	1740.6957	-53.9851	-8.797E-07	410.2224	2.931E+10	-1.5031	2193014.	0.000
300.000	-9.659E-08	1390.5072	-58.3886	-5.592E-07	409.9643	2.931E+10	0.0353	2193014.	0.000
306.000	-2.598E-06	1041.2739	-55.4339	-3.104E-07	409.7070	2.931E+10	0.9496	2193014.	0.000
312.000	-3.821E-06	725.9897	-48.3955	-1.295E-07	409.4747	2.931E+10	1.3965	2193014.	0.000
318.000	-4.152E-06	460.8155	-39.3686	-8.042E-09	409.2793	2.931E+10	1.6124	2330077.	0.000
324.000	-3.917E-06	253.5841	-29.6990	6.507E-08	409.1266	2.931E+10	1.6108	2467140.	0.000
330.000	-3.371E-06	104.2828	-20.7081	1.017E-07	409.0166	2.931E+10	1.3862	2467140.	0.000
336.000	-2.697E-06	4.8616	-13.2224	1.129E-07	408.9434	2.931E+10	1.1090	2467140.	0.000
342.000	-2.017E-06	-54.6367	-7.4074	1.078E-07	408.9800	2.931E+10	0.8293	2467140.	0.000
348.000	-1.404E-06	-84.2665	-3.1876	9.355E-08	409.0019	2.931E+10	0.5773	2467140.	0.000
354.000	-8.943E-07	-93.0961	-0.3527	7.540E-08	409.0084	2.931E+10	0.3677	2467140.	0.000
360.000	-4.991E-07	-88.6665	1.3661	5.680E-08	409.0051	2.931E+10	0.2052	2467140.	0.000
366.000	-2.127E-07	-76.8293	2.2441	3.986E-08	408.9964	2.931E+10	0.0875	2467140.	0.000
372.000	-2.070E-08	-61.8261	2.5320	2.567E-08	408.9853	2.931E+10	0.008510	2467140.	0.000
378.000	9.538E-08	-46.5026	2.4398	1.459E-08	408.9740	2.931E+10	-0.0392	2467140.	0.000
384.000	1.544E-07	-32.5804	2.1318	6.494E-09	408.9638	2.931E+10	-0.0635	2467140.	0.000
390.000	1.733E-07	-20.9357	1.7276	1.018E-09	408.9552	2.931E+10	-0.0713	2467140.	0.000
396.000	1.666E-07	-11.8517	1.3083	-2.338E-09	408.9485	2.931E+10	-0.0685	2467140.	0.000
402.000	1.453E-07	-5.2307	0.9237	-4.086E-09	408.9436	2.931E+10	-0.0597	2467140.	0.000
408.000	1.175E-07	-0.7587	0.5995	-4.699E-09	408.9403	2.931E+10	-0.0483	2467140.	0.000
414.000	8.887E-08	1.9736	0.3449	-4.575E-09	408.9412	2.931E+10	-0.0365	2467140.	0.000
420.000	6.264E-08	3.3899	0.1580	-4.026E-09	408.9423	2.931E+10	-0.0258	2467140.	0.000
426.000	4.056E-08	3.8782	0.0307	-3.282E-09	408.9426	2.931E+10	-0.0167	2467140.	0.000
432.000	2.325E-08	3.7651	-0.0481	-2.500E-09	408.9426	2.931E+10	-0.009562	2467140.	0.000
438.000	1.057E-08	3.3070	-0.0898	-1.776E-09	408.9422	2.931E+10	-0.004345	2467140.	0.000
444.000	1.942E-09	2.6917	-0.1052	-1.162E-09	408.9418	2.931E+10	-0.000799	2467140.	0.000
450.000	-3.378E-09	2.0471	-0.1034	-6.771E-10	408.9413	2.931E+10	0.001389	2467140.	0.000
456.000	-6.184E-09	1.4519	-0.0916	-3.191E-10	408.9409	2.931E+10	0.002543	2467140.	0.000
462.000	-7.206E-09	0.9480	-0.0751	-7.346E-11	408.9405	2.931E+10	0.002963	2467140.	0.000
468.000	-7.065E-09	0.5506	-0.0575	7.990E-11	408.9402	2.931E+10	0.002905	2467140.	0.000
474.000	-6.247E-09	0.2576	-0.0411	1.626E-10	408.9400	2.931E+10	0.002569	2467140.	0.000
480.000	-5.114E-09	0.0570	-0.0271	1.948E-10	408.9398	2.931E+10	0.002103	2467140.	0.000
486.000	-3.910E-09	-0.0679	-0.0160	1.937E-10	408.9398	2.931E+10	0.001608	2467140.	0.000

492.000	-2.790E-09	-0.1349	-0.007691	1.729E-10	408.9399	2.931E+10	0.001147	2467140.	0.000
498.000	-1.835E-09	-0.1606	-0.001986	1.427E-10	408.9399	2.931E+10	0.000755	2467140.	0.000
504.000	-1.078E-09	-0.1591	0.001607	1.099E-10	408.9399	2.931E+10	0.000443	2467140.	0.000
510.000	-5.157E-10	-0.1416	0.003572	7.918E-11	408.9399	2.931E+10	0.000212	2467140.	0.000
516.000	-1.275E-10	-0.1164	0.004366	5.278E-11	408.9399	2.931E+10	5.243E-05	2467140.	0.000
522.000	1.177E-10	-0.0893	0.004378	3.173E-11	408.9399	2.931E+10	-4.840E-05	2467140.	0.000
528.000	2.532E-10	-0.0639	0.003920	1.605E-11	408.9398	2.931E+10	-0.000104	2467140.	0.000
534.000	3.103E-10	-0.0423	0.003225	5.176E-12	408.9398	2.931E+10	-0.000128	2467140.	0.000
540.000	3.154E-10	-0.0252	0.002453	-1.736E-12	408.9398	2.931E+10	-0.000130	2467140.	0.000
546.000	2.894E-10	-0.0129	0.001707	-5.636E-12	408.9398	2.931E+10	-0.000119	2467140.	0.000
552.000	2.477E-10	-0.004750	0.001044	-7.437E-12	408.9398	2.931E+10	-0.000102	2467140.	0.000
558.000	2.002E-10	-0.000308	0.000548	-7.955E-12	408.9398	2.931E+10	-6.368E-05	1908575.	0.000
564.000	1.523E-10	0.001842	0.000247	-7.798E-12	408.9398	2.931E+10	-3.647E-05	1436830.	0.000
570.000	1.066E-10	0.002678	6.136E-05	-7.335E-12	408.9398	2.931E+10	-2.553E-05	1436830.	0.000
576.000	6.425E-11	0.002594	-6.140E-05	-6.796E-12	408.9398	2.931E+10	-1.539E-05	1436830.	0.000
582.000	2.507E-11	0.001956	-0.000126	-6.330E-12	408.9398	2.931E+10	-6.003E-06	1436830.	0.000
588.000	-1.171E-11	0.001102	-0.000135	-6.017E-12	408.9398	2.931E+10	2.805E-06	1436830.	0.000
594.000	-4.714E-11	0.000348	-9.288E-05	-5.869E-12	408.9398	2.931E+10	1.129E-05	1436830.	0.000
600.000	-8.214E-11	0.000	0.000	-5.833E-12	408.9398	2.931E+10	1.967E-05	718415.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
The above values of total stress are computed for combined axial stress and do not equal the
actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =      0.2500000 inches
Computed slope at pile head      =     -0.0033766 radians
Maximum bending moment           =        970478. inch-lbs
Maximum shear force              =         27486. lbs
Depth of maximum bending moment  =     72.0000000 inches below pile head
Depth of maximum shear force     =      0.000000 inches below pile head
Number of iterations             =             16
Number of zero deflection points =              7
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 0.500000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 185000.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	0.000	39342.	-0.006069	408.9398	2.931E+10	-500.7315	3004.3892	0.000
6.000	0.4636	233778.	36313.	-0.006045	581.1939	2.931E+10	-509.1752	6590.0262	0.000
12.000	0.4275	449172.	33237.	-0.005975	739.9026	2.931E+10	-515.9388	7241.9008	0.000
18.000	0.3919	645891.	30127.	-0.005863	884.8504	2.931E+10	-520.9779	7976.4468	0.000
24.000	0.3571	823707.	26991.	-0.005713	1015.8707	2.931E+10	-524.2504	8808.3104	0.000
30.000	0.3233	982464.	23841.	-0.005528	1132.8469	2.931E+10	-525.7162	9755.4529	0.000
36.000	0.2908	1122071.	20688.	-0.005312	1235.7137	2.931E+10	-525.3365	10840.	0.000
42.000	0.2596	1242511.	17543.	-0.005070	1324.4576	2.931E+10	-523.0740	12090.	0.000
48.000	0.2299	1343839.	14417.	-0.004806	1399.1185	2.931E+10	-518.8916	13540.	0.000
54.000	0.2019	1426181.	11322.	-0.004522	1459.7905	2.931E+10	-512.7519	15236.	0.000
60.000	0.1757	1489740.	8269.7090	-0.004224	1506.6225	2.931E+10	-504.6161	17236.	0.000
66.000	0.1512	1534794.	5272.5352	-0.003914	1539.8198	2.931E+10	-494.4418	19616.	0.000
72.000	0.1287	1561700.	2342.6657	-0.003597	1559.6447	2.931E+10	-482.1813	22481.	0.000
78.000	0.1081	1570892.	-507.2090	-0.003277	1566.4180	2.931E+10	-467.7769	25971.	0.000
84.000	0.0894	1562888.	-3264.0068	-0.002956	1560.5200	2.931E+10	-451.1556	30289.	0.000
90.000	0.0726	1538287.	-5914.1312	-0.002639	1542.3932	2.931E+10	-432.2192	35723.	0.000
96.000	0.0577	1497776.	-8443.2719	-0.002328	1512.5439	2.931E+10	-410.8277	42715.	0.000
102.000	0.0447	1442136.	-10836.	-0.002027	1471.5464	2.931E+10	-386.7713	51964.	0.000
108.000	0.0334	1372244.	-13076.	-0.001739	1420.0480	2.931E+10	-359.7144	64656.	0.000
114.000	0.0238	1289090.	-15142.	-0.001467	1358.7782	2.931E+10	-329.0822	83001.	0.000
120.000	0.0158	1193797.	-17011.	-0.001213	1288.5634	2.931E+10	-293.7891	111710.	0.000
126.000	0.009236	1087656.	-18646.	-0.000979	1210.3557	2.931E+10	-251.4530	163345.	0.000
132.000	0.004029	972216.	-19986.	-0.000768	1125.2960	2.931E+10	-195.0698	290501.	0.000
138.000	1.547E-05	849532.	-20585.	-0.000582	1034.8992	2.931E+10	-4.5148	1750756.	0.000
144.000	-0.002955	726493.	-20048.	-0.000421	944.2403	2.931E+10	183.3906	372398.	0.000
150.000	-0.005033	609891.	-18827.	-0.000284	858.3245	2.931E+10	223.7174	266711.	0.000
156.000	-0.006362	501204.	-17415.	-0.000170	778.2408	2.931E+10	246.9199	232874.	0.000
162.000	-0.007075	401292.	-15891.	-7.786E-05	704.6230	2.931E+10	261.0176	221343.	0.000
168.000	-0.007296	310686.	-14301.	-5.001E-06	637.8618	2.931E+10	268.9415	221161.	0.000
174.000	-0.007135	229691.	-12678.	5.030E-05	578.1824	2.931E+10	272.1448	228838.	0.000
180.000	-0.006693	158441.	-11047.	9.002E-05	525.6834	2.931E+10	271.4739	243377.	0.000
186.000	-0.006055	96928.	-9430.0621	0.000116	480.3590	2.931E+10	267.4757	265035.	0.000
192.000	-0.005299	45022.	-7846.0429	0.000131	442.1134	2.931E+10	260.5307	295006.	0.000

198.000	-0.004487	2485.2557	-6311.6970	0.000136	410.7710	2.931E+10	250.9179	335519.	0.000
204.000	-0.003672	-31019.	-4842.3967	0.000133	431.7956	2.931E+10	238.8488	390242.	0.000
210.000	-0.002896	-55918.	-3455.7538	0.000124	450.1417	2.931E+10	223.3655	462832.	0.000
216.000	-0.002188	-72763.	-2175.4397	0.000111	462.5535	2.931E+10	203.4059	557882.	0.000
222.000	-0.001569	-82269.	-1019.1072	9.469E-05	469.5577	2.931E+10	182.0383	696146.	0.000
228.000	-0.001051	-85202.	4.7732	7.755E-05	471.7193	2.931E+10	159.2552	908872.	0.000
234.000	-0.000638	-82384.	886.9405	6.040E-05	469.6423	2.931E+10	134.8006	1267038.	0.000
240.000	-0.000327	-74693.	1649.3702	4.433E-05	463.9758	2.931E+10	119.3427	2193014.	0.000
246.000	-0.000106	-62689.	2124.0874	3.027E-05	455.1312	2.931E+10	38.8964	2193014.	0.000
252.000	3.669E-05	-49271.	2200.5418	1.881E-05	445.2443	2.931E+10	-13.4116	2193014.	0.000
258.000	0.000119	-36325.	2029.4956	1.005E-05	435.7049	2.931E+10	-43.6038	2193014.	0.000
264.000	0.000157	-24940.	1726.2093	3.780E-06	427.3160	2.931E+10	-57.4916	2193014.	0.000
270.000	0.000165	-15619.	1373.1791	-3.701E-07	420.4480	2.931E+10	-60.1851	2193014.	0.000
276.000	0.000153	-8460.6966	1025.0193	-2.834E-06	415.1739	2.931E+10	-55.8681	2193014.	0.000
282.000	0.000131	-3312.0998	714.1543	-4.039E-06	411.3802	2.931E+10	-47.7535	2193014.	0.000
288.000	0.000104	118.1222	456.4369	-4.366E-06	409.0268	2.931E+10	-38.1523	2193014.	0.000
294.000	7.826E-05	2174.8352	256.1679	-4.131E-06	410.5423	2.931E+10	-28.6041	2193014.	0.000
300.000	5.481E-05	3201.3081	110.2597	-3.581E-06	411.2986	2.931E+10	-20.0320	2193014.	0.000
306.000	3.529E-05	3505.9014	11.4730	-2.895E-06	411.5230	2.931E+10	-12.8969	2193014.	0.000
312.000	2.007E-05	3345.4105	-49.2238	-2.194E-06	411.4048	2.931E+10	-7.3354	2193014.	0.000
318.000	8.962E-06	2920.0853	-81.6707	-1.552E-06	411.0914	2.931E+10	-3.4802	2330077.	0.000
324.000	1.440E-06	2368.8085	-93.8877	-1.011E-06	410.6852	2.931E+10	-0.5921	2467140.	0.000
330.000	-3.173E-06	1795.6779	-91.7502	-5.850E-07	410.2629	2.931E+10	1.3046	2467140.	0.000
336.000	-5.580E-06	1269.1044	-80.9529	-2.714E-07	409.8749	2.931E+10	2.2945	2467140.	0.000
342.000	-6.429E-06	824.8455	-66.1385	-5.708E-08	409.5476	2.931E+10	2.6436	2467140.	0.000
348.000	-6.265E-06	475.5695	-50.4790	7.600E-08	409.2902	2.931E+10	2.5762	2467140.	0.000
354.000	-5.517E-06	218.9285	-35.9445	1.471E-07	409.1011	2.931E+10	2.2686	2467140.	0.000
360.000	-4.500E-06	43.9084	-23.5871	1.740E-07	408.9721	2.931E+10	1.8505	2467140.	0.000
366.000	-3.430E-06	-64.5030	-13.8049	1.719E-07	408.9873	2.931E+10	1.4102	2467140.	0.000
372.000	-2.438E-06	-122.1317	-6.5667	1.528E-07	409.0298	2.931E+10	1.0025	2467140.	0.000
378.000	-1.596E-06	-143.6422	-1.5898	1.256E-07	409.0456	2.931E+10	0.6565	2467140.	0.000
384.000	-9.313E-07	-141.4874	1.5285	9.638E-08	409.0440	2.931E+10	0.3830	2467140.	0.000
390.000	-4.399E-07	-125.5142	3.2200	6.906E-08	409.0323	2.931E+10	0.1809	2467140.	0.000
396.000	-1.026E-07	-103.0005	3.8893	4.567E-08	409.0157	2.931E+10	0.0422	2467140.	0.000
402.000	1.082E-07	-78.9441	3.8825	2.705E-08	408.9980	2.931E+10	-0.0445	2467140.	0.000
408.000	2.220E-07	-56.4708	3.4752	1.319E-08	408.9814	2.931E+10	-0.0913	2467140.	0.000
414.000	2.665E-07	-37.2709	2.8726	3.601E-09	408.9672	2.931E+10	-0.1096	2467140.	0.000
420.000	2.652E-07	-22.0074	2.2167	-2.465E-09	408.9560	2.931E+10	-0.1091	2467140.	0.000
426.000	2.369E-07	-10.6649	1.5973	-5.808E-09	408.9476	2.931E+10	-0.0974	2467140.	0.000
432.000	1.955E-07	-2.8270	1.0639	-7.189E-09	408.9419	2.931E+10	-0.0804	2467140.	0.000
438.000	1.506E-07	2.1173	0.6368	-7.262E-09	408.9413	2.931E+10	-0.0619	2467140.	0.000
444.000	1.084E-07	4.8312	0.3173	-6.551E-09	408.9433	2.931E+10	-0.0446	2467140.	0.000
450.000	7.204E-08	5.9398	0.0948	-5.448E-09	408.9442	2.931E+10	-0.0296	2467140.	0.000
456.000	4.299E-08	5.9806	-0.0471	-4.229E-09	408.9442	2.931E+10	-0.0177	2467140.	0.000
462.000	2.129E-08	5.3837	-0.1264	-3.066E-09	408.9438	2.931E+10	-0.008756	2467140.	0.000
468.000	6.205E-09	4.4704	-0.1603	-2.057E-09	408.9431	2.931E+10	-0.002552	2467140.	0.000
474.000	-3.392E-09	3.4642	-0.1638	-1.245E-09	408.9423	2.931E+10	0.001395	2467140.	0.000
480.000	-8.736E-09	2.5074	-0.1489	-6.340E-10	408.9416	2.931E+10	0.003592	2467140.	0.000
486.000	-1.100E-08	1.6794	-0.1245	-2.055E-10	408.9410	2.931E+10	0.004523	2467140.	0.000
492.000	-1.120E-08	1.0138	-0.0971	7.009E-11	408.9405	2.931E+10	0.004606	2467140.	0.000
498.000	-1.016E-08	0.5139	-0.0708	2.264E-10	408.9402	2.931E+10	0.004177	2467140.	0.000
504.000	-8.485E-09	0.1642	-0.0478	2.958E-10	408.9399	2.931E+10	0.003489	2467140.	0.000
510.000	-6.610E-09	-0.0600	-0.0291	3.065E-10	408.9398	2.931E+10	0.002718	2467140.	0.000
516.000	-4.807E-09	-0.1863	-0.0151	2.813E-10	408.9399	2.931E+10	0.001977	2467140.	0.000
522.000	-3.234E-09	-0.2413	-0.005141	2.375E-10	408.9400	2.931E+10	0.001330	2467140.	0.000
528.000	-1.957E-09	-0.2485	0.001263	1.874E-10	408.9400	2.931E+10	0.000805	2467140.	0.000
534.000	-9.856E-10	-0.2266	0.004893	1.388E-10	408.9400	2.931E+10	0.000405	2467140.	0.000
540.000	-2.921E-10	-0.1901	0.006469	9.612E-11	408.9399	2.931E+10	0.000120	2467140.	0.000
546.000	1.679E-10	-0.1492	0.006622	6.140E-11	408.9399	2.931E+10	-6.903E-05	2467140.	0.000
552.000	4.447E-10	-0.1108	0.005867	3.480E-11	408.9399	2.931E+10	-0.000183	2467140.	0.000
558.000	5.854E-10	-0.0789	0.004760	1.539E-11	408.9398	2.931E+10	-0.000186	1908575.	0.000
564.000	6.294E-10	-0.0537	0.003749	1.829E-12	408.9398	2.931E+10	-0.000151	1436830.	0.000
570.000	6.074E-10	-0.0339	0.002860	-7.132E-12	408.9398	2.931E+10	-0.000145	1436830.	0.000
576.000	5.438E-10	-0.0193	0.002033	-1.258E-11	408.9398	2.931E+10	-0.000130	1436830.	0.000
582.000	4.564E-10	-0.009462	0.001315	-1.553E-11	408.9398	2.931E+10	-0.000109	1436830.	0.000
588.000	3.575E-10	-0.003524	0.000730	-1.685E-11	408.9398	2.931E+10	-8.561E-05	1436830.	0.000
594.000	2.542E-10	-0.000666	0.000290	-1.728E-11	408.9398	2.931E+10	-6.087E-05	1436830.	0.000
600.000	1.501E-10	0.000	0.000	-1.735E-11	408.9398	2.931E+10	-3.594E-05	718415.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
  The above values of total stress are computed for combined axial stress and do not equal the
  actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2:

Pile-head deflection	=	0.5000000 inches
Computed slope at pile head	=	-0.0060688 radians
Maximum bending moment	=	1570892. inch-lbs
Maximum shear force	=	39342. lbs
Depth of maximum bending moment	=	78.0000000 inches below pile head
Depth of maximum shear force	=	0.000000 inches below pile head
Number of iterations	=	14
Number of zero deflection points	=	6

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 1.000000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 185000.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0000	0.000	56322.	-0.0109	408.9398	2.931E+10	-630.8822	1892.6466	0.000
6.000	0.9345	338686.	52500.	-0.0109	658.4936	2.931E+10	-643.2139	4129.6277	0.000
12.000	0.8695	654140.	48609.	-0.0108	890.9289	2.931E+10	-653.7128	4511.0246	0.000
18.000	0.8052	945912.	44661.	-0.0106	1105.9144	2.931E+10	-662.3301	4935.1402	0.000
24.000	0.7422	1213624.	40667.	-0.0104	1303.1727	2.931E+10	-669.0192	5408.7071	0.000
30.000	0.6806	1456977.	36638.	-0.0101	1482.4816	2.931E+10	-673.7358	5939.7945	0.000
36.000	0.6208	1675743.	32588.	-0.009796	1643.6752	2.931E+10	-676.4371	6538.1435	0.000
42.000	0.5630	1869778.	28527.	-0.009433	1786.6452	2.931E+10	-677.0820	7215.6063	0.000
48.000	0.5076	2039012.	24469.	-0.009033	1911.3421	2.931E+10	-675.6301	7986.7270	0.000
54.000	0.4546	2183461.	20426.	-0.008601	2017.7760	2.931E+10	-672.0417	8869.5209	0.000
60.000	0.4044	2303220.	16411.	-0.008142	2106.0179	2.931E+10	-666.2770	9886.5346	0.000
66.000	0.3569	2398470.	12437.	-0.007661	2176.2007	2.931E+10	-658.2946	11066.	0.000
72.000	0.3124	2469476.	8518.4457	-0.007162	2228.5202	2.931E+10	-648.0510	12445.	0.000
78.000	0.2710	2516592.	4667.7987	-0.006652	2263.2362	2.931E+10	-635.4980	14072.	0.000
84.000	0.2326	2540258.	899.5630	-0.006135	2280.6739	2.931E+10	-620.5805	16008.	0.000
90.000	0.1974	2541005.	-2771.8745	-0.005615	2281.2249	2.931E+10	-603.2319	18340.	0.000
96.000	0.1652	2519460.	-6331.6753	-0.005097	2265.3493	2.931E+10	-583.3683	21184.	0.000
102.000	0.1362	2476340.	-9764.4158	-0.004585	2233.5776	2.931E+10	-560.8785	24710.	0.000
108.000	0.1102	2412466.	-13054.	-0.004085	2186.5137	2.931E+10	-535.6080	29162.	0.000
114.000	0.0872	2328763.	-16183.	-0.003600	2124.8384	2.931E+10	-507.3321	34920.	0.000
120.000	0.0670	2226266.	-19132.	-0.003134	2049.3159	2.931E+10	-475.7062	42600.	0.000
126.000	0.0496	2106138.	-21879.	-0.002690	1960.8022	2.931E+10	-440.1696	53284.	0.000
132.000	0.0347	1969686.	-24399.	-0.002273	1860.2602	2.931E+10	-399.7359	69088.	0.000
138.000	0.0223	1818395.	-26656.	-0.001886	1748.7850	2.931E+10	-352.4619	94898.	0.000
144.000	0.0121	1654003.	-28594.	-0.001530	1627.6561	2.931E+10	-293.7048	145796.	0.000
150.000	0.003921	1478661.	-30094.	-0.001210	1498.4596	2.931E+10	-206.2580	315657.	0.000
156.000	-0.002430	1295559.	-30176.	-0.000926	1363.5444	2.931E+10	178.8395	441576.	0.000
162.000	-0.007190	1118600.	-28853.	-0.000679	1233.1562	2.931E+10	262.3368	218931.	0.000
168.000	-0.0106	950831.	-27153.	-0.000467	1109.5394	2.931E+10	304.3506	172674.	0.000
174.000	-0.0128	793803.	-25248.	-0.000288	993.8366	2.931E+10	330.6422	155066.	0.000
180.000	-0.0140	648498.	-23213.	-0.000141	886.7715	2.931E+10	347.5553	148560.	0.000
186.000	-0.0145	515557.	-21097.	-2.174E-05	788.8170	2.931E+10	357.7983	148219.	0.000
192.000	-0.0143	395380.	-18935.	7.149E-05	700.2671	2.931E+10	362.8187	152255.	0.000
198.000	-0.0136	288175.	-16756.	0.000141	621.2751	2.931E+10	363.4984	160060.	0.000
204.000	-0.0126	193990.	-14585.	0.000191	551.8770	2.931E+10	360.4243	171624.	0.000
210.000	-0.0113	112736.	-12447.	0.000222	492.0069	2.931E+10	352.2514	186431.	0.000
216.000	-0.009934	44138.	-10379.	0.000238	441.4617	2.931E+10	337.0814	203584.	0.000
222.000	-0.008478	-12336.	-8408.1479	0.000241	418.0291	2.931E+10	319.7269	226277.	0.000
228.000	-0.007037	-57296.	-6547.5660	0.000234	451.1573	2.931E+10	300.4671	256203.	0.000
234.000	-0.005666	-91427.	-4807.5974	0.000219	476.3057	2.931E+10	279.5225	296017.	0.000
240.000	-0.004407	-115474.	-3197.8486	0.000198	494.0242	2.931E+10	257.0605	349981.	0.000
246.000	-0.003290	-130240.	-1727.0969	0.000173	504.9047	2.931E+10	233.1901	425256.	0.000
252.000	-0.002333	-136583.	-403.7093	0.000146	509.5778	2.931E+10	207.9391	534736.	0.000
258.000	-0.001544	-135408.	763.6846	0.000118	508.7123	2.931E+10	181.1922	704125.	0.000
264.000	-0.000921	-127680.	1764.8054	9.075E-05	503.0178	2.931E+10	152.5148	993513.	0.000
270.000	-0.000455	-114432.	2721.2006	6.598E-05	493.2564	2.931E+10	166.2836	2193014.	0.000
276.000	-0.000129	-95172.	3361.8906	4.453E-05	479.0650	2.931E+10	47.2797	2193014.	0.000
282.000	7.936E-05	-74188.	3416.7117	2.719E-05	463.6036	2.931E+10	-29.0060	2193014.	0.000
288.000	0.000197	-54232.	3113.7172	1.405E-05	448.8992	2.931E+10	-71.9922	2193014.	0.000
294.000	0.000248	-36855.	2625.8321	4.730E-06	436.0953	2.931E+10	-90.6362	2193014.	0.000
300.000	0.000254	-22732.	2075.7095	-1.368E-06	425.6894	2.931E+10	-92.7380	2193014.	0.000
306.000	0.000232	-11943.	1543.5866	-4.917E-06	417.7397	2.931E+10	-84.6363	2193014.	0.000
312.000	0.000195	-4198.1401	1076.1556	-6.568E-06	412.0331	2.931E+10	-71.1740	2193014.	0.000
318.000	0.000153	985.4295	684.6840	-6.897E-06	409.6659	2.931E+10	-59.3165	2330077.	0.000
324.000	0.000112	4033.3801	368.6194	-6.384E-06	411.9117	2.931E+10	-46.0383	2467140.	0.000
330.000	7.614E-05	5423.0343	136.5816	-5.416E-06	412.9356	2.931E+10	-31.3076	2467140.	0.000
336.000	4.697E-05	5684.3819	-15.2873	-4.279E-06	413.1282	2.931E+10	-19.3153	2467140.	0.000
342.000	2.479E-05	5249.0857	-103.8137	-3.160E-06	412.8075	2.931E+10	-10.1934	2467140.	0.000
348.000	9.052E-06	4445.6330	-145.5604	-2.168E-06	412.2155	2.931E+10	-3.7221	2467140.	0.000
354.000	-1.226E-06	3507.1734	-155.2139	-1.354E-06	411.5240	2.931E+10	0.5043	2467140.	0.000
360.000	-7.198E-06	2586.0723	-144.8217	-7.306E-07	410.8453	2.931E+10	2.9598	2467140.	0.000
366.000	-9.994E-06	1770.9351	-123.6143	-2.847E-07	410.2447	2.931E+10	4.1094	2467140.	0.000
372.000	-1.061E-05	1103.3326	-98.1922	9.416E-09	409.7528	2.931E+10	4.3647	2467140.	0.000
378.000	-9.881E-06	592.6084	-72.9094	1.830E-07	409.3764	2.931E+10	4.0629	2467140.	0.000
384.000	-8.419E-06	228.0138	-50.3351	2.670E-07	409.1078	2.931E+10	3.4619	2467140.	0.000
390.000	-6.677E-06	-12.0059	-31.7126	2.891E-07	408.9486	2.931E+10	2.7457	2467140.	0.000
396.000	-4.950E-06	-153.1789	-17.3689	2.722E-07	409.0527	2.931E+10	2.0355	2467140.	0.000
402.000	-3.412E-06	-221.0375	-7.0540	2.339E-07	409.1027	2.931E+10	1.4028	2467140.	0.000
408.000	-2.144E-06	-238.3459	-0.2008	1.868E-07	409.1154	2.931E+10	0.8816	2467140.	0.000
414.000	-1.169E-06	-223.8619	3.8865	1.395E-07	409.1047	2.931E+10	0.4808	2467140.	0.000
420.000	-4.695E-07	-192.0175	5.9081	9.699E-08	409.0813	2.931E+10	0.1931	2467140.	0.000
426.000	-5.499E-09	-153.1795	6.4941	6.166E-08	409.0527	2.931E+10	0.002261	2467140.	0.000

432.000	2.704E-07	-114.2252	6.1673	3.429E-08	409.0239	2.931E+10	-0.1112	2467140.	0.000
438.000	4.060E-07	-79.2477	5.3329	1.449E-08	408.9982	2.931E+10	-0.1670	2467140.	0.000
444.000	4.443E-07	-50.2627	4.2839	1.241E-09	408.9768	2.931E+10	-0.1827	2467140.	0.000
450.000	4.209E-07	-27.8437	3.2165	-6.752E-09	408.9603	2.931E+10	-0.1731	2467140.	0.000
456.000	3.633E-07	-11.6493	2.2491	-1.079E-08	408.9484	2.931E+10	-0.1494	2467140.	0.000
462.000	2.914E-07	-0.8303	1.4415	-1.207E-08	408.9404	2.931E+10	-0.1198	2467140.	0.000
468.000	2.185E-07	5.6753	0.8125	-1.158E-08	408.9440	2.931E+10	-0.0898	2467140.	0.000
474.000	1.525E-07	8.9458	0.3549	-1.008E-08	408.9464	2.931E+10	-0.0627	2467140.	0.000
480.000	9.752E-08	9.9569	0.0465	-8.144E-09	408.9471	2.931E+10	-0.0401	2467140.	0.000
486.000	5.476E-08	9.5222	-0.1413	-6.151E-09	408.9468	2.931E+10	-0.0225	2467140.	0.000
492.000	2.370E-08	8.2747	-0.2381	-4.330E-09	408.9459	2.931E+10	-0.009747	2467140.	0.000
498.000	2.807E-09	6.6745	-0.2708	-2.800E-09	408.9447	2.931E+10	-0.001154	2467140.	0.000
504.000	-9.893E-09	5.0311	-0.2621	-1.602E-09	408.9435	2.931E+10	0.004068	2467140.	0.000
510.000	-1.642E-08	3.5331	-0.2296	-7.254E-10	408.9424	2.931E+10	0.006750	2467140.	0.000
516.000	-1.860E-08	2.2772	-0.1864	-1.308E-10	408.9415	2.931E+10	0.007648	2467140.	0.000
522.000	-1.799E-08	1.2962	-0.1413	2.349E-10	408.9407	2.931E+10	0.007395	2467140.	0.000
528.000	-1.578E-08	0.5810	-0.0997	4.270E-10	408.9402	2.931E+10	0.006489	2467140.	0.000
534.000	-1.286E-08	0.0994	-0.0643	4.966E-10	408.9399	2.931E+10	0.005289	2467140.	0.000
540.000	-9.821E-09	-0.1919	-0.0363	4.871E-10	408.9399	2.931E+10	0.004038	2467140.	0.000
546.000	-7.016E-09	-0.3378	-0.0156	4.329E-10	408.9400	2.931E+10	0.002885	2467140.	0.000
552.000	-4.626E-09	-0.3797	-0.001210	3.595E-10	408.9401	2.931E+10	0.001902	2467140.	0.000
558.000	-2.702E-09	-0.3531	0.007075	2.845E-10	408.9400	2.931E+10	0.000860	1908575.	0.000
564.000	-1.212E-09	-0.2855	0.0105	2.181E-10	408.9400	2.931E+10	0.000290	1436830.	0.000
570.000	-8.463E-11	-0.2273	0.0115	1.646E-10	408.9400	2.931E+10	2.027E-05	1436830.	0.000
576.000	7.635E-10	-0.1584	0.0110	1.252E-10	408.9399	2.931E+10	-0.000183	1436830.	0.000
582.000	1.417E-09	-0.0960	0.009401	9.913E-11	408.9399	2.931E+10	-0.000339	1436830.	0.000
588.000	1.953E-09	-0.0458	0.006980	8.462E-11	408.9398	2.931E+10	-0.000468	1436830.	0.000
594.000	2.433E-09	-0.0124	0.003829	7.867E-11	408.9398	2.931E+10	-0.000583	1436830.	0.000
600.000	2.897E-09	0.000	0.000	7.740E-11	408.9398	2.931E+10	-0.000694	718415.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
  The above values of total stress are computed for combined axial stress and do not equal the
  actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =      1.0000000 inches
Computed slope at pile head      =     -0.0109108 radians
Maximum bending moment           =      2541005. inch-lbs
Maximum shear force              =        56322. lbs
Depth of maximum bending moment  =     90.0000000 inches below pile head
Depth of maximum shear force     =      0.000000 inches below pile head
Number of iterations             =             18
Number of zero deflection points =              6
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 3.000000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 185000.000 lbs

Depth x inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	3.0000	0.000	98732.	-0.0277	408.9398	2.931E+10	-844.6667	844.6667	0.000
6.000	2.8338	607934.	93556.	-0.0276	856.8830	2.931E+10	-880.8334	1864.9740	0.000
12.000	2.6684	1184020.	88162.	-0.0275	1281.3596	2.931E+10	-917.0002	2061.9207	0.000
18.000	2.5044	1726825.	82552.	-0.0272	1681.3138	2.931E+10	-953.1671	2283.5754	0.000
24.000	2.3425	2234924.	76748.	-0.0267	2055.6954	2.931E+10	-981.3756	2513.6103	0.000
30.000	2.1834	2707186.	70823.	-0.0262	2403.6711	2.931E+10	-993.6777	2730.5911	0.000
36.000	2.0276	3143060.	64831.	-0.0256	2724.8355	2.931E+10	-1003.6494	2969.8974	0.000
42.000	1.8757	3542088.	58787.	-0.0250	3018.8511	2.931E+10	-1011.2425	3234.7429	0.000
48.000	1.7281	3903907.	52704.	-0.0242	3285.4498	2.931E+10	-1016.4101	3528.9264	0.000
54.000	1.5853	4228249.	46597.	-0.0234	3524.4338	2.931E+10	-1019.1063	3856.9663	0.000
60.000	1.4478	4514942.	40482.	-0.0225	3735.6773	2.931E+10	-1019.2858	4224.2727	0.000
66.000	1.3157	4763915.	34373.	-0.0215	3919.1277	2.931E+10	-1016.9036	4637.3712	0.000
72.000	1.1895	4975197.	28287.	-0.0205	4074.8064	2.931E+10	-1011.9141	5104.1958	0.000
78.000	1.0694	5148920.	22238.	-0.0195	4202.8104	2.931E+10	-1004.2705	5634.4780	0.000
84.000	0.9557	5285319.	16244.	-0.0184	4303.3134	2.931E+10	-993.9237	6240.2705	0.000
90.000	0.8484	5384737.	10319.	-0.0173	4376.5669	2.931E+10	-980.8206	6936.6642	0.000
96.000	0.7477	5447621.	4482.2923	-0.0162	4422.9020	2.931E+10	-964.9027	7742.7871	0.000
102.000	0.6537	5474532.	-1250.7232	-0.0151	4442.7304	2.931E+10	-946.1025	8683.2240	0.000
108.000	0.5665	5466139.	-6862.0516	-0.0140	4436.5461	2.931E+10	-924.3403	9790.0843	0.000
114.000	0.4860	5423227.	-12334.	-0.0129	4404.9279	2.931E+10	-899.5181	11106.	0.000
120.000	0.4121	5346701.	-17647.	-0.0118	4348.5415	2.931E+10	-871.5110	12689.	0.000
126.000	0.3448	5237586.	-22782.	-0.0107	4268.1424	2.931E+10	-840.1545	14621.	0.000
132.000	0.2839	5097036.	-27718.	-0.009625	4164.5808	2.931E+10	-805.2237	17018.	0.000

138.000	0.2293	4926339.	-32433.	-0.008599	4038.8067	2.931E+10	-766.3991	20056.	0.000
144.000	0.1807	4726933.	-36902.	-0.007611	3891.8786	2.931E+10	-723.2073	24013.	0.000
150.000	0.1379	4500418.	-41096.	-0.006667	3724.9756	2.931E+10	-674.9099	29357.	0.000
156.000	0.1007	4248583.	-44981.	-0.005772	3539.4166	2.931E+10	-620.2768	36957.	0.000
162.000	0.0687	3973453.	-48513.	-0.004930	3336.6931	2.931E+10	-557.0550	48664.	0.000
168.000	0.0415	3677367.	-51626.	-0.004147	3118.5281	2.931E+10	-480.4514	69394.	0.000
174.000	0.0189	3363148.	-54198.	-0.003427	2887.0031	2.931E+10	-376.8254	119522.	0.000
180.000	0.000422	3034600.	-55753.	-0.002772	2644.9195	2.931E+10	-141.7423	2015136.	0.000
186.000	-0.0143	2700260.	-55108.	-0.002185	2398.5681	2.931E+10	356.7943	149224.	0.000
192.000	-0.0258	2378151.	-52712.	-0.001665	2161.2290	2.931E+10	441.8564	102765.	0.000
198.000	-0.0343	2071408.	-49902.	-0.001210	1935.2123	2.931E+10	494.7858	86477.	0.000
204.000	-0.0403	1782007.	-46824.	-0.000816	1721.9735	2.931E+10	531.2904	79067.	0.000
210.000	-0.0441	1511328.	-43568.	-0.000479	1522.5293	2.931E+10	554.2582	75381.	0.000
216.000	-0.0461	1260259.	-40218.	-0.000195	1337.5343	2.931E+10	562.2839	73246.	0.000
222.000	-0.0465	1029145.	-36839.	3.937E-05	1167.2434	2.931E+10	563.8944	72830.	0.000
228.000	-0.0456	818098.	-33467.	0.000228	1011.7379	2.931E+10	560.3654	73753.	0.000
234.000	-0.0437	627039.	-30128.	0.000376	870.9596	2.931E+10	552.5909	75845.	0.000
240.000	-0.0411	455730.	-26846.	0.000487	744.7343	2.931E+10	541.2302	79066.	0.000
246.000	-0.0379	303801.	-23642.	0.000565	632.7893	2.931E+10	526.7893	83465.	0.000
252.000	-0.0343	170769.	-20533.	0.000613	534.7670	2.931E+10	509.6684	89172.	0.000
258.000	-0.0305	56045.	-17533.	0.000637	450.2354	2.931E+10	490.1916	96405.	0.000
264.000	-0.0267	-41044.	-14657.	0.000638	439.1824	2.931E+10	468.6262	105491.	0.000
270.000	-0.0229	-121254.	-11915.	0.000622	498.2830	2.931E+10	445.1951	116899.	0.000
276.000	-0.0192	-185409.	-9319.5431	0.000590	545.5542	2.931E+10	420.0843	131307.	0.000
282.000	-0.0158	-234398.	-6878.9485	0.000547	581.6512	2.931E+10	393.4472	149710.	0.000
288.000	-0.0126	-269171.	-4602.3927	0.000496	607.2725	2.931E+10	365.4048	173602.	0.000
294.000	-0.009820	-290728.	-2498.0548	0.000438	623.1561	2.931E+10	336.0412	205313.	0.000
300.000	-0.007369	-300121.	-573.7578	0.000378	630.0772	2.931E+10	305.3912	248668.	0.000
306.000	-0.005286	-298452.	1162.6489	0.000317	628.8474	2.931E+10	273.4111	310371.	0.000
312.000	-0.003569	-286872.	2702.6199	0.000257	620.3151	2.931E+10	239.9126	403341.	0.000
318.000	-0.002205	-266590.	4073.8532	0.000200	605.3709	2.931E+10	217.1652	591048.	0.000
324.000	-0.001168	-238430.	5283.8494	0.000148	584.6217	2.931E+10	186.1669	956670.	0.000
330.000	-0.000423	-203513.	6364.6999	0.000103	558.8942	2.931E+10	174.1166	2467140.	0.000
336.000	7.078E-05	-162283.	6799.7396	6.576E-05	528.5142	2.931E+10	-29.1034	2467140.	0.000
342.000	0.000366	-122063.	6261.2984	3.666E-05	498.8789	2.931E+10	-150.3770	2467140.	0.000
348.000	0.000511	-87228.	5387.7842	1.525E-05	473.2121	2.931E+10	-140.7944	1653984.	0.000
354.000	0.000549	-57443.	4532.6172	4.405E-07	451.2654	2.931E+10	-144.2612	1577601.	0.000
360.000	0.000516	-32838.	3675.7019	-8.799E-06	433.1357	2.931E+10	-141.3772	1643819.	0.000
366.000	0.000443	-13315.	2705.0035	-1.352E-05	418.7507	2.931E+10	-182.1889	2467140.	0.000
372.000	0.000354	-347.8603	1722.0358	-1.492E-05	409.1961	2.931E+10	-145.4670	2467140.	0.000
378.000	0.000264	7382.5494	959.9266	-1.420E-05	414.3795	2.931E+10	-108.5694	2467140.	0.000
384.000	0.000183	11203.	408.0192	-1.230E-05	417.1943	2.931E+10	-75.3997	2467140.	0.000
390.000	0.000116	12306.	38.1590	-9.892E-06	418.0073	2.931E+10	-47.8870	2467140.	0.000
396.000	6.466E-05	11683.	-185.2672	-7.437E-06	417.5479	2.931E+10	-26.5884	2467140.	0.000
402.000	2.721E-05	10099.	-298.5994	-5.208E-06	416.3813	2.931E+10	-11.1890	2467140.	0.000
408.000	2.163E-06	8111.0211	-334.8350	-3.345E-06	414.9162	2.931E+10	-0.8895	2467140.	0.000
414.000	-1.292E-05	6088.7914	-321.5605	-1.891E-06	413.4262	2.931E+10	5.3143	2467140.	0.000
420.000	-2.053E-05	4256.4937	-280.2871	-8.328E-07	412.0761	2.931E+10	8.4435	2467140.	0.000
426.000	-2.292E-05	2727.1954	-226.6865	-1.181E-07	410.9493	2.931E+10	9.4234	2467140.	0.000
432.000	-2.195E-05	1536.5182	-171.3382	3.183E-07	410.0719	2.931E+10	9.0261	2467140.	0.000
438.000	-1.910E-05	670.4301	-120.7014	5.441E-07	409.4338	2.931E+10	7.8529	2467140.	0.000
444.000	-1.542E-05	86.8936	-78.1192	6.216E-07	409.0038	2.931E+10	6.3412	2467140.	0.000
450.000	-1.164E-05	-268.3802	-44.7389	6.031E-07	409.1375	2.931E+10	4.7856	2467140.	0.000
456.000	-8.185E-06	-451.3119	-20.2856	5.294E-07	409.2723	2.931E+10	3.3655	2467140.	0.000
462.000	-5.285E-06	-512.9824	-3.6690	4.307E-07	409.3178	2.931E+10	2.1733	2467140.	0.000
468.000	-3.016E-06	-496.2960	6.5717	3.274E-07	409.3055	2.931E+10	1.2402	2467140.	0.000
474.000	-1.356E-06	-434.8494	11.9653	2.321E-07	409.2602	2.931E+10	0.5577	2467140.	0.000
480.000	-2.304E-07	-353.2276	13.9226	1.515E-07	409.2001	2.931E+10	0.0947	2467140.	0.000
486.000	4.617E-07	-268.1151	13.6372	8.791E-08	409.1373	2.931E+10	-0.1898	2467140.	0.000
492.000	8.245E-07	-189.7762	12.0506	4.105E-08	409.0796	2.931E+10	-0.3390	2467140.	0.000
498.000	9.543E-07	-123.5996	9.8562	8.980E-09	409.0309	2.931E+10	-0.3924	2467140.	0.000
504.000	9.323E-07	-71.5213	7.5290	-1.099E-08	408.9925	2.931E+10	-0.3834	2467140.	0.000
510.000	8.225E-07	-33.2273	5.3644	-2.171E-08	408.9643	2.931E+10	-0.3382	2467140.	0.000
516.000	6.718E-07	-7.1005	3.5211	-2.583E-08	408.9450	2.931E+10	-0.2762	2467140.	0.000
522.000	5.124E-07	9.0833	2.0603	-2.563E-08	408.9465	2.931E+10	-0.2107	2467140.	0.000
528.000	3.642E-07	17.6795	0.9788	-2.289E-08	408.9528	2.931E+10	-0.1498	2467140.	0.000
534.000	2.377E-07	20.8801	0.2363	-1.895E-08	408.9552	2.931E+10	-0.0978	2467140.	0.000
540.000	1.369E-07	20.5569	-0.2258	-1.471E-08	408.9549	2.931E+10	-0.0563	2467140.	0.000
546.000	6.125E-08	18.2030	-0.4702	-1.074E-08	408.9532	2.931E+10	-0.0252	2467140.	0.000
552.000	7.995E-09	14.9382	-0.5556	-7.348E-09	408.9508	2.931E+10	-0.003287	2467140.	0.000
558.000	-2.692E-08	11.5517	-0.5398	-4.637E-09	408.9483	2.931E+10	0.008563	1908575.	0.000
564.000	-4.765E-08	8.4708	-0.4799	-2.588E-09	408.9460	2.931E+10	0.0114	1436830.	0.000
570.000	-5.797E-08	5.7988	-0.4040	-1.128E-09	408.9441	2.931E+10	0.0139	1436830.	0.000
576.000	-6.118E-08	3.6253	-0.3184	-1.631E-10	408.9425	2.931E+10	0.0147	1436830.	0.000
582.000	-5.993E-08	1.9783	-0.2314	4.103E-10	408.9412	2.931E+10	0.0144	1436830.	0.000
588.000	-5.626E-08	0.8476	-0.1479	6.995E-10	408.9404	2.931E+10	0.0135	1436830.	0.000
594.000	-5.154E-08	0.2017	-0.0705	8.069E-10	408.9399	2.931E+10	0.0123	1436830.	0.000
600.000	-4.657E-08	0.000	0.000	8.275E-10	408.9398	2.931E+10	0.0112	718415.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
  The above values of total stress are computed for combined axial stress and do not equal the
  actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =      3.0000000 inches
Computed slope at pile head      =     -0.0276967 radians
Maximum bending moment           =      5474532. inch-lbs
Maximum shear force              =        98732. lbs
Depth of maximum bending moment  =    102.0000000 inches below pile head
Depth of maximum shear force     =      0.000000 inches below pile head
Number of iterations             =             14
Number of zero deflection points =              5
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 5.000000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 185000.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	5.0000	0.000	121782.	-0.0424	408.9398	2.931E+10	-844.6667	506.8000	0.000
6.000	4.7454	762589.	116606.	-0.0424	970.8373	2.931E+10	-880.8334	1113.7081	0.000
12.000	4.4918	1493295.	111212.	-0.0421	1509.2423	2.931E+10	-917.0001	1224.9113	0.000
18.000	4.2399	2190650.	105602.	-0.0417	2023.0732	2.931E+10	-953.1669	1348.8422	0.000
24.000	3.9908	2853193.	99774.	-0.0412	2511.2538	2.931E+10	-989.3337	1487.4204	0.000
30.000	3.7452	3479472.	93730.	-0.0406	2972.7139	2.931E+10	-1025.5005	1642.9140	0.000
36.000	3.5038	4068043.	87468.	-0.0398	3406.3893	2.931E+10	-1061.6673	1818.0154	0.000
42.000	3.2675	4617469.	80990.	-0.0389	3811.2221	2.931E+10	-1097.8342	2015.9375	0.000
48.000	3.0368	5126324.	74294.	-0.0379	4186.1610	2.931E+10	-1134.0011	2240.5350	0.000
54.000	2.8124	5593190.	67382.	-0.0368	4530.1615	2.931E+10	-1170.1680	2496.4601	0.000
60.000	2.5949	6016660.	60252.	-0.0356	4842.1860	2.931E+10	-1206.3350	2789.3621	0.000
66.000	2.3847	6395335.	52914.	-0.0344	5121.2042	2.931E+10	-1239.8601	3119.5016	0.000
72.000	2.1824	6727921.	45478.	-0.0330	5366.2636	2.931E+10	-1238.8023	3405.7257	0.000
78.000	1.9884	7014383.	38057.	-0.0316	5577.3365	2.931E+10	-1234.9164	3726.3099	0.000
84.000	1.8030	7254794.	30667.	-0.0302	5754.4780	2.931E+10	-1228.1539	4086.9822	0.000
90.000	1.6265	7449343.	23328.	-0.0287	5897.8273	2.931E+10	-1218.4647	4494.7208	0.000
96.000	1.4592	7598334.	16055.	-0.0271	6007.6087	2.931E+10	-1205.7952	4958.1063	0.000
102.000	1.3012	7702192.	8867.0746	-0.0255	6084.1335	2.931E+10	-1190.0876	5487.7974	0.000
108.000	1.1526	7761456.	1782.9815	-0.0240	6127.8009	2.931E+10	-1171.2768	6097.1888	0.000
114.000	1.0136	7776790.	-5178.7128	-0.0224	6139.1000	2.931E+10	-1149.2880	6803.3345	0.000
120.000	0.8841	7748984.	-11999.	-0.0208	6118.6114	2.931E+10	-1124.0325	7628.2756	0.000
126.000	0.7641	7678952.	-18657.	-0.0192	6067.0098	2.931E+10	-1095.4016	8600.9968	0.000
132.000	0.6536	7567741.	-25133.	-0.0176	5985.0663	2.931E+10	-1063.2579	9760.3979	0.000
138.000	0.5524	7416533.	-31405.	-0.0161	5873.6522	2.931E+10	-1027.4224	11160.	0.000
144.000	0.4603	7226653.	-37450.	-0.0146	5733.7433	2.931E+10	-987.6542	12875.	0.000
150.000	0.3770	6999576.	-43244.	-0.0132	5566.4263	2.931E+10	-943.6176	15018.	0.000
156.000	0.3023	6736938.	-48759.	-0.0118	5372.9074	2.931E+10	-894.8278	17758.	0.000
162.000	0.2360	6440556.	-53966.	-0.0104	5154.5247	2.931E+10	-840.5516	21374.	0.000
168.000	0.1775	6112451.	-58826.	-0.009120	4912.7675	2.931E+10	-779.6160	26356.	0.000
174.000	0.1265	5754891.	-63295.	-0.007906	4649.3071	2.931E+10	-709.9931	33672.	0.000
180.000	0.0826	5370464.	-67308.	-0.006767	4366.0502	2.931E+10	-627.7409	45593.	0.000
186.000	0.0453	4962218.	-70762.	-0.005710	4065.2430	2.931E+10	-523.4780	69329.	0.000
192.000	0.0141	4533999.	-73416.	-0.004738	3749.7194	2.931E+10	-361.2861	153830.	0.000
198.000	-0.0116	4091744.	-73468.	-0.003855	3423.8534	2.931E+10	344.0068	178661.	0.000
204.000	-0.0322	3660944.	-70958.	-0.003062	3106.4275	2.931E+10	492.6947	91885.	0.000
210.000	-0.0483	3247049.	-67766.	-0.002355	2801.4579	2.931E+10	571.1480	70956.	0.000
216.000	-0.0604	2852978.	-64206.	-0.001731	2511.0950	2.931E+10	615.4736	61107.	0.000
222.000	-0.0691	2480415.	-60429.	-0.001185	2236.5803	2.931E+10	643.4924	55903.	0.000
228.000	-0.0747	2130455.	-56518.	-0.000713	1978.7197	2.931E+10	660.3990	53078.	0.000
234.000	-0.0776	1803785.	-52529.	-0.000310	1738.0200	2.931E+10	669.0467	51716.	0.000
240.000	-0.0784	1500791.	-48509.	2.772E-05	1514.7654	2.931E+10	671.2111	51383.	0.000
246.000	-0.0773	1221620.	-44491.	0.000306	1309.0640	2.931E+10	668.0921	51864.	0.000
252.000	-0.0747	966222.	-40505.	0.000530	1120.8798	2.931E+10	660.5507	53055.	0.000
258.000	-0.0709	734385.	-36575.	0.000704	950.0554	2.931E+10	649.2322	54921.	0.000
264.000	-0.0663	525753.	-32724.	0.000833	796.3296	2.931E+10	634.6375	57476.	0.000
270.000	-0.0609	339849.	-28968.	0.000922	659.3500	2.931E+10	617.1662	60777.	0.000
276.000	-0.0552	176085.	-25326.	0.000975	538.6844	2.931E+10	597.1438	64920.	0.000
282.000	-0.0492	33779.	-21810.	0.000996	433.8291	2.931E+10	574.8398	70056.	0.000
288.000	-0.0432	-87841.	-18434.	0.000991	473.6634	2.931E+10	550.4801	76393.	0.000
294.000	-0.0373	-189623.	-15209.	0.000962	548.6597	2.931E+10	524.2548	84226.	0.000
300.000	-0.0317	-272490.	-12148.	0.000915	609.7179	2.931E+10	496.3240	93972.	0.000
306.000	-0.0264	-337426.	-9258.2351	0.000852	657.5651	2.931E+10	466.8199	106224.	0.000
312.000	-0.0215	-385481.	-6550.2313	0.000778	692.9731	2.931E+10	435.8481	121856.	0.000
318.000	-0.0170	-417757.	-3956.5792	0.000696	716.7552	2.931E+10	428.7026	151072.	0.000
324.000	-0.0131	-434506.	-1422.4943	0.000609	729.0958	2.931E+10	415.9923	190454.	0.000
330.000	-0.009718	-436179.	955.0457	0.000520	730.3291	2.931E+10	376.5210	232472.	0.000
336.000	-0.006866	-424199.	3090.6540	0.000432	721.5019	2.931E+10	335.3484	293051.	0.000
342.000	-0.004535	-400050.	4972.8370	0.000348	703.7082	2.931E+10	292.0460	386378.	0.000
348.000	-0.002696	-365297.	6585.5994	0.000269	678.1008	2.931E+10	245.5415	546553.	0.000
354.000	-0.001305	-321621.	7900.5318	0.000199	645.9191	2.931E+10	192.7693	886617.	0.000
360.000	-0.000308	-270932.	8859.3845	0.000138	608.5702	2.931E+10	126.8483	2467140.	0.000
366.000	0.000355	-215615.	8802.2241	8.849E-05	567.8111	2.931E+10	-145.9018	2467140.	0.000

372.000	0.000753	-165502.	7882.8322	4.949E-05	530.8862	2.931E+10	-160.5622	1278766.	0.000
378.000	0.000949	-121131.	6881.0157	2.015E-05	498.1925	2.931E+10	-173.3766	1096568.	0.000
384.000	0.000995	-82974.	5832.4001	-7.356E-07	470.0776	2.931E+10	-176.1619	1062085.	0.000
390.000	0.000940	-51141.	4785.4257	-1.446E-05	446.6216	2.931E+10	-172.8296	1103374.	0.000
396.000	0.000822	-25517.	3771.1665	-2.231E-05	427.7415	2.931E+10	-165.2568	1206755.	0.000
402.000	0.000672	-5837.0261	2811.7349	-2.551E-05	413.2407	2.931E+10	-154.5537	1379619.	0.000
408.000	0.000515	8280.4000	1923.6724	-2.526E-05	415.0410	2.931E+10	-141.4671	1646596.	0.000
414.000	0.000369	17303.	1044.0970	-2.265E-05	421.6892	2.931E+10	-151.7247	2467140.	0.000
420.000	0.000244	20860.	288.2548	-1.874E-05	424.3099	2.931E+10	-100.2227	2467140.	0.000
426.000	0.000144	20804.	-190.1755	-1.448E-05	424.2686	2.931E+10	-59.2541	2467140.	0.000
432.000	7.002E-05	18610.	-454.3093	-1.044E-05	422.6521	2.931E+10	-28.7905	2467140.	0.000
438.000	1.879E-05	15375.	-563.8538	-6.965E-06	420.2687	2.931E+10	-7.7243	2467140.	0.000
444.000	-1.357E-05	11859.	-570.2924	-4.178E-06	417.6779	2.931E+10	5.5781	2467140.	0.000
450.000	-3.135E-05	8541.0303	-514.8820	-2.090E-06	415.2331	2.931E+10	12.8921	2467140.	0.000
456.000	-3.865E-05	5685.1459	-428.5263	-6.346E-07	413.1288	2.931E+10	15.8932	2467140.	0.000
462.000	-3.897E-05	3400.1235	-332.7764	2.951E-07	411.4451	2.931E+10	16.0235	2467140.	0.000
468.000	-3.511E-05	1691.1737	-241.3954	8.162E-07	410.1859	2.931E+10	14.4369	2467140.	0.000
474.000	-2.917E-05	501.5669	-162.0960	1.041E-06	409.3094	2.931E+10	11.9963	2467140.	0.000
480.000	-2.262E-05	-256.2878	-98.1998	1.066E-06	409.1286	2.931E+10	9.3024	2467140.	0.000
486.000	-1.639E-05	-679.1971	-50.0786	9.699E-07	409.4402	2.931E+10	6.7380	2467140.	0.000
492.000	-1.098E-05	-859.3847	-16.3152	8.125E-07	409.5730	2.931E+10	4.5165	2467140.	0.000
498.000	-6.637E-06	-876.7829	5.4213	6.348E-07	409.5858	2.931E+10	2.7290	2467140.	0.000
504.000	-3.366E-06	-795.7384	17.7609	4.636E-07	409.5261	2.931E+10	1.3842	2467140.	0.000
510.000	-1.073E-06	-664.6815	23.2373	3.142E-07	409.4295	2.931E+10	0.4412	2467140.	0.000
516.000	4.039E-07	-517.5886	24.0628	1.932E-07	409.3212	2.931E+10	-0.1661	2467140.	0.000
522.000	1.245E-06	-376.3568	22.0285	1.017E-07	409.2171	2.931E+10	-0.5120	2467140.	0.000
528.000	1.624E-06	-253.4728	18.4885	3.726E-08	409.1266	2.931E+10	-0.6679	2467140.	0.000
534.000	1.692E-06	-154.5773	14.3971	-4.502E-09	409.0537	2.931E+10	-0.6959	2467140.	0.000
540.000	1.570E-06	-80.6981	10.3722	-2.858E-08	408.9992	2.931E+10	-0.6457	2467140.	0.000
546.000	1.349E-06	-30.0470	6.7705	-3.991E-08	408.9619	2.931E+10	-0.5549	2467140.	0.000
552.000	1.091E-06	0.6362	3.7595	-4.292E-08	408.9403	2.931E+10	-0.4488	2467140.	0.000
558.000	8.343E-07	15.1625	1.6169	-4.131E-08	408.9510	2.931E+10	-0.2654	1908575.	0.000
564.000	5.958E-07	20.1313	0.3927	-3.769E-08	408.9546	2.931E+10	-0.1427	1436830.	0.000
570.000	3.820E-07	19.9591	-0.3097	-3.359E-08	408.9545	2.931E+10	-0.0915	1436830.	0.000
576.000	1.927E-07	16.4893	-0.7226	-2.986E-08	408.9519	2.931E+10	-0.0461	1436830.	0.000
582.000	2.366E-08	11.3545	-0.8780	-2.701E-08	408.9482	2.931E+10	-0.005666	1436830.	0.000
588.000	-1.314E-07	6.0131	-0.8006	-2.523E-08	408.9442	2.931E+10	0.0315	1436830.	0.000
594.000	-2.791E-07	1.8035	-0.5056	-2.443E-08	408.9411	2.931E+10	0.0668	1436830.	0.000
600.000	-4.246E-07	0.000	0.000	-2.425E-08	408.9398	2.931E+10	0.1017	718415.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
The above values of total stress are computed for combined axial stress and do not equal the
actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 5:

Pile-head deflection	=	5.0000000	inches
Computed slope at pile head	=	-0.0424318	radians
Maximum bending moment	=	7776790.	inch-lbs
Maximum shear force	=	121782.	lbs
Depth of maximum bending moment	=	114.0000000	inches below pile head
Depth of maximum shear force	=	0.000000	inches below pile head
Number of iterations	=	22	
Number of zero deflection points	=	5	

Summary of Pile Response(s)

Definitions of Pile-Head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

Load Case No.	Load Type No.	Condition 1 V(lbs) or y(inches)		Condition 2 in-lb, rad., or in-lb/rad.	Axial Load lbs	Pile-Head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-Head Rotation radians
1	4	y = 0.2500	M =	0.000	185000.	0.25000000	970478.	27486.	0.00000000
2	4	y = 0.5000	M =	0.000	185000.	0.50000000	1570892.	39342.	0.00000000
3	4	y = 1.0000	M =	0.000	185000.	1.00000000	2541005.	56322.	0.00000000
4	4	y = 3.0000	M =	0.000	185000.	3.00000000	5474532.	98732.	0.00000000
5	4	y = 5.0000	M =	0.000	185000.	5.00000000	7776790.	121782.	0.00000000

Summary of Warning Messages

The following warning was reported 2079 times

**** Warning ****

An unreasonable input value for shear strength has been specified for a soil defined using the soft clay criteria. The input value is greater than 8.68 psi (1,250 psf). You should check your input data for correctness.

LATERAL RESISTNACE OF ABUTMENT PILE CAP

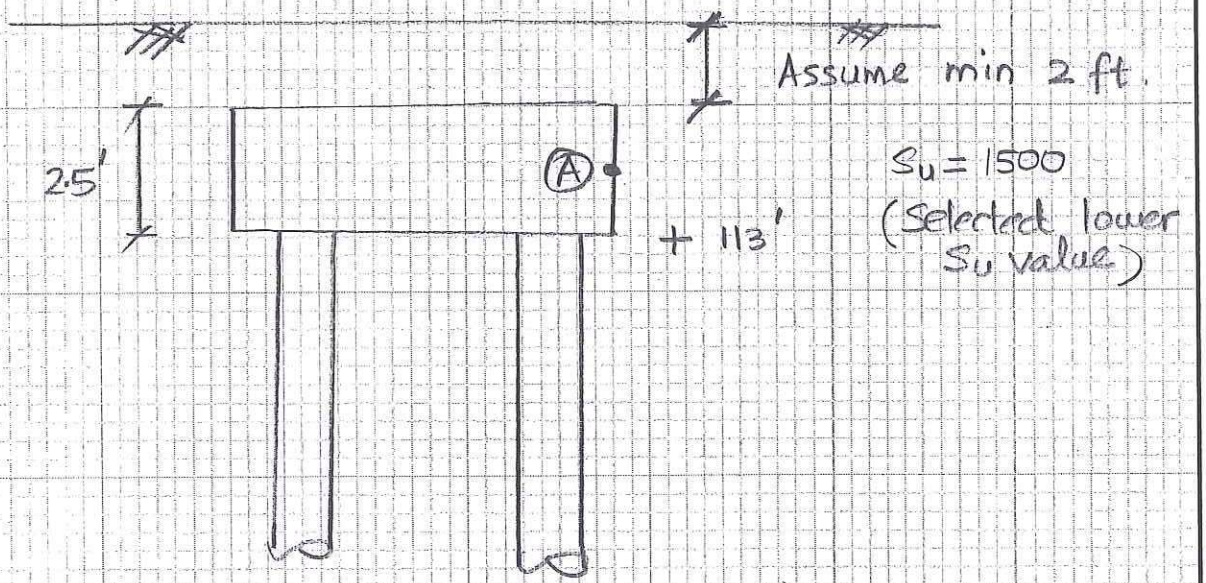
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV WIDENING - SEGMENT 2 Project No. 11-137

By Ranjan Date 2/29/12 Checked By Andy Date 3/5/12 Sheet 1 of 1

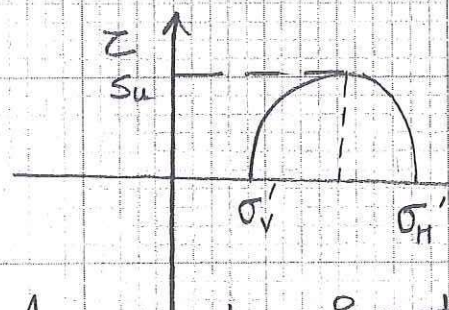
Passive Resistance at Abutment pile cap



(A) Assume fine-grained soils (S_u = 1500 psf)

At point A, vertical overburden stress

$$\sigma_V' = 3.25 \times 120 = 390 \text{ psf}$$



$$\therefore \sigma_H' = \sigma_V + 2 S_u$$
$$= 390 + (2 \times 1500)$$
$$= 3390 \text{ psf}$$

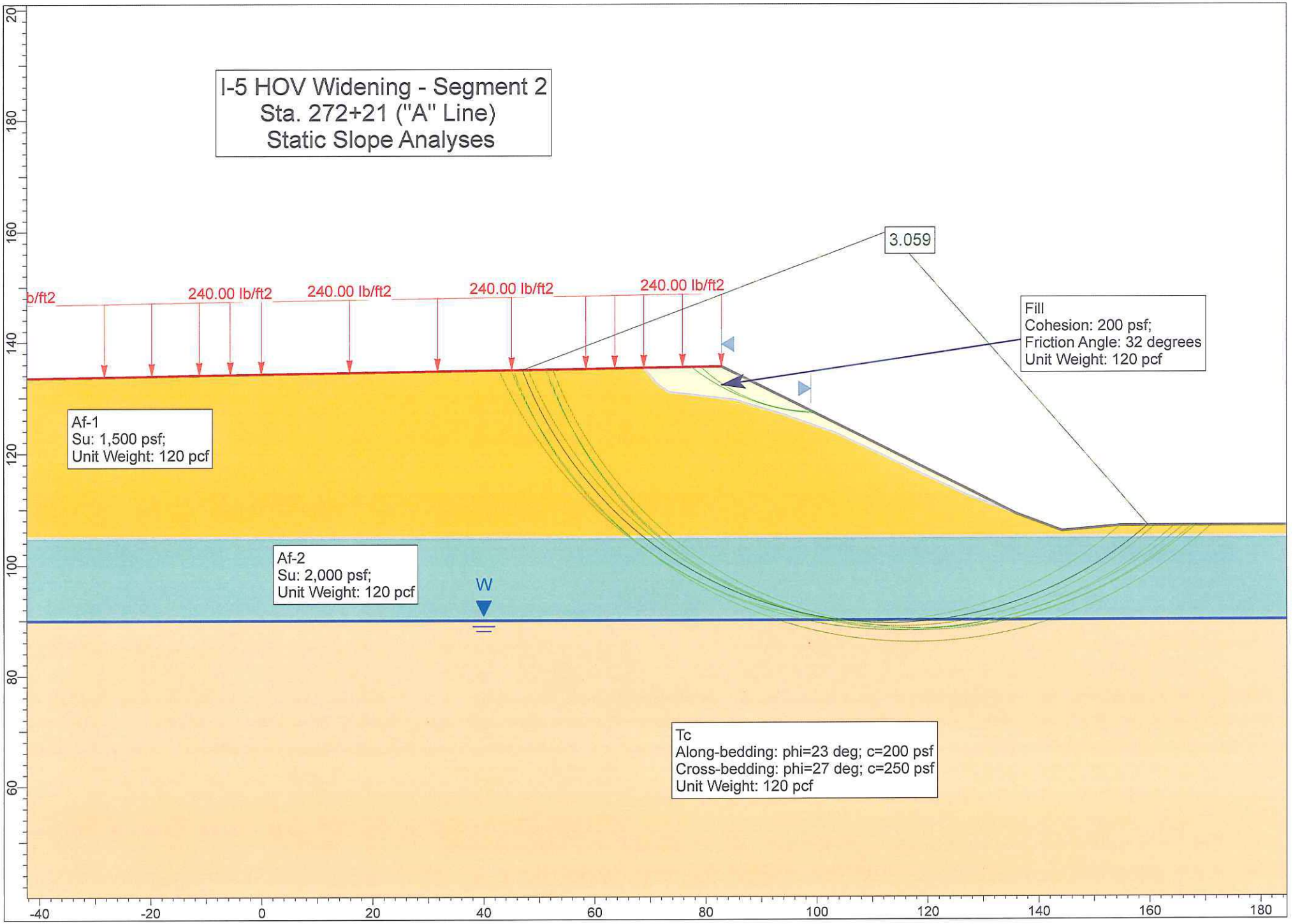
(B) Assume $\phi = 32^\circ$ materials

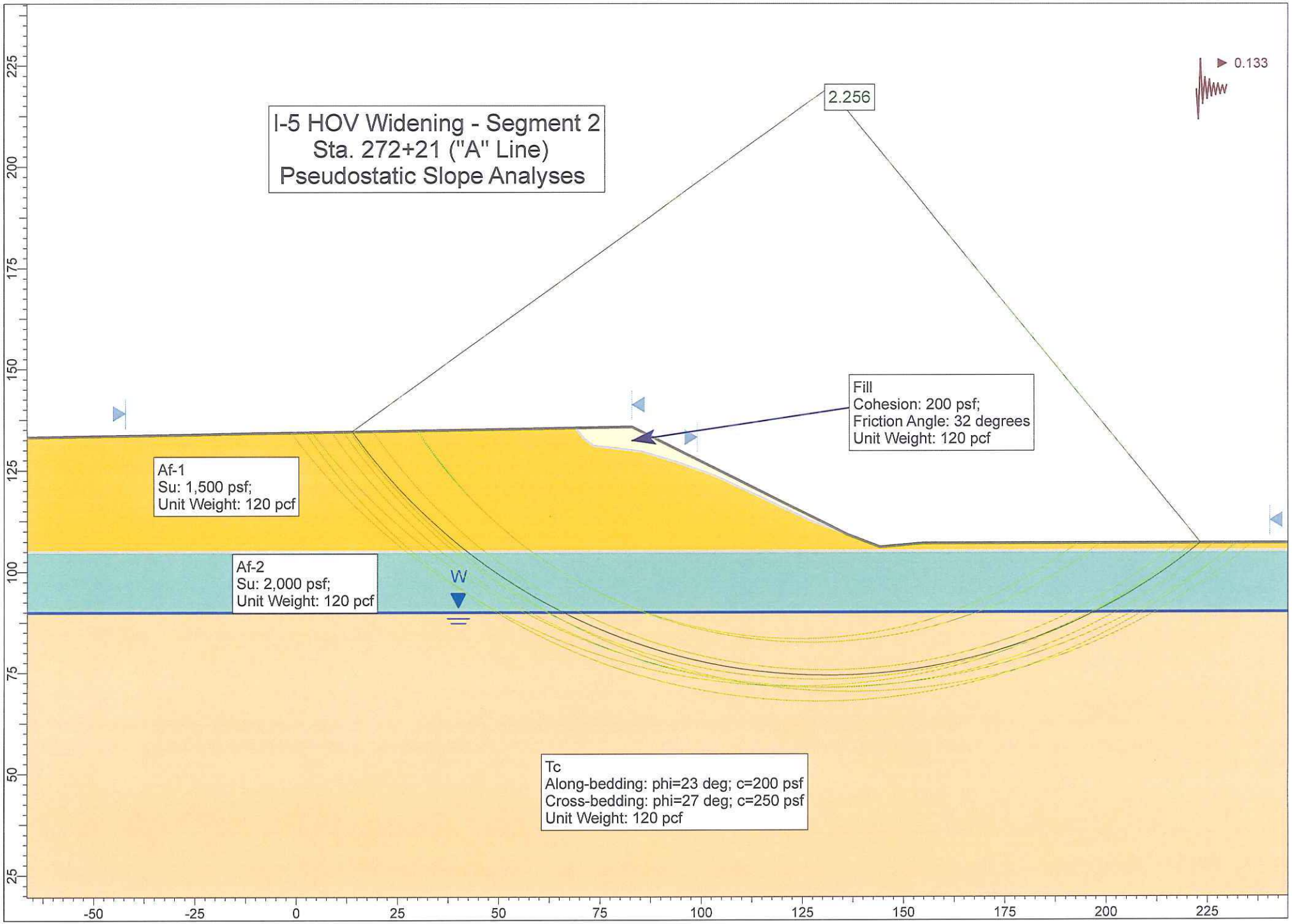
Using Rankine Method, $K_p = 3.25$

$\therefore$ Equivalent fluid pressure = $3.25 \times 120 = 390$ psf/ft

$\Rightarrow$ SELECT Equivalent fluid pressure of 390 psf/ft

SLOPE STABILITY


I-5 HOV Widening - Segment 2
Sta. 272+21 ("A" Line)
Static Slope Analyses
3.059
b/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
Fill
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Af-1
Su: 1,500 psf;
Unit Weight: 120 pcf
Af-2
Su: 2,000 psf;
Unit Weight: 120 pcf
W
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
20
180
160
140
120
100
80
60
-40
-20
0
20
40
60
80
100
120
140
160
180


I-5 HOV Widening - Segment 2
Sta. 272+21 ("A" Line)
Pseudostatic Slope Analyses
0.133
2.256
Fill
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Af-1
Su: 1,500 psf;
Unit Weight: 120 pcf
Af-2
Su: 2,000 psf;
Unit Weight: 120 pcf
W
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
225
200
175
150
125
100
75
50
25
-50
-25
0
25
50
75
100
125
150
175
200
225

Appendix D

CALIFORNIA DEPARTMENT OF TRANSPORTATION REVIEW COMMENTS AND EMI RESPONSES

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

TO: MR. LAM NGUYEN
Office of Special Funded Projects (OSFP)
Attention: Ms. LUQI YANG
Fax: (916) 227-8683

DATE: March 25,2013

FILE: 12 ORA 05 4.97
District County Route Post mile

FDN REPORT BY: Earth Mechanics, Inc DATED: March 18, 2013

Avenida Vaquero UC (Widen)
Structure Name

GENERAL PLAN DATED: January 14, 2013 FDN PLAN DATED: January 14, 2013

12-0F96C01 55-0223
EA Number Bridge Number

Submittal (*Check One*): [ ] 1st [ ] 2nd [ ] 3rd [X] 4th [ ] Other:

The Office of Geotechnical Design South 1 (OGDS-1) has reviewed the submittal titled "Revised Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, City of San Clemente, Orange County, California, 12-Ora-05, PM 4.97, Caltrans Project ID 1200020278 (EA No 12-0F96C01)", prepared by Earth Mechanics, Inc, dated March 18, 2013.

During our review, we made reference to the following:

- "Revised Final Structure Foundation Report for Avenida Vaquero UC (Widen), Bridge No. 55-0223, San Clemente, Orange County, California, 12-Ora-05, PM 4.97, Caltrans Project ID 1200020278, EA No 12-0F96C01", prepared by Earth Mechanics, Inc, dated February 15, 2013.
- Caltrans OGDS-1 review comment memorandum dated September 14, 2012.
- Caltrans OGDS-1 review comment memorandum dated November 5, 2012.
- Caltrans OGDS-1 review comment memorandum dated March 15, 2013.

The consultants have adequately responded to OGDS-1 review comments.

Please call Sharid Amiri at (949)724-2599, if you have any questions.

Approval:

Reviewed By: Sharid Amiri, PhD, P.E.
Geotechnical Design South-1

(C1) Approved
Office of Special Funded projects

Cc: OGDS (Sacramento) DES Office of Specifications and Estimates (All Reviews) OSC R.E Pending File

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

March 18, 2013

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Response to Comment on Revised Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, City of San Clemente, Orange County, California 12-Ora-5, PM 4.97, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)***

Dear Mr. Montes:

The Caltrans Office of Geotechnical Design South 1 (OGDS-1) reviewed the Revised Final Structure Foundation Report, dated February 15, 2013, and provided a comment in a memorandum dated March 15, 2013. A copy of the memorandum is provided in Attachment 1 for reference. EMI prepared the response to the Caltrans comment which is provided below. For convenience, the Caltrans comment is shown below in italics followed by the EMI response.

The response to the Caltrans comment has been incorporated into the Revised Final Structure Foundation Report.

1. *Revise the Reference list in the subject foundation report to include Robertson el.al paper on CPT dated 2009.*

The reference list in the subject foundation report has been revised to include Canadian Journal of Geotechnical Engineering by Robertson dated 2009.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions please call us.

Sincerely,

EARTH MECHANICS, INC.

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

Wendy A. Drummond, CEG 2049
Senior Geologist

GJG/gjg,avk,wad

Attachment:

Attachment 1 – Review Comment by Caltrans Office of Geotechnical South 1 (OGDS-1), Dated March 15, 2013, on the Revised Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, Prepared by Earth Mechanics, Inc., Dated February 15, 2013.

Reference:

Revised Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, City of San Clemente, Orange County, California; 12-Ora-5, PM 4.97, Caltrans Project No. 1200020278 (EA No. 12-0F96C01); Prepared by Earth Mechanics, Inc., Dated February 15, 2013.

ATTACHMENT 1

Review Comment by Caltrans Office of Geotechnical South 1 (OGDS-1), Dated March 15, 2013, on the Revised Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, Prepared by Earth Mechanics, Inc., Dated February 15, 2013

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

TO: MR. LAM NGUYEN
Office of Special Funded Projects (OSFP)
Attention: Ms. LUQI YANG
Fax: (916) 227-8683

DATE: March 15,2013

FILE: 12 ORA 05 4.97
District County Route Post mile

FDN REPORT BY: Earth Mechanics, Inc DATED: February 15, 2013

Avenida Vaquero UC (Widen)
Structure Name

GENERAL PLAN DATED: January 14, 2013 FDN PLAN DATED: January 14, 2013

12-0F96C01 55-0223
EA Number Bridge Number

Submittal (*Check One*): [ ] 1st [ ] 2nd [X] 3rd [ ] 4th [ ] Other:

The Office of Geotechnical Design South 1 (OGDS-1) has reviewed the submittal titled "Revised Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, City of San Clemente, Orange County, California, 12-Ora-05, PM 4.97, Caltrans Project ID 1200020278 (EA No 12-0F96C01)", prepared by Earth Mechanics, Inc, dated February 15, 2013.

During our review, we made reference to the following:

- "Final Structure Foundation Report for Avenida Vaquero UC (Widen), Bridge No. 55-0223, San Clemente, Orange County, California, 12-Ora-05, PM 4.97, Caltrans Project ID 1200020278, EA No 12-0F96C01", prepared by Earth Mechanics, Inc, dated September 28, 2012.
- Caltrans OGDS-1 review comment memorandum dated September 14, 2012.
- Caltrans OGDS-1 review comment memorandum dated November 5, 2012.

We have the following comment:

- Revise the Reference list in the subject foundation report to include Robertson el.al paper on CPT dated 2009.

Please call Sharid Amiri at (949)724-2599, if you have any questions.

Approval:

Reviewed By: Sharid Amiri, PhD, P.E.
Geotechnical Design South-1

(C3) Not Approved
Office of Special Funded projects

Cc: OGDS (Sacramento) DES Office of Specifications and Estimates (All Reviews) OSC R.E Pending File

Ranjan Gunaranjan

From: Sharid Amiri <sharid.amiri@dot.ca.gov>
Sent: Friday, February 08, 2013 10:37 AM
To: Luqi Yang
Cc: casey.weber@aecom.com; Ranjan Gunaranjan; Andrew Korkos; Ahmed Abou-Abdou; Kamran Mazhar
Subject: Fw: I-5 HOV Segment 2 - Avenida Vaquero UC Widening - Response to Caltrans Comments Letter
Attachments: RESPONSE Avenida Vaquero UC Bridge 1-10-13.pdf

Correct request date was January **15th**, 2013 . sorry for the typo.

Sharid K. Amiri (PhD, PE)

Senior Transportation Engineer
D-12 Oversight
Geotechnical Design South-1
3347 Michelson Drive, Suite 100
Irvine, Ca. 92612
Tel. (949) 724-2599

----- Forwarded by Sharid Amiri/D12/Caltrans/CAGov on 02/08/2013 10:34 AM -----

Sharid Amiri/D12/Caltrans/CAGov

02/08/2013 10:30 AM

To: Luqi Yang/HQ/Caltrans/CAGov

cc: "casey.weber@aecom.com" <casey.weber@aecom.com>, Ranjan Gunaranjan <ranjan@earthmech.com>, Andrew Korkos <A.Korkos@earthmech.com>, Ahmed Abou-Abdou/D12/Caltrans/CAGov@DOT, Kamran Mazhar/D12/Caltrans/CAGov@DOT

Subject: RE: I-5 HOV Segment 2 - Avenida Vaquero UC Widening - Response to Caltrans Comments Letter

Luqi

In response to your request dated January 5th, 2013, I have reviewed the "response to our comments letter" vis a vis the subject bridge structure prepared by EMI consultants. The consultants have adequately responded to our review comments. We will review the revised Foundation Report and the plans submittal once is prepared and submitted to our office.

any questions please let me know.

Thank you

Sharid K. Amiri (PhD, PE)

Senior Transportation Engineer
D-12 Oversight
Geotechnical Design South-1
3347 Michelson Drive, Suite 100
Irvine, Ca. 92612
Tel. (949) 724-2599

Andrew Korkos <A.Korkos@earthmech.com>

Andrew Korkos <A.Korkos@earthmech.com>

01/10/2013 05:19 PM

To "casey.weber@aecom.com" <casey.weber@aecom.com>

cc "Sharid Amiri (sharid.amiri@dot.ca.gov)" <sharid.amiri@dot.ca.gov>, Ranjan Gunaranjan <ranjan@earthmech.com>

Subject RE: I-5 HOV Segment 2 - Avenida Vaquero UC Widening - Response to Caltrans Comments Letter

Sorry…
Here's the attachement.

Andy
EARTH MECHANICS, INC.
17800 Newhope Street, Suite B, Fountain Valley, California 92708
Tel: (714) 751-3826
Fax: (714) 751-3928
www.earthmech.com
****

From: Andrew Korkos
Sent: Thursday, January 10, 2013 5:15 PM
To: 'casey.weber@aecom.com'
Cc: Sharid Amiri (sharid.amiri@dot.ca.gov); Ranjan Gunaranjan
Subject: I-5 HOV Segment 2 - Avenida Vaquero UC Widening - Response to Caltrans Comments Letter

Casey, attached is our response letter for your January 14 submittal package.

Sharid, please review our responses to comments. Per our meeting, EMI will create a revised foundation report that will include the responses to comments.

Please feel free to call me if you have any questions.

Thanks,
Andy
EARTH MECHANICS, INC.
17800 Newhope Street, Suite B, Fountain Valley, California 92708
Tel: (714) 751-3826
Fax: (714) 751-3928
www.earthmech.com
****

(See attached file: RESPONSE Avenida Vaquero UC Bridge 1-10-13.pdf)

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

January 10, 2013

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Response to Comments on Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, City of San Clemente, Orange County, California 12-Ora-5, PM 4.97, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)***

Dear Mr. Montes:

The Caltrans Office of Geotechnical Design South 1 (OGDS-1) reviewed the Final Structure Foundation Report, dated September 28, 2012, and provided comments in a memorandum dated November 5, 2012. A copy of the memorandum is provided in Attachment 1 for reference. EMI prepared responses to the Caltrans comments which are provided below. For convenience, the Caltrans comments are shown below in italics followed by EMI responses. Upon approval of the responses, the Final Foundation Report will be revised to include the responses.

1. *Title Sheet addressed to AECOM: It refers to a review and concurrence for the response to Caltrans OGDS-1 September 14, 2012 review comments. Include the date of the meeting where over the shoulder meeting was conducted and the name of the oversight engineer. In addition take out the word concurrence from the text. Since over the shoulder review is not considered acceptance or concurrence. Revise "Reviewer" to "Oversight Geo-Professional."*

The second paragraph of the title sheet (letter) will be revised as follows:

"A Structure Foundation Report for the proposed bridge widening, dated April 24, 2012, was submitted to Caltrans for review. The Caltrans Office of Geotechnical Design South 1 (OGDS-1) reviewed the report and provided comments in a memorandum dated September 14, 2012. EMI prepared responses to the OGDS-1 review comments, which were reviewed by the Caltrans Oversight Geo-Professional at the over-the-shoulder review meeting conducted at the EMI office on September 20, 2012. The EMI oversight engineers, Mr. Lino Cheang and Mr. Raja Pirathiviraj, and the Caltrans Oversight Geo-Professional, Dr. Sharid Amiri, were the attendees of this over-the-shoulder review meeting. Responses to Caltrans comments have been incorporated into this Final Foundation Report. Caltrans review comments and EMI responses are provided in Appendix D."

2. *Existing geotechnical information was reviewed and collected to prepare the subject report. Revise Section 1.2 of the subject report accordingly.*

Section 1.2 of the Final Foundation Report (Page 1) will be revised as follows:

"1.2 Scope of Work

The geotechnical tasks provided for the proposed bridge widening include:

- Collect and review existing geotechnical information available for the subject site.
- Perform site-specific field investigation including excavating and logging four exploratory boreholes and conducting one Cone Penetration Test (CPT) sounding.
- Collect representative samples of subsurface materials.
- Perform laboratory soil tests on selected soil and bedrock samples.
- Perform geotechnical engineering analyses and development of lateral pressures.
- Develop construction recommendations.
- Prepare this report presenting our findings, conclusions, and recommendations."

3. The site investigation must be site specific and stated as such in the report. Revise Section 1.2 of the subject report accordingly.

Amended Section 1.2 above, which will be added to the revised foundation report, includes a statement indicating that the field investigation was site-specific.

4. Project description does not make any reference to the other bridge structures that are part of the subject project. Revise Section 1.3 accordingly.

As part of the I-5 HOV Widening Project, the proposed improvements in Segment 2 include only one bridge widening: Avenida Vaquero UC (Bridge No. 55-0223); no other bridge structures are proposed within Segment 2. However, other bridge structures are proposed to be widened or replaced in Segments 1 and 3, which are being designed under other contracts. The Avenida Pico UC (Bridge No. 55-0207) structure is proposed to be replaced in Segment 1, while the 5/N5-N1 Connector Separation (Bridge No. 55-0226), the Route 5/1 Separation (Bridge No. 55-0510), and the Camino Capistrano UC (Bridge No. 55-0227) are proposed to be widened in Segment 3.

The second paragraph in Section 1.3 of the Final Foundation Report will be revised as follows:

"To accommodate the two additional HOV lanes, the I-5 mainline will be widened in the northbound (NB) and southbound (SB) directions. Major improvements proposed in Segment 2 include widening the Avenida Vaquero UC, ramp improvements at the Avenida Vista Hermosa and Camino de Estrella interchanges, several earth retaining walls, sound walls, and new pavement. Other improvements in Segment 2 include sign structures, utility lines, drainage structures, lighting, landscaping, and roadway striping. Several other bridge structures are proposed to be widened or replaced in Segments 1 and 3 as part of the subject project. The Avenida Pico UC (Bridge No. 55-0207) structure is proposed to be replaced in Segment 1, while the 5/N5-N1 Connector Separation (Bridge No. 55-0226), the Camino Capistrano UC (Bridge No. 55-0227), and the Route 5/1 Separation (Bridge No. 55-0510) are proposed to be widened in Segment 3. The subject foundation report addresses only the proposed widening of the Avenida Vaquero UC (Bridge No. 55-0223)."

5. Revise Section 1.4 to include a table for "As-Built Foundation Data" with the relevant information.

Section 1.4 of the Final Foundation Report (Page 3) will be revised as follows:

"1.4 Existing Bridge Information

This existing UC structure was constructed in 1983 to replace an older bridge. The existing UC is a single span structure, which has a total length of approximately 174 feet measured along the I-5 centerline and a width of approximately 140 feet. The existing bridge was constructed with cast-in-place pre-stressed concrete box girders. Based on the as-built plans, the existing UC is supported on 16-inch diameter Cast-in-Drilled-Hole (CIDH) piles. Pertinent foundation data as shown on the as-built plans is summarized as follows.

As-Built Foundation Data

Support	Pile Type	Design Vertical Load (tons)	Specified Pile Tip Elevation (ft)
Abutment 1	16-inch diameter CIDH piles	70	+93.0
Abutment 2			+85.0

6. Revise the notes in Table 1, to include the appropriate Survey Datum.

Revised Table 1, which will be inserted into the Foundation Report, is shown below.

TABLE 1. BOREHOLE AND CPT EXPLORATION INFORMATION

Boring / CPT Number	Easting	Northing	Station ("A" Line) (feet)	Offset (feet)	GSE (feet)	GWE (feet)	Boring/ CPT Depth (feet)	Method	Figure No.
A-11-219	6,136,646	2,111,089	272+09	64.2 LT	+133.5	NE	91.5	HSA	2
A-11-220	6,136,719	2,111,192	272+06	61.5 RT	+135.7	NE	90.5	HSA	2
A-11-221	6,136,532	2,111,317	274+29	62.2 RT	+130.5	NE	91.5	HSA	2
A-11-222	6,136,446	2,111,223	274+51	63.5 LT	+127.9	+73.9	90.3	HSA	2
CPT-11-222	6,136,441	2,111,226	274+57	63.6 LT	+127.8	NM	99.6	CPT	2

Notes: 1. Exploration locations were field surveyed using California Coordinate System (CCS) 83 (1991.35) Zone 6 and vertical datum NAVD 1988, and information was provided to EMI by AECOM.
2. GSE = Ground Surface Elevation (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Elevation (approximate); NE = Not Encountered; NM = Not Measured.
4. HSA = Hollow-Stem Auger Boring; CPT = Cone Penetration Test Sounding.

7. Revise Section 2 to include survey conducted for each boring and CPT.

Section 2.2 of the Final Foundation Report (Page 3) will be revised as follows:

"2.2 Field Investigation

To supplement existing subsurface information, a site-specific field investigation was conducted at the bridge site between October 10 and October 13, 2011. Four exploratory boreholes (A-11-219 through A-11-222) and one Cone Penetration Test (CPT) sounding (CPT-11-222) were conducted specifically for the proposed UC widening. The exploration locations were field surveyed using California Coordinate System (CCS) 83 (1991.35) Zone 6 and vertical datum NAVD 1988 to obtain coordinates and elevations and establish stations and offsets. Exploration information, including Boring/CPT number, northing, easting, station, offset, ground surface elevation, exploration depth, and groundwater elevation are summarized in Table 1. The locations of the boreholes and the CPT soundings are shown on Figure 2 and on the LOTB sheets provided in Appendix A."

8. Revise Section 2.0 of the subject report to include a narrative as to how the hammer efficiency is assessed per Caltrans Guidelines.

The first paragraph in Section 2.2 of the Final Foundation Report (Page 3) will be revised as follows:

"2.2.1 Exploratory Boreholes

Boreholes were conducted for the purpose of collecting samples of subsurface earth materials and logging subsurface conditions at the bridge location. The boreholes were excavated by 2R Drilling Inc. under subcontract with EMI, using a truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers. Subsurface materials and conditions were logged and samples of subsurface materials were collected. Small soil and bedrock samples were collected from borings generally at 5-foot vertical intervals by means of split-spoon drive samplers; the Standard Penetration Test (SPT) sampler and the Modified California Drive (MCD) sampler were used to collect small disturbed and relatively undisturbed samples, respectively. The SPT sampler (1.4-inch ID) and MCD sampler (2.5-inch ID) were driven a total depth of 18 inches or until refusal, using a 140-pound automatic hammer falling 30 inches. The blowcounts for the last 12 inches of penetration were recorded on the boring logs. The SPT hammer energy measurements for this drill rig were performed by SPT CAL under subcontract with 2R Drilling, Inc. on April 14, 2011. Results of the SPT hammer energy measurements indicate that the average SPT hammer efficiency [i.e., average energy transfer ratio (ETR)] is approximately 82%."

The SPT hammer energy report will be included in an appendix in the revised foundation report.

9. Revise Section 2.3 to include a Table for the laboratory tests performed with type of test, applicable test method (i.e. ASTM, CT designation) and purpose of the test.

Section 2.3 of the foundation report will be revised to include the table below.

Explanation of Laboratory Tests Performed

Type of Test	Applicable Test Method	Purpose
Unit Weight	ASTM D 4767	Estimate in-situ unit soil weight
Moisture Content	ASTM D 2216	Estimate in-situ soil moisture content
No. 200 Wash	ASTM D 1140	Determine the percentage of fine grained particles of soil
Sieve Analysis & Hydrometer	ASTM D 422	Determine particle size distribution of soil
Atterberg Limits	ASTM D 4318	Determine plasticity of fine-grained soil
Consolidation	ASTM D 2435	Determine compressibility of fine-grained soil
Direct Shear	ASTM D 3080	Determine strength parameters of coarse-grained soil
Unconsolidated-Undrained Triaxial	ASTM D 2850	Estimate strength parameters of fine-grained soil
Compaction	CT 216	Determine maximum density and optimum moisture of soil
Soil pH	CT 532/643	Determine corrosion potential of soil
Minimum Resistivity	CT 532/643	Determine corrosion potential of soil
Sulfate Content	CT 417	Determine corrosion potential of soil
Chloride Content	CT 422	Determine corrosion potential of soil

Notes: 1. ASTM = American Society for Testing and Materials.
2. CT = California Test Method.

10. Revise Section 4.0 to include a separate subsection (i.e. 4.3) for Idealized Soil Profile along with the Table 2 and the corresponding narrative.

Section 4.3, shown below, will be added to the Foundation Report.

"4.3 Idealized Soil Profile

Based on information collected from the four site-specific soil borings (A-11-219, A-11-220, A-11-221, and A-11-222) and one CPT sounding (CPT-11-222), an idealized soil profile for foundation analysis and design was developed along the proposed bridge alignment. The soil profile and design strength parameters are presented in Table 2 and shown graphically in Figure 3A. In Table 2, the drained soil strength parameters (friction angle and cohesion) are based on the database of results obtained from all direct shear tests performed for the overall Segment 2 project. The design friction angle and cohesion are based on the ultimate shear strength parameters obtained from the direct shear tests. The undrained shear strength parameters, shown in Table 2, are based on the results of unconsolidated-undrained triaxial tests. It should be noted that the design strength parameters obtained from the direct shear and unconsolidated-undrained triaxial tests are lower than shear strength values that would be estimated using SPT or CPT correlations."

11. Insert the Idealized Soil Profile in the main report where appropriate.

Figure 3A, showing the idealized soil profile and design strength parameters, was prepared by EMI and is provided in Attachment 3 of this addendum. The idealized soil profile figure will be added to the revised foundation report.

12. Revise the Idealized Soil Profile to include station line.

Figure 3A, showing the idealized soil profile with the station line, will be added to the revised foundation report.

13. Designate where the supports are located on the Idealized Soil Profile.

Figure 3A, showing the locations of the supports, will be added to the revised foundation report.

14. Revise the Table of Contents accordingly.

The table of contents will be revised to reflect the format changes discussed herein.

15. Was the CPT calibrated against the borings performed at the site? Explain and provide justification.

CPT-11-222 was calibrated against the nearby boring A-11-222 performed at the site. Based on the CPT sounding, at the northern abutment (Abutment 2) area, stratigraphy consists of about 40 feet of stiff to hard clayey and silty artificial fills overlying medium stiff to very stiff clayey and silty alluvial soils down to about El. +40 feet. The alluvium is underlain by sedimentary bedrock of the Capistrano formation. The soil behavior type shown on the CPT sounding log is consistent with the observations from the nearby boring A-11-222.

The undrained shear strength values obtained from unconsolidated-undrained triaxial tests match the lower bound shear strength values that were estimated using CPT correlations. Therefore, the design strength parameters, shown in Table 2, were conservatively selected based on the results of the unconsolidated-undrained triaxial tests and lower-bound strengths shown in the CPT log.

In addition, the small-strain shear wave velocity (Vs30) measured by the seismic cone penetrometer used in Sounding CPT-11-222 was used to normalize the Vs30 values calculated using correlations with SPT blowcounts obtained from other borings drilled for this bridge.

16. How was the cone factor Nk as it relates to the subject CPT investigation evaluated? Explain and provide justification.

Based on the CPT output file provided in Appendix C of the Final Foundation Report, an Nk value of 15 was used in estimating the undrained shear strength values using CPT correlation, which is the mid value of typical Nk values that range between 10 and 20 indicated in the CPT guidelines by Robertson (2009). Sufficient data does not exist to modify the Nk value for local conditions.

17. Explain how the clayey soil at depth of approximately 80 feet is designated as normally consolidated for the subject site.

Based on three consolidation tests, conducted on samples collected from the borings at the subject bridge site, some clayey soils are normally to under-consolidated while other clays are slightly over-consolidated. The foundation report does not explicitly indicate that all clayey soils are normally consolidated.

18. Explain why Nk values typically used for normally consolidated clay is used for the subject site where the soil is over-consolidated clay is

Please see responses to Comment Nos. 16 and 17.

19. Include the legend LOTB (Log of Test Boring) sheet in the subject report where appropriate.

The legend sheets for the LOTB (2010 Caltrans Standard Plans Sheets A10F and A10G) will be included in the revised foundation report.

20. Explain what is meant by "original grade elevation" in Table 5.

"Original Grade Elevation" in the original Table 5 is incorrect. "Original Grade Elevation" should be "Finished Grade Elevation." Revised Table 5, that will be included in the Foundation Report, is shown below.

Table 5. Foundation Design Data Sheet

Support No.	Design Method	Pile Type	Finished Grade Elevation (feet)	Cut-off Elevation (feet)	Pile Cap Size (feet)		Permissible Settlement under Service Load (inch)	Number of Pile per Support
					B	L		
Abut 1 Right	WSD	24" CIDH	124.1	118.1	9.5	17.0	1	5
Abut 1 Left	WSD	24" CIDH	121.7	114.9	9.5	17.0	1	5
Abut 2 Right	WSD	24" CIDH	117.0	114.4	9.5	17.0	1	5
Abut 2 Left	WSD	24" CIDH	116.0	111.4	9.5	17.0	1	5

21. Refer to the CPT data and calculate the bearing capacity and the consolidation settlement magnitude when spread footing is considered. Explain why spread footing cannot be considered based on the engineering calculation derived from the CPT.

The CPT data shows that the lower-bound undrained shear strength is equivalent to the strength obtained from laboratory tests, which was used in the analysis to determine bearing capacity. The CPT data was not used to evaluate consolidation settlement because there is only one CPT sounding performed at one corner of the bridge. The primary purpose of the CPT sounding, conducted for the bridge, was to estimate shear wave velocity and assess liquefaction potential.

Spread footings are not recommended as a foundation for the Avenida Vaquero Undercrossing abutments due to higher settlement estimates caused by high footing pressures at the abutments. Spread footing settlement is estimated using the AASHTO LRFD Equation 10.6.2.4.2-3, which is allowed for use by current LRFD standards. In addition, spread footings were not recommended because of possible differential settlement due to significantly different subsurface conditions between the two abutments, and, non-uniform subsurface conditions at Abutment 1.

22. The settlement calculation shown for the spread footing is based on the soil upper layer elevation of 130 feet. The bottom of the footing elevation on the Foundation Plan sheet indicates much lower elevation. Reconcile and explain.

Spread footing settlement was recalculated using the deeper footing elevation shown on the Foundation Plans. Based on the analysis, the settlement is on the order of 2.8 inches for no overexcavation and 2.1 inches for 5 feet of overexcavation. Overexcavation of 5 feet adjacent to the existing bridge foundations is not recommended; therefore, the recommendation is to support the proposed bridge on pile foundations. The revised spread footing settlement calculation is provided in Attachment 4 and will be provided in the revised foundation report.

23. Why CPT data was not used in part for evaluation of the design parameters?

CPT data was used in assessing the in-situ shear strength and subsurface conditions. Although the CPT data shows that there are layers with higher shear strengths, the CPT data also shows soil layers with lower strengths that are equivalent to the strengths selected for the idealized soil profile. Our rationale was to use lower-bound strengths from the CPT data as well as strength data from the UU triaxial and direct shear tests.

24. Compare the in-situ data interpreted by CPT with the laboratory tests values and come up with idealized strength parameters.

Please see response to Comment No. 23.

25. Why idealized soil profile soil strength characterization in Table 2 is based only on the SPT, when CPT was also conducted to characterize the subsurface soil?

Please see response to Comment No. 23.

26. The pile cut off elevation at abutment 2 falls well below the elevation 130. Clarify why idealized soil profile from elevation 130 to 90 is lumped as one layer.

The existing grade elevations at the site-specific borings and CPT sounding vary between about +128 ft and +130 ft. Based on the boreholes, stratigraphy at Abutment 2 includes about 40 feet of artificial fill relative to the existing ground surface. Blowcounts within the upper 40 feet of fill vary erratically between 11 and 34, and are relatively consistent within the 40-ft thick layer. As a result, we conservatively used a lower-bound shear strength value for the entire fill layer.

27. Address abutment 1 by referring to the comment 25 (above).

A CPT sounding was not performed at Abutment 1. Shear strengths were selected based on the laboratory testing. The subsurface conditions at Abutment 1 are different than those at Abutment 2; bedrock was encountered at higher elevations at Abutment 1 compared to Abutment 2.

28. What version of Caltrans SDC (Seismic Design Criteria) is being referred to in Section 5.6.2 of the subject report? The reference is missing in the Reference Section of the subject report. Revise accordingly.

The horizontal movement at which the maximum passive pressure is expected to be fully mobilized can be determined following the procedure outlined in Section 7.8.1 of the Caltrans SDC (2010c). The Section 5.6.2 of the Final Foundation Report (Page 21) is revised as follows and will be included in the revised foundation report.

"5.6.2 Passive Resistance of Abutment Wall Backfill

Under seismic loading, an ultimate passive earth pressure of 5 ksf may be used for the approach backfill and abutment walls with a height equal to or greater than 5.5 feet. For abutment walls with heights less than 5.5 feet, the passive pressure may be calculated proportionally (e.g., for a 4-foot high wall, the passive pressure is [4/5.5]x 5 ksf = 3.64 ksf. The horizontal movement at which the maximum passive pressure is expected to be fully mobilized can be determined following the procedure outlined in Section 7.8.1 of the Caltrans SDC (2010c)."

Also, the reference section in the revised foundation report will include the following reference:

California Department of Transportation, 2010c, Seismic Design Criteria (SDC), Version 1.6, November.

29. Provide SAP input files corresponding to the seismic analysis of the abutments.

EMI did not perform SAP analyses for the subject project and does not have the SAP files. AECOM should be contacted regarding the SAP analysis.

30. Revise the subject report to include Section 3.0 for only "Geology".

Section 3.0 will be retitled as requested.

31. Take out Seismicity from Section 3.0.

Section 3.0 will be retitled as requested.

32. Revise the subject report to include Section 5 as "Seismicity and Geo-Seismic Hazards" to have subsections 5-1 for "Seismic Study", 5-2 for "Ground Rupture", 5-3 for "Caltrans ARS Curve", 5-3-1 for "Development of Vs30", 5-3-2 for "Development of Caltrans ARS Curve", 5-4 for "Liquefaction", 5-5 for "Lateral Spread", 5-6 for "Seismic Settlement".

Section 5.0 and its subsections will be formatted as requested.

33. Revise the subject report to include Section 6 for "Soil Corrosion".

Section 6.0 will be retitled as requested.

34. Revise the subject report to include Section 7 for "Scour".

Section 7.0 will be retitled as requested.

35. Revise the subject report to include Section 8.0 for "Foundation Recommendations".

Section 8.0 will be retitled as requested.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions please call us.

Sincerely,

EARTH MECHANICS, INC.

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

Wendy A. Drummond, CEG 2049
Senior Geologist

GJG/gjg,avk,wad

Attachments:

Attachment 1 – Review Comments by Caltrans Office of Geotechnical South 1 (OGDS-1), Dated November 5, 2012, on the Final Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, Prepared by Earth Mechanics, Inc., Dated September 28, 2012.

Attachment 2 – The SPT Hammer Energy Report.

Attachment 3 – Figure 3A Showing Idealized Soil Profile and Design Strength Parameters.

Attachment 4 – Revised Settlement Calculations for Spread Footing.

References:

Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, City of San Clemente, Orange County, California; 12-Ora-5, PM 4.97, Caltrans Project No. 1200020278 (EA No. 12-0F96C01); Prepared by Earth Mechanics, Inc., Dated September 28, 2012.

Robertson, P.K., 2009, Interpretation of Cone Penetration Tests – A Unified Approach, Canadian Geotechnical Journal Volume 46: 1337-1355.

ATTACHMENT 1

Review Comments by Caltrans Office of Geotechnical South 1 (OGDS-1), Dated November 5, 2012, on the Final Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, Prepared by Earth Mechanics, Inc., Dated September 28, 2012

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

TO: MR. JEFF DEFEVERE
Office of Special Funded Projects (OSFP)
Attention: Ms. LUQI YANG
Fax: (916) 227-8683

DATE: November 5, 2012

FILE: 12 ORA 05 4.97
District County Route Post mile

FDN REPORT BY: Earth Mechanics, Inc DATED: September 28, 2012

Avenida Vaquero UC (Widen)
Structure Name

GENERAL PLAN DATED: September 24, 2012 FDN PLAN DATED: September 24, 2012

12-0F96C01 55-0223
EA Number Bridge Number

Submittal (*Check One*): [ ] 1st [X] 2nd [ ] 3rd [ ] 4th [ ] Other:

The Office of Geotechnical Design South 1 (OGDS-1) has reviewed the submittal titled "Final Structure Foundation Report for Avenida Vaquero Undercrossing (Widen), Bridge No. 55-0223, I-5 HOV Widening, Segment 2 Project, City of San Clemente, Orange County, California, 12-Ora-05, PM 4.97, Caltrans Project ID 1200020278 (EA No 12-0F96C01)", prepared by Earth Mechanics, Inc, dated September 28, 2012 and received by our office on October 4th.

During our review, we made reference to the following:

- "Structure Foundation Report for Avenida Vaquero UC (Widen), Bridge No. 55-0223, San Clemente, Orange County, California, 12-Ora-05, PM 4.97, Caltrans Project ID 1200020278, EA No 12-0F96C01", prepared by Earth Mechanics, Inc, dated April 24, 2012.
- Caltrans OGDS-1 review comment memorandum dated September 14, 2012.

We have the following comments:

1. Title Sheet addressed to AECOM: It refers to a review and concurrence for the response to Caltrans OGDS-1 September 14, 2012 review comments. Include the date of the meeting where over the shoulder meeting was conducted and the name of the oversight engineer. In addition take out the word concurrence from the text. Since over the shoulder review is not considered acceptance or concurrence. Revise "Reviewer" to "Oversight Geo-Professional".
2. Existing geotechnical information was reviewed and collected to prepare the subject report. Revise Section 1.2 of the subject report accordingly.
3. The site investigation must be site specific and stated as such in the report. Revise Section 1.2 of the subject report accordingly.
4. Project description does not make any reference to the other bridge structures that are part of the subject project. Revise Section 1.3 accordingly.
5. Revise Section 1.4 to include a table for "As-Built Foundation Data" with the relevant information.
6. Revise the notes in Table 1, to include the appropriate Survey Datum.

7. Revise Section 2 to include survey conducted for each boring and CPT.
8. Revise Section 2.0 of the subject report to include a narrative as to how the hammer efficiency is assessed per Caltrans Guidelines.
9. Revise Section 2.3 to include a Table for the laboratory tests performed with type of test, applicable test method (i.e. ASTM, CT designation) and purpose of the test.
10. Revise Section 4.0 to include a separate subsection (i.e. 4.3) for Idealized Soil Profile along with the Table 2 and the corresponding narrative.
11. Insert the Idealized Soil Profile in the main report where appropriate.
12. Revise the Idealized Soil Profile to include station line.
13. Designate where the supports are located on the Idealized Soil Profile.
14. Revise the Table of Contents accordingly.
15. Was the CPT calibrated against the borings performed at the site? Explain and provide justification.
16. How was the cone factor Nk as it relates to the subject CPT investigation evaluated? Explain and provide justification.
17. Explain how the clayey soil at depth of approximately 80 feet is designated as normally consolidated for the subject site.
18. Explain why Nk values typically used for normally consolidated clay is used for the subject site where the soil is over-consolidated clay is
19. Include the legend LOTB (Log of Test Boring) sheet in the subject report where appropriate.
20. Explain what is meant by "original grade elevation" in Table 5.
21. Refer to the CPT data and calculate the bearing capacity and the consolidation settlement magnitude when spread footing is considered. Explain why spread footing cannot be considered based on the engineering calculation derived from the CPT.
22. The settlement calculation shown for the spread footing is based on the soil upper layer elevation of 130 feet. The bottom of the footing elevation on the Foundation Plan sheet indicates much lower elevation. Reconcile and explain.
23. Why CPT data was not used in part for evaluation of the design parameters?
24. Compare the in-situ data interpreted by CPT with the laboratory tests values and come up with idealized strength parameters.
25. Why idealized soil profile soil strength characterization in Table 2 is based only on the SPT, when CPT was also conducted to characterize the subsurface soil?
26. The pile cut off elevation at abutment 2 falls well below the elevation 130. Clarify why idealized soil profile from elevation 130 to 90 is lumped as one layer.
27. Address abutment 1 by referring to the comment 25 (above).
28. What version of Caltrans SDC (Seismic Design Criteria) is being referred to in Section 5.6.2 of the subject report? The reference is missing in the Reference Section of the subject report. Revise accordingly.
29. Provide SAP input files corresponding to the seismic analysis of the abutments.
30. Revise the subject report to include Section 3.0 for only "Geology".
31. Take out Seismicity from Section 3.0.
32. Revise the subject report to include Section 5 as "Seismicity and Geo-Seismic Hazards" to have subsections 5-1 for "Seismic Study", 5-2 for "Ground Rupture", 5-3 for "Caltrans ARS Curve", 5-3-1 for "Development of Vs30", 5-3-2 for "Development of Caltrans ARS Curve", 5-4 for "Liquefaction", 5-5 for "Lateral Spread", 5-6 for "Seismic Settlement".
33. Revise the subject report to include Section 6 for "Soil Corrosion".
34. Revise the subject report to include Section 7 for "Scour".

35. Revise the subject report to include Section 8.0 for "Foundation Recommendations"

Please call Sharid Amiri at (949)724-2599, if you have any questions.

Approval: Reviewed By: Sharid Amiri, PhD, P.E.
Geotechnical Design South-1

(C3) Not Approved
Office of Special Funded projects

Cc: OGDS (Sacramento) DES Office of Specifications and Estimates (All Reviews) OSC R.E Pending File

ATTACHMENT 2

The SPT Hammer Energy Report

SPT Hammer Energy Measurements

Hammer Calibration done on:
April 14, 2011
in Los Angeles, CA

CME 75LC Drill – 2R #7
Operator: Jeff Callaway

Prepared for:

2R Drilling Inc.
3968 Chino Ave.
Chino, CA 91710
909.465.1765

Prepared by:

Brian Serl
Calibration Engineer

SPT CAL
6979 Canosa Place
Rancho Cucamonga, CA 91701
bc@sptcal.com
http://www.sptcal.com
909.730.2161

TABLE OF CONTENTS

1 INTRODUCTION

2 FIELD EQUIPMENT & PROCEDURES

3 INSTRUMENTATION

4 OBSERVATIONS

5 RESULTS

TABLE 1

REFERENCES

Presentation of SPT Analyzer Test Data

1. Introduction

This report presents the results of SPT Hammer Energy Measurements recorded with an SPT Analyzer from Pile Dynamics carried out on April 14, 2011 in Los Angeles, CA.

2. Field Equipment and Procedures

The CME 75LC drill is known as 2R #7. The operator of this drill and attached hydraulic CME automatic trip hammer was Jeff Callaway of 2R Drilling Inc.

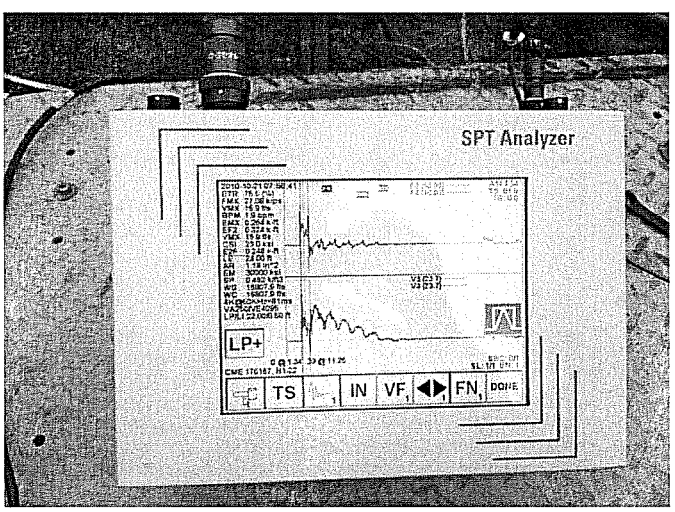
The CME Auto Hammer uses a 140 lb. weight and is dropped approximately 30" on to an anvil above the bore hole. AWJ drill rod connects the anvil to a split spoon type soil sampler inside an 8" o.d. hollow stem auger at the designated sample depth. After the sampler is lowered to the designated sample depth it is driven into the subsurface 18". The number of blows required to penetrate the last 12" is referred to as the "N value", which is related to soil strength.

The first sample that was recorded for this report was taken at 30' below ground surface and then every 5' to the final sample depth of 50'. We performed measurements conforming to ASTM D4633-05 which states that;

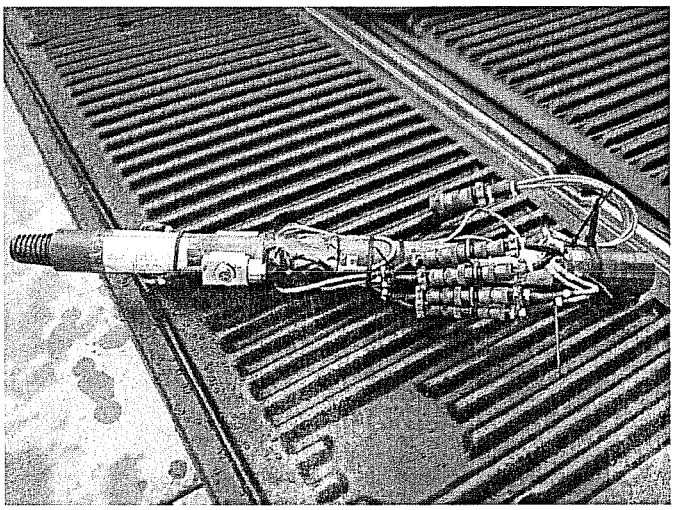
- Perform measurements for at least 3 depths of quality data, with 5 depths preferred
- Tests should be limited to moderate N-values ranges between 5 and 50
- Energy evaluation of the hammer system is more reliable when the length (LE) is (30 ft to 40 ft) or more

3. Instrumentation

An SPT Analyzer from Pile Dynamics was used to record and the process the data. The raw data was stored directly in the SPT Analyzer computer with subsequent analysis in the office with PDA-W and PDIPlot software. The measurements and analysis were conducted in general accordance with ASTM D4945 and ASTM D6066 test standards.



The SPT Analyzer is fully compliant with the minimum digital sampling frequency requirements of ASTM D4633-05 (50 kHz) and EN ISO 22476-3:2005 (100 kHz), as well as with the low pass filter, (cutoff frequency of 5000 Hz instead of 3000 Hz) requirements of ASTM D4633-05. All equipment and analysis also conform to ASTM D6066.



A 2' instrumented section of AWJ rod, with two sets of accelerometers and strain transducers mounted on opposite sides of the drill rod, was placed below the anvil. It measured strain and acceleration of every hammer blow. The SPT Analyzer then calculates the amount of energy transferred to the rod by force and velocity measurements.

4. Observations

The drill rig motor was operating around 1400 rpms during each sample interval. The motor is diesel fueled. The throttle control is electronic and digitally modulated. The rpms did not wander or adjust and that is reflected in the consistent 52 blows per minute at each sample interval. The drill and sample equipment looked to be well maintained and operated. The operator, Jeff Callaway, has used this type of drill and autohammer since 2001.

5. Results

Results from the SPT Hammer Energy Measurements are summarized in Table 1. It shows the Energy Transfer Ratio (ETR) at each sampling depth. ETR is the ratio of the measured maximum transferred energy to rated energy of the hammer which is the product of the weight of the hammer times the height of the fall. 140 lb x 30" = 4200 lb-in = 0.350 kip-ft.

The ETR for all of the blow counts measured averaged 82%

Table 1 – Summary of SPT Hammer Energy Measurements

Sample Depth	Average SPT Hammer Efficiency (ETR)
30'	79%
35'	81%
40'	84%
45'	83%
50'	83%
Average	**82%**

Please call or email me with any questions or if you need additional information.

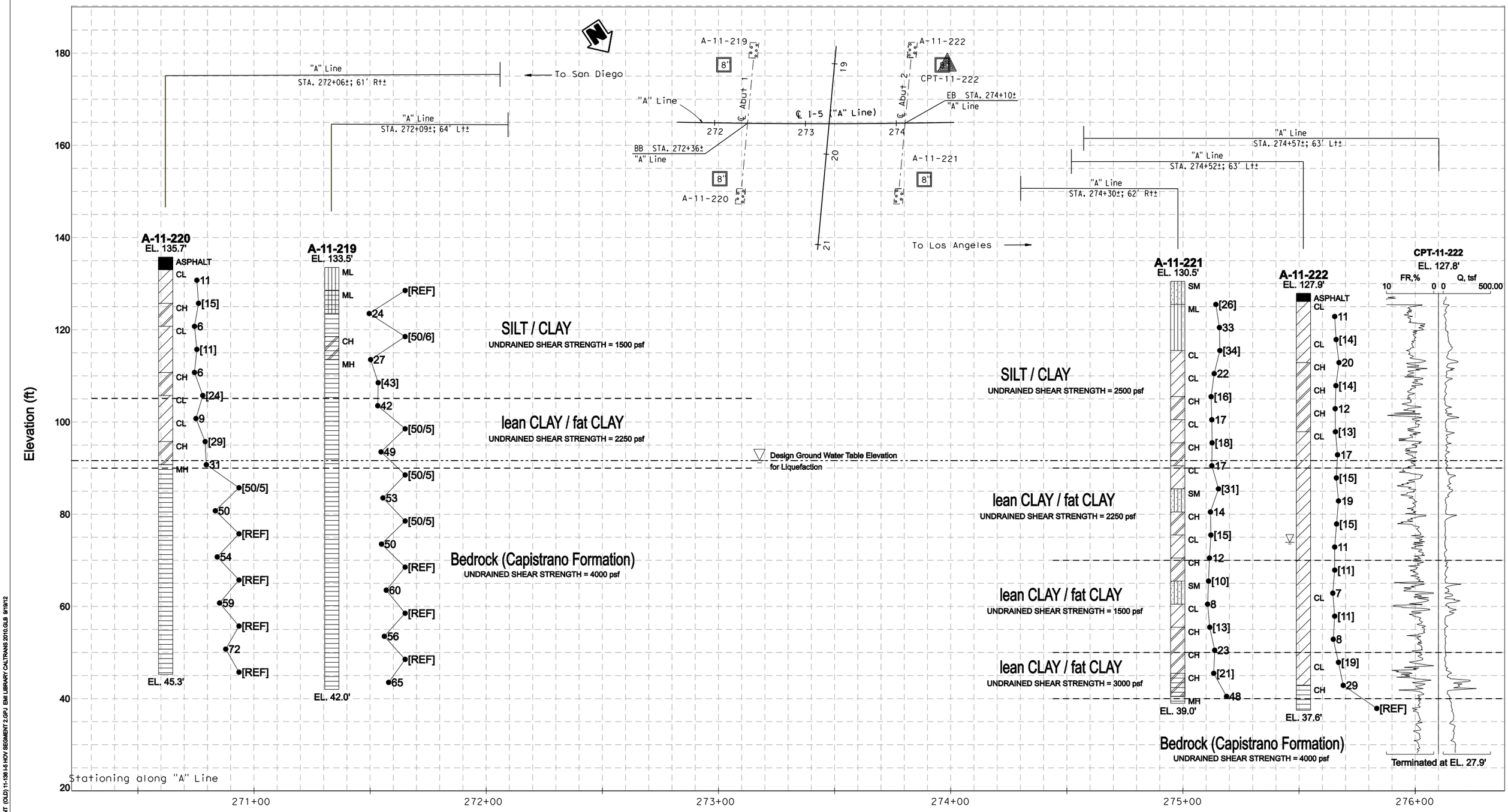
Brian Serl
909-730-2161
bc@sptcal.com

References

- *Stress Wave Methods in Civil Engineering.* Proceedings of The Fifth Highway Geophysics - NDE Conference: Charlotte, NC; 472-480.
- Abou-matar, H., Goble, G. G., October, 1997. *SPT Dynamic Analysis and Measurements.* Journal of Geotechnical and Geoenvironmental Engineering, ASCE, October 1997: Reston, VA; 921-926.
- Rausche, F., Thendean, G., Abou-matar, H., Likins, G. E., Goble, G. G., September, 1995.*Robinson, B., Webster, S., Alvarez, C., December, 2008.* . PDA Users Day: Cleveland, OH.
- Batchelor, C., Goble, G. G., Berger, J. A., Miner, R., May, 1995. *Standard Penetration Test Energy Measurements on the Seattle ASCE Field Testing Program.* Seminar In Situ Testing for Seismic Evaluation: University of Washington.
- Goble, G. G., Abou-matar, H., September, 1992. *Determination of wave equation soil constants from the standard penetration test.* Proceedings of the Fourth International Conference on the Application of Stress-Wave Theory to Piles: The Netherlands; 99-103.
- Morgano, C.M., Liang, R., September, 1992. *Energy transfer in SPT - Rod length effect.* Proceedings of the Fourth International Conference on the Application of Stress-Wave Theory to Piles: The Netherlands; 121-127.

ATTACHMENT 3

Figure 3A Showing Idealized Soil Profile and Design Strength Parameters



SIMPLE FENCE - 11X17 MET+ENG + BLOWCOUNT (OLD) 11-136 I-5 HOV SEGMENT 2.GPJ EMI LIBRARY CALTRANS 2010.GLB 9/19/12

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

Figure 3A Showing Idealized Soil Profile

Cross Section Identification

DIST.	COUNTY	ROUTE	POSTMILE	EA
	Orange		D/D	11-136

PROJECT OR BRIDGE NAME: **I-5 HOV Widening - Segment 2 - Avenida Vaquero UC**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
			1 of 0

ATTACHMENT 4

Revised Settlement Calculation for Spread Footing

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 9/18/12 Checked By Lino Date 9/19/12 Sheet 1 of 3

Avenida Vaquero UC - Abutments 1 & 2

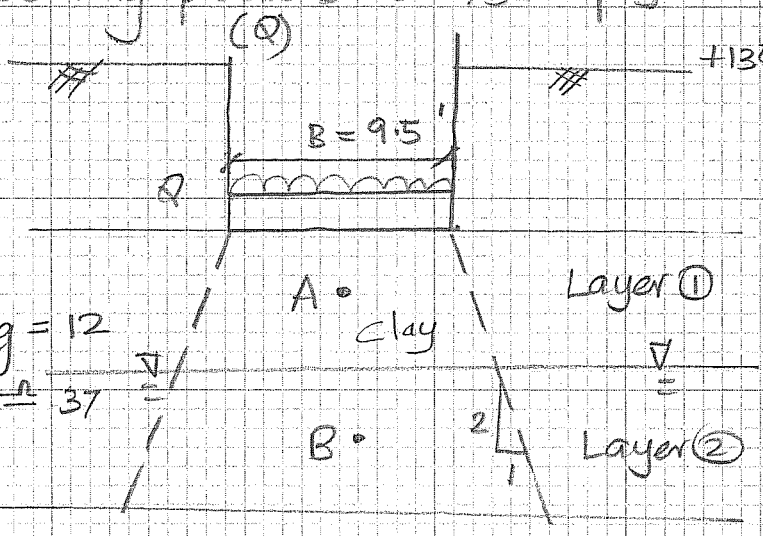
Foundation Type Selection

Settlement Calculation for Spread footing

Per Bridge Designers,

Footing size = 9.5' x 13.5'

Bearing pressure = 7500 psf



Using AASHTO LRFD Eq

$$\Delta H_i = \frac{H_i}{C'} \log\left(\frac{\sigma_o' + \Delta\sigma_v'}{\sigma_o'}\right)$$

Layer	mid pant	H(ft)	C'	Initial σ_o'(ksf)	$\Delta\sigma_{v_i}$(ksf)	ΔH_i(inch)
①	A	19	37	3.42	3.75	1.98
②	B	22	37	5.88	1.80	0.83

$\sum H_i$ = 2.8 inches

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV Widening - Segment 2 Project No. 11-136

By Ranjan Date 9/18/12 Checked By Lino Date 9/19/12 Sheet 2 of 3

Consider 5' of overexcavation below footing,

Layer	Mid Point	H_i (ft)	C'	σ_o' (ksf)	$\Delta\sigma_v'$ (ksf)	ΔH_i (in)
①	A	14	37	3.72	3.31	1.26
②	B	22	37	5.88	1.80	0.83

$\Sigma \Delta H_i = 2.09" > 1"$

$\Rightarrow$ Even with 5' overex, the total settlement is $2.09" > 1"$

$\Rightarrow$ Spread footing for Abutment is not feasible.

Note: In order to get 1" of settlement, bearing pressure should be about 3.1 ksf with 5' of overexcavation.

$\Rightarrow$ CIDH Pile foundation is recommended.

σ'_o = initial vertical effective stress at the midpoint of layer *i* (ksf)

$\Delta\sigma_v$ = increase in vertical stress at the midpoint of layer *i* (ksf)

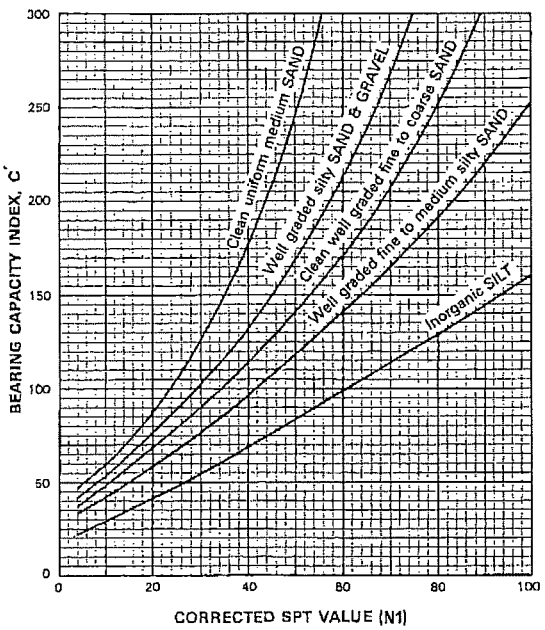


Figure 10.6.2.4.2-1—Bearing Capacity Index versus Corrected SPT (modified from Cheney and Chassie, 2000, after Hough, 1959)

10.6.2.4.3—Settlement of Footings on Cohesive Soils

Spread footings in which cohesive soils are located within the zone of stress influence shall be investigated for consolidation settlement. Elastic and secondary settlement shall also be investigated in consideration of the timing and sequence of construction loading and the tolerance of the structure to total and differential movements.

Where laboratory test results are expressed in terms of void ratio, e, the consolidation settlement of footings shall be taken as:

- For overconsolidated soils where $\sigma'_p > \sigma'_o$, see Figure 10.6.2.4.3-1:

$$S_c = \left[\frac{H_c}{1+e_o}\right]\left[C_r \log\left(\frac{\sigma'_p}{\sigma'_o}\right) + C_c \log\left(\frac{\sigma'_f}{\sigma'_p}\right)\right] \quad (10.6.2.4.3\text{-}1)$$

- For normally consolidated soils where $\sigma'_p = \sigma'_o$:

The Hough method is applicable to cohesionless soil deposits. The "Inorganic Silt" curve should generally not be applied to soils that exhibit plasticity. The settlement characteristics of cohesive soils that exhibit plasticity should be investigated using undisturbed samples and laboratory consolidation tests as prescribed in Article 10.6.2.4.3.

C10.6.2.4.3

In practice, footings on cohesive soils are most likely founded on overconsolidated clays, and settlements can be estimated using elastic theory (Baguelin et al., 1978), or the tangent modulus method (Janbu, 1963, 1967). Settlements of footings on overconsolidated clay usually occur at approximately one order of magnitude faster than soils without preconsolidation, and it is reasonable to assume that they take place as rapidly as the loads are applied. Infrequently, a layer of cohesive soil may exhibit a preconsolidation stress less than the calculated existing overburden stress. The soil is then said to be underconsolidated because a state of equilibrium has not yet been reached under the applied overburden stress. Such a condition may have been caused by a recent lowering of the groundwater table. In this case, consolidation settlement will occur due to the additional load of the structure and the settlement that is occurring to reach a state of equilibrium. The total consolidation settlement due to these two components can be estimated by Eq. 10.6.2.4.3-3 or Eq. 10.6.2.4.3-6.

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

September 26, 2012

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***I-5 HOV Widening, Segment 2 Project, Responses to Caltrans Comments on the Structure Foundation Report for Avenida Vaquero Undercrossing (Widen) Bridge No. 55-0223, City of San Clemente, Orange County, California 12-Ora-5, PM 4.97, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)***

Dear Mr. Montes:

Earth Mechanics, Inc. (EMI) submitted the subject structure foundation report, dated April 24, 2012, to Caltrans for review and comments. Caltrans Office of Geotechnical Design South 1 (OGDS-1) has reviewed the report and provided comments in a memorandum dated September 14, 2012. A copy of this memorandum is provided in Attachment 1.

This letter provides our responses to Caltrans OGDS-1 comments. For convenience, Caltrans comments are provided in italics followed by EMI responses.

1. Provide all input software files and actual spread sheets (not PDF) in a CD for our review.

We will comply. We will provide a CD containing all input software files and actual spread sheets of our analyses.

2. Justify why spread footing is not selected as a foundation of choice. Provide supporting documentation and engineering calculation.

Spread footing is not recommended as a suitable foundation option for Avenida Vaquero Undercrossing abutments due to higher settlement estimates caused by higher footing pressures at the abutments. Based on the footing pressures provided by the bridge designers, the settlement of the spread footing is estimated to be about 4.6 inches. A 5-foot deep overexcavation will only lower the settlement to about 3.9 inches. The settlement calculations will be included in Appendix C of the Final Structure Foundation Report.

3. Provide the CPT data (Excel or PDF).

We will comply. We will include the CPT data in Appendix A of the Final Structure Foundation Report. We will also include a PDF copy of the CPT data in the CD mentioned in our first response.

4. Provide the backup information for the development of the Design ARS curve.

We will comply. All the backup information for the development of the design ARS curve is provided in Attachment 2.

5. Insert a figure to include the idealized soil profile with field groundwater table elevation, assumed designed groundwater table elevation and liquefaction layers if any. This figure should include the proposed structure alignment, support numbers and location, vertical and horizontal axis for elevation and stationing respectively. It should include the boring profile with the idealized strength, friction angle and field SPT numbers and CPT.

We will comply. A cross section, showing the idealized soil profile with field SPT numbers and CPT profile, field and design groundwater table elevations, and design soil strength parameters, will be included in Appendix C of the Final Structure Foundation Report. The cross section will also show the proposed structure alignment, support numbers, and locations.

Please submit this letter to Caltrans for their review of our responses and comments/concurrence. Any additional review comments by Caltrans will be incorporated into the Final Foundation Report.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions please call us.

Sincerely,
EARTH MECHANICS, INC.

REGISTERED PROFESSIONAL ENGINEER
GNANAPRAGASAM J. GUNARANJAN
No. GE2970
Exp: 12-31-13
GEOTECHNICAL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ANDREW V. KORKOS
NO. 2357
EXP. 3/31/14
GEOTECHNICAL
STATE OF CALIFORNIA

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

Attachments
Attachment 1 – Caltrans Review Comments, Dated September 14, 2012.
Attachment 2 – Backup Information for Development of Design ARS Curve.

ATTACHMENT 1

Review Comments by Caltrans Office of Geotechnical South 1 (OGDS-1), Dated September 14, 2012, on the Structure Foundation Report for Avenida Vaquero UC (Widen), Bridge No. 55-0223, Prepared by Earth Mechanics, Inc., Dated April 24, 2012

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

TO: MR. JEFF DEFEVERE
Office of Special Funded Projects (OSFP)
Attention: Ms. LUQI YANG
Fax: (916) 227-8683

DATE: September 14, 2012

FILE: 12 ORA 05 4.97
District County Route Post mile

FDN REPORT BY: Earth Mechanics, Inc DATED: April 24, 2012

Avenida Vaquero UC (Widen)
Structure Name

GENERAL PLAN DATED: April 24, 2012 FDN PLAN DATED: April 24, 2012

12-0F96C01 55-0223
EA Number Bridge Number

Submittal (*Check One*): [X] 1st [ ] 2nd [ ] 3rd [ ] 4th [ ] Other:

The Office of Geotechnical Design South 1 (OGDS-1) has reviewed the submittal titled "Structure Foundation Report for Avenida Vaquero UC (Widen), Bridge No. 55-0223, San Clemente, Orange County, California, 12-Ora-05, PM 4.97, Caltrans Project ID 1200020278, EA No 12-0F96C01", prepared by Earth Mechanics, Inc, dated April 24, 2012.

We have the following comments:

1. Provide all input software files and actual spread sheets (not PDF) in a CD for our review.
2. Justify why spread footing is not selected as a foundation of choice. Provide supporting documentation and engineering calculation.
3. Provide the CPT data. (Excel or PDF)
4. Provide the backup information for the development of the Design ARS curve.
5. Insert a figure to include the idealized soil profile with field groundwater table elevation, assumed designed groundwater table elevation and liquefaction layers if any. This figure should include the proposed structure alignment, support numbers and location, vertical and horizontal axis for elevation and stationing respectively. It should include the boring profile with the idealized strength, friction angle and field SPT numbers and CPT.

Please call Sharid Amiri at (949)724-2599, if you have any questions.

Approval:

Reviewed By: Sharid Amiri, PhD, P.E.
Geotechnical Design South-1

(C3) Not Approved
Office of Special Funded projects

Cc: OGDS (Sacramento) DES Office of Specifications and Estimates (All Reviews) OSC R.E Pending File

ATTACHMENT 2

Backup Information for Development of Design ARS Curve

The Segment 2 project area is located within the San Juan Valley hydrologic area. No indication of a static groundwater table was observed within the depths explored during the investigation for the overall project. However, perched groundwater was encountered in seven of the thirty-four deep boreholes (>30 feet deep), drilled for Segment 2, at elevations ranging from about +74 to +184 feet. The perched groundwater condition is validated by the fact that groundwater was found within a very wide range of elevation.

Soil moisture content and groundwater elevation can fluctuate due to variations in seasonal rainfall, nearby irrigation, changes in or addition of flood control improvements, groundwater injection or extraction activities, construction activities, or numerous other man-made or natural conditions.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Seismic Design Criteria

To develop the ARS curves in accordance with the 2010 Seismic Design Criteria (SDC) (Caltrans, 2010) and Geotechnical Services Design Manual (Caltrans, 2009e) procedures, we considered the following response spectra. The resulting ARS curve is the envelop of all the following spectra:

- Deterministic Criteria based on late-Quaternary faults in the 2007 fault database (Shantz and Merriam, 2009 and Caltrans, 2009a and 2009c).
- Probabilistic Criteria based on 5% in 50 years probability of exceedance ground motion.
- Minimum Deterministic Spectrum based on a Mw = 6.5 strike-slip event occurring at a distance of 7.5 miles (12 km) from the site.

We used the Caltrans Deterministic Response Spectrum Spreadsheet as recommended by the Geotechnical Services Design Manual (Caltrans, 2009e) to develop the deterministic ARS curves. The spreadsheet uses the arithmetic average of two Next Generation Attenuation (NGA) relationships developed by Chiou-Youngs (2008) and Campbell-Bozorgnia (2008) with user-provided input parameters as listed in Table 3. Results obtained from the spreadsheet were then verified with the Caltrans online web tool (Caltrans, 2009b).

The probabilistic response spectrum is based on data from the 2008 United States Geological Survey (USGS, 2008a) National Seismic Hazard Map for the 5% in 50 years probability of exceedance (975-year return period) ground motion. To develop the probabilistic spectrum, the Caltrans Probabilistic Response Spectrum Spreadsheet and the USGS Interactive Deaggregation Tool (USGS, 2008b) were used. Results obtained from both the spreadsheet and deaggregation tool were then verified with the Caltrans online web tool (Caltrans, 2009b).

A small-strain shear wave velocity (V_s^{30}) of 830 feet per seconds (ft/sec) was measured, for the upper 100 feet of subsurface materials, by the seismic cone penetrometer used in Sounding CPT-11-222. A V_s^{30} of 781 ft/sec was calculated using correlations with SPT blowcounts (Caltrans, 2009e) for the upper 100 feet of subsurface materials obtained from Boring A-11-222, which was drilled immediately next to CPT-11-222. The calculated V_s^{30} obtained from Boring

A-11-222 and the three other borings, drilled at the bridge site, were normalized using the ratio of (830/781). The calculated and normalized V_s^{30} values are presented in Table 4.

Table 3. Site Characteristics and Deterministic Controlling Fault Parameters

Site Characteristics	
Site Coordinates	Latitude = 33.4528 degrees Longitude = -117.6437 degrees
Depth to V_s=1.0 km/s, $Z_{1.0}$	Site is not in deep sedimentary basin, therefore basin amplification
Depth to V_s=2.5 km/s, $Z_{2.5}$	factors = 1
Deterministic Controlling Fault Parameters	
Fault Name	Newport-Inglewood-Rose Canyon Fault (Offshore or Dana Point)
Fault ID	222
Fault Type	Right Lateral Strike Slip (RLSS)
Fault Dip	90 degrees
Dip Direction	Vertical
Top of Rupture Plane	0 miles (0 km)
Bottom of Rupture Plane	8.12 miles (13 km)
R_{RUP}[1]	4.35 miles (7 km)
R_{JB}[2]	4.35 miles (7 km)
R_X[3]	4.35 miles (7 km)
F_{rv} (1 for reverse, 0 for others)	0
F_{nm} (1 for normal, 0 for others)	0
Hanging Wall	No
Near-Field Factor Required	Yes, up to 1.2

Note:

1. *R_{RUP} = closest distance from the site to the fault rupture plane.*
2. *R_{JB} = Joyner-Boore distance; the shortest horizontal distance to the surface projection of the rupture area.*
3. *R_X = horizontal distance from the site to the fault trace or surface projection of the top of the rupture plane.*

Table 4. Small Strain Shear-Wave Velocity V_S^{30}

Boring/CPT	Source of Shear-Wave Velocity	Small Strain Shear-Wave Velocity V_S^{30} (feet/sec)	
		Calculated	Normalized
A-11-219	SPT Correlations	1,270	1,350
A-11-220	SPT Correlations	922	980
A-11-221	SPT Correlations	846	900
A-11-222	SPT Correlations	781	830
CPT-11-222	Field Measurement	830	830

ARS curves were developed for each normalized V_s^{30} presented in Table 4. The recommended design ARS curve is the mathematical mean of all the ARS curves, which is presented in Figure 4 together with the digitized coordinates. As shown in Figure 4, a peak ground acceleration (PGA) of 0.39g is obtained from the design ARS curve

Soil Boring Label: A-11-219

Boring Type: Hollow Stem Boring Date: 10/12/2011 Logged by: RJ

Tabulated Calculation Performed by: CTY 1/11/2012

H_{EG} (%)= 75

Depth (ft)	BC	SPT, MCD	N_{60}	Soil Type	V_s (m/sec)	Thickness (ft)		$D_i/V_{s,i}$
10	24	1	30	Clay	270	10		0.0371
20	27	1	34	Clay	281	10		0.0357
30	42	1	53	Bedrock	386	10		0.0259
40	49	1	61	Bedrock	405	10		0.0247
50	53	1	66	Bedrock	415	10		0.0241
60	50	1	63	Bedrock	408	10		0.0245
70	60	1	75	Bedrock	432	10		0.0231
80	56	1	70	Bedrock	423	10		0.0237
90	65	1	81	Bedrock	443	10		0.0226
					d (ft) =	90	$\Sigma D_i/V_{s,i}$=	0.2413

$V_{s(d)} = d/\{\Sigma D_i/V_{s,i}\}$= 373

$V_{s30} = \{1.45-0.015*d*.3048\}*V_{s(d)}$= 387 m/s

Soil Boring Label: A-11-220

Boring Type: Hollow Stem Boring Date: 10/13/2011 Logged by: RJ

Tabulated Calculation Performed by: CTY 1/11/2012

H_{EG} (%)= 75

Depth (ft)	BC	SPT, MCD	N_{60}	Soil Type	V_s (m/sec)	Thickness (ft)		$D_i/V_{s,i}$
5	11	1	14	Clay	208	5		0.024
15	6	1	8	Clay	170	10		0.0588
25	6	1	8	Clay	170	10		0.0588
35	9	1	11	Clay	195	10		0.0514
45	31	1	39	Clay	294	10		0.034
55	50	1	63	Bedrock	408	10		0.0245
65	54	1	68	Bedrock	418	10		0.0239
75	59	1	74	Bedrock	430	10		0.0233
85	72	1	90	Bedrock	458	10		0.0218
					d (ft) =	85	$\Sigma D_i/V_{s,i}$=	0.3207

$V_{s(d)} = d/\{\Sigma D_i/V_{s,i}\}$= 265

$V_{s30} = \{1.45-0.015*d*.3048\}*V_{s(d)}$= 281 m/s

Soil Boring Label: **A-11-221**

Boring Type: Hollow Stem Boring Date: 10/13/2011 Logged by: RJ

Tabulated Calculation Performed by: CTY 1/11/2012

H_{EG} (%)= 75

Depth (ft)	BC	SPT, MCD	N_{60}	Soil Type	V_s (m/sec)	Thickness (ft)		$D_i/V_{s,i}$
10	33	1	41	Clay	300	10		0.0333
20	22	1	28	Clay	262	10		0.0382
30	17	1	21	Clay	240	10		0.0416
40	17	1	21	Clay	240	10		0.0416
50	14	1	18	Clay	225	10		0.0444
60	12	1	15	Clay	214	10		0.0467
70	8	1	10	Clay	187	10		0.0535
80	23	1	29	Clay	266	10		0.0376
90	48	1	60	Bedrock	402	10		0.0249
					d (ft) =	90	$\Sigma D_i/V_{s,i}$=	0.3617

$V_{s(d)} = d/\{\Sigma D_i/V_{s,i}\}$= 249

$V_{s30} = \{1.45-0.015*d*.3048\}*V_{s(d)}$= 258 m/s

Soil Boring Label: A-11-222

Boring Type: Hollow Stem Boring Date: 10/12/2011 Logged by: RJ

Tabulated Calculation Performed by: CTY 1/11/2012

H_{EG} (%)= 75

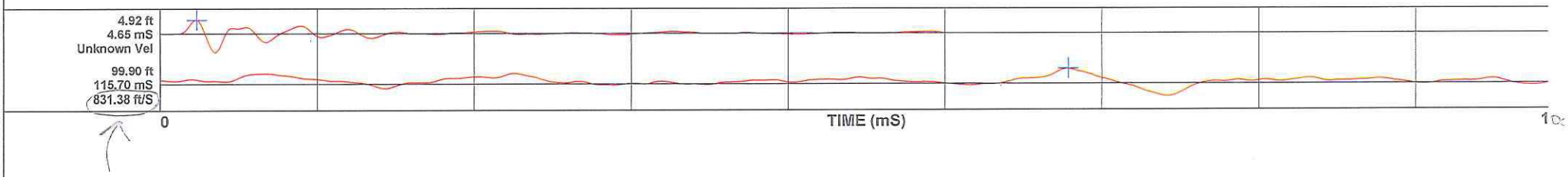
Depth (ft)	BC	SPT, MCD	N_{60}	Soil Type	V_s (m/sec)	Thickness (ft)		$D_i/V_{s,i}$
5	11	1	14	Clay	208	5		0.024
15	20	1	25	Clay	254	10		0.0394
25	12	1	15	Clay	214	10		0.0467
35	17	1	21	Clay	240	10		0.0416
45	19	1	24	Clay	250	10		0.0401
55	11	1	14	Clay	208	10		0.0481
65	7	1	9	Clay	179	10		0.0559
75	8	1	10	Clay	187	10		0.0535
85	29	1	36	Bedrock	343	10		0.0292
					d (ft) =	85	$\Sigma D_i/V_{s,i}$=	0.3784

$V_{s(d)} = d/\{\Sigma D_i/V_{s,i}\}$= 225

$V_{s30} = \{1.45-0.015*d*.3048\}*V_{s(d)}$= 238 m/s

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	
Job Number	11-136	Cone Number	DSG1023	GPS
Hole Number	CPT-11-222	Date and Time	10/10/2011 12:58:35 AM	



Avenida Vaquero UC (55-0223)

ARS Curve

Fault & Site Data Input Sheet

Fault & Site Data Input Sheet

The input sheet is to help the user organize the site data for developing the design response spectrum. Beta-Testers: If you fill out the fault and site information for each location, please provide this document and the *checker* to facilitate the QC/QA procedures listed in the 2009 Deterministic Fault Information & Seismic Procedures QC/QA checklist.

Project Information

Dist – EA: 12 – 0F96C County: Orange Route: 5 PM: 4.97

Bridge/Facility Name: Avenida Vaquero Bridge/Facility No.: 55-0223

Latitude: 33.4528 Longitude: -117.6437

Fault Information (#1)

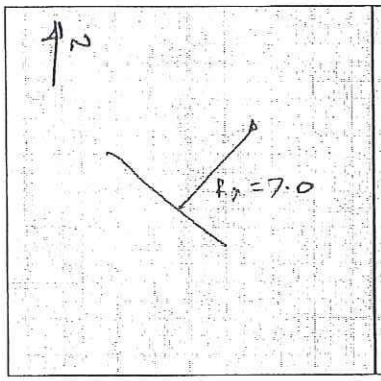
Fault Name: Newport Inglewood – Rose Canyon fault zone Fault ID#: 222

MMax: 7.5 (offshore or Dana Point section) Fault Type: RLSS

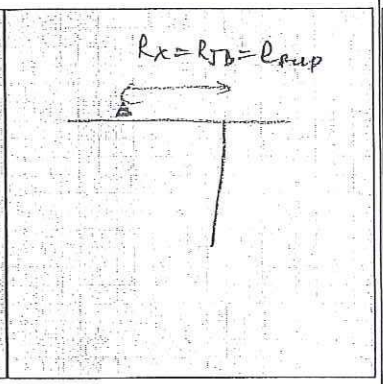
Fault Dip: 90 Dip Direction: V

Top of Rupture: 0 Bottom of Rupture: 13

Plan View



Elevation View



Calculated or Measure Distances

R_{RUP}: 7

R_{JB}: 7

R_X: 7

Determination of V_{S30}

V_{S30} (m/s): 253

Determination of Z1.0 and Z2.5

$Z_{1.0}$ (m/s): _____

$Z_{2.5}$ (km/s): _____

Notes:

Similar calculations for other V_{S30} values.

V_{S30} = 274, 299, 411

Fault Information (#2)

Fault Name: _____ Fault ID#: _____

MMax: _____ Fault Type: _____

Fault Dip: _____ Dip Direction: _____

Top of Rupture: _____ Bottom of Rupture: _____

Plan View

Elevation View

Calculated or Measure Distances

R_{RUP}: _____

R_{JB}: _____

R_X: _____

Determination of V_{S30}

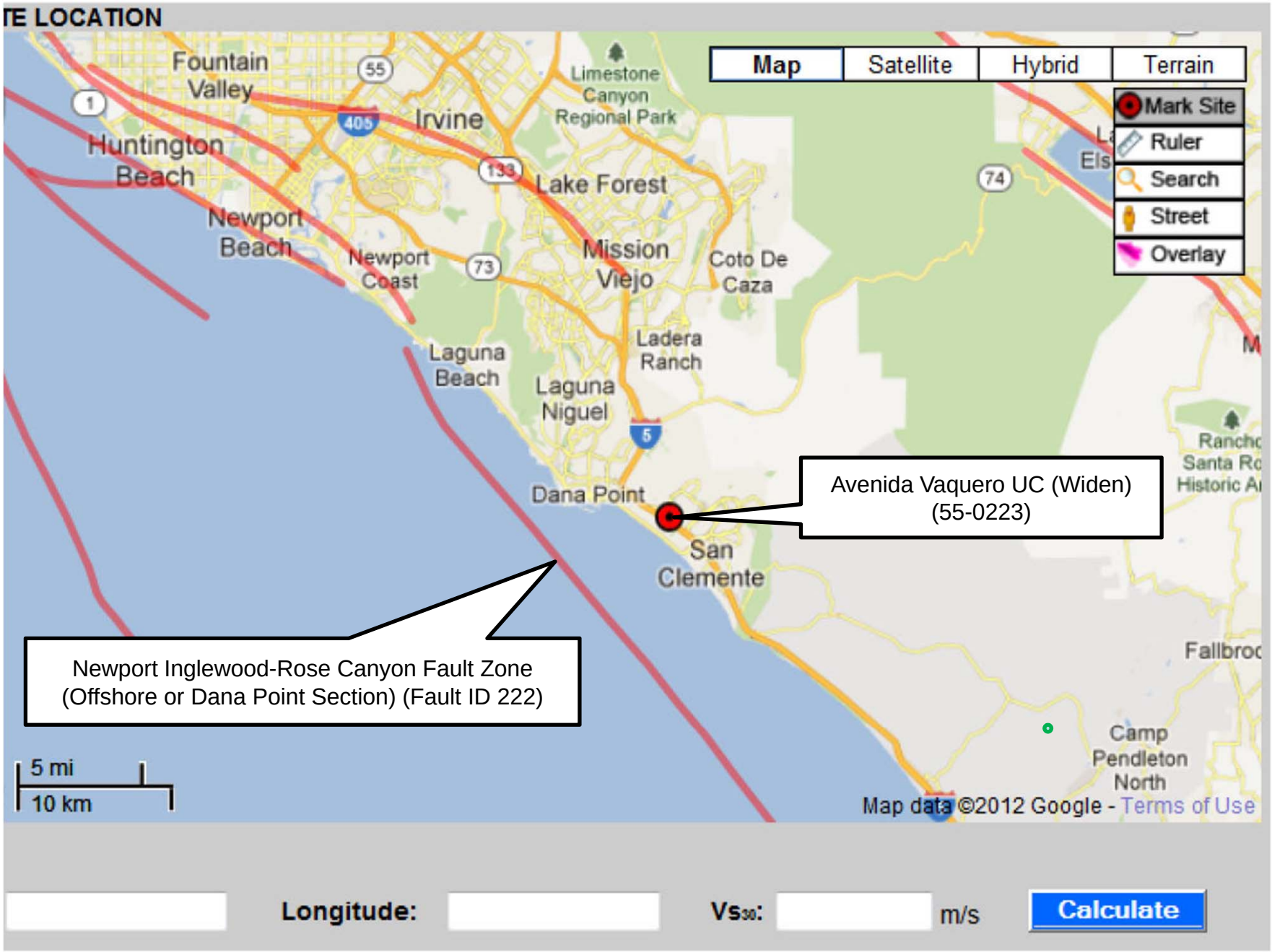
V_{S30} (m/s): _____

Determination of Z1.0 and Z2.5

$Z_{1.0}$ (m/s): _____

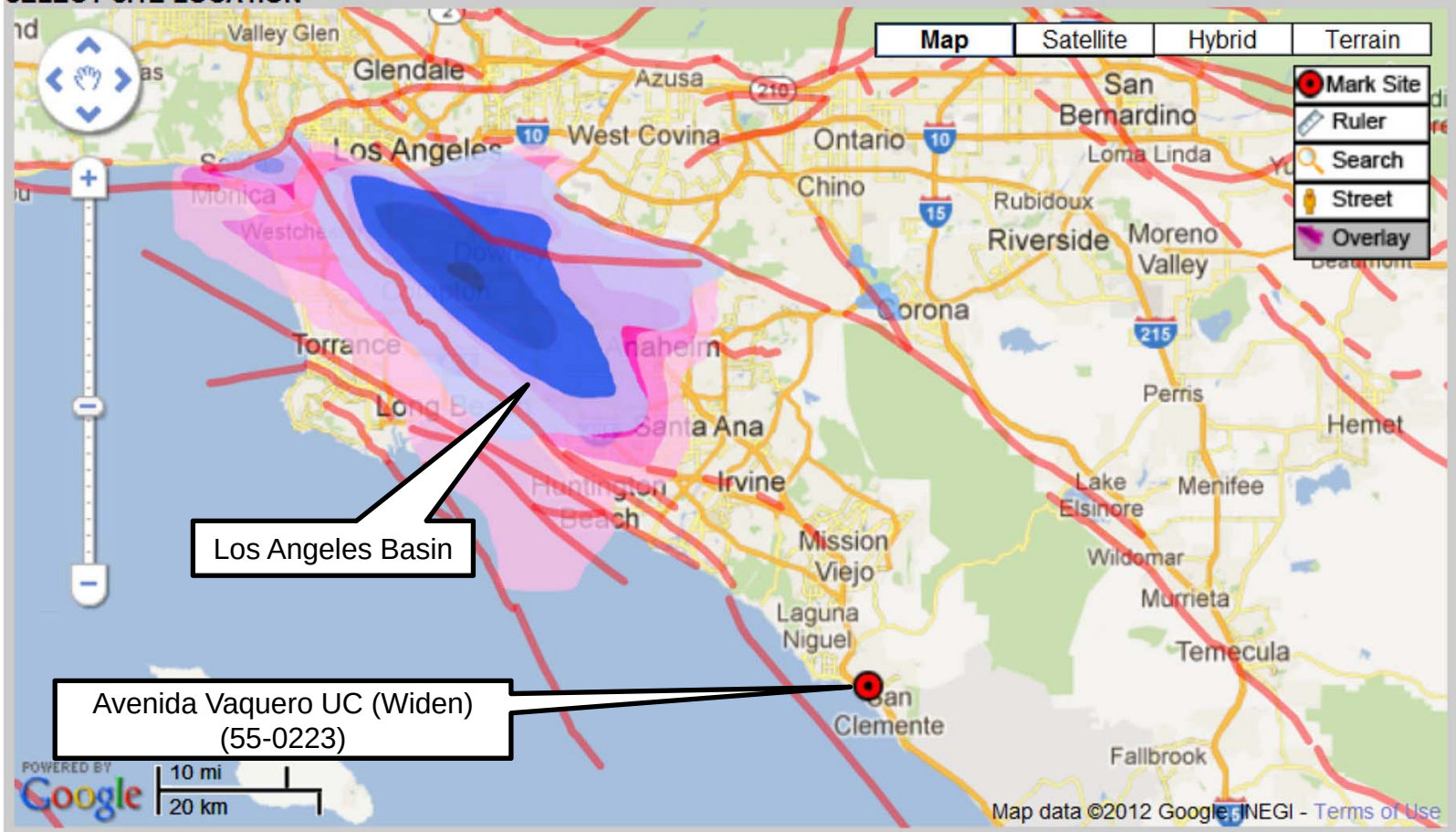
$Z_{2.5}$ (km/s): _____

Notes:



Avenida Vaquero UC (Widen) **Bridge No. 55-0223**	**ARS Online Fault Map**
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Project No. 11-136 / Date: 09-25-12

SELECT SITE LOCATION



Latitude: **Longitude:** **Vs_{30}:** m/s **Calculate**

BASIN LEGEND

Depth to Vs = 1.0 km/s		400 m		500 m		600 m		700 m		800 m		1000 m
Depth to Vs = 2.5 km/s		3.0 km		3.5 m		4.0 km		5.0 km		6.0 km		
Eastern Shear Zone												

Avenida Vaquero UC (Widen)
Bridge No. 55-0223

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

ARS Online Basin Map

Project No. 11-136

Date: 09-25-12

ARS Online Output

SITE DATA

Shear Wave Velocity, V_{S30}:	253 m/s
Latitude:	33.452800
Longitude:	-117.643700
Depth to Vs = 1.0 km/s:	331 m
Depth to Vs = 2.5 km/s:	2.00 km

DETERMINISTIC

Newport Inglewood-Rose Canyon fault zone (Offshore or Dana Point section)

Fault ID:	222
Maximum Magnitude (MMax):	7.5
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	13.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	6.98 km
Rjb:	6.98 km
Rx:	6.98 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA(Final Spectrum)
0.01	0.360	1.000	1.000	0.360
0.02	0.365	1.000	1.000	0.365
0.022	0.368	1.000	1.000	0.368
0.025	0.373	1.000	1.000	0.373
0.029	0.378	1.000	1.000	0.378
0.03	0.380	1.000	1.000	0.380
0.032	0.384	1.000	1.000	0.384
0.035	0.391	1.000	1.000	0.391
0.036	0.393	1.000	1.000	0.393
0.04	0.400	1.000	1.000	0.400
0.042	0.405	1.000	1.000	0.405
0.044	0.409	1.000	1.000	0.409
0.045	0.411	1.000	1.000	0.411
0.046	0.413	1.000	1.000	0.413
0.048	0.418	1.000	1.000	0.418

0.05	0.422	1.000	1.000	0.422
0.055	0.435	1.000	1.000	0.435
0.06	0.448	1.000	1.000	0.448
0.065	0.461	1.000	1.000	0.461
0.067	0.467	1.000	1.000	0.467
0.07	0.475	1.000	1.000	0.475
0.075	0.488	1.000	1.000	0.488
0.08	0.502	1.000	1.000	0.502
0.085	0.516	1.000	1.000	0.516
0.09	0.530	1.000	1.000	0.530
0.095	0.544	1.000	1.000	0.544
0.1	0.558	1.000	1.000	0.558
0.11	0.581	1.000	1.000	0.581
0.12	0.603	1.000	1.000	0.603
0.13	0.623	1.000	1.000	0.623
0.133	0.629	1.000	1.000	0.629
0.14	0.641	1.000	1.000	0.641
0.15	0.657	1.000	1.000	0.657
0.16	0.670	1.000	1.000	0.670
0.17	0.683	1.000	1.000	0.683
0.18	0.694	1.000	1.000	0.694
0.19	0.704	1.000	1.000	0.704
0.2	0.713	1.000	1.000	0.713
0.22	0.723	1.000	1.000	0.723
0.24	0.731	1.000	1.000	0.731
0.25	0.734	1.000	1.000	0.734
0.26	0.735	1.000	1.000	0.735
0.28	0.738	1.000	1.000	0.738
0.29	0.739	1.000	1.000	0.739
0.3	0.740	1.000	1.000	0.740
0.32	0.739	1.000	1.000	0.739
0.34	0.736	1.000	1.000	0.736
0.35	0.735	1.000	1.000	0.735
0.36	0.733	1.000	1.000	0.733
0.38	0.730	1.000	1.000	0.730
0.4	0.725	1.000	1.000	0.725
0.42	0.723	1.000	1.000	0.723
0.44	0.720	1.000	1.000	0.720
0.45	0.718	1.000	1.000	0.718
0.46	0.717	1.000	1.000	0.717
0.48	0.713	1.000	1.000	0.713
0.5	0.710	1.000	1.000	0.710
0.55	0.689	1.000	1.020	0.702
0.6	0.669	1.000	1.040	0.696
0.65	0.651	1.000	1.060	0.690
0.667	0.645	1.000	1.067	0.689
0.7	0.635	1.000	1.080	0.685
0.75	0.619	1.000	1.100	0.681
0.8	0.602	1.000	1.120	0.674
0.85	0.585	1.000	1.140	0.667

0.9	0.569	1.000	1.160	0.661
0.95	0.555	1.000	1.180	0.655
1	0.541	1.000	1.200	0.649
1.1	0.512	1.000	1.200	0.615
1.2	0.486	1.000	1.200	0.584
1.3	0.463	1.000	1.200	0.555
1.4	0.441	1.000	1.200	0.529
1.5	0.421	1.000	1.200	0.505
1.6	0.400	1.000	1.200	0.480
1.7	0.380	1.000	1.200	0.456
1.8	0.363	1.000	1.200	0.435
1.9	0.347	1.000	1.200	0.416
2	0.332	1.000	1.200	0.399
2.2	0.302	1.000	1.200	0.362
2.4	0.276	1.000	1.200	0.331
2.5	0.264	1.000	1.200	0.317
2.6	0.254	1.000	1.200	0.304
2.8	0.234	1.000	1.200	0.281
3	0.217	1.000	1.200	0.261
3.2	0.202	1.000	1.200	0.242
3.4	0.188	1.000	1.200	0.226
3.5	0.182	1.000	1.200	0.219
3.6	0.176	1.000	1.200	0.212
3.8	0.166	1.000	1.200	0.199
4	0.156	1.000	1.200	0.187
4.2	0.148	1.000	1.200	0.177
4.4	0.140	1.000	1.200	0.168
4.6	0.133	1.000	1.200	0.160
4.8	0.127	1.000	1.200	0.152
5	0.121	1.000	1.200	0.145

To use above data in Excel, copy/paste:

```
0.01    0.360    1.000    1.000    0.360
0.02    0.365    1.000    1.000    0.365
```

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA(Final Spectrum)
0.01	0.360	1.000	1.000	0.360
0.02	0.417	1.000	1.000	0.417
0.022	0.426	1.000	1.000	0.426
0.025	0.438	1.000	1.000	0.438
0.029	0.452	1.000	1.000	0.452
0.03	0.455	1.000	1.000	0.455
0.032	0.462	1.000	1.000	0.462
0.035	0.471	1.000	1.000	0.471
0.036	0.473	1.000	1.000	0.473
0.04	0.484	1.000	1.000	0.484

0.042	0.489	1.000	1.000	0.489
0.044	0.494	1.000	1.000	0.494
0.045	0.497	1.000	1.000	0.497
0.046	0.499	1.000	1.000	0.499
0.048	0.504	1.000	1.000	0.504
0.05	0.508	1.000	1.000	0.508
0.055	0.519	1.000	1.000	0.519
0.06	0.528	1.000	1.000	0.528
0.065	0.537	1.000	1.000	0.537
0.067	0.541	1.000	1.000	0.541
0.07	0.546	1.000	1.000	0.546
0.075	0.554	1.000	1.000	0.554
0.08	0.562	1.000	1.000	0.562
0.085	0.569	1.000	1.000	0.569
0.09	0.576	1.000	1.000	0.576
0.095	0.583	1.000	1.000	0.583
0.1	0.590	1.000	1.000	0.590
0.11	0.608	1.000	1.000	0.608
0.12	0.626	1.000	1.000	0.626
0.13	0.642	1.000	1.000	0.642
0.133	0.647	1.000	1.000	0.647
0.14	0.658	1.000	1.000	0.658
0.15	0.673	1.000	1.000	0.673
0.16	0.687	1.000	1.000	0.687
0.17	0.701	1.000	1.000	0.701
0.18	0.714	1.000	1.000	0.714
0.19	0.727	1.000	1.000	0.727
0.2	0.739	1.000	1.000	0.739
0.22	0.742	1.000	1.000	0.742
0.24	0.745	1.000	1.000	0.745
0.25	0.747	1.000	1.000	0.747
0.26	0.748	1.000	1.000	0.748
0.28	0.750	1.000	1.000	0.750
0.29	0.752	1.000	1.000	0.752
0.3	0.753	1.000	1.000	0.753
0.32	0.744	1.000	1.000	0.744
0.34	0.735	1.000	1.000	0.735
0.35	0.731	1.000	1.000	0.731
0.36	0.728	1.000	1.000	0.728
0.38	0.720	1.000	1.000	0.720
0.4	0.713	1.000	1.000	0.713
0.42	0.707	1.000	1.000	0.707
0.44	0.701	1.000	1.000	0.701
0.45	0.698	1.000	1.000	0.698
0.46	0.695	1.000	1.000	0.695
0.48	0.690	1.000	1.000	0.690
0.5	0.685	1.000	1.000	0.685
0.55	0.658	1.000	1.020	0.671
0.6	0.635	1.000	1.040	0.661
0.65	0.615	1.000	1.060	0.652

0.667	0.608	1.000	1.067		0.649
0.7	0.596	1.000	1.080		0.644
0.75	0.580	1.000	1.100		0.638
0.8	0.556	1.000	1.120		0.623
0.85	0.535	1.000	1.140		0.610
0.9	0.516	1.000	1.160		0.598
0.95	0.498	1.000	1.180		0.588
1	0.482	1.000	1.200		0.579
1.1	0.449	1.000	1.200		0.539
1.2	0.421	1.000	1.200		0.506
1.3	0.397	1.000	1.200		0.477
1.4	0.376	1.000	1.200		0.451
1.5	0.357	1.000	1.200		0.429
1.6	0.341	1.000	1.200		0.409
1.7	0.326	1.000	1.200		0.391
1.8	0.312	1.000	1.200		0.375
1.9	0.300	1.000	1.200		0.360
2	0.289	1.000	1.200		0.347
2.2	0.263	1.000	1.200		0.315
2.4	0.241	1.000	1.200		0.289
2.5	0.231	1.000	1.200		0.277
2.6	0.222	1.000	1.200		0.266
2.8	0.206	1.000	1.200		0.247
3	0.192	1.000	1.200		0.231
3.2	0.179	1.000	1.200		0.214
3.4	0.167	1.000	1.200		0.200
3.5	0.161	1.000	1.200		0.194
3.6	0.156	1.000	1.200		0.188
3.8	0.147	1.000	1.200		0.177
4	0.139	1.000	1.200		0.167
4.2	0.133	1.000	1.200		0.160
4.4	0.128	1.000	1.200		0.154
4.6	0.123	1.000	1.200		0.148
4.8	0.119	1.000	1.200		0.143
5	0.115	1.000	1.200		0.138

To use above data in Excel, copy/paste:

```
0.01    0.360    1.000    1.000    0.360
0.02    0.417    1.000    1.000    0.417
```

Envelope Data

Period	SA
0.01	0.360
0.02	0.417
0.022	0.426
0.025	0.438
0.029	0.452
0.03	0.455
0.032	0.462

0.035	0.471
0.036	0.473
0.04	0.484
0.042	0.489
0.044	0.494
0.045	0.497
0.046	0.499
0.048	0.504
0.05	0.508
0.055	0.519
0.06	0.528
0.065	0.537
0.067	0.541
0.07	0.546
0.075	0.554
0.08	0.562
0.085	0.569
0.09	0.576
0.095	0.583
0.1	0.590
0.11	0.608
0.12	0.626
0.13	0.642
0.133	0.647
0.14	0.658
0.15	0.673
0.16	0.687
0.17	0.701
0.18	0.714
0.19	0.727
0.2	0.739
0.22	0.742
0.24	0.745
0.25	0.747
0.26	0.748
0.28	0.750
0.29	0.752
0.3	0.753
0.32	0.744
0.34	0.736
0.35	0.735
0.36	0.733
0.38	0.730
0.4	0.725
0.42	0.723
0.44	0.720
0.45	0.718
0.46	0.717
0.48	0.713
0.5	0.710

0.55	0.702
0.6	0.696
0.65	0.690
0.667	0.689
0.7	0.685
0.75	0.681
0.8	0.674
0.85	0.667
0.9	0.661
0.95	0.655
1	0.649
1.1	0.615
1.2	0.584
1.3	0.555
1.4	0.529
1.5	0.505
1.6	0.480
1.7	0.456
1.8	0.435
1.9	0.416
2	0.399
2.2	0.362
2.4	0.331
2.5	0.317
2.6	0.304
2.8	0.281
3	0.261
3.2	0.242
3.4	0.226
3.5	0.219
3.6	0.212
3.8	0.199
4	0.187
4.2	0.177
4.4	0.168
4.6	0.160
4.8	0.152
5	0.145

To use above data in Excel, copy/paste:

```
0.01    0.360
0.02    0.417
```

Caltrans Deterministic ARS Spreadsheet

Newport-Inglewood-Rose Canyon Fault (Offshore or Dana Point)

(Fault ID# 222)

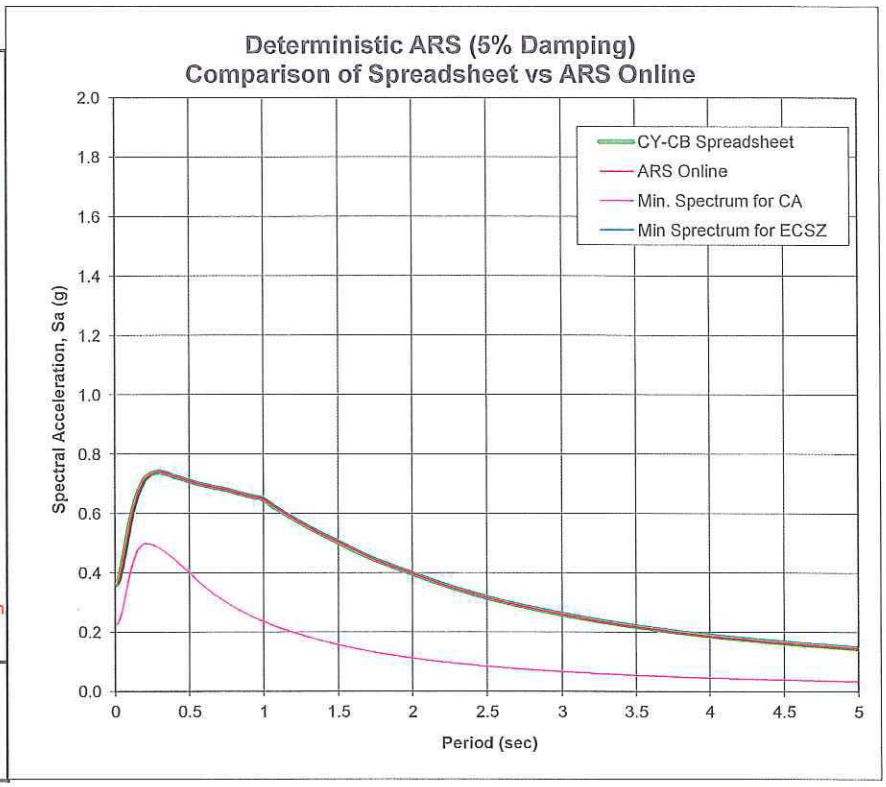
Comparison of ARS Curves
(unlock sheet with "shmi")

Model Inputs

Fault		
Magnitude	7.5	(5 to 8.5)
F_{RV}	0	(input 1 = Rev)
F_{NM}	0	(input 1 = Normal)
Dip (degree)	90	(0 to 90)
Z_{TOR} (km)	0	
Distance		
R_{RUP} (km)	7.0	
R_{JB} (km)	7.0	
R_{X} (km)	7.0	
Hanging Wall?	☐ Yes?	
Near-Field Factor?	☑ Yes?	
Site		
V_{S30} (m/sec)	253	(270 to 1500 m/s)
$Z_{1.0}$ (m)	0	(0 - No Basin)
$Z_{2.5}$ (km)	0	(0 - No Basin)
No. Cal. Basin?	☐ Yes ?	(Check only for sites located within a Basin)
So. Cal. Basin?	☐ Yes ?	

Analysis

ARS Online vs CY-CB Spreadsheet Results
MAX. % Diff. = 0%



CY-CB Spreadsheet Results	
T (sec)	CB-CY S(a)
0.010	0.36019
0.020	0.36504
0.022	0.36849
0.025	0.37302
0.029	0.37834
0.030	0.38002
0.032	0.38441
0.035	0.39068
0.036	0.39270
0.040	0.40044
0.042	0.40473
0.044	0.40902
0.045	0.41133
0.046	0.41360
0.048	0.41791
0.050	0.42220
0.055	0.43505
0.060	0.44813
0.065	0.46124
0.067	0.46669
0.070	0.47471
0.075	0.48809
0.080	0.50232
0.085	0.51643
0.090	0.53040
0.095	0.54424
0.100	0.55768
0.110	0.58156
0.120	0.60363
0.130	0.62366
0.133	0.62907
0.140	0.64104
0.150	0.65687
0.160	0.67062
0.170	0.68274
0.180	0.69398

Place ARS Online Deterministic Data Here "Paste"					
T (sec)	Base S(a)	Basin Factor	Near Fault Factor	Final Adj. S(a)	Diff. (%)
0.01	0.36	1	1	0.36	0%
0.02	0.365	1	1	0.365	0%
0.022	0.368	1	1	0.368	0%
0.025	0.373	1	1	0.373	0%
0.029	0.378	1	1	0.378	0%
0.03	0.38	1	1	0.38	0%
0.032	0.384	1	1	0.384	0%
0.035	0.391	1	1	0.391	0%
0.036	0.393	1	1	0.393	0%
0.04	0.4	1	1	0.4	0%
0.042	0.405	1	1	0.405	0%
0.044	0.409	1	1	0.409	0%
0.045	0.411	1	1	0.411	0%
0.046	0.414	1	1	0.414	0%
0.048	0.418	1	1	0.418	0%
0.05	0.422	1	1	0.422	0%
0.055	0.435	1	1	0.435	0%
0.06	0.448	1	1	0.448	0%
0.065	0.461	1	1	0.461	0%
0.067	0.467	1	1	0.467	0%
0.07	0.475	1	1	0.475	0%
0.075	0.488	1	1	0.488	0%
0.08	0.502	1	1	0.502	0%
0.085	0.516	1	1	0.516	0%
0.09	0.53	1	1	0.53	0%
0.095	0.544	1	1	0.544	0%
0.1	0.558	1	1	0.558	0%
0.11	0.581	1	1	0.581	0%
0.12	0.604	1	1	0.604	0%
0.13	0.624	1	1	0.624	0%
0.133	0.629	1	1	0.629	0%
0.14	0.641	1	1	0.641	0%
0.15	0.657	1	1	0.657	0%
0.16	0.671	1	1	0.671	0%
0.17	0.683	1	1	0.683	0%
0.18	0.694	1	1	0.694	0%

For Comparsion Plots of Min. Sprectra, Paste Special into Cells			
Min. Spectrum for CA		Min Sprectrum for ECSZ	
T (sec)	S (a)	T (sec)	S (a)
0.01	0.2256075		
0.02	0.2282413		
0.022	0.2304705		
0.025	0.2335229		
0.029	0.2372919		
0.03	0.2383928		
0.032	0.2417077		
0.035	0.246544		
0.036	0.2481738		
0.04	0.2544528		
0.042	0.2578153		
0.044	0.2612041		
0.045	0.2629579		
0.046	0.2647201		
0.048	0.2681292		
0.05	0.2715586		
0.055	0.2836013		
0.06	0.2957196		
0.065	0.3077784		
0.067	0.3126592		
0.07	0.3198958		
0.075	0.331892		
0.08	0.3444809		
0.085	0.3569197		
0.09	0.3691513		
0.095	0.381161		
0.1	0.3928396		
0.11	0.4122428		
0.12	0.4300455		
0.13	0.4461102		
0.133	0.4504477		
0.14	0.4601098		
0.15	0.4727888		
0.16	0.4798754		
0.17	0.485729		
0.18	0.4908149		

0.190	0.70411
0.200	0.71329
0.220	0.72314
0.240	0.73093
0.250	0.73394
0.260	0.73553
0.280	0.73867
0.290	0.73919
0.300	0.73976
0.320	0.73883
0.340	0.73674
0.350	0.73526
0.360	0.73370
0.380	0.72982
0.400	0.72556
0.420	0.72305
0.440	0.71991
0.450	0.71856
0.460	0.71696
0.480	0.71363
0.500	0.71051
0.550	0.70276
0.600	0.69646
0.650	0.69072
0.660	0.68809
0.700	0.68566
0.750	0.68125
0.800	0.67404
0.850	0.66737
0.900	0.66081
0.950	0.65498
1.000	0.64909
1.100	0.61451
1.200	0.58339
1.300	0.55501
1.400	0.52903
1.500	0.50461
1.600	0.47920
1.700	0.45586
1.800	0.43474
1.900	0.41560
2.000	0.39815
2.200	0.36184
2.400	0.33081
2.500	0.31692
2.600	0.30399
2.800	0.28069
3.000	0.26039
3.200	0.24210
3.400	0.22591
3.500	0.21850
3.600	0.21150
3.800	0.19856
4.000	0.18698
4.200	0.17708
4.400	0.16791
4.600	0.15952
4.800	0.15182
5.000	0.14469

0.19	0.704	1	1	0.704	0%
0.2	0.713	1	1	0.713	0%
0.22	0.723	1	1	0.723	0%
0.24	0.731	1	1	0.731	0%
0.25	0.734	1	1	0.734	0%
0.26	0.735	1	1	0.735	0%
0.28	0.739	1	1	0.739	0%
0.29	0.739	1	1	0.739	0%
0.3	0.74	1	1	0.74	0%
0.32	0.739	1	1	0.739	0%
0.34	0.737	1	1	0.737	0%
0.35	0.735	1	1	0.735	0%
0.36	0.734	1	1	0.734	0%
0.38	0.73	1	1	0.73	0%
0.4	0.725	1	1	0.725	0%
0.42	0.723	1	1	0.723	0%
0.44	0.72	1	1	0.72	0%
0.45	0.718	1	1	0.718	0%
0.46	0.717	1	1	0.717	0%
0.48	0.713	1	1	0.713	0%
0.5	0.71	1	1	0.71	0%
0.55	0.689	1	1.02	0.703	0%
0.6	0.669	1	1.04	0.696	0%
0.65	0.651	1	1.06	0.691	0%
0.667	0.646	1	1.067	0.689	0%
0.7	0.635	1	1.08	0.685	0%
0.75	0.619	1	1.1	0.681	0%
0.8	0.602	1	1.12	0.674	0%
0.85	0.585	1	1.14	0.667	0%
0.9	0.57	1	1.16	0.661	0%
0.95	0.555	1	1.18	0.655	0%
1	0.541	1	1.2	0.649	0%
1.1	0.512	1	1.2	0.615	0%
1.2	0.486	1	1.2	0.584	0%
1.3	0.463	1	1.2	0.555	0%
1.4	0.441	1	1.2	0.529	0%
1.5	0.421	1	1.2	0.505	0%
1.6	0.4	1	1.2	0.48	0%
1.7	0.38	1	1.2	0.456	0%
1.8	0.363	1	1.2	0.435	0%
1.9	0.347	1	1.2	0.416	0%
2	0.332	1	1.2	0.399	0%
2.2	0.302	1	1.2	0.362	0%
2.4	0.276	1	1.2	0.331	0%
2.5	0.264	1	1.2	0.317	0%
2.6	0.254	1	1.2	0.304	0%
2.8	0.234	1	1.2	0.281	0%
3	0.217	1	1.2	0.261	0%
3.2	0.202	1	1.2	0.242	0%
3.4	0.188	1	1.2	0.226	0%
3.5	0.182	1	1.2	0.219	0%
3.6	0.176	1	1.2	0.212	0%
3.8	0.166	1	1.2	0.199	0%
4	0.156	1	1.2	0.187	0%
4.2	0.148	1	1.2	0.177	0%
4.4	0.14	1	1.2	0.168	0%
4.6	0.133	1	1.2	0.16	0%
4.8	0.127	1	1.2	0.152	0%
5	0.121	1	1.2	0.145	0%

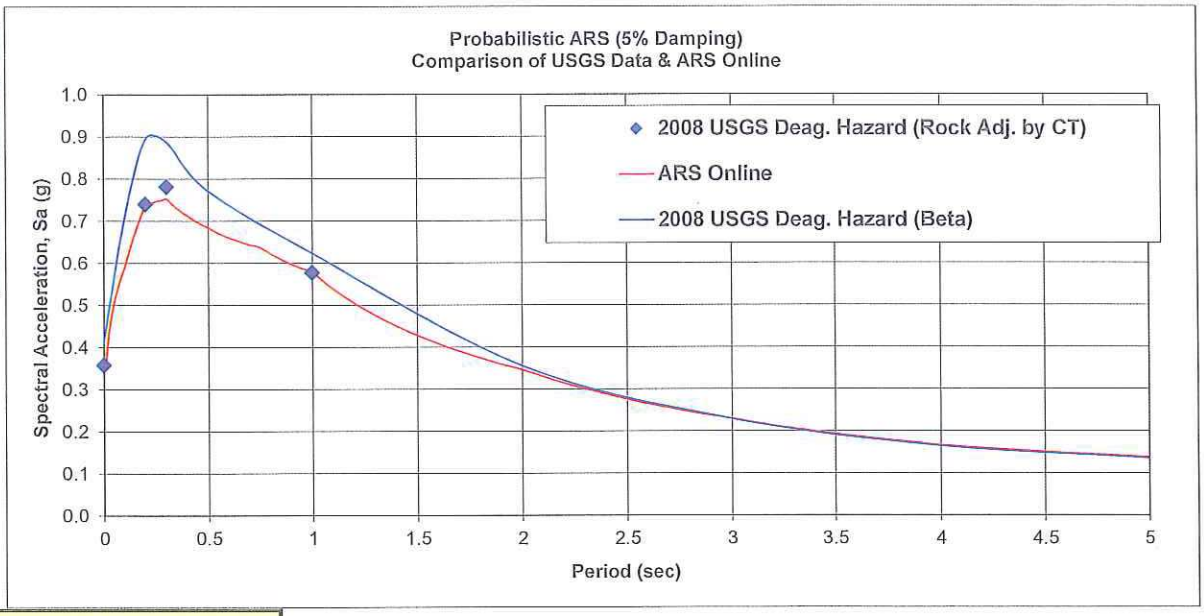
0.19	0.4950471		
0.2	0.498635		
0.22	0.497883		
0.24	0.4959677		
0.25	0.494554		
0.26	0.4926042		
0.28	0.4887438		
0.29	0.4863301		
0.3	0.4839208		
0.32	0.4768409		
0.34	0.4694934		
0.35	0.4657192		
0.36	0.4619905		
0.38	0.4544097		
0.4	0.4469446		
0.42	0.4375534		
0.44	0.4283533		
0.45	0.4239857		
0.46	0.4196096		
0.48	0.4111691		
0.5	0.4031001		
0.55	0.3772017		
0.6	0.3547423		
0.65	0.3348755		
0.66	0.3300489		
0.7	0.317242		
0.75	0.3014416		
0.8	0.2859415		
0.85	0.2718785		
0.9	0.2590047		
0.95	0.2472861		
1	0.2364164		
1.1	0.2160741		
1.2	0.1986572		
1.3	0.183501		
1.4	0.1701423		
1.5	0.1581935		
1.6	0.1469128		
1.7	0.1368524		
1.8	0.1279021		
1.9	0.1199194		
2	0.112808		
2.2	0.100161		
2.4	0.089697		
2.5	0.0851254		
2.6	0.08093		
2.8	0.0734866		
3	0.067119		
3.2	0.0616731		
3.4	0.0569134		
3.5	0.0547581		
3.6	0.0527294		
3.8	0.0490069		
4	0.0456977		
4.2	0.0428869		
4.4	0.040331		
4.6	0.0380084		
4.8	0.0358808		
5	0.0339305		

Caltrans Probabilistic Spreadsheet

Comparison spreadsheet of the 2008 USGS Probabilistic Seismic Hazard Data and ARS Online Probabilistic Data (unlock spreadsheet "shmi")
Spectral Accelerations Points from USGS Website at http://earthquake.usgs.gov/research/hazmaps/products_data/2008/data/

*** Note: This spreadsheet uses the given latitude and longitude data provided by the user to estimate spectral acceleration values with a probability of exceedence 5% in 50 yrs (or 975 yr return period). The four spectral acceleration data points plotted on the graph are from the USGS website and are based on a 0.05 degree grid. Basic interpolation is used to estimate intermediate values inside each grid. Raw Data points are provided in the tabs of this spreadsheet. Corner grid spectral acceleration data are shown in the "calculation" tab.**

Input Site Information	
Latitude	Longitude
33.4528	-117.6437
V_{S30} (m/s) =	253
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	7
$Z_{1.0}$ (m) =	0
$Z_{2.5}$ (km) =	0



Place ARS Online Probabilistic Data Here "Paste"

T (sec)	Base Spectrum S(a)	Basin Factor	Near Fault Factor	Final Adj. Spectrum S(a)
0.01	0.36	1	1	0.36
0.02	0.417	1	1	0.417
0.022	0.426	1	1	0.426
0.025	0.438	1	1	0.438
0.029	0.452	1	1	0.452
0.03	0.455	1	1	0.455
0.032	0.462	1	1	0.462
0.035	0.471	1	1	0.471
0.036	0.473	1	1	0.473
0.04	0.484	1	1	0.484
0.042	0.489	1	1	0.489
0.044	0.494	1	1	0.494
0.045	0.497	1	1	0.497
0.046	0.499	1	1	0.499
0.048	0.504	1	1	0.504
0.05	0.508	1	1	0.508
0.055	0.519	1	1	0.519
0.06	0.528	1	1	0.528
0.065	0.537	1	1	0.537
0.067	0.541	1	1	0.541
0.07	0.546	1	1	0.546
0.075	0.554	1	1	0.554
0.08	0.562	1	1	0.562
0.085	0.569	1	1	0.569
0.09	0.576	1	1	0.576
0.095	0.583	1	1	0.583
0.1	0.59	1	1	0.59
0.11	0.608	1	1	0.608
0.12	0.626	1	1	0.626
0.13	0.642	1	1	0.642
0.133	0.647	1	1	0.647
0.14	0.658	1	1	0.658
0.15	0.673	1	1	0.673
0.16	0.687	1	1	0.687
0.17	0.701	1	1	0.701
0.18	0.714	1	1	0.714
0.19	0.727	1	1	0.727
0.2	0.739	1	1	0.739
0.22	0.742	1	1	0.742
0.24	0.745	1	1	0.745
0.25	0.747	1	1	0.747
0.26	0.748	1	1	0.748

Analysis of ARS Online Results vs USGS Deaggregation Hazard (Adj. By CT)

Period (sec)	USGS Interpolated Spectral Accel.	Adj. for Near Fault Effect	Adj. for Soil Amplification	Adj. For Basin Effect	Final Adj. USGS Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.350	1.000	1.024	1.000	0.358	0.36	-0.5%
0.2	0.835	1.000	0.886	1.000	0.741	0.739	0.2%
0.3	0.690	1.000	1.133	1.000	0.782	0.753	3.7%
1	0.261	1.200	1.844	1.000	0.578	0.579	-0.2%

Max % Difference = 3.7%

USGS Deaggregation Hazard (Beta) with Near Field and Basin Factors

Period (sec)	INPUT USGS Deagg. Spec Accel	Adj. for Near Fault Effect	Adj. For Basin Effect	Final Adj. USGS Deagg Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.4105	1.000	1.000	0.411	0.36	*12.3%*
0.1	0.7065	1.000	1.000	0.707	0.59	*16.5%*
0.2	0.8929	1.000	1.000	0.893	0.739	*17.2%*
0.3	0.8883	1.000	1.000	0.888	0.753	*15.2%*
0.5	0.7727	1.000	1.000	0.773	0.685	11.3%
1	0.5205	1.200	1.000	0.625	0.579	7.3%
2	0.2973	1.200	1.000	0.357	0.347	2.7%
3	0.1919	1.200	1.000	0.230	0.231	0.3%
4	0.13783	1.200	1.000	0.165	0.167	0.9%
5	0.11323	1.200	1.000	0.136	0.138	1.5%

Max % Difference = 11.3%

0.28	0.75	1	1	0.75
0.29	0.752	1	1	0.752
0.3	0.753	1	1	0.753
0.32	0.744	1	1	0.744
0.34	0.735	1	1	0.735
0.35	0.731	1	1	0.731
0.36	0.728	1	1	0.728
0.38	0.72	1	1	0.72
0.4	0.714	1	1	0.714
0.42	0.707	1	1	0.707
0.44	0.701	1	1	0.701
0.45	0.698	1	1	0.698
0.46	0.695	1	1	0.695
0.48	0.69	1	1	0.69
0.5	0.685	1	1	0.685
0.55	0.658	1	1.02	0.671
0.6	0.635	1	1.04	0.661
0.65	0.615	1	1.06	0.652
0.667	0.608	1	1.067	0.649
0.7	0.596	1	1.08	0.644
0.75	0.58	1	1.1	0.638
0.8	0.556	1	1.12	0.623
0.85	0.535	1	1.14	0.61
0.9	0.516	1	1.16	0.598
0.95	0.498	1	1.18	0.588
1	0.482	1	1.2	0.579
1.1	0.449	1	1.2	0.539
1.2	0.422	1	1.2	0.506
1.3	0.397	1	1.2	0.477
1.4	0.376	1	1.2	0.451
1.5	0.357	1	1.2	0.429
1.6	0.341	1	1.2	0.409
1.7	0.326	1	1.2	0.391
1.8	0.312	1	1.2	0.375
1.9	0.3	1	1.2	0.36
2	0.289	1	1.2	0.347
2.2	0.263	1	1.2	0.315
2.4	0.241	1	1.2	0.289
2.5	0.231	1	1.2	0.277
2.6	0.222	1	1.2	0.266
2.8	0.206	1	1.2	0.247
3	0.192	1	1.2	0.231
3.2	0.179	1	1.2	0.214
3.4	0.167	1	1.2	0.2
3.5	0.162	1	1.2	0.194
3.6	0.156	1	1.2	0.188
3.8	0.147	1	1.2	0.177
4	0.139	1	1.2	0.167
4.2	0.133	1	1.2	0.16
4.4	0.128	1	1.2	0.154
4.6	0.123	1	1.2	0.148
4.8	0.119	1	1.2	0.143
5	0.115	1	1.2	0.138

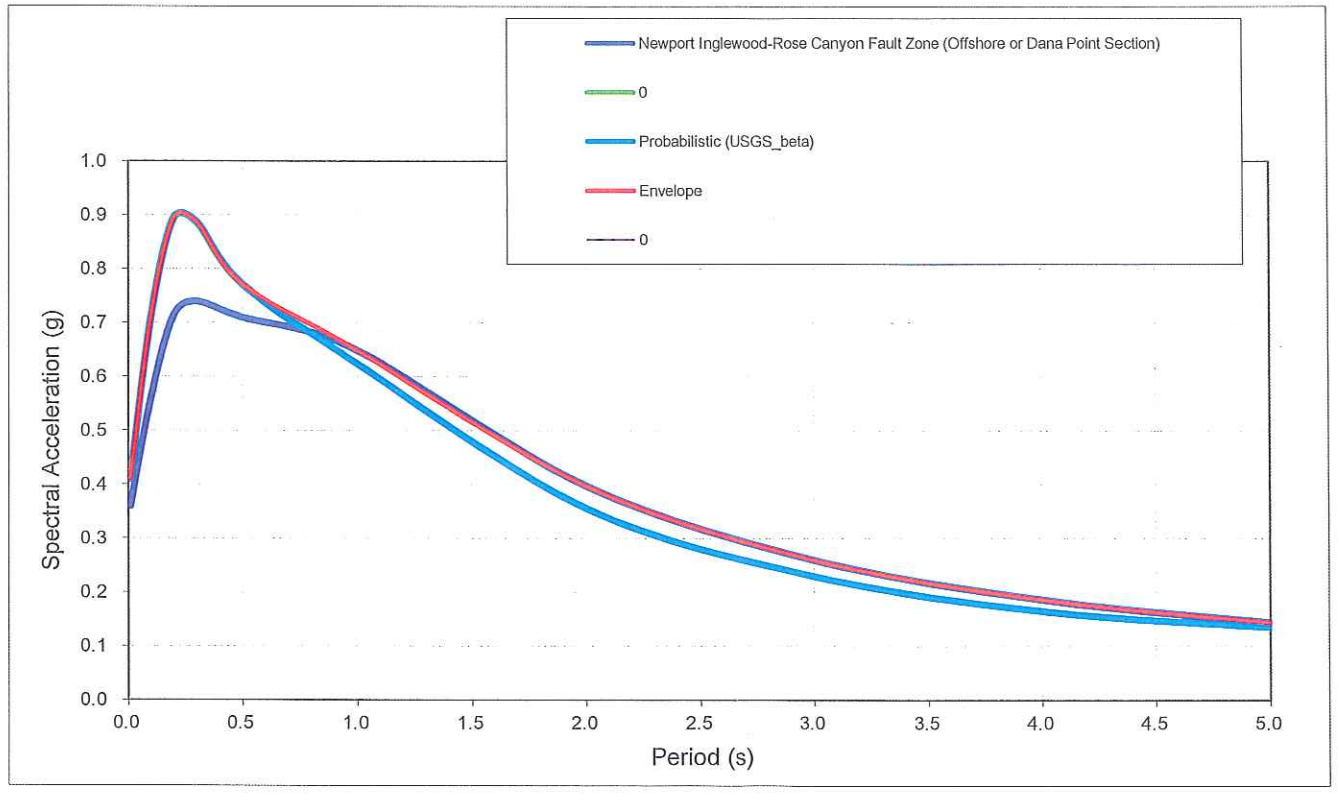
ARS Curves

Deterministic, Probabilistic and Envelope

Bridge	Figure Number	Latitude	Longitude	Soil Profile Type	V_{s30} (m/s)	$Z_{1.0}$ (m)	$Z_{2.5}$ (km)	M	od-Rose Canyon Fault Zone (Offshore or Da								
									R_x (km)	R_jb (km)	R_{rup} (km)	R_x (km)	R_jb (km)	R_{rup} (km)	R_x (km)	R_jb (km)	R_{rup} (km)
Route 5/1 Separation	2	33.4670	-117.6699	D	253	0	0		6.15	6.15	6.15						
Project Number	11-137				V_{s30} (ft/s)												
Date	1/12/2012				830												

0 Enter 0 Sec accelaration here for USGS Spectrum

Newport Inglewood-Rose Canyon Fault Zone (Offshore or Dana Point Section)		0		0		Probabilistic (USGS_beta)		Envelope	
T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	Sa (g)
0.010	0.360188633					0.010	0.4105	0.010	0.411
0.100	0.55768081					0.100	0.7065	0.100	0.707
0.200	0.713291877					0.200	0.8929	0.200	0.893
0.300	0.739764442					0.300	0.8883	0.300	0.888
0.500	0.710506181					0.500	0.7727	0.500	0.773
1.000	0.649086611					1.000	0.6246	1.000	0.649
2.000	0.398146986					2.000	0.35676	2.000	0.398
3.000	0.260386183					3.000	0.23032	3.000	0.260
4.000	0.186978323					4.000	0.16545	4.000	0.187
5.000	0.144689287					5.000	0.13593	5.000	0.145



2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

This document is to be filled out by *checker* to evaluate the fault parameters and design response spectrum used for seismic design recommendations for bridge structures. To facilitate the quality check, the designer shall provide the checker all pertinent project information, geologic information and approved exceptions (if applicable) needed to complete this form. The *checker* must be familiar with the Seismic Design Criteria (Appendix B), Deterministic PGA Map and ARS Online Report, and Geotechnical Services Design Manual in order to successfully perform a quality check. Tools available to checkers include the Deterministic Response Spectrum Spreadsheet, Probabilistic Response Spectrum Spreadsheet (after USGS), 2008 USGS National Seismic Hazard Map and the ARS Online web tool. The above documents and tools are available at http://dap3.dot.ca.gov/shake_stable/technical.php.

Project Information

Dist – EA: 12-0F96C County: ORA Route: 5 PM: 4.97

Bridge/Facility Name: Avenida Vaquero Bridge/Facility No.: 55-0223

Latitude: 33.4528 Longitude: -117.6437

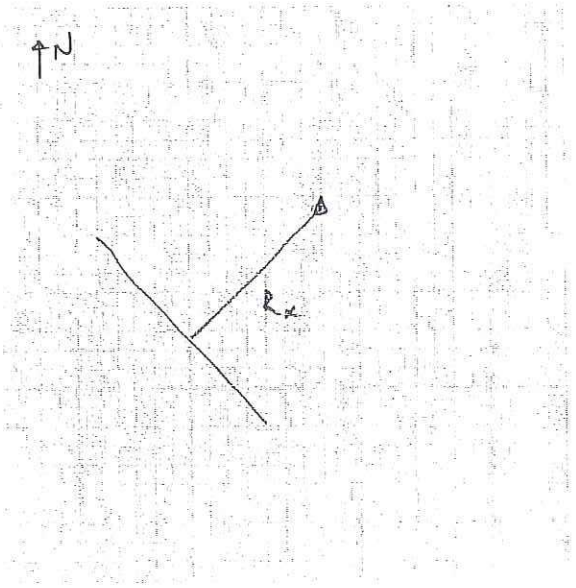
Deterministic Fault Information

Fault Name: Newport Inglewood Loss Canyon Fault ID#: 222 M_{MAX}: 7.5 Fault Type: RLSS

Fault Dip: 90 Dip Direction: V Top of Rupture: 0 Bottom of Rupture: 13

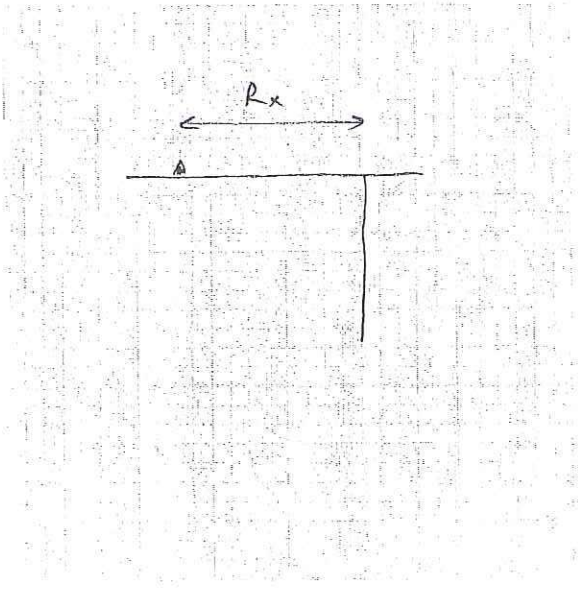
Plan View

(rough sketch; show dimensions)



Elevation View

(rough sketch; show dimensions)



Calculated or Measured Distances

R_{RUP}:	7 km	☒	Calculated / graphically	☒	Same as Rx (by definition)
R_{JB}:	7 km	☒	Calculated / graphically	☒	Same as Rx (by definition)
R_X:	7 km	☒	"Ruler" function on ARS Online	☐	Deterministic PGA Map

2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

Determination of V_{S30}

V_{S30} (m/s): 253

Method of Determining V_{S30}: SPT, CPT (e.g. P-S logging, Geophysics, SPT correlations, etc)

Additional Explanation (if needed): Calibrated with CPT data

Determination of Z1.0 and Z2.5 (if site located in designated California deep basin)

$Z_{1.0}$ (m/s): 0 $Z_{2.5}$ (km/s): 0

Method of Determining $Z_{1.0}$ & $Z_{2.5}$: ARS online (e.g. ARS Online, SDC figure, other)

Additional Explanation (if needed): _____

Deterministic - Special Conditions

Yes	No	N/A	
☒	☐		Was the Errata Deterministic Fault Database Spreadsheet reviewed to ensure that the correct fault parameters used in the analysis.
☒	☐	☐	Were the Near-Fault Factors applied correctly? *Applies to sites with a R_{RUP} distance of 25 km or less, as defined in the SDC.*
☒	☐	☐	Were deep basin depths ($Z_{1.0}$ & $Z_{2.5}$) estimated correctly? *Applies to sites located in deep basins as shown in Figures B.5 - B.11 of the SDC or ARS Online.*
☐	☐	☒	If the site is located within the Eastern California Shear Zone (ECSZ), was the design ARS larger than the minimum spectrum for the ECSZ (as defined in the SDC, Appendix B, Figure B.2)?
☐	☐	☒	If the controlling fault is the Cascadia Subduction Zone, was the alternate seismic procedure applied correctly (as defined in the SDC, Appendix B)?
☐	☐	☒	If the deterministic ARS falls below the Minimum Deterministic Spectra (as defined in the SDC), did the Minimum Deterministic Spectra control the deterministic design spectrum?
☒	☐		Did the ARS Online deterministic spectrum correspond within 10% of the calculated deterministic spectrum? If not, note it in the comments section of this document and email a copy to the ARS Online development team, ARS_Online@dot.ca.gov, so that they may address the potential bug.

Probabilistic - Special Conditions

Yes	No	N/A	
☒	☐	☐	Were Near-Fault Factors applied correctly (as defined by SDC)? *Applies to sites with a deaggregation R distance of 25 km or less.*
☒	☐	☐	Were deep basin depths ($Z_{1.0}$ & $Z_{2.5}$) estimated correctly? *Applies to sites located in deep basins as shown in Figures B.5 - B.11 of the SDC or ARS Online.*
☒	☐	☐	If the site has a V_{S30} of less than 300 m/s, was the resulting ARS curve checked against spectral acceleration from USGS Interactive Deaggregation tool?
☒	☐	☐	If the USGS Interactive Deaggregation tool and spectral acceleration data were used, were the appropriate near-fault and basin correction factors applied?

2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

Yes	No	N/A	
☐	☐	☒	If the probabilistic ARS falls below the Minimum Deterministic Spectra (as defined in the SDC), did the Minimum Deterministic Spectra control the design spectrum?
☒	☐		Did the ARS Online design spectrum correspond within 10% of the USGS spectral acceleration data from the verification spreadsheet? If not, note it in the comments section of this document and email a copy to the ARS Online development team, ARS_Online@dot.ca.gov, so that they may address the potential bug.

Comments / Observations Encountered during QC/QA process:

ARS curves were generated for other V_{s30} = 274, 299 & 411. Design ARS curve is average all the ARS curves

I certify that I have performed a quality check of the referenced fault information and design response spectrum provided by the geotechnical designer. The quality check is based on Seismic Design Criteria (Appendix B), Deterministic PGA Map and ARS Online Report, and the Geotechnical Services Design Manual.

LINO CHEANG — PRINCIPAL

Checker (Print) — Title

[signature] — 1/23/2012

Checker (Signature) — Date

I certify that the referenced project complies with Geotechnical Service's Quality Control/Quality Assurance procedures, as described in the memorandum, "Quality Control/Quality Assurance for the 2009 Seismic Design Procedures", dated August 12, 2009.

LINO CHEANG — PRINCIPAL

Functional Supervisor (Print) — Title

[signature] — 1/23/2012

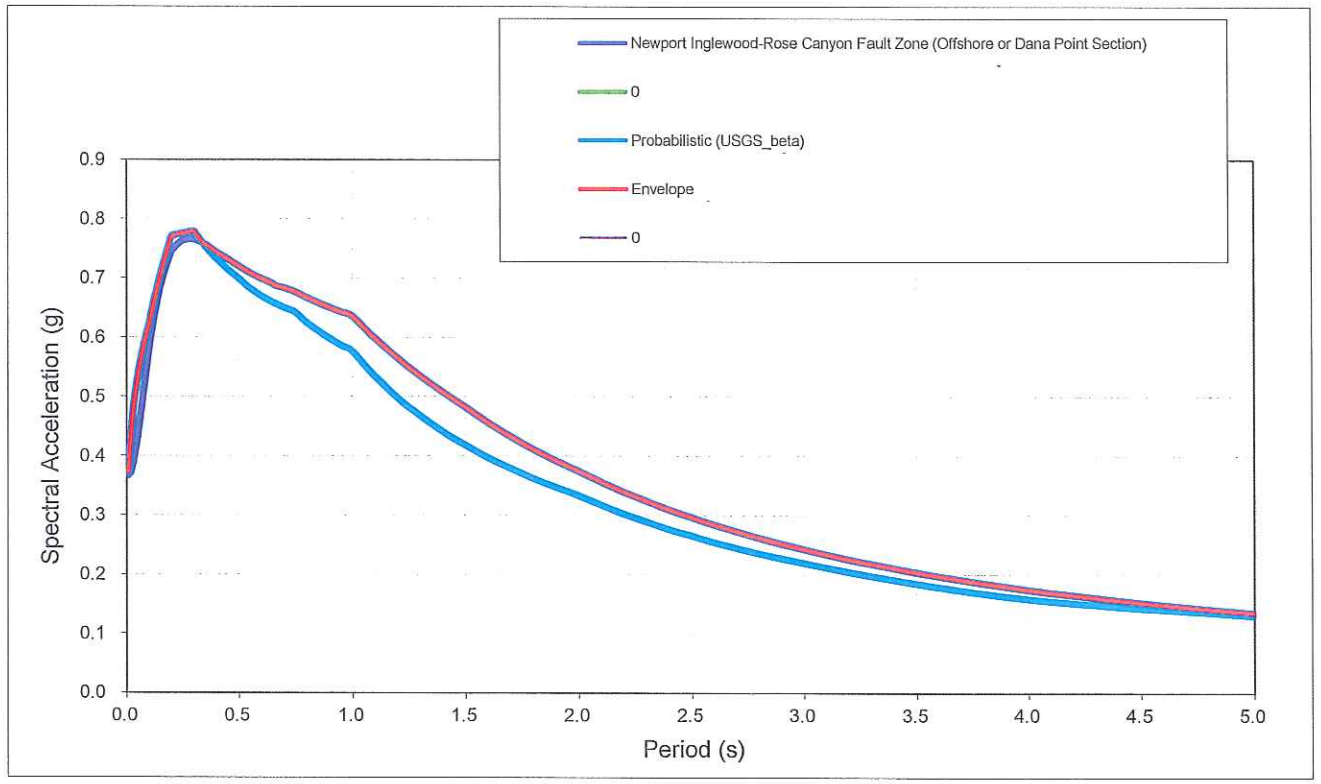
Functional Supervisor (Signature) — Date

(This original checklist and signature sheet shall be placed in the geotechnical project file, and a copy sent to the Mark Willian of the Geotechnical Services Corporate Unit).

Bridge	Figure Number	Latitude	Longitude	Soil Profile Type	V_{s30} (m/s)	$Z_{1.0}$ (m)	$Z_{2.5}$ (km)	M	od-Rose Canyon Fault Zone (Offshore or Da								
									R_x (km)	R_jb (km)	R_{rup} (km)	R_x (km)	R_jb (km)	R_{rup} (km)	R_x (km)	R_jb (km)	R_{rup} (km)
		33.4528	-117.6437	D	274	0	0										
Project Number					V_{s30} (ft/s)												
Date					899												

0 Enter 0 Sec accelaration here for USGS Spectrum

Newport Inglewood-Rose Canyon Fault Zone (Offshore or Dana Point Section)		0		0		Probabilistic (USGS_beta)		Envelope	
T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	Sa (g)
0.01	0.367483757					0.01	0.373	0.010	0.373
0.02	0.372878337					0.02	0.435	0.020	0.435
0.022	0.376612143					0.022	0.444	0.022	0.444
0.025	0.381719558					0.025	0.457	0.025	0.457
0.029	0.387780669					0.029	0.473	0.029	0.473
0.03	0.389622068					0.03	0.476	0.030	0.476
0.032	0.394401745					0.032	0.483	0.032	0.483
0.035	0.401316563					0.035	0.493	0.035	0.493
0.036	0.403595784					0.036	0.496	0.036	0.496
0.04	0.412325764					0.04	0.508	0.040	0.508
0.042	0.4170792					0.042	0.513	0.042	0.513
0.044	0.421792055					0.044	0.519	0.044	0.519
0.045	0.424316818					0.045	0.521	0.045	0.521
0.046	0.426793599					0.046	0.524	0.046	0.524
0.048	0.431552504					0.048	0.529	0.048	0.529
0.05	0.436319935					0.05	0.533	0.050	0.533
0.055	0.45050421					0.055	0.545	0.055	0.545
0.06	0.464919742					0.06	0.556	0.060	0.556
0.065	0.479241711					0.065	0.566	0.065	0.566
0.067	0.485162971					0.067	0.569	0.067	0.569
0.07	0.493820748					0.07	0.575	0.070	0.575
0.075	0.508303732					0.075	0.584	0.075	0.584
0.08	0.523574876					0.08	0.592	0.080	0.592
0.085	0.538755738					0.085	0.6	0.085	0.600
0.09	0.553711073					0.09	0.608	0.090	0.608
0.095	0.568523383					0.095	0.615	0.095	0.615
0.1	0.582937367					0.1	0.622	0.100	0.622
0.11	0.608451716					0.11	0.641	0.110	0.641
0.12	0.631985618					0.12	0.659	0.120	0.659
0.13	0.653212044					0.13	0.675	0.130	0.675
0.133	0.658912123					0.133	0.68	0.133	0.680
0.14	0.671572593					0.14	0.691	0.140	0.691
0.15	0.688239635					0.15	0.706	0.150	0.706
0.16	0.7024508					0.16	0.72	0.160	0.720
0.17	0.714861013					0.17	0.733	0.170	0.733
0.18	0.726321737					0.18	0.747	0.180	0.747
0.19	0.736563506					0.19	0.759	0.190	0.759

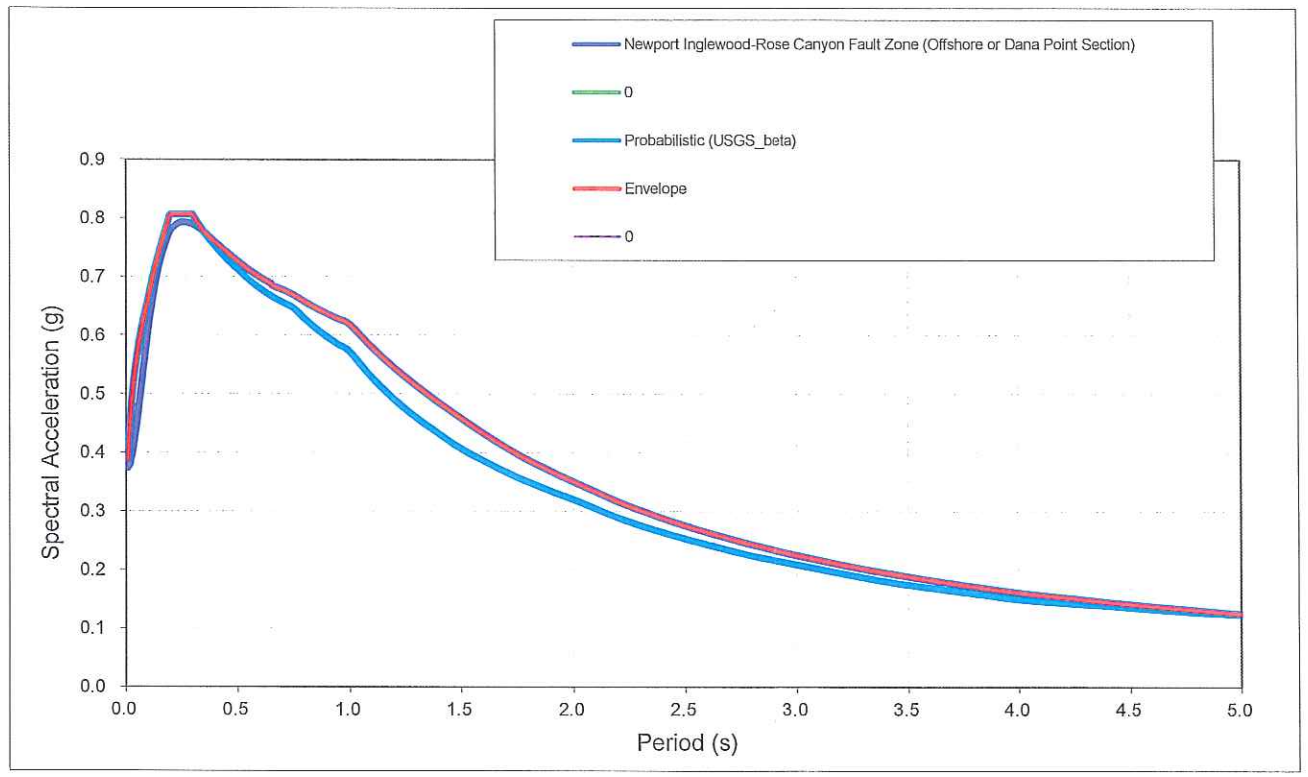


0.2	0.745780214					0.2	0.771	0.200	0.771
0.22	0.75456869					0.22	0.773	0.220	0.773
0.24	0.761190174					0.24	0.775	0.240	0.775
0.25	0.76354716					0.25	0.776	0.250	0.776
0.26	0.764343588					0.26	0.776	0.260	0.776
0.28	0.765992666					0.28	0.778	0.280	0.778
0.29	0.765670833					0.29	0.778	0.290	0.778
0.3	0.76540889					0.3	0.779	0.300	0.779
0.32	0.762915396					0.32	0.769	0.320	0.769
0.34	0.759261756					0.34	0.759	0.340	0.759
0.35	0.756987965					0.35	0.754	0.350	0.757
0.36	0.754677723					0.36	0.75	0.360	0.755
0.38	0.749268773					0.38	0.741	0.380	0.749
0.4	0.743514669					0.4	0.733	0.400	0.744
0.42	0.739344999					0.42	0.726	0.420	0.739
0.44	0.734567133					0.44	0.719	0.440	0.735
0.45	0.732410817					0.45	0.715	0.450	0.732
0.46	0.73003976					0.46	0.712	0.460	0.730
0.48	0.725147175					0.48	0.706	0.480	0.725
0.5	0.720563555					0.5	0.7	0.500	0.721
0.55	0.70938881					0.55	0.684	0.550	0.709
0.6	0.699980989					0.6	0.671	0.600	0.700
0.65	0.691474537					0.65	0.66	0.650	0.691
0.66	0.688117161					0.667	0.657	0.660	0.688
0.7	0.68389537					0.7	0.651	0.700	0.684
0.75	0.677136386					0.75	0.643	0.750	0.677
0.8	0.667811171					0.8	0.626	0.800	0.668
0.85	0.659236551					0.85	0.612	0.850	0.659
0.9	0.650925405					0.9	0.599	0.900	0.651
0.95	0.643429405					0.95	0.587	0.950	0.643
1	0.636011885					1	0.577	1.000	0.636
1.1	0.599077928					1.1	0.535	1.100	0.599
1.2	0.566061278					1.2	0.499	1.200	0.566
1.3	0.536026529					1.3	0.469	1.300	0.536
1.4	0.508681833					1.4	0.442	1.400	0.509
1.5	0.483211345					1.5	0.419	1.500	0.483
1.6	0.457226189					1.6	0.398	1.600	0.457
1.7	0.433499778					1.7	0.38	1.700	0.433
1.8	0.412047345					1.8	0.363	1.800	0.412
1.9	0.392664492					1.9	0.348	1.900	0.393
2	0.375106655					2	0.334	2.000	0.375
2.2	0.339920906					2.2	0.303	2.200	0.340
2.4	0.31016432					2.4	0.277	2.400	0.310
2.5	0.296905957					2.5	0.266	2.500	0.297
2.6	0.284602782					2.6	0.255	2.600	0.285
2.8	0.262476165					2.8	0.236	2.800	0.262
3	0.243242267					3	0.22	3.000	0.243
3.2	0.226090449					3.2	0.205	3.200	0.226
3.4	0.210914326					3.4	0.191	3.400	0.211
3.5	0.203975918					3.5	0.185	3.500	0.204
3.6	0.197416952					3.6	0.179	3.600	0.197
3.8	0.185311881					3.8	0.168	3.800	0.185
4	0.174478047					4	0.159	4.000	0.174
4.2	0.16523024					4.2	0.152	4.200	0.165
4.4	0.156681115					4.4	0.146	4.400	0.157
4.6	0.148860597					4.6	0.141	4.600	0.149
4.8	0.141689258					4.8	0.136	4.800	0.142
5	0.135050779					5	0.131	5.000	0.135

Bridge	Figure Number	Latitude	Longitude	Soil Profile Type	V_{s30} (m/s)	$Z_{1.0}$ (m)	$Z_{2.5}$ (km)	M	od-Rose Canyon Fault Zone (Offshore or Da								
									R_x (km)	R_jb (km)	R_{rup} (km)	R_x (km)	R_jb (km)	R_{rup} (km)	R_x (km)	R_jb (km)	R_{rup} (km)
				D	299	0	0										
Project Number					V_{s30} (ft/s)												
Date																	
					981												

0 Enter 0 Sec accelaration here for USGS Spectrum

Newport Inglewood-Rose Canyon Fault Zone (Offshore or Dana Point Section)		0		0		Probabilistic (USGS_beta)		Envelope	
T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	Sa (g)
0.01	0.374182242					0.01	0.388	0.010	0.388
0.02	0.380071004					0.02	0.455	0.020	0.455
0.022	0.384100018					0.022	0.465	0.022	0.465
0.025	0.389795745					0.025	0.479	0.025	0.479
0.029	0.396639243					0.029	0.495	0.029	0.495
0.03	0.398662801					0.03	0.499	0.030	0.499
0.032	0.403880288					0.032	0.507	0.032	0.507
0.035	0.411525657					0.035	0.517	0.035	0.517
0.036	0.414093233					0.036	0.521	0.036	0.521
0.04	0.423938798					0.04	0.534	0.040	0.534
0.042	0.429228703					0.042	0.54	0.042	0.540
0.044	0.434428451					0.044	0.545	0.044	0.545
0.045	0.437208809					0.045	0.548	0.045	0.548
0.046	0.439931978					0.046	0.551	0.046	0.551
0.048	0.445206408					0.048	0.556	0.048	0.556
0.05	0.450527429					0.05	0.562	0.050	0.562
0.055	0.466221625					0.055	0.574	0.055	0.574
0.06	0.482151211					0.06	0.586	0.060	0.586
0.065	0.497852741					0.065	0.597	0.065	0.597
0.067	0.504305138					0.067	0.601	0.067	0.601
0.07	0.513691838					0.07	0.607	0.070	0.607
0.075	0.529416012					0.075	0.617	0.075	0.617
0.08	0.545825331					0.08	0.626	0.080	0.626
0.085	0.562175957					0.085	0.635	0.085	0.635
0.09	0.578188636					0.09	0.643	0.090	0.643
0.095	0.594045123					0.095	0.651	0.095	0.651
0.1	0.609489201					0.1	0.659	0.100	0.659
0.11	0.636687487					0.11	0.677	0.110	0.677
0.12	0.661704037					0.12	0.695	0.120	0.695
0.13	0.684119912					0.13	0.711	0.130	0.711
0.133	0.690096144					0.133	0.716	0.133	0.716
0.14	0.703417655					0.14	0.726	0.140	0.726
0.15	0.720869927					0.15	0.741	0.150	0.741
0.16	0.735437456					0.16	0.755	0.160	0.755
0.17	0.748015836					0.17	0.768	0.170	0.768
0.18	0.759567383					0.18	0.781	0.180	0.781
0.19	0.76977613					0.19	0.793	0.190	0.793

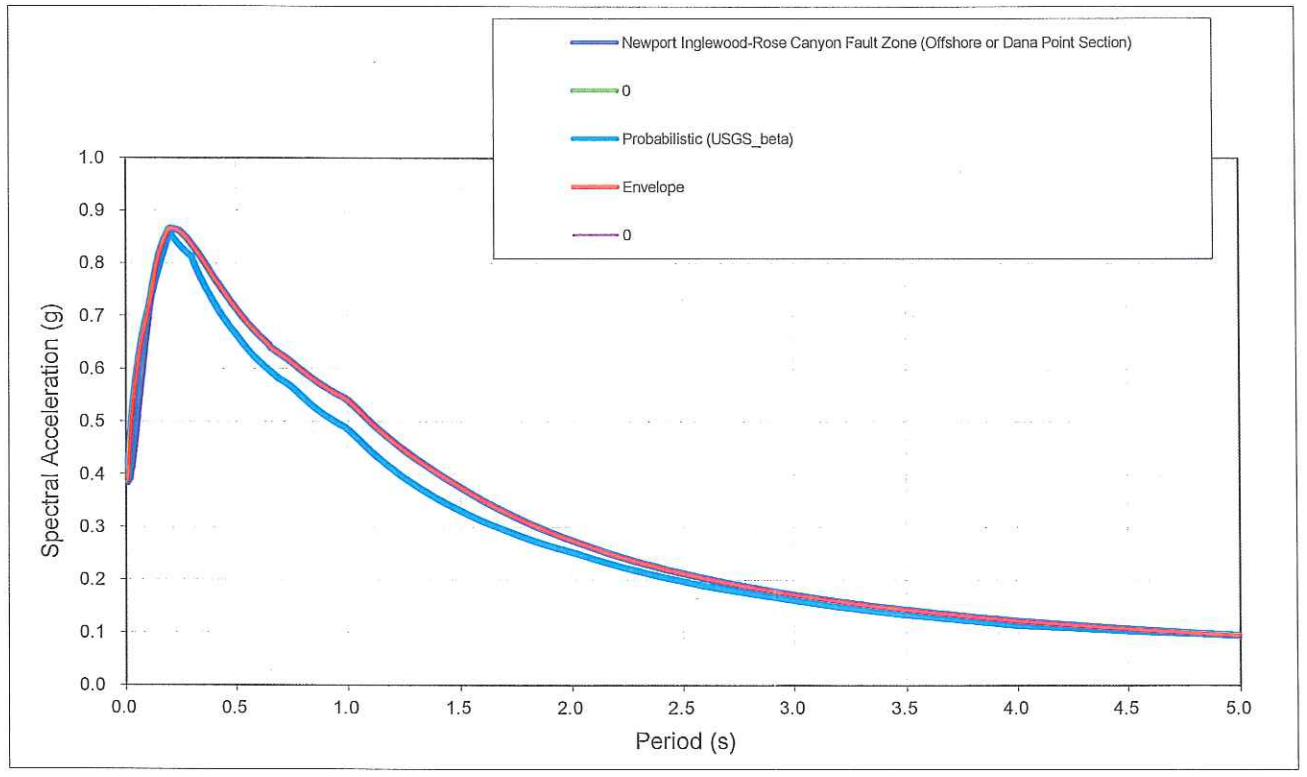


0.2	0.778878783					0.2	0.805	0.200	0.805
0.22	0.786200196					0.22	0.806	0.220	0.806
0.24	0.791255305					0.24	0.806	0.240	0.806
0.25	0.792757945					0.25	0.806	0.250	0.806
0.26	0.792570519					0.26	0.806	0.260	0.806
0.28	0.79235841					0.28	0.806	0.280	0.806
0.29	0.791023487					0.29	0.806	0.290	0.806
0.3	0.789757926					0.3	0.806	0.300	0.806
0.32	0.785436399					0.32	0.794	0.320	0.794
0.34	0.779963991					0.34	0.783	0.340	0.783
0.35	0.776777425					0.35	0.777	0.350	0.777
0.36	0.773610211					0.36	0.772	0.360	0.774
0.38	0.766466859					0.38	0.762	0.380	0.766
0.4	0.75904342					0.4	0.753	0.400	0.759
0.42	0.753030964					0.42	0.744	0.420	0.753
0.44	0.746447616					0.44	0.736	0.440	0.746
0.45	0.743416122					0.45	0.732	0.450	0.743
0.46	0.740202652					0.46	0.728	0.460	0.740
0.48	0.733623135					0.48	0.721	0.480	0.734
0.5	0.727470038					0.5	0.714	0.500	0.727
0.55	0.712643667					0.55	0.696	0.550	0.713
0.6	0.699973095					0.6	0.681	0.600	0.700
0.65	0.688572804					0.65	0.668	0.650	0.689
0.66	0.684470373					0.667	0.664	0.660	0.684
0.7	0.67840256					0.7	0.657	0.700	0.678
0.75	0.669251502					0.75	0.647	0.750	0.669
0.8	0.657830123					0.8	0.629	0.800	0.658
0.85	0.64738693					0.85	0.613	0.850	0.647
0.9	0.637382847					0.9	0.598	0.900	0.637
0.95	0.62829692					0.95	0.585	0.950	0.628
1	0.619445929					1	0.573	1.000	0.619
1.1	0.580452211					1.1	0.529	1.100	0.580
1.2	0.545853111					1.2	0.492	1.200	0.546
1.3	0.514499134					1.3	0.46	1.300	0.514
1.4	0.486116056					1.4	0.433	1.400	0.486
1.5	0.459896086					1.5	0.408	1.500	0.460
1.6	0.433620513					1.6	0.387	1.600	0.434
1.7	0.409749468					1.7	0.368	1.700	0.410
1.8	0.388202155					1.8	0.351	1.800	0.388
1.9	0.368769626					1.9	0.335	1.900	0.369
2	0.3512749					2	0.321	2.000	0.351
2.2	0.317383009					2.2	0.29	2.200	0.317
2.4	0.289016262					2.4	0.265	2.400	0.289
2.5	0.276440253					2.5	0.254	2.500	0.276
2.6	0.264799424					2.6	0.244	2.600	0.265
2.8	0.243917245					2.8	0.225	2.800	0.244
3	0.225806046					3	0.21	3.000	0.226
3.2	0.209812759					3.2	0.195	3.200	0.210
3.4	0.195674554					3.4	0.181	3.400	0.196
3.5	0.189215351					3.5	0.175	3.500	0.189
3.6	0.183111624					3.6	0.17	3.600	0.183
3.8	0.17185257					3.8	0.16	3.800	0.172
4	0.161782068					4	0.15	4.000	0.162
4.2	0.153196358					4.2	0.144	4.200	0.153
4.4	0.1452742					4.4	0.139	4.400	0.145
4.6	0.138032335					4.6	0.133	4.600	0.138
4.8	0.131396536					4.8	0.128	4.800	0.131
5	0.125257138					5	0.124	5.000	0.125

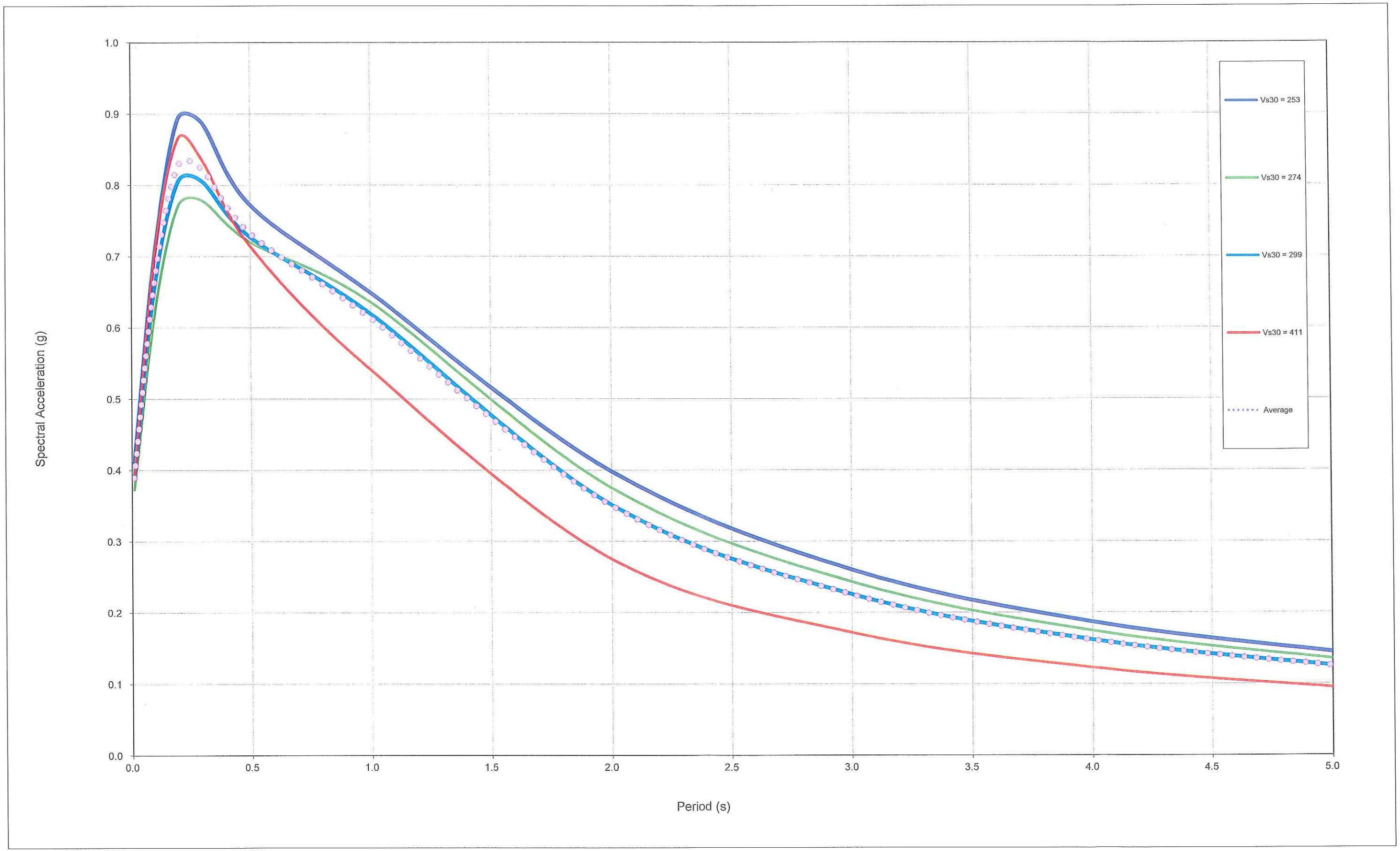
Bridge	Figure Number	Latitude	Longitude	Soil Profile Type	V_{s30} (m/s)	$Z_{1.0}$ (m)	$Z_{2.5}$ (km)	M	od-Rose Canyon Fault Zone (Offshore or Da								
									R_x (km)	R_jb (km)	R_{rup} (km)	R_x (km)	R_jb (km)	R_{rup} (km)	R_x (km)	R_jb (km)	R_{rup} (km)
				D	411	0	0		6.15	6.15	6.15						
Project Number					V_{s30} (ft/s)												
Date																	
					1348												

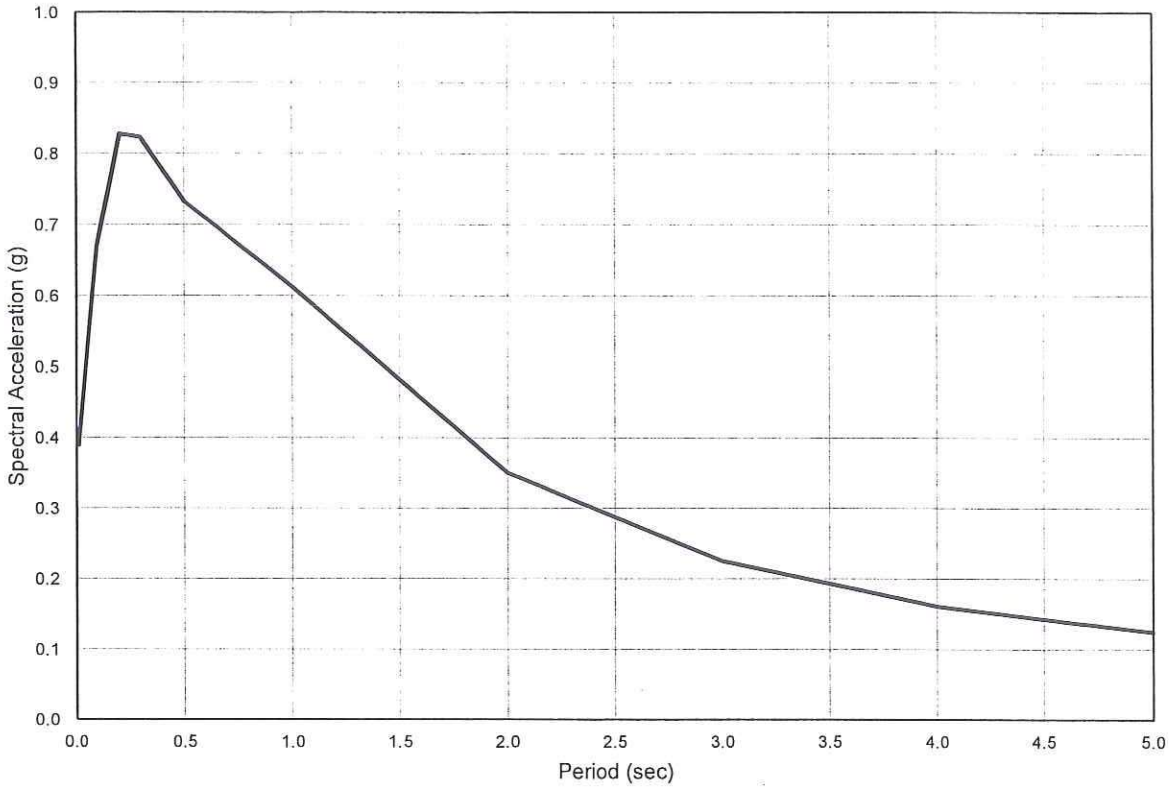
0 Enter 0 Sec accelaration here for USGS Spectrum

Newport Inglewood-Rose Canyon Fault Zone (Offshore or Dana Point Section)		0		0		Probabilistic (USGS_beta)		Envelope	
T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	S_a (g)	T (sec)	Sa (g)
0.01	0.385114839					0.01	0.388	0.010	0.388
0.02	0.39194742					0.02	0.465	0.020	0.465
0.022	0.396837199					0.022	0.476	0.022	0.476
0.025	0.404188614					0.025	0.492	0.025	0.492
0.029	0.413419313					0.029	0.511	0.029	0.511
0.03	0.416056481					0.03	0.516	0.030	0.516
0.032	0.422849904					0.032	0.525	0.032	0.525
0.035	0.433121865					0.035	0.537	0.035	0.537
0.036	0.436685622					0.036	0.541	0.036	0.541
0.04	0.450488719					0.04	0.556	0.040	0.556
0.042	0.457759916					0.042	0.563	0.042	0.563
0.044	0.464843902					0.044	0.57	0.044	0.570
0.045	0.468598859					0.045	0.573	0.045	0.573
0.046	0.472269722					0.046	0.576	0.046	0.576
0.048	0.479504924					0.048	0.583	0.048	0.583
0.05	0.486885951					0.05	0.589	0.050	0.589
0.055	0.508061816					0.055	0.603	0.055	0.603
0.06	0.529472602					0.06	0.617	0.060	0.617
0.065	0.550218315					0.065	0.63	0.065	0.630
0.067	0.558618013					0.067	0.635	0.067	0.635
0.07	0.570691879					0.07	0.642	0.070	0.642
0.075	0.5908802					0.075	0.654	0.075	0.654
0.08	0.611081781					0.08	0.665	0.080	0.665
0.085	0.631221158					0.085	0.675	0.085	0.675
0.09	0.650558725					0.09	0.685	0.090	0.685
0.095	0.669611005					0.095	0.695	0.095	0.695
0.1	0.688099548					0.1	0.704	0.100	0.704
0.11	0.719729707					0.11	0.724	0.110	0.724
0.12	0.748372743					0.12	0.742	0.120	0.748
0.13	0.773421461					0.13	0.759	0.130	0.773
0.133	0.779918301					0.133	0.764	0.133	0.780
0.14	0.794504641					0.14	0.775	0.140	0.795
0.15	0.813235506					0.15	0.79	0.150	0.813
0.16	0.82748219					0.16	0.805	0.160	0.827
0.17	0.839129574					0.17	0.819	0.170	0.839
0.18	0.849505342					0.18	0.832	0.180	0.850
0.19	0.858157871					0.19	0.845	0.190	0.858



0.2	0.865480922					0.2	0.858	0.200	0.865
0.22	0.864964596					0.22	0.847	0.220	0.865
0.24	0.862160041					0.24	0.837	0.240	0.862
0.25	0.859629131					0.25	0.832	0.250	0.860
0.26	0.855135656					0.26	0.828	0.260	0.855
0.28	0.846838967					0.28	0.82	0.280	0.847
0.29	0.841359629					0.29	0.816	0.290	0.841
0.3	0.836046468					0.3	0.812	0.300	0.836
0.32	0.8247165					0.32	0.792	0.320	0.825
0.34	0.812514691					0.34	0.773	0.340	0.813
0.35	0.806052803					0.35	0.765	0.350	0.806
0.36	0.799813883					0.36	0.756	0.360	0.800
0.38	0.786630375					0.38	0.741	0.380	0.787
0.4	0.773542387					0.4	0.726	0.400	0.774
0.42	0.761384635					0.42	0.712	0.420	0.761
0.44	0.748955264					0.44	0.699	0.440	0.749
0.45	0.743120041					0.45	0.693	0.450	0.743
0.46	0.737239444					0.46	0.687	0.460	0.737
0.48	0.725423916					0.48	0.676	0.480	0.725
0.5	0.714449634					0.5	0.666	0.500	0.714
0.55	0.688532097					0.55	0.639	0.550	0.689
0.6	0.666209279					0.6	0.617	0.600	0.666
0.65	0.646454078					0.65	0.598	0.650	0.646
0.66	0.640324514					0.667	0.592	0.660	0.640
0.7	0.628982675					0.7	0.581	0.700	0.629
0.75	0.613302076					0.75	0.567	0.750	0.613
0.8	0.596170258					0.8	0.547	0.800	0.596
0.85	0.580757741					0.85	0.529	0.850	0.581
0.9	0.566409687					0.9	0.513	0.900	0.566
0.95	0.553363656					0.95	0.499	0.950	0.553
1	0.541062673					1	0.486	1.000	0.541
1.1	0.499370841					1.1	0.445	1.100	0.499
1.2	0.46323016					1.2	0.41	1.200	0.463
1.3	0.431044771					1.3	0.38	1.300	0.431
1.4	0.402407695					1.4	0.354	1.400	0.402
1.5	0.376490713					1.5	0.332	1.500	0.376
1.6	0.351671316					1.6	0.312	1.600	0.352
1.7	0.329388983					1.7	0.295	1.700	0.329
1.8	0.309375075					1.8	0.279	1.800	0.309
1.9	0.291385099					1.9	0.265	1.900	0.291
2	0.275368802					2	0.253	2.000	0.275
2.2	0.24662306					2.2	0.228	2.200	0.247
2.4	0.223158796					2.4	0.207	2.400	0.223
2.5	0.212897819					2.5	0.198	2.500	0.213
2.6	0.203470581					2.6	0.189	2.600	0.203
2.8	0.186694189					2.8	0.175	2.800	0.187
3	0.172251992					3	0.162	3.000	0.172
3.2	0.159859674					3.2	0.15	3.200	0.160
3.4	0.148937579					3.4	0.14	3.400	0.149
3.5	0.143960982					3.5	0.135	3.500	0.144
3.6	0.139264511					3.6	0.131	3.600	0.139
3.8	0.130618134					3.8	0.123	3.800	0.131
4	0.122901488					4	0.115	4.000	0.123
4.2	0.116348489					4.2	0.111	4.200	0.116
4.4	0.110345878					4.4	0.106	4.400	0.110
4.6	0.104872543					4.6	0.102	4.600	0.105
4.8	0.099869491					4.8	0.099	4.800	0.100
5	0.095250726					5	0.095	5.000	0.095


Spectral Acceleration (g)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Period (s)
Vs30 = 253
Vs30 = 274
Vs30 = 299
Vs30 = 411
Average



Latitude = 33.4528 °
Longitude = -117.6437 °
Damping Ratio = 5%

Spectral Coordinates	
Period (sec)	Acc. (g)
	Design
0.010	0.390
0.100	0.670
0.200	0.828
0.300	0.823
0.500	0.733
1.000	0.613
2.000	0.350
3.000	0.225
4.000	0.162
5.000	0.125

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Design ARS Curve
	Project: 11-136 Date: 01/26/12	Figure 4

FINAL GEOTECHNICAL DESIGN REPORT

Interstate 5 HOV Widening, Segment 2
Orange County, California
12-Ora-5, PM 3.8/6.2
Caltrans Project No. 1200020278
(EA No. 12-0F96C01)
EMI Project No. 11-136
Date: September 21, 2012

EARTH MECHANICS, INC.

Geotechnical and Earthquake Engineering

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

September 21, 2012

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Final Geotechnical Design Report, Interstate 5 HOV Widening, Segment 2 Cities of San Clemente and Dana Point, Orange County, California 12-Ora-5, PM 3.8/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)***

Dear Mr. Montes:

Attached is the Final Geotechnical Design Report (GDR) for improvements proposed for the Interstate 5 (I-5) HOV Widening, Segment 2 Project, which is located in Orange County, California. The GDR is intended to satisfy the requirements described in the California Department of Transportation (Caltrans) Guidelines for Preparing Geotechnical Design Reports (2006). The GDR describes geotechnical conditions in the project area based on information obtained from our literature review, geotechnical field investigation, and laboratory soil testing. The GDR contains the findings of our geotechnical investigation and laboratory testing, results of our analyses, and design and construction recommendations for proposed improvements.

A GDR for the project, dated March 30, 2012, was submitted to Caltrans for review. The Caltrans Office of Geotechnical Design South 1 (OGDS-1) reviewed the report and provided their comments in a spreadsheet dated July 24, 2012. EMI prepared responses to the OGDS-1 review comments, which were reviewed and concurred with by the OGDS-1 reviewer. Responses to Caltrans comments have been incorporated into this Final GDR. Caltrans approval email along with review comments and EMI responses are provided in Appendix D.

We appreciate the opportunity to provide geotechnical services for the project. If you have any questions please call us.

Sincerely,
EARTH MECHANICS, INC.

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FINAL GEOTECHNICAL DESIGN REPORT
INTERSTATE 5 HOV WIDENING, SEGMENT 2
CITIES OF SAN CLEMENTE AND DANA POINT, ORANGE COUNTY, CALIFORNIA
12-ORA-5, PM 3.8/6.2
CALTRANS PROJECT NO. 1200020278 (EA NO. 12-0F96C01)

Prepared for:

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EMI Project Number: 11-136

September 21, 2012

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1.0 INTRODUCTION

This Geotechnical Design Report (GDR) presents the findings and conclusions of a geotechnical study conducted by Earth Mechanics, Inc. (EMI) for proposed improvements for the Interstate 5 (I-5) High Occupancy Vehicle (HOV) Widening, Segment 2 Project. The location of the project is shown on Figure 1. The purpose of the geotechnical study was to obtain information on subsurface earth materials and conditions, and develop design and construction recommendations to assist AECOM in preparing the project plans, specifications, and cost estimates.

Our scope of work included preparing this GDR per Topic 113 of the Caltrans Highway Design Manual (2008). This report was prepared in general accordance with Caltrans Guidelines for Preparing Geotechnical Design Reports (2006a). Pavement section recommendations and soil corrosion are addressed in the project Materials Report (EMI, 2012a).

Orange County Transportation Authority (OCTA), in cooperation with the California Department of Transportation (Caltrans), and the Cities of Dana Point, San Clemente, and San Juan Capistrano, is proposing to widen the I-5 mainline between Avenida Pico and San Juan Creek Road. The project will add one HOV lane in each direction of the I-5 freeway, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. This report applies only to Segment 2 of the overall project; the limits of Segment 2 extend along the mainline from about 1,600 feet southeast of Avenida Vista Hermosa to about 2,400 feet northwest of Camino de Estrella.

The geotechnical scope of work for preparing this GDR included the following tasks:

- Geotechnical field exploration including drilling and logging fifty-seven exploratory borings, and conducting nine Cone Penetration Test (CPT) soundings.
- Laboratory testing of selected earth samples to determine classification and various engineering parameters.
- Evaluate stability of proposed cut slopes.
- Evaluate stability and settlement of modified earthen embankments.
- Evaluate and provide deep foundation recommendations for proposed sound walls.
- Develop recommendations for earthwork.
- Prepare this report presenting our findings, conclusions, and recommendations.

The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and recommend design and construction criteria for the roadway portions of the project. This report also establishes a geotechnical baseline to be used in assessing the existence and scope of changed site conditions.

This report is intended for use by the project design engineers, construction personnel, bidders, and contractors.

INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

SITE LOCATION MAP

Figure 1

Project No. 11-136

Date: 03-19-12

2.0 EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 Existing Facilities

The I-5 freeway as a major north-south freeway in the State of California that serves local traffic, regional traffic, interstate traffic, and international traffic to and from Canada and Mexico. The I-5 freeway is designated in the National Highway System (NHS), Department of Defense Rural Interstates and Single Routing in Urban Areas and the Strategic Highway Corridor Network (STRAHNET). I-5 is a major commuter route between Los Angeles and Orange Counties. The I-5, in the cities of San Clemente and Dana Point, has eight or nine general purpose lanes with occasional auxiliary lanes and inside and outside shoulders.

The Avenida Vista Hermosa interchange area has five and four general purpose lanes in the northbound (NB) and southbound (SB) directions, respectively. In the NB direction, one of the lanes is dropped after the NB off-ramp resulting in four lanes through the interchange area. The mainline has inside and outside shoulders, and an auxiliary lane from the Avenida Vista Hermosa SB on-ramp to the Avenida Pico SB off-ramp. The existing interchange is a partial cloverleaf configuration with a direct off-ramp and loop on-ramp in the NB direction, and a direct on-ramp, direct off-ramp, and loop on-ramp in the SB direction.

At Avenida Vaquero, there is no existing interchange that includes ramps. The I-5 mainline spans Avenida Vaquero by way of the existing single-span UC structure.

The Camino de Estrella interchange area has four general purpose lanes in the NB direction and a fifth lane is added from the NB loop on-ramp. Also, there is an auxiliary lane from the NB on-ramp to the NB I-5 to NB Pacific Coast Highway (PCH) Connector; the fifth general purpose lane is dropped after the Connector. In the SB direction, there are four general purpose lanes and an auxiliary lane between the Camino Las Ramblas SB loop on-ramp and the Camino de Estrella SB off-ramp. The mainline has inside and outside shoulders. In the NB direction, the existing interchange is a partial cloverleaf with a direct on-ramp, direct off-ramp, and loop on-ramp; in the SB direction the interchange is a tight diamond with direct on-ramp and direct off-ramp.

2.2 Proposed Improvements

OCTA, in cooperation with Caltrans, and the Cities of Dana Point, San Clemente, and San Juan Capistrano, is proposing to widen the I-5 mainline between Avenida Pico and San Juan Creek Road. The project will add one HOV lane in each direction of the I-5 freeway, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. ***This report applies only to Segment 2 of the overall project; the limits of Segment 2 extend along the mainline from about 1,600 feet southeast of Avenida Vista Hermosa to about 2,400 feet northwest of Camino de Estrella.***

To accommodate the two additional HOV lanes, the I-5 mainline will be widened in both the NB and SB directions of the freeway. Major improvements proposed in Segment 2 include widening the Avenida Vaquero Undercrossing (UC), ramp improvements at the Avenida Vista Hermosa and Camino de Estrella interchanges, several earth retaining walls, sound walls, and new pavement. Ancillary improvements include sign structures, utility lines, drainage structures, lighting, landscaping, and roadway striping.

3.0 PERTINENT REPORTS AND INVESTIGATIONS

3.1 Pertinent Previous Reports and Investigations

Based on our understanding, no previous geotechnical studies were performed specifically for the proposed improvements described in this report. The Log-of-Test-Boring sheets, included with the as-built plans, for the existing bridges (Avenida Vista Hermosa UC, Avenida Vaquero UC, and Camino de Estrella OC) were reviewed by EMI. Also, as-built roadway plans for the existing I-5 mainline and ramp improvements were reviewed by EMI for this geotechnical study.

3.2 Related Reports Prepared for the Proposed Improvements

A separate Materials Report (EMI, 2012a) was prepared for the project that addresses pavement design and soil corrosion. The Materials Report should be referred to for pavement and culvert material recommendations. Also, separate Foundation Reports (2012b, 2012c, 2012d, and 2012e) were prepared by EMI for the proposed widening of the Avenida Vaquero UC, the tieback walls, the standard and non-standard retaining walls, and the sign structures. The reports can be referred to for geotechnical information and recommendations pertaining to the specific improvements.

4.0 PHYSICAL SETTING

4.1 Climate

Weather in the coastal Orange County area is a Mediterranean-type, semi-arid, climate characterized by warm dry summers and mild winters. A dominating factor in the weather is the semi-permanent north Pacific high pressure system that migrates northward in summer, holding storm tracks well to the north, and as a result southern California receives little or no precipitation during the summers. In winter, the north Pacific high moves southward permitting storm centers to swing across southern California. These storms generate moderate, but occasionally severe, precipitation events. When changes in the circulation pattern permit storms to approach from a southwesterly direction, the colder northern air masses merge with subtropical air masses and bring copious amounts of moisture with the northeastward streaming air. This results in heavy rains and often produces widespread flooding, especially in the spring when it coincides with runoff from melting snow in the mountains.

Summer is a dry period over most of the area. With the northward migration of the Pacific high most storm tracks are deflected far to the north during summer, and southern California seldom receives precipitation from Pacific storms during this time of year. Occasionally, during the summer months, moist air drifts northward from the Gulf of Mexico or the Gulf of California creating monsoonal conditions. At such times, scattered, locally heavy thunder showers occur, mostly in the desert and inland mountain areas.

The average annual high temperature is 73°F and the average low is about 52°F. The hottest months are July, August, and September when high temperatures average in the high 70s, and low temperatures average in the high 50s. The coolest temperatures are in the winter months of December, January, and February when average highs are in the high 60s and average lows are in the low to mid 40s.

The extreme high temperatures occur during July, August, and September with the record high of 108°F. These high temperatures are commonly associated with adiabatic heating associated with the Santa Ana winds. The extreme low temperatures average about 44°F in December through February with a record low of 21°F. Freezing occurs occasionally on winter nights, but is generally of short duration (a few hours) and does not commonly result in a "hard" freeze.

Annual precipitation averages about 14 inches. The wettest months are November through March with an average of 3.4 inches in February. Snow is not uncommon in the surrounding high mountains but is extremely rare in the project area.

The prevailing wind direction is from the southwest. Generally these light winds bring cool ocean air that moderates the local climate. A typical weather characteristic in the area results from the juxtaposition of cool marine waters and dry hot desert air. As the moist marine air masses drift over colder water, a bank of fog or low clouds, locally referred to as the "marine layer", sweeps inland a short distance before evaporating. Characteristically, the marine layer extends inland a mile or two and then recedes offshore during the heat of the afternoon. Occasionally the layer may extend to the bordering hills and mountains during the night. During May and June, the marine layer can remain the entire day.

4.2 Topography and Drainage

The project area extends in a curving southwest to southeast direction for a distance of about 2½ miles from the southern end of the San Joaquin Hills of south Orange County. The project corridor is located in the northwestern portion of the Peninsular Ranges geomorphic province. The I-5 alignment is along the rolling hills bordering the Santa Ana Mountains which rise to elevations up to +1,675 ft above sea level. The I-5 freeway, in the project area, is a series of crest and sag vertical curves. Elevations along the project alignment range from about +130 ft at Avenida Vaquero to about +218 ft near Camino de Estrella. Graded ascending and descending slopes, with heights up to 80 feet tall and inclinations of 2H:1V or flatter, exist adjacent to the mainline and ramps.

Major rivers within south Orange County are San Juan Creek and San Mateo Creek. San Juan Creek originates in the Santa Ana Mountains to the northeast and flows to the Pacific Ocean in Dana Point, just northerly of the project corridor. San Mateo Creek is located southwesterly of the project site. It also originates in the Santa Ana Mountains to the northeast and flows to the Pacific Ocean in San Clemente.

Drainages in proximity to the project area flow from the Santa Ana Mountains on the northeast. These include, from north to south, San Juan Creek, Prima Deshecha Canada, Segunda Deshecha Canada and San Mateo creeks. Prima Deshecha Canada passes under the project corridor in the vicinity of Avenida Vaquero, this is the only natural, named drainage that crosses this segment of the project corridor. Other drainage features within the project area include grated inlets, catch basins, and reinforced concrete pipes.

4.3 Man-Made and Natural Features of Engineering and Construction Significance

4.3.1 Man Made Features

Utilities: Based on the project utility plans, numerous utilities exist within the project area. The plans show utilities owned by: AT&T (telephone); the City of San Clemente (sewer); Cox Communications (fiber and cable); San Diego Gas & Electric (buried and overhead electrical lines); Southern California Gas (natural gas); South Coast Water District (water); and, Tri-Cities Municipal Water District (water). Existing utility lines are shown to be located along the existing Caltrans right-of-way lines (along the mainline and the ramps) and along the local streets that cross the mainline. Caltrans electrical and irrigation lines, not shown on the current plans, are presumed to exist within the project limits.

Existing underground utilities include: fiber optic lines along the northbound and southbound outside shoulders of the mainline and along some of the ramps; AT&T telephone lines along the Caltrans right-of-way line on the south side of the mainline; 8-inch, 10-inch, 16-inch, and 27-inch water lines at various locations throughout the project area; 2-inch to 6-inch gas lines along Avenida Vaquero, Camino de Estrella, and the local streets adjacent to the mainline; and 8-inch, 18-inch, and 21-inch sewer lines along the local streets and in the vicinity of the interchanges. Existing aboveground utilities are 12 KV overhead electrical distribution lines. The project plans should be referred to regarding the locations and alignments of the existing utilities.

Existing utilities should be protected in place or relocated in accordance with the project plans. The most notable utility impact appears to be the relocation of the fiber optic line that runs along the north side of the mainline (in the northbound outside shoulder of the freeway).

Drainage Facilities: Surface water (run-off) sheet flows over existing paved and unpaved surfaces into existing earthen swales, concrete v-ditches, and into grated drop inlets. The existing drainage system along the I-5 mainline and in the existing interchanges, within the project limits, includes 18-inch and 24-inch Reinforced Concrete Pipes (RCP) connected to the drop inlets. It is presumed that the Caltrans drainage system ultimately sends water to the local municipal drainage system which ultimately conveys the water into the Prima Deshecha Canada channel. The Prima Deshecha Canada channel appears to be the largest drainage feature in the project area; the channel/RCB structure is located approximately 275 feet west of the Avenida Vaquero UC and crosses the mainline at a slight skew.

Existing drainage culverts, that are anticipated to be exposed due to the proposed construction, should be inspected and any corroded or damaged culverts should be replaced.

Fill: Fill of varying thickness is present throughout the project site. Portions of existing mainline embankment, on- and off-ramp embankments, and bridge approach embankments are believed to be composed of artificial fill. Relatively thin fills are presumed to be present along the existing mainline. The actual thickness of fills throughout the project area is unknown and documentation regarding placement of existing fills was not reviewed by EMI. Fill materials encountered in the exploratory boreholes generally consisted of fine-grained soils (clay and silt) derived from the on-site terrace deposits and sedimentary bedrock. In localized areas, sand was encountered which may or may not be derived from the local formation.

4.3.2 Natural Features

The bedrock of the Capistrano formation throughout the project area was found to be massive to poorly bedded. Where bedding was observed, the strikes were generally to the northeast with shallow dips less than about 10 degrees westerly. Throughout the project corridor, the dominant structural pattern is high-angle joints and fractures within the Capistrano bedrock. The exposed cuts, during grading for the project, should be inspected by a Certified Engineering Geologist to verify the geologic structure and address any potentially adverse conditions.

Existing slopes are moderately to densely vegetated; existing vegetation must be removed prior to placing compacted fill. In addition, loose, soft, dry, wet, unstable, or otherwise unsuitable materials should be removed from areas to receive fill.

4.4 Regional Geology and Seismicity

4.4.1 Physiography

The project area is located in the northwestern part of the Peninsular Ranges physiographic province. The Peninsular Ranges comprise a northwest-southeast trending group of fault-bounded ranges between the Salton Trough and the Pacific Ocean. The Santa Ana Mountains, Puente Hills, and San Joaquin Hills are ranges within the Peninsular Ranges (Figure 2).

The project site is located on the low lying rolling hills westerly of the Santa Ana Mountains at the southerly end of the San Joaquin Hills in an area referred to as the Capistrano Embayment.

4.4.2 Stratigraphy

The geologic units encountered in the project area are described below. The distribution and approximate location of the geologic units are shown on the geological map (Figure 3) and on the Exploratory Borehole Location Maps (Figures 5 through 17).

- Capistrano Formation (Tc): These marine sedimentary deposits generally consist of brown to gray silty claystone, claystone, and siltstone. Secondary gypsum is commonly found deposited along joints, fractures and shears. The formation is generally soft when moist and has engineering properties similar to stiff to very stiff soils. The formation consists generally of soft, weakly cemented to uncemented material that can be disaggregated with finger pressure. A few hard beds occur throughout the formation.

  Within the project area, the Capistrano formation consists of an oxidized (weathered) zone defined by a light brown to brown color with a mottled appearance, underlain by an unoxidized zone that is generally dark brown to dark gray with a greater degree of induration.

- Undifferentiated Marine and non-marine Terrace Deposits (Qt): Portions of the project area, mostly southerly of Camino Las Ramblas, are capped by terrace deposits. Shell fragments were found associated with the marine terrace deposits. The terrace deposits were observed to unconformably overlie bedrock units of the Capistrano formation directly. These Pleistocene terrace deposits are characterized by a basal cobble sequence fining upward to light brown and yellow brown fine to coarse grained sands, silty sand, sandy silt and clayey silt.

- Alluvium (Qal): The drainages and canyons crossing the project corridor are mantled by a relatively thin cover of alluvium. These deposits are generally derived from the surrounding bedrock units and terrace deposits and are located in the lower elevations of the site. Where encountered in the borings the alluvium was observed to consist of silty sand to sandy clay.

- Artificial Fill (Af): Artificial fill placed during construction of the I-5 freeway and adjacent residential and commercial developments is located along the project corridor. Fill materials were most likely derived from excavation of the Capistrano formation bedrock and local surficial deposits. Little or no documentation of the limits of fills or the observation and testing of the fill placement were examined.

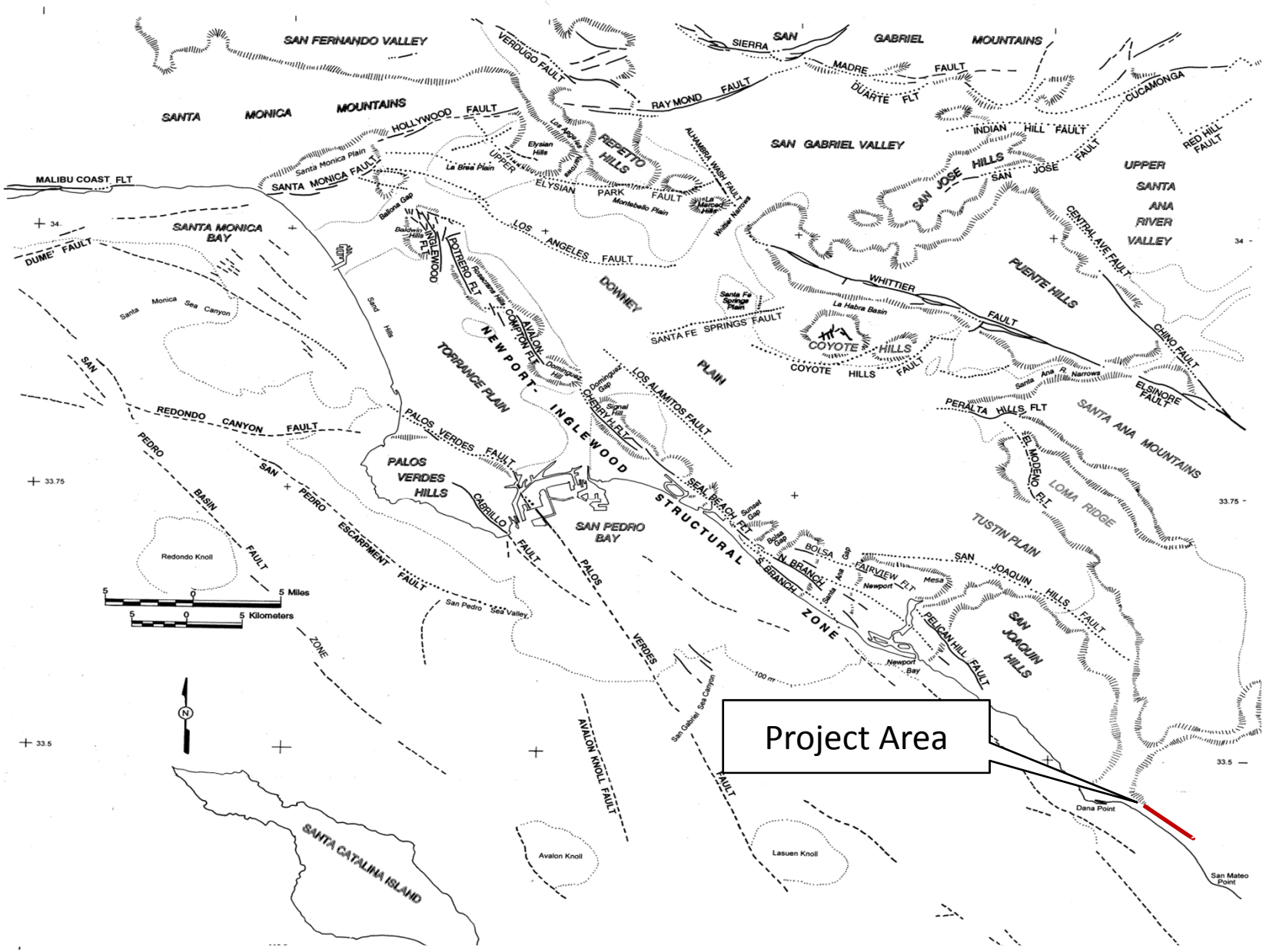
4.4.3 Geologic Structure

The Peninsular Ranges are characterized by northwest-southeast trending mountains and valleys that have been faulted and uplifted by northwest-southwest trending faults. The Capistrano Embayment is a relatively flat structural trough of Miocene to Pliocene age. The trough is bordered on the east by the Cristianitos Fault. Geologic faults in the region are shown on Figure 2. The California Geological Survey does not show any active faults at the site (Jennings, 2010). The nearest known major active faults are the Newport-Inglewood Structural Zone about 5 miles southwest of the site in the offshore area, the Palos Verdes fault about 19 miles to the west, also in the offshore area, and the Elsinore fault about 35 miles to the northeast. A subsurface fault, the San Joaquin Hills blind thrust, is postulated west of the site at a depth of about 2.5 to 3 miles. These faults are discussed in more detail below. Other nearby faults such as the Cristianitos fault and Mission Viejo faults are about 3.5 to 7 miles east of the site but are not believed to be active.

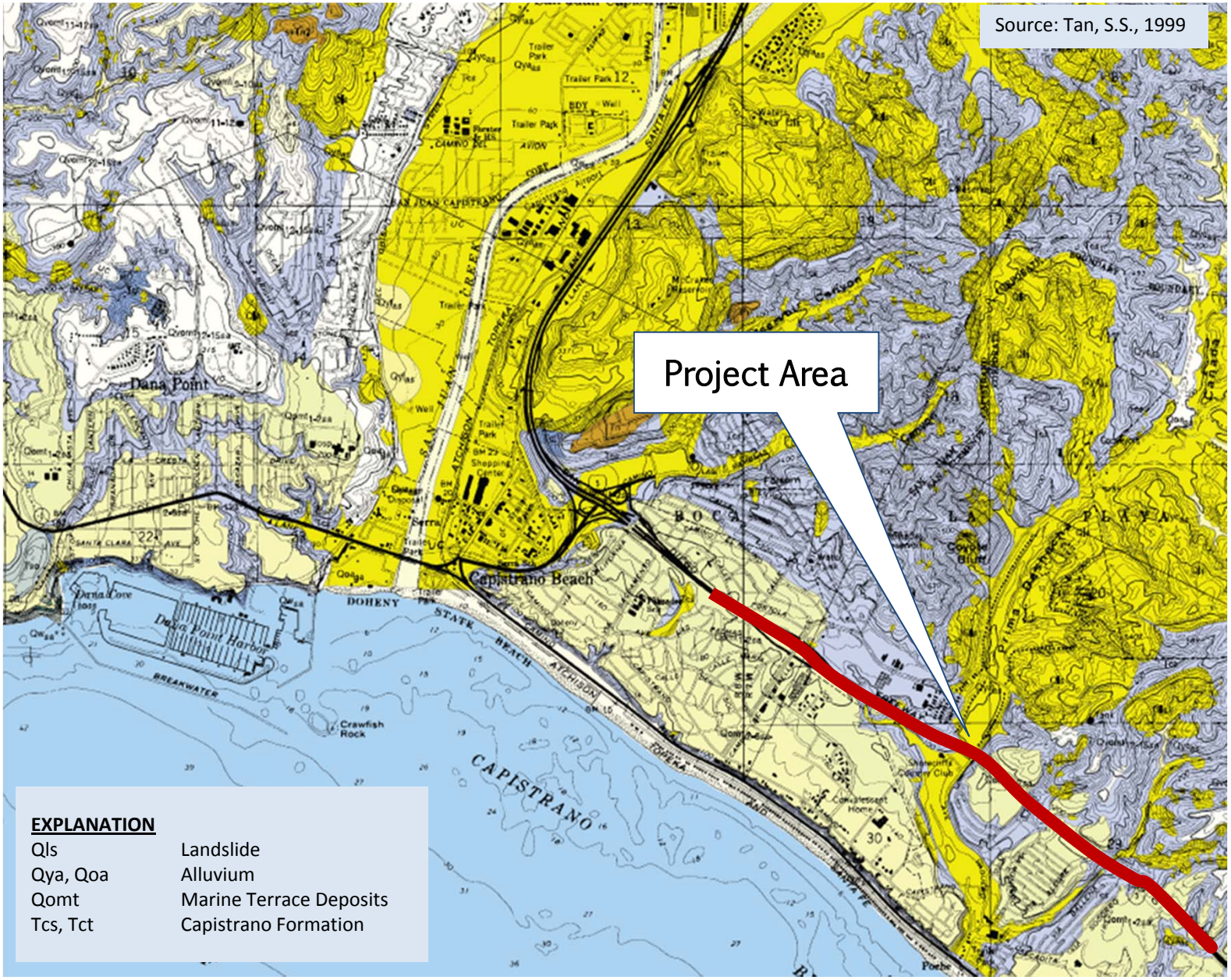
4.4.4 Geologic Hazards

The geological hazards present at the site include landsliding, liquefaction, and earthquake shaking. The site lies outside identified tsunami inundation zones (CGS, 2009), and there are no large bodies of water within the project area that could generate a seiche. There are no volcanos in the region and there are no known active surface faults within the project area so ground rupture is not a factor. The California Geological Survey (2002) has indicated that the portion of the project alignment underlain by young alluvium in the area of the Prima Deshecha Canada (Avenida Vaquero) is susceptible to liquefaction during a strong earthquake (Figure 4). However, based on site specific boreholes in the area of the existing Avenida Vaquero UC, liquefaction potential is very low due to the high content of medium to highly plastic fines in the geologic formations and the absence of shallow groundwater.

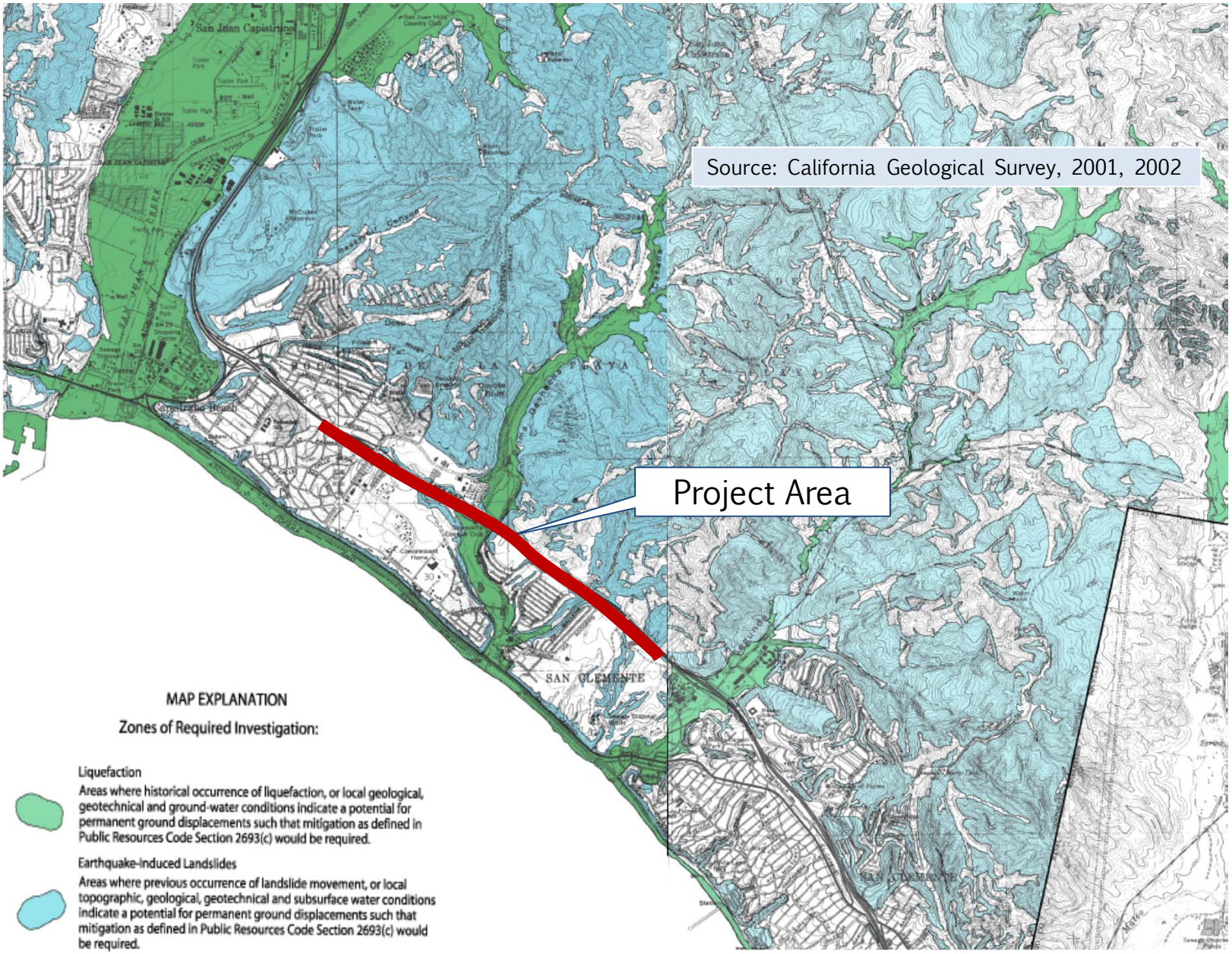
The Capistrano formation bedrock underlying the majority of the site is notoriously susceptible to landsliding. Figure 4 shows areas identified as having potential for landslides as a result of earthquake shaking.



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Map of Physiography and Active Faults Figure 2
	Project No. 11-136 / Date: 03-19-12	



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Geological Map
	Project No. 11-136 / Date: 03-08-12	Figure 3



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Seismic Hazard Map Figure 4
	Project No. 11-136 / Date: 03-08-12	

4.4.5 Seismicity

The project is located in seismically active southern California. The present-day seismotectonic stress field in the Los Angeles region is one of north-northeasterly compression. This is indicated by geologic structures, by earthquake focal-mechanism solutions, and by geodetic measurements. The data suggests crustal shortening of between 0.2 and 0.35 inch/year across the greater Los Angeles area (Argus et al., 1999).

Historic earthquake epicenter maps show widespread seismicity throughout the region. Although historical earthquakes occur in proximity to known faults, they are difficult to directly associate with mapped faults. Part of this difficulty is due to the fact that the basin is underlain by several poorly known subsurface thrust faults, generally referred to as blind thrust faults. Ward (1994) estimated that about 40 percent of seismic moment cannot be associated with known faults. Earthquakes occur primarily as loose clusters along the Newport-Inglewood Structural Zone, the southern margin of the Santa Monica Mountains, the margin between the Santa Susana-San Fernando Valley and the southern margin of the San Gabriel Mountains, and in the Coyote Hills-Puente Hills area. There is no clustering or alignment of earthquakes in proximity to the site. There are fewer earthquakes in the site region than anywhere else in the Los Angeles Basin area. This apparent lack of earthquake activity suggests that the site area is tectonically stable and suggests that there are no unrecognized active faults at the site.

The largest historical earthquake within the Los Angeles Basin was the 1933 Long Beach event which had a magnitude of about M_W = 6.4 (M_L = 6.3). This earthquake did not rupture the surface but is believed to have been associated with the Newport-Inglewood Structural Zone (Benioff, 1938). The association was based on abundant ground failures along the NISZ trend but no unequivocal surface rupture was identified. Reevaluation of the seismicity data by Hauksson and Gross (1991) relocated the 1933 earthquake hypocenter to a depth of about 6 miles below the Huntington Beach-Newport Beach city boundary.

Other major earthquakes in the region include the 1994 Northridge and the 1971 San Fernando earthquake both of which occurred in the San Fernando Valley region. The 1994 earthquake had a moment magnitude (M_W) of about 6.7 (M_S = 6.8, M_L = 6.4), and occurred on a southerly dipping subsurface fault which was unknown prior to the earthquake. The main shock occurred at a depth of about 19 km. Earthquake aftershocks clearly defined the rupture surface dipping about 35 degrees southerly from a depth of about 1.2 or 1.9 miles (2 or 3 km) to 14.3 miles (23 km) (Hauksson et al, 1995). The causative fault was never identified with certainty. The event may have occurred on an eastern extension of the Oakridge fault (Yeats and Huftile, 1995), a southerly dipping feature fault bounding the Ventura Basin and the Santa Susana Mountains.

The 1971 San Fernando earthquake was of similar size (M_W = 6.7, M_S = 6.4, M_L = 6.4) to the 1994 event but did involve surface rupture. The 1971 event occurred on a northerly dipping thrust fault that dips from the northern side of the San Fernando Valley to a depth of about 15 km under the San Gabriel Mountains. Several mapped surface faults were involved such as the Sylmar fault, Tujunga fault, and Lakeview fault. These faults are commonly considered to be part of the Sierra Madre fault system which extends easterly from the San Fernando Valley, along the base of the San Gabriel Mountains on the north side of the San Gabriel Valley, and to the Cucamonga fault in the San Bernardino area.

The 1987 Whittier earthquake (M_L = 5.9, M_W = 5.9) occurred on a subsurface fault dipping under the Puente Hills to about 10 miles beneath the San Gabriel Basin (Shaw and Shearer, 1999; Shaw et al., 2002). This event did not rupture the ground surface.

A magnitude 5.4 earthquake occurred at a depth of about 9 miles (15 km) on 29 July 2008. The epicenter was in the Chino Hills area between the Chino fault and the Whittier fault. Preliminary data were inconclusive with regard to the causative fault. Detailed analysis by Shao and Hauksson (2009) indicated a rupture plane striking N71°W, dipping 62° northeast. They suggested a preference for the Whittier fault being the causative fault but were uncertain, primarily because the Whittier fault is supposed to dip much steeper (~ 80°). The aftershock pattern formed a subhorizontal alignment indicating the possibility that the event could have been associated with a subsurface thrust fault such as one of the blind faults of the Puente Hills Blind Thrust Fault System or with a blind fault under the Peralta Hills.

Another significant earthquake was the 1812 earthquake which caused damage at the San Juan Capistrano Mission. The location and magnitude of the 1812 earthquake are unknown because of the sparse population at the time, but geological studies (Jacoby et al., 1988; Fumal et al., 1993; Weldon et al., 2004) postulate that it did not occur in the Capistrano area, but rather was a large distant event on the San Andreas fault in the Wrightwood area of the San Gabriel Mountains.

The earliest documented earthquake in the region was reported by the Portola´ expedition as they camped near the Santa Ana River in 1769. This event has been attributed by various geoscientists to just about every fault in the Los Angeles area but it could just as well have been a distant event that shook a wide area as did the 1971 San Fernando, the 1987 Whittier, and the 1994 Northridge events, as well as many other more-distant events (for example, 1992 Landers event).

Results of the seismicity evaluation are provided in Section 7.4 of this report.

4.5 Soil Survey Mapping

Soil Survey maps were not reviewed for the subject project.

5.0 EXPLORATION

5.1 Drilling and Sampling

A geotechnical field investigation was conducted between September 26 and November 7, 2011. Fifty-seven (57) exploratory boreholes were drilled and nine (9) Cone Penetration Test (CPT) soundings were completed under the supervision of EMI for Segment 2. The boreholes were conducted for the purpose of collecting samples of subsurface earth materials and logging subsurface conditions where improvements are proposed. The CPT soundings were conducted to obtain continuous subsurface information and estimate the shear wave velocity. The boreholes and CPT's were conducted at various locations along the NB and SB outside shoulders of the I-5 mainline and along inside and outside shoulders of ramps.

Boreholes were excavated using either a truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers, a limited-access tripod rig equipped with 6-inch diameter solid flight augers, or a 3-inch diameter hand auger. Subsurface earth materials and conditions were logged and samples of subsurface materials were collected for laboratory testing. Large bulk samples of

near-surface soils were logged and collected. Smaller soil/bedrock samples were collected from borings generally at 5-foot vertical intervals by means of split-spoon drive samplers; the Standard Penetration Test (SPT) sampler and the Modified California Drive (MCD) sampler were used to collect small disturbed and relatively undisturbed samples, respectively. The SPT sampler (1.4-inch ID) and MCD sampler (2.5-inch ID) were driven a total depth of 18 inches or until refusal, using a 140-pound hammer falling 30 inches. The blowcounts for the last 12 inches of penetration were recorded on the boring logs. The MCD is a split-barrel sampler with a tapered cutting tip and lined with a series of 1-inch tall brass rings. Log-of-Test-Boring (LOTB) sheets and boring logs are presented in Appendix A.

The CPT soundings were performed using an electronic cone penetrometer in general accordance with current ASTM Standards (ASTM D5778 and ASTM D3441). CPT equipment consisted of a cone penetrometer assembly mounted at the end of a series of hollow sounding rods. The cone penetrometer assembly consisted of a conical tip with a 60° apex angle and a projected cross sectional area of 1.55 in² and a cylindrical friction sleeve with a surface area of 23.25 in². The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurements of cone tip resistance and sleeve friction during penetration. The cone penetrometer assembly is continuously pushed into the soil by a set of hydraulic rams at a standard rate of 0.79 inch per second while the cone tip resistance and sleeve friction are recorded every 1.967 inches and digitally stored. A specially designed all-wheel drive 25-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the testing equipment. The computer generated graphical logs include tip resistance, friction resistance, and friction ratio. Soil behavior type interpretations are based on the guidelines by Robertson and Campanella (1989). Logs of CPT soundings are given in Appendix A.

EMI borehole and CPT information is summarized in Table 1 below. The approximate locations of the boreholes and CPT's for this project are shown on Figures 5 through 17.

Table 1. Borehole and CPT Exploration Information

Borehole or CPT Number	Easting	Northing	Station (A-Line)	Offset (feet)	GSE (feet)	GWE (feet)	Depth (feet)	Method	Figure No.
A-11-201	6,141,475	2,107,376	211+00	86.5 RT	+174.2	NE	31.5	HSA	5
A-11-202	6,141,102	2,107,839	216+91	143.2 RT	+186.6	NE	31.5	HSA	5
A-11-203	6,140,877	2,108,123	220+52	180.9 RT	+194.0	NE	31.5	HSA	7
HA-11-204	6,140,853	2,108,454	223+06	395.0 RT	+204.6	NE	5.0	HA	7
A-11-205	6,141,307	2,107,306	211+67	83.1 LT	+176.1	NE	6.5	HSA	5
A-11-206	6,140,825	2,107,781	218+44	95.7 LT	+188.0	NE	31.5	HSA	5
HA-11-207	6,140,359	2,108,250	225+06	101.2 LT	+172.8	NE	5.0	HA	6
HA-11-208	6,139,842	2,108,603	231+56	157.5 LT	+160.4	NE	5.0	HA	8
A-11-209	6,139,326	2,108,993	238+05	100.9 LT	+149.5	NE	10.0	HSA	8

Notes: 1. Easting/Northing coordinates and Stations/offsets were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevations (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Encountered During Drilling (approximate);
NE = Groundwater Table Not Encountered; NM = Groundwater Not Measured.
4. HSA = Hollow-stem Auger Boring; HA = Hand Auger; CPT = Cone Penetration Test Sounding.

Table 1. Exploratory Borehole and CPT Sounding Information (Continued)

Borehole or CPT Number	Easting	Northing	Station (A-Line)	Offset (feet)	GSE (feet)	GWE (feet)	Depth (feet)	Method	Figure No.
CPT-11-209	6,139,320	2,108,999	238+13	99.2 LT	+149.6	NM	79.7	CPT	8
A-11-210	6,139,075	2,109,173	241+13	81.5 LT	+156.9	NE	50.75	HSA	8
A-11-211	6,139,067	2,109,357	242+18	69.9 RT	+159.8	NE	31.5	HSA	8
A-11-212	6,138,769	2,109,535	245+65	63.1 RT	+167.6	NE	30.8	HSA	9
HA-11-213	6,138,270	2,109,914	252+03	70.3 RT	+180.8	NE	2.0	HA	9
A-11-214	6,138,347	2,109,669	249+87	67.5 LT	+180.2	NE	51.5	HSA	9
CPT-11-215	6,137,929	2,110,034	255+38	65.0 LT	+180.5	NM	60.6	CPT	9
A-11-216	6,137,682	2,110,250	258+66	65.1 LT	+172.3	NE	51.5	HSA	10
HA-11-217	6,137,366	2,110,708	264+05	71.7 RT	+159.9	NE	2.0	HA	10
HA-11-218	6,136,919	2,110,885	268+65	70.6 LT	+143.3	NE	2.0	HA	10
A-11-219	6,136,646	2,111,089	272+09	64.2 LT	+133.5	NE	91.5	HSA	11
A-11-220	6,136,719	2,111,192	272+06	61.5 RT	+135.7	NE	90.5	HSA	11
A-11-221	6,136,532	2,111,317	274+30	62.3 RT	+130.5	NE	91.5	HSA	11
A-11-222	6,136,446	2,111,223	274+52	63.5 LT	+127.9	+73.9	90.3	HSA	11
CPT-11-222	6,136,441	2,111,226	274+57	63.7 LT	+127.8	NM	99.6	CPT	11
CPT-11-223	6,136,131	2,111,411	278+22	64.7 LT	+129.9	NM	70.0	CPT	11
A-11-224	6,136,364	2,111,437	276+34	76.1 RT	+130.4	NE	51.5	HSA	11
A-11-225	6,135,700	2,111,632	283+08	74.8 LT	+142.4	NE	31.5	HSA	11
A-11-226	6,135,930	2,111,668	281+21	64.7 RT	+139.1	+113.4	50.8	HSA	11
CPT-11-227	6,135,270	2,112,017	288+68	64.2 RT	+156.5	NM	36.6	CPT	12
A-11-228	6,135,303	2,111,845	287+59	72.8 LT	+153.5	NE	37.0	HSA	12
CPT-11-229	6,134,993	2,112,018	291+13	65.2 LT	+161.9	NM	77.9	CPT	12
A-11-230	6,134,671	2,112,187	294+77	65.8 LT	+172.3	+126.8	50.0	HSA	12
HA-11-231	6,134,541	2,112,404	290+73	77.6 RT	+160.7	NE	5.0	HA	13
A-11-232	6,134,393	2,112,320	297+83	79.7 LT	+182.5	NE	50.4	HSA	13
A-11-233	6,133,981	2,112,548	302+49	91.1 LT	+193.7	NE	51.5	HSA	13
CPT-11-234	6,133,976	2,112,743	303+58	71.1 RT	+193.1	NM	37.7	CPT	13
A-11-235	6,133,663	2,112,993	307+62	99.5 RT	+198.5	+179.7	51.5	HSA	13
CPT-11-236	6,133,416	2,113,273	311+29	177.6 RT	+208.5	NM	20.0	CPT	15
HA-11-237	6,133,363	2,113,205	311+31	91.6 RT	+204.6	NE	5.0	HA	15
HA-11-238	6,133,617	2,112,774	306+72	105.0 LT	+200.4	NE	2.0	HA	13
A-11-239	6,133,185	2,113,003	311+53	176.8 LT	+209.7	NE	6.5	HSA	14

Notes: 1. Easting/Northing coordinates and Stations/offsets were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevations (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Encountered During Drilling (approximate);
NE = Groundwater Table Not Encountered; NM = Groundwater Not Measured.
4. HSA = Hollow-stem Auger Boring; HA = Hand Auger; CPT = Cone Penetration Test Sounding.

Table 1. Exploratory Borehole and CPT Sounding Information (Continued)

Borehole or CPT Number	Easting	Northing	Station (A-Line)	Offset (feet)	GSE (feet)	GWE (feet)	Depth (feet)	Method	Figure No.
A-11-240	6,132,803	2,113,218	315+88	232.3 LT	+219.5	NE	6.5	HSA	14
HA-11-241	6,133,207	2,113,113	312+01	76.1 LT	+203.9	NE	5.0	HA	14
HA-11-242	6,133,192	2,113,697	315+61	384.6 RT	+230.2	NE	5.0	HA	15
HA-11-243	6,133,251	2,113,438	313+60	211.5 RT	+212.4	NE	5.0	HA	15
A-11-244	6,132,930	2,113,518	316+65	85.2 RT	+207.9	NE	31.5	HSA	15
CPT-11-245	6,132,743	2,113,667	319+02	93.8 RT	+215.6	NM	57.9	CPT	15
A-11-246	6,132,919	2,113,331	315+62	72.5 LT	+206.7	NE	31.5	HSA	14
A-11-247	6,132,675	2,113,509	318+66	73.8 LT	+209.8	NE	51.5	HSA	14
A-11-248	6,132,607	2,113,347	318+23	245.4 LT	+220.0	NE	6.5	HSA	14
A-11-249	6,132,256	2,113,680	323+23	155.3 LT	+216.2	NE	6.5	HSA	16
HA-11-250	6,132,812	2,113,774	319+07	221.2 RT	+233.2	NE	5.0	HA	15
HA-11-251	6,132,458	2,113,897	322+56	133.8 RT	+221.4	NE	5.0	HA	16
HA-11-252	6,132,111	2,114,041	326+23	98.0 RT	+215.1	NE	5.0	HA	16
A-11-253	6,131,811	2,114,191	329+58	96.0 RT	+206.0	+183.0	51.5	HSA	16
A-11-254	6,131,567	2,114,354	332+62	120.3 RT	+201.4	+183.8	50.5	HSA	17
A-11-255	6,131,622	2,114,082	330+77	87.2 LT	+206.8	+176.8	30.8	HSA	16
A-11-256	6,131,235	2,114,347	335+28	84.0 LT	+197.7	NE	6.5	HSA	17
HA-11-257	6,131,159	2,114,644	337+77	94.7 RT	+193.1	NE	5.0	HA	17
A-11-258	6,132,809	2,113,348	316+61	123.6 LT	+227.0	NE	31.5	HSA	14
A-11-259	6,132,899	2,113,643	317+64	166.2 RT	+236.6	NE	31.5	HSA	15
A-11-260	6,140,910	2,108,148	220+47	221.3 RT	+208.2	NE	30.4	SS	7
A-11-261	6,138,920	2,109,492	244+14	106.5 RT	+178.8	NE	31.1	SS	8
A-11-262	6,134,034	2,112,767	303+22	122.2 RT	+208.8	NE	36.5	HSA	13
A-11-263	6,133,504	2,113,253	310+46	214.1 RT	+230.0	NE	36.5	HSA	15
A-11-264	6,135,616	2,111,832	284+76	61.8 RT	+146.4	NE	50.5	HSA	12

Notes: 1. Easting/Northing coordinates and Stations/offsets were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevation (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Encountered During Drilling (approximate);
NE = Groundwater Not Encountered; NM = Groundwater Not Measured.
4. HSA = Hollow-stem Auger Boring; SS = Solid-stem Auger; HA = Hand Auger; CPT = Cone Penetration Test Sounding.

5.2 Geologic Mapping

Published geological maps (Morton and Miller, 1981; Tan, 1999; Kennedy et al, 2007) show the area is underlain by Pleistocene marine and non-marine terrace deposits (Qt), Quaternary-age alluvium (Qal) and Miocene- to Pliocene-age Capistrano formation bedrock (Figure 3).

The project area was field-mapped by EMI's Certified Engineering Geologist (CEG). The available geologic exposures throughout the area were observed and recorded by the geologist; however, much of the area was covered by vegetation and could not easily be inspected. Small trenches were hand-dug at various locations for the purpose of evaluating geologic exposures.

5.3 Geophysical Studies

Geophysical studies were not conducted in the project area as part of this investigation.

5.4 Instrumentation

Instrumentation was not necessary and therefore not installed for the field investigation program.

5.5 Exploration Notes

No unique conditions were encountered or observed during the field exploration. Excavations in existing fill, terrace deposits, and Capistrano formation sedimentary bedrock can be performed with conventional heavy-duty excavation equipment.

6.0 GEOTECHNICAL TESTING

6.1 In-Situ Testing

Blowcounts from the SPT and MCD samplers were recorded during the exploration. In addition, Cone Penetration Test (CPT) soundings were conducted throughout the project area. Shear wave velocity measurements were obtained at some of the CPT locations.

6.2 Laboratory Testing

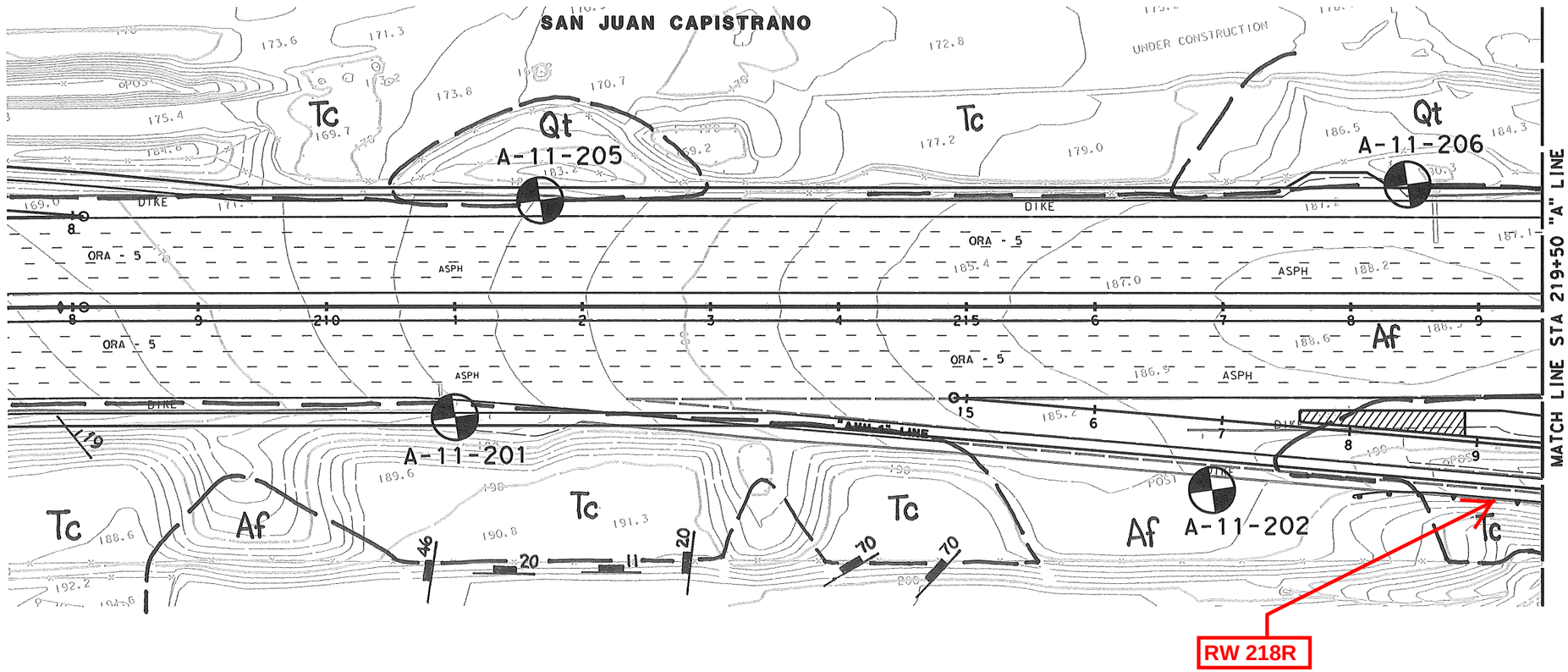
Laboratory tests were performed on representative samples of soil and bedrock to determine or derive relevant physical and engineering properties. Selected samples were tested to determine soil/bedrock classification, shear strength parameters, consolidation characteristics, and corrosion potential. A list of tests performed, the corresponding test methods, and purpose of testing is presented in Table 2.

Laboratory tests were conducted in general accordance with California Test (CT) methods or American Society for Testing and Materials (ASTM) standards. The laboratory test results are presented in Appendix B.

Table 2. Explanation of Laboratory Tests Performed

Type of Test	*Applicable Test Method*	*Purpose*
Dry Density	ASTM[1] D 2937	Estimate in-situ soil density
Moisture Content	ASTM D 2216	Estimate in-situ soil moisture content
No. 200 Wash	ASTM D 1140	Estimate percentage of gravel, sand, and fines content
Grain Size Distribution	ASTM D 422	Estimate percentage of gravel, sand, and fines content
Direct Shear	ASTM D 3080	Estimate strength parameters of soil
UU Triaxial Test	ASTM D 2850	Estimate undrained shear strength parameters of soil
Consolidation	ASTM D 2435	Estimate soil consolidation characteristics
Expansion Index	ASTM D 4829	Determine expansion classification
Maximum Density	CT2 216	Estimate maximum density and optimum moisture content
Soil pH	CT 643	Determine pH to assess corrosion potential of soil
Minimum Resistivity	CT 643	Determine corrosion potential of soil
Sulfate Content	CT 417	Determine sulfate content to assess corrosion potential of soil
Chloride Content	CT 422	Determine chloride content to assess corrosion potential of soil

Notes: 1. ASTM = American Society for Testing and Materials.
2. CT = California Test Method.



0 50 100 Feet

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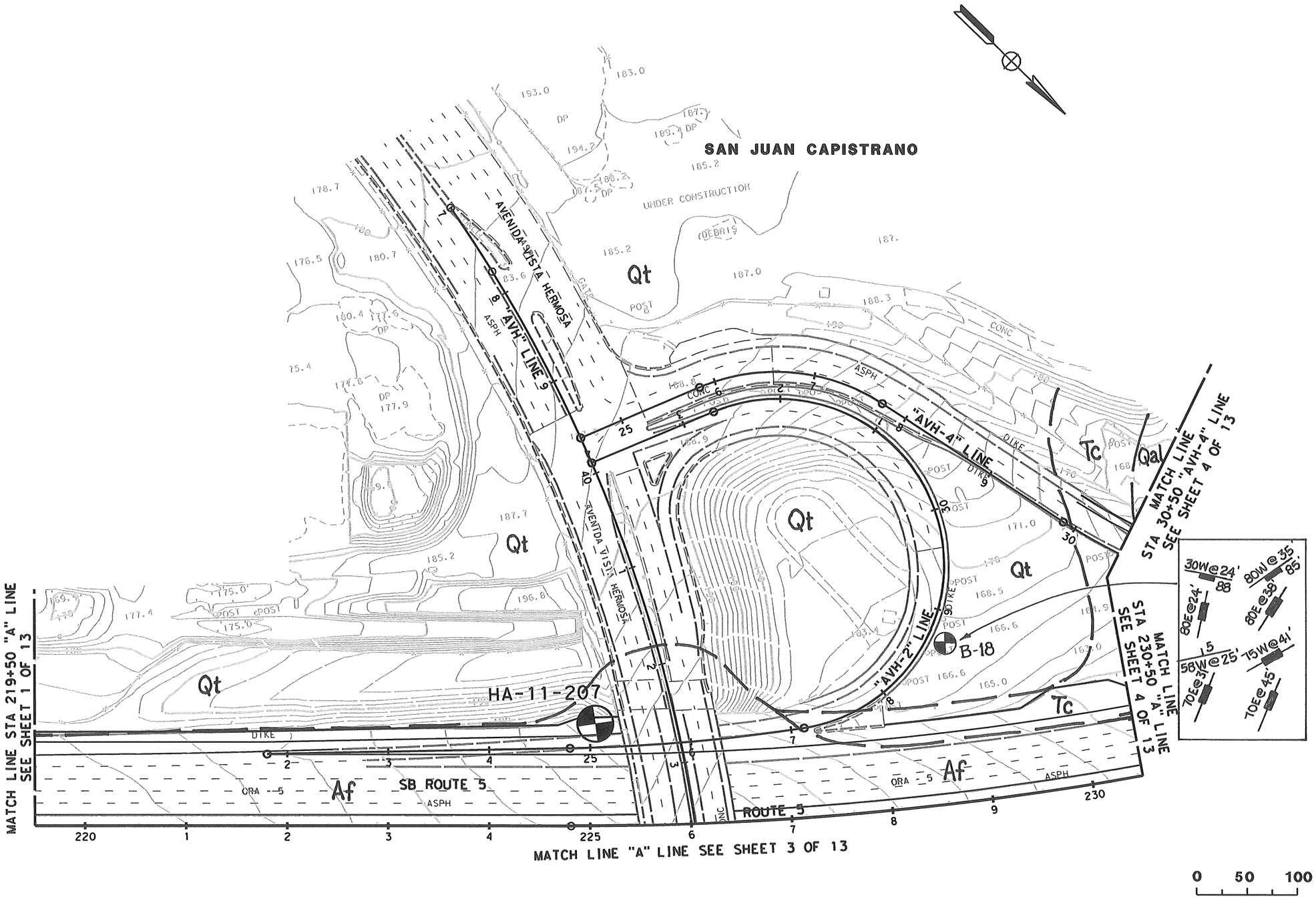
Exploratory Boring Location Map (1 of 13)

Figure 5

Project No.: 11-136 | **Date: 03-01-2012**



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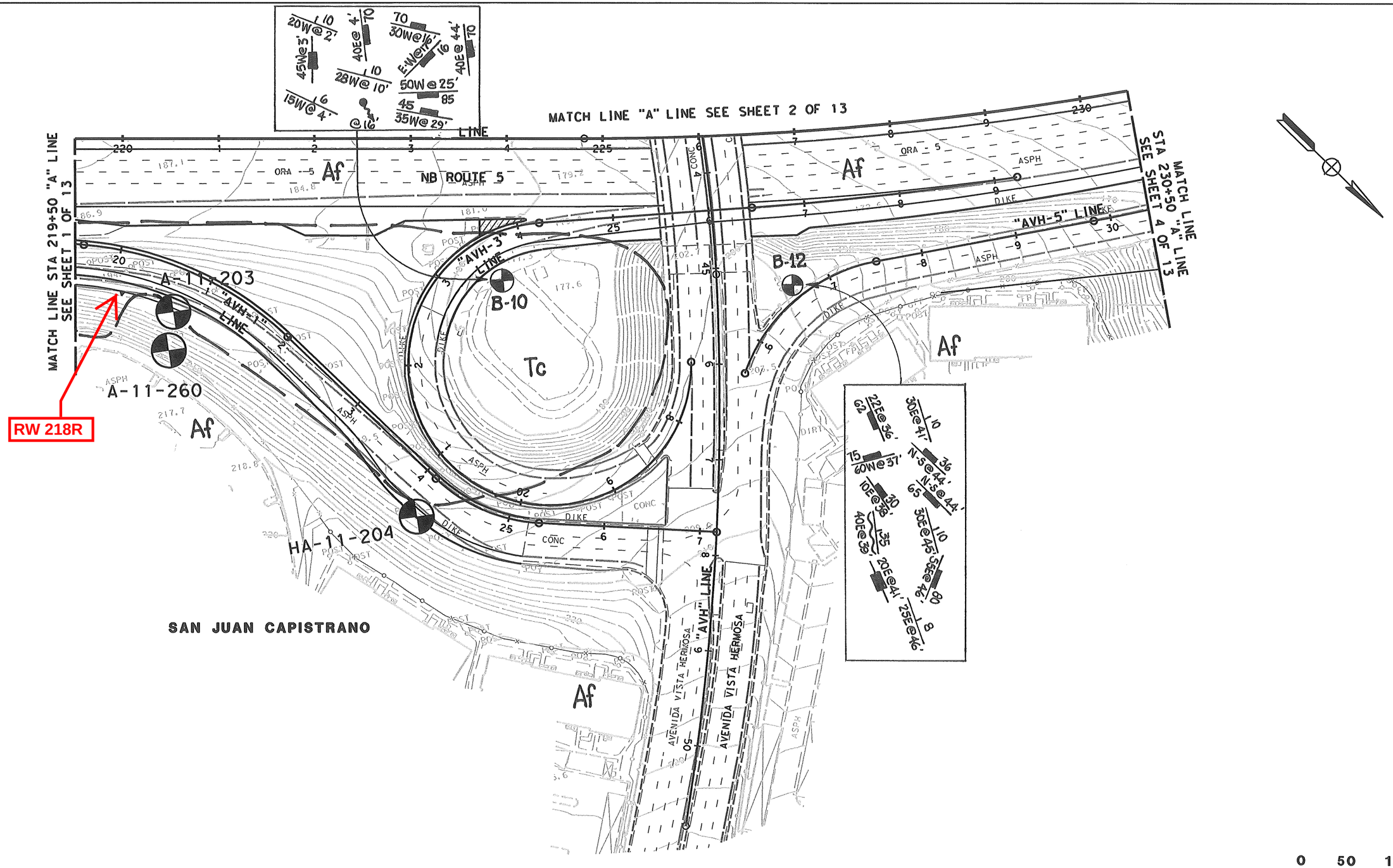
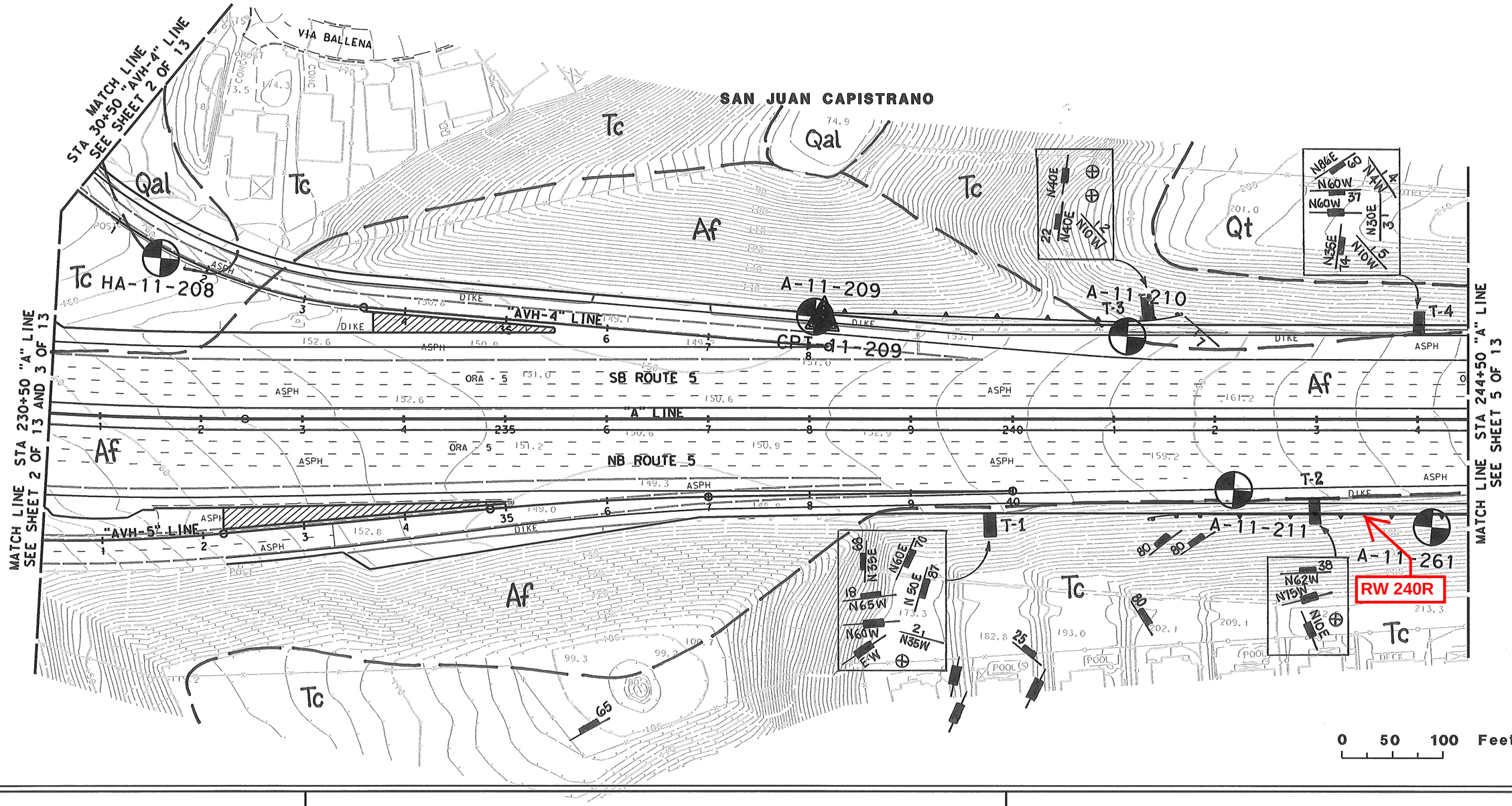
Exploratory Boring Location Map (2 of 13)

Figure 6



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (3 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 7



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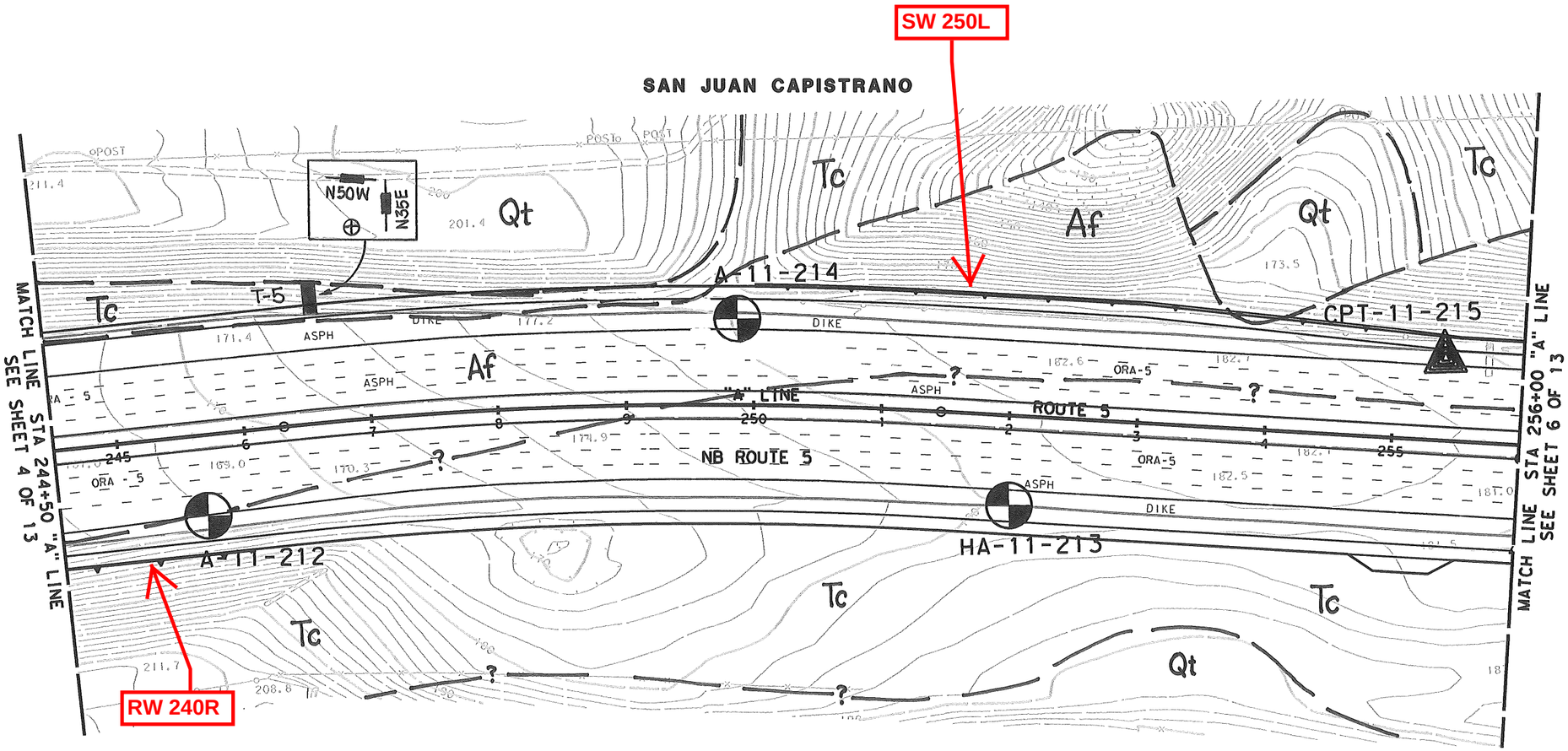
Exploratory Boring Location Map (4 of 13)

Figure 8



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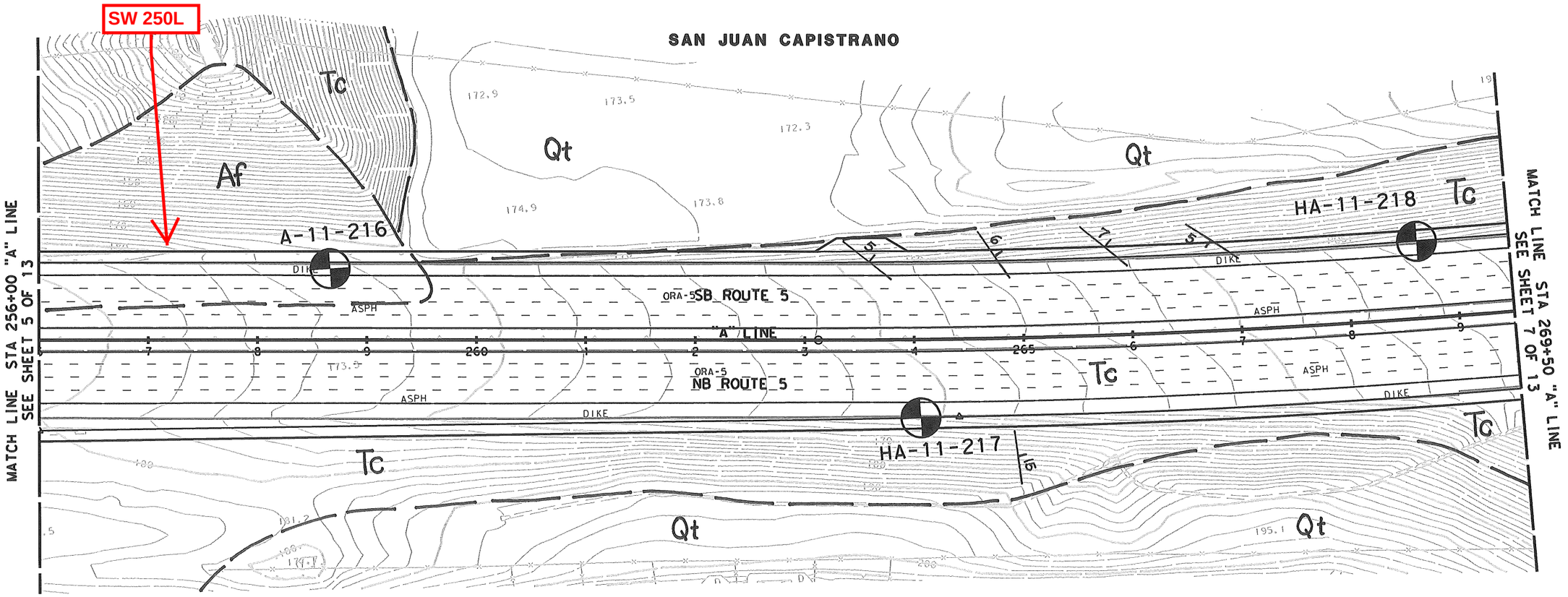
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (5 of 13)

Project No.: 11-136 | **Date: 03-01-2012**

Figure 9



Earth Mechanics, Inc.
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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (6 of 13)

Project No.: 11-136 | **Date: 03-01-2012**

Figure 10

SAN JUAN CAPISTRANO

RW 275L

SW 278L

RW 274R

RW 280R

A-11-219

A-11-220

A-11-221

A-11-222

CPT-11-222

A-11-224

CPT-11-223

A-11-225

A-11-226

Qt

Tc

Qal

Af

SB ROUTE 5

NB ROUTE 5

"A" LINE

AVENIDA VAQUERO

BIKE LANE

CALLE ARCO

DIRT

ASPH

CONC

ORA-5

MATCH LINE STA 269+50 "A" LINE SEE SHEET 6 OF 13

MATCH LINE STA 283+50 "A" LINE SEE SHEET 8 OF 13

0 50 100 Feet

Earth Mechanics, Inc.
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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (7 of 13)

Project No.: 11-136

Date: 03-01-2012

Figure 11

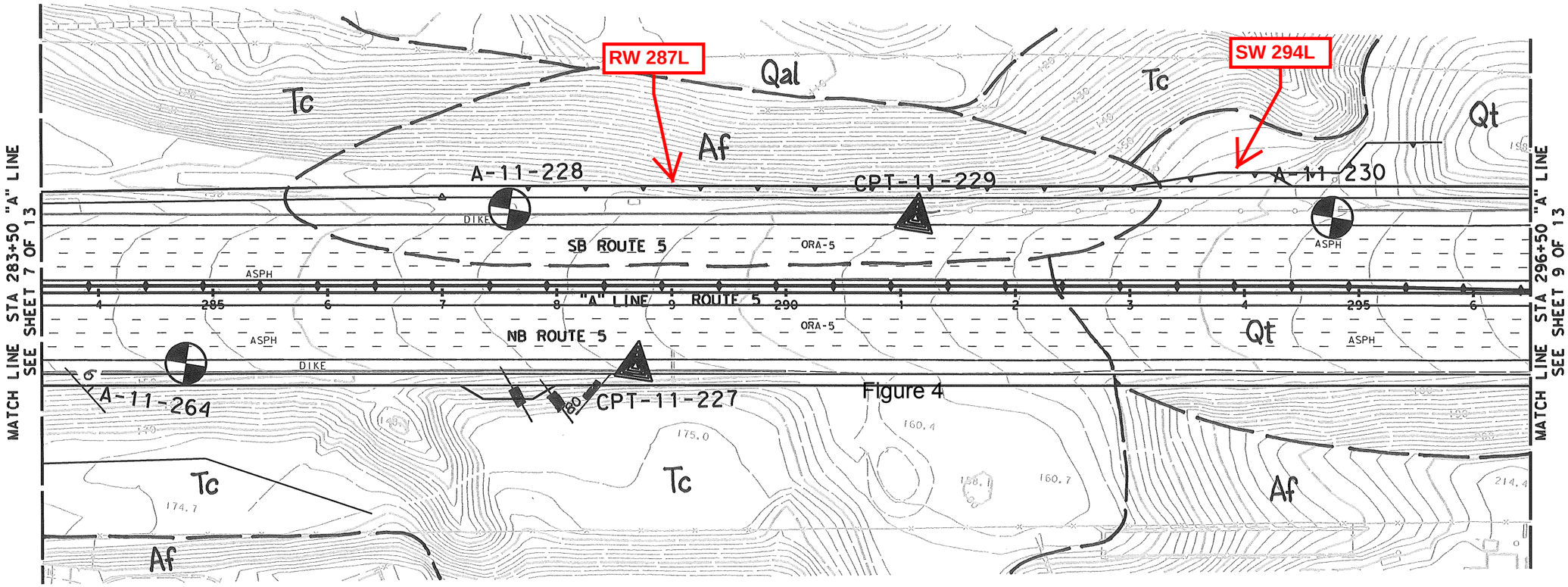

Figure 4

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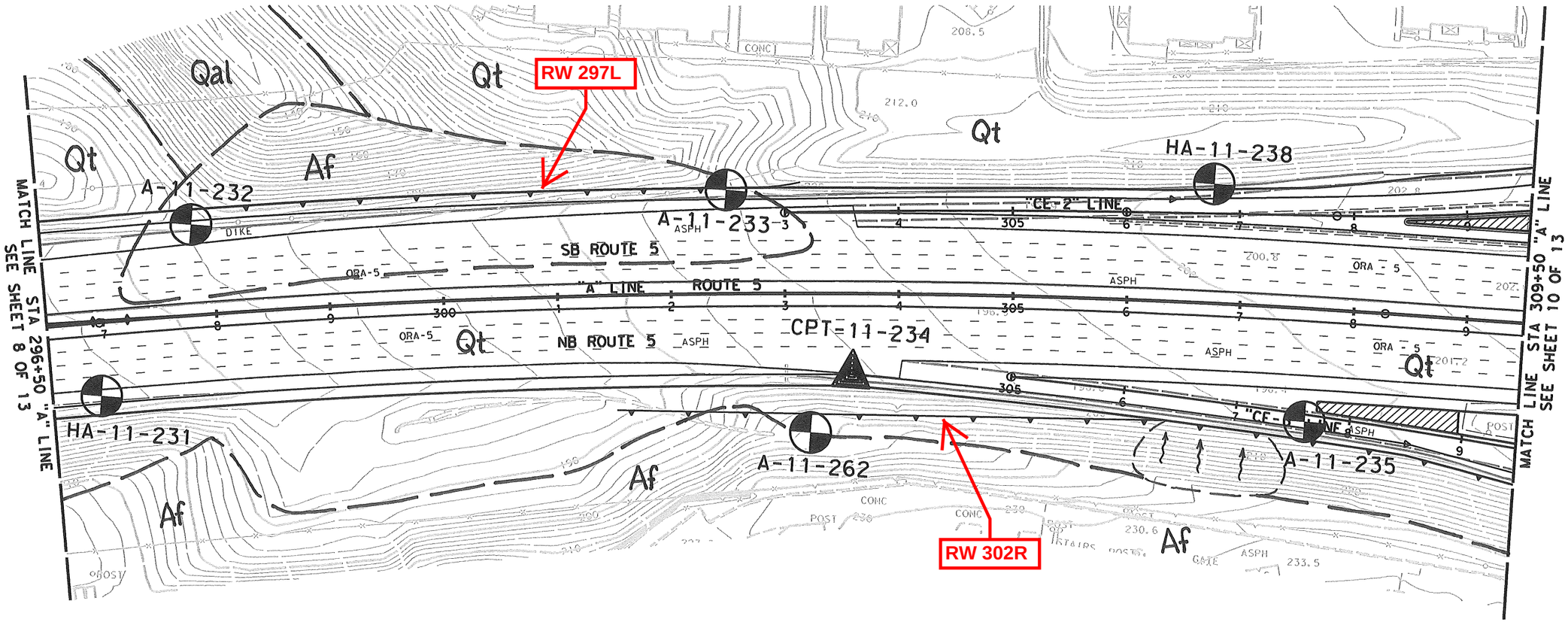
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (8 of 13)

Project No.: 11-136 | **Date: 03-01-2012**

Figure 12

SAN JUAN CAPISTRANO



0 50 100 Feet

Earth Mechanics, Inc.
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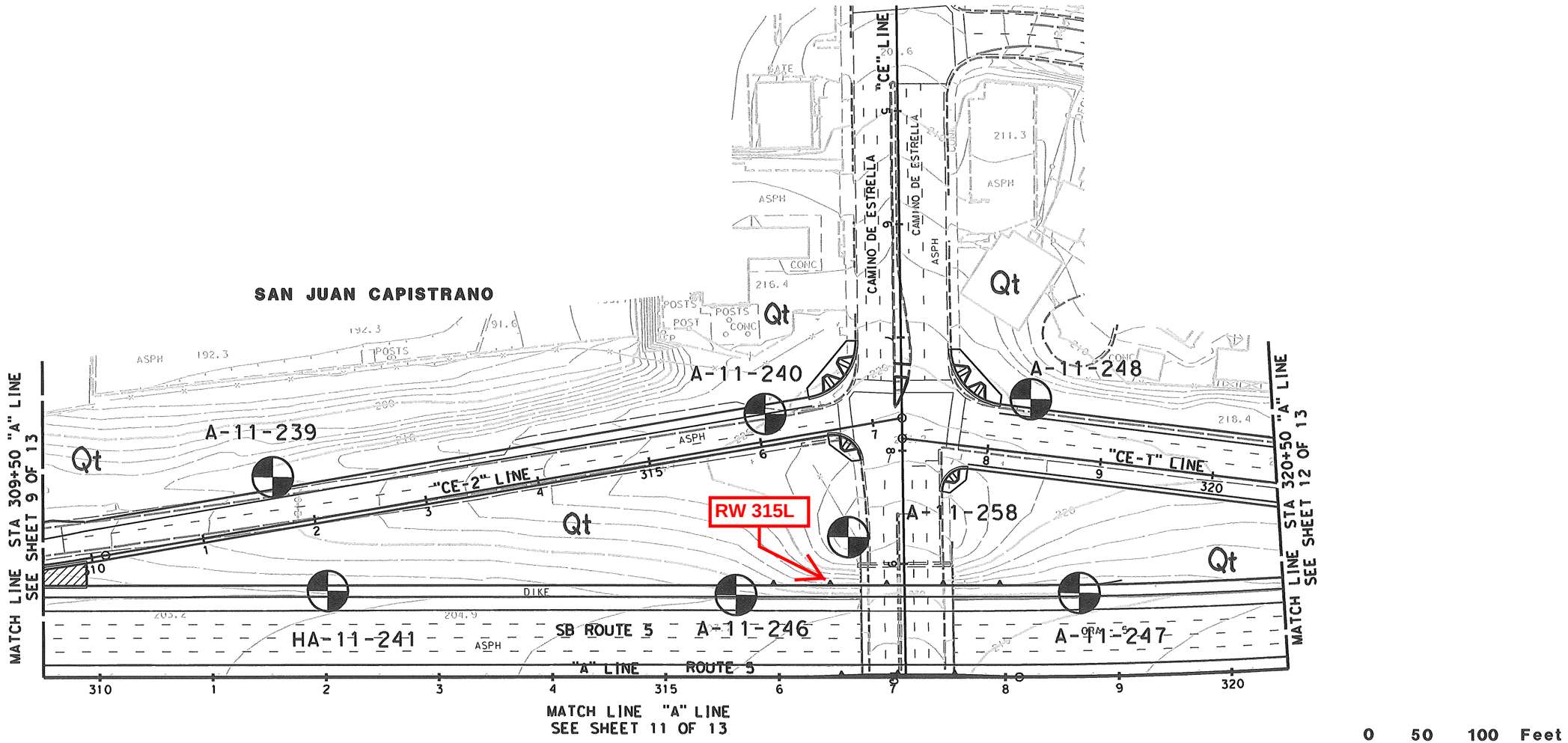
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (9 of 13)

Project No.: 11-136

Date: 03-01-2012

Figure 13



Earth Mechanics, Inc.
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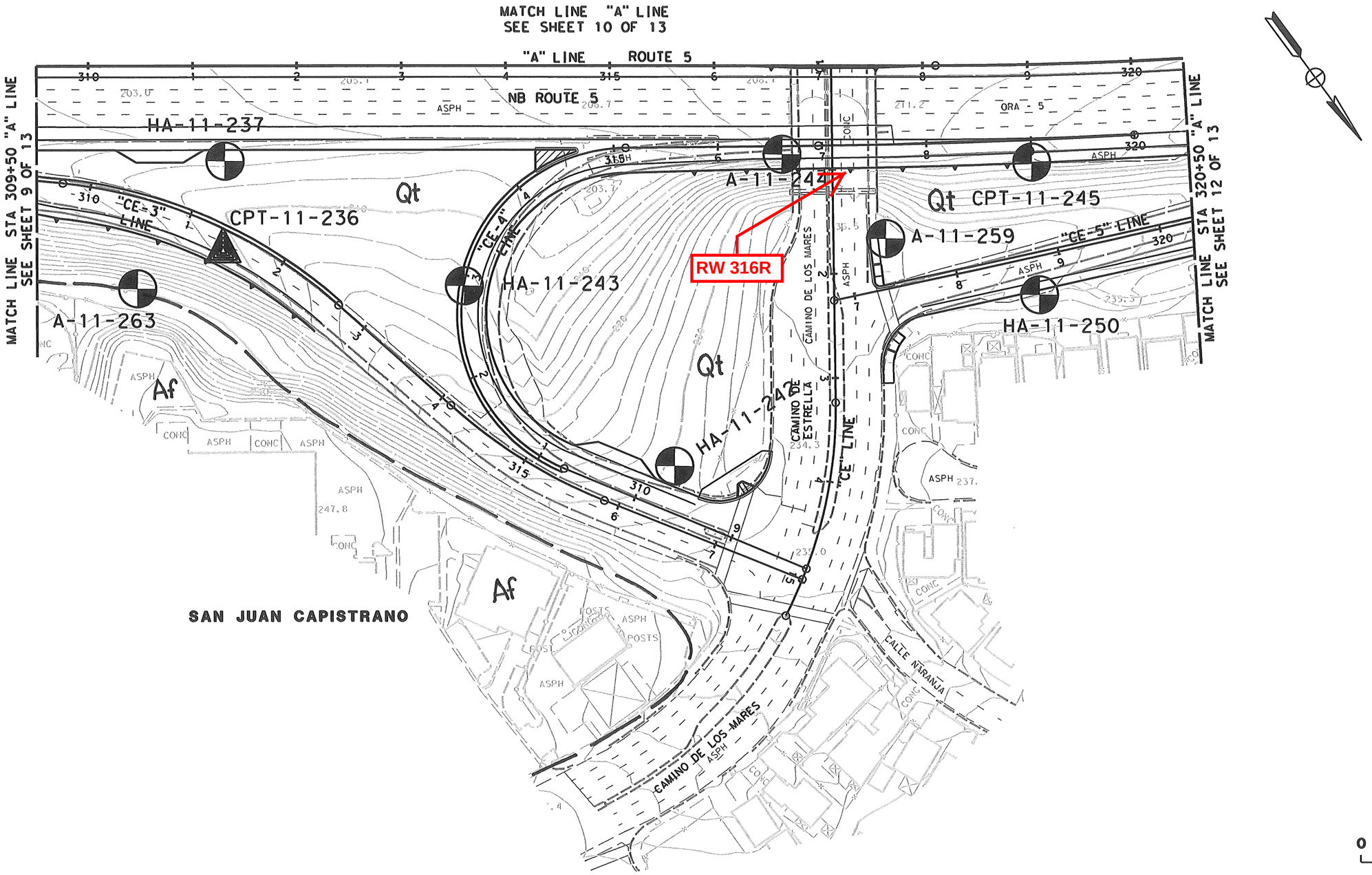
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (10 of 13)

Figure 14



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (11 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 15

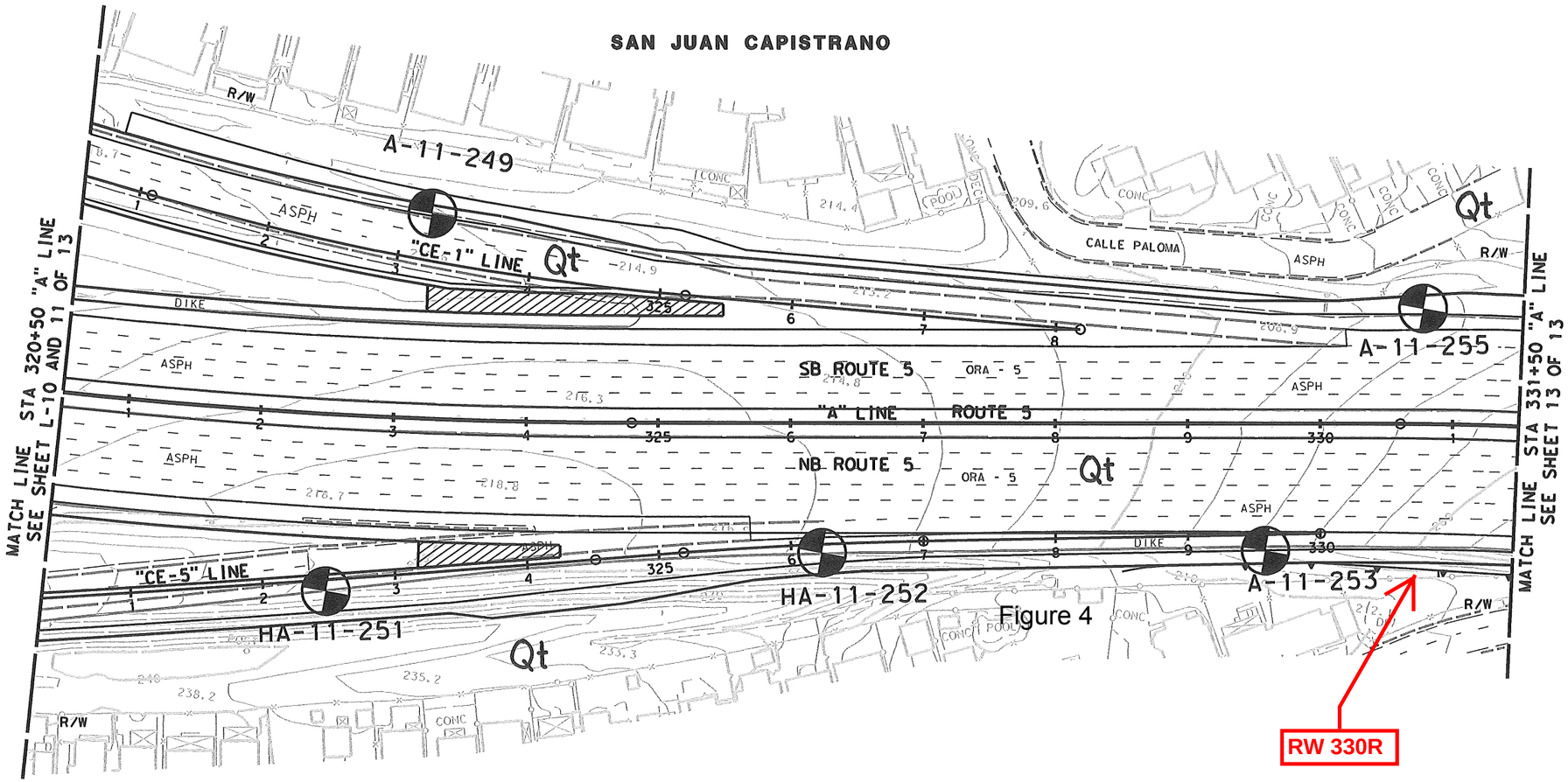
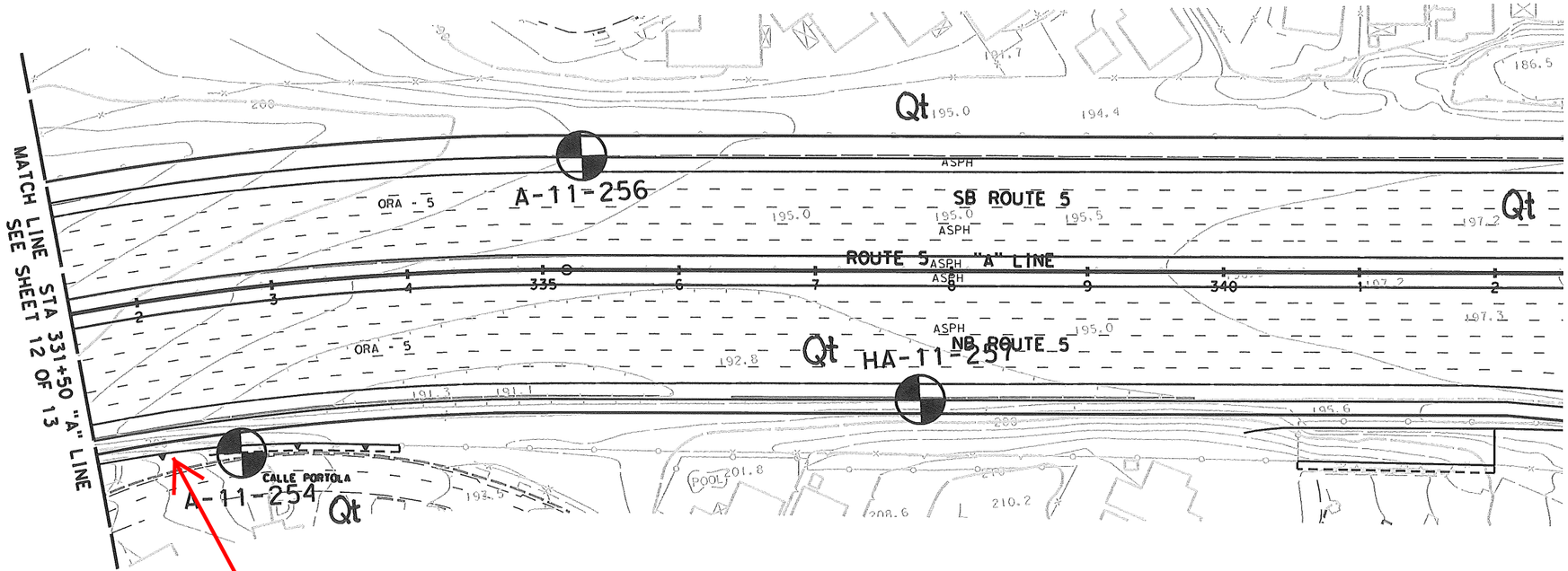


Figure 4

Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (12 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 16

SAN JUAN CAPISTRANO



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (13 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 17

7.0 GEOTECHNICAL CONDITIONS

7.1 Site Geology

As discussed previously, the project area is located in the northwestern part of the Peninsular Ranges physiographic province. The Peninsular Ranges comprise a northwest-southeast trending group of fault-bounded ranges between the Salton Trough and the Pacific Ocean. The Santa Ana Mountains, Puente Hills, and San Joaquin Hills are ranges within the Peninsular Ranges.

The project site is located on the low lying rolling hills westerly of the Santa Ana Mountains at the southerly end of the San Joaquin Hills in an area referred to as the Capistrano Embayment.

7.1.1 Lithology

The project area is underlain by silty claystone, claystone, and siltstone of the Capistrano formation, terrace deposits, and alluvium consisting of non-indurated silty sand with clay and gravel, and landslide deposits derived from units of the Capistrano formation.

7.1.2 Geologic Structure

The geologic structure in the project area consists of slightly to moderately folded bedrock of the Capistrano formation overlain by horizontally bedded Quaternary terrace deposits and alluvium without any notable geological structures such as faults, folds, or unconformities.

The Capistrano formation is widespread throughout the southern part of Orange County, which is known geologically as the Capistrano Embayment. The Capistrano Embayment is the name given to the structural/stratigraphic block west of the Cristianitos Fault (Figure 2). Geological structure in the Capistrano Embayment area consists primarily of a broad, gentle syncline of the Monterey and Capistrano formations between the San Joaquin Hills and the Santa Ana Mountains. This structure originated as a deep submarine structural trough that has since been uplifted at least 3000 feet from the marine environment to its present position above sea level (Ehlig, 1989). Subsequent regional uplift during the late Pliocene and Pleistocene time resulted in folding of the bedrock units.

The bedrock of the Capistrano formation underlying the project area was found to be massive to poorly bedded. Where bedding was observed, the strikes were generally to the northeast with shallow dips less than about 10 degrees westerly. Throughout the project corridor, the dominant structural pattern is high-angle joints and fractures within the Capistrano bedrock.

Pleistocene terrace deposits unconformably overlie the Capistrano formation. The contact is generally undulatory, with a slight overall dip seaward averaging about 2 degrees. This erosional contact is marked by cobble and boulder rich beds of varying thicknesses.

7.1.3 Natural Slope Stability

No landslide deposits were observed during the site investigation. Review of geotechnical reports by others, on file with the City of San Clemente, indicate shallow landslides were present in the vicinity of the project corridor during investigations for adjacent residential developments. According to the available data, the landslides were removed or stabilized during grading.

Currently, the existing cut and fill slopes along the project corridor are generally graded at 2H:1V. Minor seepage was observed in areas on slopes however the slopes were generally well vegetated and appear to be performing well.

7.2 Subsurface Soil Conditions

7.2.1 Stratigraphy

The geologic units encountered in the project area are described in this section. The distribution and location of these materials are shown on the Figures 5 through 17.

Artificial fill (Af) placed during construction of the I-5 freeway and adjacent residential and commercial developments is located along the project corridor. Fill materials were most likely derived from excavation of the Capistrano formation bedrock and local surficial deposits. The fills are predominantly composed of clayey silts and clay soils.

Generally, the existing fills overlie terrace deposits (Qt) or Capistrano formation bedrock (Tc). The terrace deposits are characterized by a basal cobble sequence fining upward to coarse to fine grained sands, silty sand, sandy silt, and clayey silt. The terrace deposits unconformably overlie bedrock units of the Capistrano formation.

The Capistrano formation is a marine sedimentary deposit generally consisting of brown to gray silty claystone, claystone, and siltstone. Secondary gypsum is commonly found deposited along joints, fractures and shears. The formation is generally soft when moist and has engineering properties similar to stiff to very stiff soils. The formation consists generally of soft, weakly cemented to uncemented material that can be disaggregated with finger pressure. A few hard beds occur throughout the formation. Within the project area, the Capistrano formation consists of an oxidized (weathered) zone defined by a light brown to brown color with a mottled appearance, underlain by an unoxidized zone that is generally dark brown to dark gray with a greater degree of induration.

Alluvium (Qal) is present in the drainages and canyons crossing the project corridor. The drainages and canyons are mantled by a relatively thin cover of alluvium that are generally derived from the surrounding bedrock and terrace deposits and are located in the lower elevations of the site. Where encountered in the borings the alluvium was observed to consist of silty sand to sandy clay.

Because of the large extent that the project area encompasses, the subsurface soil layering cannot be described by a single representative profile. The above soil description is general and only describes the subsurface in very broad terms. For details of stratigraphy at each borehole location, refer to the boring logs, LOTB sheets, and the CPT sounding logs provided in Appendix A.

7.2.2 Soil and Bedrock Strength Parameters

Shear strength parameters for soils, terrace deposits, and Capistrano formation bedrock were estimated using results of direct shear tests and unconsolidated-undrained triaxial tests and SPT blowcount correlations. The shear strength parameters used for geotechnical analyses are shown in Table 3 below. The properties of the fill and alluvium vary with depth and location. Refer to

the borehole logs in Appendix A for SPT blowcount information, and the laboratory test results in Appendix B.

Table 3. Engineering Properties of Existing Earth Materials

Material Type	*Design Friction Angle (degrees)*	*Design Cohesion (psf)*	*Range of Undrained Shear Strength (psf)*	*Typical Total Unit Weight (pcf)*
Alluvium (Qal)	-	-	1,500 – 2,500	120
Artificial Fill (Af)	32	200	1,500 – 2,500	120
Terrace Deposit (Qt)	27	210	2,000 – 3,000	120
Capistrano formation, Tc (cross-bedding)	27	250	3,000 – 4,000	120
Capistrano formation, Tc (along-bedding)	23	200	-	120

7.2.3 Expansion Potential

Based on visual classification and laboratory tests, the vast majority of earth materials throughout the project site are plastic fine-grained materials including fills and alluvium composed of clay and silt, terrace deposits, and clayey siltstone and claystone of the Capistrano formation. The clays found throughout the project are predominantly fat clays and the silts are elastic silts. Based on Plasticity Index (PI) and Expansion Index (EI) values, the vast majority of earth materials throughout the project site are classified as having "high" or "very high" expansion potential. These materials have a tendency to swell by increasing the moisture content in the materials. The in-situ native soils, terrace deposits, and Capistrano formation bedrock should not be left in-place directly beneath proposed pavement sections and should not be used as fill directly beneath pavement sections. In addition, these expansive materials should not be used as backfill behind or beneath retaining walls. However, these expansive materials may be used in general fill areas, away from proposed pavement and structures. Laboratory tests may be required during earthwork operations to verify the expansion potential of soils used in specific areas.

7.2.4 Settlement Potential

Since subsurface materials consist of predominantly fine-grained soil, terrace deposits, and fine-grained sedimentary bedrock, consolidation (long-term) settlement can occur under additional vertical loading due to embankment or structure foundations. In areas where coarse-grained earth materials are present, immediate (elastic) settlement can occur under additional vertical loading. Settlement due to proposed embankment widening and proposed foundations is discussed in subsequent sections of this report.

7.3 Water

7.3.1 Surface Water

Surface water (run-off) sheet flows over existing paved and unpaved surfaces into existing earthen swales, concrete v-ditches, and into grated drop inlets. The existing drainage system

along the I-5 mainline and in the existing interchanges, within the project limits, includes 18-inch and 24-inch Reinforced Concrete Pipes (RCP) connected to the drop inlets. It is presumed that the Caltrans drainage system ultimately sends water to the local municipal drainage system which ultimately conveys the water into the Prima Deshecha Canada channel. The Prima Deshecha Canada channel appears to be the largest drainage feature in the project area; the channel/RCB structure is located approximately 275 feet west of the Avenida Vaquero UC and crosses the mainline at a slight skew.

Scour: Since the project area is presently improved (i.e. roadway surfaces are paved and drainage is controlled by engineered facilities), and there are no existing or proposed unlined open flood control channels in the project area, then scour is not anticipated to be a design issue.

Erosion: Because surficial earth materials within the project area are predominantly fine-grained with moderate to significant cohesion, the surficial materials have a relatively low potential for erosion. Erosion of the existing slope faces was observed to generally be minimal.

Clayey earth materials tend to expand when wet and shrink while drying. The swell-shrink cycle has a tendency to produce surface cracking which would allow infiltration of water from rainfall and irrigation, ultimately causing shear strength reduction in the surficial earth materials. This shear strength reduction can result in increased surface erodibility over long periods of time.

Areas where granular surficial materials (sand and silty sand which have little to no cohesion) may be exposed, are susceptible to erosion and can erode to varying degrees over time. Slope areas that expose sandy materials are susceptible to rilling, piping, and accelerated erosion.

Provisions for surface drainage, slope planting, and other measures in accordance with Caltrans requirements should be fulfilled to provide mitigate erosion. To minimize erosion of slopes, surface water should not be directed to flow over slope faces, and, concentrated flows of water should be controlled and outlet onto non-erodible surfaces. Graded slopes should be planted as soon as possible, after grading is completed, to minimize erosion.

7.3.2 Groundwater

The Segment 2 project area is within the San Juan Valley hydrologic area. No indication of a static groundwater table was observed within the depths explored during the investigation for the overall project. However, perched groundwater was encountered in seven of the thirty-four deep boreholes (>30 feet deep), drilled for the Segment 2 project, at elevations ranging from +74 to +184 feet. The perched groundwater condition is validated by the fact that groundwater was found within a very wide range of elevation.

The as-built LOTB sheets for the existing Avenida Vista Hermosa UC and Camino de Estrella OC, indicate in a note that groundwater was not encountered or do not indicate the presence of groundwater. The borings for the original structures were drilled in 1966 and 1968. The as-built LOTB for the Avenida Vaquero UC shows groundwater at elevation +92 feet in one boring.

Soil moisture content and groundwater level can fluctuate due to variations in seasonal rainfall, nearby irrigation, changes in or addition of flood control improvements, groundwater injection or extraction activities, construction activities, or numerous other man-made or natural conditions.

7.4 Project Site Seismicity

7.4.1 Ground Motions

The seismic design parameters were determined using the current web-based Caltrans and United States Geological Survey (USGS) software. Current design methodology includes developing the deterministic and probabilistic acceleration response spectra (ARS) curves and using the largest magnitude curve for design. Using a Latitude and Longitude of 33.4528° N and -117.6437° W for the Avenida Vaquero UC, and using shear wave velocities of 252 m/s (886 ft/s) to 411 m/s (1,348 ft/s) for the upper 100 feet of subsurface soils, the controlling ARS curve was determined to be the probabilistic curve. The fault nearest the project area, which has the most influence on the ARS curves, is the Newport-Inglewood-Rose Canyon fault. Results of the analysis show that the peak ground acceleration (PGA) is approximately 0.39g. Since the I-5 mainline alignment (in the project area) essentially parallels the alignment of the Newport-Inglewood-Rose Canyon fault, and the average ARS curve (based on various shear wave velocities) is selected for design, the PGA determined for the Avenida Vaquero UC is considered applicable for the entire project. The detailed procedure for developing the design ARS curve is described in the a separate report prepared for the proposed widening of the Avenida Vaquero UC (EMI, 2012b).

The Newport-Inglewood-Rose Canyon fault is a Right Lateral Strike-Slip fault with a maximum earthquake magnitude of 7.5. The site-to-fault distance is about 7 km (4.36 miles). A Near-Fault Factor was applied since the bridge location is within 15 km (9.4 miles) of the fault. A Basin Factor was not applied since the bridge is located outside of the limits of the Los Angeles Basin (shown in Appendix B of the Caltrans Seismic Design Criteria, 2009).

7.4.2 Ground Rupture

There are no known active faults at the site so there is little potential for ground rupture.

8.0 GEOTECHNICAL ANALYSES AND DESIGN

8.1 Dynamic Analyses

8.1.1 Parameter Selection

The design horizontal PGA for the project is assigned to be 0.39g. Generally, the PGA is used to evaluate liquefaction potential and slope stability. In evaluating liquefaction potential, the PGA is used in the analysis. However, in evaluating global slope stability under pseudo-static conditions, Caltrans recommends using a horizontal seismic coefficient (k_h) equal to one-third of the PGA but not greater than 0.20 (in accordance with Section 5.2.2.3 of the Caltrans BDS, 2004). Therefore, a horizontal seismic coefficient of 0.133 was used in evaluating the global stability of slopes and retaining walls.

8.1.2 Liquefaction Potential and Seismically-Induced Settlement

Liquefaction Potential: Liquefaction is the loss of shear strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. The primary factors influencing the potential for

liquefaction include: groundwater elevation, soil type and grain-size characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. Soils most susceptible to liquefaction are saturated low-density sands and silty sands within 50 feet of the ground surface.

The vast majority of earth materials within the project area are fine-grained; the earth materials throughout the area include sedimentary bedrock of the Capistrano formation, terrace deposits, alluvium, and artificial fills that are derived from the bedrock and terrace materials. A localized area of sandy deposits was encountered just east of Camino de Estrella which are believed to be coarse-grained terrace deposits; the SPT blowcounts in this material are generally high. Lastly, there is no established shallow groundwater table within the project area. Based on the earth materials found throughout the area and lack of a shallow groundwater table, liquefaction of the earth materials is unlikely.

Seismically-Induced Settlement: Because of the stiff to hard nature of the subsurface materials (sedimentary bedrock, terrace deposits, compacted fill), and because the materials are composed predominantly of medium to highly plastic fine-grained particles, seismic settlement of in-situ earth material is expected to be negligible.

8.2 Permanent Cuts and Temporary Excavations

Based on the current grading plans and cross-sections, relatively minor to fairly significant cuts are planned to achieve proposed finish grades (to accommodate mainline widening). Generally, the permanent cuts involve sliver cuts into existing ascending slopes. The existing slopes range in height from less than 4 feet to about 55 feet. The proposed cuts into the slopes can be up to 24 feet wide (measured horizontally into the slope) and up to 12 feet deep (measured vertically). The proposed cuts will result in new permanent cut slope faces having inclinations of 2H:1V or flatter. In addition to the permanent cuts, temporary excavations (generally 2 to 15 feet deep) are proposed to accomplish remedial removals in areas where compacted fill and new pavement are proposed and to accommodate construction of cantilevered retaining walls. A list of the larger permanent cut slopes is given below (the station limits, relative to "A-Line," are approximate).

- Station 241+00 to 244+00, south side of mainline
- Station 246+00 to 249+25, south side of mainline
- Station 246+00 to 247+50, north side of mainline
- Station 260+00 to 269+00, north and south sides of mainline
- Station 269+00 to 272+00, south side of mainline
- Station 281+00 to 290+00, north side of mainline
- Station 293+00 to 295+00, north side of mainline
- Station 295+00 to 297+50, north and south sides of mainline
- Station 324+25 to 327+50, north side of mainline
- Station 337+00 to 339+00, north side of mainline

8.2.1 Slope Stability

Surficial Stability: The compacted fill materials are assumed to have a minimum friction angle of 32 degrees and a minimum cohesion of 200 psf. Based on these soil shear strengths, the proposed 2H:1V slopes are surficially stable with a factor-of-safety greater than 1.5.

Global Stability: The proposed cut slopes, described above, were evaluated for global stability. Global stability of cut slopes was evaluated under both static and pseudo-static conditions using the computer program SLIDE (Rocscience, 2006). The proposed cut slopes provide support for existing adjacent developments, at the top of the slopes, including residential and commercial properties and associated infrastructure. Therefore, factors-of-safety of 1.5 and 1.1 for static and pseudo-static conditions, respectively, are the minimum values used to assess long-term slope stability. Based on our analysis, the factor-of-safety of proposed cut slopes exceeds 1.5, which meets the required minimum for global stability under static conditions. Seismic slope stability under the pseudo-static condition was evaluated using a seismic coefficient (k_h) of 0.133. Results of the analysis indicate that the factor-of-safety for the pseudo-static condition is greater than 1.1.

Topic 304 of the Caltrans HDM (2008) advises that for new construction, widening, or where slopes are otherwise being modified, embankment (fill) slopes should be constructed at an inclination of 4H:1V or flatter. Due to right-of-way limitations, possible physical obstructions, and associated earthwork costs, the proposed cut slopes for the project can be constructed with an finish inclination of 2H:1V (existing cut slopes are graded to 2H:1V). Slopes steeper than 4H:1V require obtaining a design exception from Caltrans and obtaining approval from the Caltrans Landscape Architect.

8.2.2 Rippability

Excavations are anticipated to be accomplished in existing fill, terrace deposits, and sedimentary bedrock of the Capistrano formation. The on-site materials can be excavated using conventional heavy-duty earth-moving equipment; the materials are not expected to pose a rippability problem.

8.2.3 Earthwork Factors

The volume change of on-site materials upon excavation and compaction will vary with material type and density. Although accurate grading factors cannot be determined, the following estimates are provided for determining preliminary earthwork quantities.

Table 4. Earthwork Factors

Earth Material	Volume Change after Compaction
Compacted Fill	-3 to +3 percent
Terrace Deposits	-1 to +6 percent
Capistrano formation Sedimentary Bedrock	+4 to +12 percent
Note: Negative and positive factors represent shrinkage and bulking, respectively.	

8.3 Embankments

8.3.1 Description

Existing embankments within the project area include the mainline embankment, and the on- and off-ramp embankments at Avenida Vista Hermosa and Camino de Estrella. The embankments

and associated slopes can be compacted fill or native cut materials. Existing embankments range in height from about 60 feet to less than a few feet and have side slopes with an inclination of about 2H:1V or flatter. The existing slopes exhibit no evidence of gross or surficial instability and appear to have performed adequately over time.

Based on the current grading plans and cross-sections, relatively minor to moderate fills are required to achieve proposed finish grades. Generally, the grading involves placing compacted fills along portions of the mainline and ramps to widen the existing embankments. The fills will be placed along the existing outside edges of the embankments, where there are presently graded descending slopes. At the locations where fill is proposed, the existing slopes range in height from less than 4 feet to about 60 feet. In most cases, the thicker fills will be placed behind proposed retaining walls. The proposed compacted fills, to create new slopes (2H:1V or flatter), can be sliver fills less than 4 feet wide and up to 10 feet wide (measured horizontally from the existing slope face); the fills range in thickness from less than 2 feet and up to about 12 feet. The fills behind proposed retaining walls can be up to 20 feet wide and 12 feet thick. A list of where the thicker fills are proposed is given below (the station limits are relative to the "A-Line" and are approximate).

- Station 213+00 to 217+00, sliver fill for proposed 2H:1V slope (south side of mainline)
- Station 274+00 to 275+00, retaining wall backfill (north and south sides of mainline)
- Station 289+00 to 293+00, retaining wall backfill (south side of mainline)
- Station 293+25 to 294+00, fill slope (south side of mainline)
- Station 298+50 to 299+25, retaining wall backfill (south side of mainline)

8.3.2 Settlement

Compacted fill placed for new embankments or embankment widening generally induces compression of underlying earth materials resulting in settlement of the embankment. Immediate settlement is usually associated with c oarse-grained soils (sand) and occurs during grading; consolidation settlement is associated with fine-grained soils (silt and clay) or very soft or weathered sedimentary bedrock and occurs over longer time periods. Settlement magnitude and time period is directly related to the depth of fill placed above compressible earth materials, the thickness of compressible materials, and the compressibility characteristics of the materials.

The thickest fills proposed for widening existing embankments are about 8 feet thick (and about 10 feet wide) and occur at only a few locations: (1) between Station 213+00 and 217+00, and (2) between Station 293+25 and 294+00. Typical cross-sections were selected to evaluate potential settlement. The finish slopes will have an inclination of 2H:1V. Based on the slope configurations described above, the estimated settlement is expected to be less than ¾-inch.

8.3.3 Stability

Surficial Stability: The compacted fill materials are assumed to have a minimum friction angle of 32 degrees and a minimum cohesion of 200 psf. Based on these soil shear strengths, the proposed 2H:1V slopes are surficially stable with a factor-of-safety greater than 1.5.

Global Stability: The typical cross-sections described above, where embankment widening is occurring, were used to evaluate global stability of proposed slopes under both static and pseudo-

static conditions using the computer program SLIDE (Rocscience, 2006). The compacted fill used for the new embankment is assumed to have a minimum friction angle and minimum cohesion of 32 degrees and 200 psf, respectively.

For consistency, EMI is using minimum factors-of-safety of 1.5 and 1.1 for static and pseudo-static conditions, respectively, for long-term gross stability of fill slopes. Based on our analysis, the factor-of-safety of proposed fill slopes exceeds 1.5, which meets the required minimum for stability under static conditions. Seismic slope stability (pseudo-static condition) was evaluated using a seismic coefficient (k_h) of 0.133. Results of the analysis indicate that the factor-of-safety for the pseudo-static condition is greater than 1.1, which meets the minimum required value.

Topic 304 of the Caltrans HDM (2008) advises that for new construction, widening, or where slopes are otherwise being modified, embankment (fill) slopes should be constructed with an inclination of 4H:1V or flatter. The requirement for constructing 4H:1V slopes (or flatter) is based on the assumptions that adequate space is available, that there are no physical obstructions interfering with the slope, and that earthwork costs are not prohibitive. Where space is limited by right-of-way or other physical constraints, or when fill quantities and associated earthwork costs become unreasonable, stable fill slopes can be constructed with inclinations steeper than 4H:1V. However, slopes steeper than 4H:1V require obtaining a design exception from Caltrans and obtaining approval from the Caltrans Landscape Architect.

8.4 Earth Retaining Structures

Several earth retaining structures are proposed for the project and include sound wall on retaining walls, retaining walls with barriers, and tieback walls. The proposed cantilevered retaining walls and the tieback walls are addressed in two separate foundation reports (EMI, 2012d, 2012c).

8.5 Sound Walls

8.5.1 SW No. 250L

Proposed Sound Wall (SW) No. 250L will be located on the south side of the mainline between the Avenida Vista Hermosa Interchange and the Avenida Vaquero UC. The wall will extend from about Station 249+50 to Station 259+64 and will be located near the top of an existing descending slope. The proposed wall is about 1,020 feet long, has heights between 10.33 feet and 11.67 feet, and is a Caltrans standard masonry block sound wall on barrier.

Two exploratory boreholes and one CPT sounding were performed near the proposed alignment of SW No. 250L. The boreholes and CPT sounding are identified as A-11-214, CPT-11-215, and A-11-216. Based on observations from the boreholes and CPT, the stratigraphy along the wall alignment can be described as about 10 feet of stiff clay with interbedded medium dense to dense silty and clayey sand (fill) overlying about 20 to 30 feet of stiff to very stiff lean clay and fat clay (terrace deposits) overlying clayey siltstone/claystone of the Capistrano formation. The design shear strengths of the earth materials, used in geotechnical analysis, are provided in Table 3. Groundwater was not encountered in the two boreholes drilled near the proposed wall.

The sound wall will be supported on 16-inch diameter Cast-in-Drilled-Hole (CIDH) piles. Based on the wall layout plans provided by AECOM, the bottom of the barrier will be situated between about elevations +180.5 and +169.6 ft. Since the subsurface materials are predominantly fine-

grained clayey materials, EMI conducted a comparative analysis of lateral deflection and capacity for CIDH piles in CT Standard Plan soil (30° sand) versus CIDH piles in actual earth materials that exist along the wall alignment. The analysis was conducted in order to verify the use of the standard plan design for the clayey soils along the wall alignment; the standard plan design is based on granular soil (sand). Using the loads (axial, shear, and bending moment at the pile top) provided by the structural engineer, the comparative analysis shows that piles in the in-situ clayey soils will exhibit smaller lateral deflections, and lower shear and bending moments along the pile length, compared to the same piles in 30° sand. In addition, within the normal service range of lateral deflection (¼-inch or less), the results of the analysis show that the lateral capacity of a 16-inch CIDH pile in the site soils is greater than the capacity for the same pile in pure 30° frictional soil (refer to analysis provided in Appendix C). Therefore, the pile length and spacing for 16-inch diameter CIDH piles can be selected from the Caltrans standard plan for masonry block sound wall on barrier on pile footing, based on the applicable ground condition (Case 1 or Case 2), the applicable retained earth height (He), and a 30° friction angle.

8.5.2 SW No. 278L

Proposed SW No. 278L will be located on the south side of the mainline just northwest of the Avenida Vaquero UC; the sound wall will adjoin proposed RW No. 275L and proposed RW No. 287L at both ends. The wall extends from about Station 277+72 to Station 288+56. The proposed wall is about 1,082 feet long, has heights between 11.67 feet and 14.33 feet, and is a Caltrans standard masonry block sound wall on barrier.

Two exploratory boreholes and one CPT sounding were performed near the proposed alignment of SW No. 278L. The boreholes and CPT sounding are identified as CPT-11-223, A-11-225, and A-11-228. Based on observations from the boreholes and CPT, the stratigraphy along the wall alignment varies from about 4 feet to 40 feet of stiff to very stiff clayey soil (fill) overlying very stiff to hard clayey siltstone/claystone of the Capistrano formation. The design shear strengths of the earth materials, used in geotechnical analysis, are provided in Table 3. Groundwater was not encountered in the boreholes drilled near the proposed wall.

The sound wall will be supported on 16-inch diameter CIDH piles. Based on the wall layout plans provided by AECOM, the bottom of the barrier will be situated between about elevations +124.5 and +154.0 ft. Like SW No 250L described above, a comparative analysis of lateral deflection and capacity for CIDH piles in 30° sand versus CIDH piles in actual earth materials was conducted. Using the loads (axial, shear, and bending moment at the pile top) provided by the structural engineer, the comparative analysis shows that piles in the in-situ clayey soils and bedrock will exhibit smaller lateral deflections, and lower shear and bending moments along the pile length, compared to the same piles in 30° sand (calculations are provided in Appendix C). Therefore, the pile length and spacing for 16-inch diameter CIDH piles can be selected from the Caltrans standard plan for masonry block sound wall on barrier on pile footing, based on the applicable ground condition (Case 1 or Case 2), the applicable retained earth height (He), and a 30° friction angle.

8.5.3 SW No. 294L

Proposed SW No. 294L will be located on the south side of the mainline between the Avenida Vaquero UC and the Camino de Estrella Interchange. The wall will extend from about Station

293+36 to Station 294+74 and will be located within relatively flat ground. The proposed wall is about 138 feet long, has a constant height of 14.33 feet, and is a Caltrans standard masonry block sound wall on barrier.

One exploratory borehole and one CPT sounding were performed near proposed SW No. 294L, which are identified as CPT -11-229 and A-11-230. At the CPT location, the subsurface is believed to consist of about 30 feet of stiff to very stiff clayey and silty soil (fill) overlying Capistrano formation. At the borehole location, the stratigraphy was observed to be about 12 feet of very stiff terrace deposits overlying stiff to hard clayey siltstone/claystone of the Capistrano formation. The design shear strengths of the earth materials, used in geotechnical analysis, are provided in Table 3. Groundwater was encountered at a depth of about 45 feet in the exploratory borehole.

The sound wall will be supported on 16-inch diameter CIDH piles. Based on the wall layout plans provided by AECOM, the bottom of the barrier will be situated between about elevations +167.6 and +171.7 ft. Like the other sound walls, since the materials along this wall are predominantly fine-grained clayey materials, EMI conducted the comparative analysis to verify the use of the standard plan design for the clayey soils along the wall alignment. Like the other sound walls, the comparative analysis shows that piles in the in-situ clayey soils will exhibit smaller lateral deflections, and lower shear and bending moments along the pile length, and have higher capacity, compared to the same piles in 30° sand. Therefore, the pile length and spacing for 16-inch diameter CIDH piles can be selected from the Caltrans standard plan for masonry block sound wall on barrier on pile footing, based on the applicable ground condition and a 30° friction angle.

8.6 Culvert Foundations

Large-diameter culverts or large RCB structures requiring special foundations are not proposed for the project. Based on the preliminary plans, drainage improvements appear to involve installing new relatively small diameter RCP and extending existing RCP culverts.

8.7 Underdrain Recommendations

Existing underdrains that are noted on the as-built plans, and other undocumented underdrains discovered during construction, should be replaced. Additional underdrains should be installed in accordance with the recommendations below and those provided in the project Final Materials Report (EMI, 2012a).

Since earth materials throughout the project area are highly expansive, minimizing the amount of surface water and groundwater entering the subgrade beneath pavement sections is important to minimize the expansion of native materials and potential distress to new pavement. Therefore, underdrains should be placed along the edge of the mainline and ramps as mitigation against subgrade expansion. The underdrains will aid in collecting groundwater and surface water that infiltrates into the ground, and minimize the amount of water that enters the subgrade below the pavement. Underdrains should be placed in all cut areas and at-grade areas where widening and new pavement is proposed. The underdrains should be placed along the outside edge of the proposed shoulders. Underdrains in fill areas should be evaluated on a case-by-case basis. Final

plans should be reviewed by EMI to verify locations of proposed drains and to determine if underdrains are needed in fill areas. Underdrains should outlet to approved drainage devices.

8.8 Soil Corrosivity

Representative soil and bedrock samples were tested to determine corrosivity including minimum resistivity, pH, soluble sulfate content, and soluble chloride content. A total of thirty-six samples were tested for corrosivity using California Test methods 417, 422, and 643. The minimum resistivities ranged from 122 to 2,260 ohm-cm, the pH ranged from 3.5 to 8.1, soluble sulfate ranged from 220 to 8,636 parts per million (ppm), and the soluble chloride ranged from 120 to 4,642 ppm.

According to the Caltrans Corrosion Guidelines (2003), soils are corrosive if the pH is 5.5 or less, or chloride concentration is 500 parts per million (ppm) or greater, or sulfate concentration is 2,000 ppm or greater. Based on the test results, the on-site earth materials are corrosive to concrete and bare metals. The project area is deemed to be an aggressive corrosion environment. Appropriate corrosion measures should be taken for any concrete or steel elements that will be in contact with on-site soil and bedrock.

9.0 MATERIAL SOURCES

Fill is expected to be required for the proposed improvements. Fill materials can be obtained from public or private sources. Private sources of construction materials (sand, gravel, aggregate base, concrete, and asphalt concrete) were not investigated by EMI. However, materials are available from various commercial suppliers located in Orange County and the surrounding area. The Materials Report (EMI, 2012a) gives a list of potential commercial suppliers for sand, gravel, aggregate base, and concrete.

Pulverizing existing pavement, during construction, might be performed. New asphalt pavement can be produced using Reclaimed Asphalt Pavement (RAP). RAP, pulverized AC and pulverized Portland cement concrete may be used on the project if approved by Caltrans. The quality and use of recycled and reclaimed materials should conform to Caltrans Specifications (2010a).

10.0 MATERIAL DISPOSAL

Due to remedial earthwork recommended below spread footings for cantilevered retaining walls (overexcavation and soil replacement) and the remedial earthwork for new pavement sections, the project is expected to generate earth materials that will require off-site disposal. Disposal sites were not investigated for the project.

11.0 CONSTRUCTION CONSIDERATIONS

11.1 Construction Advisories

All work should be performed in accordance with the Caltrans Standard Specifications (2010) except as indicated in the Special Provisions prepared for the project improvements. Compaction of soil should be conducted in accordance with requirements in Section 19-5 of the Caltrans Standard Specifications (2010a). Fill placed on sloping ground should be properly keyed and

benched into existing ground and placed as specified in Section 19-6 of the Caltrans Standard Specifications (2010a).

11.2 Construction Considerations that Influence Design

No construction considerations influenced the analyses or design of proposed improvements described in this report.

11.3 Construction Considerations that Influence Specifications

Special Provisions that are influenced by geotechnical factors include shoring requirements, dewatering requirements, and corrosion protection specifications. Temporary construction slopes, bracing, and shoring should be made the contractor's responsibility.

11.4 Construction Monitoring and Instrumentation

Qualified geotechnical personnel should perform field inspections and soil testing during the following stages of construction:

- Grading operations, including excavations and placement of compacted fill.
- Excavations and remedial earthwork for structure foundations.
- Foundation construction including spread footings and CIDH piles.
- Excavations for utility trenches and drainage structures.
- Monitoring vertical and horizontal movement of existing structures and utilities that will be protected in place.
- Removal or support of buried utilities or structures.
- Shoring installation, if necessary.
- When any unusual conditions are encountered.

Temporary construction slopes and shoring used during construction of proposed improvements should be monitored by the contractor and qualified geotechnical personnel.

11.5 Hazardous Waste Considerations

With the exception of the Aerially-Deposited Lead (ADL) investigation, evaluating the presence and concentration of hazardous contaminants is beyond EMI's scope of work and therefore is not addressed herein. The results of the ADL investigation are provided in a separate report (EMI, 2012f). EMI assumes that no hazardous or toxic materials exist within the project area; therefore, no hazardous waste considerations are provided. If for any reason hazardous or toxic materials are believed to exist within the project area, an environmental consultant should be retained.

11.6 Differing Site Conditions

The analyses and recommendations contained in this report are based on the data obtained from the review of available geologic references, our site reconnaissance, exploratory boreholes and CPT soundings, and laboratory testing. The borehole and CPT sounding logs indicate subsurface conditions only at specific locations and times drilled, and only to the depths penetrated. The borehole and CPT logs do not necessarily reflect subsurface variations that may exist between

such locations. If variations in soil and subsurface conditions, from those described herein are noted during construction, the recommendations presented in this report must be re-evaluated. In the event that any changes in the nature, design, or location of the proposed facilities occur, the conclusions and recommendations in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing by the designer. Therefore, upon encountering any site conditions that are perceived to differ materially from those conditions anticipated in this report, the resident engineer should contact the geotechnical designer immediately.

12.0 RECOMMENDATIONS AND SPECIFICATIONS

Below are recommendations for proposed improvements. If designers have questions or disagree with the recommendations, or, if variations in subsurface conditions from those described herein are observed during construction, the geotechnical engineer should be contacted to verify the applicability of the recommendations. Recommendations in this report may require modification based on actual subsurface conditions encountered during construction.

- Earthwork throughout the project area is anticipated to be minor to substantial. In any fill areas, compressible surficial materials including topsoil, loose alluvium, dry or saturated soil, and unsuitable fill should be completely removed prior to placing compacted fill. A minimum overexcavation of 2 feet is recommended within all areas to receive compacted fill; the overexcavation should extend horizontally a minimum distance of 2 feet from edges of new fills. Actual depths and extent of the remedial removals should be determined in the field by qualified geotechnical personnel. Bottoms of overexcavations should be scarified to a minimum depth of 8 inches, moisture conditioned to near optimum moisture content, and compacted in place to at least 95 percent relative compaction. Excavation bottoms should be firm and unyielding prior to placing compacted fill. Remedial excavation beneath proposed retaining wall spread footings is discussed in a separate foundation report (EMI, 2012d). Remedial excavation in areas where new pavement is proposed is addressed in the Materials Report (EMI, 2012a).

- Earthwork should be performed in accordance with Caltrans Standard Specifications (2010a). Compaction of soil should be conducted in accordance with requirements in Section 19-5 of the Standard Specifications (2010a).

- The Capistrano formation bedrock throughout the project area was found to be massive to poorly bedded. Where bedding was observed, the strikes were generally to the northeast with shallow dips less than about 10 degrees westerly. Throughout the project area, the dominant structural pattern is high-angle joints and fractures within the Capistrano bedrock. The exposed cuts, during grading for the project, should be inspected by a Certified Engineering Geologist to verify the geologic structure and address any potentially adverse conditions.

- Fills placed against sloping ground shall be keyed and benched into the sloping ground and placed as specified in Section 19-6 of the Caltrans Standard Specifications (Caltrans, 2010a).

- Existing topsoil can be stockpiled for future use on finished grades to help in the re-vegetation of the area.

- All overexcavations should be observed by qualified geotechnical personnel to confirm that unsuitable materials are removed and that firm and unyielding ground surfaces are exposed. Overexcavated areas should be cleaned of loose soils and debris and should be observed to be firm and unyielding prior to receiving fill.

- The in-situ sedimentary bedrock of the Capistrano formation, the terrace deposits, and the existing fills that are derived from the on-site earth materials, are classified as having "high" to "very high" expansion potential. There are localized areas of sandy soils that are non-expansive but compose only a relatively small area of the project. The in-situ native soils, terrace deposits, and sedimentary bedrock are considered suitable for use as compacted fill in general fill areas, assuming the soils meet the quality requirements given in the Caltrans Standard Specifications (2010a). However, the in-situ expansive earth materials should not be placed as fill behind or beneath proposed retaining walls and should not be used beneath proposed pavement sections. Laboratory tests may be required during earthwork operations to verify the expansion potential of soils used in specific areas.

- All finish slopes should be planted as soon as practical after grading in an attempt to minimize surface erosion. Local areas may require additional measures at the discretion of the resident engineer present on-site during construction.

- Design of temporary construction slopes and shoring is the contractor's responsibility during construction.

- It shall be made the contractor's responsibility to control surface water and dewater the site as necessary. Free water shall not be allowed to stand in any excavations. If excavations become flooded, at least the bottom 8 inches of soil should be removed and replaced or re-compacted in-place to 95 percent relative compaction. Additional removals may be required at the discretion of the resident engineer or geotechnical inspection personnel.

13.0 LIMITATIONS

This report is intended for use by AECOM, the Orange County Transportation Authority, the California Department of Transportation, and the Cities of Dana Point and San Clemente for the I-5 HOV Widening, Segment 2 Project. This report is based on the project as described herein and the information obtained from the exploratory boreholes and Cone Penetration Test (CPT) soundings at the approximate locations indicated on the attached plans. The findings and recommendations contained herein are based on results of the field investigation, laboratory tests, and engineering analyses. Also, the earth materials and subsurface conditions encountered in the exploratory boreholes and CPT's are presumed to be representative of the project site; however, subsurface conditions and characteristics of soils between exploratory boreholes and CPT's can vary. The findings reflect an interpretation of the direct evidence obtained. Recommendations presented herein are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. EMI should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Modifications to project plans or variations in subsurface conditions may require re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained herein are applicable to the specific design elements and locations which are the subject of this report. Data, opinions, and recommendations herein have no applicability to any other design elements or to any other locations, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of EMI.

EMI is not responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the Contractor, or any other person performing any construction, or for the failure of any worker to carry out the construction in accordance with the Final construction drawings and specifications.

Services performed by EMI were conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

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APPENDIX A
EXPLORATORY BOREHOLE AND CPT SOUNDING LOGS

Grade Elevation	+27.3 ft				
Boring Depth	25.0 ft	Driller	SoCal Drilling	SHEET 1 OF 1	
Borehole Diameter	8 inches	Type of Rig	Mud Rotary	Comments	
Date Drilled	04-21-10	Drive Wt.	140-lb		
Logged By	P. F. Chan	Drop	30 inches		

Depth (ft)	Sample Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	1			SILTY SAND (SM): dark olive-brown, moist, mostly medium to fine, little fines			R,CP
5	D	2	20		Poorly graded SAND (SP): loose, light olive-gray, moist, mostly coarse to fine SAND, slightly compact when handled	14	106	DS
10	S	3	20		Poorly graded SAND with SILT and GRAVEL (SP-SM): light olive-gray, moist, little GRAVEL, mostly coarse to fine SAND, few fines, compact	35	-	PA
15	D	4	40			24	108	

1. 'Sample Type' – Graphical representation of sample type as shown below.
   - S: Split Spoon – Standard Penetration Test Sample (SPT)
   - D: Drive Sample – California Drive Sampler
   - B: Bulk Sample – Obtained by collecting cuttings in a plastic bag
   - T: Tube Sample – Thin-walled Tube Sample
   - P: Thin-walled Pitcher Core Sample

2. 'Sample' – Sample Number

3. 'Blows/foot' – Number of blows required to advance sampler one foot (unless a distance is specified). Samplers in general were driven into the soil at the bottom of the hole with a 140-lb automatic trip hammer falling a standard 30 inches (as specified in header).

   'REC/RQD' – Sample Core Recovery (REC) in percent (%) and Rock Quality Designation (RQD) in percent (%). RQD is defined as the percentage of core in each run in which the spacing between natural fractures is greater than 4 inches. Mechanical breaks of the core are not considered.

4. 'Graphic Log' – Standard symbols for soil and rock types, as shown in Note B opposite

5. ▼ Groundwater elevation while drilling.

6. 'Geotechnical Description' (See also Note A, opposite).
   Soil – Soil classifications are in general accordance with the American Society for Testing and Materials (ASTM) D2488.84. Designations include consistency, moisture, and color. Field description have been modified to reflect results of laboratory analyses where deemed appropriate.

   Rock – Rock classifications generally include a rock type, color, moisture, mineral constituents, degree of weathering, alteration and the mechanical properties of the rock.

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

EMI Project No.: 11-136 Date: 03/05/12

LEGEND FOR LETTER-SIZE GEOTECHNICAL BORING LOGS (SHEET 1 OF 2)

7. 'Moisture Content' and 'Total Unit Weight' determined by laboratory testing.

8. 'Tests/Results' – Identify types of laboratory tests performed on samples collected from the field investigation. Abbreviations of tests are provided below:

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

Criteria for Describing Moisture Condition

Description	Criteria (After ASTM D 2488)
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

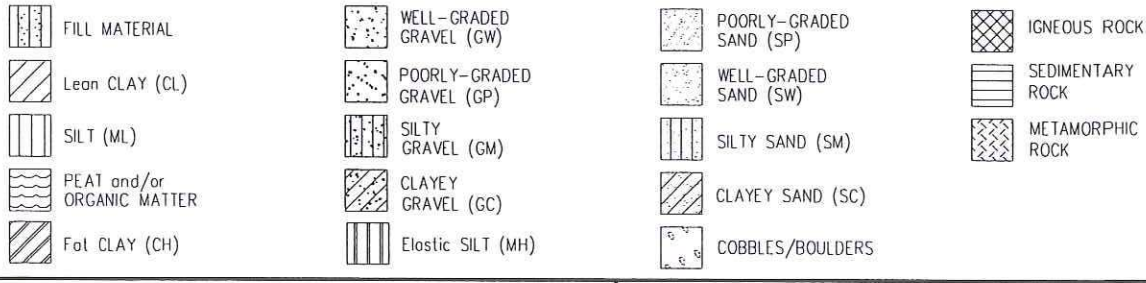
Relative Density of Coarse–Grained Soil

Blows/foot	Relative Density	Field Test (After Sowers, 1979)
0 – 4	Very Loose	Easily penetrated 12" with 0.5–inch steel rod pushed by hand
5 – 10	Loose	Easily penetrated with 0.5–inch steel rod pushed by hand
11 – 30	Medium Dense	Easily penetrated with 0.5–inch steel rod driven by 5–lb hammer
31 – 50	Dense	Penetrated a foot with 0.5–inch steel rod driven by 5–lb hammer
> 50	Very Dense	Penetrated a few inches with 0.5–inch steel rod driven by 5–lb hammer

Consistency of Cohesive Soils

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

Legend of Earth Materials



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I–5 HOV Widening Segment 2

EMI Project No.: 11–136 | Date: 03/05/12

LEGEND FOR LETTER–SIZE GEOTECHNICAL BORING LOGS (SHEET 2 OF 2)

LOG OF BORING NO. HA-11-204

Grade Elevation:	+204.6 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 223+06; 395' RT; "A" Line
Date Drilled:	10/17/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY fat CLAY (CH): olive-brown, moist, fine SAND, trace medium SAND, trace fine GRAVEL, high plasticity	-	-	PI,CP,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-205

Grade Elevation:	+176.1 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/30/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 211+67; 83' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0					7" Asphalt Concrete, 3" Base			
	B	0			SILTY SAND with GRAVEL (SM): olive-brown, moist, coarse to fine SAND, little coarse to fine GRAVEL, nonplastic	-	-	
					some asphalt fragments			
5	S	1	13		Elastic SILT (MH): very stiff, olive-brown, moist, fine SAND, high plasticity	28	-	PI
					Terminated Boring at 6.5 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-207

Grade Elevation:	+172.8 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 225+06; 101' LT; "A" Line
Date Drilled:	10/17/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0					7" Asphalt Concrete, 12" Base			
	B	0			SILTY SAND with GRAVEL (SM): olive-yellow, moist, coarse to fine SAND, little coarse to fine GRAVEL, nonplastic	-	-	CP,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-208

Grade Elevation:	+160.4 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 231+56; 157' LT; "A" Line
Date Drilled:	10/11/11	Drive Wt. (lbs):		
Logged By:	RJ	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			Lean CLAY with SAND (CL): olive-brown, moist, medium to fine SAND, low to medium plasticity	-	-	CP,R
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-209

Grade Elevation:	+149.5 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 238+05; 101' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0					Asphalt Concrete			
	B	0			Lean CLAY (CL): olive, moist, coarse to fine SAND, medium plasticity	-	-	PI,R
5	S	1	3		CLAYEY SAND (SC): very loose, olive-brown, moist, 5% fine GRAVEL, 59% coarse to fine SAND, 33% fines, medium plasticity	12	-	PA
10					Terminated boring at 10 ft depth due to hard drilling No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-213

Grade Elevation:	+180.8 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 252+03; 70' RT; "A" Line
Date Drilled:	10/18/11	Drive Wt. (lbs):		
Logged By:	KIAT	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY lean CLAY to CLAYEY SAND (CL to SC): olive-brown, moist, medium to fine SAND, low to medium plasticity	-	-	
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-217

Grade Elevation:	+159.9 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 264+05; 72' RT; "A" Line
Date Drilled:	10/13/11	Drive Wt. (lbs):		
Logged By:	RJ	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY elastic SILT (MH): olive-brown, moist, coarse to fine SAND, trace fine GRAVEL, high plasticity	-	-	PI,CR,R
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-218

Grade Elevation:	+143.3 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 268+65; 70' LT; "A" Line
Date Drilled:	10/12/11	Drive Wt. (lbs):		
Logged By:	RJ	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			Fat CLAY with SAND (CH): olive-brown, moist, fine SAND, high plasticity, claystone [Bedrock]	-	-	PI,R
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-237

Grade Elevation:	+204.6 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 311+31; 92' RT; "A" Line
Date Drilled:	10/17/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILTY SAND (SM): light yellowish brown, moist, fine SAND, nonplastic	-	-	
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-238

Grade Elevation:	+200.4 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 306+72; 105' LT; "A" Line
Date Drilled:	09/28/11	Drive Wt. (lbs):		
Logged By:	KIAT	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILT (ML): olive-brown, moist, medium to fine SAND, low to medium plasticity	-	-	
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. A-11-239

Grade Elevation:	+209.7 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 311+53; 177' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			Lean CLAY (CL): olive-brown, moist, fine SAND, medium to high plasticity	-	-	CP
	S	1	5		medium stiff, 13% fine SAND, 87% fines	16	-	PA
5	D	2	27		very stiff, PP=3.5 tsf, some veins of caliche	24	121	PI
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-240

Grade Elevation:	+219.5 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 315+88; 232' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY lean CLAY (CL): olive-brown, moist, fine SAND, medium to high plasticity	-	-	PI,R
	D	1	23		Lean CLAY (CL): very stiff, olive-brown, moist, fine SAND, medium to high plasticity, PP=3.25 tsf	20	122	
5	S	2	9		stiff, 14% fine SAND, 86% fines	21	-	PI,PA
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-241

Grade Elevation:	+203.9 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 312+01; 76' LT; "A" Line
Date Drilled:	10/10/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY SILT (ML): light yellowish brown, moist, fine SAND, low plasticity	-	-	CR,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-242

Grade Elevation:	+230.2 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 315+62; 385' RT; "A" Line
Date Drilled:	10/06/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			CLAYEY SAND (SC): dark yellowish brown, moist, medium to fine SAND, nonplastic to low plasticity	-	-	
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-243

Grade Elevation:	+212.4 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 313+60; 212' RT; "A" Line
Date Drilled:	10/10/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			Lean CLAY with SAND (CL): dark yellowish brown, moist, medium to fine SAND, trace fine GRAVEL, low plasticity	-	-	R,PI
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-248

Grade Elevation:	+220.0 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 318+24; 245' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY lean CLAY (CL): olive-brown, moist, fine SAND, low to medium plasticity	-	-	
	D	1	24		Lean CLAY with SAND (CL): stiff, olive-brown, moist, 6% fine GRAVEL, 19% fine SAND, 75% fines, low to medium plasticity, PP=3.25 tsf	13	126	PA
5	S	2	15		very stiff, asphalt concrete encountered at bottom of sample	13	-	PI
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-249

Grade Elevation:	+216.2 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 323+24; 155' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY lean CLAY (CL): olive-brown, moist, fine SAND, medium to high plasticity	-	-	CP,PI,R
	S	1	8		Lean CLAY (CL): stiff, olive-brown, moist, fine SAND, medium plasticity, with 4" SILT layer at top	19	-	PI
5	D	2	61		hard, 7% fine SAND, 93% fines, PP>4.5 tsf	15	132	PA
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-250

Grade Elevation:	+233.2 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 319+07; 221' RT; "A" Line
Date Drilled:	10/07/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILTY SAND with GRAVEL (SM): light yellowish brown, moist, medium to fine SAND, little fine GRAVEL, nonplastic	-	-	CP,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-251

Grade Elevation:	+221.4 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 322+56; 134' RT; "A" Line
Date Drilled:	10/07/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			CLAYEY SAND (SC): light yellowish brown, moist, medium to fine SAND, trace fine GRAVEL, low plasticity	-	-	
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-252

Grade Elevation:	+215.1 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 326+24; 98' RT; "A" Line
Date Drilled:	10/07/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			CLAYEY SAND (SC): light yellowish brown, moist, medium to fine SAND, trace fine GRAVEL, low plasticity	-	-	
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-256

Grade Elevation:	+197.7 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 335+28; 84' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILTY SAND to SILT with SAND (SM to ML): olive-brown, moist, fine SAND, nonplastic to low plasticity	-	-	
	S	1	18		SANDY lean CLAY (CL): very stiff, olive-brown, moist, 5% fine GRAVEL, 31% medium to fine SAND, 64% fines, medium plasticity	10	-	PA
5	D	2	26		Lean CLAY with SAND (CL): hard, olive-brown, moist, 1% fine GRAVEL, 15% medium to fine SAND, 84% fines, medium plasticity, PP>4.5 tsf	14	124	PA,PI
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-257

Grade Elevation:	+193.1 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 337+77; 95' RT; "A" Line
Date Drilled:	10/07/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILTY SAND with GRAVEL (SM): light yellowish brown, moist, medium to fine SAND, trace fine GRAVEL, nonplastic	-	-	CP,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
10								
15								
20								
25								
30								
35								

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

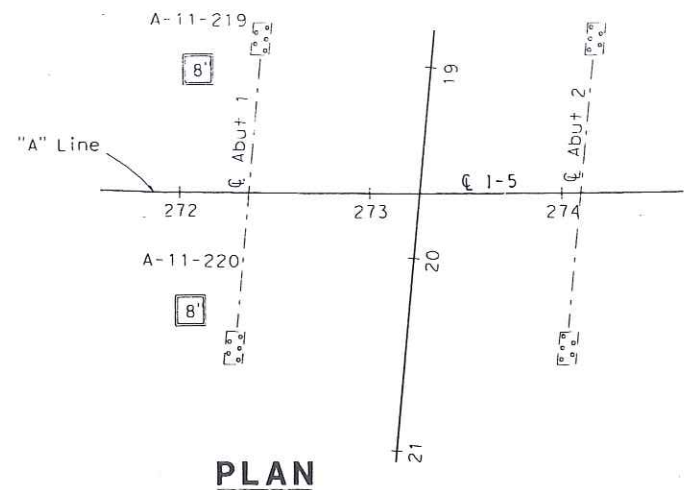
(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.

To San Diego



PLAN

1" = 50'

To Los Angeles

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

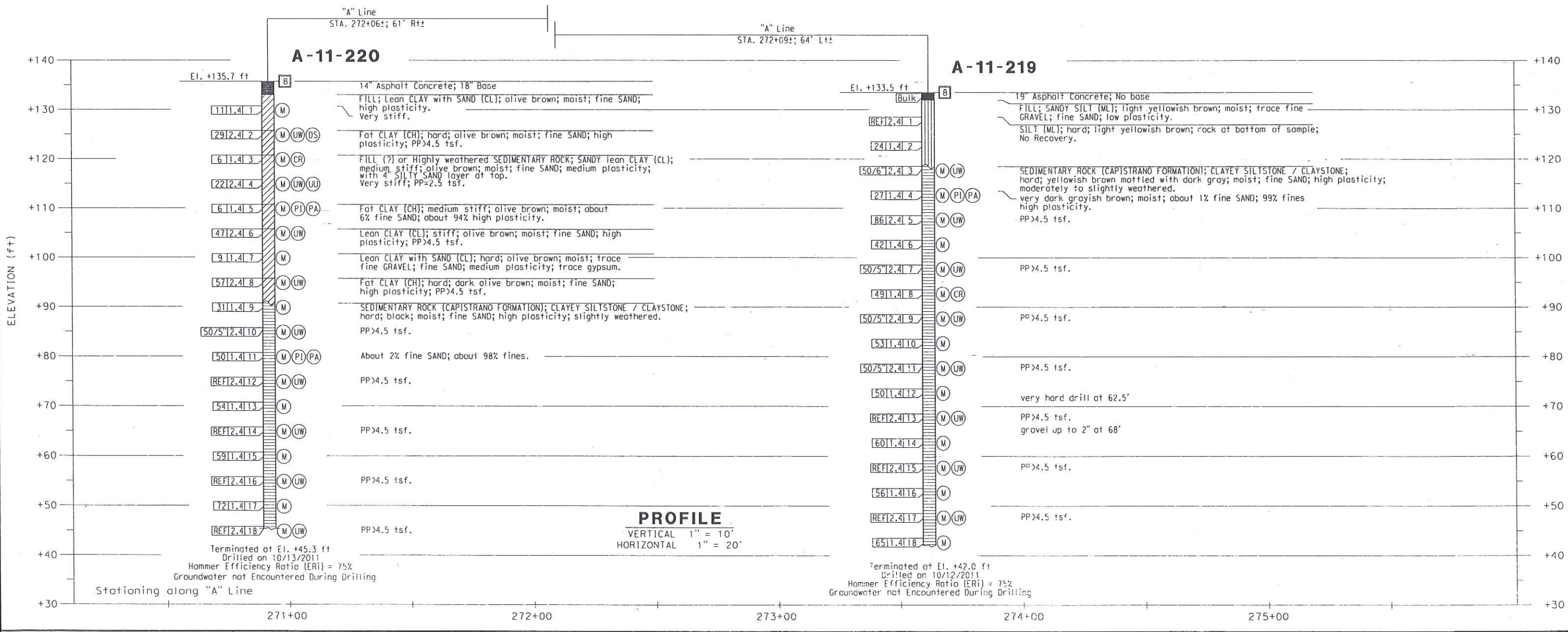
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. 55-0223	AVENIDA VAQUERO UC (WIDEN)
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES 4.97	LOG OF TEST BORINGS 1 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

FILE => $REQUEST

CONTRACT NO.: 12-0F960 PROJECT ID: 1200020276

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER — DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¾" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

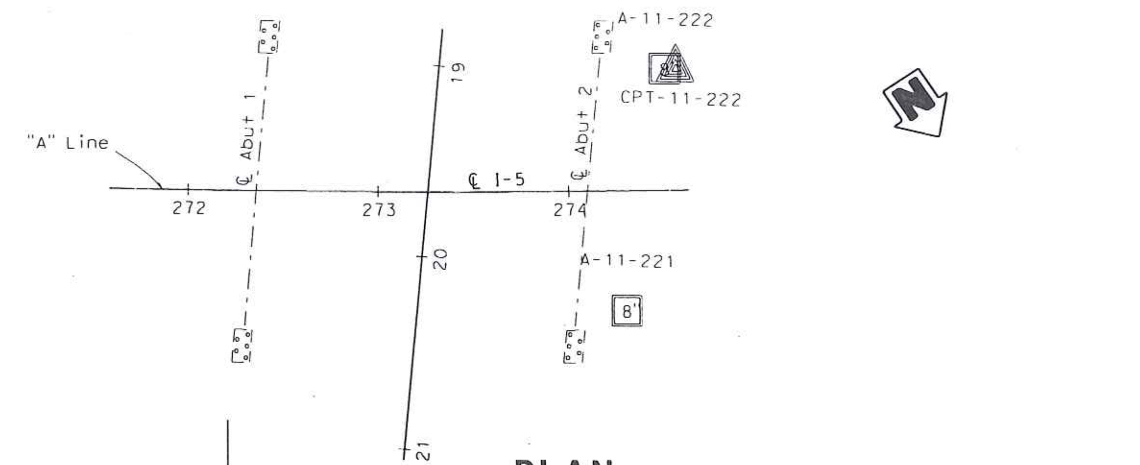
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN
1" = 50'

A-11-221
"A" Line STA. 274+30±; 62' Rt±

El. +130.5 ft

Sample	Tests	Description
Bulk	CP, CR	12" Asphalt Concrete; 6" Base. FILL; SILTY SAND with GRAVEL (SM); yellowish brown; moist; little fine GRAVEL; medium to fine SAND; nonplastic.
51 2.4 1		SILT with SAND (ML); hard; olive brown; moist; fine SAND; low plasticity; No Recovery.
33 1.4 2	M	
68 2.4 3	M, UW, DS	Lean CLAY with SAND (CL); hard; dark brown mottled with olive brown; moist; fine SAND; medium to high plasticity; PP>4.5 tsf.
22 1.4 4	M, CR, PI	SANDY lean CLAY (CL); very stiff; dark olive brown; moist; trace fine GRAVEL; fine SAND; medium plasticity.
31 2.4 5	M, UW	Fat CLAY (CH); very stiff; olive brown; moist; trace fine GRAVEL; few fine SAND; high plasticity; PP=3.75 tsf.
17 1.4 6	M	SANDY lean CLAY (CL); very stiff; dark olive brown and pale brown; moist; trace fine GRAVEL; some fine SAND.
35 2.4 7	M, UW, C	Fat CLAY with SAND (CH); hard; dark brown grades to olive brown; moist; few fine GRAVEL; medium to fine SAND; high plasticity, PP>4.5 tsf, with lens of CLAYEY SAND.
17 1.4 8	M, PI	ALLUVIUM; SANDY lean CLAY (CL); very stiff; very dark grayish brown; moist; trace fine GRAVEL; some medium to fine SAND, medium plasticity.
62 2.4 9	M, UW, PA	SILTY SAND (SM); dense; olive brown; moist; about 6% fine GRAVEL; about 74% medium to fine SAND; about 20% nonplastic to low plasticity fines; with clay chunk.
14 1.4 10	M	Fat CLAY with SAND (CH); very stiff; black; moist; trace fine GRAVEL; medium to fine SAND, High plasticity.
30 2.4 11	M, UW, UU	Lean CLAY with SAND (CL); very stiff; dark brown; moist; trace fine GRAVEL; medium to fine SAND; medium plasticity.
12 1.4 12	M	Fat CLAY (CH); very stiff; olive brown; moist; fine SAND; high plasticity.
20 2.4 13	M, UW	SILTY SAND (SM); medium dense; olive brown; moist; fine SAND; low plasticity; with CLAYEY SAND layer.
8 1.4 14	M	Lean CLAY (CL); stiff; olive brown mottled with white; moist; fine SAND; medium plasticity; with gypsum.
25 2.4 15	M, UW	Fat CLAY (CH); very stiff; olive brown mottled with white; moist; fine SAND; high plasticity; with gypsum.
23 1.4 16	M	Fat CLAY with SAND (CH); olive brown mottled with gray; moist; fine SAND; high plasticity.
42 2.4 17	M, UW	SEDIMENTARY ROCK (CAPISTRANO FORMATION); CLAYEY SILTSTONE / CLAYSTONE; hard; very dark grayish brown; moist; fine SAND; high plasticity.
48 1.4 18	M, PI, PA	about 5% fine SAND; about 95% high plasticity fines; moderately to slightly weathered.

Terminated at El. +39.0 ft
Drilled on 10/13/2011
Hammer Efficiency Ratio (ERi) = 75%
Groundwater not Encountered During Drilling

A-11-222
"A" Line STA. 274+57±; 63' Lt±

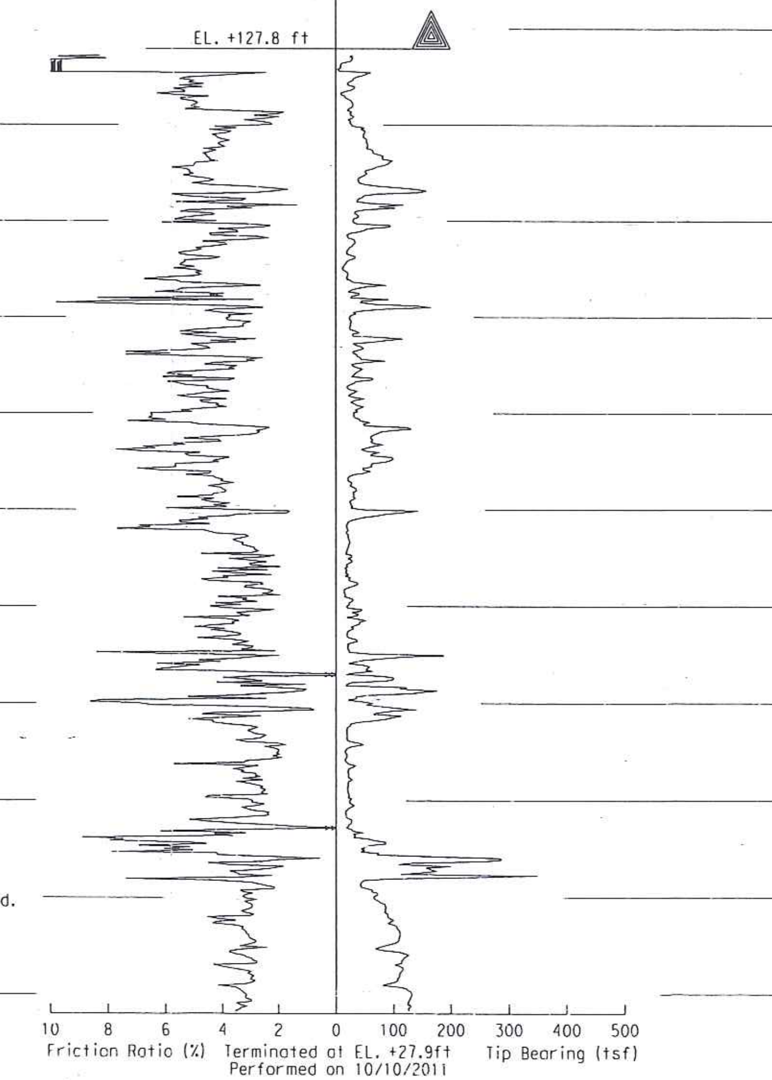
El. +127.9 ft

Sample	Tests	Description
Bulk		21" Asphalt Concrete. FILL; Lean CLAY with SAND (CL); olive brown; moist; fine SAND; medium plasticity. Stiff.
11 1.4 1	M, CR	
28 2.4 2	M, UW, C	Lean CLAY (CL); hard; olive brown; moist; fine SAND; medium plasticity; PP>4.5 tsf.
20 1.4 3		No Recovery.
27 2.4 4	M, UW, UU	Fat CLAY (CH); hard; olive brown mottled with olive gray; moist; fine SAND; high plasticity; PP>4.5 tsf.
12 1.4 5	M, PI	Fat CLAY with SAND (CH); very stiff; dark olive brown; moist; trace fine GRAVEL; some fine SAND; high plasticity; with lens of SILTY SAND.
25 2.4 6	M, UW	SANDY lean CLAY (CL); hard; dark olive brown; moist; trace fine GRAVEL; some fine SAND; medium plasticity, gravelly at 33-35'.
17 1.4 7	M	ALLUVIUM; very stiff; medium to fine SAND.
29 2.4 8	M, UW	Olive brown mottled with olive gray; with CLAYEY SAND layer, PP=3.5 tsf.
19 1.4 9	M	
30 2.4 10	M, UW	Stiff; PP=1.5 tsf.
11 1.4 11	M	
22 2.4 12	M, UW, C	PP=1.75 tsf.
7 1.4 13	M, PA	Lean CLAY with SAND (CL); stiff; olive brown mottled with white; moist; about 18% fine SAND; about 92% medium plasticity fines; with gypsum. Very stiff; PP=2.25 tsf.
22 2.4 14	M, UW, UU	
8 1.4 15	M	Stiff.
38 2.4 16	M, UW	SANDY lean CLAY (CL); medium stiff; olive brown mottled with yellowish brown; moist; trace fine GRAVEL; some medium to fine SAND; medium plasticity; PP=0.75 tsf.
29 1.4 17	M	SEDIMENTARY ROCK (CAPISTRANO FORMATION); CLAYEY SILTSTONE / CLAYSTONE; hard; very dark grayish brown; moist; fine SAND; high plasticity; intensely weathered.
REF 2.4 18	M, UW	PP=3.5 tsf to PP>4.5 tsf, moderately to slightly weathered.

GWS +73.9 ft 10/12/2011

Terminated at El. +37.6 ft
Drilled on 10/12/2011
Hammer Efficiency Ratio (ERi) = 75%

CPT-11-222



ELEVATION (ft): +130, +120, +110, +100, +90, +80, +70, +60, +50, +40, +30, +20

Stationing along "A" Line: 273+00, 274+00, 275+00, 276+00, 277+00

PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY: J. FANG	R. JIE — FIELD INVESTIGATION BY:
SIGN OFF DATE	CHECKED BY: G. J. GUNARANJAN	DATE: 9/2011, 10/2011

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

A. KORKOS — PROJECT ENGINEER

BRIDGE NO. 55-0223 — POST MILES 4.97

AVENIDA VAQUERO UC (WIDEN)
LOG OF TEST BORINGS 2 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES — SHEET OF

FILE => $REQUEST — CONTRACT NO.: 12-0F96C1 — PROJECT ID: 1200020278

FED. ROAD DIST. No.	STATE	F. A. PROJECT No.	SHEET No.	TOTAL SHEETS
7	CALIF.			

DIST.	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
07	Ora	5	60/6.1	526	538
	30	5	PR1/R72.4		

Robert W. Reynolds #165
March 12, 1972

BENCH MARK

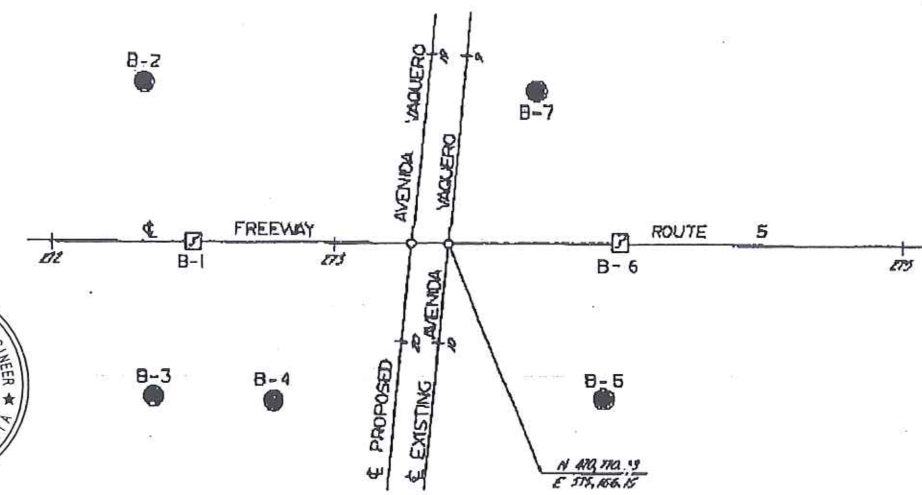
#271-26-50 Elev. 131.79
3/4" std. brass cap monument 4' Rt. ℄ Fwy.
Sta. 271+04.30 M.P.C.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.					
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
12	ORA	5	3.8/6.2		
GEOTECHNICAL PROFESSIONAL				DATE	
AVENIDA VAQUERO UC (WIDEN)					
LOG OF TEST BORINGS 3 OF 3					
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA			UNIT: PROJECT NUMBER & PHASE: 12000202781		
			BRIDGE No. 55-0223	Sheet 1	of 1

REGISTERED PROFESSIONAL ENGINEER
A. KORKOS
NO. GE 2357
EXP. 3-31-14
GEOTECHNICAL
STATE OF CALIFORNIA

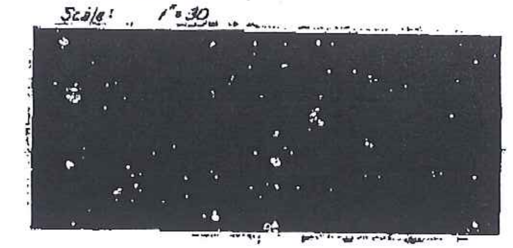
Revisions made to this Log of Test Borings from the original ___ Log of Test Borings are the addition of the following table and notes:

Boring	Station	Offset from C/L Rte. 101



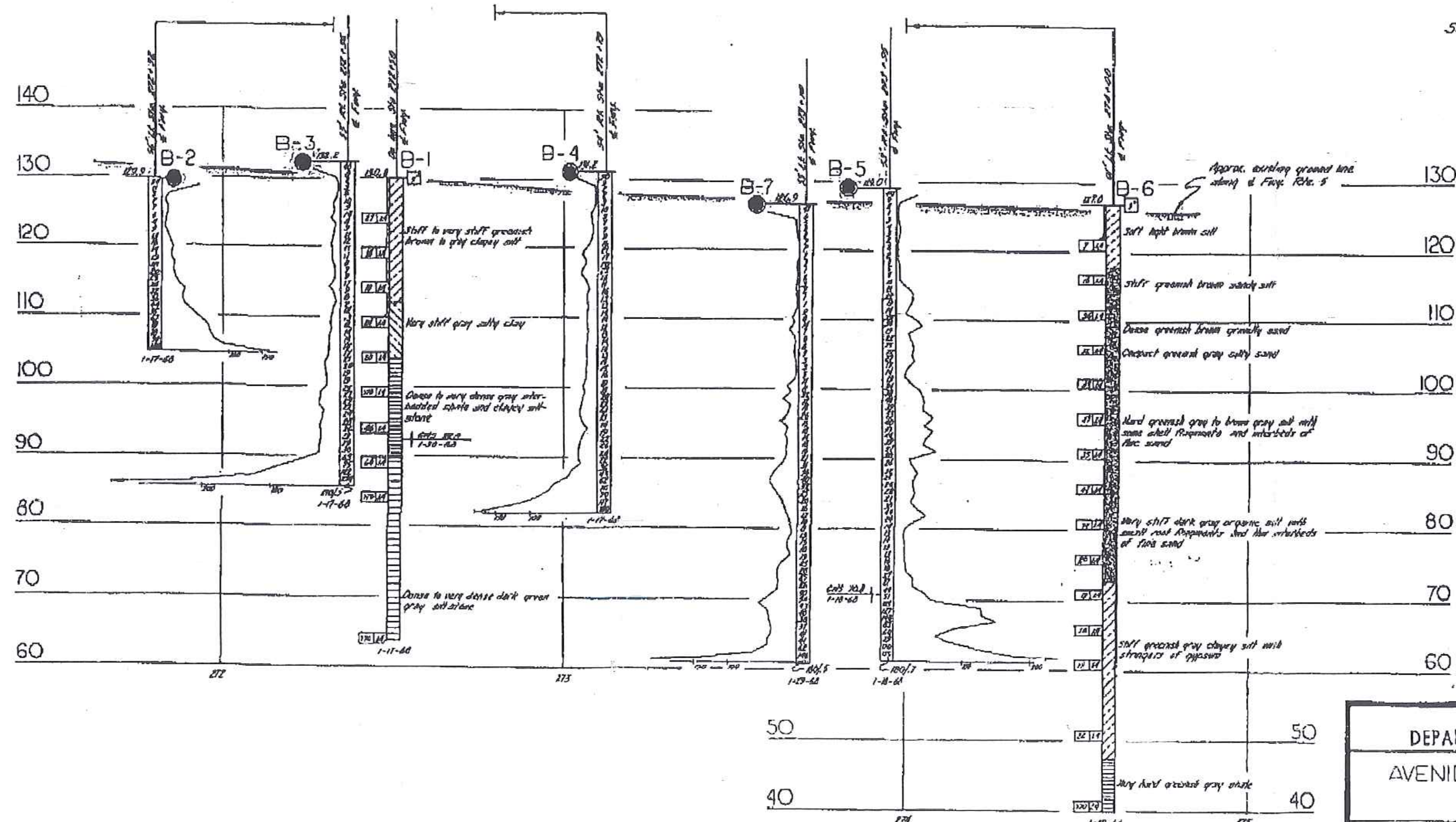
PLAN

Scale: 1"=30

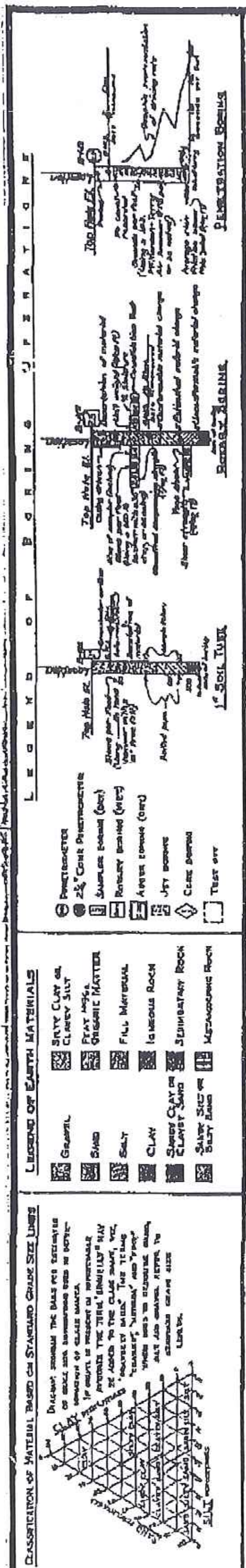


PROFILE

Scale: Vert. 1"=10' Horiz. 1"=20'



NO AS BUILT CORRECTION
AS BUILT
CORRECTIONS BY W. Lohse
CONTRACT NO. 07-105274
DATE 4-1-85 and 10-18-85



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.

FIELD STUDY	R. Cowley 1-13-68
DRAWN	R. Allen 2-9-68
CHECKED	R. Cowley 3-11-68

Charles C. Black
Engineering Geologist

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

526

Sheet	of
11	11

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
AVENIDA VAQUERO UNDERCROSSING

LOG OF TEST BORINGS

SCALE As Noted	BRIDGE 55-223	FILE	DRAWING 55223-7

Charge 01X09 / 10.A A05XN

Disregard prints bearing earlier revisions → PREL. DRAWING No. PR-

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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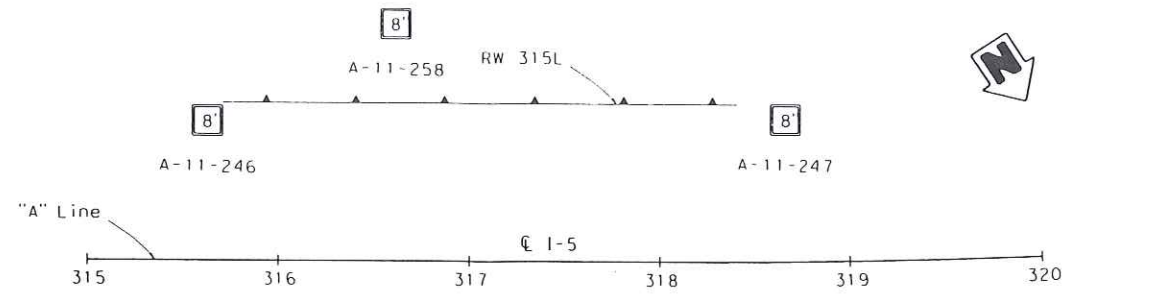
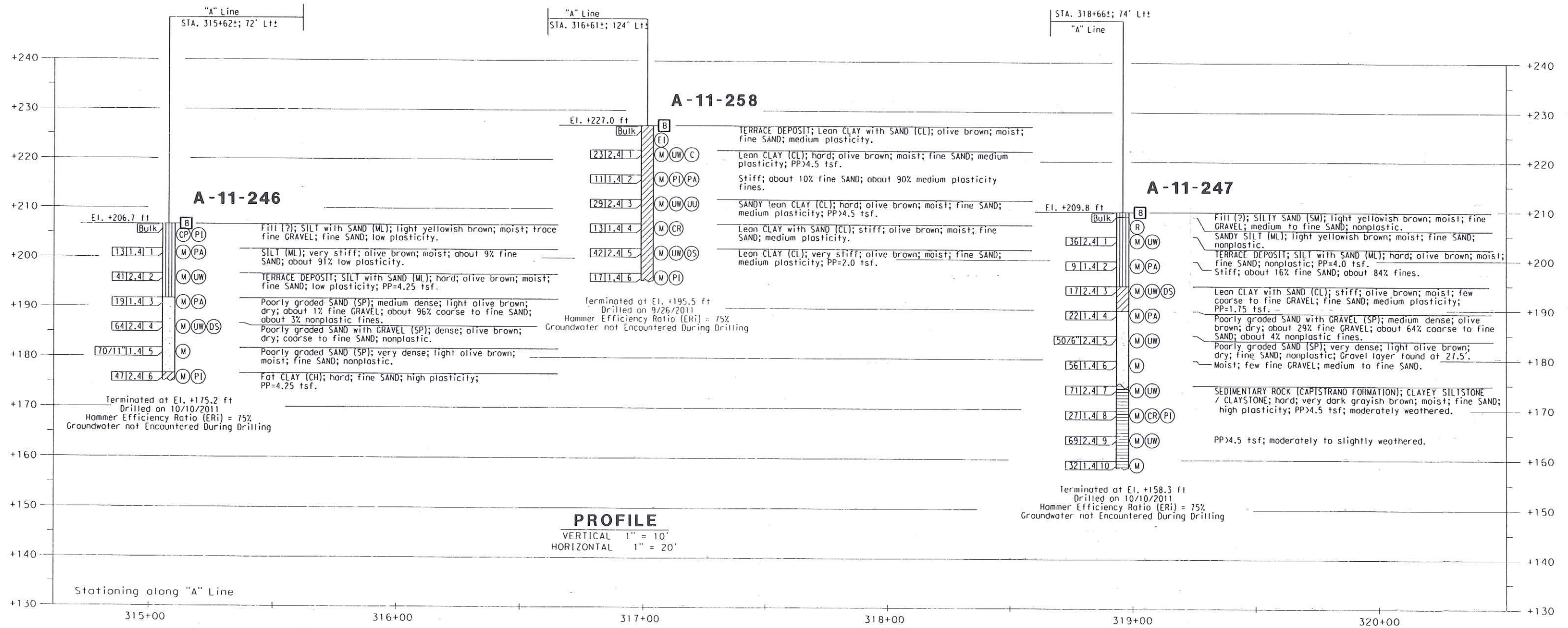


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

DESIGN OVERSIGHT / SIGN OFF DATE	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. 55-0224
	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES 5.8

TIEBACK WALLS 315L & 316R

LOG OF TEST BORINGS 1 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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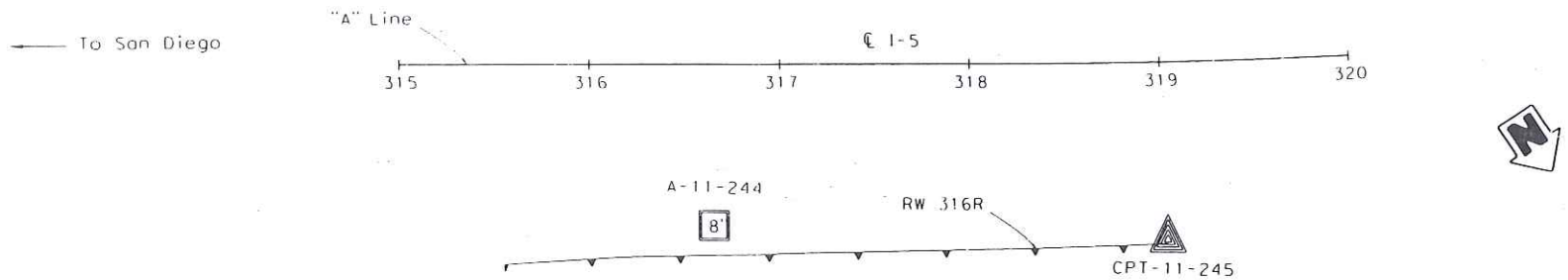
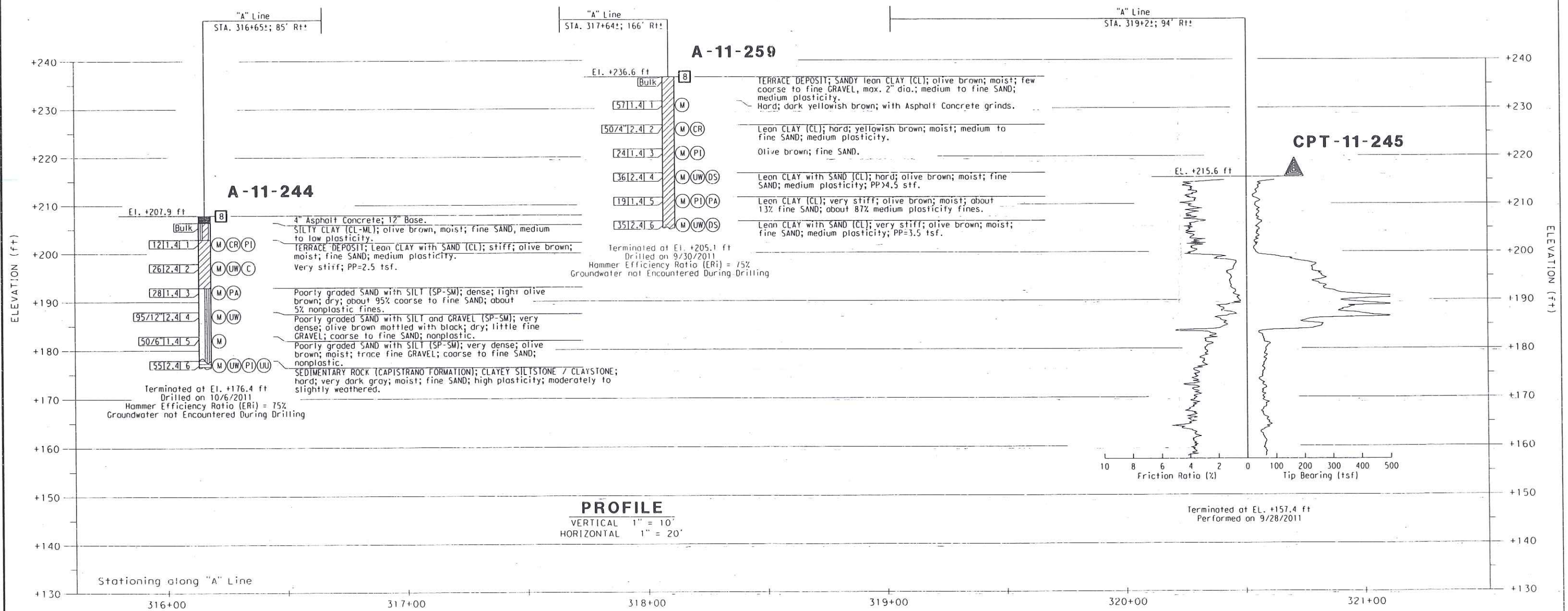


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 5-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. 55-0224
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011				POST MILES 5.8

TIEBACK WALLS 315L & 316R

LOG OF TEST BORINGS 2 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES

SHEET OF

DIST.	COUNTY	ROUTE	POST MILES	SHEET NO.	TOTAL SHEETS
07	ORA	5	24.6/24.8	538	
		32	E. Katella		

Robert W. Campbell #1465
REGISTERED ENGINEER — PROFESSIONAL ENGINEER
DATE APPROVED March 12, 1979

BENCH MARK

BM # 318-2A-60 Elev. 206.92

Std. Brass Cap Monument 4' Rt ℄ Fwy Sta. 318+10.92 BC

10+00.00 POT ℄ Estrella

317+11.94 POT ℄ Fwy

N 473,033.24
E 571,433.87

B-2

ROUTE 5

℄ CAMINO DE LA ESTRELLA

℄ FWY

B-1

AS BUILT PLANS
Contract No. 07-105274
Date Completed
Document No.

PLAN
Scale 1" = 25'

NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION DATE OCTOBER, 1986

REGISTERED PROFESSIONAL ENGINEER
A. KORKOS
NO. GE 2357
EXP. 3-31-12
GEOTECHNICAL
STATE OF CALIFORNIA

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

GEOTECHNICAL PROFESSIONAL — DATE

TIEBACK WALLS 315L & 316R

LOG OF TEST BORINGS 3 OF 3

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT:
PROJECT NUMBER & PHASE: 12000202781

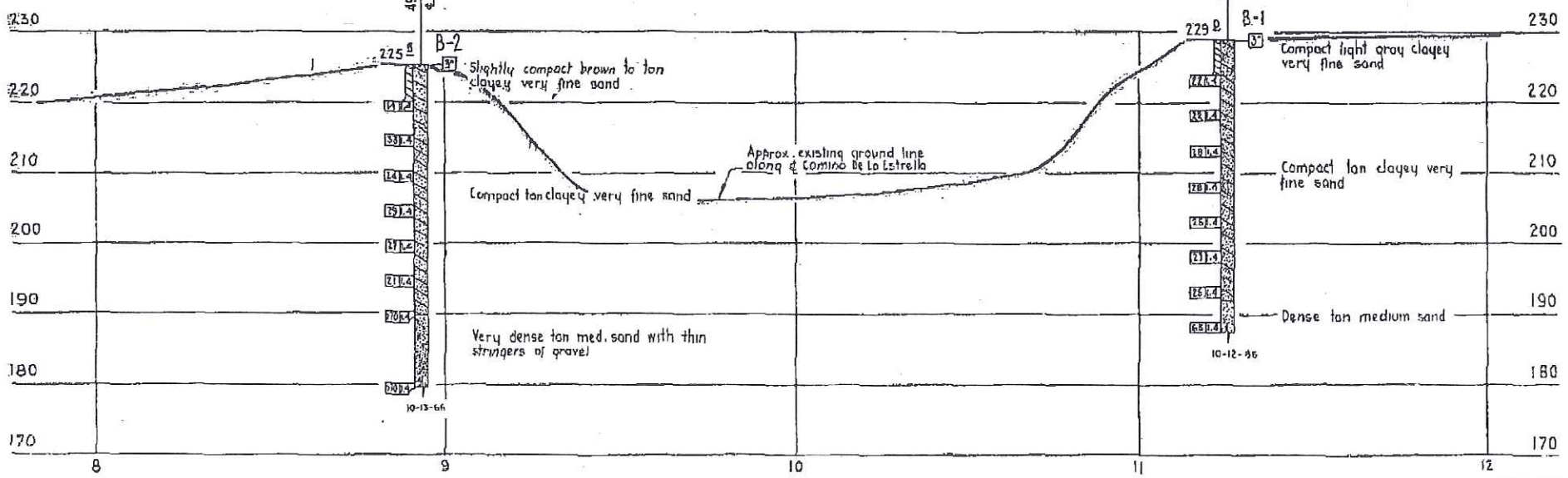
BRIDGE No.	Sheet	of
55-0224	x	x

Revisions made to this Log of Test Borings from the original ____ Log of Test Borings are the addition of the following table and notes:

Boring	Station	Offset from C/L Rte. 101

45' Lt. Sta. 8+55 ℄ Camino De La Estrella

46' Rt. Sta. 11+25 ℄ Camino De La Estrella



NO AS BUILT CORRECTION

AS BUILT
CORRECTIONS BY W. Lohse
CONTRACT NO. 07-105274
DATE 4-1-83 and 10-18-83

PROFILE
Scale: Vert. 1" = 10
Horiz. 1" = 20

LEGEND OF EXPLORATIONS

Piezometer
24" Cored Borehole
Sampling Borings (SPT)
Rotary Borings (SPT)
Auger Borings (SPT)
Jet Borings
Core Borings
Test Pit

LEGEND OF EARTH MATERIALS

Silty Clay or Clayey Silt
Peat with Organic Matter
Fill Material
Igneous Rock
Sedimentary Rock
Metamorphic Rock
Gravel
Sand
Silt
Clay
Sandy Clay or Clayey Sand
Sandy Silt or Silty Sand

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

Materials passing the No. 200 (0.074mm) sieve are classified as silts or clays when the plasticity index and liquid limit are determined in accordance with AASHTO Designation T 90. The material is classified as silt or clay according to the location of the plasticity index and liquid limit with respect to the "A" line in the plasticity chart. Materials passing the No. 200 (0.074mm) sieve are classified as sand when 15 percent or more of the material passes the No. 200 (0.074mm) sieve and the plasticity index is not more than 6 more than the number of percent passing the No. 200 (0.074mm) sieve. Materials passing the No. 200 (0.074mm) sieve are classified as gravel when 15 percent or more of the material passes the No. 200 (0.074mm) sieve and the plasticity index is more than 6 more than the number of percent passing the No. 200 (0.074mm) sieve.

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.

FIELD STUDY	N. GILMORE 10-17-86
DRAWN	R.N.V. SESTOPAL 11-18-86
CHECKED	R.D. MINER 12-22-86

Approved for Publication: Charles S. Mack, Engineering Geologist

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

538

Charge 07209
W.A. 105211

Bar equal to one inch on original drawing. If not one inch, scale accordingly.

SHEET, DRAWING No. PR-

Sht 12 of 12

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CAMINO DE ESTRELLA OVERCROSSING REPLACE

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 55-224 | FILE | DRAWING 5-5-22 4-11

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

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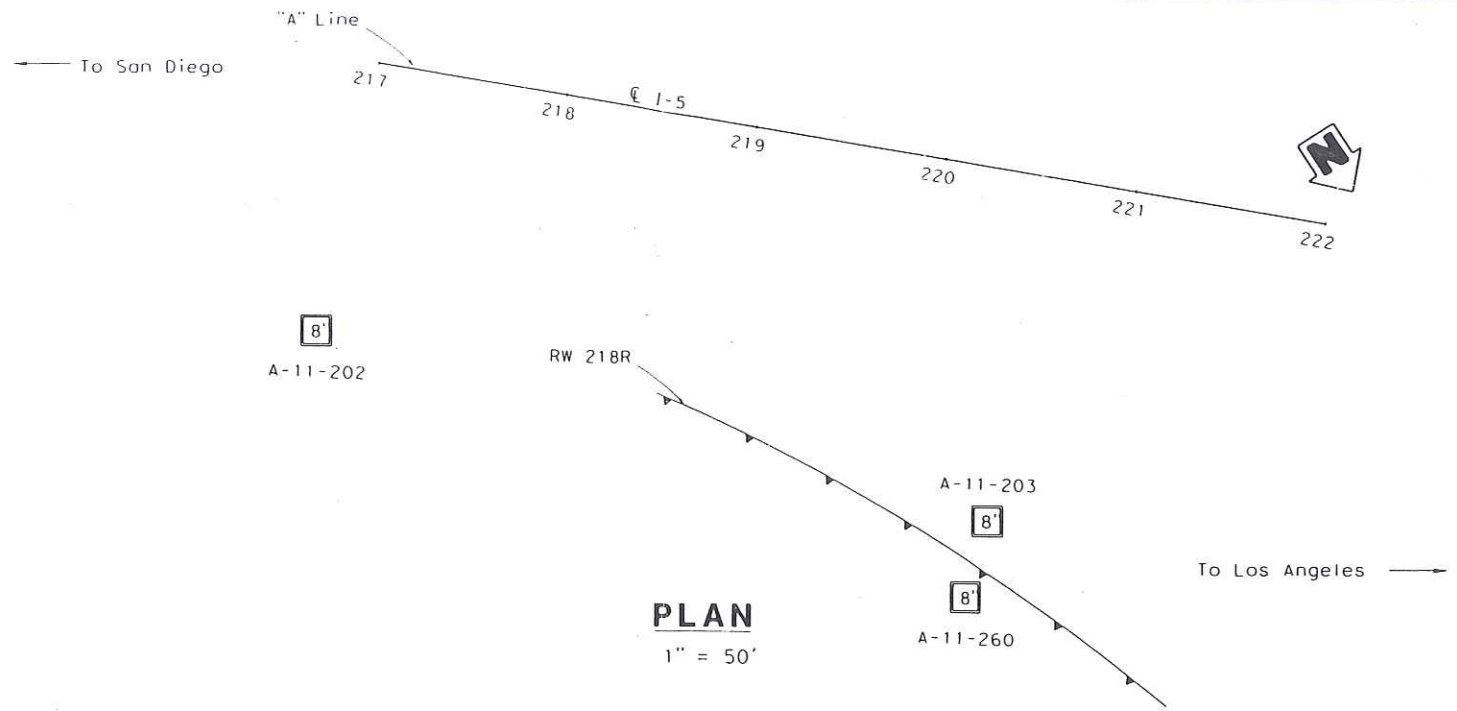
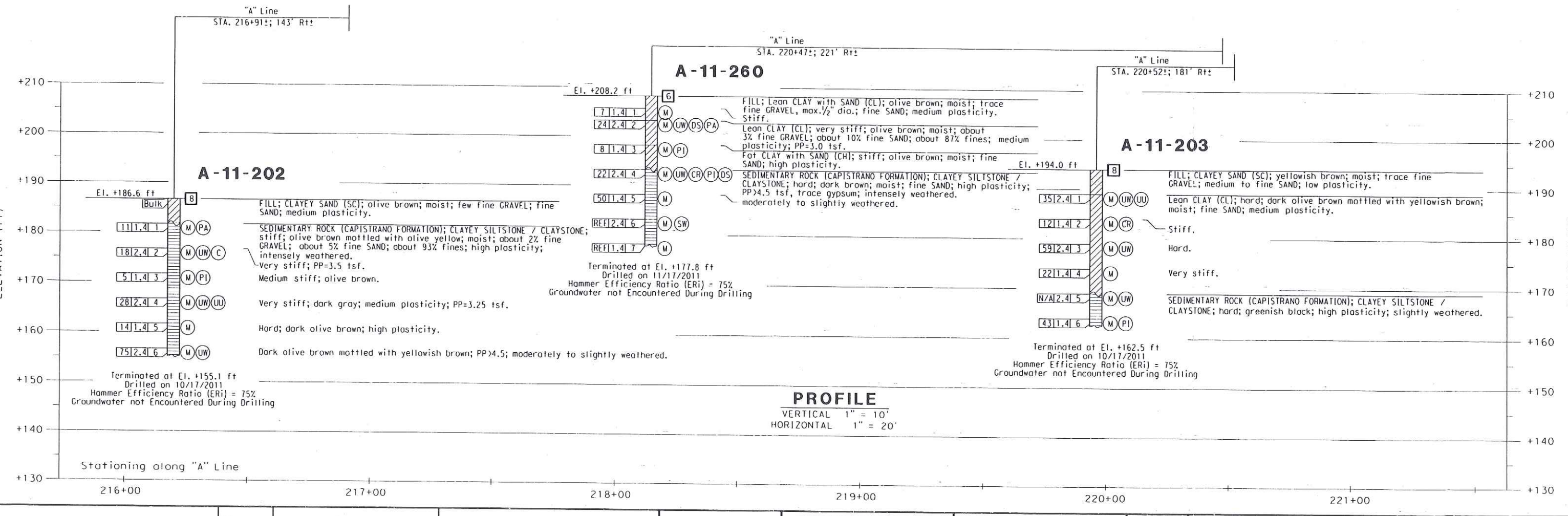


PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS, PROJECT ENGINEER
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		

BRIDGE NO. -
POST MILES 3.94

RETAINING WALL NO. 218R

LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: -
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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(2) 2.4" samples were taken using a California Modified Sampler.
(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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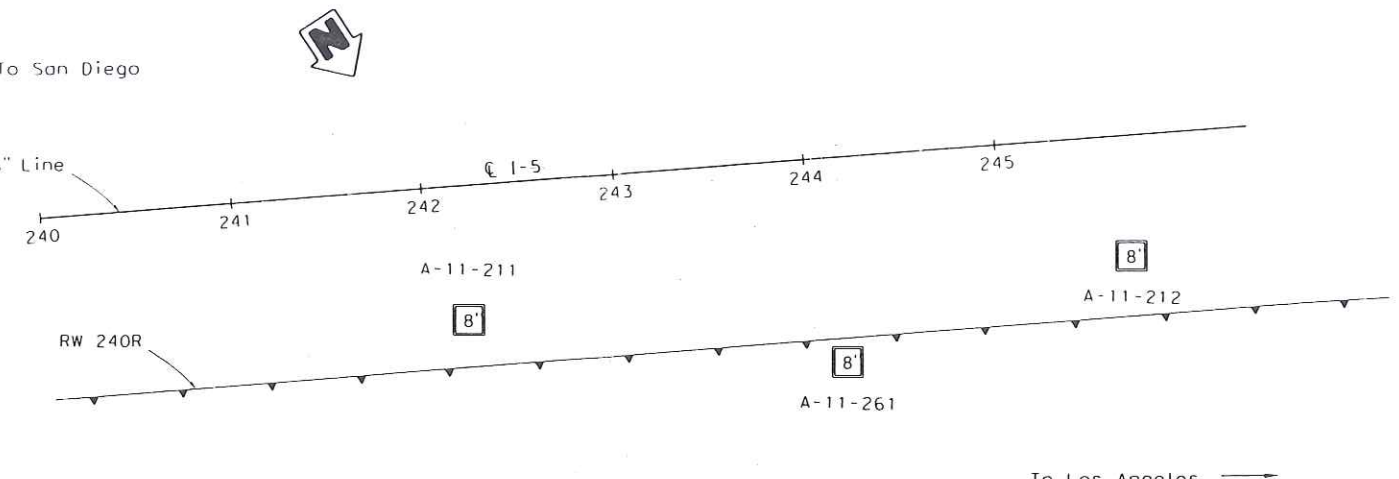
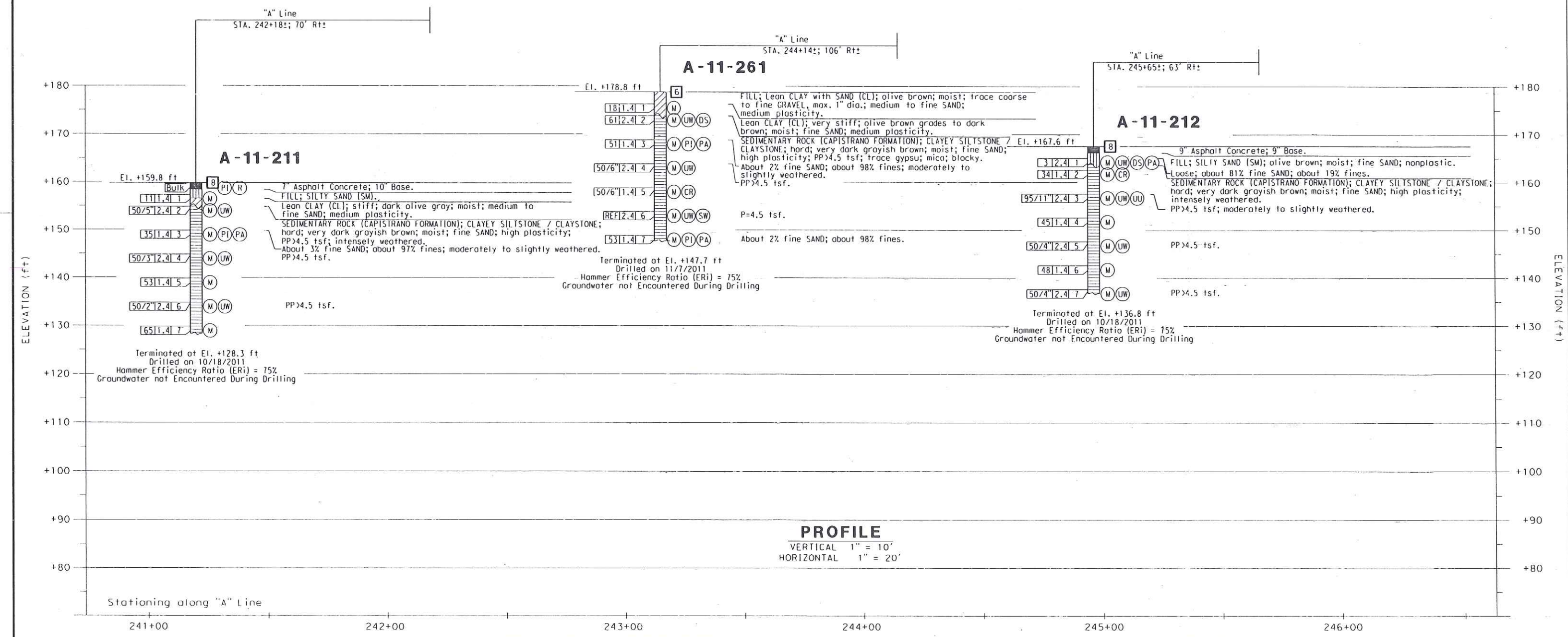
EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES 4.38

RETAINING WALL NO. 240R

LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES

SHEET OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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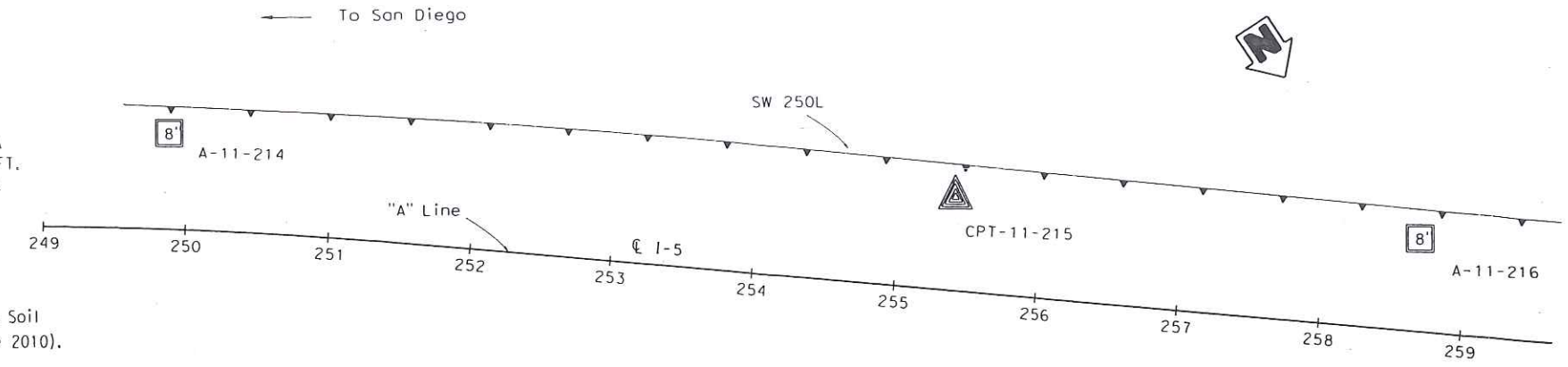

PLAN

1" = 60'

To Los Angeles

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS NO. GE 2357 EXP. 3-31-14 — GLOTECHNICAL — STATE OF CALIFORNIA

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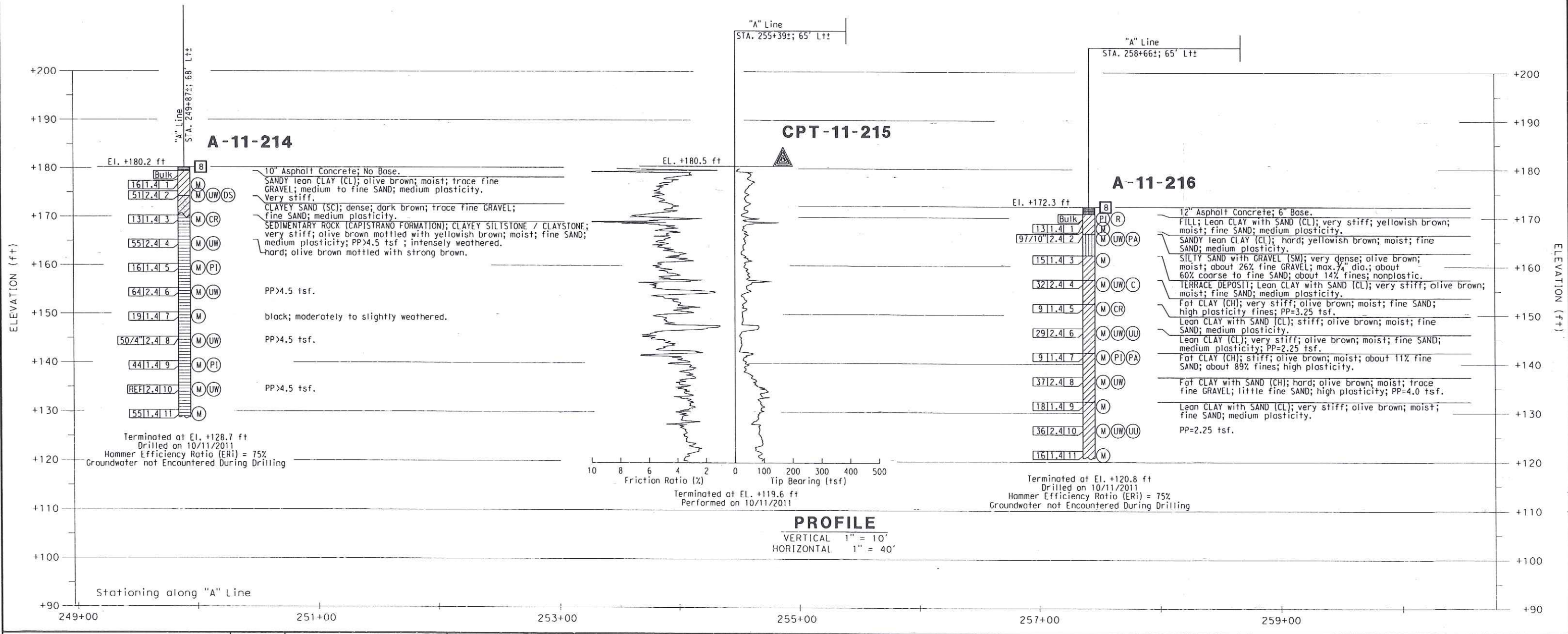
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011				POST MILES 4.53

SOUND WALL NO. 250L

LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: -
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

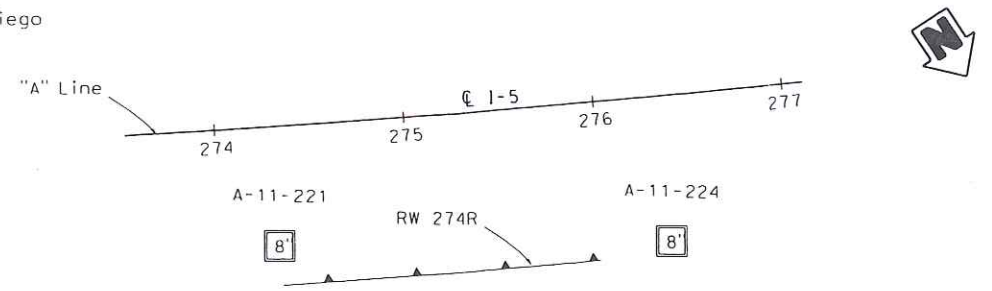
REVISION DATES | SHEET | OF

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

NOTES:

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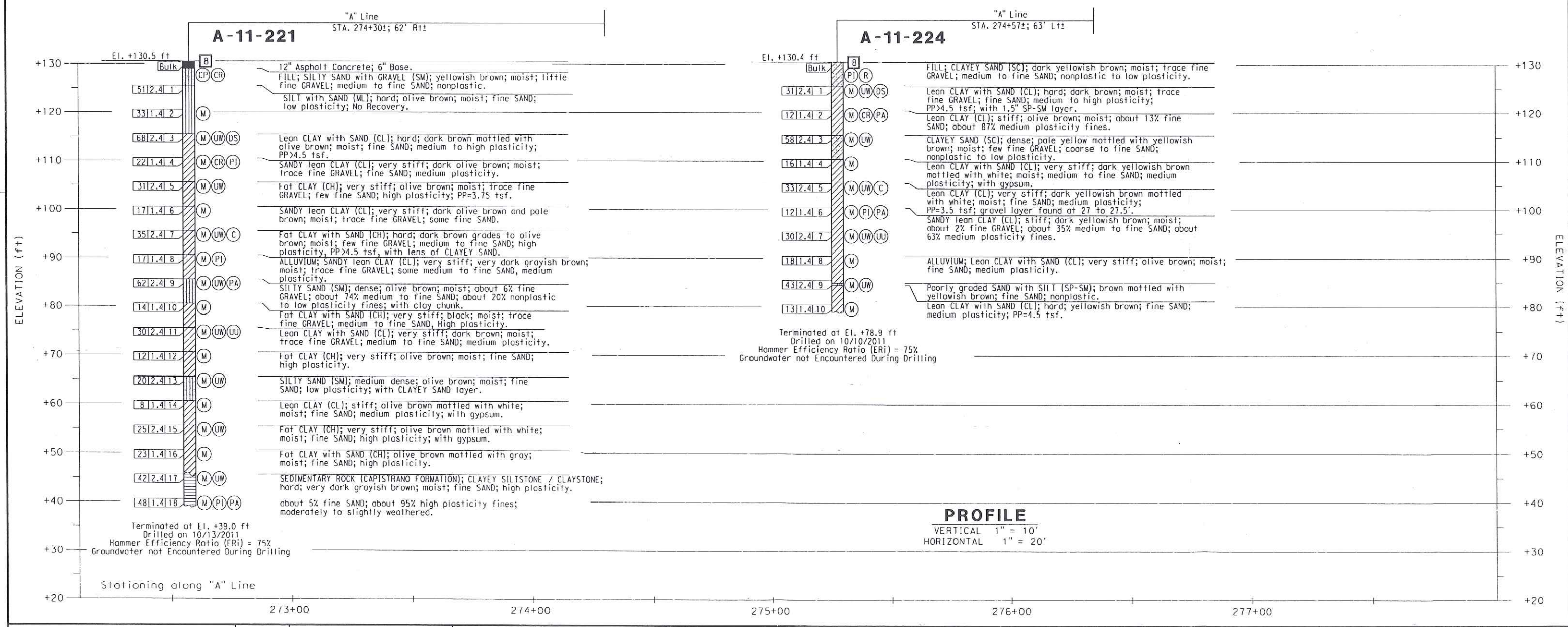
PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -

RETAINING WALL 274R

LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER — DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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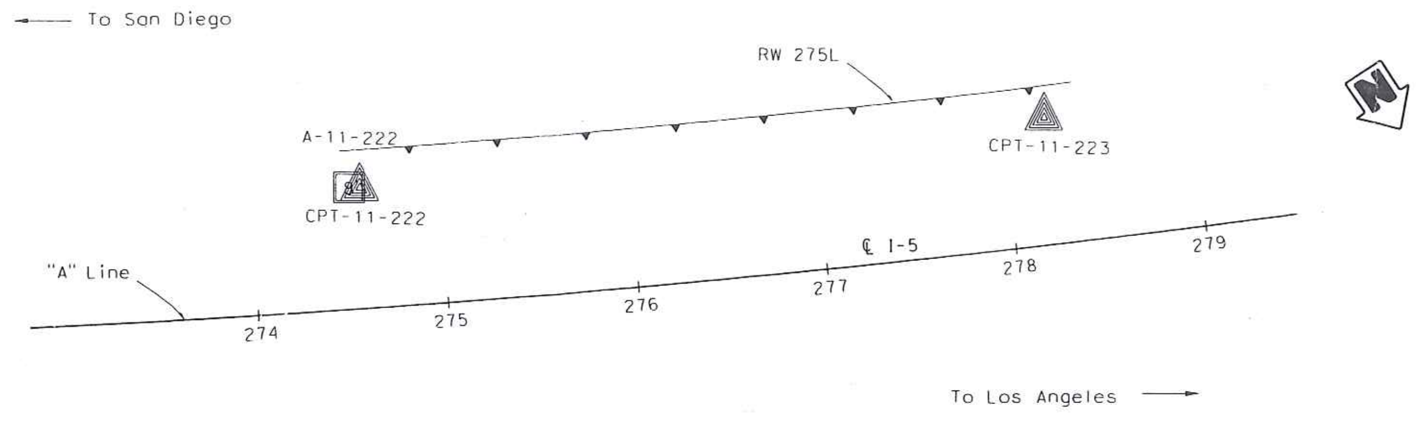
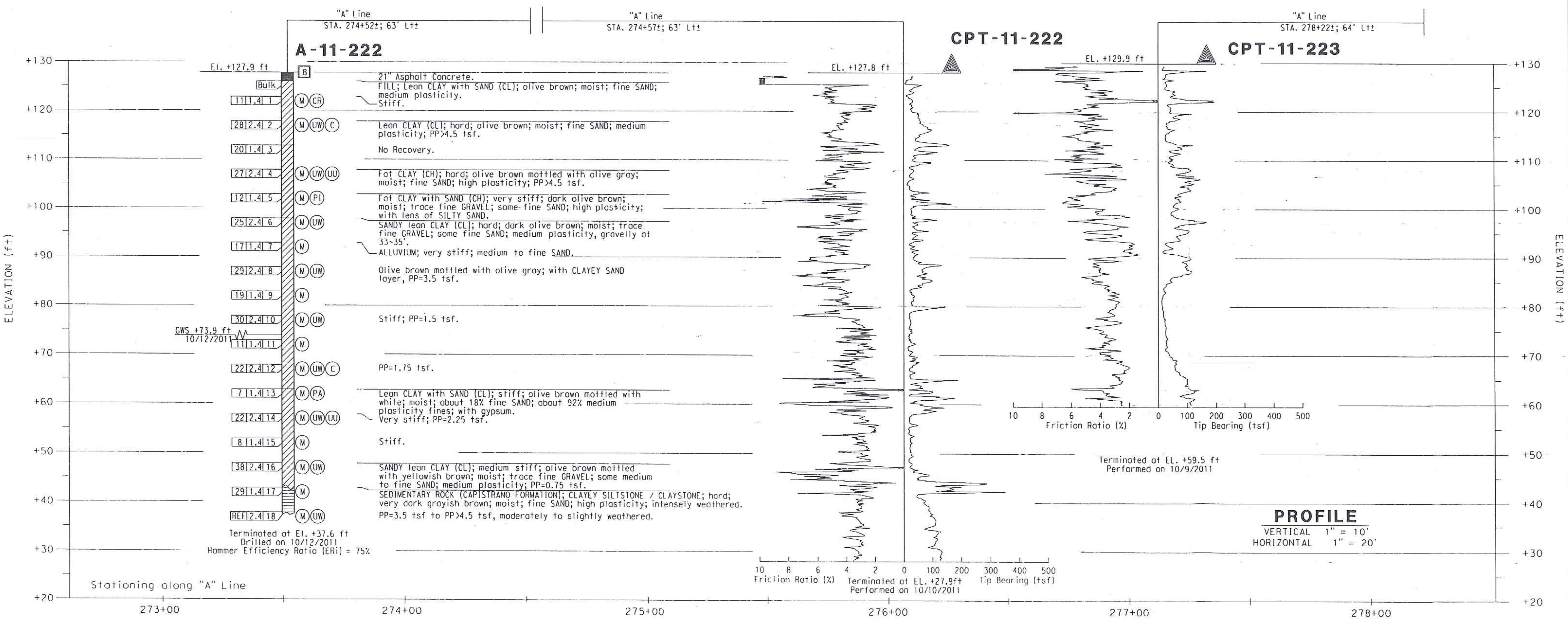


PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY: J. FANG	R. JIE — FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
SIGN OFF DATE	CHECKED BY: G. J. GUNARANJAN	DATE: 9/2011, 10/2011	A. KORKOS — PROJECT ENGINEER

BRIDGE NO. -
POST MILES -

RETAINING WALL 275L

LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES — SHEET — OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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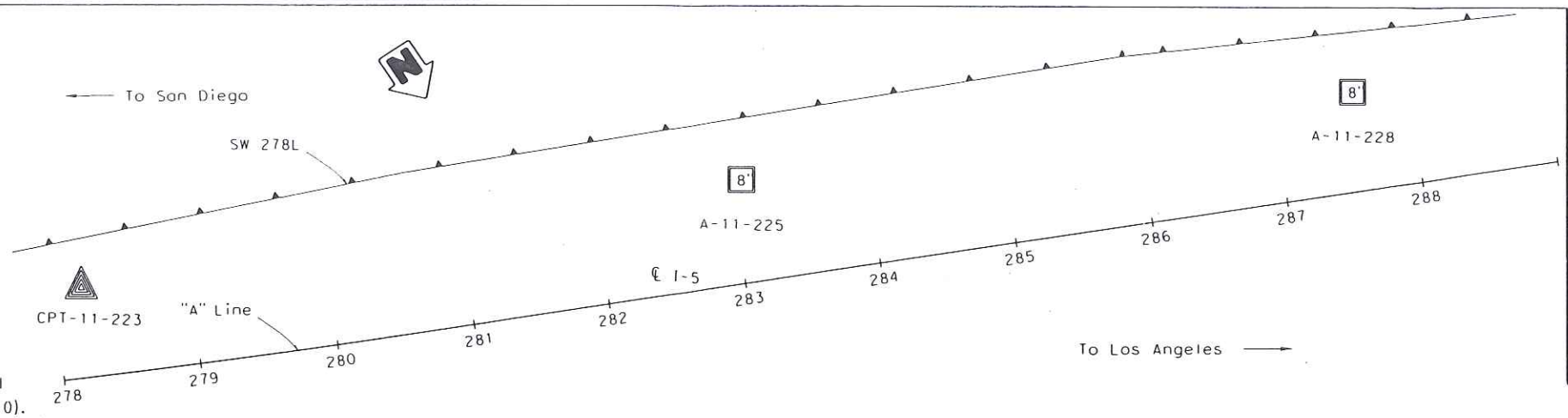

PLAN

1" = 60'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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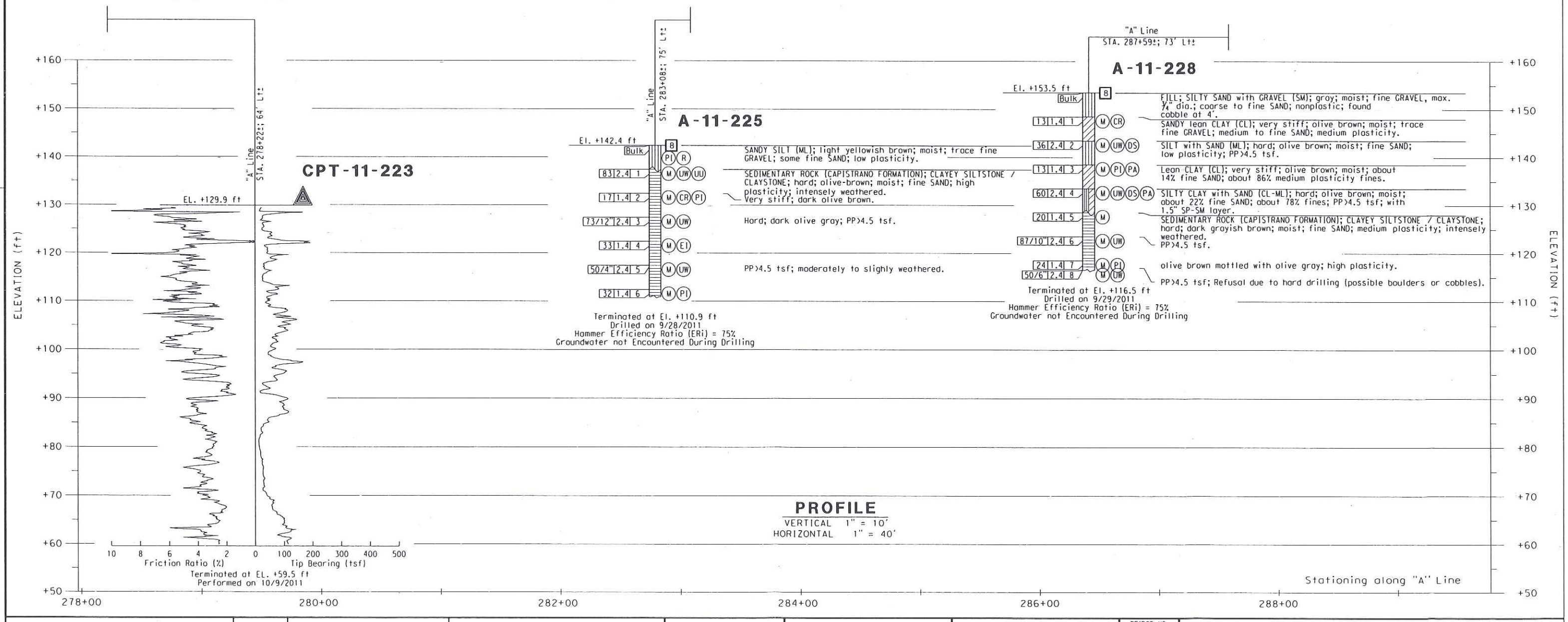
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	SOUND WALL NO. 278L
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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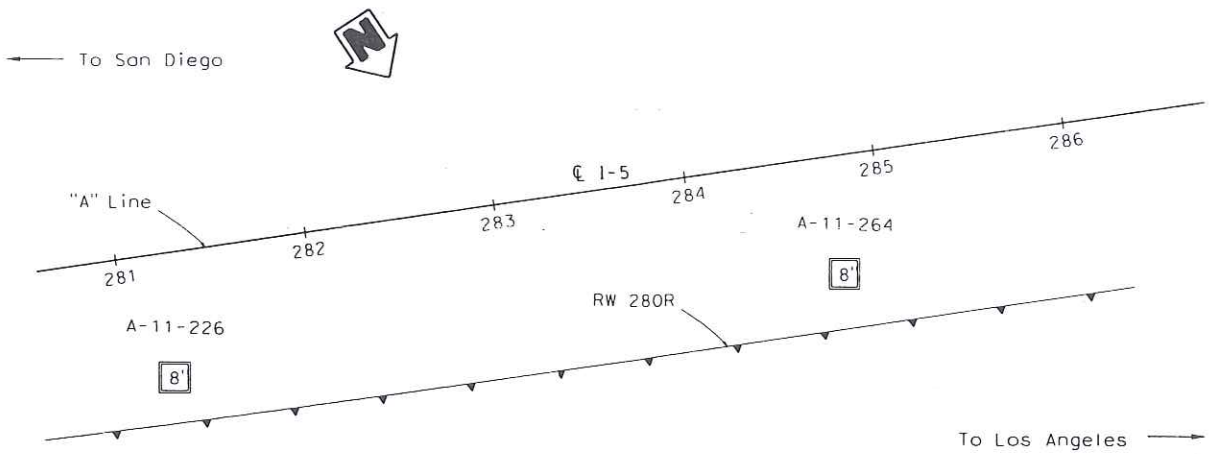

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE, CA 92863-1584

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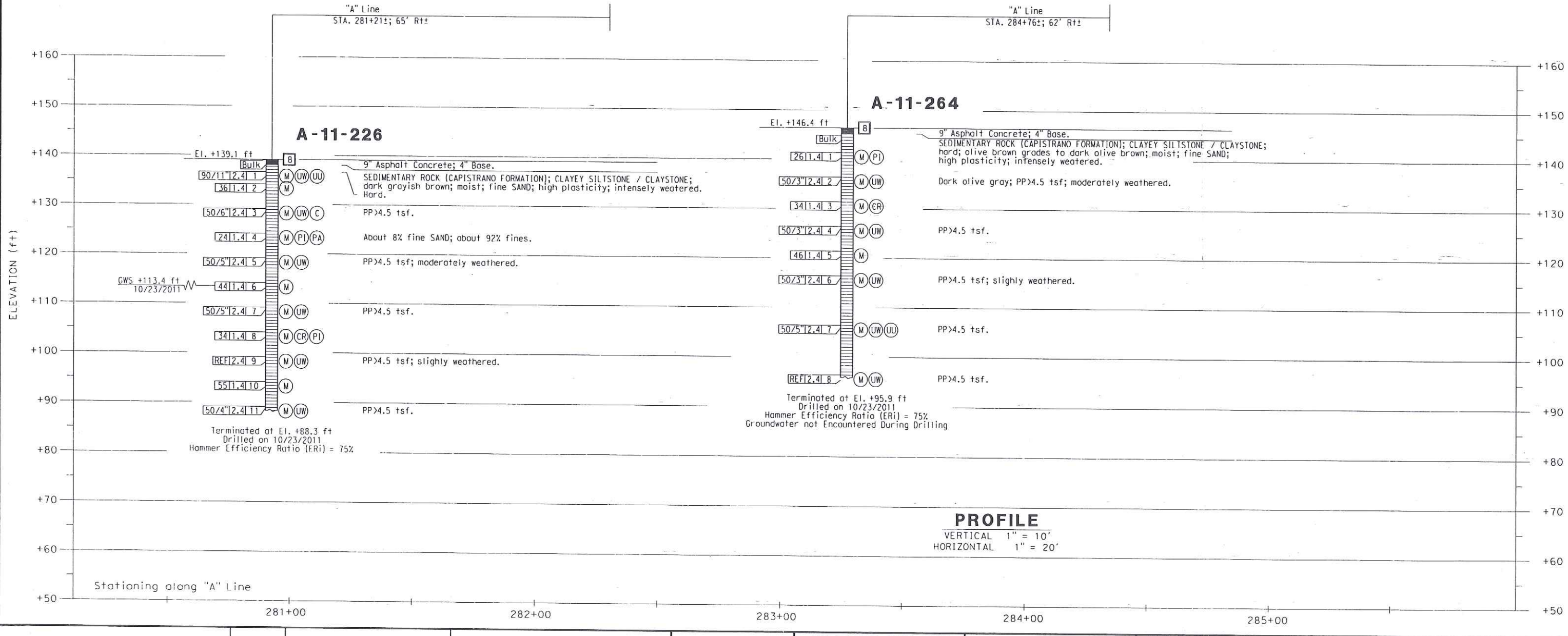
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL 280R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

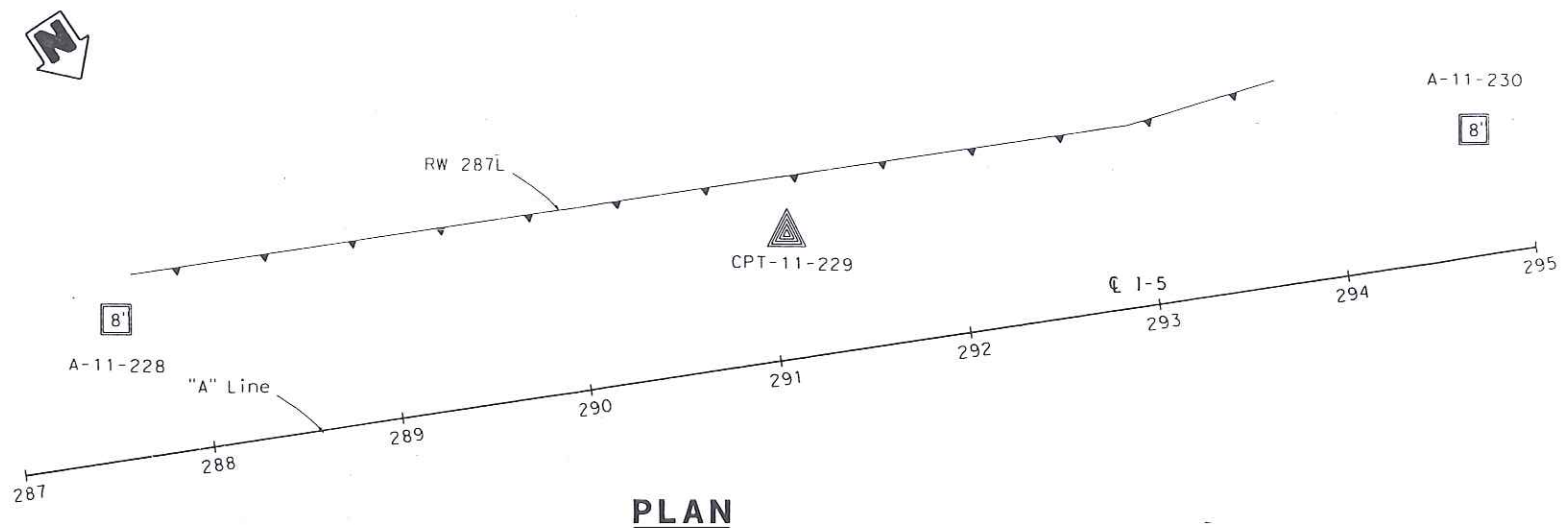
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

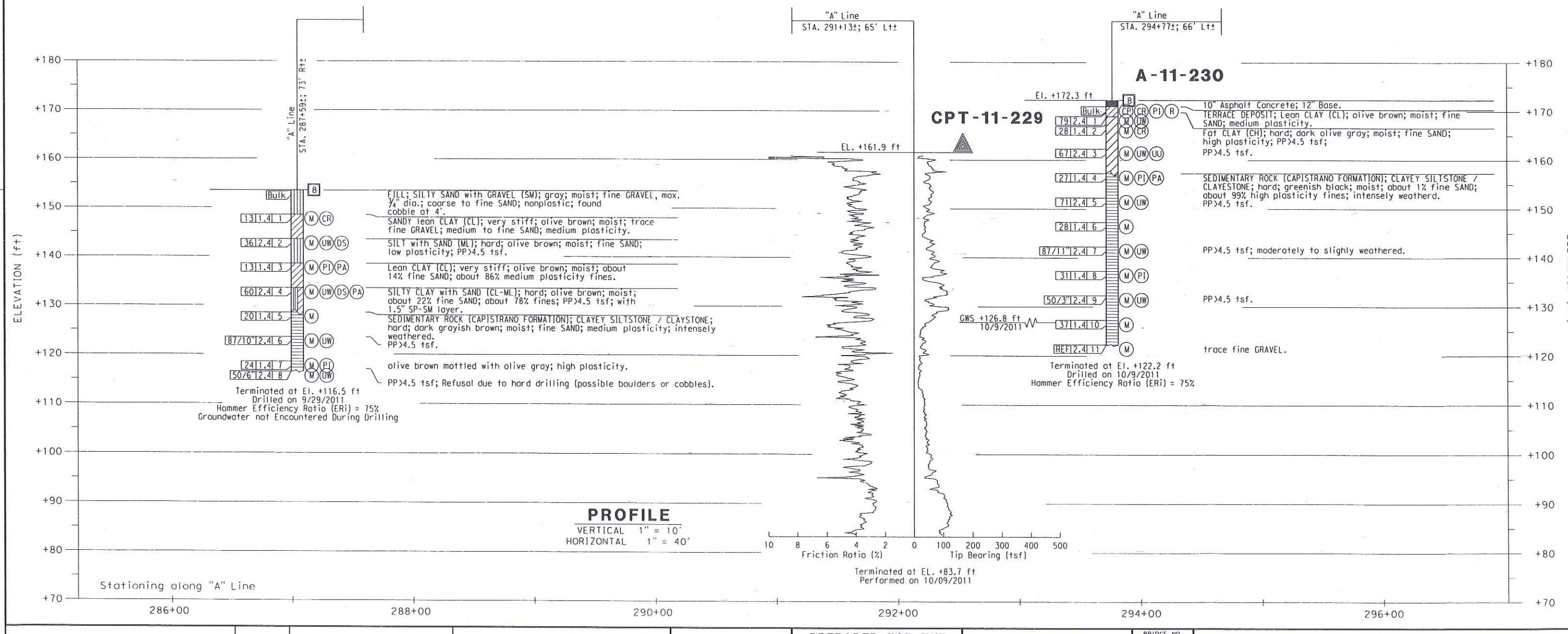
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -	RETAINING WALL 287L
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES -	LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

CONTRACT NO.: 12-0E966 | PROJECT ID: 12000202781

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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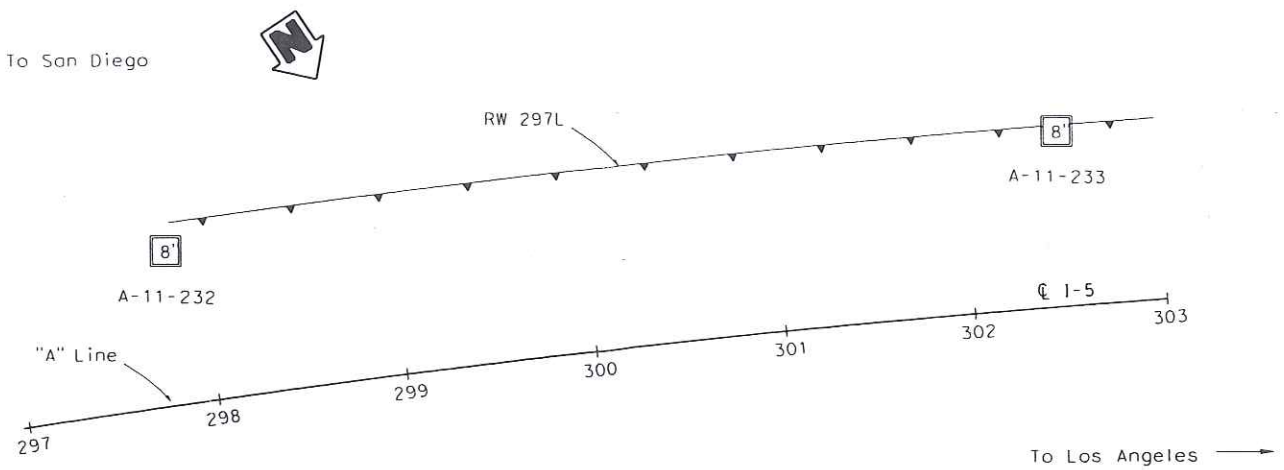
(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS NO. GE 2357 EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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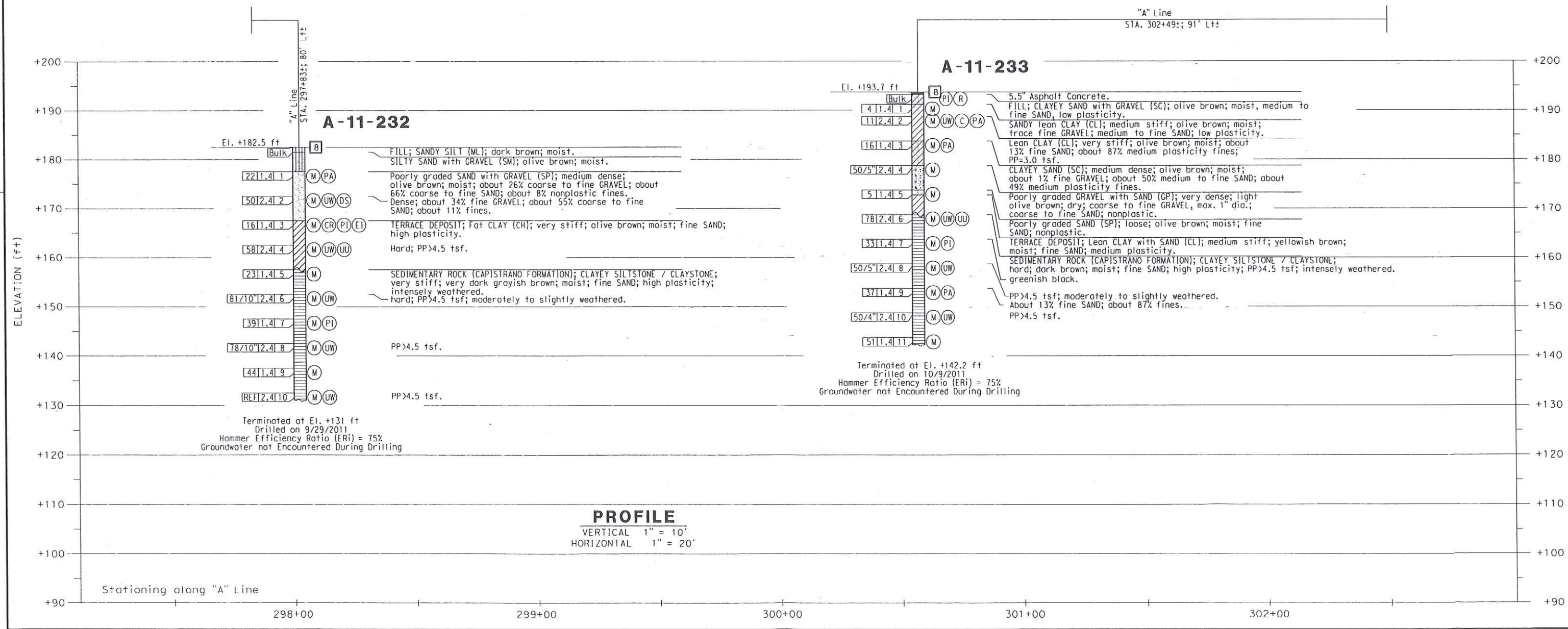
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE; K. KAEKUL; C. PONGSAKORNPATARA		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -	RETAINING WALL 297L
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011				POST MILES -	LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

FILE => $REQUEST

CONTRACT NO.: 12-0F96C1 PROJECT ID: 1200020278

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

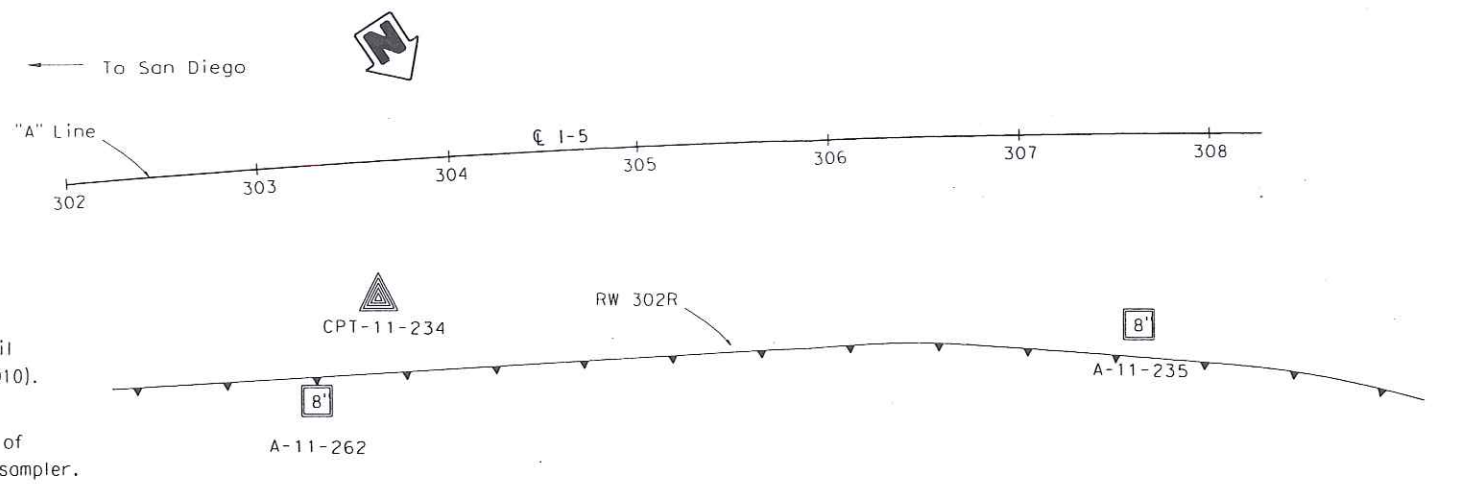
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

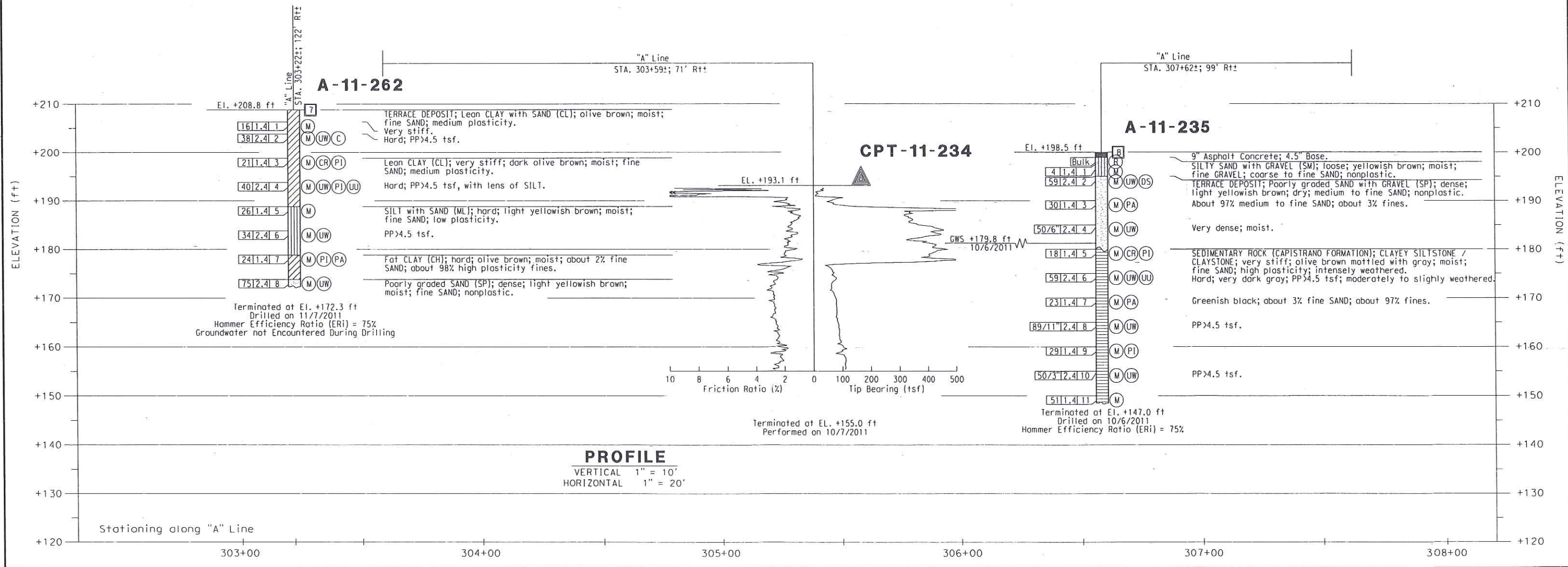
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'

To Los Angeles



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL 302R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 1 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

FILE => REQUEST

CONTRACT NO.: 12-0F960 PROJECT ID: 1200020278

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¾" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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(2) 2.4" samples were taken using a California Modified Sampler.
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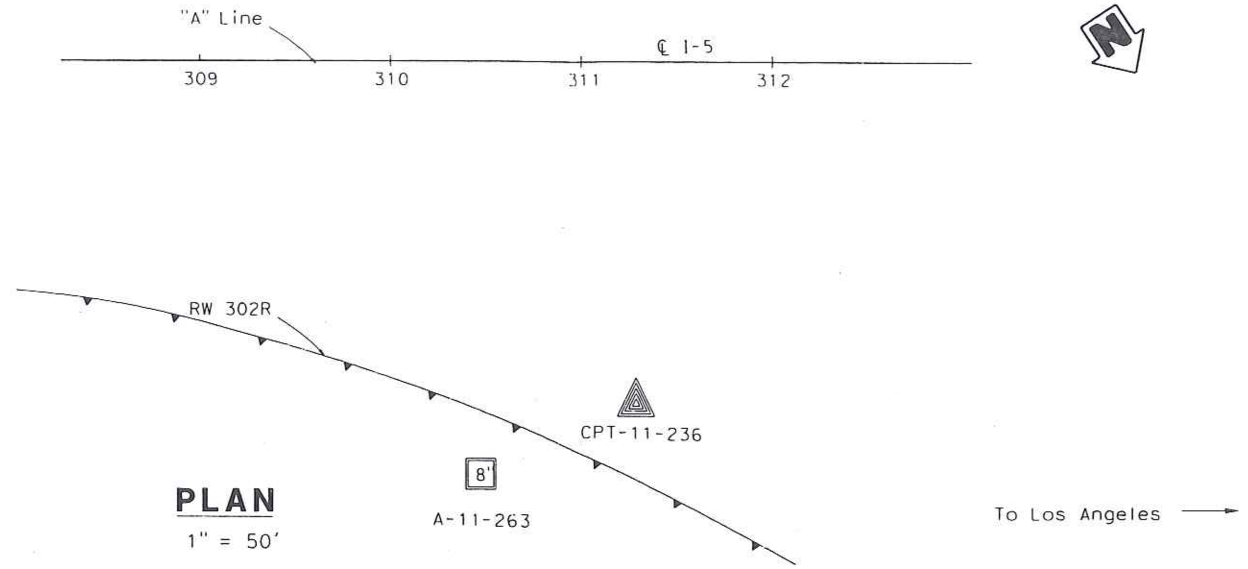
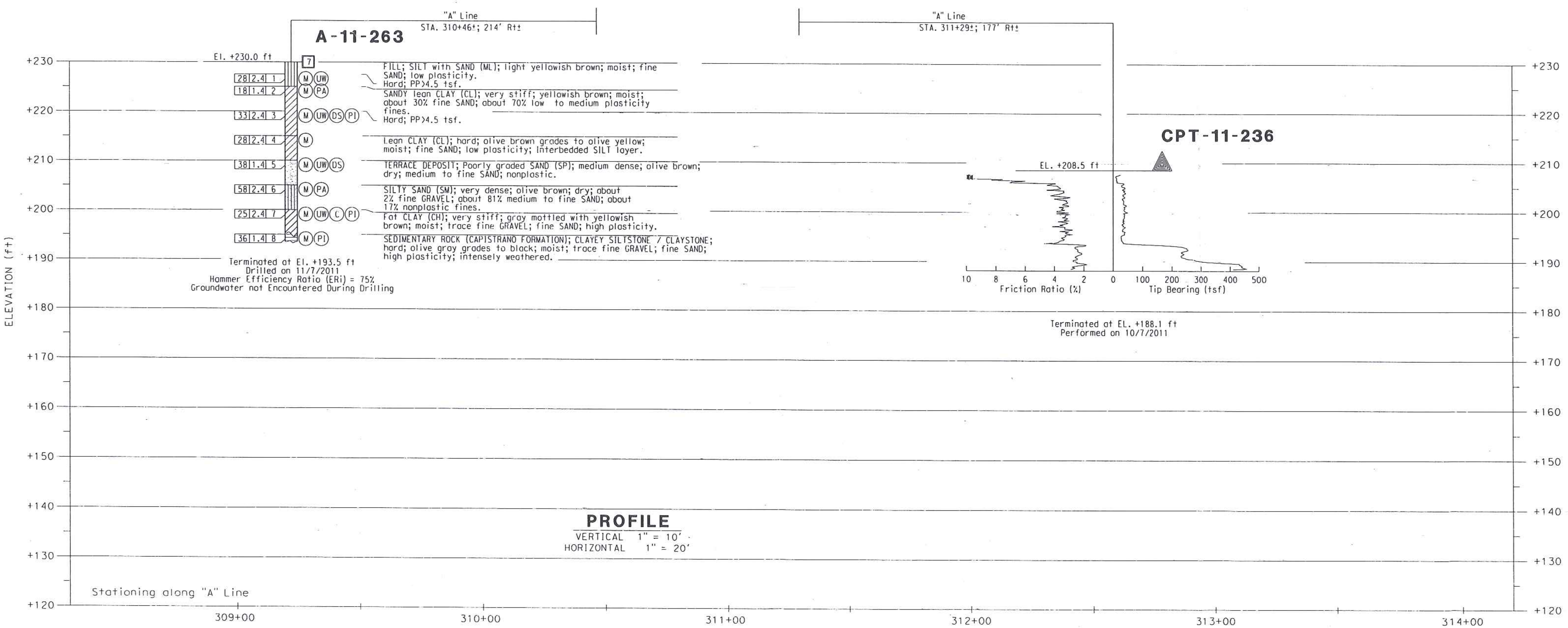
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -	RETAINING WALL 302R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011				POST MILES 5.51	LOG OF TEST BORINGS 2 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

FILE => $REQUEST

CONTRACT NO.: 12-0F96C1 PROJECT ID: 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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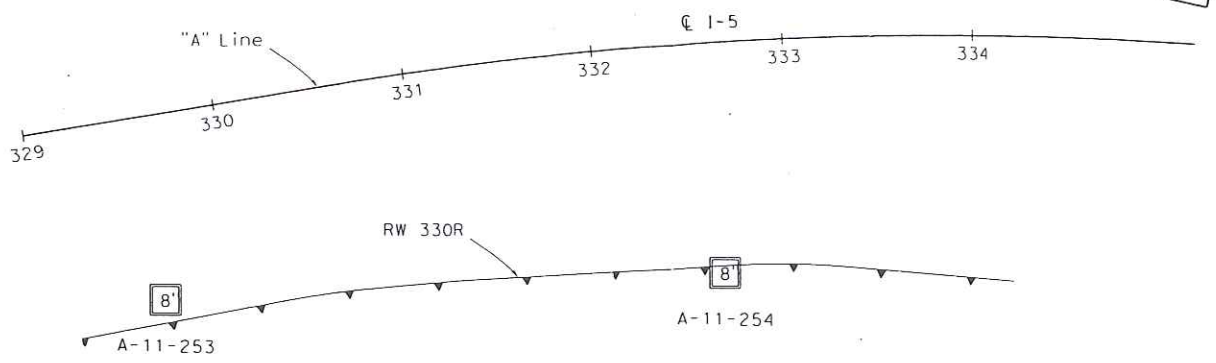

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS NO. GE 2357 EXP. 3-31-14 GEOTECHNICAL — STATE OF CALIFORNIA

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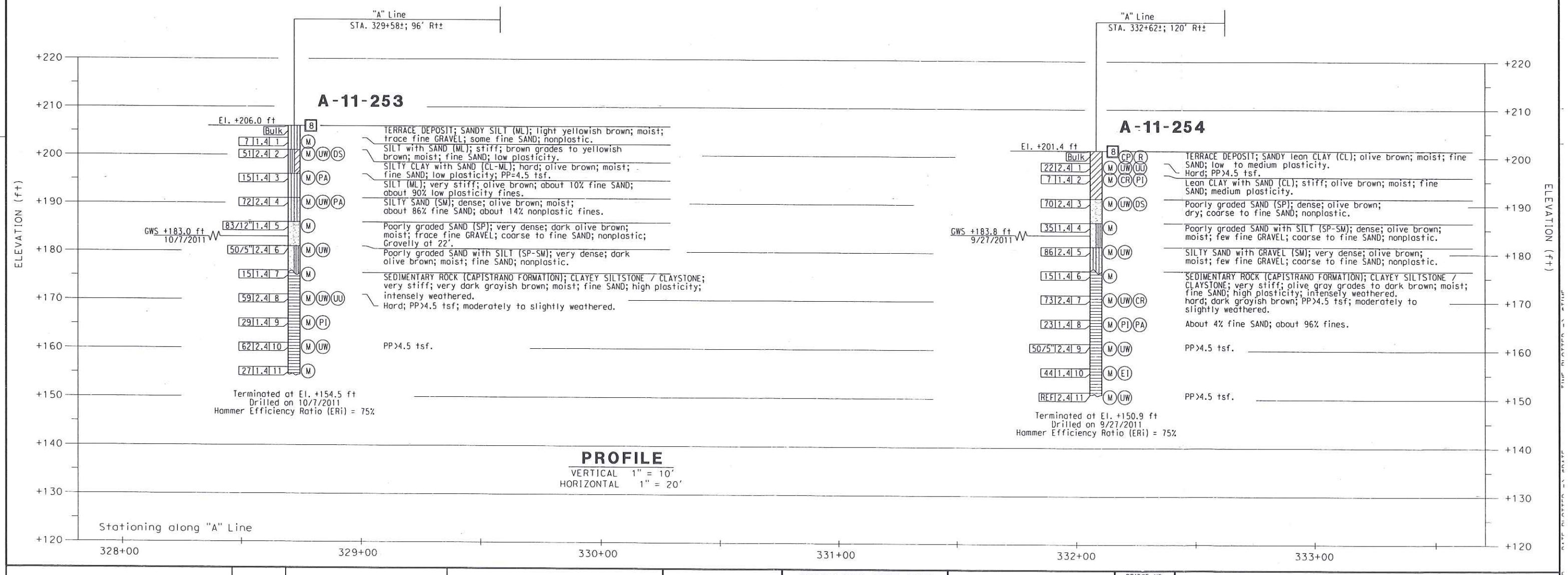
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -	RETAINING WALL 330R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES -	LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¾" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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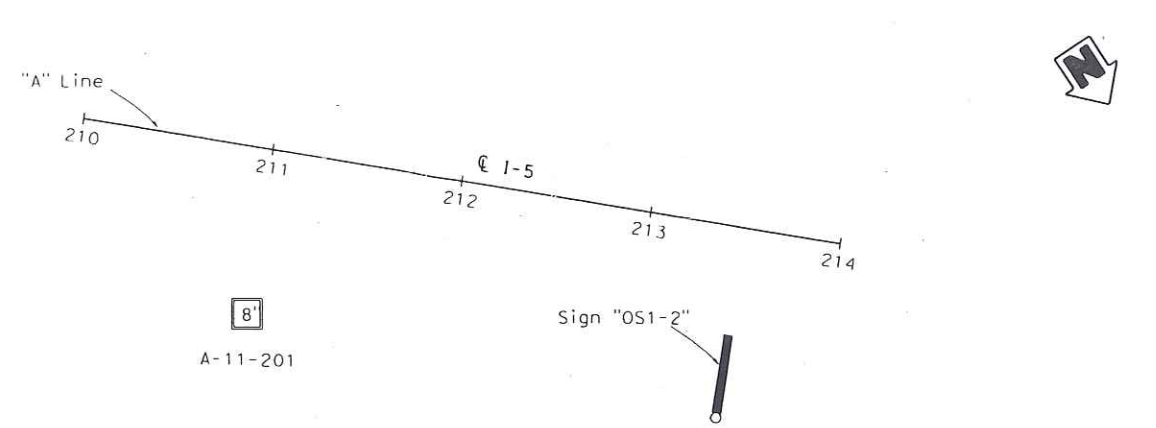

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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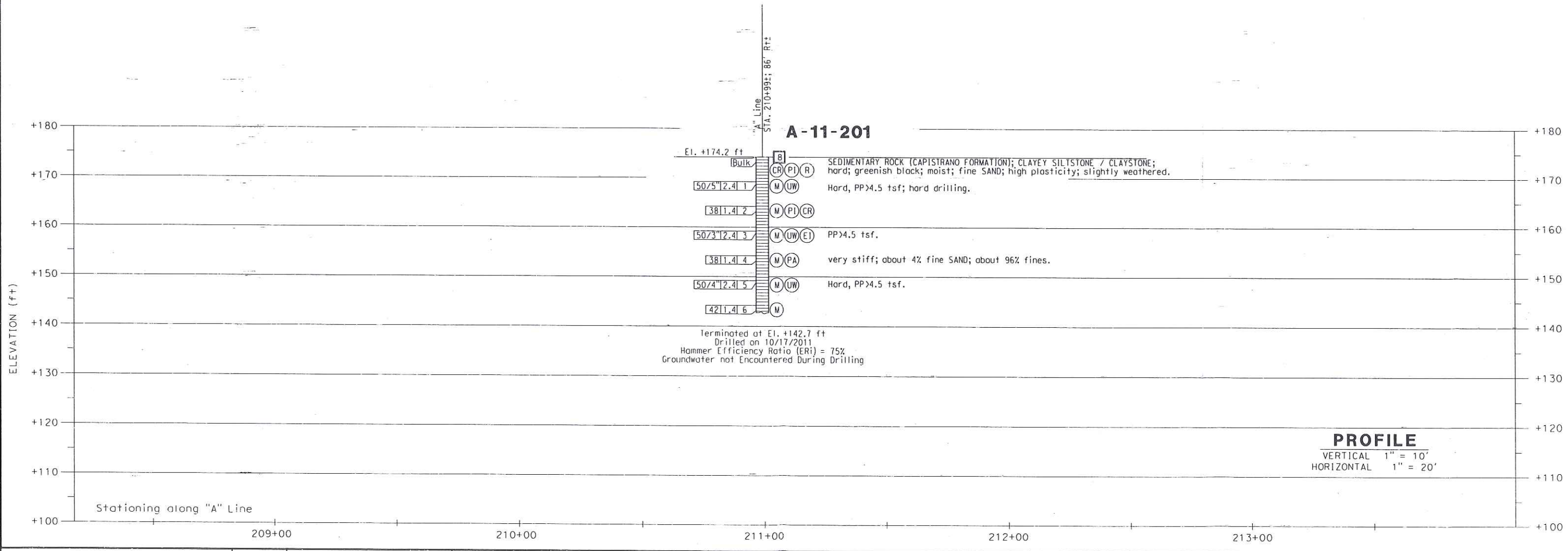
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES -

OVERHEAD SIGN STRUCTURES

LOG OF TEST BORING 1 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

FILE => $REQUEST

CONTRACT NO : 12-0E960 PROJECT ID: 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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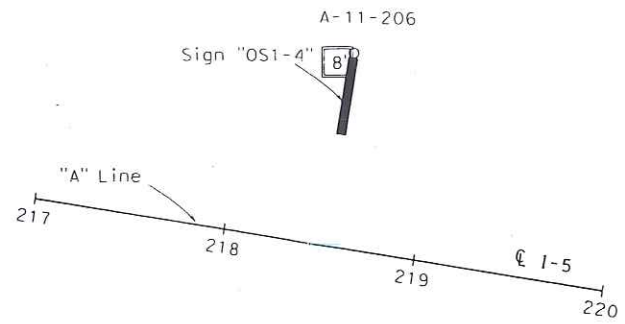

PLAN

1" = 50'

To Los Angeles

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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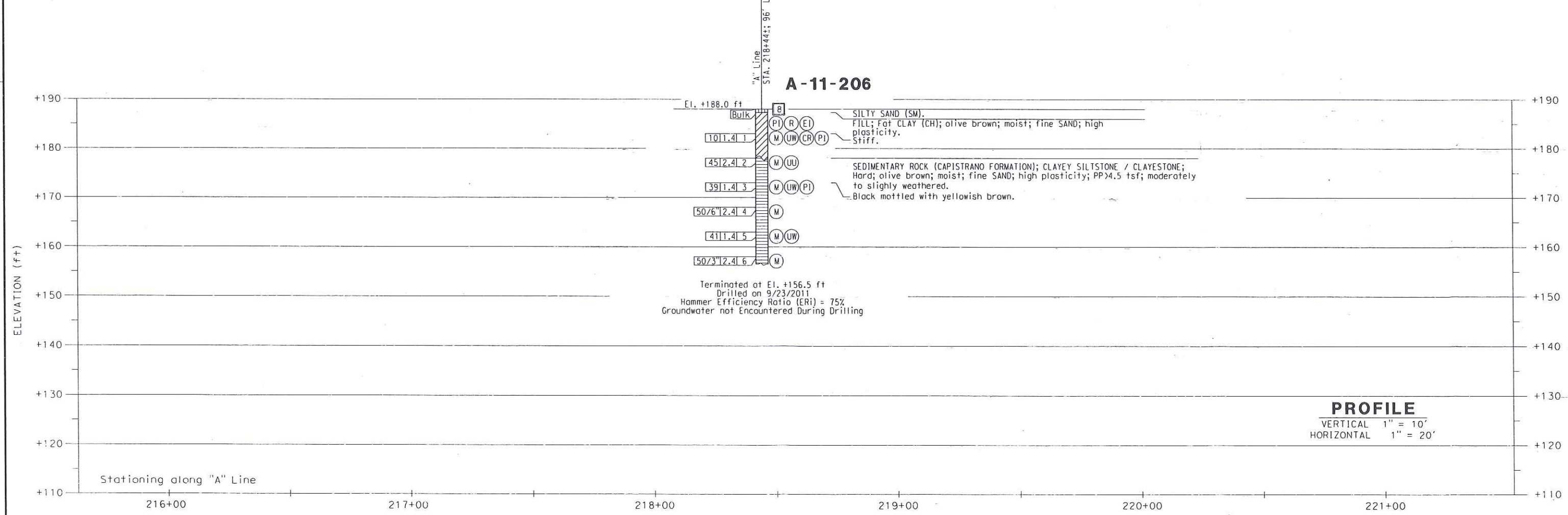
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES -	LOG OF TEST BORING 2 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

FILE => $REQUEST

CONTRACT NO.: 12-0F96C1 PROJECT ID: 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

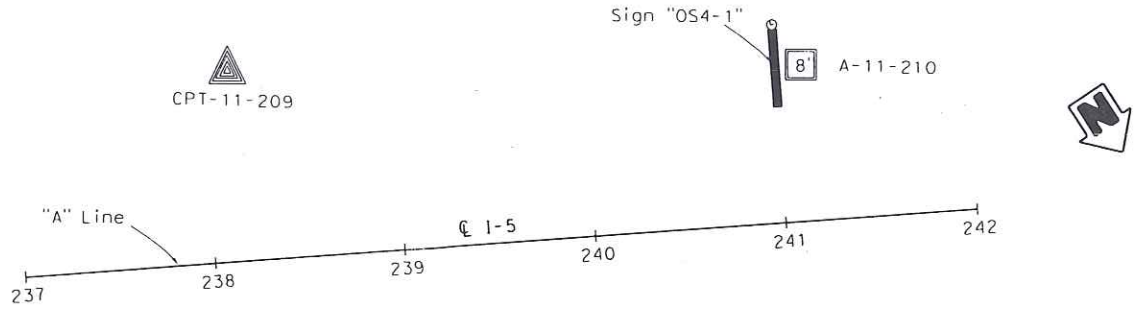
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

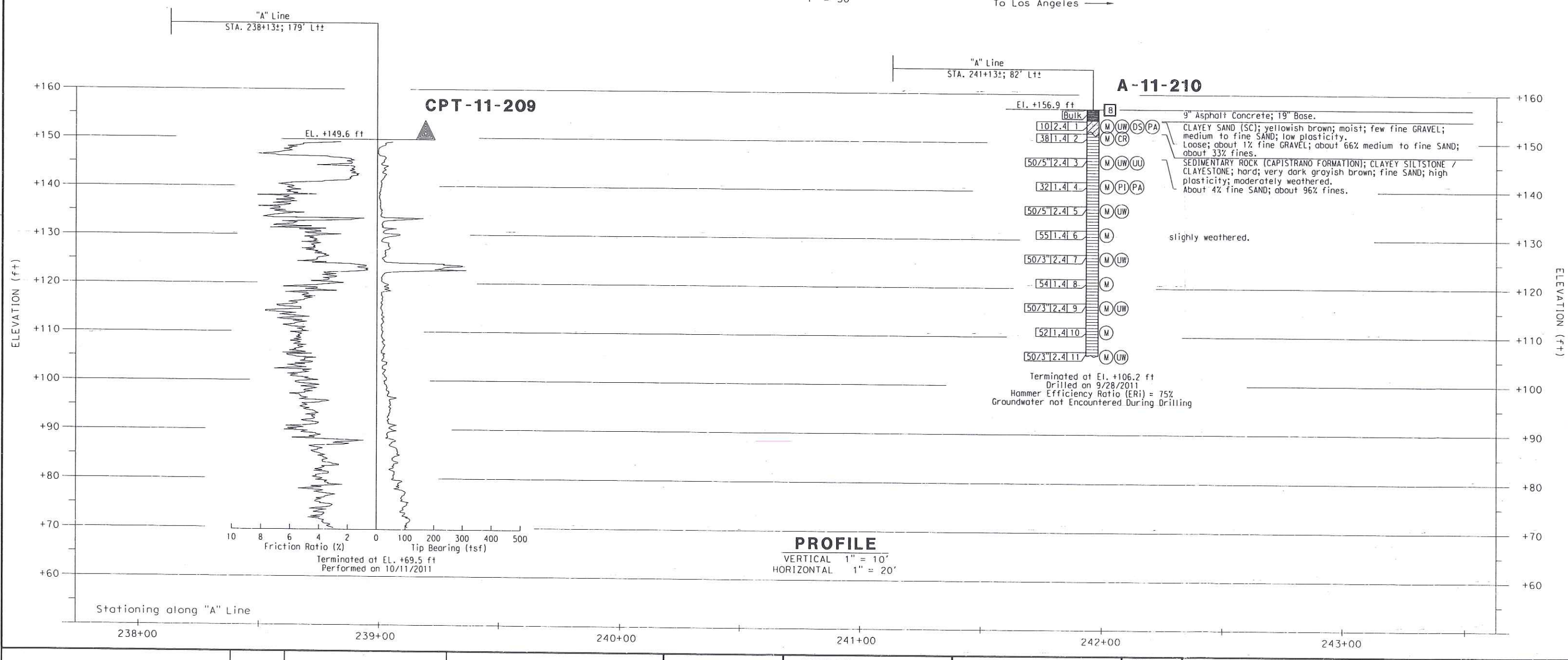
EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PLAN

1" = 50'

To Los Angeles



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES -

OVERHEAD SIGN STRUCTURES

LOG OF TEST BORINGS 3 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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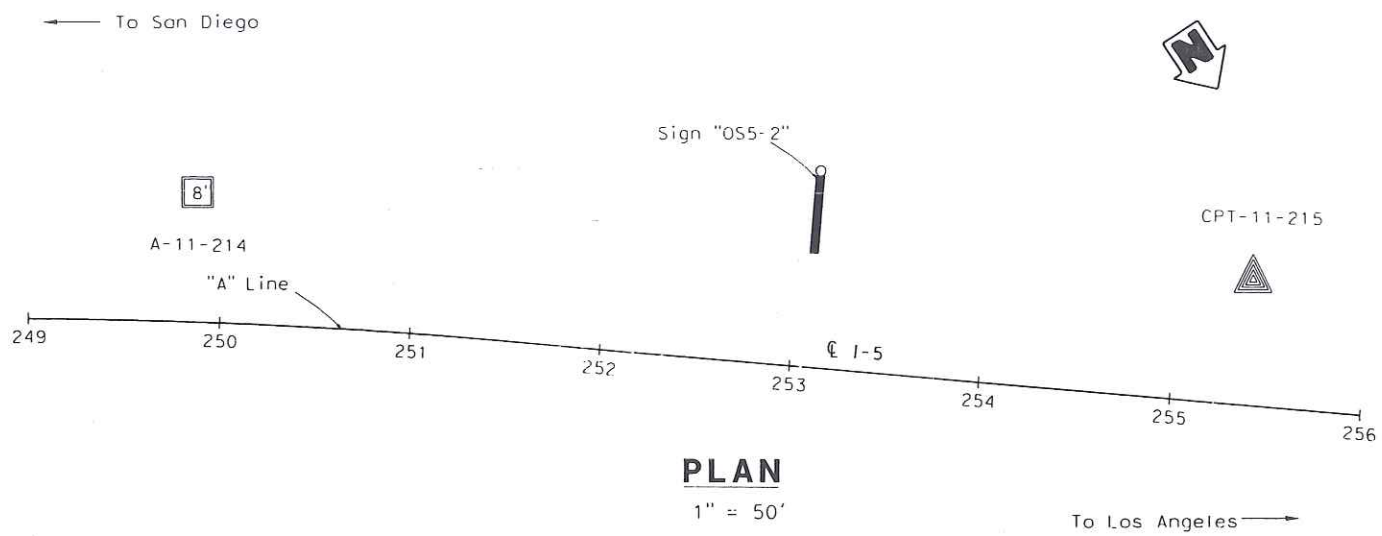

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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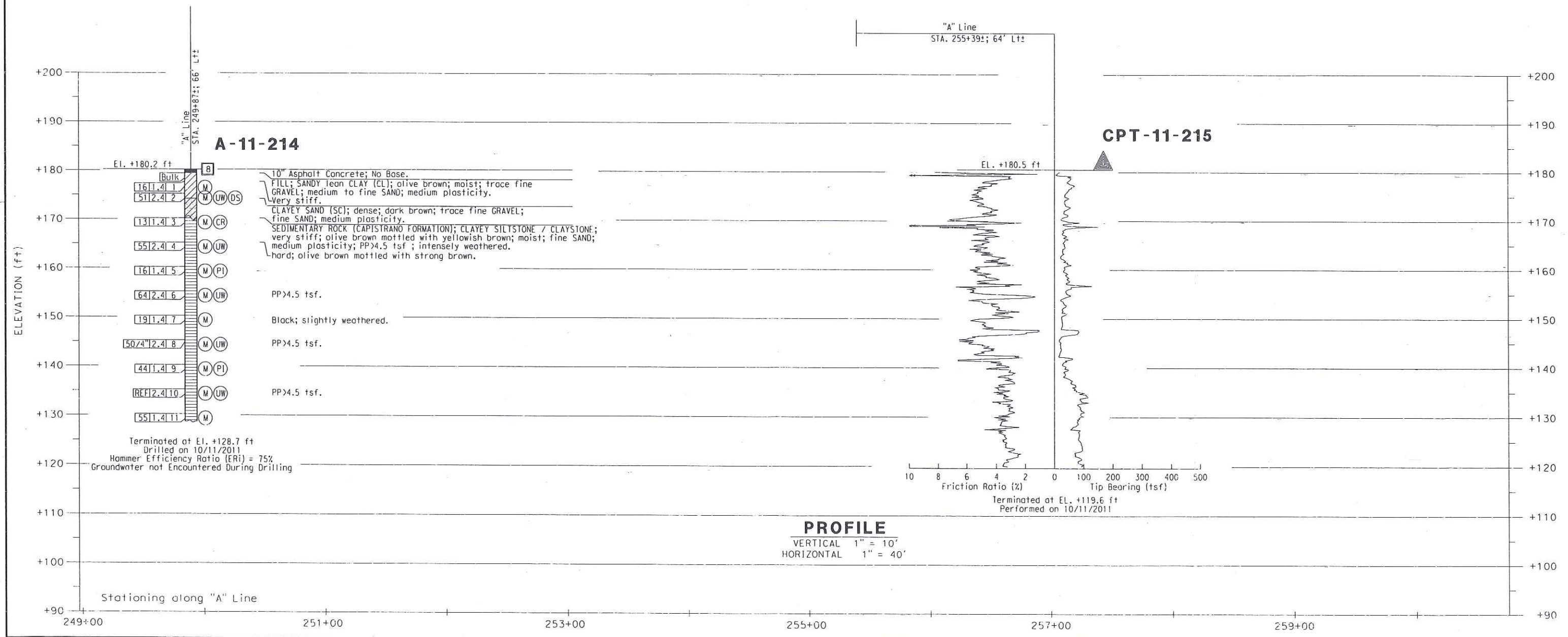
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 4 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES | SHEET | OF

CONTRACT NO.: 12-0E960 PROJECT ID: 1200020278

FILE => $REQUEST

DATE PLOTTED => 27-JUL-2012

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¾" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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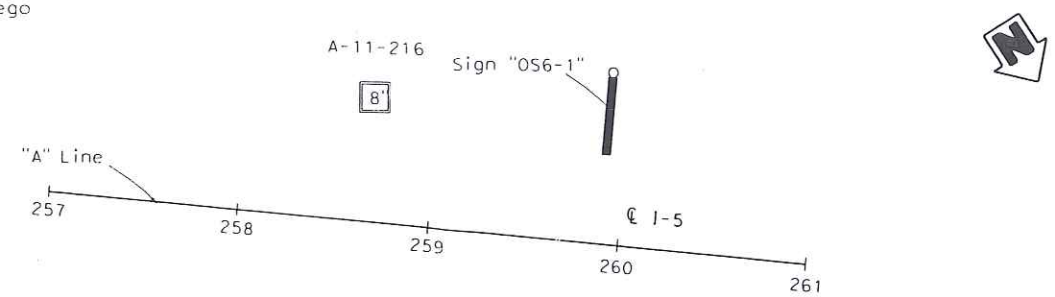

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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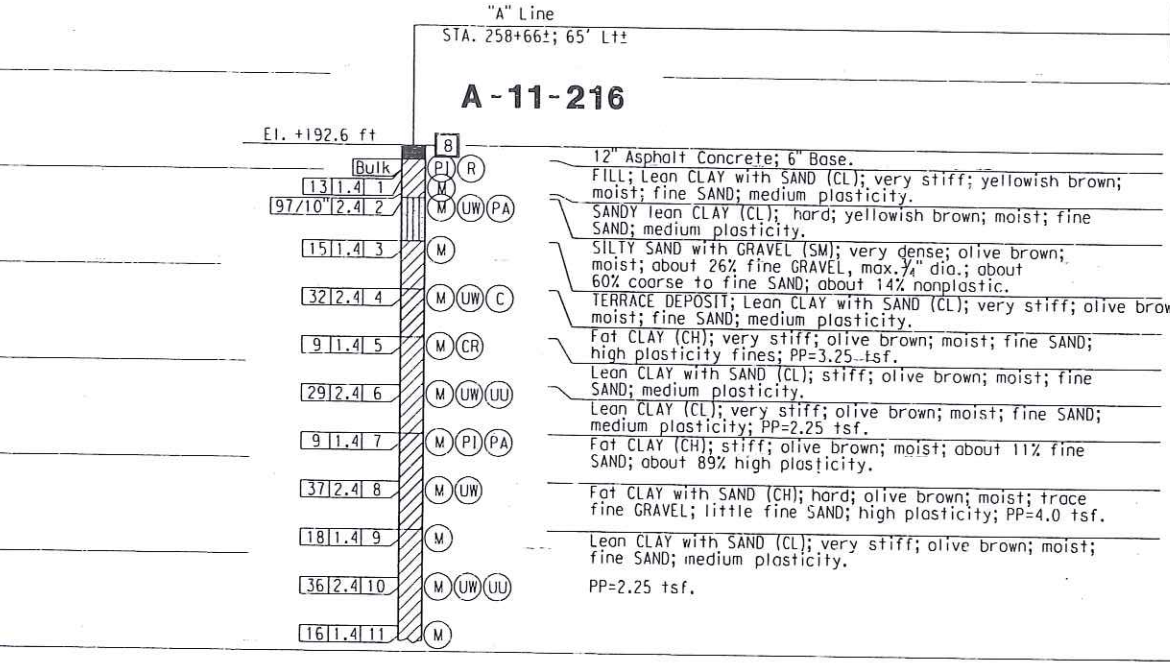
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES -

OVERHEAD SIGN STRUCTURES

LOG OF TEST BORING 5 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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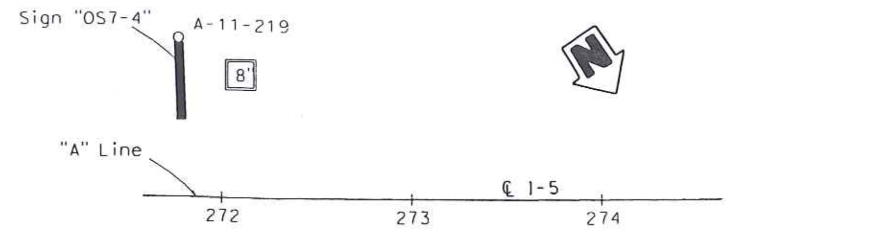
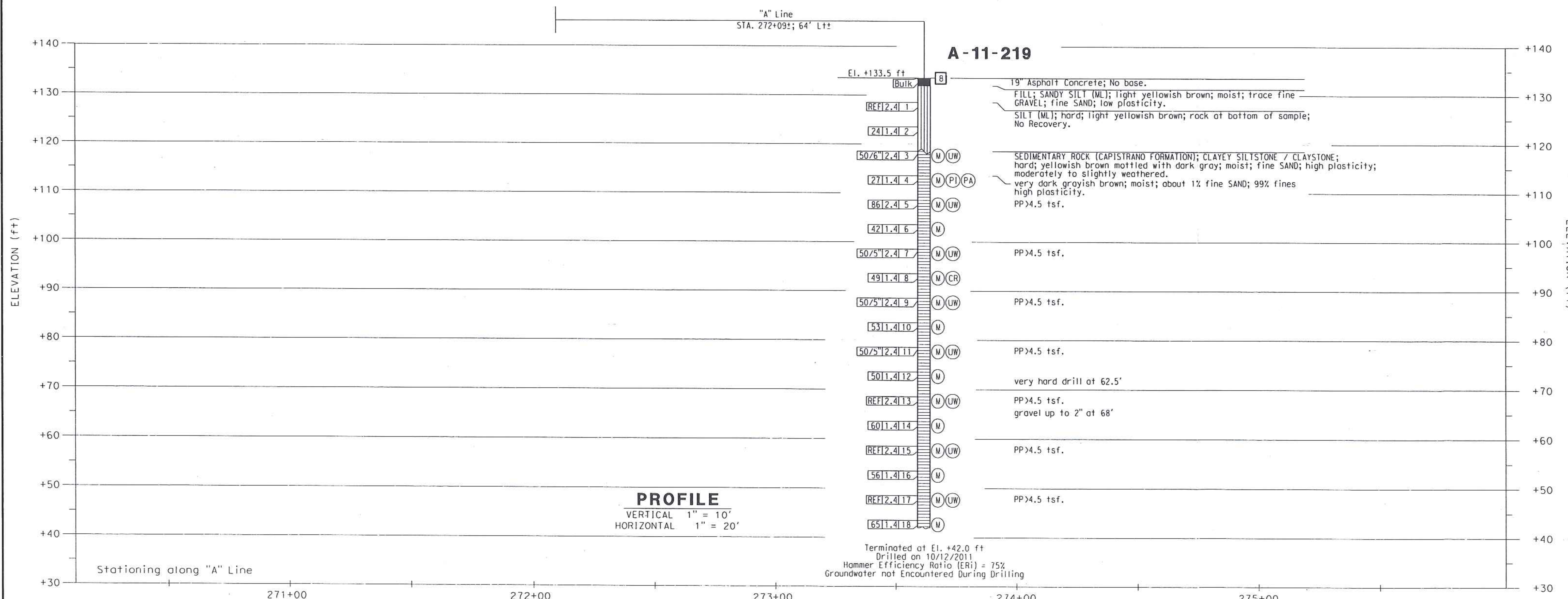


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO.	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES	LOG OF TEST BORING 6 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES SHEET OF

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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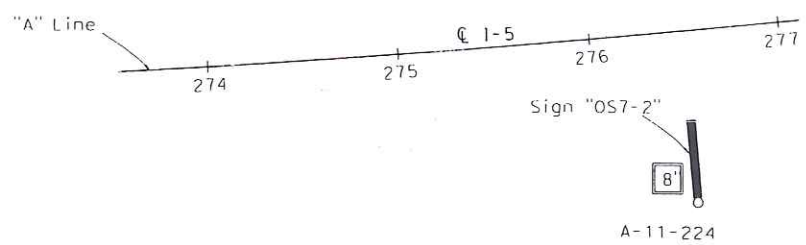
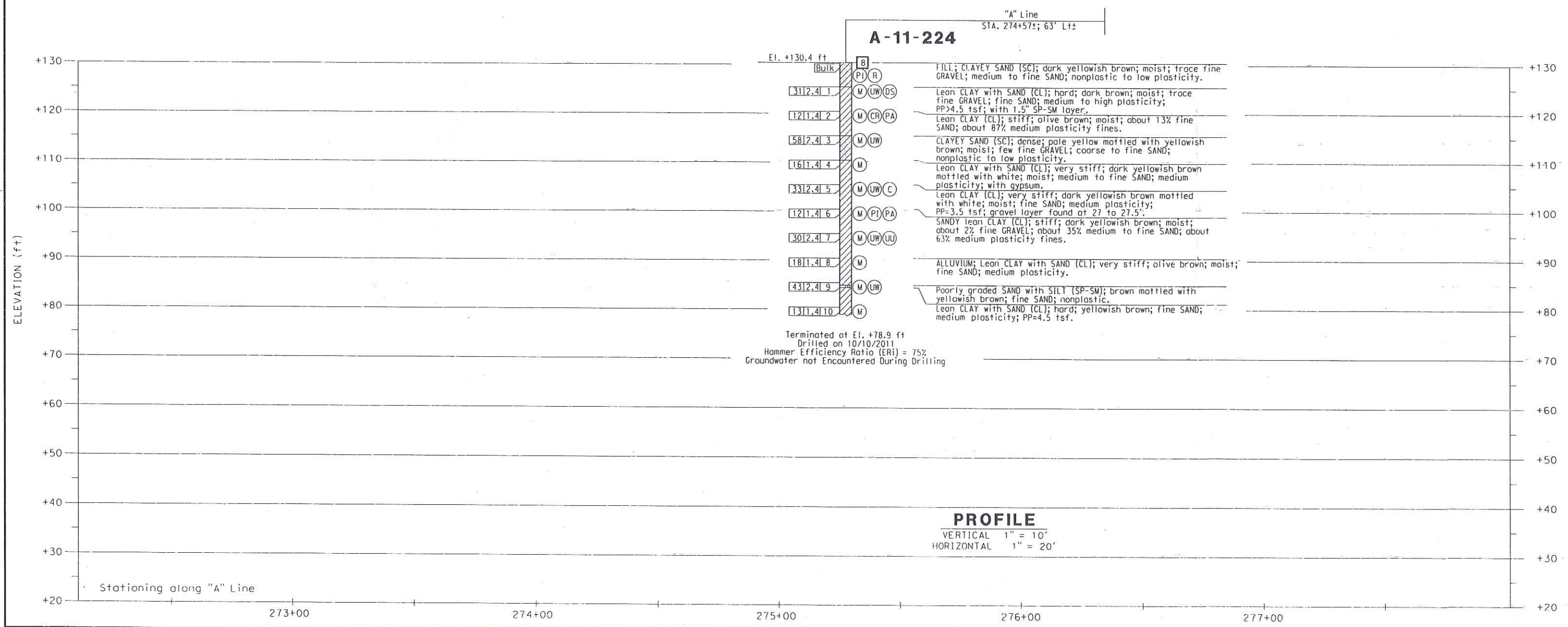


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORING 7 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES | SHEET | OF

CONTRACT NO. 12-0F0601 PROJECT ID 1200020278

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER ★ A. KORKOS NO. GE 2357 EXP. 3-31-14 ★ GEOTECHNICAL STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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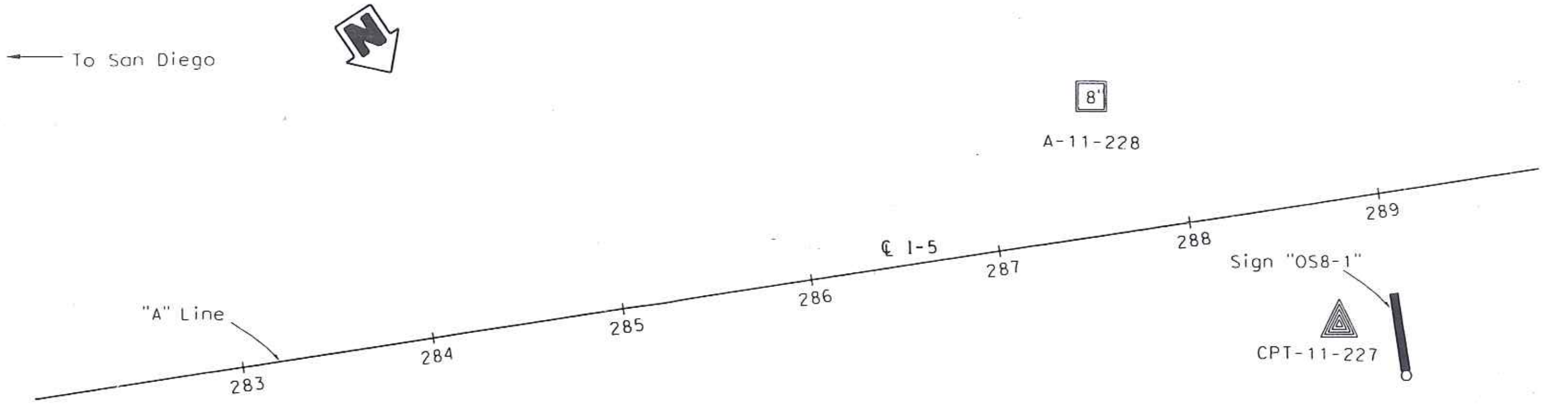
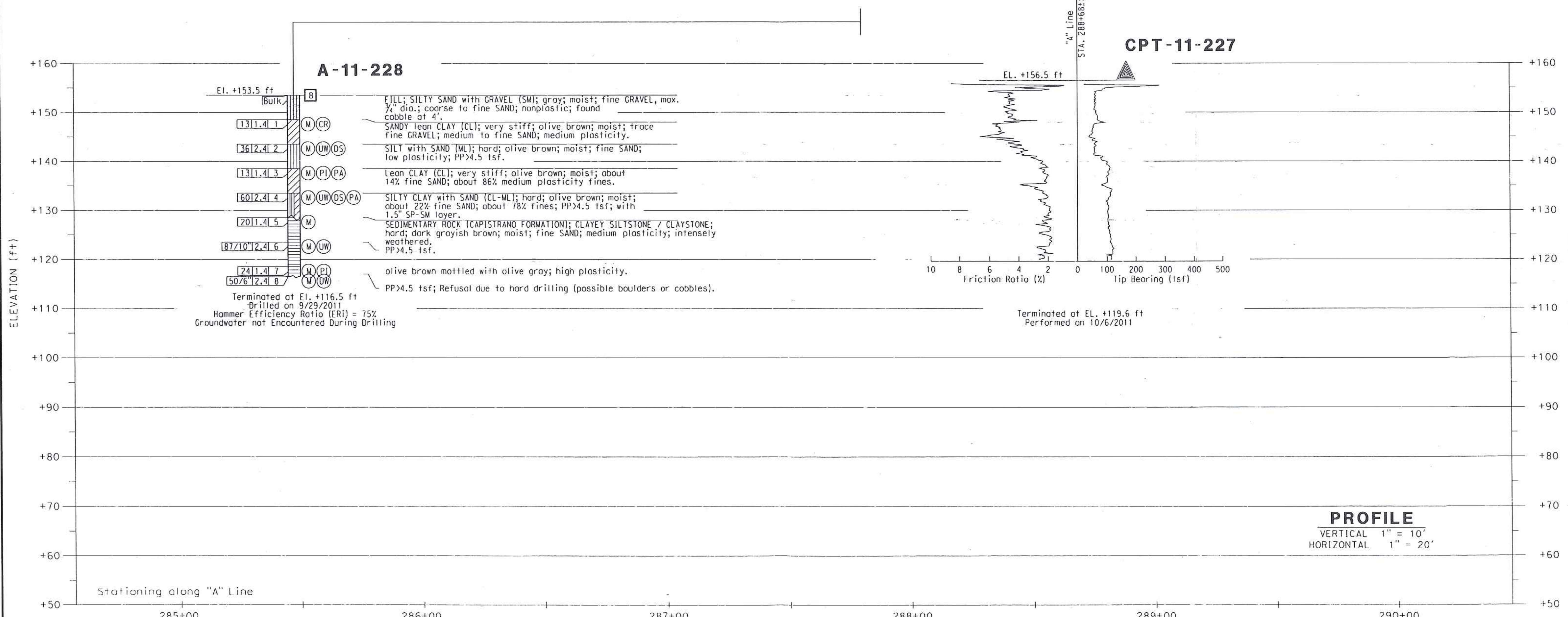


PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE FIELD INVESTIGATION BY:
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	DATE: 9/2011, 10/2011

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

A. KORKOS
PROJECT ENGINEER

BRIDGE NO. -
POST MILES -

OVERHEAD SIGN STRUCTURES
LOG OF TEST BORINGS 8 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES SHEET OF

CONTRACT NO.: 12-0E96C1 PROJECT ID: 1200020278

FILE => $REQUEST

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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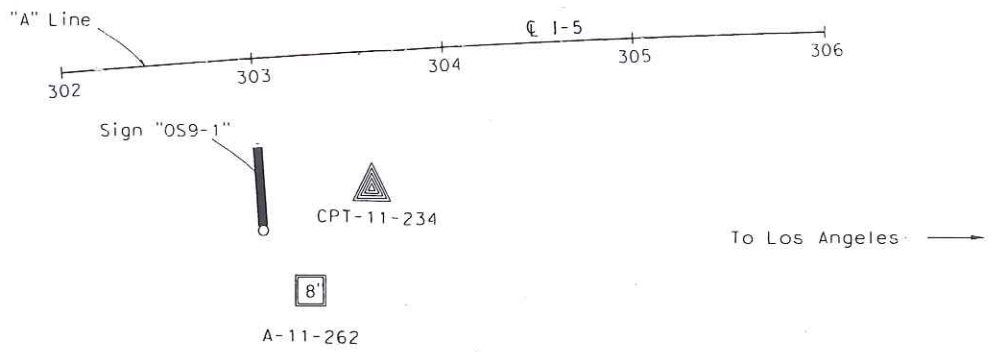

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

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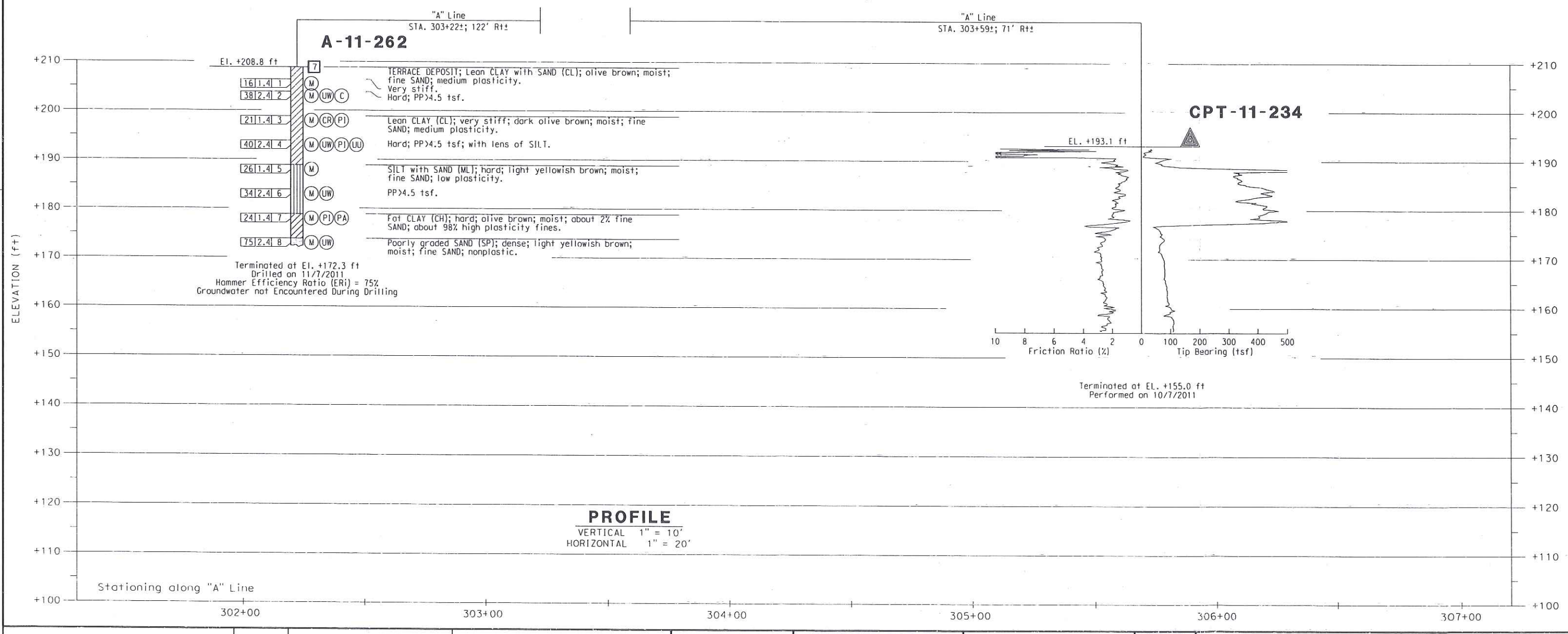
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 9 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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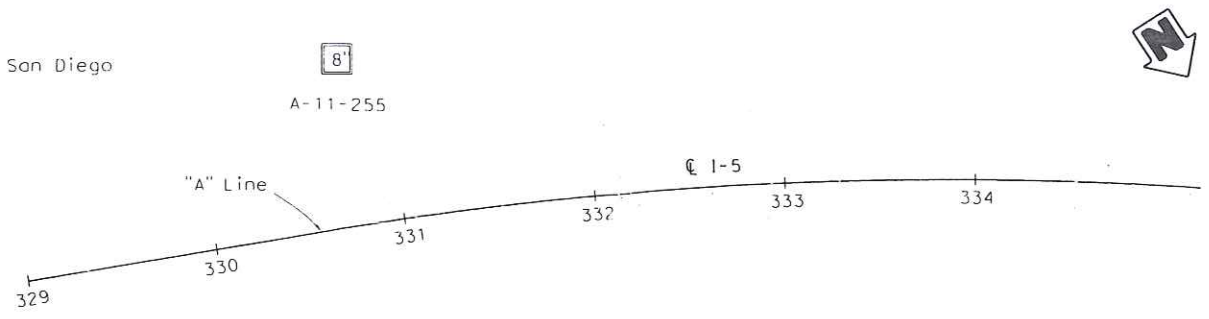

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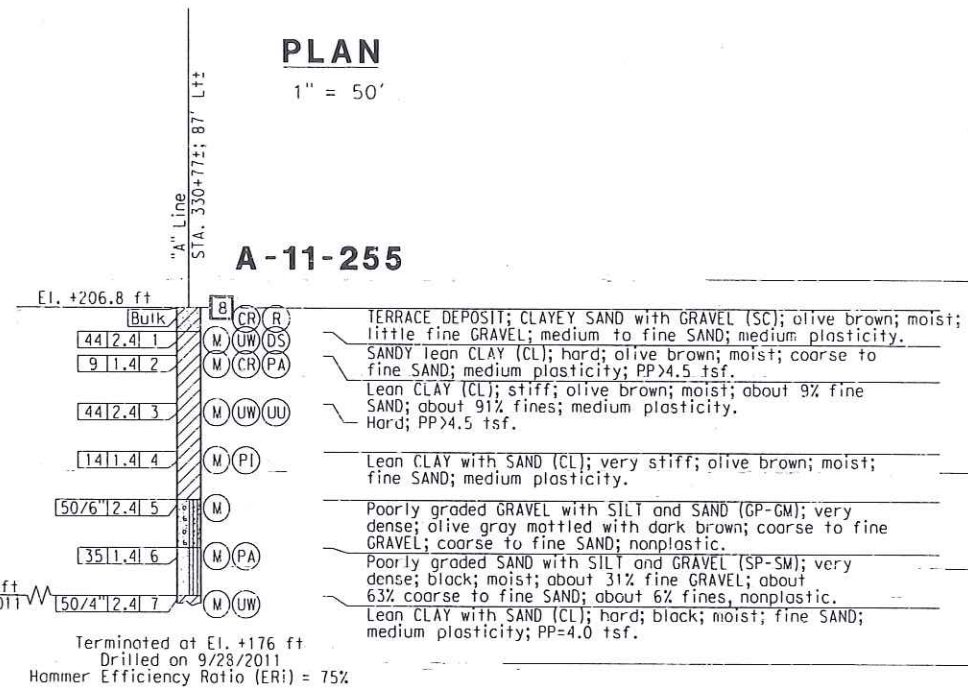
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.

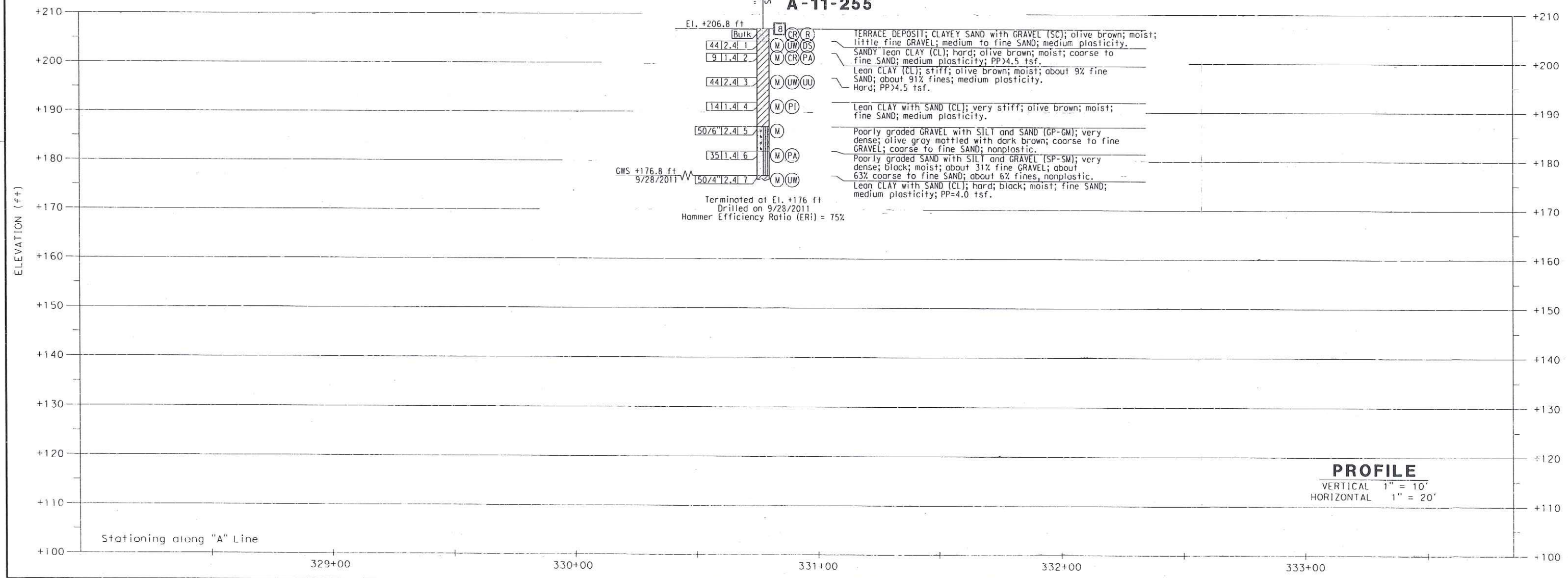
PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'



DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. -	I-5 HOV WIDENING SEGMENT 2
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES -	LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

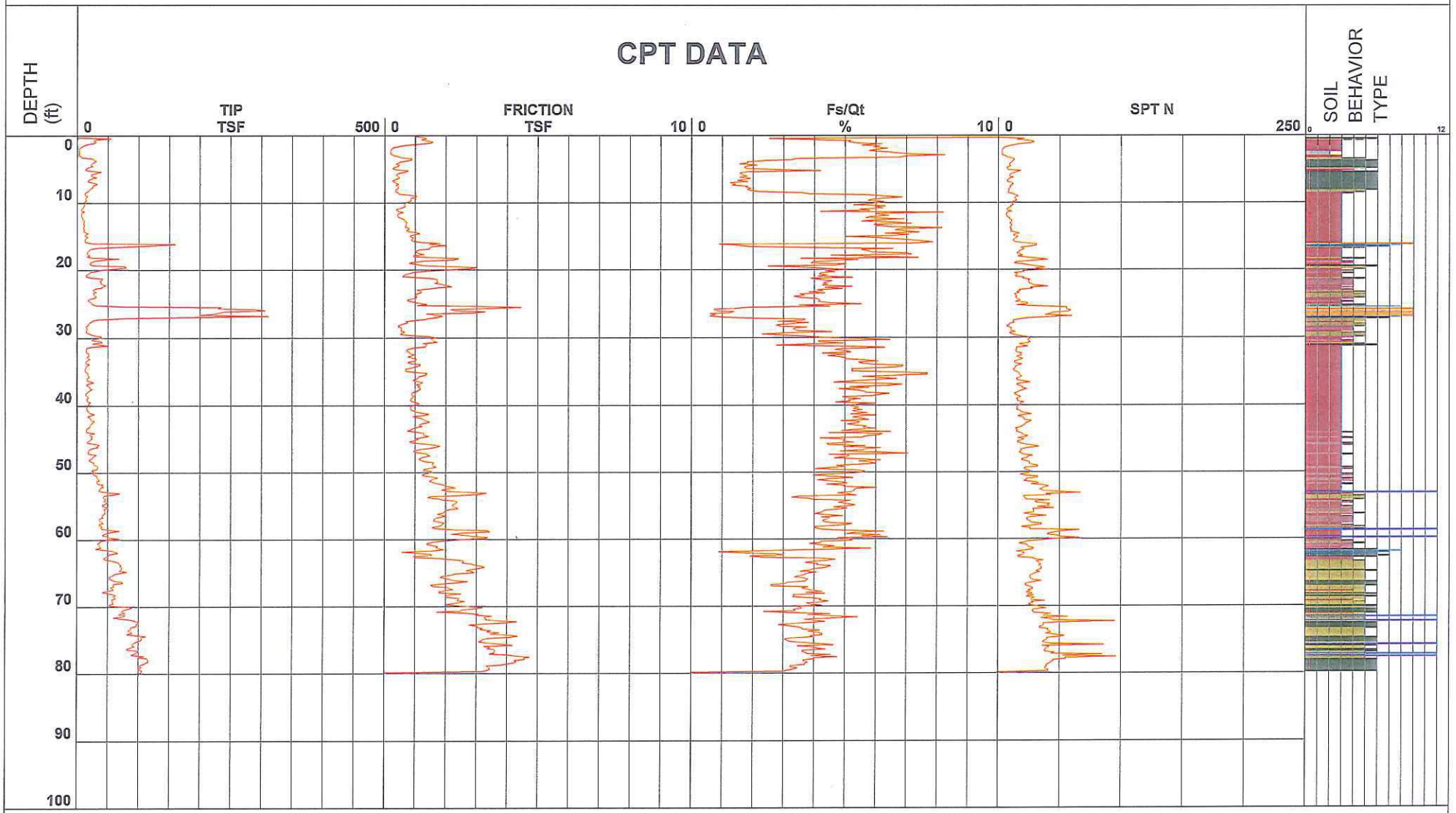
FILE => 4REQUEST

CONTRACT NO. 12-0E066 | PROJECT ID: 1200020778

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(577).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-209	Date and Time	10/11/2011 11:42:23 PM	Maximum Depth	80.05 ft
Water Table Depth	80.05 ft				

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

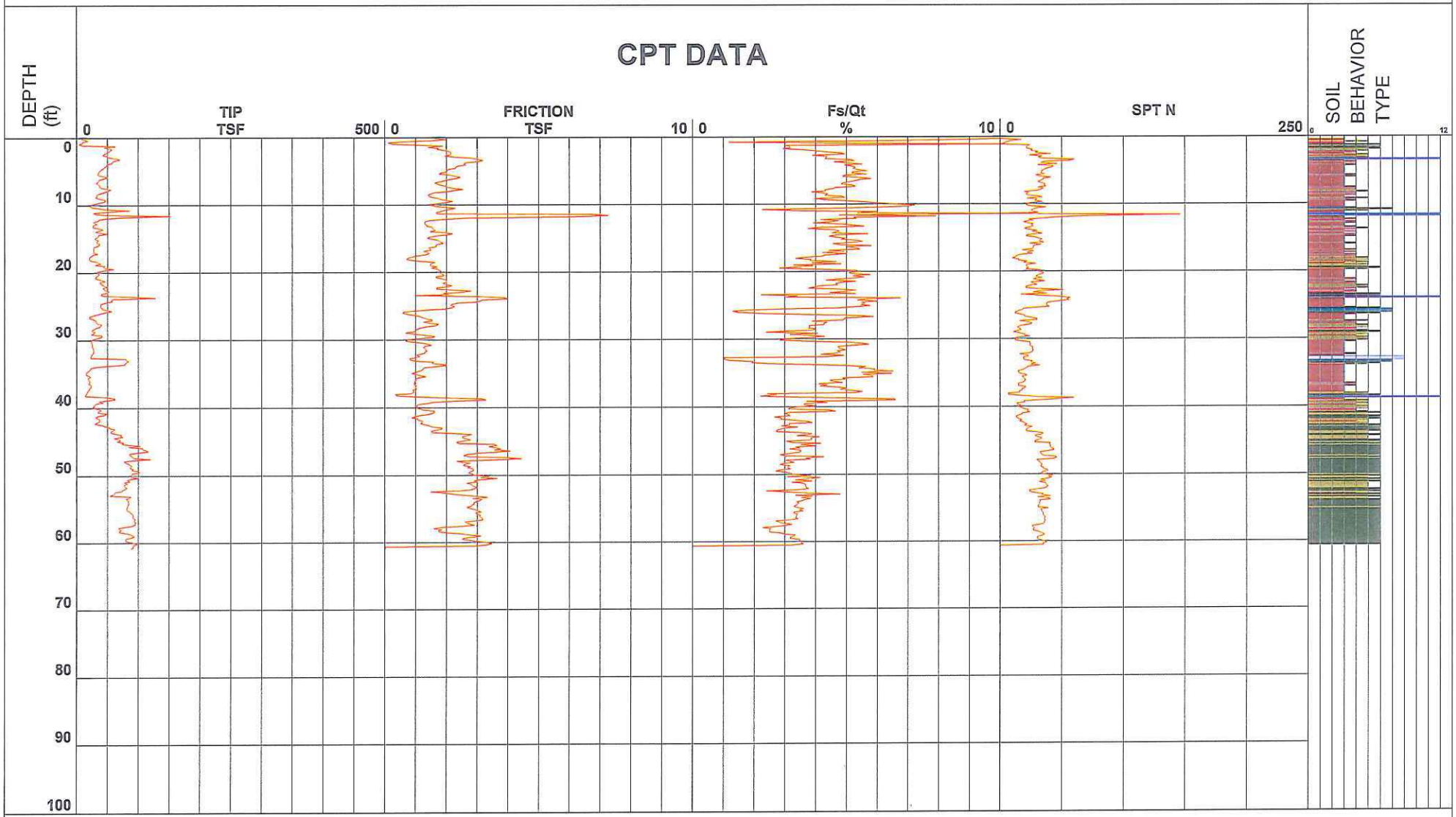
Depth Increment

(*)Soil behavior type and SPT based on data from UBC-1983

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(576).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-215	Date and Time	10/11/2011 10:34:01 PM	Maximum Depth	60.86 ft
Water Table Depth		>60.86 ft			

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
0.33	1.1	0.5	-	1.3	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.49	54.3	87.1	152.0	1.4	0.4	2.5	5	silty SAND to sandy SILT	120	4.0	14	22	62	48	-	-	20	16	N/A	0.00	N/A	N/A
0.66	31.3	50.2	146.5	1.2	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	32	15	N/A	0.00	N/A	N/A
0.82	26.6	42.7	-	1.4	0.3	5.2	3	silty CLAY to CLAY	115	1.5	18	28	-	-	1.9	9.9	39	15	N/A	0.00	N/A	N/A
0.98	30.7	49.2	-	1.6	0.3	5.1	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	37	15	N/A	0.00	N/A	N/A
1.15	27.5	44.2	-	1.5	0.3	5.5	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	39	15	N/A	0.00	N/A	N/A
1.31	17.9	28.7	-	1.1	0.3	6.2	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	49	15	N/A	0.00	N/A	N/A
1.48	12.5	20.1	-	0.7	0.3	5.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	54	15	N/A	0.00	N/A	N/A
1.64	8.0	12.8	-	0.5	0.3	6.2	3	silty CLAY to CLAY	115	1.5	5	9	-	-	0.6	9.9	66	15	N/A	0.00	N/A	N/A
1.80	5.6	9.0	-	0.3	0.2	6.0	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	75	15	N/A	0.00	N/A	N/A
1.97	3.9	6.3	-	0.3	-3.1	6.6	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.9	87	15	N/A	0.00	N/A	N/A
2.13	3.7	5.9	-	0.2	-3.3	6.2	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.3	9.7	88	15	N/A	0.00	N/A	N/A
2.30	3.7	5.9	-	0.2	-3.3	6.0	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.2	9.0	87	15	N/A	0.00	N/A	N/A
2.46	3.1	5.0	-	0.2	-3.4	6.7	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	7.1	95	15	N/A	0.00	N/A	N/A
2.62	3.1	4.9	-	0.2	-3.5	7.0	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	6.5	95	15	N/A	0.00	N/A	N/A
2.79	3.0	4.8	-	0.2	-3.6	7.5	2	Organic SOILS - Peats	100	1.0	3	5	-	-	0.3	6.0	95	10	N/A	0.00	N/A	N/A
2.95	3.7	5.9	-	0.3	-3.6	8.6	2	Organic SOILS - Peats	100	1.0	4	6	-	-	0.4	7.0	95	10	N/A	0.00	N/A	N/A
3.12	6.0	9.5	-	0.4	-3.6	7.2	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	77	15	N/A	0.00	N/A	N/A
3.28	7.8	12.5	-	0.5	-3.8	6.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	69	15	-	-	0.17	-
3.45	25.5	40.9	126.9	0.9	-3.8	3.5	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	34	15	0.74	-	0.17	51.2
3.61	26.9	43.2	126.0	0.9	-3.6	3.3	4	clayy SILT to silty CLAY	115	2.0	13	22	-	-	1.9	9.9	32	15	0.90	-	0.17	51.2
3.77	31.0	49.8	113.2	0.7	-3.6	2.4	5	silty SAND to sandy SILT	120	4.0	8	12	44	43	-	-	26	16	1.87	-	0.16	41.1
3.94	28.5	45.7	95.6	0.5	-2.3	1.8	5	silty SAND to sandy SILT	120	4.0	7	11	41	42	-	-	24	16	2.42	-	0.16	49.2
4.10	25.4	40.8	92.0	0.5	-1.4	1.9	5	silty SAND to sandy SILT	120	4.0	6	10	37	42	-	-	26	16	2.50	-	0.16	51.2
4.27	23.7	38.1	83.0	0.4	-0.6	1.6	5	silty SAND to sandy SILT	120	4.0	6	10	35	41	-	-	25	16	2.72	-	0.15	51.2
4.43	22.4	36.0	94.0	0.5	-0.2	2.2	5	silty SAND to sandy SILT	120	4.0	6	9	33	41	-	-	29	16	2.46	-	0.15	51.2
4.59	25.1	40.2	90.5	0.5	0.0	1.8	5	silty SAND to sandy SILT	120	4.0	6	10	37	41	-	-	26	16	2.54	-	0.14	51.2
4.76	19.0	30.5	80.0	0.3	0.1	1.7	5	silty SAND to sandy SILT	120	4.0	5	8	28	40	-	-	29	16	2.81	-	0.14	51.2
4.92	14.9	23.9	75.4	0.3	0.1	1.8	4	clayy SILT to silty CLAY	115	2.0	7	12	-	-	1.0	9.9	34	15	2.95	-	0.14	51.2
5.09	13.2	21.1	-	0.4	0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	43	15	-	-	0.13	-
5.25	18.3	29.4	-	0.8	0.2	4.3	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	42	15	-	-	0.13	-
5.41	39.1	62.7	110.2	0.7	0.3	1.8	5	silty SAND to sandy SILT	120	4.0	10	16	52	43	-	-	20	16	2.16	-	0.13	32.3
5.58	32.0	51.3	94.4	0.5	0.3	1.6	5	silty SAND to sandy SILT	120	4.0	8	13	45	42	-	-	21	16	2.45	-	0.13	42.7
5.74	25.9	41.6	87.3	0.4	0.3	1.6	5	silty SAND to sandy SILT	120	4.0	6	10	38	41	-	-	24	16	2.61	-	0.12	51.2
5.91	22.8	36.5	84.9	0.4	0.3	1.7	5	silty SAND to sandy SILT	120	4.0	6	9	34	40	-	-	27	16	2.67	-	0.12	51.2
6.07	24.2	38.9	90.1	0.4	0.3	1.8	5	silty SAND to sandy SILT	120	4.0	6	10	36	40	-	-	26	16	2.55	-	0.12	51.2
6.23	31.5	50.6	93.9	0.5	0.3	1.6	5	silty SAND to sandy SILT	120	4.0	8	13	45	41	-	-	21	16	2.46	-	0.11	43.5
6.40	23.9	38.3	91.8	0.5	0.3	1.9	5	silty SAND to sandy SILT	120	4.0	6	10	35	40	-	-	27	16	2.51	-	0.11	51.2
6.56	20.3	32.0	82.3	0.4	0.4	1.8	5	silty SAND to sandy SILT	120	4.0	5	8	29	39	-	-	29	16	2.74	-	0.10	51.2
6.73	17.6	27.5	72.9	0.3	0.4	1.5	5	silty SAND to sandy SILT	120	4.0	4	7	24	38	-	-	30	16	3.03	-	0.10	51.2
6.89	18.4	28.3	80.6	0.3	0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	9	14	-	-	1.3	9.9	31	15	2.79	-	0.09	51.2
7.05	28.6	43.5	80.4	0.4	0.4	1.3	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	21	16	2.80	-	0.09	51.2
7.22	32.4	48.7	89.1	0.5	0.4	1.5	5	silty SAND to sandy SILT	120	4.0	8	12	43	41	-	-	21	16	2.57	-	0.08	45.7
7.38	27.7	41.2	80.1	0.4	0.4	1.3	5	silty SAND to sandy SILT	120	4.0	7	10	38	40	-	-	22	16	2.80	-	0.08	51.2
7.55	24.5	36.0	87.8	0.4	0.4	1.9	5	silty SAND to sandy SILT	120	4.0	6	9	33	39	-	-	28	16	2.60	-	0.08	51.2
7.71	26.2	38.0	88.5	0.5	0.4	1.8	5	silty SAND to sandy SILT	120	4.0	7	10	35	40	-	-	27	16	2.58	-	0.07	51.2
7.87	22.8	32.7	87.4	0.4	0.4	2.0	5	silty SAND to sandy SILT	120	4.0	6	8	30	39	-	-	30	16	2.61	-	0.07	51.2
8.04	20.3	28.8	81.4	0.4	0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	10	14	-	-	1.4	9.9	31	15	2.77	-	0.06	51.2
8.20	18.7	26.3	81.0	0.4	0.4	2.0	4	clayy SILT to silty CLAY	115	2.0	9	13	-	-	1.3	9.9	33	15	2.78	-	0.06	51.2
8.37	16.7	26.8	87.3	0.4	0.4	2.3	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.2	9.9	35	15	2.61	-	0.05	51.2
8.53	12.7	20.4	-	0.5	0.4	3.8	3	silty CLAY to CLAY	115	1.5	8	14	-	-	0.9	9.9	47	15	-	-	0.05	-
8.69	12.4	19.9	-	0.5	0.4	4.0	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	49	15	-	-	0.05	-
8.86	13.7	22.0	-	0.8	0.4	6.0	3	silty CLAY to CLAY	115	1.5	9	15	-	-	0.9	9.9	54	15	-	-	0.05	-
9.02	16.7	26.8	-	1.0	0.4	6.4	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	51	15	-	-	0.05	-
9.19	14.8	23.8	-	1.0	0.4	7.1	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	56	15	-	-	0.05	-
9.35	13.7	21.9	-	0.9	0.4	6.6	3	silty CLAY to CLAY	115	1.5	9	15	-	-	0.9	9.9	56	15	-	-	0.05	-
9.51	14.5	23.3	-	0.9	0.3	6.1	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	53	15	-	-	0.05	-
9.68	15.2	24.4	-	0.9	0.3	6.0	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	52	15	-	-	0.05	-
9.84	12.8	20.5	-	0.8	-0.4	6.5	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	57	15	-	-	0.05	-
10.01	11.8	19.0	-	0.7	-1.4	6.3	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	58	15	-	-	0.05	-
10.17	11.2	17.9	-	0.7	-1.7	6.2	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.5	59	15	-	-	0.05	-
10.34	12.1	19.4	-	0.6	-1.7	5.5	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	55	15	-	-	0.05	-
10.50	10.8	17.4	-	0.7	-1.7	6.7	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.7	8.9	62	15	-	-	0.05	-
10.66	10.9	17.4	-	0.6	-1.7	6.3	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.7	8.8	60	15	-	-	0.05	-
10.83	8.6	13.7	-	0.5	-2.1	6.7	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	6.8	68	15	-	-	0.05	-
10.99	7.2	11.3	-	0.4	-2.5	6.0	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	5.5	71	15	-	-	0.05	-
11.16	7.2	11.1	-	0.4	-2.5	6.4	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	5.5	72	15	-	-	0.05	-
11.32	11.5	17.5	-	0.5	-2.8	4.4	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	8.9	54	15	-	-	0.05	-
11.48	7.5	11.2	-	0.6	-5.2	9.0	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	5.6	80	15	-	-	0.05	-
11.65	7.7	11.5	-	0.5	-5.5	6.6	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	5.7	72	15	-	-	0.05	-
11.81	6.8	10.0	-	0.4	-5.5	6.8	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	4.9	77	15	-	-	0.05	-
11.98	7.0	10.0	-	0.4	-5.5	7.1	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	5.0	78	15	-	-	0.05	-
12.14	7.6	10.8	-	0.4	-5.5	6.4	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	5.4	73	15	-	-	0.05	-
12.30	9.4	13.3	-	0.5	-5.5	6.1	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	6.8	67	15	-	-	0.05	-
12.47	9.0	12.5	-	0.6	-5.5	7.5	3	silty CLAY to CLAY	115	1.5	6	8	-	-	0.6	6.4	73	15	-	-	0.05	-
12.63	11.2	15.4	-	0.7	-5.6	6.4	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.8	8.0	64	15	-	-	0.05	-
12.80	11.9	16.1	-	0.7	-5.7	5.9	3	silty CLAY to CLAY	115	1.5	8	11	-	-	0.8	8.4	61	15	-	-	0.05	-
12.96	11.0	14.7	-	0.7	-5.7	7.1	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	7.7	67	15	-	-	0.05	-
13.12	9.9	13.0	-	0.7	-5.7	7.8	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	6.7	72	15	-	-	0.05	-
13.29	12.1	15.7	-	0.7	-5.8	6.3	3	silty CLAY to CLAY	115	1.5	8	10	-	-	0.8	8.3	63	15	-	-	0.05	-
13.45	11.6	14.9	-	0.7	-5.8	6.5	3	silty CLAY to CLAY	115	1.5	8	10	-	-	0.8	7.8	65	15	-	-	0.05	-
13.62	10.3	13.1	-	0.7	-5.8	7.0	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	6.8	70	15	-	-	0.05	-
13.78	9.8	12.3	-	0.8	-5.8	8.9	3	silty CLAY to CLAY	115	1.5	7	8	-	-	0.7	6.4	77	15	-	-	0.05	-
13.94	11.9	14.8	-	0.8	-5.8	7.3	3	silty CLAY to CLAY	115	1.5	8	10	-	-	0.8	7.8	67	15	-	-	0.05	-
14.11	10.9	13.3	-	0.7	-5.9	7.2	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	7.0	70	15	-	-	0.05	-
14.27	11.0	13.4	-	0.8	-5.9	7.6	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	7.1	71	15	-	-	0.05	-
14.44	14.1	16.9	-	1.0	-5.9	7.9	3	silty CLAY to CLAY	115	1.5	9	11	-	-	1.0	9.1	66	15	-	-	0.05	-
14.60	18.2	21.6	-	1.1	-5.9	6.6	3	silty CLAY to CLAY	115	1.5	12	14	-	-	1.3	9.9	56	15	-	-	0.05	-
14.76	13.7	16.0	-	1.0	-5.9	7.6	3	silty CLAY to CLAY	115	1.5	9	11	-	-	0.9	8.6	66	15	-	-	0.05	-
14.93	12.7	14.7	-	0.8	-5.9	7.0	3	silty CLAY to CLAY	115	1.5	8	10	-	-	0.9	7.9	67	15	-	-	0.05	-
15.09	16.9	19.4	-	0.9	-5.9	5.3	3	silty CLAY to CLAY	115	1.5	11	13	-	-	1.2	9.9	55	15	-	-	0.05	-
15.26	15.7	17.6	-	1.0	-5.9	6.5	3	silty CLAY to CLAY	115	1.5	10	12	-	-	1.1	9.7	60	15	-	-	0.05	-
15.42	13.5	15.2	-	0.9	-5.9	7.1	3	silty CLAY to CLAY	115	1.5	9	10	-	-	0.9	8.2	66	15	-	-	0.05	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic -	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
15.58	12.4	13.7	-	0.9	-5.8	7.7	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	7.4	71	15	-	-	0.05	-
15.75	12.5	13.8	-	0.9	-5.8	8.1	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	7.4	72	15	-	-	0.05	-
15.91	15.1	16.5	-	1.2	-5.8	8.4	3	silty CLAY to CLAY	115	1.5	10	11	-	-	1.0	9.0	68	15	-	-	0.05	-
16.08	25.3	27.3	-	1.8	-5.8	7.4	3	silty CLAY to CLAY	115	1.5	17	18	-	-	1.8	9.9	54	15	-	-	0.05	-
16.24	159.9	160.3	169.8	1.4	-5.0	0.9	6	clean SAND to silty SAND	125	5.0	32	32	83	46	-	-	7	16	0.00	-	0.05	0.0
16.40	128.0	127.7	160.7	2.0	0.6	1.6	6	clean SAND to silty SAND	125	5.0	26	26	75	45	-	-	12	16	0.00	-	0.05	0.0
16.57	82.8	82.1	129.3	1.5	0.6	1.9	5	silty SAND to sandy SILT	120	4.0	21	21	61	43	-	-	18	16	1.83	-	0.05	22.2
16.73	37.0	38.2	-	1.5	0.7	4.1	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.6	9.9	37	15	-	-	0.05	-
16.90	22.4	22.9	-	1.5	0.7	6.9	3	silty CLAY to CLAY	115	1.5	15	15	-	-	1.5	9.9	56	15	-	-	0.05	-
17.06	20.5	20.8	-	1.1	0.7	5.8	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.4	9.9	55	15	-	-	0.05	-
17.23	18.0	18.1	-	1.0	0.7	6.1	3	silty CLAY to CLAY	115	1.5	12	12	-	-	1.2	9.9	59	15	-	-	0.05	-
17.39	17.4	17.3	-	1.0	0.7	6.2	3	silty CLAY to CLAY	115	1.5	12	12	-	-	1.2	9.6	60	15	-	-	0.05	-
17.55	16.1	15.9	-	1.1	0.7	7.5	3	silty CLAY to CLAY	115	1.5	11	11	-	-	1.1	8.8	66	15	-	-	0.05	-
17.72	17.9	17.5	-	1.3	0.7	7.6	3	silty CLAY to CLAY	115	1.5	12	12	-	-	1.2	9.8	64	15	-	-	0.05	-
17.88	21.0	20.3	-	1.0	0.7	4.8	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.4	9.9	52	15	-	-	0.05	-
18.05	16.4	15.7	-	1.0	0.6	6.3	3	silty CLAY to CLAY	115	1.5	11	10	-	-	1.1	8.7	63	15	-	-	0.05	-
18.21	25.0	23.7	-	1.8	0.0	7.7	3	silty CLAY to CLAY	115	1.5	17	16	-	-	1.7	9.9	57	15	-	-	0.05	-
18.37	67.8	63.8	158.5	2.4	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	34	32	-	-	4.7	9.9	28	15	0.58	-	0.05	4.1
18.54	41.9	39.0	-	2.3	0.6	5.6	3	silty CLAY to CLAY	115	1.5	28	26	-	-	2.9	9.9	42	15	-	-	0.05	-
18.70	28.6	26.4	-	1.3	0.6	4.8	3	silty CLAY to CLAY	115	1.5	19	18	-	-	2.0	9.9	47	15	-	-	0.05	-
18.87	23.8	21.8	-	0.9	0.6	4.1	3	silty CLAY to CLAY	115	1.5	16	15	-	-	1.6	9.9	48	15	-	-	0.05	-
19.03	20.9	19.0	-	0.8	0.6	4.1	3	silty CLAY to CLAY	115	1.5	14	13	-	-	1.4	9.9	50	15	-	-	0.05	-
19.19	21.1	19.0	-	1.1	0.6	5.3	3	silty CLAY to CLAY	115	1.5	14	13	-	-	1.4	9.9	55	15	-	-	0.05	-
19.36	25.9	23.1	-	1.2	0.6	4.9	3	silty CLAY to CLAY	115	1.5	17	15	-	-	1.8	9.9	50	15	-	-	0.05	-
19.52	78.1	71.4	137.9	1.9	0.5	2.5	5	silty SAND to sandy SILT	120	4.0	20	18	56	42	-	-	22	16	1.56	-	0.05	24.2
19.69	80.1	72.9	174.5	3.0	0.5	3.8	4	clayy SILT to silty CLAY	115	2.0	40	36	-	-	5.6	9.9	27	15	0.00	-	0.04	0.0
19.85	63.5	57.5	170.8	2.8	0.5	4.5	4	clayy SILT to silty CLAY	115	2.0	32	29	-	-	4.4	9.9	32	15	0.00	-	0.04	0.0
20.01	41.4	35.7	-	2.1	0.5	5.2	3	silty CLAY to CLAY	115	1.5	28	24	-	-	2.9	9.9	42	15	-	-	0.04	-
20.18	31.7	27.2	-	1.4	0.5	4.5	3	silty CLAY to CLAY	115	1.5	21	18	-	-	2.2	9.9	45	15	-	-	0.04	-
20.34	21.8	18.5	-	1.0	0.5	4.9	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	9.9	54	15	-	-	0.04	-
20.51	19.9	16.8	-	0.8	0.5	4.5	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.4	9.6	55	15	-	-	0.04	-
20.67	16.9	14.1	-	0.7	0.5	4.5	3	silty CLAY to CLAY	115	1.5	11	9	-	-	1.1	8.0	59	15	-	-	0.04	-
20.83	14.7	12.2	-	0.6	0.5	4.8	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.8	64	15	-	-	0.04	-
21.00	14.6	12.0	-	0.6	0.5	4.5	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.7	63	15	-	-	0.04	-
21.16	22.0	18.0	-	1.2	0.5	5.6	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	9.9	57	15	-	-	0.04	-
21.33	41.2	33.4	-	1.6	0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	2.9	9.9	39	15	-	-	0.04	-
21.49	41.1	33.1	-	1.7	0.2	4.3	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	2.9	9.9	41	15	-	-	0.04	-
21.65	37.1	29.6	-	1.7	0.0	4.7	3	silty CLAY to CLAY	115	1.5	25	20	-	-	2.6	9.9	44	15	-	-	0.04	-
21.82	39.7	31.5	-	1.8	-0.1	4.6	3	silty CLAY to CLAY	115	1.5	26	21	-	-	2.8	9.9	42	15	-	-	0.04	-
21.98	38.4	30.2	-	1.6	-0.2	4.4	3	silty CLAY to CLAY	115	1.5	26	20	-	-	2.7	9.9	43	15	-	-	0.04	-
22.15	42.5	33.2	-	1.9	-0.2	4.6	3	silty CLAY to CLAY	115	1.5	28	22	-	-	3.0	9.9	41	15	-	-	0.04	-
22.31	47.0	36.5	-	2.0	-0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	24	18	-	-	3.3	9.9	39	15	-	-	0.04	-
22.47	42.0	32.3	-	2.2	-0.3	5.4	3	silty CLAY to CLAY	115	1.5	28	22	-	-	2.9	9.9	45	15	-	-	0.04	-
22.64	40.6	31.0	-	1.8	-0.6	4.5	3	silty CLAY to CLAY	115	1.5	27	21	-	-	2.8	9.9	42	15	-	-	0.04	-
22.80	29.6	22.5	-	1.5	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	20	15	-	-	2.0	9.9	51	15	-	-	0.04	-
22.97	26.0	19.6	-	1.1	-0.6	4.3	3	silty CLAY to CLAY	115	1.5	17	13	-	-	1.8	9.9	51	15	-	-	0.04	-
23.13	27.7	20.7	-	1.2	-0.6	4.5	3	silty CLAY to CLAY	115	1.5	18	14	-	-	1.9	9.9	50	15	-	-	0.04	-
23.30	31.6	23.5	-	1.2	-0.6	4.0	3	silty CLAY to CLAY	115	1.5	21	16	-	-	2.2	9.9	46	15	-	-	0.04	-
23.46	26.1	19.3	-	1.1	-0.6	4.6	3	silty CLAY to CLAY	115	1.5	17	13	-	-	1.8	9.9	52	15	-	-	0.04	-
23.62	28.1	20.6	-	1.0	-0.6	3.7	3	silty CLAY to CLAY	115	1.5	19	14	-	-	1.9	9.9	47	15	-	-	0.04	-
23.79	28.3	20.6	-	1.0	-0.6	3.9	3	silty CLAY to CLAY	115	1.5	19	14	-	-	2.0	9.9	48	15	-	-	0.04	-
23.95	31.4	22.7	-	1.0	-0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	16	11	-	-	2.2	9.9	44	15	-	-	0.04	-
24.12	29.0	20.8	-	1.0	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	19	14	-	-	2.0	9.9	47	15	-	-	0.04	-
24.28	22.9	16.3	-	0.9	-0.6	4.3	3	silty CLAY to CLAY	115	1.5	15	11	-	-	1.6	9.6	55	15	-	-	0.04	-
24.44	18.2	12.9	-	0.8	-0.6	4.5	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.4	61	15	-	-	0.04	-
24.61	18.4	13.0	-	0.8	-0.6	4.5	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.5	61	15	-	-	0.04	-
24.77	22.5	15.7	-	0.9	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.5	9.2	56	15	-	-	0.04	-
24.94	24.3	16.8	-	1.1	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	16	11	-	-	1.7	9.9	56	15	-	-	0.04	-
25.10	25.0	17.2	-	1.4	-0.6	5.9	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	9.9	59	15	-	-	0.04	-
25.26	30.9	21.2	-	1.1	-1.0	3.7	3	silty CLAY to CLAY	115	1.5	21	14	-	-	2.1	9.9	46	15	-	-	0.04	-
25.43	74.5	59.7	177.2	3.4	-1.0	4.6	4	clayy SILT to silty CLAY	115	2.0	37	30	-	-	5.2	9.9	32	15	0.00	-	0.04	0.0
25.59	234.5	187.3	226.7	4.5	0.3	1.9	6	clean SAND to silty SAND	125	5.0	47	37	88	46	-	-	11	16	0.00	-	0.04	0.0
25.76	229.6	182.8	206.8	3.3	0.7	1.4	6	clean SAND to silty SAND	125	5.0	46	37	87	46	-	-	9	16	0.00	-	0.04	0.0
25.92	290.5	230.5	230.5	2.2	0.7	0.7	6	clean SAND to silty SAND	125	5.0	58	46	95	47	-	-	5	16	0.00	-	0.04	0.0
26.08	305.9	241.9	241.9	2.3	0.6	0.8	6	clean SAND to silty SAND	125	5.0	61	48	95	47	-	-	5	16	0.00	-	0.04	0.0
26.25	239.6	188.8	210.6	3.3	0.7	1.4	6	clean SAND to silty SAND	125	5.0	48	38	88	46	-	-	8	16	0.00	-	0.04	0.0
26.41	230.4	180.9	199.8	2.9	0.8	1.3	6	clean SAND to silty SAND	125	5.0	46	36	87	46	-	-	8	16	0.00	-	0.04	0.0
26.58	225.3	176.4	176.4	1.4	0.8	0.6	6	clean SAND to silty SAND	125	5.0	45	35	86	46	-	-	5	16	0.00	-	0.04	0.0
26.74	200.1	156.1	162.7	1.6	0.8	0.8	6	clean SAND to silty SAND	125	5.0	40	31	82	45	-	-	6	16	0.00	-	0.04	0.0
26.90	311.3	242.1	242.1	1.9	0.8	0.6	6	clean SAND to silty SAND	125	5.0	62	48	95	47	-	-	5	16	0.00	-	0.04	0.0
27.07	163.3	126.6	145.7	1.7	1.0	1.1	6	clean SAND to silty SAND	125	5.0	33	25	75	44	-	-	9	16	1.49	-	0.04	8.4
27.23	75.6	58.4	112.1	1.5	1.1	2.0	5	silty SAND to sandy SILT	120	4.0	19	15	49	40	-	-	22	16	2.13	-	0.04	35.4
27.40	35.3	22.2	-	1.3	1.1	3.9	3	silty CLAY to CLAY	115	1.5	24	15	-	-	2.4	9.9	46	15	-	-	0.04	-
27.56	25.3	15.8	-	0.9	1.1	3.9	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	9.3	54	15	-	-	0.04	-
27.72	24.6	15.3	-	0.7	1.1	3.0	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.7	9.0	50	15	-	-	0.04	-
27.89	20.3	12.5	-	0.8	1.1	4.1	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	7.3	60	15	-	-	0.04	-
28.05	18.7	11.5	-	0.6	0.9	3.6	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.3	6.6	60	15	-	-	0.04	-
28.22	18.2	11.1	-	0.5	0.1	3.0	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	6.4	58	15	-	-	0.04	-
28.38	15.1	9.2	-	0.4	0.0	3.3	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	5.2	65	15	-	-	0.04	-
28.54	14.7	8.9	-	0.5	0.0	4.2	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	5.0	71	15	-	-	0.04	-
28.71	17.3	10.4	-	0.6	-0.1	3.7	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	5.9	63	15	-	-	0.04	-
28.87	16.4	9.8	-	0.5	-0.1	3.7	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	5.6	65	15	-	-	0.04	-
29.04	15.4	9.2	-	0.5	-0.1	3.9	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	5.2	68	15	-	-	0.04	-
29.20	14.7	8.7	-	0.7	-0.2	5.2	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.9	75	15	-	-	0.04	-
29.36	18.6	10.9	-	0.6	-0.2	3.3	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	6.3	60	15	-	-	0.04	-
29.53	23.1	13.5	-	0.5	-0.2	2.5	4	clayy SILT to silty CLAY	115	2.0	12	7	-	-	1.6	7.9	50	15	-	-	0.04	-
29.69	28.4	16.5	-	0.9	-0.3	3.3	3	silty CLAY to CLAY	115	1.5	19	11	-	-	1.9	9.9	50	15	-	-	0.04	-
29.86	39.6	22.9	-	1.5	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.7	9.9	46	15	-	-	0.04	-
30.02	38.8	22.3	-	1.7	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.7	9.9	49	15	-	-	0.04	-
30.19	26.9	15.4	-	1.5	-0.6	6.0	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	9.2	62	15	-	-	0.04	-
30.35	24.6	14.0	-	1.6	-0.6	7.0	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.7	8.3	68	15	-	-	0.04	-
30.51	39.2	22.1	-	1.6	-1.2	4.3	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.7	9.9	48	15	-	-	0.04	-
30.68	41.3	23.2	-	1.7	-4.3	4.4	3	silty CLAY to CLAY	115	1.5	28	15	-	-	2.9	9.9	47	15	-	-	0.04	-
30.84	25.4	14.2	-	1.3	-5.6	5.3	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.4	62	15	-	-	0.04	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-[illegible]
Project No: 11-[illegible]
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn
31.01	35.7	19.8	-	1.4	-5.9	4.1	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	50	15	-	-	0.04	-
31.17	49.2	27.2	-	1.4	-5.8	2.9	4	clayy SILT to silty CLAY	115	2.0	25	14	-	-	3.4	9.9	38	15	-	-	0.04	-
31.33	24.8	13.7	-	1.3	-5.8	5.8	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.1	65	15	-	-	0.04	-
31.50	15.3	8.4	-	1.0	-6.8	7.1	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.7	83	15	-	-	0.04	-
31.66	16.2	8.8	-	0.8	-6.8	5.5	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	5.0	76	15	-	-	0.04	-
31.83	15.5	8.4	-	0.7	-6.8	5.3	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.7	77	15	-	-	0.04	-
31.99	14.8	8.0	-	0.7	-6.8	5.8	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.5	80	15	-	-	0.04	-
32.15	16.1	8.6	-	0.8	-6.8	5.9	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.9	78	15	-	-	0.04	-
32.32	19.5	10.4	-	0.8	-6.8	4.7	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	6.1	68	15	-	-	0.04	-
32.48	19.3	10.3	-	1.0	-6.8	5.6	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	5.9	72	15	-	-	0.04	-
32.65	20.0	10.6	-	0.9	-6.8	4.9	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	6.2	68	15	-	-	0.04	-
32.81	16.2	8.5	-	0.8	-6.8	5.4	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.8	77	15	-	-	0.04	-
32.97	18.0	9.4	-	0.9	-6.8	5.6	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	5.4	74	15	-	-	0.04	-
33.14	20.8	10.8	-	1.0	-6.8	5.6	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.3	70	15	-	-	0.04	-
33.30	18.3	9.5	-	1.0	-7.1	6.3	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	5.5	77	15	-	-	0.04	-
33.47	15.2	7.8	-	0.9	-7.3	7.0	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.4	85	15	-	-	0.04	-
33.63	14.0	7.2	-	0.8	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	4.0	86	15	-	-	0.04	-
33.79	15.0	7.7	-	0.8	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.3	84	15	-	-	0.04	-
33.96	19.9	10.1	-	1.2	-7.7	6.6	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	5.9	76	15	-	-	0.04	-
34.12	16.8	8.5	-	1.2	-7.8	7.8	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.8	85	15	-	-	0.04	-
34.29	15.0	7.6	-	1.0	-7.8	7.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.2	89	15	-	-	0.04	-
34.45	14.3	7.2	-	0.9	-7.8	7.3	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	4.0	89	15	-	-	0.04	-
34.61	13.5	6.7	-	0.7	-7.8	6.1	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	3.7	87	15	-	-	0.04	-
34.78	13.1	6.5	-	0.7	-7.8	6.2	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	3.5	89	15	-	-	0.04	-
34.94	13.8	6.8	-	0.7	-7.8	6.1	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	3.8	87	15	-	-	0.04	-
35.11	16.3	8.0	-	1.1	-7.7	7.5	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.5	86	15	-	-	0.04	-
35.27	18.1	8.8	-	1.4	-7.7	8.7	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	5.1	86	15	-	-	0.04	-
35.43	17.9	8.7	-	1.4	-7.7	8.7	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	5.0	87	15	-	-	0.04	-
35.60	19.0	9.2	-	1.3	-7.7	7.5	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.3	81	15	-	-	0.04	-
35.76	20.0	9.7	-	1.1	-7.7	6.2	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.6	76	15	-	-	0.04	-
35.93	17.8	8.6	-	1.1	-7.7	7.0	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.9	82	15	-	-	0.04	-
36.09	15.7	7.5	-	1.0	-7.7	7.7	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.2	89	15	-	-	0.04	-
36.26	15.9	7.6	-	0.9	-7.7	6.8	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.0	4.3	86	15	-	-	0.04	-
36.42	21.2	10.0	-	1.1	-7.7	5.8	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	73	15	-	-	0.04	-
36.58	27.0	12.8	-	1.3	-7.7	5.0	3	silty CLAY to CLAY	115	1.5	18	9	-	-	1.8	7.6	64	15	-	-	0.04	-
36.75	19.0	8.9	-	1.2	-7.7	7.0	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.1	81	15	-	-	0.04	-
36.91	15.3	7.2	-	1.0	-7.7	8.0	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.0	91	15	-	-	0.04	-
37.08	18.2	8.5	-	1.2	-7.7	7.3	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.9	83	15	-	-	0.04	-
37.24	21.1	9.8	-	1.1	-7.7	5.7	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.7	74	15	-	-	0.04	-
37.40	20.3	9.4	-	1.2	-7.7	6.5	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.4	78	15	-	-	0.04	-
37.57	24.4	11.2	-	1.2	-7.7	5.3	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.7	68	15	-	-	0.04	-
37.73	20.7	9.5	-	1.1	-7.7	6.0	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	76	15	-	-	0.04	-
37.90	18.3	8.3	-	1.0	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.8	81	15	-	-	0.04	-
38.06	16.3	7.4	-	0.9	-7.6	6.6	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.2	86	15	-	-	0.04	-
38.22	13.9	6.3	-	0.9	-7.6	7.7	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	3.4	95	15	-	-	0.04	-
38.39	14.6	6.6	-	0.9	-7.6	7.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.6	92	15	-	-	0.04	-
38.55	16.4	7.3	-	1.0	-7.6	6.8	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.1	87	15	-	-	0.04	-
38.72	18.9	8.4	-	0.9	-7.6	5.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	4.9	78	15	-	-	0.04	-
38.88	17.7	7.9	-	0.9	-7.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.5	81	15	-	-	0.04	-
39.04	15.6	6.9	-	0.9	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	3.9	88	15	-	-	0.04	-
39.21	16.8	7.4	-	0.9	-7.6	5.9	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.2	83	15	-	-	0.04	-
39.37	17.0	7.5	-	0.9	-7.6	6.0	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.2	83	15	-	-	0.04	-
39.54	22.3	9.7	-	1.0	-7.6	5.2	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.7	72	15	-	-	0.04	-
39.70	19.2	8.3	-	1.1	-7.6	6.8	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	4.8	82	15	-	-	0.04	-
39.86	19.1	8.3	-	1.0	-7.6	6.2	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	4.8	81	15	-	-	0.04	-
40.03	17.7	7.7	-	0.9	-7.6	5.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.4	82	15	-	-	0.04	-
40.19	16.5	7.1	-	0.9	-7.6	6.2	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.0	86	15	-	-	0.04	-
40.36	15.6	6.7	-	0.9	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.7	89	15	-	-	0.04	-
40.52	16.3	7.0	-	0.9	-7.6	6.2	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	3.9	86	15	-	-	0.04	-
40.68	15.9	6.8	-	0.9	-7.6	6.5	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.0	3.8	89	15	-	-	0.04	-
40.85	19.0	8.0	-	1.0	-7.6	6.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.6	81	15	-	-	0.04	-
41.01	19.5	8.2	-	1.1	-7.6	6.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.7	81	15	-	-	0.04	-
41.18	22.5	9.4	-	1.3	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.5	77	15	-	-	0.04	-
41.34	28.0	11.7	-	1.5	-7.6	5.7	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.0	68	15	-	-	0.04	-
41.50	21.2	8.8	-	1.3	-7.5	6.7	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.2	80	15	-	-	0.04	-
41.67	17.0	7.1	-	0.9	-7.5	6.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.0	87	15	-	-	0.04	-
41.83	20.8	8.6	-	1.1	-7.6	5.9	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.0	79	15	-	-	0.04	-
42.00	22.4	9.2	-	1.2	-7.5	6.2	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	77	15	-	-	0.04	-
42.16	22.5	9.2	-	1.3	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	78	15	-	-	0.04	-
42.32	28.4	11.6	-	1.4	-7.5	5.3	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.0	67	15	-	-	0.04	-
42.49	26.8	10.9	-	1.5	-7.5	6.0	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.5	72	15	-	-	0.04	-
42.65	24.4	9.9	-	1.3	-7.5	6.1	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	5.9	75	15	-	-	0.04	-
42.82	22.8	9.2	-	1.2	-7.5	5.7	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	75	15	-	-	0.04	-
42.98	21.5	8.7	-	1.2	-7.5	6.0	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.1	79	15	-	-	0.04	-
43.15	21.4	8.6	-	1.2	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.0	80	15	-	-	0.04	-
43.31	18.7	7.5	-	1.0	-7.5	6.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.3	85	15	-	-	0.04	-
43.47	15.2	6.1	-	0.9	-7.5	7.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.3	95	15	-	-	0.04	-
43.64	16.5	6.5	-	0.9	-7.5	6.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.7	89	15	-	-	0.04	-
43.80	15.3	6.0	-	0.7	-7.5	5.9	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.3	90	15	-	-	0.04	-
43.97	15.9	6.3	-	1.0	-7.5	7.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.5	95	15	-	-	0.04	-
44.13	28.8	11.3	-	1.3	-7.5	4.9	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	6.8	66	15	-	-	0.04	-
44.29	21.0	8.2	-	1.3	-7.5	7.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.8	84	15	-	-	0.04	-
44.46	20.9	8.1	-	1.3	-7.5	7.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.7	84	15	-	-	0.04	-
44.62	25.4	9.8	-	1.4	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.8	76	15	-	-	0.04	-
44.79	22.6	8.7	-	1.3	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.1	79	15	-	-	0.04	-
44.95	24.8	9.5	-	1.0	-7.5	4.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.6	70	15	-	-	0.04	-
45.11	22.5	8.6	-	1.1	-7.5	5.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.1	77	15	-	-	0.04	-
45.28	19.5	7.4	-	1.0	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	83	15	-	-	0.04	-
45.44	16.8	6.4	-	0.8	-7.5	5.9	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.6	88	15	-	-	0.04	-
45.61	17.1	6.5	-	0.9	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.6	89	15	-	-	0.04	-
45.77	29.6	11.2	-	1.3	-7.5	4.8	3	silty CLAY to CLAY	115	1.5	20	7	-	-	2.0	6.8	66	15	-	-	0.04	-
45.93	36.8	13.9	-	1.6	-7.5	4.8	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	8.5	61	15	-	-	0.04	-
46.10	31.9	12.0	-	1.8	-7.5	6.2	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	7.3	69	15	-	-	0.04	-
46.26	34.3	13.0	-	1.7	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.9	65	15	-	-	0.04	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic -	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
46.43	24.7	9.3	-	1.5	-7.5	6.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.7	5.4	79	15	-	-	0.04	-
46.59	20.7	7.8	-	1.2	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.4	84	15	-	-	0.04	-
46.75	19.0	7.2	-	1.1	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	4.0	87	15	-	-	0.04	-
46.92	19.6	7.4	-	0.9	-7.5	5.6	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.1	82	15	-	-	0.04	-
47.08	17.8	6.7	-	1.1	-7.5	7.3	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.7	92	15	-	-	0.04	-
47.25	19.8	7.5	-	1.4	-7.5	8.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.2	91	15	-	-	0.04	-
47.41	31.1	11.7	-	1.4	-7.5	4.9	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	6.9	66	15	-	-	0.04	-
47.57	28.8	10.9	-	1.5	-7.5	5.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.3	71	15	-	-	0.04	-
47.74	25.5	9.6	-	1.3	-7.5	5.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.5	74	15	-	-	0.04	-
47.90	25.2	9.5	-	1.2	-7.5	5.2	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.4	73	15	-	-	0.04	-
48.07	21.1	8.0	-	1.1	-7.5	6.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.4	82	15	-	-	0.04	-
48.23	19.5	7.3	-	1.2	-7.5	7.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.0	88	15	-	-	0.04	-
48.39	23.9	9.0	-	1.3	-7.5	6.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.0	78	15	-	-	0.04	-
48.56	27.4	10.4	-	1.6	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.9	75	15	-	-	0.04	-
48.72	26.7	10.1	-	1.6	-7.5	6.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.6	76	15	-	-	0.04	-
48.89	28.6	10.8	-	1.6	-7.5	6.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.1	72	15	-	-	0.04	-
49.05	33.8	12.7	-	1.6	-7.5	5.2	3	silty CLAY to CLAY	115	1.5	23	8	-	-	2.3	7.3	64	15	-	-	0.04	-
49.22	33.7	12.7	-	1.7	-7.5	5.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	7.2	66	15	-	-	0.04	-
49.38	34.1	12.9	-	1.5	-7.5	5.0	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.3	63	15	-	-	0.04	-
49.54	32.4	12.2	-	1.3	-7.5	4.4	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	62	15	-	-	0.04	-
49.71	23.8	9.0	-	1.3	-7.5	6.1	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.9	78	15	-	-	0.04	-
49.87	27.3	10.3	-	1.5	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.7	74	15	-	-	0.04	-
50.04	27.5	10.4	-	1.5	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.7	74	15	-	-	0.04	-
50.20	26.1	9.8	-	1.4	-7.5	5.9	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.3	74	15	-	-	0.04	-
50.36	28.8	10.9	-	1.2	-7.5	4.8	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.9	67	15	-	-	0.04	-
50.53	32.7	12.3	-	1.3	-7.5	4.3	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.8	62	15	-	-	0.04	-
50.69	33.1	12.5	-	1.6	-7.5	5.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	65	15	-	-	0.04	-
50.86	33.2	12.5	-	1.7	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	67	15	-	-	0.04	-
51.02	35.5	13.4	-	1.6	-7.5	4.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.4	62	15	-	-	0.04	-
51.18	36.8	13.9	-	1.5	-7.5	4.5	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.7	59	15	-	-	0.04	-
51.35	32.5	12.3	-	1.5	-7.5	5.0	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.7	65	15	-	-	0.04	-
51.51	32.8	12.4	-	1.6	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.7	66	15	-	-	0.04	-
51.68	34.4	13.0	-	1.7	-7.5	5.6	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.0	65	15	-	-	0.04	-
51.84	42.8	16.1	-	1.9	-7.5	4.7	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.9	57	15	-	-	0.04	-
52.00	39.9	15.0	-	2.0	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	8.2	61	15	-	-	0.04	-
52.17	43.3	16.3	-	2.1	-7.5	5.3	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.9	59	15	-	-	0.04	-
52.33	38.4	14.5	-	2.3	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	7.8	66	15	-	-	0.04	-
52.50	37.9	14.3	-	2.0	-7.5	5.9	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	7.7	64	15	-	-	0.04	-
52.66	35.4	13.4	-	1.9	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.1	66	15	-	-	0.04	-
52.82	38.7	14.6	-	2.1	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	7.8	63	15	-	-	0.04	-
52.99	52.3	19.7	-	2.7	-7.5	5.5	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	55	15	-	-	0.04	-
53.15	69.9	26.4	-	3.3	-7.5	5.0	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.8	9.9	47	15	-	-	0.04	-
53.32	60.6	22.9	-	3.1	-7.5	5.3	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	51	15	-	-	0.04	-
53.48	44.7	16.9	-	2.4	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.1	9.0	60	15	-	-	0.04	-
53.64	43.1	16.3	-	1.5	-7.5	3.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.7	53	15	-	-	0.04	-
53.81	43.5	16.4	-	1.4	-7.5	3.5	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.7	51	15	-	-	0.04	-
53.97	46.4	17.5	-	1.8	-7.5	4.1	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.3	53	15	-	-	0.04	-
54.14	47.1	17.8	-	1.9	-7.5	4.3	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.4	53	15	-	-	0.04	-
54.30	43.7	16.5	-	2.3	-7.5	5.6	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.7	60	15	-	-	0.04	-
54.46	47.8	18.0	-	2.4	-7.5	5.3	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.5	57	15	-	-	0.04	-
54.63	49.0	18.5	-	2.3	-7.5	5.1	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.8	55	15	-	-	0.04	-
54.79	44.4	16.8	-	2.3	-7.5	5.5	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	8.8	59	15	-	-	0.04	-
54.96	41.4	15.6	-	2.2	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	8.1	62	15	-	-	0.04	-
55.12	43.8	16.5	-	2.2	-7.5	5.5	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.6	59	15	-	-	0.04	-
55.28	50.3	19.0	-	2.3	-7.5	5.0	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	9.9	54	15	-	-	0.04	-
55.45	47.3	17.9	-	2.4	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	9.3	57	15	-	-	0.04	-
55.61	44.0	16.6	-	2.1	-7.5	5.2	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.5	58	15	-	-	0.04	-
55.78	45.8	17.3	-	2.0	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.9	55	15	-	-	0.04	-
55.94	45.8	17.3	-	2.0	-7.6	4.6	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.9	55	15	-	-	0.04	-
56.11	46.1	17.4	-	1.9	-7.6	4.5	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.9	54	15	-	-	0.04	-
56.27	42.9	16.2	-	1.7	-7.5	4.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.2	55	15	-	-	0.04	-
56.43	42.8	16.2	-	1.9	-7.5	4.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.2	57	15	-	-	0.04	-
56.60	40.5	15.3	-	2.0	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.7	61	15	-	-	0.04	-
56.76	42.6	16.1	-	1.8	-7.6	4.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.1	57	15	-	-	0.04	-
56.93	37.2	14.0	-	1.7	-7.5	4.9	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.9	61	15	-	-	0.04	-
57.09	36.7	13.8	-	1.6	-7.6	4.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.8	61	15	-	-	0.04	-
57.25	37.5	14.1	-	1.6	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.0	60	15	-	-	0.04	-
57.42	41.0	15.5	-	1.8	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.7	58	15	-	-	0.04	-
57.58	43.1	16.2	-	2.0	-7.6	4.9	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.1	58	15	-	-	0.04	-
57.75	36.4	13.7	-	1.9	-7.6	5.8	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.7	65	15	-	-	0.04	-
57.91	36.9	13.9	-	1.9	-7.6	5.6	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.8	64	15	-	-	0.04	-
58.07	40.5	15.3	-	1.8	-7.6	4.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.5	59	15	-	-	0.04	-
58.24	38.9	14.7	-	1.6	-7.7	4.4	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	7.1	58	15	-	-	0.04	-
58.40	40.2	15.2	-	1.6	-7.6	4.4	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.4	57	15	-	-	0.04	-
58.57	53.9	20.3	-	2.3	-7.6	4.5	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	51	15	-	-	0.04	-
58.73	69.2	26.1	-	3.4	-7.6	5.1	3	silty CLAY to CLAY	115	1.5	46	17	-	-	4.8	9.9	48	15	-	-	0.04	-
58.89	54.8	20.7	-	3.4	-7.6	6.7	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	58	15	-	-	0.04	-
59.06	48.3	18.2	-	2.6	-7.6	5.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.9	58	15	-	-	0.04	-
59.22	43.2	16.3	-	2.2	-7.6	5.5	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	7.9	60	15	-	-	0.04	-
59.39	42.0	15.8	-	2.6	-7.6	6.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	7.6	64	15	-	-	0.04	-
59.55	51.6	19.5	-	2.9	-7.6	5.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.5	57	15	-	-	0.04	-
59.71	52.9	20.0	-	3.4	-7.6	6.8	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	59	15	-	-	0.04	-
59.88	69.5	26.2	-	3.3	-7.6	5.0	3	silty CLAY to CLAY	115	1.5	46	17	-	-	4.8	9.9	48	15	-	-	0.04	-
60.04	48.6	18.4	-	2.5	-7.6	5.6	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.8	57	15	-	-	0.04	-
60.21	37.8	14.3	-	2.0	-7.6	5.8	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	6.7	64	15	-	-	0.04	-
60.37	38.0	14.4	-	1.6	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	6.7	60	15	-	-	0.04	-
60.53	33.7	12.7	-	1.4	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	5.8	63	15	-	-	0.04	-
60.70	35.9	13.5	-	1.4	-7.6	4.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.3	60	15	-	-	0.04	-
60.86	36.6	13.8	-	1.5	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.4	61	15	-	-	0.04	-
61.03	37.5	14.2	-	1.7	-7.6	5.1	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.5	62	15	-	-	0.04	-
61.19	39.4	14.9	-	1.7	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	6.9	59	15	-	-	0.04	-
61.35	30.7	11.6	-	1.8	-7.6	6.6	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	5.2	73	15	-	-	0.04	-
61.52	44.7	16.9	-	1.9	-7.7	4.7	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	7.8	56	15	-	-	0.04	-
61.68	58.5	22.1	-	1.5	-7.7	2.8	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	42	15	-	-	0.04	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
61.85	63.8	32.8	65.3	0.6	-7.7	0.9	5	silty SAND to sandy SILT	120	4.0	16	8	30	35	-	-	23	16	3.32	-	0.04	51.2
62.01	66.2	34.0	82.2	1.0	-7.7	1.6	5	silty SAND to sandy SILT	120	4.0	17	8	31	35	-	-	27	16	2.74	-	0.03	51.2
62.17	54.1	20.4	-	1.5	-6.9	3.0	4	clayy SILT to silty CLAY	115	2.0	27	10	-	-	3.7	9.5	44	15	-	-	0.03	-
62.34	51.9	19.6	-	1.6	-6.7	3.2	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	9.1	46	15	-	-	0.03	-
62.50	50.2	18.9	-	1.0	-6.5	2.1	4	clayy SILT to silty CLAY	115	2.0	25	9	-	-	3.4	8.7	41	15	-	-	0.03	-
62.67	44.9	16.9	-	1.0	-6.2	2.5	4	clayy SILT to silty CLAY	115	2.0	22	8	-	-	3.0	7.7	46	15	-	-	0.03	-
62.83	43.6	16.5	-	1.8	-5.5	4.5	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.5	56	15	-	-	0.03	-
63.00	47.6	18.0	-	2.2	-5.5	5.1	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	8.2	56	15	-	-	0.03	-
63.16	57.8	21.8	-	2.6	-5.4	4.7	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	50	15	-	-	0.03	-
63.32	64.8	24.4	-	2.6	-5.2	4.3	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.5	9.9	46	15	-	-	0.03	-
63.49	68.5	25.9	-	2.5	-5.2	3.9	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	44	15	-	-	0.03	-
63.65	68.9	26.0	-	2.8	-5.2	4.4	3	silty CLAY to CLAY	115	1.5	46	17	-	-	4.7	9.9	45	15	-	-	0.03	-
63.82	72.2	27.2	-	3.0	-5.2	4.3	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	44	15	-	-	0.03	-
63.98	69.6	26.3	-	3.2	-5.2	4.8	3	silty CLAY to CLAY	115	1.5	46	18	-	-	4.8	9.9	47	15	-	-	0.03	-
64.14	73.3	27.7	-	3.3	-5.2	4.7	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	45	15	-	-	0.03	-
64.31	72.4	27.3	-	3.1	-5.2	4.5	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	45	15	-	-	0.03	-
64.47	72.7	27.4	-	2.9	-5.3	4.2	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	44	15	-	-	0.03	-
64.64	68.9	26.0	-	2.7	-5.3	4.1	3	silty CLAY to CLAY	115	1.5	46	17	-	-	4.7	9.9	44	15	-	-	0.03	-
64.80	81.2	30.6	-	2.9	-5.3	3.7	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.6	9.9	40	15	-	-	0.03	-
64.96	72.0	27.2	-	2.9	-5.3	4.3	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	44	15	-	-	0.03	-
65.13	62.5	23.6	-	2.3	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.03	-
65.29	59.2	22.4	-	2.2	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.1	9.9	47	15	-	-	0.03	-
65.46	54.5	20.6	-	1.9	-5.3	3.8	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.1	48	15	-	-	0.03	-
65.62	54.6	20.6	-	1.8	-5.3	3.6	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.1	47	15	-	-	0.03	-
65.78	53.6	20.2	-	2.0	-5.2	3.9	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.7	8.9	49	15	-	-	0.03	-
65.95	56.5	21.3	-	2.1	-5.2	4.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.4	48	15	-	-	0.03	-
66.11	60.6	22.9	-	2.3	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	47	15	-	-	0.03	-
66.28	73.2	27.6	-	2.7	-5.3	3.9	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.0	9.9	43	15	-	-	0.03	-
66.44	75.0	28.3	-	2.4	-5.3	3.3	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	40	15	-	-	0.03	-
66.60	59.9	22.6	-	1.8	-5.3	3.3	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	44	15	-	-	0.03	-
66.77	58.4	22.1	-	1.5	-5.3	2.8	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.6	42	15	-	-	0.03	-
66.93	60.6	22.9	-	1.6	-5.3	2.8	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.2	9.9	41	15	-	-	0.03	-
67.10	54.2	20.4	-	2.1	-5.3	4.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	8.8	49	15	-	-	0.03	-
67.26	58.1	21.9	-	2.1	-5.3	3.9	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.5	47	15	-	-	0.03	-
67.42	59.5	22.5	-	2.2	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.7	47	15	-	-	0.03	-
67.59	49.9	18.8	-	2.0	-5.3	4.3	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	8.0	52	15	-	-	0.03	-
67.75	41.9	15.8	-	1.8	-5.3	4.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	6.6	58	15	-	-	0.03	-
67.92	48.4	18.3	-	1.8	-5.3	4.1	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	7.7	52	15	-	-	0.03	-
68.08	57.7	21.8	-	2.5	-5.3	4.7	3	silty CLAY to CLAY	115	1.5	38	15	-	-	3.9	9.3	50	15	-	-	0.03	-
68.24	63.4	23.9	-	2.1	-5.3	3.5	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.3	9.9	44	15	-	-	0.03	-
68.41	59.6	22.5	-	2.0	-5.3	3.6	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.6	45	15	-	-	0.03	-
68.57	60.9	23.0	-	2.0	-5.3	3.5	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.2	9.8	45	15	-	-	0.03	-
68.74	62.8	23.7	-	2.4	-5.3	4.1	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.03	-
68.90	57.3	21.6	-	2.4	-5.3	4.5	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.1	50	15	-	-	0.03	-
69.07	57.1	21.6	-	2.4	-5.3	4.5	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.1	50	15	-	-	0.03	-
69.23	58.9	22.2	-	2.6	-5.3	4.8	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.4	50	15	-	-	0.03	-
69.39	57.4	21.7	-	2.4	-5.3	4.6	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.1	50	15	-	-	0.03	-
69.56	60.0	22.6	-	2.2	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.5	47	15	-	-	0.03	-
69.72	52.4	19.8	-	2.0	-5.3	4.2	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	8.2	50	15	-	-	0.03	-
69.89	55.0	20.8	-	2.3	-5.3	4.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	8.6	51	15	-	-	0.03	-
70.05	85.3	32.2	-	2.9	-5.4	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.03	-
70.21	89.8	33.9	-	3.2	-5.3	3.7	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	38	15	-	-	0.03	-
70.38	81.9	30.9	-	2.9	-5.3	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.03	-
70.54	76.1	28.7	-	2.5	-5.3	3.5	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	40	15	-	-	0.03	-
70.71	73.2	27.6	-	2.5	-5.3	3.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.0	9.9	41	15	-	-	0.03	-
70.87	72.7	27.4	-	1.7	-5.3	2.5	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	36	15	-	-	0.03	-
71.03	78.9	29.8	-	2.6	-5.4	3.5	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	40	15	-	-	0.03	-
71.20	68.0	25.6	-	3.1	-5.4	4.8	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.7	9.9	47	15	-	-	0.03	-
71.36	78.5	29.6	-	3.0	-5.3	4.0	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	42	15	-	-	0.03	-
71.53	77.1	29.1	-	3.5	-5.3	4.8	3	silty CLAY to CLAY	115	1.5	51	19	-	-	5.3	9.9	45	15	-	-	0.03	-
71.69	60.0	22.6	-	3.3	-5.3	5.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.2	53	15	-	-	0.03	-
71.85	73.1	27.6	-	3.3	-5.3	4.8	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.0	9.9	46	15	-	-	0.03	-
72.02	89.2	33.7	-	3.3	-5.3	3.9	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	39	15	-	-	0.03	-
72.18	93.1	35.1	-	3.7	-5.4	4.1	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	39	15	-	-	0.03	-
72.35	99.6	37.6	-	4.3	-5.4	4.5	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	39	15	-	-	0.03	-
72.51	101.2	38.2	-	3.9	-5.3	4.0	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.0	9.9	37	15	-	-	0.03	-
72.67	97.1	36.7	-	3.3	-5.3	3.5	4	clayy SILT to silty CLAY	115	2.0	49	18	-	-	6.7	9.9	36	15	-	-	0.03	-
72.84	97.4	46.1	125.3	2.8	-5.3	3.0	4	clayy SILT to silty CLAY	115	2.0	49	23	-	-	6.7	9.9	30	15	1.89	-	0.03	48.7
73.00	95.8	45.3	132.0	3.0	-5.3	3.3	4	clayy SILT to silty CLAY	115	2.0	48	23	-	-	6.6	9.9	32	15	1.63	-	0.02	49.7
73.17	87.6	33.1	-	3.0	-5.3	3.7	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.0	9.9	38	15	-	-	0.02	-
73.33	88.6	33.4	-	3.2	-5.3	3.8	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	39	15	-	-	0.02	-
73.49	86.4	32.6	-	3.1	-5.3	3.8	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	39	15	-	-	0.02	-
73.66	83.3	31.4	-	3.5	-5.3	4.4	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.7	9.9	42	15	-	-	0.02	-
73.82	87.9	33.2	-	3.4	-5.3	4.0	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	40	15	-	-	0.02	-
73.99	90.4	34.1	-	3.6	-5.3	4.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	40	15	-	-	0.02	-
74.15	81.2	30.7	-	3.5	-5.3	4.5	3	silty CLAY to CLAY	115	1.5	54	20	-	-	5.6	9.9	43	15	-	-	0.02	-
74.31	95.2	35.9	-	4.1	-5.5	4.5	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	40	15	-	-	0.02	-
74.48	112.2	42.4	-	4.4	-5.4	4.0	4	clayy SILT to silty CLAY	115	2.0	56	21	-	-	7.8	9.9	36	15	-	-	0.02	-
74.64	104.0	39.3	-	4.1	-5.4	4.1	4	clayy SILT to silty CLAY	115	2.0	52	20	-	-	7.2	9.9	37	15	-	-	0.02	-
74.81	105.2	49.2	137.9	3.4	-5.4	3.4	4	clayy SILT to silty CLAY	115	2.0	53	25	-	-	7.3	9.9	31	15	1.32	-	0.02	40.2
74.97	105.4	49.2	133.1	3.2	-5.4	3.2	4	clayy SILT to silty CLAY	115	2.0	53	25	-	-	7.3	9.9	30	15	1.56	-	0.02	44.7
75.13	102.1	47.6	133.5	3.2	-5.4	3.3	4	clayy SILT to silty CLAY	115	2.0	51	24	-	-	7.1	9.9	31	15	1.53	-	0.02	45.9
75.30	95.7	36.1	-	3.1	-5.4	3.4	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	36	15	-	-	0.01	-
75.46	92.9	35.1	-	3.3	-5.4	3.8	4	clayy SILT to silty CLAY	115	2.0	46	18	-	-	6.4	9.9	38	15	-	-	0.01	-
75.63	90.4	34.1	-	3.8	-5.4	4.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	41	15	-	-	0.01	-
75.79	90.4	34.1	-	4.2	-5.4	4.9	3	silty CLAY to CLAY	115	1.5	60	23	-	-	6.2	9.9	42	15	-	-	0.01	-
75.96	94.0	35.5	-	3.2	-5.4	3.6	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.01	-
76.12	86.9	32.8	-	3.5	-5.4	4.2	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	41	15	-	-	0.01	-
76.28	81.6	30.8	-	3.4	-5.4	4.3	3	silty CLAY to CLAY	115	1.5	54	21	-	-	5.6	9.9	42	15	-	-	0.01	-
76.45	81.7	30.8	-	3.6	-5.4	4.6	3	silty CLAY to CLAY	115	1.5	54	21	-	-	5.6	9.9	43	15	-	-	0.01	-
76.61	99.7	37.6	-	3.6	-5.4	3.8	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	37	15	-	-	0.01	-
76.78	99.3	37.5	-	3.6	-5.4	3.8	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	37	15	-	-	0.01	-
76.94	96.7	36.5	-	3.6	-5.4	3.9	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	38	15	-	-	0.01	-
77.10	90.7	34.2	-	3.4	-5.4	4.0	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	39	15	-	-	0.01	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
77.27	88.9	33.5	-	4.0	-5.4	4.8	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	42	15	-	-	0.01	-
77.43	109.9	41.5	-	4.3	-5.4	4.1	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	36	15	-	-	0.01	-
77.60	99.8	37.7	-	4.7	-5.5	5.0	3	silty CLAY to CLAY	115	1.5	67	25	-	-	6.9	9.9	41	15	-	-	0.01	-
77.76	113.9	43.0	-	4.6	-5.5	4.2	4	clayy SILT to silty CLAY	115	2.0	57	21	-	-	7.9	9.9	36	15	-	-	0.01	-
77.92	115.3	43.5	-	4.6	-5.5	4.1	4	clayy SILT to silty CLAY	115	2.0	58	22	-	-	8.0	9.9	36	15	-	-	0.01	-
78.09	116.4	53.2	152.0	4.2	-5.5	3.8	4	clayy SILT to silty CLAY	115	2.0	58	27	-	-	8.1	9.9	31	15	0.67	-	0.01	22.6
78.25	116.4	53.2	153.3	4.3	-5.4	3.8	4	clayy SILT to silty CLAY	115	2.0	58	27	-	-	8.1	9.9	32	15	0.61	-	0.01	22.3
78.42	112.2	42.3	-	4.3	-5.4	4.0	4	clayy SILT to silty CLAY	115	2.0	56	21	-	-	7.8	9.9	35	15	-	-	0.01	-
78.58	109.6	41.3	-	4.0	-5.4	3.9	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	35	15	-	-	0.01	-
78.74	103.6	39.1	-	3.8	-5.4	3.9	4	clayy SILT to silty CLAY	115	2.0	52	20	-	-	7.2	9.9	36	15	-	-	0.01	-
78.91	102.7	46.7	135.6	3.3	-5.4	3.4	4	clayy SILT to silty CLAY	115	2.0	51	23	-	-	7.1	9.9	32	15	1.39	-	0.01	45.7
79.07	105.6	48.0	136.2	3.4	-5.4	3.4	4	clayy SILT to silty CLAY	115	2.0	53	24	-	-	7.3	9.9	31	15	1.37	-	0.01	43.0
79.24	99.7	37.6	-	3.4	-5.4	3.6	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	36	15	-	-	0.01	-
79.40	102.8	46.7	137.7	3.4	-5.4	3.5	4	clayy SILT to silty CLAY	115	2.0	51	23	-	-	7.1	9.9	32	15	1.28	-	0.01	45.1
79.56	106.3	48.2	134.7	3.3	-5.5	3.3	4	clayy SILT to silty CLAY	115	2.0	53	24	-	-	7.4	9.9	31	15	1.45	-	0.01	43.8
79.73	106.4	48.2	130.8	3.2	-5.5	3.1	4	clayy SILT to silty CLAY	115	2.0	53	24	-	-	7.4	9.9	30	15	1.66	-	0.00	46.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
0.33	13.9	22.3	-	2.0	0.3	9.9	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	63	15	N/A	0.00	N/A	N/A
0.49	18.1	29.1	-	1.5	0.3	8.3	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	54	15	N/A	0.00	N/A	N/A
0.66	10.4	16.6	-	0.6	0.2	6.0	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	59	15	N/A	0.00	N/A	N/A
0.82	9.7	15.5	-	0.1	0.2	1.2	4	clayy SILT to silty CLAY	115	2.0	5	8	-	-	0.7	9.9	36	15	N/A	0.00	N/A	N/A
0.98	4.6	7.4	-	0.2	0.2	5.1	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	76	15	N/A	0.00	N/A	N/A
1.15	10.7	17.1	-	1.2	0.3	9.9	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.8	9.9	69	15	N/A	0.00	N/A	N/A
1.31	62.5	100.2	179.6	1.9	0.3	3.0	5	silty SAND to sandy SILT	120	4.0	16	25	67	48	-	-	21	16	N/A	0.00	N/A	N/A
1.48	45.0	72.1	155.0	1.4	0.3	3.2	5	silty SAND to sandy SILT	120	4.0	11	18	56	48	-	-	25	16	N/A	0.00	N/A	N/A
1.64	54.8	87.9	171.9	1.7	0.4	3.2	5	silty SAND to sandy SILT	120	4.0	14	22	63	48	-	-	23	16	N/A	0.00	N/A	N/A
1.80	57.6	92.4	169.6	1.7	0.3	2.9	5	silty SAND to sandy SILT	120	4.0	14	23	64	48	-	-	21	16	N/A	0.00	N/A	N/A
1.97	54.2	86.8	183.0	1.9	0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	24	15	N/A	0.00	N/A	N/A
2.13	52.5	84.2	191.6	2.1	0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	26	42	-	-	3.7	9.9	26	15	N/A	0.00	N/A	N/A
2.30	48.7	78.2	195.3	2.1	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	28	15	N/A	0.00	N/A	N/A
2.46	44.4	71.2	197.7	2.2	0.3	4.9	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.1	9.9	31	15	N/A	0.00	N/A	N/A
2.62	43.1	69.1	197.0	2.1	0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.0	9.9	31	15	N/A	0.00	N/A	N/A
2.79	50.1	80.3	184.3	2.0	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	26	15	N/A	0.00	N/A	N/A
2.95	53.0	85.0	202.5	2.3	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.7	9.9	27	15	N/A	0.00	N/A	N/A
3.12	63.9	102.5	223.2	2.8	0.3	4.4	9	very stiff fine SOIL	120	2.0	32	51	68	47	-	-	25	30	N/A	0.00	N/A	N/A
3.28	70.2	112.7	233.3	3.0	0.3	4.3	9	very stiff fine SOIL	120	2.0	35	56	71	47	-	-	24	30	0.00	-	0.11	0.0
3.45	62.1	99.7	242.7	3.2	0.3	5.1	9	very stiff fine SOIL	120	2.0	31	50	67	46	-	-	28	30	0.00	-	0.11	0.0
3.61	58.0	93.0	237.4	3.0	0.3	5.3	9	very stiff fine SOIL	120	2.0	29	46	65	46	-	-	29	30	0.00	-	0.11	0.0
3.77	58.2	93.4	219.6	2.7	0.3	4.6	9	very stiff fine SOIL	120	2.0	29	47	65	46	-	-	27	30	0.00	-	0.11	0.0
3.94	51.3	82.3	216.8	2.6	0.3	5.0	9	very stiff fine SOIL	120	2.0	26	41	61	45	-	-	29	30	0.00	-	0.11	0.0
4.10	47.8	76.7	222.1	2.6	0.1	5.5	9	very stiff fine SOIL	120	2.0	24	38	58	45	-	-	32	30	0.00	-	0.11	0.0
4.27	49.0	78.5	210.4	2.4	-0.5	5.0	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	30	15	0.00	-	0.11	0.0
4.43	44.8	71.8	207.2	2.3	-0.5	5.2	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.2	9.9	32	15	0.00	-	0.11	0.0
4.59	43.6	69.9	207.2	2.3	-0.5	5.3	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	32	15	0.00	-	0.11	0.0
4.76	39.9	64.0	197.0	2.1	-0.5	5.2	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	33	15	0.00	-	0.11	0.0
4.92	37.8	60.7	196.2	2.0	-0.5	5.4	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
5.09	35.8	57.3	-	2.0	-0.5	5.7	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	36	15	-	-	0.11	-
5.25	35.7	57.2	187.4	1.9	-0.5	5.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
5.41	34.3	55.0	182.9	1.8	-0.6	5.2	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	35	15	0.00	-	0.11	0.0
5.58	37.2	59.6	-	2.1	-0.6	5.7	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	36	15	-	-	0.11	-
5.74	45.4	72.9	203.6	2.3	-0.6	5.0	4	clayy SILT to silty CLAY	115	2.0	23	36	-	-	3.2	9.9	31	15	0.00	-	0.11	0.0
5.91	50.2	80.4	211.5	2.4	-0.6	4.9	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	29	15	0.00	-	0.11	0.0
6.07	43.0	69.0	209.8	2.3	-0.6	5.5	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.0	9.9	33	15	0.00	-	0.11	0.0
6.23	36.2	58.1	-	2.1	-0.6	5.9	3	silty CLAY to CLAY	115	1.5	24	39	-	-	2.5	9.9	36	15	-	-	0.11	-
6.40	36.5	58.5	194.3	2.0	-0.6	5.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	35	15	0.00	-	0.11	0.0
6.56	34.3	55.0	-	1.8	-0.9	5.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	36	15	-	-	0.11	-
6.73	32.2	51.6	-	1.6	-0.9	5.1	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	36	15	-	-	0.11	-
6.89	35.0	53.6	175.6	1.7	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
7.05	37.6	57.0	178.9	1.8	-0.9	4.9	4	clayy SILT to silty CLAY	115	2.0	19	28	-	-	2.6	9.9	34	15	0.00	-	0.11	0.0
7.22	38.0	57.1	187.4	2.0	-0.9	5.3	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
7.38	38.8	57.6	189.7	2.1	-0.8	5.3	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
7.55	49.0	71.8	194.9	2.3	-0.9	4.7	4	clayy SILT to silty CLAY	115	2.0	24	36	-	-	3.4	9.9	30	15	0.00	-	0.11	0.0
7.71	55.5	80.6	204.1	2.5	-0.9	4.6	4	clayy SILT to silty CLAY	115	2.0	28	40	-	-	3.9	9.9	29	15	0.00	-	0.11	0.0
7.87	52.0	74.7	189.6	2.2	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	26	37	-	-	3.7	9.9	29	15	0.00	-	0.11	0.0
8.04	46.5	66.2	179.6	2.0	-0.9	4.4	4	clayy SILT to silty CLAY	115	2.0	23	33	-	-	3.3	9.9	30	15	0.00	-	0.11	0.0
8.20	41.8	58.9	159.8	1.6	-0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	2.9	9.9	30	15	0.29	-	0.11	1.3
8.37	35.4	49.4	156.6	1.5	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	34	15	0.37	-	0.11	1.4
8.53	32.2	51.7	162.7	1.4	-0.9	4.5	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	34	15	0.00	-	0.11	0.0
8.69	33.9	46.4	152.9	1.5	-0.9	4.4	4	clayy SILT to silty CLAY	115	2.0	17	23	-	-	2.4	9.9	35	15	0.49	-	0.11	2.2
8.86	31.0	49.6	-	1.5	-0.9	4.9	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	36	15	-	-	0.11	-
9.02	35.2	54.4	178.4	1.7	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	18	27	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
9.19	45.3	60.3	163.8	1.8	-0.9	4.0	4	clayy SILT to silty CLAY	115	2.0	23	30	-	-	3.2	9.9	30	15	0.00	-	0.11	0.0
9.35	47.2	62.3	173.2	2.0	-1.0	4.3	4	clayy SILT to silty CLAY	115	2.0	24	31	-	-	3.3	9.9	31	15	0.00	-	0.11	0.0
9.51	44.6	58.3	183.7	2.2	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	22	29	-	-	3.1	9.9	34	15	0.00	-	0.11	0.0
9.68	35.3	56.6	-	2.0	-0.9	5.7	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	36	15	-	-	0.11	-
9.84	27.6	44.3	-	1.7	-0.9	6.2	3	silty CLAY to CLAY	115	1.5	18	30	-	-	1.9	9.9	42	15	-	-	0.11	-
10.01	22.6	36.2	-	1.5	-0.9	6.7	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	46	15	-	-	0.11	-
10.17	22.3	35.8	-	1.6	-0.9	7.4	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	49	15	-	-	0.11	-
10.34	26.4	42.4	-	1.9	-0.9	7.2	3	silty CLAY to CLAY	115	1.5	18	28	-	-	1.8	9.9	45	15	-	-	0.11	-
10.50	38.6	61.8	-	2.3	-1.0	6.0	3	silty CLAY to CLAY	115	1.5	26	41	-	-	2.7	9.9	36	15	-	-	0.11	-
10.66	47.6	58.8	176.1	2.2	-1.4	4.6	4	clayy SILT to silty CLAY	115	2.0	24	29	-	-	3.3	9.9	33	15	0.00	-	0.11	0.0
10.83	86.0	105.5	162.1	1.9	-1.6	2.3	5	silty SAND to sandy SILT	120	4.0	22	26	69	45	-	-	17	16	0.00	-	0.11	0.0
10.99	52.8	64.2	156.2	1.8	-1.5	3.5	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.7	9.9	28	15	0.49	-	0.11	3.0
11.16	27.9	43.2	-	1.7	-1.5	6.1	3	silty CLAY to CLAY	115	1.5	19	29	-	-	1.9	9.9	42	15	-	-	0.11	-
11.32	32.1	49.0	-	1.7	-1.5	5.5	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	38	15	-	-	0.11	-
11.48	48.7	73.2	-	6.7	-1.3	9.9	9	very stiff fine SOIL	120	2.0	24	37	57	41	-	-	43	30	-	-	0.11	-
11.65	152.0	179.7	326.7	7.3	0.3	4.8	9	very stiff fine SOIL	120	2.0	76	90	86	47	-	-	21	30	0.00	-	0.11	0.0
11.81	75.3	96.4	316.4	6.0	0.0	8.0	9	very stiff fine SOIL	120	2.0	38	48	66	44	-	-	35	30	0.00	-	0.11	0.0
11.98	50.7	59.1	191.8	2.7	0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.6	9.9	35	15	0.00	-	0.11	0.0
12.14	37.1	52.7	-	2.0	0.4	5.4	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.6	9.9	37	15	-	-	0.11	-
12.30	35.5	44.1	-	1.5	0.4	4.2	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.5	9.9	36	15	-	-	0.11	-
12.47	27.8	38.5	-	1.3	0.4	4.9	3	silty CLAY to CLAY	115	1.5	19	26	-	-	1.9	9.9	40	15	-	-	0.11	-
12.63	29.6	40.4	-	1.3	0.4	4.5	4	clayy SILT to silty CLAY	115	2.0	15	20	-	-	2.1	9.9	38	15	-	-	0.11	-
12.80	33.2	40.2	-	1.3	0.4	4.0	4	clayy SILT to silty CLAY	115	2.0	17	30	-	-	2.3	9.9	36	15	-	-	0.11	-
12.96	27.9	37.1	-	1.4	0.4	5.0	3	silty CLAY to CLAY	115	1.5	19	25	-	-	1.9	9.9	41	15	-	-	0.11	-
13.12	26.1	34.3	-	1.4	0.3	5.4	3	silty CLAY to CLAY	115	1.5	17	23	-	-	1.8	9.9	44	15	-	-	0.11	-
13.29	27.8	36.1	-	1.5	0.3	5.7	3	silty CLAY to CLAY	115	1.5	19	24	-	-	1.9	9.9	44	15	-	-	0.11	-
13.45	37.3	43.7	-	1.5	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	36	15	-	-	0.11	-
13.62	42.8	46.8	142.9	1.6	0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	3.0	9.9	33	15	1.16	-	0.11	44.3
13.78	36.2	45.3	-	1.7	0.2	4.7	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	37	15	-	-	0.10	-
13.94	30.9	38.3	-	1.5	0.2	4.9	3	silty CLAY to CLAY	115	1.5	21	26	-	-	2.2	9.9	40	15	-	-	0.10	-
14.11	41.4	50.6	-	2.0	0.2	4.8	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	2.9	9.9	35	15	-	-	0.10	-
14.27	48.7	52.0	166.2	2.2	0.2	4.6	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.4	9.9	34	15	0.00	-	0.10	0.0
14.44	35.9	43.0	-	2.0	0.2	5.8	3	silty CLAY to CLAY	115	1.5	24	29	-	-	2.5	9.9	41	15	-	-	0.10	-
14.60	35.8	42.4	-	1.7	0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.5	9.9	38	15	-	-	0.10	-
14.76	33.6	39.3	-	1.5	0.1	4.6	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	38	15	-	-	0.10	-
14.93	29.7	34.4	-	1.4	0.1	4.8	3	silty CLAY to CLAY	115	1.5	20	23	-	-	2.1	9.9	42	15	-	-	0.10	-
15.09	30.9	35.3	-	1.5	0.1	5.1	3	silty CLAY to CLAY	115	1.5	21	24	-	-	2.1	9.9	42	15	-	-	0.10	-
15.26	35.9	40.6	-	1.7	0.1	4.9	3	silty CLAY to CLAY	115	1.5	24	27	-	-	2.5	9.9	39	15	-	-	0.10	-
15.42	33.3	37.3	-	1.8	0.1	5.5	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.3	9.9	43	15	-	-	0.10	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
15.58	33.4	37.0	-	1.8	0.1	5.7	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.3	9.9	43	15	-	-	0.10	-
15.75	36.9	40.5	-	1.9	0.1	5.3	3	silty CLAY to CLAY	115	1.5	25	27	-	-	2.6	9.9	40	15	-	-	0.10	-
15.91	37.0	40.2	-	1.7	0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.6	9.9	39	15	-	-	0.10	-
16.08	34.8	37.4	-	1.7	0.1	4.9	3	silty CLAY to CLAY	115	1.5	23	25	-	-	2.4	9.9	41	15	-	-	0.10	-
16.24	29.1	31.0	-	1.7	0.1	6.0	3	silty CLAY to CLAY	115	1.5	19	21	-	-	2.0	9.9	47	15	-	-	0.10	-
16.40	28.4	29.9	-	1.4	0.0	5.2	3	silty CLAY to CLAY	115	1.5	19	20	-	-	2.0	9.9	45	15	-	-	0.10	-
16.57	27.8	29.0	-	1.5	0.0	5.5	3	silty CLAY to CLAY	115	1.5	19	19	-	-	1.9	9.9	47	15	-	-	0.10	-
16.73	27.6	28.5	-	1.5	0.0	5.6	3	silty CLAY to CLAY	115	1.5	18	19	-	-	1.9	9.9	48	15	-	-	0.10	-
16.90	28.6	29.3	-	1.3	0.0	4.6	3	silty CLAY to CLAY	115	1.5	19	20	-	-	2.0	9.9	44	15	-	-	0.10	-
17.06	28.1	28.5	-	1.4	0.0	5.1	3	silty CLAY to CLAY	115	1.5	19	19	-	-	2.0	9.9	46	15	-	-	0.10	-
17.23	34.1	34.2	-	1.4	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	17	17	-	-	2.4	9.9	40	15	-	-	0.10	-
17.39	26.8	26.6	-	1.3	0.0	5.2	3	silty CLAY to CLAY	115	1.5	18	18	-	-	1.9	9.9	48	15	-	-	0.10	-
17.55	24.4	24.0	-	1.1	0.0	4.5	3	silty CLAY to CLAY	115	1.5	16	16	-	-	1.7	9.9	47	15	-	-	0.10	-
17.72	21.0	20.5	-	0.9	-0.1	4.4	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.4	9.9	50	15	-	-	0.10	-
17.88	20.8	20.1	-	0.8	-0.1	3.9	3	silty CLAY to CLAY	115	1.5	14	13	-	-	1.4	9.9	48	15	-	-	0.10	-
18.05	21.4	20.5	-	0.7	-0.1	3.5	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.5	9.9	46	15	-	-	0.10	-
18.21	22.9	21.8	-	0.9	-0.1	4.0	3	silty CLAY to CLAY	115	1.5	15	15	-	-	1.6	9.9	47	15	-	-	0.10	-
18.37	31.5	29.7	-	1.2	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	16	15	-	-	2.2	9.9	41	15	-	-	0.10	-
18.54	35.2	32.8	-	1.6	-0.1	4.8	3	silty CLAY to CLAY	115	1.5	23	22	-	-	2.4	9.9	42	15	-	-	0.10	-
18.70	39.4	36.4	-	1.5	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	20	18	-	-	2.7	9.9	38	15	-	-	0.10	-
18.87	30.6	28.0	-	1.5	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	20	19	-	-	2.1	9.9	46	15	-	-	0.10	-
19.03	46.1	42.7	128.1	1.5	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	23	21	-	-	3.2	9.9	33	15	1.90	-	0.10	51.2
19.19	43.4	39.1	-	1.7	-1.0	4.0	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.0	9.9	37	15	-	-	0.10	-
19.36	46.5	42.7	128.5	1.5	-1.0	3.4	4	clayy SILT to silty CLAY	115	2.0	23	21	-	-	3.2	9.9	33	15	1.89	-	0.10	51.2
19.52	60.3	55.2	131.4	1.7	-0.9	2.9	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	27	15	1.81	-	0.10	38.6
19.69	44.2	38.8	-	1.8	-0.9	4.1	4	clayy SILT to silty CLAY	115	2.0	22	19	-	-	3.1	9.9	37	15	-	-	0.10	-
19.85	34.6	30.1	-	1.8	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	23	20	-	-	2.4	9.9	46	15	-	-	0.10	-
20.01	32.8	28.3	-	1.8	-0.9	5.6	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	48	15	-	-	0.10	-
20.18	36.4	31.2	-	1.9	-0.9	5.2	3	silty CLAY to CLAY	115	1.5	24	21	-	-	2.5	9.9	45	15	-	-	0.10	-
20.34	36.8	31.3	-	1.9	-0.9	5.3	3	silty CLAY to CLAY	115	1.5	25	21	-	-	2.6	9.9	45	15	-	-	0.10	-
20.51	33.5	28.3	-	1.9	-0.9	6.0	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	49	15	-	-	0.10	-
20.67	31.8	26.6	-	1.7	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	21	18	-	-	2.2	9.9	48	15	-	-	0.10	-
20.83	30.5	25.3	-	1.7	-0.9	5.8	3	silty CLAY to CLAY	115	1.5	20	17	-	-	2.1	9.9	51	15	-	-	0.10	-
21.00	35.7	29.4	-	1.9	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	24	20	-	-	2.5	9.9	47	15	-	-	0.10	-
21.16	42.9	35.1	-	2.0	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	29	23	-	-	3.0	9.9	41	15	-	-	0.10	-
21.33	46.5	37.8	-	2.0	-0.9	4.5	4	clayy SILT to silty CLAY	115	2.0	23	19	-	-	3.2	9.9	39	15	-	-	0.10	-
21.49	38.0	30.6	-	2.0	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	25	20	-	-	2.6	9.9	46	15	-	-	0.10	-
21.65	39.5	31.6	-	1.9	-0.9	5.0	3	silty CLAY to CLAY	115	1.5	26	21	-	-	2.7	9.9	44	15	-	-	0.10	-
21.82	42.4	33.7	-	2.0	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	28	22	-	-	3.0	9.9	42	15	-	-	0.10	-
21.98	46.3	36.5	-	2.2	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	31	24	-	-	3.2	9.9	41	15	-	-	0.10	-
22.15	50.8	39.7	-	2.1	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	25	20	-	-	3.5	9.9	37	15	-	-	0.10	-
22.31	43.0	33.3	-	1.7	-0.9	4.1	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	3.0	9.9	40	15	-	-	0.10	-
22.47	44.8	34.5	-	1.7	-0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	22	17	-	-	3.1	9.9	38	15	-	-	0.10	-
22.64	46.7	35.7	-	2.2	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	31	24	-	-	3.2	9.9	41	15	-	-	0.10	-
22.80	52.9	40.1	-	2.8	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	35	27	-	-	3.7	9.9	41	15	-	-	0.10	-
22.97	51.0	38.4	-	2.6	-0.9	5.2	3	silty CLAY to CLAY	115	1.5	34	26	-	-	3.6	9.9	41	15	-	-	0.10	-
23.13	42.6	31.9	-	1.9	-0.9	4.6	3	silty CLAY to CLAY	115	1.5	28	21	-	-	3.0	9.9	42	15	-	-	0.10	-
23.30	39.5	29.3	-	2.1	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	26	20	-	-	2.7	9.9	47	15	-	-	0.10	-
23.46	45.6	38.0	100.6	1.0	-0.9	2.3	5	silty SAND to sandy SILT	120	4.0	11	10	35	38	-	-	30	16	2.33	-	0.10	51.2
23.62	90.6	75.3	167.6	3.1	-0.9	3.5	4	clayy SILT to silty CLAY	115	2.0	45	38	-	-	6.3	9.9	26	15	0.00	-	0.09	0.0
23.79	128.2	106.3	188.1	3.9	-0.9	3.1	5	silty SAND to sandy SILT	120	4.0	32	27	69	43	-	-	20	16	0.00	-	0.09	0.0
23.95	59.3	42.8	-	4.0	-0.4	6.9	3	silty CLAY to CLAY	115	1.5	40	29	-	-	4.1	9.9	44	15	-	-	0.09	-
24.12	56.7	40.7	-	3.2	0.0	5.8	3	silty CLAY to CLAY	115	1.5	38	27	-	-	4.0	9.9	42	15	-	-	0.09	-
24.28	58.3	41.5	-	3.1	-0.3	5.5	3	silty CLAY to CLAY	115	1.5	39	28	-	-	4.1	9.9	41	15	-	-	0.09	-
24.44	49.7	35.2	-	3.0	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	33	23	-	-	3.5	9.9	45	15	-	-	0.09	-
24.61	43.6	30.7	-	2.4	-0.3	5.7	3	silty CLAY to CLAY	115	1.5	29	20	-	-	3.0	9.9	46	15	-	-	0.09	-
24.77	39.3	27.5	-	2.2	-0.8	5.8	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	49	15	-	-	0.09	-
24.94	39.2	27.2	-	2.2	-0.3	5.7	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	49	15	-	-	0.09	-
25.10	39.2	27.1	-	2.3	-0.5	6.0	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	50	15	-	-	0.09	-
25.26	41.7	28.6	-	2.2	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	47	15	-	-	0.09	-
25.43	42.4	28.8	-	2.0	-1.2	4.9	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	45	15	-	-	0.09	-
25.59	50.6	40.4	117.9	1.5	-1.1	3.0	4	clayy SILT to silty CLAY	115	2.0	25	20	-	-	3.5	9.9	32	15	2.04	-	0.09	51.2
25.76	57.0	45.4	94.8	1.0	-0.2	1.8	5	silty SAND to sandy SILT	120	4.0	14	11	41	39	-	-	24	16	2.44	-	0.09	49.6
25.92	47.5	37.7	78.3	0.6	-0.1	1.4	5	silty SAND to sandy SILT	120	4.0	12	9	35	38	-	-	24	16	2.85	-	0.08	51.2
26.08	39.9	31.6	78.3	0.6	-0.1	1.6	5	silty SAND to sandy SILT	120	4.0	10	8	29	37	-	-	28	16	2.86	-	0.08	51.2
26.25	32.3	21.3	-	0.8	-0.1	2.4	4	clayy SILT to silty CLAY	115	2.0	16	11	-	-	2.2	9.9	40	15	-	-	0.08	-
26.41	26.5	17.4	-	1.0	-0.1	4.1	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.8	9.9	52	15	-	-	0.08	-
26.58	21.2	13.8	-	1.1	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	8.1	64	15	-	-	0.08	-
26.74	21.2	13.7	-	1.2	-0.4	6.3	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	8.0	66	15	-	-	0.08	-
26.90	27.1	17.4	-	1.3	-0.7	5.3	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.9	9.9	57	15	-	-	0.08	-
27.07	31.4	20.1	-	1.5	-0.7	5.2	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	53	15	-	-	0.08	-
27.23	31.5	20.0	-	1.5	-1.0	5.2	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	53	15	-	-	0.08	-
27.40	32.4	20.5	-	1.3	-1.0	4.1	3	silty CLAY to CLAY	115	1.5	22	14	-	-	2.2	9.9	49	15	-	-	0.08	-
27.56	34.2	21.5	-	1.5	-1.2	4.6	3	silty CLAY to CLAY	115	1.5	23	14	-	-	2.4	9.9	50	15	-	-	0.08	-
27.72	41.0	25.6	-	1.8	-1.2	4.5	3	silty CLAY to CLAY	115	1.5	27	17	-	-	2.8	9.9	46	15	-	-	0.08	-
27.89	39.4	24.5	-	1.7	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	26	16	-	-	2.7	9.9	47	15	-	-	0.08	-
28.05	37.8	23.3	-	1.4	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	25	16	-	-	2.6	9.9	46	15	-	-	0.08	-
28.22	32.0	19.6	-	1.2	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	49	15	-	-	0.08	-
28.38	29.0	17.7	-	1.1	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	19	12	-	-	2.0	9.9	52	15	-	-	0.08	-
28.54	25.5	15.5	-	1.0	-1.7	4.3	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.2	56	15	-	-	0.08	-
28.71	26.1	15.7	-	1.0	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.8	9.4	55	15	-	-	0.08	-
28.87	30.3	18.2	-	0.9	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	48	15	-	-	0.08	-
29.04	28.7	17.1	-	0.7	-1.7	2.5	4	clayy SILT to silty CLAY	115	2.0	14	9	-	-	2.0	9.9	45	15	-	-	0.08	-
29.20	24.5	14.5	-	1.0	-1.8	4.4	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.7	8.6	58	15	-	-	0.08	-
29.36	41.4	24.4	-	1.3	-1.8	3.3	4	clayy SILT to silty CLAY	115	2.0	21	12	-	-	2.9	9.9	42	15	-	-	0.08	-
29.53	41.7	24.5	-	1.6	-2.5	4.1	3	silty CLAY to CLAY	115	1.5	28	16	-	-	2.9	9.9	45	15	-	-	0.08	-
29.69	36.9	21.5	-	1.6	-2.9	4.5	3	silty CLAY to CLAY	115	1.5	25	14	-	-	2.5	9.9	49	15	-	-	0.08	-
29.86	30.0	17.4	-	1.1	-3.0	4.0	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	52	15	-	-	0.08	-
30.02	24.9	14.3	-	0.8	-3.0	3.2	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	53	15	-	-	0.08	-
30.19	24.2	13.9	-	0.7	-3.0	3.1	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	8.3	53	15	-	-	0.08	-
30.35	24.8	14.2	-	0.9	-3.0	4.0	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.4	57	15	-	-	0.08	-
30.51	25.3	14.3	-	1.3	-3.0	5.5	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	62	15	-	-	0.08	-
30.68	25.5	14.4	-	1.4	-3.0	5.9	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.6	64	15	-	-	0.08	-
30.84	26.4	14.8	-	1.5	-3.0	6.1	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	8.9	64	15	-	-	0.08	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore press (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic -	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
31.01	25.6	14.3	-	1.3	-3.0	5.7	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	63	15	-	-	0.08	-
31.17	26.6	14.8	-	1.3	-3.0	5.1	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	8.9	60	15	-	-	0.08	-
31.33	28.1	15.5	-	1.3	-3.0	5.1	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.3	59	15	-	-	0.08	-
31.50	27.6	15.2	-	1.3	-3.0	5.2	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	9.1	60	15	-	-	0.08	-
31.66	27.9	15.3	-	1.4	-3.0	5.3	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.2	60	15	-	-	0.08	-
31.83	28.2	15.3	-	1.3	-3.0	5.0	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.2	59	15	-	-	0.08	-
31.99	27.3	14.8	-	1.3	-3.0	5.2	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	8.9	60	15	-	-	0.08	-
32.15	25.1	13.5	-	1.2	-3.0	5.0	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.1	62	15	-	-	0.08	-
32.32	24.9	13.4	-	1.0	-3.0	4.5	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.0	60	15	-	-	0.08	-
32.48	23.3	12.4	-	1.1	-3.0	5.3	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.4	65	15	-	-	0.08	-
32.65	23.5	12.5	-	1.0	-3.0	4.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.4	63	15	-	-	0.08	-
32.81	80.6	56.9	85.5	0.8	-3.0	1.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	40	-	-	17	16	2.66	-	0.08	36.9
32.97	81.1	57.1	86.1	0.8	-3.0	1.1	5	silty SAND to sandy SILT	120	4.0	20	14	48	40	-	-	17	16	2.64	-	0.07	36.7
33.14	84.3	59.2	92.1	1.0	-3.0	1.2	5	silty SAND to sandy SILT	120	4.0	21	15	50	40	-	-	17	16	2.50	-	0.07	34.6
33.30	80.6	56.5	110.9	1.6	-3.0	2.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	39	-	-	23	16	2.15	-	0.06	37.3
33.47	79.8	55.7	109.2	1.5	-2.9	2.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	39	-	-	23	16	2.17	-	0.06	38.1
33.63	76.9	53.6	120.3	1.9	-2.9	2.5	5	silty SAND to sandy SILT	120	4.0	19	13	46	39	-	-	26	16	2.01	-	0.06	40.3
33.79	52.6	26.9	-	2.0	-2.9	4.0	4	clayy SILT to silty CLAY	115	2.0	26	13	-	-	3.6	9.9	43	15	-	-	0.05	-
33.96	33.7	17.2	-	1.7	-2.9	5.3	3	silty CLAY to CLAY	115	1.5	22	11	-	-	2.3	9.9	57	15	-	-	0.05	-
34.12	23.6	12.0	-	1.3	-2.9	6.1	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.1	69	15	-	-	0.05	-
34.29	23.0	11.6	-	1.2	-2.8	5.9	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.6	6.9	69	15	-	-	0.05	-
34.45	20.7	10.4	-	1.2	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.1	75	15	-	-	0.05	-
34.61	18.8	9.4	-	1.1	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.4	78	15	-	-	0.05	-
34.78	16.0	8.0	-	1.0	-2.8	7.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.5	86	15	-	-	0.05	-
34.94	16.2	8.0	-	0.9	-2.8	6.3	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.6	82	15	-	-	0.05	-
35.11	16.3	8.0	-	1.1	-2.8	7.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.6	86	15	-	-	0.05	-
35.27	20.9	10.2	-	1.2	-2.8	6.2	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.0	74	15	-	-	0.05	-
35.43	22.9	11.2	-	1.3	-2.8	6.4	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.6	72	15	-	-	0.05	-
35.60	18.8	9.1	-	1.1	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.3	79	15	-	-	0.05	-
35.76	20.3	9.8	-	1.0	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.8	72	15	-	-	0.05	-
35.93	20.8	10.0	-	1.0	-2.8	5.5	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	72	15	-	-	0.05	-
36.09	22.1	10.6	-	1.0	-2.8	4.9	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.3	68	15	-	-	0.05	-
36.26	21.4	10.2	-	1.0	-2.8	5.1	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.0	70	15	-	-	0.05	-
36.42	20.1	9.5	-	1.0	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.6	73	15	-	-	0.05	-
36.58	23.7	11.2	-	1.0	-2.8	4.5	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	65	15	-	-	0.05	-
36.75	23.9	11.3	-	1.0	-2.8	4.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.7	66	15	-	-	0.05	-
36.91	23.9	11.2	-	1.0	-2.8	4.6	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.7	65	15	-	-	0.05	-
37.08	21.5	10.1	-	1.0	-2.8	5.3	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	71	15	-	-	0.05	-
37.24	20.9	9.7	-	1.0	-2.8	5.6	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.7	73	15	-	-	0.05	-
37.40	19.0	8.8	-	0.9	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.1	76	15	-	-	0.05	-
37.57	18.5	8.5	-	1.0	-2.8	5.8	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.9	78	15	-	-	0.05	-
37.73	17.2	7.9	-	0.9	-2.8	6.3	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.5	83	15	-	-	0.05	-
37.90	16.6	7.6	-	0.9	-2.8	6.1	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.3	83	15	-	-	0.05	-
38.06	14.9	6.8	-	0.4	-2.8	2.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	3.8	72	15	-	-	0.05	-
38.22	14.6	6.6	-	0.4	-2.8	3.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.7	75	15	-	-	0.05	-
38.39	47.6	21.5	-	1.1	-2.9	2.3	4	clayy SILT to silty CLAY	115	2.0	24	11	-	-	3.3	9.9	39	15	-	-	0.05	-
38.55	61.9	27.8	-	2.1	-3.3	3.6	4	clayy SILT to silty CLAY	115	2.0	31	14	-	-	4.3	9.9	41	15	-	-	0.05	-
38.72	62.4	27.9	-	3.2	-5.9	5.3	3	silty CLAY to CLAY	115	1.5	42	19	-	-	4.3	9.9	47	15	-	-	0.05	-
38.88	50.1	22.3	-	3.3	-7.0	6.9	3	silty CLAY to CLAY	115	1.5	33	15	-	-	3.5	9.9	56	15	-	-	0.05	-
39.04	36.2	16.0	-	2.4	-7.6	7.0	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	65	15	-	-	0.05	-
39.21	42.9	18.9	-	1.6	-7.7	3.9	3	silty CLAY to CLAY	115	1.5	29	13	-	-	3.0	9.9	50	15	-	-	0.05	-
39.37	31.7	13.9	-	1.4	-7.7	4.7	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.2	8.5	60	15	-	-	0.05	-
39.54	30.1	13.2	-	1.1	-7.7	4.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.0	8.0	58	15	-	-	0.05	-
39.70	29.0	12.7	-	1.1	-7.7	3.9	3	silty CLAY to CLAY	115	1.5	19	8	-	-	2.0	7.7	59	15	-	-	0.05	-
39.86	26.5	11.5	-	1.1	-7.7	4.4	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	6.9	64	15	-	-	0.05	-
40.03	30.5	13.2	-	1.0	-7.7	3.7	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.1	8.0	57	15	-	-	0.05	-
40.19	38.0	16.4	-	1.2	-7.7	3.4	3	silty CLAY to CLAY	115	1.5	25	11	-	-	2.6	9.9	50	15	-	-	0.05	-
40.36	40.1	17.2	-	1.2	-7.7	3.3	3	silty CLAY to CLAY	115	1.5	27	11	-	-	2.7	9.9	49	15	-	-	0.05	-
40.52	36.4	15.5	-	1.6	-7.7	4.8	3	silty CLAY to CLAY	115	1.5	24	10	-	-	2.5	9.6	58	15	-	-	0.05	-
40.68	34.9	14.9	-	1.6	-7.7	5.0	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.4	9.1	60	15	-	-	0.05	-
40.85	49.2	20.9	-	1.6	-7.7	3.3	4	clayy SILT to silty CLAY	115	2.0	25	10	-	-	3.4	9.9	45	15	-	-	0.05	-
41.01	46.4	19.6	-	1.4	-7.7	3.2	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	46	15	-	-	0.05	-
41.18	37.4	15.7	-	1.2	-7.6	3.3	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.7	51	15	-	-	0.05	-
41.34	31.5	13.2	-	1.0	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.1	56	15	-	-	0.05	-
41.50	33.4	13.9	-	0.9	-7.6	2.9	3	silty CLAY to CLAY	115	1.5	22	9	-	-	2.3	8.5	52	15	-	-	0.05	-
41.67	37.6	15.6	-	1.1	-7.7	3.1	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.7	50	15	-	-	0.05	-
41.83	38.1	15.8	-	1.1	-7.7	3.1	3	silty CLAY to CLAY	115	1.5	25	11	-	-	2.6	9.8	50	15	-	-	0.05	-
42.00	37.4	15.4	-	1.2	-7.7	3.5	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.5	53	15	-	-	0.05	-
42.16	33.1	13.6	-	1.2	-7.6	4.0	3	silty CLAY to CLAY	115	1.5	22	9	-	-	2.3	8.3	58	15	-	-	0.05	-
42.32	30.1	12.3	-	1.2	-7.6	4.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	7.5	61	15	-	-	0.05	-
42.49	41.3	16.8	-	1.3	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.9	50	15	-	-	0.05	-
42.65	45.6	18.5	-	1.4	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	30	12	-	-	3.1	9.9	48	15	-	-	0.05	-
42.82	53.1	21.5	-	1.5	-7.6	3.0	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	43	15	-	-	0.05	-
42.98	54.7	22.0	-	1.9	-7.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	45	15	-	-	0.05	-
43.15	62.3	25.0	-	1.9	-7.6	3.1	4	clayy SILT to silty CLAY	115	2.0	31	13	-	-	4.3	9.9	41	15	-	-	0.05	-
43.31	58.8	23.5	-	1.7	-7.6	3.0	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.1	9.9	41	15	-	-	0.05	-
43.47	55.9	22.3	-	1.5	-7.6	2.9	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	42	15	-	-	0.05	-
43.64	57.0	22.6	-	1.6	-7.6	2.9	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	41	15	-	-	0.05	-
43.80	63.7	25.2	-	2.2	-7.6	3.6	4	clayy SILT to silty CLAY	115	2.0	32	13	-	-	4.4	9.9	43	15	-	-	0.05	-
43.97	73.0	28.8	-	2.8	-7.6	4.0	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.1	9.9	42	15	-	-	0.05	-
44.13	71.7	28.1	-	2.7	-7.6	3.9	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	42	15	-	-	0.05	-
44.29	74.9	29.3	-	2.5	-7.4	3.5	4	clayy SILT to silty CLAY	115	2.0	37	15	-	-	5.2	9.9	40	15	-	-	0.05	-
44.46	61.5	23.9	-	2.5	-7.4	4.3	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	46	15	-	-	0.05	-
44.62	70.0	27.2	-	2.7	-7.4	4.0	4	clayy SILT to silty CLAY	115	2.0	35	14	-	-	4.9	9.9	43	15	-	-	0.05	-
44.79	71.8	27.7	-	2.8	-7.4	4.0	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	43	15	-	-	0.05	-
44.95	66.5	25.6	-	2.5	-7.3	4.0	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.6	9.9	44	15	-	-	0.05	-
45.11	76.3	29.3	-	2.3	-7.4	3.2	4	clayy SILT to silty CLAY	115	2.0	38	15	-	-	5.3	9.9	38	15	-	-	0.05	-
45.28	74.2	28.4	-	2.4	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.2	9.9	39	15	-	-	0.05	-
45.44	85.3	32.5	-	3.6	-7.3	4.3	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	41	15	-	-	0.05	-
45.61	103.4	61.9	157.5	3.7	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	52	31	-	-	7.2	9.9	29	15	0.96	-	0.05	12.7
45.77	85.3	32.3	-	3.4	-7.3	4.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	40	15	-	-	0.05	-
45.93	107.4	64.1	155.1	3.6	-7.2	3.4	4	clayy SILT to silty CLAY	115	2.0	54	32	-	-	7.5	9.9	27	15	1.07	-	0.05	15.6
46.10	108.1	64.3	159.4	3.8	-7.2	3.6	4	clayy SILT to silty CLAY	115	2.0	54	32	-	-	7.5	9.9	28	15	0.89	-	0.05	10.3
46.26	113.1	67.2	153.4	3.6	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	57	34	-	-	7.9	9.9	26	15	1.15	-	0.05	17.4

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

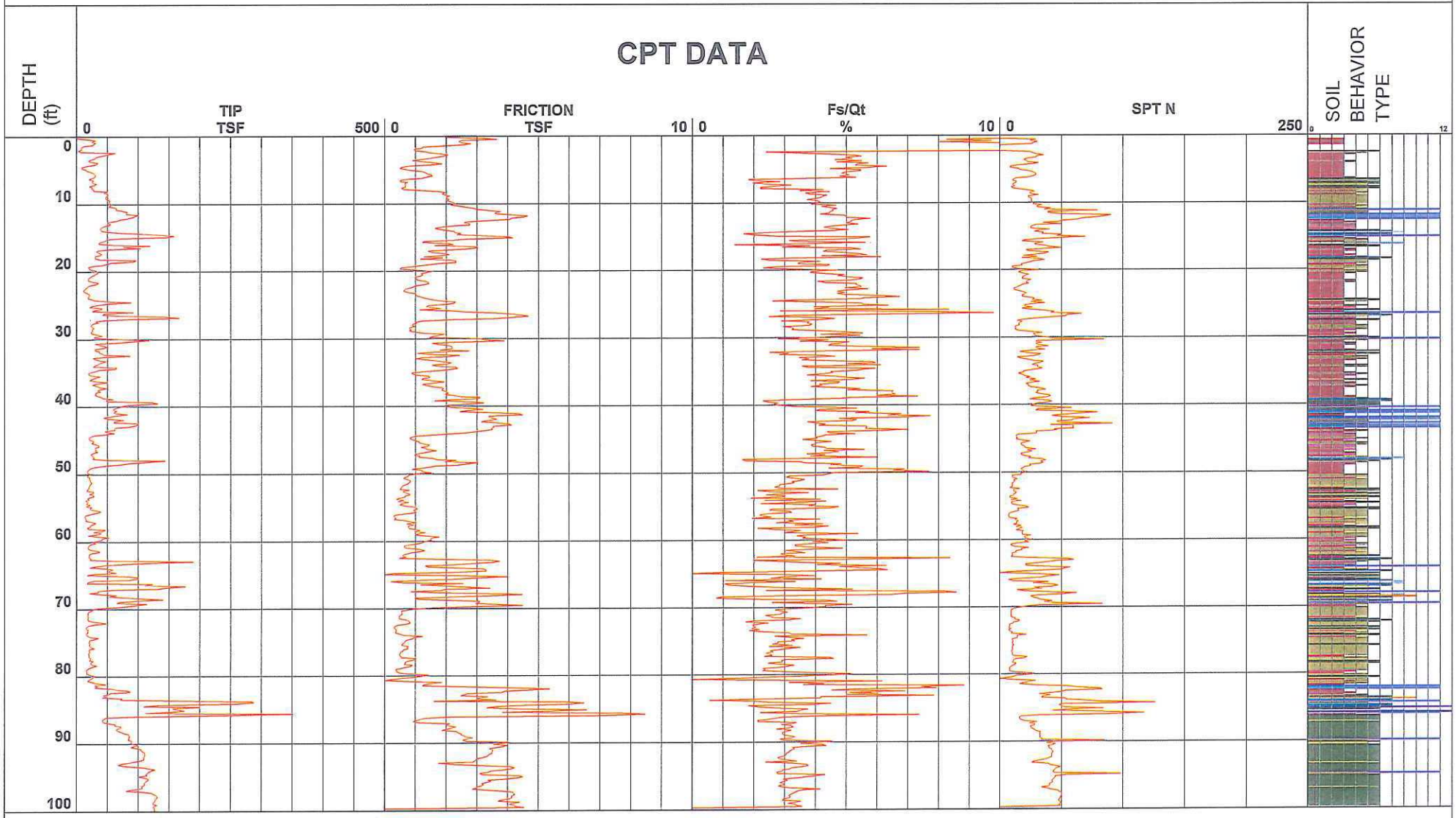
Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
46.43	116.1	68.9	164.4	4.1	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	58	34	-	-	8.1	9.9	27	15	0.00	-	0.05	0.0
46.59	101.2	38.2	-	3.6	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.1	9.9	36	15	-	-	0.05	-
46.75	87.4	33.0	-	3.0	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	38	15	-	-	0.05	-
46.92	86.1	32.5	-	2.7	-7.1	3.2	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	37	15	-	-	0.05	-
47.08	89.9	53.0	131.3	2.6	-7.1	2.9	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	28	15	1.87	-	0.05	40.9
47.25	91.3	53.7	136.2	2.8	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	46	27	-	-	6.4	9.9	29	15	1.79	-	0.04	40.1
47.41	93.1	35.1	-	4.0	-7.1	4.4	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	40	15	-	-	0.04	-
47.57	120.1	70.4	171.2	4.4	-7.1	3.8	4	clayy SILT to silty CLAY	115	2.0	60	35	-	-	8.4	9.9	28	15	0.00	-	0.04	0.0
47.74	90.1	34.0	-	3.4	-7.1	3.9	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	39	15	-	-	0.04	-
47.90	77.7	29.3	-	2.3	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	38	15	-	-	0.04	-
48.07	79.9	30.2	-	2.5	-7.1	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	38	15	-	-	0.04	-
48.23	84.4	31.8	-	2.8	-7.1	3.4	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	38	15	-	-	0.04	-
48.39	87.0	32.8	-	2.6	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	36	15	-	-	0.04	-
48.56	90.0	52.2	130.6	2.6	-7.1	2.9	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	28	15	1.88	-	0.04	41.7
48.72	87.8	33.1	-	2.8	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	36	15	-	-	0.04	-
48.89	87.2	32.9	-	2.7	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	36	15	-	-	0.04	-
49.05	92.6	53.4	137.9	2.9	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	46	27	-	-	6.4	9.9	29	15	1.72	-	0.04	40.4
49.22	90.3	34.1	-	2.9	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.03	-
49.38	100.6	57.9	136.7	2.9	-7.2	3.0	4	clayy SILT to silty CLAY	115	2.0	50	29	-	-	7.0	9.9	27	15	1.78	-	0.03	35.9
49.54	102.2	58.7	133.5	2.8	-7.1	2.8	5	silty SAND to sandy SILT	120	4.0	26	15	49	39	-	-	26	16	1.84	-	0.03	35.1
49.71	90.4	51.8	134.5	2.7	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	29	15	1.83	-	0.03	42.1
49.87	90.1	34.0	-	2.9	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.02	-
50.04	89.0	33.6	-	2.9	-7.1	3.4	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.2	9.9	37	15	-	-	0.02	-
50.20	89.1	33.6	-	3.4	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	39	15	-	-	0.02	-
50.36	100.9	57.5	141.8	3.1	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	50	29	-	-	7.0	9.9	28	15	1.58	-	0.02	36.3
50.53	88.3	33.3	-	3.7	-7.2	4.3	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	40	15	-	-	0.02	-
50.69	82.3	31.1	-	3.1	-7.2	3.9	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.02	-
50.86	86.7	32.7	-	2.9	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	37	15	-	-	0.02	-
51.02	77.5	29.3	-	3.0	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	42	15	-	-	0.02	-
51.18	82.7	31.2	-	2.7	-7.2	3.3	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	38	15	-	-	0.02	-
51.35	78.0	29.4	-	2.8	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	40	15	-	-	0.02	-
51.51	77.7	29.3	-	2.8	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	41	15	-	-	0.02	-
51.68	79.3	29.9	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	40	15	-	-	0.02	-
51.84	81.9	30.9	-	3.0	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.02	-
52.00	79.3	29.9	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	41	15	-	-	0.02	-
52.17	75.0	28.3	-	2.8	-7.2	3.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	42	15	-	-	0.02	-
52.33	73.6	27.8	-	2.5	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	40	15	-	-	0.02	-
52.50	63.1	23.8	-	1.5	-7.2	2.5	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	39	15	-	-	0.02	-
52.66	62.0	23.4	-	1.9	-7.2	3.3	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	43	15	-	-	0.02	-
52.82	59.2	22.3	-	2.2	-7.2	3.9	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.1	9.9	47	15	-	-	0.02	-
52.99	54.4	20.5	-	2.6	-7.2	5.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	53	15	-	-	0.02	-
53.15	88.5	33.4	-	3.0	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	37	15	-	-	0.02	-
53.32	85.9	32.4	-	3.3	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	40	15	-	-	0.02	-
53.48	80.8	30.5	-	2.9	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	40	15	-	-	0.02	-
53.64	82.4	31.1	-	3.2	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.02	-
53.81	84.8	32.0	-	3.1	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	39	15	-	-	0.02	-
53.97	83.9	31.7	-	3.0	-7.3	3.7	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.02	-
54.14	85.4	32.2	-	2.9	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.02	-
54.30	84.3	31.8	-	2.9	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.02	-
54.46	83.4	31.5	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	38	15	-	-	0.02	-
54.63	83.0	31.3	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.8	9.9	38	15	-	-	0.02	-
54.79	81.2	30.6	-	2.7	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.6	9.9	38	15	-	-	0.02	-
54.96	82.1	31.0	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	39	15	-	-	0.02	-
55.12	81.6	30.8	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.02	-
55.28	86.5	32.6	-	3.0	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	38	15	-	-	0.02	-
55.45	87.7	33.1	-	3.1	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	38	15	-	-	0.02	-
55.61	89.7	33.8	-	3.0	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	37	15	-	-	0.02	-
55.78	91.8	34.6	-	3.0	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	36	15	-	-	0.02	-
55.94	91.4	34.5	-	3.1	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.3	9.9	37	15	-	-	0.02	-
56.11	91.3	34.4	-	3.1	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.3	9.9	37	15	-	-	0.02	-
56.27	93.4	35.2	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	36	15	-	-	0.02	-
56.43	95.4	36.0	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	36	15	-	-	0.02	-
56.60	93.5	35.3	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.02	-
56.76	94.4	50.7	135.4	2.9	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.6	9.9	30	15	1.74	-	0.02	43.4
56.93	96.5	51.7	127.1	2.6	-7.3	2.8	4	clayy SILT to silty CLAY	115	2.0	48	26	-	-	6.7	9.9	28	15	1.92	-	0.02	42.2
57.09	95.2	50.9	128.1	2.7	-7.2	2.9	4	clayy SILT to silty CLAY	115	2.0	48	25	-	-	6.6	9.9	28	15	1.91	-	0.02	43.1
57.25	95.0	50.7	131.4	2.8	-7.3	3.0	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.6	9.9	29	15	1.87	-	0.01	43.3
57.42	90.6	34.2	-	2.9	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.01	-
57.58	79.4	30.0	-	2.4	-7.3	3.1	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.01	-
57.75	68.6	25.9	-	1.9	-7.3	2.9	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	39	15	-	-	0.01	-
57.91	69.8	26.3	-	1.6	-7.3	2.4	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	36	15	-	-	0.01	-
58.07	72.8	27.5	-	1.9	-7.3	2.7	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	37	15	-	-	0.01	-
58.24	70.0	26.4	-	1.7	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	37	15	-	-	0.01	-
58.40	70.6	26.6	-	1.8	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.9	9.9	37	15	-	-	0.01	-
58.57	81.6	43.1	114.1	2.1	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	41	22	-	-	5.6	9.9	30	15	2.10	-	0.01	51.2
58.73	87.3	46.1	124.6	2.5	-7.3	3.0	4	clayy SILT to silty CLAY	115	2.0	44	23	-	-	6.1	9.9	30	15	1.95	-	0.01	48.8
58.89	91.5	48.2	129.9	2.7	-7.3	3.1	4	clayy SILT to silty CLAY	115	2.0	46	24	-	-	6.4	9.9	30	15	1.89	-	0.00	46.2
59.06	93.4	35.3	-	3.1	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	36	15	-	-	0.00	-
59.22	88.7	33.5	-	2.9	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.2	9.9	37	15	-	-	0.00	-
59.39	81.0	30.6	-	2.6	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	38	15	-	-	0.00	-
59.55	79.6	30.0	-	2.5	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.00	-
59.71	80.4	30.3	-	2.8	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	40	15	-	-	0.00	-
59.88	84.7	32.0	-	2.9	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	39	15	-	-	0.00	-
60.04	94.3	35.6	-	3.3	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.00	-
60.21	98.7	37.3	-	3.5	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	49	19	-	-	6.9	9.9	36	15	-	-	0.00	-
60.37	92.7	35.0	-	3.3	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	38	15	-	-	0.00	-
60.53	92.4	34.9	-	3.0	-7.2	3.4	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	36	15	-	-	0.00	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(568).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-222	Date and Time	10/10/2011 12:58:35 AM	Maximum Depth	99.90 ft
Water Table Depth		>99.90 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
0.33	3.1	4.9	-	3.2	0.1	9.9	2	Organic SOILS - Peats	100	1.0	3	5	-	-	0.3	9.9	95	10	N/A	0.00	N/A	N/A
0.49	22.8	36.5	-	3.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	54	15	N/A	0.00	N/A	N/A
0.66	30.5	48.9	-	2.5	0.3	8.3	3	silty CLAY to CLAY	115	1.5	20	33	-	-	2.2	9.9	45	15	N/A	0.00	N/A	N/A
0.82	24.8	39.8	-	2.4	0.3	9.7	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	52	15	N/A	0.00	N/A	N/A
0.98	31.0	49.7	-	2.5	0.3	8.1	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	44	15	N/A	0.00	N/A	N/A
1.15	28.0	44.9	-	2.8	0.3	10.0	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	50	15	N/A	0.00	N/A	N/A
1.31	25.6	41.1	-	2.6	0.4	9.9	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	51	15	N/A	0.00	N/A	N/A
1.48	11.3	18.2	-	1.9	0.4	9.9	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	68	15	N/A	0.00	N/A	N/A
1.64	8.3	13.4	-	1.2	0.5	9.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	75	15	N/A	0.00	N/A	N/A
1.80	7.8	12.6	-	1.2	0.5	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.97	8.8	14.2	-	1.0	0.5	9.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	74	15	N/A	0.00	N/A	N/A
2.13	2.7	4.4	-	1.0	0.5	9.9	2	Organic SOILS - Peats	100	1.0	3	4	-	-	0.3	7.3	95	10	N/A	0.00	N/A	N/A
2.30	6.6	10.6	-	1.3	0.6	9.9	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.5	9.9	82	15	N/A	0.00	N/A	N/A
2.46	62.1	99.7	160.1	1.5	0.7	2.4	5	silty SAND to sandy SILT	120	4.0	16	25	67	48	-	-	18	16	N/A	0.00	N/A	N/A
2.62	54.8	87.8	175.2	1.8	0.8	3.3	5	silty SAND to sandy SILT	120	4.0	14	22	63	47	-	-	23	16	N/A	0.00	N/A	N/A
2.79	45.9	73.6	191.4	2.1	0.8	4.5	4	clayy SILT to silty CLAY	115	2.0	23	37	-	-	3.2	9.9	29	15	N/A	0.00	N/A	N/A
2.95	36.5	58.5	189.6	1.9	0.6	5.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	35	15	N/A	0.00	N/A	N/A
3.12	31.5	50.5	-	1.7	0.5	5.5	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.2	9.9	37	15	N/A	0.00	N/A	N/A
3.28	30.2	48.5	-	1.5	0.5	5.0	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	36	15	-	-	0.24	-
3.45	23.5	37.6	-	1.2	0.5	5.2	3	silty CLAY to CLAY	115	1.5	16	25	-	-	1.6	9.9	41	15	-	-	0.24	-
3.61	19.6	31.4	-	0.9	0.5	4.7	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	42	15	-	-	0.24	-
3.77	21.7	34.8	-	1.2	0.4	5.6	3	silty CLAY to CLAY	115	1.5	14	23	-	-	1.5	9.9	44	15	-	-	0.24	-
3.94	34.4	55.1	172.3	1.6	0.4	4.7	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	34	15	0.00	-	0.24	0.0
4.10	32.5	52.1	-	1.9	0.4	5.7	3	silty CLAY to CLAY	115	1.5	22	35	-	-	2.3	9.9	38	15	-	-	0.24	-
4.27	28.2	45.2	-	1.5	0.4	5.4	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	39	15	-	-	0.24	-
4.43	15.8	25.4	-	0.8	0.5	5.4	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	49	15	-	-	0.24	-
4.59	9.2	14.7	-	0.6	0.4	6.5	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	9.9	64	15	-	-	0.24	-
4.76	8.9	14.2	-	0.5	0.4	5.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	63	15	-	-	0.24	-
4.92	15.5	24.9	-	0.7	0.4	4.6	3	silty CLAY to CLAY	115	1.5	10	17	-	-	1.1	9.9	46	15	-	-	0.24	-
5.09	16.9	27.1	-	0.9	0.3	5.6	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	48	15	-	-	0.24	-
5.25	22.6	36.2	-	1.2	0.3	5.5	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	43	15	-	-	0.24	-
5.41	26.7	42.8	-	1.3	0.3	5.1	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	39	15	-	-	0.24	-
5.58	28.8	46.1	-	1.4	0.3	4.9	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.24	-
5.74	30.7	49.2	-	1.5	0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	36	15	-	-	0.24	-
5.91	30.4	48.8	-	1.5	0.3	5.2	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	37	15	-	-	0.24	-
6.07	28.7	46.0	-	1.4	0.3	4.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.24	-
6.23	22.9	36.8	-	1.2	0.3	5.4	3	silty CLAY to CLAY	115	1.5	15	25	-	-	1.6	9.9	42	15	-	-	0.24	-
6.40	20.3	32.5	-	0.7	0.4	3.8	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	39	15	-	-	0.24	-
6.56	28.0	44.4	95.2	0.5	0.4	1.8	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	25	16	2.43	-	0.24	50.8
6.73	25.3	39.7	96.0	0.5	0.4	2.1	5	silty SAND to sandy SILT	120	4.0	6	10	36	40	-	-	27	16	2.42	-	0.24	51.2
6.89	26.3	40.7	115.2	0.7	0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	31	15	2.08	-	0.23	51.2
7.05	32.6	49.9	103.5	0.6	0.2	2.0	5	silty SAND to sandy SILT	120	4.0	8	12	44	41	-	-	24	16	2.27	-	0.23	44.3
7.22	29.1	44.0	108.3	0.7	0.3	2.4	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	28	16	2.19	-	0.23	51.2
7.38	21.1	33.8	-	0.7	0.4	3.3	4	clayy SILT to silty CLAY	115	2.0	11	17	-	-	1.5	9.9	36	15	-	-	0.22	-
7.55	25.6	37.8	107.1	0.7	0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	13	19	-	-	1.8	9.9	31	15	2.21	-	0.22	51.2
7.71	24.4	35.7	97.1	0.5	0.4	2.3	4	clayy SILT to silty CLAY	115	2.0	12	18	-	-	1.7	9.9	30	15	2.39	-	0.22	51.2
7.87	28.2	40.7	100.9	0.6	0.4	2.2	5	silty SAND to sandy SILT	120	4.0	7	10	37	40	-	-	28	16	2.32	-	0.21	51.2
8.04	28.3	45.5	151.1	1.2	0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	35	15	0.52	-	0.21	2.4
8.20	50.3	71.2	163.9	1.8	0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	25	36	-	-	3.5	9.9	26	15	0.00	-	0.21	0.0
8.37	44.2	62.0	177.3	2.0	0.4	4.5	4	clayy SILT to silty CLAY	115	2.0	22	31	-	-	3.1	9.9	31	15	0.00	-	0.21	0.0
8.53	51.0	70.8	168.6	1.9	0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.6	9.9	27	15	0.00	-	0.21	0.0
8.69	51.5	70.9	172.3	2.0	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.6	9.9	28	15	0.00	-	0.21	0.0
8.86	48.4	66.0	180.4	2.1	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	24	33	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.02	47.8	64.5	175.2	2.0	0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.19	48.2	64.5	174.0	2.0	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.35	52.2	69.2	175.7	2.1	0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.7	9.9	29	15	0.00	-	0.21	0.0
9.51	54.5	71.6	170.9	2.0	0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	27	36	-	-	3.8	9.9	27	15	0.00	-	0.21	0.0
9.68	52.8	68.7	176.3	2.1	0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	29	15	0.00	-	0.21	0.0
9.84	54.4	70.3	180.6	2.3	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	27	35	-	-	3.8	9.9	29	15	0.00	-	0.21	0.0
10.01	56.4	72.3	180.3	2.3	0.4	4.1	4	clayy SILT to silty CLAY	115	2.0	28	36	-	-	4.0	9.9	28	15	0.00	-	0.21	0.0
10.17	55.7	70.8	173.8	2.2	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	28	35	-	-	3.9	9.9	28	15	0.00	-	0.21	0.0
10.34	52.8	66.5	188.6	2.5	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	26	33	-	-	3.7	9.9	31	15	0.00	-	0.21	0.0
10.50	63.7	79.6	192.9	2.7	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	32	40	-	-	4.5	9.9	27	15	0.00	-	0.21	0.0
10.66	65.0	80.7	200.2	2.9	0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	33	40	-	-	4.6	9.9	28	15	0.00	-	0.21	0.0
10.83	64.4	79.3	205.8	3.0	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	32	40	-	-	4.5	9.9	29	15	0.00	-	0.21	0.0
10.99	74.4	90.9	216.2	3.4	0.3	4.6	9	very stiff fine SOIL	120	2.0	37	45	64	44	-	-	27	30	0.00	-	0.21	0.0
11.16	82.7	100.4	228.1	3.8	0.3	4.6	9	very stiff fine SOIL	120	2.0	41	50	67	44	-	-	26	30	0.00	-	0.21	0.0
11.32	80.6	97.0	220.8	3.6	0.4	4.5	9	very stiff fine SOIL	120	2.0	40	48	66	44	-	-	26	30	0.00	-	0.21	0.0
11.48	81.1	97.0	220.9	3.6	0.3	4.5	9	very stiff fine SOIL	120	2.0	41	48	66	44	-	-	26	30	0.00	-	0.21	0.0
11.65	99.6	118.2	235.4	4.1	0.3	4.2	9	very stiff fine SOIL	120	2.0	50	59	73	45	-	-	23	30	0.00	-	0.21	0.0
11.81	94.1	110.8	252.0	4.6	0.3	5.0	9	very stiff fine SOIL	120	2.0	47	55	70	45	-	-	26	30	0.00	-	0.21	0.0
11.98	91.1	106.5	247.8	4.5	0.3	5.0	9	very stiff fine SOIL	120	2.0	46	53	69	44	-	-	27	30	0.00	-	0.21	0.0
12.14	82.8	96.1	235.9	4.1	0.3	5.1	9	very stiff fine SOIL	120	2.0	41	48	66	44	-	-	28	30	0.00	-	0.21	0.0
12.30	70.4	81.2	236.7	4.1	0.3	5.8	9	very stiff fine SOIL	120	2.0	35	41	60	43	-	-	32	30	0.00	-	0.21	0.0
12.47	65.5	75.0	215.2	3.5	0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	33	37	-	-	4.6	9.9	32	15	0.00	-	0.21	0.0
12.63	53.0	60.3	191.5	2.7	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	27	30	-	-	3.7	9.9	34	15	0.00	-	0.21	0.0
12.80	50.1	56.7	186.5	2.6	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	25	28	-	-	3.5	9.9	35	15	0.00	-	0.21	0.0
12.96	55.4	62.2	190.7	2.8	0.4	5.1	4	clayy SILT to silty CLAY	115	2.0	28	31	-	-	3.9	9.9	33	15	0.00	-	0.21	0.0
13.12	51.5	61.5	198.5	2.8	0.4	5.5	4	clayy SILT to silty CLAY	115	2.0	26	31	-	-	3.6	9.9	35	15	0.00	-	0.21	0.0
13.29	45.4	53.7	177.5	2.2	0.4	5.0	4	clayy SILT to silty CLAY	115	2.0	23	27	-	-	3.2	9.9	35	15	0.00	-	0.21	0.0
13.45	40.5	47.5	-	1.8	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.8	9.9	36	15	-	-	0.21	-
13.62	38.5	44.8	-	1.6	0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	36	15	-	-	0.21	-
13.78	39.6	45.7	-	1.8	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	20	23	-	-	2.8	9.9	36	15	-	-	0.21	-
13.94	41.4	51.4	-	2.1	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	21	26	-	-	2.9	9.9	36	15	-	-	0.21	-
14.11	50.7	54.6	168.8	2.3	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	25	27	-	-	3.6	9.9	33	15	0.00	-	0.21	0.0
14.27	73.5	78.7	162.2	2.3	0.4	3.1	5	silty SAND to sandy SILT	120	4.0	18	20	59	43	-	-	24	16	0.00	-	0.21	0.0
14.44	108.1	115.0	172.2	2.5	0.3	2.3	5	silty SAND to sandy SILT	120	4.0	27	29	72	45	-	-	17	16	0.00	-	0.21	0.0
14.60	141.0	149.1	183.8	2.4	0.3	1.7	6	clean SAND to silty SAND	125	5.0	28	30	80	46	-	-	11	16	0.00	-	0.21	0.0
14.76	158.0	166.1	213.8	3.3	0.2	2.1	5	silty SAND to sandy SILT	120	4.0	40	42	84	46	-	-	13	16	0.00	-	0.21	0.0
14.93	145.4	152.0	223.6	4.1	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	36	38	81	46	-	-	16	16	0.00	-	0.21	0.0
15.09	72.0	74.9	227.8	4.2	0.3	5.8	9	very stiff fine SOIL	120	2.0	36	37	57	42	-	-	33	30	0.00	-	0.21	0.0
15.26	49.1	55.6	-	2.7	0.3	5.5	4	clayy SILT to silty CLAY	115	2.0	25	28	-	-	3.4	9.9	36	15	-	-	0.21	-
15.42	47.7	50.7	167.2	2.2	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	24	25	-	-	3.3	9.9	35	15	0.00	-	0.21	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
15.58	41.3	42.3	124.4	1.3	0.3	3.2	4	clayy SILT to silty CLAY	115	2.0	21	21	-	-	2.9	9.9	32	15	1.95	-	0.21	51.2
15.75	37.3	37.9	122.4	1.2	0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	19	19	-	-	2.6	9.9	35	15	1.98	-	0.20	51.2
15.91	36.8	40.0	-	2.1	0.3	5.8	3	silty CLAY to CLAY	115	1.5	25	27	-	-	2.6	9.9	42	15	-	-	0.20	-
16.08	59.5	59.9	158.5	2.2	0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	30	30	-	-	4.2	9.9	30	15	0.55	-	0.20	3.8
16.24	118.8	119.1	147.6	1.6	0.2	1.4	6	clean SAND to silty SAND	125	5.0	24	24	73	45	-	-	12	16	1.00	-	0.20	4.9
16.40	76.0	75.8	178.9	2.9	0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	38	38	-	-	5.3	9.9	27	15	0.00	-	0.20	0.0
16.57	104.0	103.1	180.6	3.0	0.1	2.9	5	silty SAND to sandy SILT	120	4.0	26	26	68	44	-	-	20	16	0.00	-	0.20	0.0
16.73	51.4	53.0	-	2.7	0.2	5.3	4	clayy SILT to silty CLAY	115	2.0	26	27	-	-	3.6	9.9	36	15	-	-	0.20	-
16.90	35.0	35.8	-	1.9	0.2	5.6	3	silty CLAY to CLAY	115	1.5	23	24	-	-	2.4	9.9	44	15	-	-	0.20	-
17.06	32.4	32.8	-	1.4	0.2	4.5	3	silty CLAY to CLAY	115	1.5	22	22	-	-	2.3	9.9	41	15	-	-	0.20	-
17.23	35.7	35.8	-	1.5	0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	39	15	-	-	0.20	-
17.39	40.3	40.0	-	2.0	0.1	5.0	3	silty CLAY to CLAY	115	1.5	27	27	-	-	2.8	9.9	40	15	-	-	0.20	-
17.55	38.8	38.2	-	2.1	0.2	5.6	3	silty CLAY to CLAY	115	1.5	26	25	-	-	2.7	9.9	42	15	-	-	0.20	-
17.72	30.5	29.8	-	1.7	0.2	5.9	3	silty CLAY to CLAY	115	1.5	20	20	-	-	2.1	9.9	48	15	-	-	0.20	-
17.88	30.4	29.4	-	1.3	0.0	4.3	3	silty CLAY to CLAY	115	1.5	20	20	-	-	2.1	9.9	43	15	-	-	0.20	-
18.05	30.9	29.6	-	1.9	-2.1	6.3	3	silty CLAY to CLAY	115	1.5	21	20	-	-	2.1	9.9	49	15	-	-	0.20	-
18.21	37.4	35.4	116.1	1.2	-4.3	3.2	4	clayy SILT to silty CLAY	115	2.0	19	18	-	-	2.6	9.9	35	15	2.07	-	0.20	51.2
18.37	96.4	90.8	148.4	2.2	-4.3	2.3	5	silty SAND to sandy SILT	120	4.0	24	23	64	43	-	-	19	16	1.01	-	0.20	6.5
18.54	93.1	87.3	152.8	2.3	-4.3	2.5	5	silty SAND to sandy SILT	120	4.0	23	22	63	43	-	-	20	16	0.81	-	0.19	5.1
18.70	56.0	52.3	158.7	2.3	-4.2	4.2	4	clayy SILT to silty CLAY	115	2.0	28	26	-	-	3.9	9.9	33	15	0.59	-	0.19	25.1
18.87	50.2	46.6	137.4	1.8	-3.0	3.6	4	clayy SILT to silty CLAY	115	2.0	25	23	-	-	3.5	9.9	32	15	1.55	-	0.19	48.1
19.03	41.5	38.4	126.0	1.4	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	2.9	9.9	35	15	1.93	-	0.19	51.2
19.19	26.2	23.6	-	1.2	-1.0	4.6	3	silty CLAY to CLAY	115	1.5	17	16	-	-	1.8	9.9	48	15	-	-	0.19	-
19.36	19.2	17.1	-	0.8	-1.0	4.7	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.7	55	15	-	-	0.19	-
19.52	20.5	18.1	-	0.6	-0.9	2.9	4	clayy SILT to silty CLAY	115	2.0	10	9	-	-	1.4	9.9	46	15	-	-	0.19	-
19.69	21.9	19.2	-	0.5	-0.9	2.4	4	clayy SILT to silty CLAY	115	2.0	11	10	-	-	1.5	9.9	42	15	-	-	0.19	-
19.85	32.1	28.0	-	1.1	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	16	14	-	-	2.2	9.9	40	15	-	-	0.19	-
20.01	32.9	28.4	-	1.5	-0.8	4.9	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	45	15	-	-	0.19	-
20.18	34.8	29.8	-	1.4	-0.8	4.1	4	clayy SILT to silty CLAY	115	2.0	17	15	-	-	2.4	9.9	41	15	-	-	0.19	-
20.34	31.0	26.4	-	1.2	-0.8	4.0	4	clayy SILT to silty CLAY	115	2.0	16	13	-	-	2.1	9.9	43	15	-	-	0.19	-
20.51	28.8	24.3	-	1.2	-0.8	4.5	3	silty CLAY to CLAY	115	1.5	19	16	-	-	2.0	9.9	47	15	-	-	0.19	-
20.67	24.2	20.2	-	1.2	-0.8	5.2	3	silty CLAY to CLAY	115	1.5	16	13	-	-	1.7	9.9	53	15	-	-	0.19	-
20.83	22.2	18.4	-	1.0	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	9.9	55	15	-	-	0.19	-
21.00	19.6	16.1	-	1.0	-0.8	5.4	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.2	59	15	-	-	0.19	-
21.16	19.2	15.7	-	1.1	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	9.0	62	15	-	-	0.19	-
21.33	19.2	15.6	-	1.1	-0.8	5.8	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	8.9	61	15	-	-	0.19	-
21.49	25.7	20.6	-	1.3	-0.8	5.4	3	silty CLAY to CLAY	115	1.5	17	14	-	-	1.8	9.9	54	15	-	-	0.19	-
21.65	34.9	27.8	-	1.4	-0.8	4.2	3	silty CLAY to CLAY	115	1.5	23	19	-	-	2.4	9.9	43	15	-	-	0.19	-
21.82	33.5	26.5	-	1.4	-0.8	4.5	3	silty CLAY to CLAY	115	1.5	22	18	-	-	2.3	9.9	45	15	-	-	0.19	-
21.98	23.8	18.7	-	1.3	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	16	12	-	-	1.6	9.9	56	15	-	-	0.19	-
22.15	19.5	15.2	-	1.0	-0.8	5.7	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	8.8	61	15	-	-	0.19	-
22.31	17.4	13.5	-	0.9	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.7	65	15	-	-	0.19	-
22.47	15.2	11.7	-	0.8	-0.8	6.0	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.6	70	15	-	-	0.19	-
22.64	13.7	10.5	-	0.7	-0.8	5.5	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.8	71	15	-	-	0.19	-
22.80	11.2	8.5	-	0.6	-0.7	6.4	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.6	80	15	-	-	0.19	-
22.97	12.6	9.5	-	0.6	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	5.3	74	15	-	-	0.19	-
23.13	16.5	12.3	-	0.8	-0.8	5.1	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	7.0	65	15	-	-	0.19	-
23.30	20.3	15.1	-	1.0	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.7	60	15	-	-	0.19	-
23.46	21.6	15.9	-	1.0	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	14	11	-	-	1.5	9.2	58	15	-	-	0.19	-
23.62	20.8	15.2	-	1.0	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.8	60	15	-	-	0.19	-
23.79	18.8	13.7	-	1.2	-0.8	6.6	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	7.9	67	15	-	-	0.19	-
23.95	18.9	13.7	-	1.3	-0.8	7.3	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	7.9	69	15	-	-	0.19	-
24.12	25.8	18.5	-	1.4	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.8	9.9	58	15	-	-	0.19	-
24.28	29.1	20.8	-	1.6	-0.8	5.7	3	silty CLAY to CLAY	115	1.5	19	14	-	-	2.0	9.9	54	15	-	-	0.19	-
24.44	54.5	44.5	134.2	1.9	-0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	27	22	-	-	3.8	9.9	33	15	1.79	-	0.19	50.7
24.61	88.3	71.9	141.8	2.3	-0.9	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	41	-	-	23	16	1.54	-	0.18	24.9
24.77	52.6	36.7	-	2.3	-0.8	4.4	4	clayy SILT to silty CLAY	115	2.0	26	18	-	-	3.7	9.9	39	15	-	-	0.18	-
24.94	37.1	25.7	-	2.0	-1.2	5.7	3	silty CLAY to CLAY	115	1.5	25	17	-	-	2.6	9.9	50	15	-	-	0.18	-
25.10	26.1	18.0	-	1.4	-1.2	5.9	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.8	9.9	58	15	-	-	0.18	-
25.26	21.2	14.5	-	1.3	-1.2	6.8	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.5	66	15	-	-	0.18	-
25.43	41.2	28.0	-	1.6	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	21	14	-	-	2.9	9.9	43	15	-	-	0.18	-
25.59	41.2	27.9	-	1.8	-1.2	4.6	3	silty CLAY to CLAY	115	1.5	27	19	-	-	2.9	9.9	45	15	-	-	0.18	-
25.76	28.8	19.3	-	1.1	-1.2	4.2	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	9.9	50	15	-	-	0.18	-
25.92	25.5	17.0	-	2.1	-1.2	8.9	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	9.9	68	15	-	-	0.18	-
26.08	92.7	73.3	150.0	2.6	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	24	16	1.21	-	0.18	15.4
26.25	45.9	30.3	-	3.6	-1.6	8.2	3	silty CLAY to CLAY	115	1.5	31	20	-	-	3.2	9.9	54	15	-	-	0.18	-
26.41	42.5	27.8	-	4.2	-1.6	9.9	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	59	15	-	-	0.18	-
26.58	69.4	45.2	-	4.4	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	46	30	-	-	4.8	9.9	42	15	-	-	0.18	-
26.74	143.8	112.3	200.5	4.7	-1.5	3.3	5	silty SAND to sandy SILT	120	4.0	36	28	71	43	-	-	21	16	0.00	-	0.18	0.0
26.90	166.4	129.6	192.6	4.1	-1.5	2.5	5	silty SAND to sandy SILT	120	4.0	42	32	76	44	-	-	16	16	0.00	-	0.18	0.0
27.07	84.6	65.7	177.9	3.6	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	42	33	-	-	5.9	9.9	30	15	0.00	-	0.18	0.0
27.23	48.5	30.8	-	2.2	-1.4	4.8	3	silty CLAY to CLAY	115	1.5	32	21	-	-	3.4	9.9	43	15	-	-	0.18	-
27.40	31.0	19.6	-	1.3	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.1	9.9	51	15	-	-	0.18	-
27.56	35.6	22.3	-	1.0	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	18	11	-	-	2.5	9.9	42	15	-	-	0.18	-
27.72	27.5	17.2	-	1.0	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	18	11	-	-	1.9	9.9	52	15	-	-	0.18	-
27.89	24.9	15.4	-	0.9	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.1	55	15	-	-	0.18	-
28.05	23.3	14.3	-	0.9	-1.2	4.2	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.6	8.5	57	15	-	-	0.18	-
28.22	25.5	15.6	-	1.0	-1.3	4.1	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.3	55	15	-	-	0.18	-
28.38	27.8	16.9	-	0.8	-2.2	3.1	3	silty CLAY to CLAY	115	1.5	19	11	-	-	1.9	9.9	49	15	-	-	0.18	-
28.54	25.1	15.2	-	0.8	-2.4	3.4	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	53	15	-	-	0.18	-
28.71	26.2	15.8	-	0.9	-2.5	3.5	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.8	9.4	52	15	-	-	0.18	-
28.87	25.2	15.1	-	0.8	-2.7	3.5	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	53	15	-	-	0.18	-
29.04	23.4	14.0	-	1.0	-3.0	4.5	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	8.2	59	15	-	-	0.18	-
29.20	25.5	15.1	-	1.3	-3.2	5.3	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	60	15	-	-	0.18	-
29.36	35.1	20.7	-	1.9	-3.3	5.8	3	silty CLAY to CLAY	115	1.5	23	14	-	-	2.4	9.9	55	15	-	-	0.18	-
29.53	41.9	24.5	-	1.7	-4.2	4.3	3	silty CLAY to CLAY	115	1.5	28	16	-	-	2.9	9.9	46	15	-	-	0.18	-
29.69	28.9	16.8	-	1.6	-5.6	5.8	3	silty CLAY to CLAY	115	1.5	19	11	-	-	2.0	9.9	59	15	-	-	0.18	-
29.86	30.2	17.5	-	1.5	-5.9	5.1	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	56	15	-	-	0.18	-
30.02	77.2	56.9	161.6	3.1	-5.9	4.1	4	clayy SILT to silty CLAY	115	2.0	39	28	-	-	5.4	9.9	31	15	0.00	-	0.18	0.0
30.19	117.4	86.3	160.6	3.3	-5.8	2.8	5	silty SAND to sandy SILT	120	4.0	29	22	62	42	-	-	21	16	0.00	-	0.18	0.0
30.35	88.0	64.6	181.6	3.9	-5.8	4.5	4	clayy SILT to silty CLAY	115	2.0	44	32	-	-	6.2	9.9	31	15	0.00	-	0.18	0.0
30.51	64.8	36.8	-	2.3	-5.0	3.6	4	clayy SILT to silty CLAY	115	2.0	32	18	-	-	4.5	9.9	36	15	-	-	0.18	-
30.68	30.5	17.2	-	1.6	-2.5	5.4	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.1	9.9	58	15	-	-	0.18	-
30.84	35.8	20.1	-	1.7	-1.5	5.1	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	53	15	-	-	0.18	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
31.01	44.9	25.1	-	2.0	-1.6	4.7	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	47	15	-	-	0.18	-
31.17	49.3	27.3	-	2.2	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	33	18	-	-	3.4	9.9	45	15	-	-	0.18	-
31.33	40.6	22.4	-	2.2	-1.5	5.7	3	silty CLAY to CLAY	115	1.5	27	15	-	-	2.8	9.9	53	15	-	-	0.18	-
31.50	29.8	16.4	-	2.2	-1.7	7.8	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.0	9.9	66	15	-	-	0.18	-
31.66	30.9	16.9	-	1.8	-1.7	6.2	3	silty CLAY to CLAY	115	1.5	21	11	-	-	2.1	9.9	61	15	-	-	0.18	-
31.83	37.1	20.2	-	2.7	-1.8	7.8	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.6	9.9	61	15	-	-	0.18	-
31.99	37.4	20.2	-	1.6	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.6	9.9	51	15	-	-	0.18	-
32.15	42.7	23.0	-	1.1	-3.0	2.6	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	3.0	9.9	40	15	-	-	0.18	-
32.32	44.0	23.5	-	1.4	0.3	3.3	4	clayy SILT to silty CLAY	115	2.0	22	12	-	-	3.0	9.9	42	15	-	-	0.18	-
32.48	86.2	61.1	137.8	2.4	0.3	2.9	5	silty SAND to sandy SILT	120	4.0	22	15	51	40	-	-	26	16	1.78	-	0.18	33.2
32.65	48.4	25.6	-	2.1	0.4	4.5	3	silty CLAY to CLAY	115	1.5	32	17	-	-	3.4	9.9	46	15	-	-	0.18	-
32.81	27.3	14.4	-	1.3	0.4	5.0	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	8.6	60	15	-	-	0.18	-
32.97	29.7	15.6	-	1.0	0.4	3.7	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.0	9.4	53	15	-	-	0.18	-
33.14	36.0	18.8	-	1.4	0.4	4.0	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	50	15	-	-	0.18	-
33.30	47.2	24.5	-	1.7	0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	24	12	-	-	3.3	9.9	44	15	-	-	0.18	-
33.47	42.0	21.7	-	2.0	0.4	4.9	3	silty CLAY to CLAY	115	1.5	28	14	-	-	2.9	9.9	51	15	-	-	0.18	-
33.63	37.0	19.1	-	2.2	0.4	6.2	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.5	9.9	58	15	-	-	0.18	-
33.79	34.2	17.5	-	2.0	0.4	6.3	3	silty CLAY to CLAY	115	1.5	23	12	-	-	2.3	9.9	60	15	-	-	0.18	-
33.96	30.7	15.7	-	1.5	0.4	5.4	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	9.5	60	15	-	-	0.18	-
34.12	27.3	13.8	-	1.7	0.4	6.6	3	silty CLAY to CLAY	115	1.5	18	9	-	-	1.9	8.3	67	15	-	-	0.18	-
34.29	65.1	32.8	-	2.3	0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	33	16	-	-	4.5	9.9	38	15	-	-	0.18	-
34.45	63.5	31.9	-	2.4	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	32	16	-	-	4.4	9.9	39	15	-	-	0.18	-
34.61	35.4	17.7	-	2.1	0.3	6.3	3	silty CLAY to CLAY	115	1.5	24	12	-	-	2.4	9.9	60	15	-	-	0.18	-
34.78	32.5	16.2	-	1.8	0.3	5.9	3	silty CLAY to CLAY	115	1.5	22	11	-	-	2.2	9.8	61	15	-	-	0.18	-
34.94	24.7	12.2	-	1.3	0.3	5.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.7	7.3	67	15	-	-	0.18	-
35.11	19.8	9.7	-	0.9	0.2	5.0	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.7	71	15	-	-	0.18	-
35.27	19.8	9.7	-	0.9	0.2	5.1	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.7	71	15	-	-	0.18	-
35.43	23.7	11.6	-	1.0	0.2	4.7	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.9	65	15	-	-	0.18	-
35.60	38.1	18.5	-	1.4	0.2	3.9	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.6	9.9	50	15	-	-	0.18	-
35.76	32.0	15.5	-	1.5	0.2	4.9	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.2	9.4	58	15	-	-	0.18	-
35.93	25.4	12.2	-	1.3	0.2	5.4	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.7	7.3	66	15	-	-	0.18	-
36.09	21.6	10.3	-	1.2	0.2	6.2	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.5	6.1	74	15	-	-	0.18	-
36.26	30.6	14.6	-	1.6	0.2	5.5	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	8.9	62	15	-	-	0.18	-
36.42	50.3	23.9	-	1.9	0.2	4.0	3	silty CLAY to CLAY	115	1.5	34	16	-	-	3.5	9.9	45	15	-	-	0.18	-
36.58	33.0	15.6	-	1.6	0.2	5.1	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.3	9.5	59	15	-	-	0.18	-
36.75	25.9	12.2	-	1.2	0.2	5.1	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.8	7.3	65	15	-	-	0.18	-
36.91	32.7	15.3	-	1.3	0.2	4.4	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.2	9.4	57	15	-	-	0.18	-
37.08	36.5	17.0	-	1.5	0.2	4.5	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	54	15	-	-	0.18	-
37.24	48.5	22.5	-	1.9	0.2	4.0	3	silty CLAY to CLAY	115	1.5	32	15	-	-	3.3	9.9	47	15	-	-	0.18	-
37.40	40.8	18.9	-	1.9	0.2	5.0	3	silty CLAY to CLAY	115	1.5	27	13	-	-	2.8	9.9	54	15	-	-	0.18	-
37.57	34.1	15.7	-	1.9	0.2	5.8	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.3	9.6	61	15	-	-	0.18	-
37.73	38.7	17.7	-	1.9	0.1	5.3	3	silty CLAY to CLAY	115	1.5	26	12	-	-	2.7	9.9	57	15	-	-	0.18	-
37.90	31.0	14.2	-	2.0	0.1	7.0	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.6	68	15	-	-	0.18	-
38.06	31.9	14.5	-	2.1	0.1	6.9	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.2	8.8	67	15	-	-	0.18	-
38.22	30.4	13.8	-	2.0	0.0	7.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.1	8.4	68	15	-	-	0.18	-
38.39	34.2	15.4	-	2.3	0.0	7.1	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.3	9.4	66	15	-	-	0.18	-
38.55	41.2	18.5	-	2.5	0.0	6.3	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	59	15	-	-	0.18	-
38.72	42.3	18.9	-	3.1	0.0	7.7	3	silty CLAY to CLAY	115	1.5	28	13	-	-	2.9	9.9	63	15	-	-	0.18	-
38.88	59.8	26.6	-	3.1	0.0	5.3	3	silty CLAY to CLAY	115	1.5	40	18	-	-	4.1	9.9	48	15	-	-	0.18	-
39.04	47.6	21.1	-	2.3	0.1	5.0	3	silty CLAY to CLAY	115	1.5	32	14	-	-	3.3	9.9	52	15	-	-	0.18	-
39.21	50.8	22.4	-	1.6	0.1	3.4	4	clayy SILT to silty CLAY	115	2.0	25	11	-	-	3.5	9.9	44	15	-	-	0.18	-
39.37	123.4	79.5	140.4	2.8	0.0	2.3	5	silty SAND to sandy SILT	120	4.0	31	20	59	41	-	-	20	16	1.75	-	0.18	23.4
39.54	131.6	84.6	149.8	3.2	0.1	2.5	5	silty SAND to sandy SILT	120	4.0	33	21	61	41	-	-	20	16	1.38	-	0.17	15.8
39.70	96.2	61.7	137.5	2.7	0.1	2.8	5	silty SAND to sandy SILT	120	4.0	24	15	51	40	-	-	26	16	1.80	-	0.17	32.9
39.86	78.5	50.2	122.9	2.1	0.1	2.7	5	silty SAND to sandy SILT	120	4.0	20	13	44	38	-	-	28	16	1.97	-	0.17	43.9
40.03	71.4	30.9	-	2.0	0.1	2.9	4	clayy SILT to silty CLAY	115	2.0	36	15	-	-	5.0	9.9	36	15	-	-	0.16	-
40.19	65.1	28.0	-	2.2	0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	33	14	-	-	4.5	9.9	40	15	-	-	0.16	-
40.36	60.7	26.0	-	2.7	0.2	4.7	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	46	15	-	-	0.16	-
40.52	60.1	25.6	-	3.2	0.2	5.6	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	50	15	-	-	0.16	-
40.68	65.5	27.8	-	2.7	0.2	4.3	3	silty CLAY to CLAY	115	1.5	44	19	-	-	4.5	9.9	43	15	-	-	0.16	-
40.85	60.6	25.7	-	2.4	0.2	4.2	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	45	15	-	-	0.16	-
41.01	64.0	27.0	-	3.7	0.1	6.0	3	silty CLAY to CLAY	115	1.5	43	18	-	-	4.4	9.9	50	15	-	-	0.16	-
41.18	82.2	34.6	-	4.4	0.2	5.5	3	silty CLAY to CLAY	115	1.5	55	23	-	-	5.7	9.9	44	15	-	-	0.16	-
41.34	66.0	27.6	-	4.5	0.2	7.0	3	silty CLAY to CLAY	115	1.5	44	18	-	-	4.6	9.9	52	15	-	-	0.16	-
41.50	53.6	22.4	-	3.4	0.0	6.6	3	silty CLAY to CLAY	115	1.5	36	15	-	-	3.7	9.9	56	15	-	-	0.16	-
41.67	44.0	18.3	-	3.4	0.0	8.2	3	silty CLAY to CLAY	115	1.5	29	12	-	-	3.0	9.9	65	15	-	-	0.16	-
41.83	51.9	21.5	-	3.5	0.0	7.1	3	silty CLAY to CLAY	115	1.5	35	14	-	-	3.6	9.9	58	15	-	-	0.16	-
42.00	76.5	31.5	-	3.6	0.0	4.9	3	silty CLAY to CLAY	115	1.5	51	21	-	-	5.3	9.9	44	15	-	-	0.16	-
42.16	62.7	25.7	-	3.3	0.0	5.5	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.3	9.9	49	15	-	-	0.16	-
42.32	60.5	24.7	-	3.1	0.0	5.4	3	silty CLAY to CLAY	115	1.5	40	16	-	-	4.2	9.9	50	15	-	-	0.16	-
42.49	96.8	39.4	-	3.6	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.8	9.9	36	15	-	-	0.16	-
42.65	101.0	41.0	-	4.0	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	50	20	-	-	7.0	9.9	36	15	-	-	0.16	-
42.82	95.3	38.5	-	4.1	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	48	19	-	-	6.6	9.9	38	15	-	-	0.16	-
42.98	85.7	34.5	-	3.5	0.0	4.2	4	clayy SILT to silty CLAY	115	2.0	43	17	-	-	6.0	9.9	39	15	-	-	0.16	-
43.15	63.1	25.3	-	3.6	0.0	5.9	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.4	9.9	51	15	-	-	0.16	-
43.31	61.2	24.5	-	3.5	0.0	5.9	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	52	15	-	-	0.16	-
43.47	62.6	24.9	-	3.5	0.1	5.8	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.3	9.9	51	15	-	-	0.16	-
43.64	46.4	18.4	-	3.2	0.1	7.4	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.9	62	15	-	-	0.16	-
43.80	47.9	18.9	-	3.0	0.1	6.6	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	59	15	-	-	0.16	-
43.97	61.0	24.0	-	2.7	0.1	4.6	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	47	15	-	-	0.16	-
44.13	47.5	18.7	-	2.1	0.1	4.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	53	15	-	-	0.16	-
44.29	30.7	12.0	-	1.6	0.1	5.8	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	7.3	68	15	-	-	0.16	-
44.46	24.0	9.3	-	1.0	0.1	4.8	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.5	72	15	-	-	0.16	-
44.62	20.6	8.0	-	0.9	0.0	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	76	15	-	-	0.16	-
44.79	20.5	7.9	-	0.8	0.0	4.6	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	75	15	-	-	0.16	-
44.95	21.9	8.4	-	0.9	0.0	4.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.9	74	15	-	-	0.16	-
45.11	28.0	10.7	-	1.0	0.7	3.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.5	64	15	-	-	0.16	-
45.28	27.7	10.6	-	1.1	0.7	4.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.9	6.4	66	15	-	-	0.16	-
45.44	24.9	9.5	-	1.1	0.7	5.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.6	72	15	-	-	0.16	-
45.61	31.4	11.9	-	1.3	0.7	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	7.3	63	15	-	-	0.16	-
45.77	36.4	13.8	-	1.5	0.7	4.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	8.5	59	15	-	-	0.16	-
45.93	36.4	13.7	-	1.4	0.7	4.2	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	8.5	58	15	-	-	0.16	-
46.10	30.4	11.5	-	1.2	0.7	4.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.9	64	15	-	-	0.16	-
46.26	30.7	11.6	-	1.3	0.7	4.7	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	7.0	65	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic -	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
46.43	32.1	12.1	-	1.4	0.7	4.7	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	7.3	64	15	-	-	0.16	-
46.59	30.1	11.3	-	1.7	0.7	6.1	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	6.8	71	15	-	-	0.16	-
46.75	34.4	13.0	-	1.5	0.7	4.6	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.8	62	15	-	-	0.16	-
46.92	27.3	10.3	-	1.3	0.7	5.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.0	70	15	-	-	0.16	-
47.08	23.4	8.8	-	1.0	0.7	5.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.1	74	15	-	-	0.16	-
47.25	26.2	9.9	-	1.0	0.7	4.2	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.8	5.7	67	15	-	-	0.16	-
47.41	26.4	10.0	-	1.1	0.7	4.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.8	70	15	-	-	0.16	-
47.57	29.2	11.0	-	1.1	0.7	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	2.0	6.4	64	15	-	-	0.16	-
47.74	26.3	9.9	-	1.6	0.7	6.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.7	77	15	-	-	0.16	-
47.90	48.7	18.4	-	1.7	0.7	3.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	50	15	-	-	0.16	-
48.07	143.6	83.7	124.7	2.3	0.6	1.7	5	silty SAND to sandy SILT	120	4.0	36	21	61	41	-	-	16	16	1.95	-	0.16	21.8
48.23	114.6	66.7	112.9	2.0	0.7	1.8	5	silty SAND to sandy SILT	120	4.0	29	17	54	40	-	-	19	16	2.11	-	0.16	30.0
48.39	87.0	32.8	-	3.0	0.7	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	38	15	-	-	0.16	-
48.56	72.6	27.4	-	2.7	0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	42	15	-	-	0.16	-
48.72	49.4	18.6	-	2.4	0.7	5.1	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.9	55	15	-	-	0.16	-
48.89	37.0	14.0	-	1.7	0.8	4.9	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	8.1	61	15	-	-	0.16	-
49.05	26.0	9.8	-	1.4	0.5	6.2	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.5	75	15	-	-	0.16	-
49.22	21.1	8.0	-	1.2	-0.8	6.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.3	83	15	-	-	0.16	-
49.38	20.2	7.6	-	0.9	-1.3	5.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.1	80	15	-	-	0.16	-
49.54	18.0	6.8	-	1.2	-1.6	8.2	2	Organic SOILS - Peats	100	1.0	18	7	-	-	1.8	3.5	95	10	-	-	0.16	-
49.71	18.6	7.0	-	1.2	-1.7	7.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.7	92	15	-	-	0.16	-
49.87	19.8	7.5	-	1.5	-1.7	9.0	2	Organic SOILS - Peats	100	1.0	20	7	-	-	1.9	3.9	93	10	-	-	0.16	-
50.04	22.2	8.4	-	1.0	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	77	15	-	-	0.16	-
50.20	18.1	6.8	-	0.8	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	84	15	-	-	0.16	-
50.36	18.2	6.9	-	0.8	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	83	15	-	-	0.16	-
50.53	21.9	8.3	-	0.7	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.4	70	15	-	-	0.16	-
50.69	20.5	7.7	-	0.6	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	4.0	72	15	-	-	0.16	-
50.86	22.2	8.4	-	0.7	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.4	71	15	-	-	0.16	-
51.02	22.5	8.5	-	0.8	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	72	15	-	-	0.16	-
51.18	23.9	9.0	-	0.8	-1.8	4.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.8	69	15	-	-	0.16	-
51.35	24.8	9.4	-	0.8	-1.8	3.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.0	67	15	-	-	0.16	-
51.51	22.7	8.6	-	0.8	-1.8	3.8	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	70	15	-	-	0.16	-
51.68	21.9	8.3	-	0.7	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.3	70	15	-	-	0.16	-
51.84	21.2	8.0	-	0.6	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.1	70	15	-	-	0.16	-
52.00	19.9	7.5	-	0.6	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.8	72	15	-	-	0.16	-
52.17	20.0	7.5	-	0.5	-1.8	3.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.8	71	15	-	-	0.16	-
52.33	17.5	6.6	-	0.5	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	3.2	77	15	-	-	0.16	-
52.50	17.1	6.4	-	0.8	-1.8	5.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.1	88	15	-	-	0.16	-
52.66	28.1	10.6	-	0.6	-1.8	2.4	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.5	56	15	-	-	0.16	-
52.82	27.5	10.4	-	0.7	-1.8	2.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.4	59	15	-	-	0.16	-
52.99	21.2	8.0	-	0.8	-1.8	4.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.0	75	15	-	-	0.16	-
53.15	27.4	10.3	-	0.8	-1.8	3.4	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.3	62	15	-	-	0.16	-
53.32	28.5	10.8	-	0.7	-1.8	2.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.6	57	15	-	-	0.16	-
53.48	22.0	8.3	-	0.7	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.1	70	15	-	-	0.16	-
53.64	17.5	6.6	-	0.5	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	3.1	78	15	-	-	0.16	-
53.81	20.7	7.8	-	0.4	-1.7	2.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.8	64	15	-	-	0.16	-
53.97	15.0	5.7	-	0.6	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.6	92	15	-	-	0.16	-
54.14	18.9	7.1	-	0.4	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.4	71	15	-	-	0.16	-
54.30	18.2	6.9	-	0.8	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.2	84	15	-	-	0.16	-
54.46	16.4	6.2	-	0.6	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.8	85	15	-	-	0.16	-
54.63	22.7	8.6	-	0.5	-1.7	2.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.2	63	15	-	-	0.16	-
54.79	16.1	6.1	-	0.6	-1.7	4.9	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.7	88	15	-	-	0.16	-
54.96	25.3	9.5	-	1.0	-1.8	4.3	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.7	69	15	-	-	0.16	-
55.12	21.8	8.2	-	1.0	-1.7	5.6	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	3.9	79	15	-	-	0.16	-
55.28	23.9	9.0	-	1.1	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.4	75	15	-	-	0.16	-
55.45	36.1	13.6	-	0.9	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	52	15	-	-	0.16	-
55.61	39.2	14.8	-	1.0	-1.7	2.7	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.6	50	15	-	-	0.16	-
55.78	32.3	12.2	-	1.0	-1.7	3.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.1	59	15	-	-	0.16	-
55.94	23.3	8.8	-	0.8	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	4.2	69	15	-	-	0.16	-
56.11	15.7	5.9	-	0.4	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.6	79	15	-	-	0.16	-
56.27	13.7	5.2	-	0.3	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.2	83	15	-	-	0.16	-
56.43	14.1	5.3	-	0.3	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.2	83	15	-	-	0.16	-
56.60	14.7	5.6	-	0.4	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.4	83	15	-	-	0.16	-
56.76	16.5	6.2	-	0.3	-1.7	2.4	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	2.7	73	15	-	-	0.16	-
56.93	14.9	5.6	-	0.6	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.4	93	15	-	-	0.16	-
57.09	26.1	9.8	-	0.8	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.7	65	15	-	-	0.16	-
57.25	31.4	11.8	-	1.0	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.7	60	15	-	-	0.16	-
57.42	26.7	10.1	-	0.7	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	62	15	-	-	0.16	-
57.58	22.3	8.4	-	0.9	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	3.9	76	15	-	-	0.16	-
57.75	23.1	8.7	-	0.8	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.0	70	15	-	-	0.16	-
57.91	17.8	6.7	-	0.8	-1.7	5.4	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.9	86	15	-	-	0.16	-
58.07	20.3	7.7	-	0.8	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.4	79	15	-	-	0.16	-
58.24	46.6	17.6	-	1.0	-1.7	2.3	4	clayy SILT to silty CLAY	115	2.0	23	9	-	-	3.2	8.7	43	15	-	-	0.16	-
58.40	42.7	16.1	-	1.1	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	7.9	49	15	-	-	0.16	-
58.57	28.1	10.6	-	1.0	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	4.9	65	15	-	-	0.16	-
58.73	39.9	15.1	-	1.3	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.3	54	15	-	-	0.16	-
58.89	36.6	13.8	-	1.1	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.6	55	15	-	-	0.16	-
59.06	19.2	7.2	-	1.0	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.1	88	15	-	-	0.16	-
59.22	36.8	13.9	-	1.4	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.6	59	15	-	-	0.16	-
59.39	52.4	19.8	-	1.8	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	48	15	-	-	0.16	-
59.55	41.5	15.6	-	1.5	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	7.5	55	15	-	-	0.16	-
59.71	41.6	15.7	-	1.5	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	7.5	54	15	-	-	0.16	-
59.88	34.7	13.1	-	1.5	-1.6	4.9	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.1	63	15	-	-	0.16	-
60.04	26.3	9.9	-	1.3	-1.6	5.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.5	74	15	-	-	0.16	-
60.21	31.3	11.8	-	1.2	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.4	64	15	-	-	0.16	-
60.37	23.9	9.0	-	1.1	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.0	75	15	-	-	0.16	-
60.53	20.5	7.7	-	0.8	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.3	78	15	-	-	0.16	-
60.70	19.4	7.3	-	0.7	-1.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.1	77	15	-	-	0.16	-
60.86	19.2	7.2	-	0.6	-1.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.0	78	15	-	-	0.16	-
61.03	19.2	7.2	-	0.7	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.0	81	15	-	-	0.16	-
61.19	24.0	9.1	-	1.2	-1.7	5.7	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	3.9	77	15	-	-	0.16	-
61.35	35.6	13.4	-	1.3	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.1	59	15	-	-	0.16	-
61.52	37.9	14.3	-	1.2	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	6.6	54	15	-	-	0.16	-
61.68	26.2	9.9	-	0.9	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.3	67	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
61.85	20.5	7.7	-	0.7	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.2	77	15	-	-	0.16	-
62.01	21.5	8.1	-	0.6	-1.7	3.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.4	71	15	-	-	0.16	-
62.17	20.2	7.6	-	0.6	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.1	74	15	-	-	0.16	-
62.34	20.9	7.9	-	0.7	-1.6	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.3	75	15	-	-	0.16	-
62.50	23.5	8.9	-	0.5	-1.6	2.5	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	3.8	62	15	-	-	0.16	-
62.67	22.7	8.6	-	1.9	-1.6	10.0	2	Organic SOILS - Peats	100	1.0	23	9	-	-	2.2	3.6	92	10	-	-	0.16	-
62.83	57.9	21.9	-	3.4	-1.7	6.3	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	55	15	-	-	0.16	-
63.00	189.2	96.4	146.7	3.7	-1.6	2.0	5	silty SAND to sandy SILT	120	4.0	47	24	66	41	-	-	17	16	1.42	-	0.16	12.3
63.16	117.9	60.0	141.7	3.5	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	59	30	-	-	8.2	9.9	27	15	1.46	-	0.16	33.8
63.32	81.8	30.9	-	2.9	-1.6	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.15	-
63.49	48.0	18.1	-	2.3	-1.6	5.2	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.2	56	15	-	-	0.15	-
63.65	32.7	12.3	-	1.3	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.4	64	15	-	-	0.15	-
63.82	22.3	8.4	-	1.4	-1.5	7.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	3.4	86	15	-	-	0.15	-
63.98	46.9	17.7	-	2.2	-1.6	5.2	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.0	57	15	-	-	0.15	-
64.14	59.3	22.4	-	3.2	-2.6	5.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	53	15	-	-	0.15	-
64.31	54.1	20.4	-	3.3	-5.1	6.5	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.2	58	15	-	-	0.15	-
64.47	52.2	19.7	-	3.3	-8.2	6.8	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	8.9	60	15	-	-	0.15	-
64.64	64.2	24.2	-	2.3	-8.2	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	44	15	-	-	0.15	-
64.80	27.5	10.4	-	0.2	-8.2	1.0	4	clayy SILT to silty CLAY	115	2.0	14	5	-	-	1.8	4.3	46	15	-	-	0.15	-
64.96	17.9	6.8	-	0.0	-8.2	0.1	1	sensitive fine SOIL	115	2.0	9	3	-	-	1.1	2.6	43	15	-	-	0.15	-
65.13	79.2	29.9	-	2.4	-8.3	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.15	-
65.29	100.7	38.0	-	4.0	-8.3	4.1	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	38	15	-	-	0.15	-
65.46	100.5	50.2	131.5	3.0	-8.3	3.1	4	clayy SILT to silty CLAY	115	2.0	50	25	-	-	7.0	9.9	29	15	1.79	-	0.15	43.9
65.62	86.8	43.3	115.2	2.2	-8.4	2.7	4	clayy SILT to silty CLAY	115	2.0	43	22	-	-	6.0	9.9	30	15	2.08	-	0.15	51.2
65.78	27.3	10.3	-	1.1	-8.5	4.9	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.2	70	15	-	-	0.15	-
65.95	19.1	7.2	-	0.2	-8.5	1.3	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.7	60	15	-	-	0.15	-
66.11	17.5	6.6	-	0.6	-8.6	4.3	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.4	83	15	-	-	0.15	-
66.28	123.6	61.4	119.1	2.6	-8.7	2.1	5	silty SAND to sandy SILT	120	4.0	31	15	51	38	-	-	22	16	2.02	-	0.15	33.0
66.44	111.5	55.3	85.8	1.2	-8.6	1.1	5	silty SAND to sandy SILT	120	4.0	28	14	47	38	-	-	17	16	2.65	-	0.14	38.4
66.60	176.8	87.7	115.3	2.1	-8.6	1.2	6	clean SAND to silty SAND	125	5.0	35	18	63	40	-	-	13	16	2.08	-	0.14	20.5
66.77	147.1	72.8	120.7	2.6	-8.6	1.8	5	silty SAND to sandy SILT	120	4.0	37	18	57	39	-	-	19	16	2.00	-	0.14	26.7
66.93	132.4	65.5	137.0	3.4	-8.5	2.7	5	silty SAND to sandy SILT	120	4.0	33	16	53	39	-	-	24	16	1.64	-	0.13	30.1
67.10	57.7	21.8	-	2.0	-8.5	3.8	3	silty CLAY to CLAY	115	1.5	38	15	-	-	3.9	9.5	47	15	-	-	0.13	-
67.26	35.1	13.3	-	1.8	-8.5	5.8	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	5.5	67	15	-	-	0.13	-
67.42	36.0	13.6	-	0.9	-8.7	2.7	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.6	52	15	-	-	0.13	-
67.59	21.4	8.1	-	1.8	-8.8	9.9	2	Organic SOILS - Peats	100	1.0	21	8	-	-	2.1	3.1	95	10	-	-	0.13	-
67.75	44.2	16.7	-	3.8	-8.8	9.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.0	71	15	-	-	0.13	-
67.92	64.8	24.4	-	4.5	-8.8	7.4	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	56	15	-	-	0.13	-
68.08	53.4	20.1	-	3.5	-8.9	7.0	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.6	8.6	60	15	-	-	0.13	-
68.24	79.2	29.9	-	2.1	-9.0	2.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	36	15	-	-	0.13	-
68.41	105.6	51.7	79.9	1.0	-9.0	1.0	5	silty SAND to sandy SILT	120	4.0	26	13	45	37	-	-	17	16	2.81	-	0.13	42.3
68.57	140.5	68.6	88.7	1.1	-9.0	0.8	6	clean SAND to silty SAND	125	5.0	28	14	55	39	-	-	13	16	2.58	-	0.13	28.9
68.74	97.7	47.7	110.9	2.2	-9.0	2.3	5	silty SAND to sandy SILT	120	4.0	24	12	43	37	-	-	27	16	2.15	-	0.12	46.9
68.90	70.6	26.6	-	3.1	-9.0	4.7	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.9	9.9	46	15	-	-	0.12	-
69.07	65.4	24.7	-	3.1	-9.0	5.0	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	49	15	-	-	0.12	-
69.23	114.0	55.4	127.8	3.0	-9.0	2.7	5	silty SAND to sandy SILT	120	4.0	29	14	48	38	-	-	26	16	1.89	-	0.12	38.3
69.39	99.0	37.4	-	3.8	-9.1	4.0	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	38	15	-	-	0.11	-
69.56	86.7	32.7	-	4.5	-9.1	5.4	3	silty CLAY to CLAY	115	1.5	58	22	-	-	6.0	9.9	45	15	-	-	0.11	-
69.72	66.0	24.9	-	2.8	-9.1	4.6	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.5	9.9	47	15	-	-	0.11	-
69.89	36.4	13.8	-	1.6	-9.1	4.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.5	62	15	-	-	0.11	-
70.05	25.1	9.5	-	1.0	-9.1	4.5	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.6	72	15	-	-	0.11	-
70.21	25.1	9.5	-	0.8	-9.2	3.6	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.6	67	15	-	-	0.11	-
70.38	20.4	7.7	-	0.5	-9.2	3.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.7	73	15	-	-	0.11	-
70.54	19.4	7.3	-	0.6	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.6	77	15	-	-	0.11	-
70.71	18.2	6.9	-	0.6	-9.2	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.4	80	15	-	-	0.11	-
70.87	19.8	7.5	-	0.6	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.6	76	15	-	-	0.11	-
71.03	18.1	6.8	-	0.5	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.3	79	15	-	-	0.11	-
71.20	19.8	7.5	-	0.5	-9.2	3.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.6	72	15	-	-	0.11	-
71.36	19.2	7.2	-	0.5	-9.2	3.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	74	15	-	-	0.11	-
71.53	18.5	7.0	-	0.5	-9.2	3.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.4	77	15	-	-	0.11	-
71.69	19.6	7.4	-	0.7	-9.2	4.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.6	80	15	-	-	0.11	-
71.85	25.2	9.5	-	0.8	-9.2	3.8	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.5	68	15	-	-	0.11	-
72.02	40.7	15.4	-	0.8	-9.1	2.2	4	clayy SILT to silty CLAY	115	2.0	20	8	-	-	2.7	6.0	46	15	-	-	0.11	-
72.18	48.0	18.1	-	0.8	-9.2	1.9	4	clayy SILT to silty CLAY	115	2.0	24	9	-	-	3.3	7.2	41	15	-	-	0.11	-
72.35	28.8	10.8	-	0.7	-9.2	2.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	4.0	59	15	-	-	0.11	-
72.51	20.4	7.7	-	0.4	-9.2	2.7	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.7	69	15	-	-	0.11	-
72.67	17.8	6.7	-	0.4	-9.2	2.6	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.2	73	15	-	-	0.11	-
72.84	16.2	6.1	-	0.3	-9.1	2.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	78	15	-	-	0.11	-
73.00	16.0	6.1	-	0.3	-9.2	2.8	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	79	15	-	-	0.11	-
73.17	19.4	7.3	-	0.4	-9.1	2.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	70	15	-	-	0.11	-
73.33	17.9	6.8	-	0.4	-9.1	2.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.2	75	15	-	-	0.11	-
73.49	19.5	7.4	-	0.4	-9.1	2.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	69	15	-	-	0.11	-
73.66	16.2	6.1	-	0.4	-9.1	3.1	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	81	15	-	-	0.11	-
73.82	16.0	6.0	-	0.5	-9.1	4.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	88	15	-	-	0.11	-
73.99	19.0	7.2	-	0.6	-9.1	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.4	80	15	-	-	0.11	-
74.15	21.8	8.2	-	1.2	-9.1	7.1	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.8	86	15	-	-	0.11	-
74.31	35.5	13.4	-	1.0	-9.1	3.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.0	55	15	-	-	0.11	-
74.48	29.0	11.0	-	0.9	-9.1	3.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	3.9	63	15	-	-	0.11	-
74.64	21.8	8.2	-	0.8	-9.1	4.5	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.8	77	15	-	-	0.11	-
74.81	21.3	8.1	-	0.7	-9.1	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	2.7	75	15	-	-	0.11	-
74.97	20.0	7.5	-	0.7	-9.1	4.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.5	79	15	-	-	0.11	-
75.13	22.6	8.5	-	0.6	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.9	70	15	-	-	0.11	-
75.30	20.9	7.9	-	0.6	-9.1	3.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.6	73	15	-	-	0.11	-
75.46	21.7	8.2	-	0.6	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	2.7	71	15	-	-	0.11	-
75.63	23.9	9.0	-	0.8	-9.0	4.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	3.1	71	15	-	-	0.11	-
75.79	29.0	11.0	-	0.7	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	3.9	60	15	-	-	0.11	-
75.96	21.9	8.2	-	0.8	-9.0	4.4	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.7	76	15	-	-	0.11	-
76.12	20.3	7.6	-	0.6	-9.0	3.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	77	15	-	-	0.11	-
76.28	21.9	8.2	-	0.6	-9.0	3.5	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.7	72	15	-	-	0.11	-
76.45	21.2	8.0	-	0.5	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.6	71	15	-	-	0.11	-
76.61	19.8	7.5	-	0.5	-9.0	3.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.4	75	15	-	-	0.11	-
76.78	20.5	7.7	-	0.5	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	72	15	-	-	0.11	-
76.94	20.1	7.6	-	0.5	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.4	73	15	-	-	0.11	-
77.10	20.8	7.8	-	0.5	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	72	15	-	-	0.11	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
77.27	23.3	8.8	-	0.5	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	66	15	-	-	0.11	-
77.43	23.0	8.7	-	1.0	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	2.8	79	15	-	-	0.11	-
77.60	21.0	7.9	-	1.0	-9.0	5.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	84	15	-	-	0.11	-
77.76	27.3	10.3	-	0.8	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	3.5	65	15	-	-	0.11	-
77.92	23.5	8.9	-	0.7	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	70	15	-	-	0.11	-
78.09	23.6	8.9	-	0.7	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	70	15	-	-	0.11	-
78.25	26.0	9.8	-	0.6	-9.0	3.0	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	3.3	63	15	-	-	0.11	-
78.42	32.8	12.4	-	0.9	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	4.3	58	15	-	-	0.11	-
78.58	25.8	9.7	-	0.9	-9.0	4.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	3.2	69	15	-	-	0.11	-
78.74	21.1	8.0	-	0.7	-9.0	3.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	76	15	-	-	0.11	-
78.91	18.7	7.1	-	0.5	-9.0	3.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.1	79	15	-	-	0.11	-
79.07	16.2	6.1	-	0.4	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	82	15	-	-	0.11	-
79.24	16.4	6.2	-	0.4	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	82	15	-	-	0.11	-
79.40	17.7	6.7	-	0.4	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.0	78	15	-	-	0.11	-
79.56	16.4	6.2	-	0.5	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	88	15	-	-	0.11	-
79.73	20.4	7.7	-	0.8	-9.0	5.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.4	82	15	-	-	0.11	-
79.89	27.6	10.4	-	1.4	-9.0	6.2	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	3.4	76	15	-	-	0.11	-
80.06	26.8	10.1	-	1.2	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	3.3	74	15	-	-	0.11	-
80.22	27.0	10.2	-	1.0	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	3.3	69	15	-	-	0.11	-
80.38	22.3	8.4	-	0.5	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.6	68	15	-	-	0.11	-
80.55	20.8	7.9	-	0.3	-9.0	1.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.4	63	15	-	-	0.11	-
80.71	18.3	6.9	-	0.0	-9.0	0.1	1	sensitive fine SOIL	115	2.0	9	3	-	-	1.1	2.0	44	15	-	-	0.11	-
80.88	27.8	10.5	-	1.0	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.8	3.4	68	15	-	-	0.11	-
81.04	30.1	11.4	-	1.9	-9.0	7.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	77	15	-	-	0.11	-
81.20	47.5	17.9	-	1.5	-9.0	3.5	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	6.3	50	15	-	-	0.11	-
81.37	30.0	11.3	-	1.3	-9.0	5.1	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	69	15	-	-	0.11	-
81.53	34.5	13.0	-	1.2	-9.0	4.2	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	4.4	61	15	-	-	0.11	-
81.70	30.2	11.4	-	2.7	-9.0	9.9	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	84	15	-	-	0.11	-
81.86	57.3	21.6	-	4.3	-9.0	8.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	7.7	61	15	-	-	0.11	-
82.02	67.8	25.6	-	5.4	-9.0	8.5	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.6	9.2	59	15	-	-	0.11	-
82.19	86.0	32.4	-	4.5	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	57	22	-	-	5.9	9.9	46	15	-	-	0.11	-
82.35	86.9	32.8	-	3.9	-9.0	4.8	3	silty CLAY to CLAY	115	1.5	58	22	-	-	6.0	9.9	43	15	-	-	0.11	-
82.52	55.2	20.8	-	3.8	-9.0	7.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.7	7.3	61	15	-	-	0.11	-
82.68	52.6	19.9	-	2.7	-9.0	5.6	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	6.9	56	15	-	-	0.11	-
82.85	43.6	16.4	-	2.6	-8.9	6.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	5.6	64	15	-	-	0.11	-
83.01	49.6	18.7	-	2.5	-8.9	5.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	6.4	57	15	-	-	0.11	-
83.17	42.9	16.2	-	3.4	-8.9	8.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	5.5	71	15	-	-	0.11	-
83.34	74.1	28.0	-	3.1	-8.9	4.5	3	silty CLAY to CLAY	115	1.5	49	19	-	-	5.1	9.9	45	15	-	-	0.11	-
83.50	71.5	27.0	-	3.0	-9.0	4.5	3	silty CLAY to CLAY	115	1.5	48	18	-	-	4.9	9.5	45	15	-	-	0.11	-
83.67	166.2	73.5	133.2	3.6	-9.0	2.2	5	silty SAND to sandy SILT	120	4.0	42	18	57	39	-	-	21	16	1.71	-	0.11	25.7
83.83	284.5	125.7	129.6	1.6	-9.0	0.6	6	clean SAND to silty SAND	125	5.0	57	25	75	42	-	-	6	16	1.89	-	0.11	12.5
83.99	287.5	126.9	176.7	5.9	-8.9	2.1	5	silty SAND to sandy SILT	120	4.0	72	32	75	42	-	-	15	16	0.00	-	0.11	0.0
84.16	257.1	113.4	179.5	6.5	-9.0	2.6	5	silty SAND to sandy SILT	120	4.0	64	28	71	41	-	-	18	16	0.00	-	0.11	0.0
84.32	131.7	49.7	-	5.9	-9.0	4.7	4	clayy SILT to silty CLAY	115	2.0	66	25	-	-	9.1	9.9	35	15	-	-	0.11	-
84.49	109.4	41.3	-	4.2	-9.2	4.0	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	36	15	-	-	0.11	-
84.65	200.4	88.1	135.1	3.7	-9.1	1.9	5	silty SAND to sandy SILT	120	4.0	50	22	63	40	-	-	17	16	1.70	-	0.11	19.3
84.81	156.2	68.6	127.3	3.3	-9.0	2.2	5	silty SAND to sandy SILT	120	4.0	39	17	55	38	-	-	21	16	1.89	-	0.11	28.9
84.98	164.5	72.2	145.6	4.4	-9.1	2.7	5	silty SAND to sandy SILT	120	4.0	41	18	56	39	-	-	23	16	1.12	-	0.10	11.1
85.14	175.3	76.8	181.1	6.6	-9.0	3.9	4	clayy SILT to silty CLAY	115	2.0	88	38	-	-	12.2	9.9	27	15	0.00	-	0.10	0.0
85.31	153.5	67.2	165.7	5.5	-9.2	3.7	4	clayy SILT to silty CLAY	115	2.0	77	34	-	-	10.7	9.9	28	15	0.00	-	0.10	0.0
85.47	112.6	49.2	142.2	3.8	-9.2	3.6	4	clayy SILT to silty CLAY	115	2.0	56	25	-	-	7.8	9.9	32	15	1.06	-	0.10	36.9
85.63	351.2	153.5	206.2	7.7	-8.9	2.2	5	silty SAND to sandy SILT	120	4.0	88	38	81	43	-	-	14	16	0.00	-	0.10	0.0
85.80	244.7	106.8	203.7	8.5	-8.9	3.5	5	silty SAND to sandy SILT	120	4.0	61	27	69	41	-	-	22	16	0.00	-	0.10	0.0
85.96	94.3	35.6	-	6.9	-9.0	7.8	3	silty CLAY to CLAY	115	1.5	63	24	-	-	6.5	9.9	50	15	-	-	0.10	-
86.13	48.3	18.2	-	2.1	-9.1	4.9	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	6.0	55	15	-	-	0.10	-
86.29	45.4	17.1	-	1.4	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	5.6	51	15	-	-	0.10	-
86.45	42.5	16.1	-	1.2	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	5.2	51	15	-	-	0.10	-
86.62	42.3	16.0	-	1.0	-9.0	2.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	5.2	49	15	-	-	0.10	-
86.78	43.7	16.5	-	0.9	-9.0	2.4	4	clayy SILT to silty CLAY	115	2.0	22	8	-	-	2.9	5.3	46	15	-	-	0.10	-
86.95	52.5	19.8	-	1.1	-9.1	2.3	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	6.5	42	15	-	-	0.10	-
87.11	63.0	23.8	-	2.1	-9.1	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.3	8.0	45	15	-	-	0.10	-
87.27	62.2	23.5	-	2.0	-9.1	3.5	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.2	7.8	45	15	-	-	0.10	-
87.44	72.2	27.2	-	2.1	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	9.2	40	15	-	-	0.10	-
87.60	72.4	27.3	-	2.3	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	9.2	41	15	-	-	0.10	-
87.77	66.4	25.1	-	2.2	-9.2	3.6	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.5	8.4	43	15	-	-	0.10	-
87.93	64.9	24.5	-	2.1	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	8.1	43	15	-	-	0.10	-
88.09	68.5	25.8	-	1.9	-9.2	3.0	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	8.6	40	15	-	-	0.10	-
88.26	73.5	27.7	-	2.4	-9.2	3.5	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.0	9.3	41	15	-	-	0.10	-
88.42	77.1	29.1	-	2.4	-9.2	3.3	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.7	39	15	-	-	0.10	-
88.59	85.1	32.1	-	2.5	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.8	9.9	37	15	-	-	0.10	-
88.75	84.8	32.0	-	2.5	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	37	15	-	-	0.10	-
88.92	87.3	32.9	-	2.6	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.0	9.9	36	15	-	-	0.10	-
89.08	84.7	32.0	-	2.6	-9.2	3.3	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	38	15	-	-	0.10	-
89.24	85.9	32.4	-	2.9	-9.2	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.10	-
89.41	83.8	31.6	-	2.7	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.7	9.9	38	15	-	-	0.10	-
89.57	89.7	38.3	118.1	2.6	-9.1	3.0	4	clayy SILT to silty CLAY	115	2.0	45	19	-	-	6.2	9.9	33	15	2.04	-	0.10	51.2
89.74	89.6	33.8	-	2.7	-9.2	3.2	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	36	15	-	-	0.10	-
89.90	88.8	33.5	-	4.0	-9.1	4.8	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	43	15	-	-	0.10	-
90.06	93.1	35.1	-	3.9	-9.1	4.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	40	15	-	-	0.10	-
90.23	100.5	37.9	-	3.5	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	36	15	-	-	0.10	-
90.39	94.2	35.5	-	4.0	-9.0	4.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	40	15	-	-	0.10	-
90.56	89.1	33.6	-	3.9	-9.0	4.6	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	42	15	-	-	0.10	-
90.72	100.9	38.1	-	3.6	-8.9	3.8	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	36	15	-	-	0.10	-
90.88	105.3	44.7	134.0	3.4	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	33	15	1.40	-	0.10	50.0
91.05	105.7	44.8	135.9	3.5	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	33	15	1.30	-	0.09	49.5
91.21	108.6	46.0	135.1	3.5	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	54	23	-	-	7.5	9.9	32	15	1.36	-	0.09	47.0
91.38	110.6	46.8	134.3	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	32	15	1.42	-	0.09	45.7
91.54	111.4	47.1	134.2	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.7	9.9	31	15	1.43	-	0.09	45.2
91.70	111.6	47.1	132.2	3.4	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.7	9.9	31	15	1.53	-	0.08	46.3
91.87	110.9	46.8	131.7	3.4	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.7	9.9	31	15	1.55	-	0.08	47.0
92.03	109.7	46.2	130.5	3.3	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.61	-	0.08	48.4
92.20	110.1	46.4	127.8	3.2	-8.9	3.1	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.75	-	0.08	48.4
92.36	109.0	45.8	124.0	3.0	-8.9	2.9	4	clayy SILT to silty CLAY	115	2.0	54	23	-	-	7.5	9.9	30	15	1.88	-	0.07	49.0
92.52	105.2	44.2	124.1	3.0	-8.9	3.0	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	31	15	1.87	-	0.07	51.1

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
92.69	95.6	36.1	-	2.9	-8.9	3.3	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	35	15	-	-	0.07	-
92.85	84.9	32.0	-	2.9	-8.9	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.07	-
93.02	74.0	27.9	-	1.8	-8.9	2.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	8.9	36	15	-	-	0.07	-
93.18	68.0	25.6	-	2.2	-8.9	3.6	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.6	8.1	43	15	-	-	0.07	-
93.34	82.6	31.2	-	3.1	-8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	41	15	-	-	0.07	-
93.51	108.1	40.8	-	4.1	-8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	54	20	-	-	7.5	9.9	36	15	-	-	0.07	-
93.67	119.5	49.9	146.5	4.2	-8.9	3.7	4	clayy SILT to silty CLAY	115	2.0	60	25	-	-	8.3	9.9	32	15	0.82	-	0.07	33.2
93.84	127.2	53.1	142.8	4.1	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	64	27	-	-	8.8	9.9	30	15	1.05	-	0.07	26.8
94.00	121.2	50.6	138.2	3.8	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	61	25	-	-	8.4	9.9	30	15	1.25	-	0.06	35.7
94.16	117.5	49.0	131.4	3.5	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	59	24	-	-	8.1	9.9	30	15	1.58	-	0.06	44.6
94.33	116.1	48.4	130.1	3.4	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.0	9.9	30	15	1.65	-	0.06	46.0
94.49	113.1	47.1	124.6	3.1	-9.0	2.9	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.8	9.9	30	15	1.86	-	0.06	47.6
94.66	114.8	47.7	126.3	3.2	-9.0	2.9	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.9	9.9	30	15	1.81	-	0.05	46.8
94.82	102.2	38.6	-	4.4	-9.0	4.6	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.0	9.9	39	15	-	-	0.05	-
94.98	110.7	41.8	-	4.5	-9.0	4.3	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	37	15	-	-	0.05	-
95.15	116.7	48.4	148.1	4.3	-9.0	3.9	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.1	9.9	33	15	0.72	-	0.05	37.3
95.31	116.9	48.4	139.8	3.9	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.1	9.9	32	15	1.13	-	0.05	39.5
95.48	114.0	47.2	129.7	3.4	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.9	9.9	31	15	1.65	-	0.05	47.4
95.64	112.0	46.3	132.3	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	56	23	-	-	7.7	9.9	31	15	1.49	-	0.05	47.2
95.81	110.0	45.4	129.4	3.3	-9.0	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.64	-	0.04	49.6
95.97	111.1	45.9	126.0	3.2	-9.0	3.0	4	clayy SILT to silty CLAY	115	2.0	56	23	-	-	7.7	9.9	30	15	1.80	-	0.04	49.0
96.13	109.4	45.1	127.9	3.2	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.5	9.9	31	15	1.72	-	0.04	49.9
96.30	105.7	43.6	127.2	3.2	-9.0	3.2	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	32	15	1.74	-	0.03	51.2
96.46	107.8	44.4	123.5	3.0	-9.0	3.0	4	clayy SILT to silty CLAY	115	2.0	54	22	-	-	7.4	9.9	31	15	1.88	-	0.03	50.9
96.63	102.2	42.0	124.3	3.0	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	51	21	-	-	7.0	9.9	32	15	1.85	-	0.03	51.2
96.79	89.2	33.7	-	2.9	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.1	9.9	37	15	-	-	0.03	-
96.95	80.9	30.5	-	3.4	-9.0	4.5	3	silty CLAY to CLAY	115	1.5	54	20	-	-	5.5	9.3	43	15	-	-	0.03	-
97.12	107.5	40.6	-	3.8	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	54	20	-	-	7.4	9.9	35	15	-	-	0.03	-
97.28	122.3	50.1	144.2	4.2	-9.1	3.6	4	clayy SILT to silty CLAY	115	2.0	61	25	-	-	8.5	9.9	32	15	0.92	-	0.03	33.2
97.45	125.1	51.2	143.5	4.2	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	63	26	-	-	8.6	9.9	31	15	0.97	-	0.02	30.6
97.61	129.3	52.9	143.8	4.2	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	65	26	-	-	9.0	9.9	30	15	0.97	-	0.02	26.2
97.77	130.9	53.6	142.2	4.2	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.1	9.9	30	15	1.06	-	0.02	25.9
97.94	131.8	53.9	141.0	4.1	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	66	27	-	-	9.1	9.9	29	15	1.13	-	0.02	26.2
98.10	130.2	53.2	141.8	4.2	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.0	9.9	30	15	1.07	-	0.02	27.0
98.27	128.6	52.5	140.3	4.1	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.9	9.9	30	15	1.14	-	0.02	29.7
98.43	128.3	52.3	135.4	3.8	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.9	9.9	29	15	1.37	-	0.01	34.4
98.59	126.4	51.5	133.7	3.7	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	63	26	-	-	8.7	9.9	29	15	1.46	-	0.01	37.8
98.76	124.9	50.8	147.2	4.4	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	32	15	0.76	-	0.01	30.1
98.92	124.4	50.6	144.5	4.2	-9.0	3.6	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	31	15	0.89	-	0.01	31.6
99.09	130.7	53.1	139.6	4.1	-9.1	3.2	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.0	9.9	29	15	1.17	-	0.01	28.6
99.25	127.1	51.6	143.8	4.2	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.8	9.9	31	15	0.94	-	0.00	29.3
99.41	124.9	50.7	144.4	4.2	-9.0	3.6	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	31	15	0.90	-	0.00	31.5
99.58	127.5	51.7	149.2	4.5	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.8	9.9	32	15	0.68	-	0.00	27.2

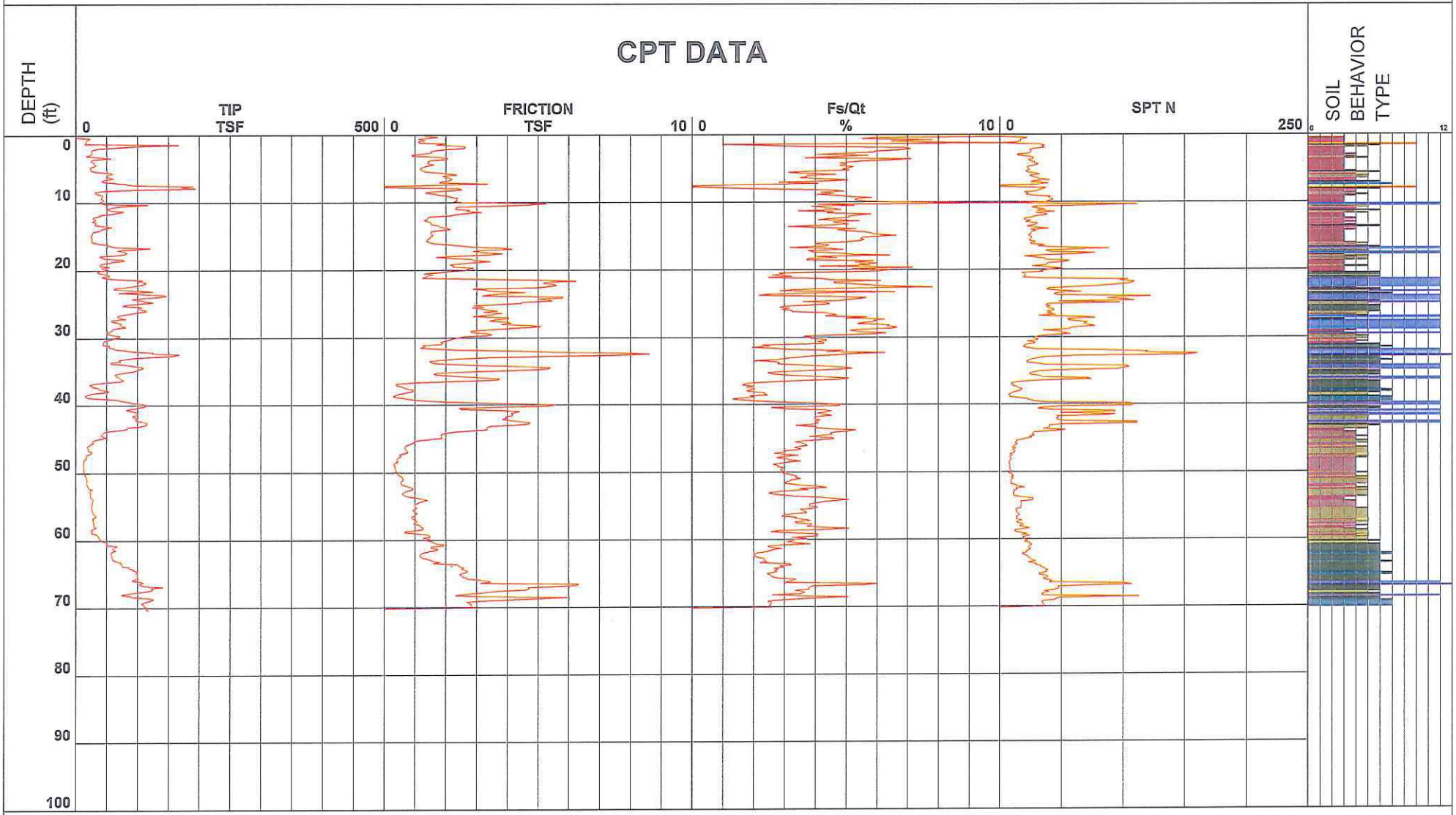
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(567).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-223	Date and Time	10/9/2011 11:47:56 PM	Maximum Depth	70.37 ft
Water Table Depth		>70.37 ft			

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
0.33	1.1	0.0	-	1.7	0.2	0.1	1	sensitive fine SOIL	115	2.0	1	0	-	-	0.1	9.9	95	15	N/A	0.00	N/A	N/A
0.49	22.8	36.6	-	1.3	0.3	5.9	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	43	15	N/A	0.00	N/A	N/A
0.66	20.0	32.1	-	1.1	0.3	5.5	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	45	15	N/A	0.00	N/A	N/A
0.82	17.1	27.4	-	1.3	0.4	7.8	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	54	15	N/A	0.00	N/A	N/A
0.98	17.2	27.6	-	1.1	0.4	6.5	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	50	15	N/A	0.00	N/A	N/A
1.15	15.1	24.2	-	1.1	0.4	7.6	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	56	15	N/A	0.00	N/A	N/A
1.31	14.6	23.5	-	2.0	0.4	9.9	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	62	15	N/A	0.00	N/A	N/A
1.48	166.0	266.2	266.2	1.7	0.5	1.0	6	clean SAND to silty SAND	125	5.0	33	53	95	48	-	-	5	16	N/A	0.00	N/A	N/A
1.64	94.2	151.1	215.9	2.5	0.6	2.6	5	silty SAND to sandy SILT	120	4.0	24	38	81	48	-	-	15	16	N/A	0.00	N/A	N/A
1.80	71.8	115.1	215.6	2.6	0.7	3.7	5	silty SAND to sandy SILT	120	4.0	18	29	72	48	-	-	22	16	N/A	0.00	N/A	N/A
1.97	37.8	60.6	-	2.6	0.7	6.9	3	silty CLAY to CLAY	115	1.5	25	40	-	-	2.7	9.9	39	15	N/A	0.00	N/A	N/A
2.13	28.1	45.0	-	2.0	0.7	7.1	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	44	15	N/A	0.00	N/A	N/A
2.30	24.7	39.6	-	1.7	0.7	6.7	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	45	15	N/A	0.00	N/A	N/A
2.46	25.6	41.1	-	1.5	0.4	6.0	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	42	15	N/A	0.00	N/A	N/A
2.62	26.2	42.0	-	1.5	0.4	5.9	3	silty CLAY to CLAY	115	1.5	17	28	-	-	1.8	9.9	41	15	N/A	0.00	N/A	N/A
2.79	25.4	40.7	-	1.3	0.4	5.0	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	39	15	N/A	0.00	N/A	N/A
2.95	22.3	35.8	-	0.9	-0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	38	15	N/A	0.00	N/A	N/A
3.12	16.0	25.6	-	0.9	0.6	5.8	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	50	15	N/A	0.00	N/A	N/A
3.28	37.7	60.5	181.5	1.8	0.6	4.8	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	33	15	0.00	-	0.16	0.0
3.45	56.5	90.7	189.4	2.1	0.6	3.7	4	clayy SILT to silty CLAY	115	2.0	28	45	-	-	4.0	9.9	24	15	0.00	-	0.16	0.0
3.61	28.5	45.7	-	2.0	0.5	7.2	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	43	15	-	-	0.16	-
3.77	24.1	38.6	-	1.6	0.5	6.6	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	45	15	-	-	0.16	-
3.94	25.4	40.8	-	1.4	-0.3	5.6	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	41	15	-	-	0.16	-
4.10	29.0	46.6	-	1.5	-0.7	5.1	4	clayy SILT to silty CLAY	115	2.0	15	23	-	-	2.0	9.9	37	15	-	-	0.16	-
4.27	29.0	46.5	-	1.4	0.0	4.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.16	-
4.43	32.4	51.9	-	1.6	-0.1	5.0	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	36	15	-	-	0.16	-
4.59	29.7	47.6	-	1.4	-0.8	4.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	36	15	-	-	0.16	-
4.76	24.2	38.8	-	1.3	-1.6	5.3	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	41	15	-	-	0.16	-
4.92	23.3	37.4	-	1.2	-1.6	5.1	3	silty CLAY to CLAY	115	1.5	16	25	-	-	1.6	9.9	41	15	-	-	0.16	-
5.09	24.2	38.8	-	1.2	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	40	15	-	-	0.16	-
5.25	24.6	39.5	-	1.2	-2.4	5.1	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	40	15	-	-	0.16	-
5.41	33.2	53.2	154.1	1.3	-2.5	4.0	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.3	9.9	32	15	0.25	-	0.16	0.8
5.58	56.4	90.4	173.7	1.8	-2.5	3.1	5	silty SAND to sandy SILT	120	4.0	14	23	64	45	-	-	22	16	0.00	-	0.16	0.0
5.74	59.4	95.3	189.9	2.1	-1.9	3.5	5	silty SAND to sandy SILT	120	4.0	15	24	65	45	-	-	23	16	0.00	-	0.16	0.0
5.91	50.5	81.0	206.4	2.4	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	29	15	0.00	-	0.16	0.0
6.07	51.1	81.9	182.2	1.9	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	26	15	0.00	-	0.16	0.0
6.23	53.8	86.3	186.9	2.0	-0.1	3.7	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	25	15	0.00	-	0.16	0.0
6.40	61.0	97.4	192.1	2.1	0.0	3.5	5	silty SAND to sandy SILT	120	4.0	15	24	66	45	-	-	23	16	0.00	-	0.16	0.0
6.56	50.2	79.1	197.3	2.2	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	28	15	0.00	-	0.16	0.0
6.73	42.0	65.3	195.6	2.1	0.0	5.1	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	33	15	0.00	-	0.16	0.0
6.89	43.7	67.3	180.3	1.9	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.1	9.9	30	15	0.00	-	0.16	0.0
7.05	64.0	97.3	171.0	1.8	0.0	2.8	5	silty SAND to sandy SILT	120	4.0	16	24	66	45	-	-	20	16	0.00	-	0.16	0.0
7.22	82.1	123.3	238.6	3.4	0.0	4.1	9	very stiff fine SOIL	120	2.0	41	62	74	46	-	-	22	30	0.00	-	0.16	0.0
7.38	93.6	138.9	174.3	1.6	0.1	1.7	6	clean SAND to silty SAND	125	5.0	19	28	78	46	-	-	12	16	0.00	-	0.16	0.0
7.55	190.5	279.4	279.4	0.0	0.0	0.1	7	grvly SAND to dense SAND	130	6.0	32	47	95	48	-	-	5	16	0.00	-	0.16	0.0
7.71	169.9	246.3	246.3	0.0	0.0	0.1	7	grvly SAND to dense SAND	130	6.0	28	41	95	48	-	-	5	16	0.00	-	0.16	0.0
7.87	193.9	277.8	281.9	2.4	0.2	1.2	6	clean SAND to silty SAND	125	5.0	39	56	95	48	-	-	6	16	0.00	-	0.16	0.0
8.04	90.5	128.2	200.2	2.5	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	23	32	75	46	-	-	17	16	0.00	-	0.16	0.0
8.20	50.0	70.1	187.4	2.2	0.2	4.5	4	clayy SILT to silty CLAY	115	2.0	25	35	-	-	3.5	9.9	30	15	0.00	-	0.16	0.0
8.37	31.7	50.8	-	1.6	0.2	5.0	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	36	15	-	-	0.16	-
8.53	32.1	51.3	157.5	1.3	0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.2	9.9	33	15	0.35	-	0.16	1.4
8.69	35.8	56.6	174.0	1.6	0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	33	15	0.00	-	0.16	0.0
8.86	43.3	68.5	163.7	1.8	0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	22	29	-	-	3.0	9.9	31	15	0.00	-	0.16	0.0
9.02	43.0	67.5	179.9	2.1	0.1	4.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	3.0	9.9	34	15	0.00	-	0.16	0.0
9.19	42.3	66.1	185.1	2.2	0.1	5.2	4	clayy SILT to silty CLAY	115	2.0	21	28	-	-	3.0	9.9	35	15	0.00	-	0.16	0.0
9.35	41.1	61.6	-	2.4	0.1	5.9	4	clayy SILT to silty CLAY	115	2.0	21	31	-	-	2.9	9.9	36	15	-	-	0.16	-
9.51	43.6	64.7	202.2	2.3	0.1	5.4	4	clayy SILT to silty CLAY	115	2.0	22	32	-	-	3.1	9.9	34	15	0.00	-	0.16	0.0
9.68	45.0	58.2	191.1	2.4	0.1	5.4	4	clayy SILT to silty CLAY	115	2.0	23	29	-	-	3.2	9.9	35	15	0.00	-	0.16	0.0
9.84	40.8	59.1	-	2.3	0.1	5.7	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.9	9.9	36	15	-	-	0.16	-
10.01	39.4	63.2	-	2.5	0.1	6.5	9	very stiff fine SOIL	120	2.0	20	32	52	41	-	-	37	30	-	-	0.16	-
10.17	46.7	75.0	-	5.3	0.1	9.9	9	very stiff fine SOIL	120	2.0	23	37	57	42	-	-	42	30	-	-	0.16	-
10.34	116.1	145.2	262.7	4.7	0.0	4.1	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	7.7	9.9	21	16	0.00	-	0.16	0.0
10.50	73.2	90.8	236.1	3.8	-0.1	5.3	9	very stiff fine SOIL	120	2.0	37	45	64	44	-	-	29	30	0.00	-	0.16	0.0
10.66	62.6	77.1	180.9	2.4	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	31	39	-	-	4.4	9.9	27	15	0.00	-	0.16	0.0
10.83	54.3	66.4	179.3	2.3	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	27	33	-	-	3.8	9.9	30	15	0.00	-	0.16	0.0
10.99	50.6	61.3	180.4	2.3	0.0	4.7	4	clayy SILT to silty CLAY	115	2.0	25	31	-	-	3.5	9.9	32	15	0.00	-	0.16	0.0
11.16	57.6	69.4	196.5	2.8	0.0	4.9	4	clayy SILT to silty CLAY	115	2.0	29	35	-	-	4.0	9.9	31	15	0.00	-	0.16	0.0
11.32	77.4	92.5	185.8	2.7	0.0	3.5	5	silty SAND to sandy SILT	120	4.0	19	23	64	44	-	-	23	16	0.00	-	0.16	0.0
11.48	68.8	81.7	206.1	3.2	0.0	4.6	4	clayy SILT to silty CLAY	115	2.0	34	41	-	-	4.8	9.9	28	15	0.00	-	0.16	0.0
11.65	60.3	71.1	187.5	2.6	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	30	36	-	-	4.2	9.9	30	15	0.00	-	0.16	0.0
11.81	39.7	57.6	-	2.3	-0.1	5.9	3	silty CLAY to CLAY	115	1.5	26	38	-	-	2.8	9.9	37	15	-	-	0.16	-
11.98	40.0	57.3	-	2.2	-0.1	5.5	4	clayy SILT to silty CLAY	115	2.0	20	29	-	-	2.8	9.9	36	15	-	-	0.16	-
12.14	30.0	42.3	-	1.5	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	20	28	-	-	2.1	9.9	39	15	-	-	0.16	-
12.30	27.4	38.2	-	1.4	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	18	25	-	-	1.9	9.9	41	15	-	-	0.16	-
12.47	31.9	43.9	-	1.4	-0.1	4.5	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.2	9.9	37	15	-	-	0.16	-
12.63	31.8	43.2	-	1.3	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.2	9.9	36	15	-	-	0.16	-
12.80	26.4	35.4	-	1.4	-0.1	5.6	3	silty CLAY to CLAY	115	1.5	18	24	-	-	1.8	9.9	44	15	-	-	0.16	-
12.96	33.1	43.9	-	1.5	-0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	17	22	-	-	2.3	9.9	37	15	-	-	0.16	-
13.12	30.9	40.5	-	1.5	-0.1	5.0	3	silty CLAY to CLAY	115	1.5	21	27	-	-	2.2	9.9	40	15	-	-	0.16	-
13.29	31.0	40.0	-	1.6	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	21	27	-	-	2.2	9.9	40	15	-	-	0.16	-
13.45	42.6	46.8	151.5	1.8	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	3.0	9.9	35	15	0.74	-	0.16	42.6
13.62	58.1	63.4	146.5	1.8	-0.1	3.2	4	clayy SILT to silty CLAY	115	2.0	29	32	-	-	4.1	9.9	26	15	0.98	-	0.16	9.7
13.78	47.4	51.4	161.4	2.1	-0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.3	9.9	34	15	0.00	-	0.16	0.0
13.94	40.3	49.7	-	2.1	-0.2	5.4	3	silty CLAY to CLAY	115	1.5	27	33	-	-	2.8	9.9	38	15	-	-	0.16	-
14.11	38.7	47.2	-	1.8	-0.5	4.8	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	37	15	-	-	0.16	-
14.27	30.6	36.8	-	1.5	-0.4	5.2	3	silty CLAY to CLAY	115	1.5	20	25	-	-	2.1	9.9	42	15	-	-	0.16	-
14.44	27.0	32.2	-	1.5	-0.4	5.8	3	silty CLAY to CLAY	115	1.5	18	21	-	-	1.9	9.9	46	15	-	-	0.16	-
14.60	26.3	31.0	-	1.5	-0.4	6.0	3	silty CLAY to CLAY	115	1.5	18	21	-	-	1.8	9.9	47	15	-	-	0.16	-
14.76	26.4	30.7	-	1.6	-0.4	6.1	3	silty CLAY to CLAY	115	1.5	18	20	-	-	1.8	9.9	48	15	-	-	0.16	-
14.93	23.8	27.5	-	1.6	-0.4	6.9	3	silty CLAY to CLAY	115	1.5	16	18	-	-	1.6	9.9	52	15	-	-	0.16	-
15.09	25.0	28.5	-	1.5	-0.5	6.2	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.7	9.9	49	15	-	-	0.16	-
15.26	27.0	30.4	-	1.5	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	18	20	-	-	1.9	9.9	47	15	-	-	0.16	-
15.42	25.6	28.6	-	1.4	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.8	9.9	48	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
15.58	25.3	28.0	-	1.4	-0.4	5.8	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.8	9.9	49	15	-	-	0.16	-
15.75	25.4	27.7	-	1.4	-0.4	5.6	3	silty CLAY to CLAY	115	1.5	17	18	-	-	1.8	9.9	48	15	-	-	0.16	-
15.91	30.1	32.5	-	1.5	-0.5	5.1	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.1	9.9	44	15	-	-	0.16	-
16.08	39.6	42.4	-	1.6	-0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	36	15	-	-	0.16	-
16.24	51.4	51.4	154.1	2.1	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	26	26	-	-	3.6	9.9	33	15	0.71	-	0.16	28.3
16.40	55.7	55.4	169.2	2.5	-0.5	4.5	4	clayy SILT to silty CLAY	115	2.0	28	28	-	-	3.9	9.9	33	15	0.00	-	0.16	0.0
16.57	64.6	64.0	178.2	2.8	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	32	32	-	-	4.5	9.9	31	15	0.00	-	0.16	0.0
16.73	120.6	118.8	204.0	3.8	-0.4	3.2	5	silty SAND to sandy SILT	120	4.0	30	30	73	44	-	-	20	16	0.00	-	0.16	0.0
16.90	91.9	90.1	214.7	4.1	-0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	46	45	-	-	6.5	9.9	27	15	0.00	-	0.16	0.0
17.06	67.3	65.7	193.4	3.3	-0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	34	33	-	-	4.7	9.9	32	15	0.00	-	0.16	0.0
17.23	76.5	74.3	175.7	2.9	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	38	37	-	-	5.4	9.9	27	15	0.00	-	0.16	0.0
17.39	82.7	80.0	186.4	3.2	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	41	40	-	-	5.8	9.9	27	15	0.00	-	0.16	0.0
17.55	80.4	77.4	206.0	3.8	-0.3	4.8	4	clayy SILT to silty CLAY	115	2.0	40	39	-	-	5.6	9.9	30	15	0.00	-	0.16	0.0
17.72	64.5	61.8	195.2	3.3	-0.3	5.3	4	clayy SILT to silty CLAY	115	2.0	32	31	-	-	4.5	9.9	34	15	0.00	-	0.16	0.0
17.88	38.4	37.0	-	2.5	-0.2	6.6	3	silty CLAY to CLAY	115	1.5	26	25	-	-	2.7	9.9	46	15	-	-	0.16	-
18.05	41.6	39.7	-	1.7	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	37	15	-	-	0.16	-
18.21	47.3	44.8	-	2.2	-0.2	4.8	4	clayy SILT to silty CLAY	115	2.0	24	22	-	-	3.3	9.9	37	15	-	-	0.16	-
18.37	75.4	70.9	172.5	2.9	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	38	35	-	-	5.3	9.9	28	15	0.00	-	0.16	0.0
18.54	78.3	73.3	173.2	2.9	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	39	37	-	-	5.5	9.9	27	15	0.00	-	0.16	0.0
18.70	58.7	54.0	-	3.4	-0.2	6.0	3	silty CLAY to CLAY	115	1.5	39	36	-	-	4.1	9.9	38	15	-	-	0.16	-
18.87	54.8	50.0	-	2.9	-0.2	5.4	3	silty CLAY to CLAY	115	1.5	37	33	-	-	3.8	9.9	37	15	-	-	0.16	-
19.03	40.8	37.0	-	2.5	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	27	25	-	-	2.8	9.9	45	15	-	-	0.16	-
19.19	39.6	35.5	-	2.1	-0.2	5.6	3	silty CLAY to CLAY	115	1.5	26	24	-	-	2.8	9.9	44	15	-	-	0.16	-
19.36	39.1	34.8	-	2.3	-0.2	6.0	3	silty CLAY to CLAY	115	1.5	26	23	-	-	2.7	9.9	45	15	-	-	0.16	-
19.52	54.0	49.3	154.8	2.2	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	27	25	-	-	3.8	9.9	34	15	0.77	-	0.16	35.1
19.69	40.6	35.6	-	2.9	-0.2	7.4	3	silty CLAY to CLAY	115	1.5	27	24	-	-	2.8	9.9	49	15	-	-	0.16	-
19.85	52.4	45.5	-	2.7	-0.2	5.3	3	silty CLAY to CLAY	115	1.5	35	30	-	-	3.7	9.9	39	15	-	-	0.16	-
20.01	40.8	35.1	-	2.6	-0.2	6.6	3	silty CLAY to CLAY	115	1.5	27	23	-	-	2.8	9.9	47	15	-	-	0.16	-
20.18	34.1	29.1	-	2.1	-0.2	6.3	3	silty CLAY to CLAY	115	1.5	23	19	-	-	2.4	9.9	49	15	-	-	0.16	-
20.34	36.9	31.3	-	1.8	-0.2	5.1	3	silty CLAY to CLAY	115	1.5	25	21	-	-	2.6	9.9	44	15	-	-	0.16	-
20.51	45.8	40.8	116.2	1.3	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	23	20	-	-	3.2	9.9	31	15	2.07	-	0.16	51.2
20.67	53.3	47.2	126.5	1.6	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	27	24	-	-	3.7	9.9	30	15	1.93	-	0.15	47.3
20.83	54.2	47.9	118.2	1.4	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	14	12	43	39	-	-	28	16	2.04	-	0.15	46.6
21.00	41.9	34.4	-	1.4	-0.2	3.3	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	2.9	9.9	36	15	-	-	0.15	-
21.16	50.4	44.2	111.8	1.2	-0.2	2.5	5	silty SAND to sandy SILT	120	4.0	13	11	40	39	-	-	29	16	2.13	-	0.15	51.1
21.33	69.6	60.8	169.8	2.9	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	35	30	-	-	4.9	9.9	31	15	0.00	-	0.14	0.0
21.49	108.5	94.4	218.4	4.8	-0.2	4.5	9	very stiff fine SOIL	120	2.0	54	47	65	43	-	-	26	30	0.00	-	0.14	0.0
21.65	101.8	88.2	256.5	6.2	-0.2	6.2	9	very stiff fine SOIL	120	2.0	51	44	63	43	-	-	32	30	0.00	-	0.14	0.0
21.82	113.8	98.2	227.8	5.3	-0.2	4.7	9	very stiff fine SOIL	120	2.0	57	49	66	43	-	-	26	30	0.00	-	0.14	0.0
21.98	112.0	96.3	225.3	5.2	-0.2	4.7	9	very stiff fine SOIL	120	2.0	56	48	66	43	-	-	27	30	0.00	-	0.14	0.0
22.15	106.5	91.2	235.8	5.5	-0.2	5.3	9	very stiff fine SOIL	120	2.0	53	46	64	43	-	-	29	30	0.00	-	0.14	0.0
22.31	96.0	81.9	239.9	5.6	-0.2	5.9	9	very stiff fine SOIL	120	2.0	48	41	60	42	-	-	32	30	0.00	-	0.14	0.0
22.47	82.3	63.0	-	5.3	-0.2	6.5	9	very stiff fine SOIL	120	2.0	41	32	52	41	-	-	37	30	-	-	0.14	-
22.64	63.4	48.2	-	4.9	-0.1	8.0	3	silty CLAY to CLAY	115	1.5	42	32	-	-	4.4	9.9	45	15	-	-	0.14	-
22.80	61.9	46.7	-	2.9	-0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.3	9.9	36	15	-	-	0.14	-
22.97	99.4	83.6	173.9	3.3	-0.1	3.4	5	silty SAND to sandy SILT	120	4.0	25	21	61	42	-	-	24	16	0.00	-	0.14	0.0
23.13	125.2	104.9	180.2	3.6	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	26	69	43	-	-	20	16	0.00	-	0.14	0.0
23.30	69.4	51.2	-	4.6	-0.2	6.7	3	silty CLAY to CLAY	115	1.5	46	34	-	-	4.8	9.9	41	15	-	-	0.14	-
23.46	99.9	83.1	191.4	4.0	-0.2	4.0	4	clayy SILT to silty CLAY	115	2.0	50	42	-	-	7.0	9.9	26	15	0.00	-	0.14	0.0
23.62	139.3	115.5	179.3	3.5	-0.2	2.5	5	silty SAND to sandy SILT	120	4.0	35	29	72	44	-	-	17	16	0.00	-	0.14	0.0
23.79	146.8	121.3	174.4	3.2	-0.2	2.2	5	silty SAND to sandy SILT	120	4.0	37	30	73	44	-	-	16	16	0.00	-	0.14	0.0
23.95	127.8	105.2	233.6	5.8	-0.2	4.6	9	very stiff fine SOIL	120	2.0	64	53	69	43	-	-	25	30	0.00	-	0.14	0.0
24.12	102.6	84.1	238.7	5.8	-0.1	5.7	9	very stiff fine SOIL	120	2.0	51	42	61	42	-	-	31	30	0.00	-	0.14	0.0
24.28	91.0	74.3	221.0	5.0	0.0	5.6	9	very stiff fine SOIL	120	2.0	45	37	57	42	-	-	32	30	0.00	-	0.14	0.0
24.44	106.7	86.9	226.0	5.4	0.0	5.1	9	very stiff fine SOIL	120	2.0	53	43	62	42	-	-	29	30	0.00	-	0.14	0.0
24.61	113.4	92.0	226.1	5.5	0.0	4.9	9	very stiff fine SOIL	120	2.0	57	46	64	43	-	-	28	30	0.00	-	0.14	0.0
24.77	125.4	101.4	200.7	4.5	0.0	3.6	5	silty SAND to sandy SILT	120	4.0	31	25	67	43	-	-	23	16	0.00	-	0.14	0.0
24.94	101.1	81.5	201.5	4.4	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	51	41	-	-	7.1	9.9	28	15	0.00	-	0.14	0.0
25.10	82.8	66.6	184.9	3.7	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	41	33	-	-	5.8	9.9	31	15	0.00	-	0.14	0.0
25.26	76.2	61.0	162.3	2.9	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	38	31	-	-	5.3	9.9	30	15	0.00	-	0.14	0.0
25.43	107.3	85.6	166.9	3.2	-0.2	3.1	5	silty SAND to sandy SILT	120	4.0	27	21	62	42	-	-	23	16	0.00	-	0.14	0.0
25.59	100.4	79.9	156.5	2.9	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	23	16	0.92	-	0.14	7.4
25.76	103.6	82.2	167.0	3.2	-0.2	3.2	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	23	16	0.00	-	0.14	0.0
25.92	112.3	88.8	167.3	3.3	-0.2	3.0	5	silty SAND to sandy SILT	120	4.0	28	22	63	42	-	-	22	16	0.00	-	0.14	0.0
26.08	114.2	90.0	177.7	3.7	-0.2	3.3	5	silty SAND to sandy SILT	120	4.0	29	23	64	42	-	-	23	16	0.00	-	0.14	0.0
26.25	99.4	78.0	166.2	3.2	-0.2	3.3	5	silty SAND to sandy SILT	120	4.0	25	20	59	42	-	-	25	16	0.00	-	0.14	0.0
26.41	88.6	69.4	185.1	3.8	-0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	44	35	-	-	6.2	9.9	30	15	0.00	-	0.14	0.0
26.58	79.7	62.2	180.1	3.6	-0.1	4.6	4	clayy SILT to silty CLAY	115	2.0	40	31	-	-	5.6	9.9	32	15	0.00	-	0.14	0.0
26.74	69.7	44.8	-	3.3	-0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	35	22	-	-	4.9	9.9	37	15	-	-	0.14	-
26.90	67.0	42.7	-	2.9	-0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	33	21	-	-	4.7	9.9	37	15	-	-	0.14	-
27.07	70.7	44.9	-	4.0	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	47	30	-	-	4.9	9.9	40	15	-	-	0.14	-
27.23	80.6	50.8	-	4.1	-0.2	5.1	4	clayy SILT to silty CLAY	115	2.0	40	25	-	-	5.6	9.9	36	15	-	-	0.14	-
27.40	57.9	36.3	-	3.6	-0.2	6.4	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.0	9.9	46	15	-	-	0.14	-
27.56	58.3	36.3	-	3.4	-0.2	6.1	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.1	9.9	45	15	-	-	0.14	-
27.72	65.9	40.8	-	4.0	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	44	27	-	-	4.6	9.9	43	15	-	-	0.14	-
27.89	73.8	45.4	-	4.1	-0.2	5.7	3	silty CLAY to CLAY	115	1.5	49	30	-	-	5.2	9.9	40	15	-	-	0.14	-
28.05	70.9	43.4	-	3.8	-0.2	5.5	3	silty CLAY to CLAY	115	1.5	47	29	-	-	4.9	9.9	40	15	-	-	0.14	-
28.22	74.8	45.5	-	4.8	-0.2	6.5	3	silty CLAY to CLAY	115	1.5	50	30	-	-	5.2	9.9	42	15	-	-	0.14	-
28.38	80.2	48.5	-	5.1	-0.5	6.5	3	silty CLAY to CLAY	115	1.5	53	32	-	-	5.6	9.9	41	15	-	-	0.14	-
28.54	66.3	39.9	-	4.4	-0.5	6.8	3	silty CLAY to CLAY	115	1.5	44	27	-	-	4.6	9.9	45	15	-	-	0.14	-
28.71	59.2	35.4	-	3.8	-0.5	6.7	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.1	9.9	47	15	-	-	0.14	-
28.87	58.8	35.0	-	3.3	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	39	23	-	-	4.1	9.9	44	15	-	-	0.14	-
29.04	55.2	32.7	-	2.8	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	37	22	-	-	3.8	9.9	44	15	-	-	0.14	-
29.20	52.2	30.7	-	2.8	-0.5	5.6	3	silty CLAY to CLAY	115	1.5	35	20	-	-	3.6	9.9	46	15	-	-	0.14	-
29.36	52.5	30.7	-	3.3	-0.5	6.5	3	silty CLAY to CLAY	115	1.5	35	20	-	-	3.7	9.9	49	15	-	-	0.14	-
29.53	59.6	34.7	-	3.5	-0.5	6.1	3	silty CLAY to CLAY	115	1.5	40	23	-	-	4.1	9.9	45	15	-	-	0.14	-
29.69	71.1	41.2	-	3.3	-0.5	4.8	4	clayy SILT to silty CLAY	115	2.0	36	21	-	-	5.0	9.9	39	15	-	-	0.14	-
29.86	71.0	52.3	148.5	2.6	-0.5	3.7	4	clayy SILT to silty CLAY	115	2.0	36	26	-	-	5.0	9.9	31	15	1.30	-	0.14	38.9
30.02	61.6	35.3	-	2.4	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	31	18	-	-	4.3	9.9	38	15	-	-	0.14	-
30.19	57.4	32.7	-	2.2	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	29	16	-	-	4.0	9.9	39	15	-	-	0.14	-
30.35	48.9	27.7	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	33	18	-	-	3.4	9.9	44	15	-	-	0.14	-
30.51	44.9	25.3	-	2.0	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	46	15	-	-	0.14	-
30.68	45.1	25.3	-	1.8	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	45	15	-	-	0.14	-
30.84	44.3	24.7	-	1.9	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	16	-	-	3.1	9.9	46	15	-	-	0.14	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
31.01	44.0	24.4	-	1.9	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	29	16	-	-	3.0	9.9	47	15	-	-	0.14	-
31.17	54.6	39.4	103.4	1.2	-0.4	2.4	5	silty SAND to sandy SILT	120	4.0	14	10	36	37	-	-	29	16	2.27	-	0.14	51.2
31.33	53.4	38.4	107.7	1.3	-0.5	2.6	4	clayy SILT to silty CLAY	115	2.0	27	19	-	-	3.7	9.9	31	15	2.20	-	0.14	51.2
31.50	60.6	43.5	99.2	1.2	-0.5	2.0	5	silty SAND to sandy SILT	120	4.0	15	11	40	38	-	-	26	16	2.35	-	0.13	51.2
31.66	64.6	46.3	121.7	1.8	-0.5	2.9	4	clayy SILT to silty CLAY	115	2.0	32	23	-	-	4.5	9.9	29	15	1.99	-	0.13	48.5
31.83	78.8	56.3	140.5	2.5	-0.6	3.2	4	clayy SILT to silty CLAY	115	2.0	39	28	-	-	5.5	9.9	28	15	1.67	-	0.13	37.5
31.99	91.1	49.0	-	4.5	-0.6	5.0	4	clayy SILT to silty CLAY	115	2.0	46	24	-	-	6.4	9.9	37	15	-	-	0.12	-
32.15	125.8	89.3	210.1	5.5	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	63	45	-	-	8.8	9.9	27	15	0.00	-	0.12	0.0
32.32	122.8	65.3	-	7.7	-0.6	6.4	9	very stiff fine SOIL	120	2.0	61	33	53	42	-	-	36	30	-	-	0.12	-
32.48	167.4	118.3	268.9	8.6	-0.6	5.2	9	very stiff fine SOIL	120	2.0	84	59	73	43	-	-	26	30	0.00	-	0.12	0.0
32.65	160.2	112.9	246.6	7.4	-0.5	4.7	9	very stiff fine SOIL	120	2.0	80	56	71	43	-	-	25	30	0.00	-	0.12	0.0
32.81	134.1	94.3	202.9	5.3	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	67	47	-	-	9.4	9.9	25	15	0.00	-	0.12	0.0
32.97	95.6	67.0	162.0	3.4	-0.4	3.6	4	clayy SILT to silty CLAY	115	2.0	48	34	-	-	6.7	9.9	27	15	0.00	-	0.12	0.0
33.14	80.0	56.0	138.8	2.5	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	40	28	-	-	5.6	9.9	28	15	1.73	-	0.12	37.8
33.30	68.9	48.0	124.0	1.9	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	34	24	-	-	4.8	9.9	29	15	1.96	-	0.12	46.4
33.47	72.5	50.5	107.6	1.5	-0.3	2.1	5	silty SAND to sandy SILT	120	4.0	18	13	44	39	-	-	25	16	2.20	-	0.12	43.6
33.63	56.9	29.1	-	1.5	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	28	15	-	-	3.9	9.9	36	15	-	-	0.11	-
33.79	57.5	29.2	-	1.6	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.0	9.9	37	15	-	-	0.11	-
33.96	80.1	55.4	130.8	2.2	-0.3	2.8	5	silty SAND to sandy SILT	120	4.0	20	14	47	39	-	-	27	16	1.88	-	0.11	38.4
34.12	92.7	63.9	155.8	3.2	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	32	-	-	6.5	9.9	28	15	1.05	-	0.11	15.0
34.29	106.8	73.5	188.9	4.5	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	53	37	-	-	7.5	9.9	29	15	0.00	-	0.11	0.0
34.45	109.3	75.0	208.5	5.4	-0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	55	37	-	-	7.7	9.9	31	15	0.00	-	0.11	0.0
34.61	102.9	51.1	-	5.3	-0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	51	26	-	-	7.2	9.9	37	15	-	-	0.11	-
34.78	100.3	49.6	-	4.8	-0.5	4.9	4	clayy SILT to silty CLAY	115	2.0	50	25	-	-	7.0	9.9	36	15	-	-	0.11	-
34.94	93.4	63.7	166.0	3.6	-0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	47	32	-	-	6.5	9.9	29	15	0.00	-	0.11	0.0
35.11	80.0	54.4	133.8	2.3	-0.5	3.0	4	clayy SILT to silty CLAY	115	2.0	40	27	-	-	5.6	9.9	28	15	1.84	-	0.11	39.4
35.27	70.0	47.5	115.5	1.7	-0.5	2.5	5	silty SAND to sandy SILT	120	4.0	18	12	42	38	-	-	28	16	2.08	-	0.11	47.1
35.43	62.8	42.5	113.5	1.6	-0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	31	21	-	-	4.4	9.9	30	15	2.11	-	0.10	51.2
35.60	65.6	31.7	-	2.0	-0.4	3.1	4	clayy SILT to silty CLAY	115	2.0	33	16	-	-	4.6	9.9	36	15	-	-	0.10	-
35.76	69.5	33.4	-	2.6	-0.4	3.8	4	clayy SILT to silty CLAY	115	2.0	35	17	-	-	4.8	9.9	39	15	-	-	0.10	-
35.93	71.4	34.2	-	3.3	-0.4	4.7	3	silty CLAY to CLAY	115	1.5	48	23	-	-	5.0	9.9	41	15	-	-	0.10	-
36.09	73.7	35.1	-	3.7	-0.4	5.2	3	silty CLAY to CLAY	115	1.5	49	23	-	-	5.1	9.9	43	15	-	-	0.10	-
36.26	77.6	36.8	-	3.7	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	52	25	-	-	5.4	9.9	41	15	-	-	0.10	-
36.42	70.9	33.5	-	2.5	-0.5	3.7	4	clayy SILT to silty CLAY	115	2.0	35	17	-	-	4.9	9.9	38	15	-	-	0.10	-
36.58	46.4	21.8	-	1.2	-0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	23	11	-	-	3.2	9.9	41	15	-	-	0.10	-
36.75	29.1	13.6	-	0.5	-0.4	2.0	4	clayy SILT to silty CLAY	115	2.0	15	7	-	-	2.0	8.2	47	15	-	-	0.10	-
36.91	22.6	10.5	-	0.4	-0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	11	5	-	-	1.5	6.2	52	15	-	-	0.10	-
37.08	25.3	11.7	-	0.4	-0.4	1.8	4	clayy SILT to silty CLAY	115	2.0	13	6	-	-	1.7	7.0	49	15	-	-	0.10	-
37.24	29.1	13.4	-	0.6	-0.4	2.2	4	clayy SILT to silty CLAY	115	2.0	15	7	-	-	2.0	8.1	48	15	-	-	0.10	-
37.40	36.1	16.6	-	0.6	-0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	18	8	-	-	2.5	9.9	42	15	-	-	0.10	-
37.57	38.0	17.4	-	0.8	-0.4	2.1	4	clayy SILT to silty CLAY	115	2.0	19	9	-	-	2.6	9.9	42	15	-	-	0.10	-
37.73	45.8	20.9	-	0.9	-0.5	2.1	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	39	15	-	-	0.10	-
37.90	53.3	34.9	88.2	0.9	-0.5	1.9	5	silty SAND to sandy SILT	120	4.0	13	9	32	36	-	-	29	16	2.59	-	0.10	51.2
38.06	46.0	20.8	-	0.8	-0.6	1.9	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	37	15	-	-	0.09	-
38.22	28.0	12.6	-	0.7	-0.6	2.6	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.5	52	15	-	-	0.09	-
38.39	19.4	8.7	-	0.5	-0.6	2.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.0	63	15	-	-	0.09	-
38.55	15.4	6.9	-	0.4	-0.6	2.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	3.8	71	15	-	-	0.09	-
38.72	16.2	7.2	-	0.3	-0.6	2.2	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.0	65	15	-	-	0.09	-
38.88	21.4	9.5	-	0.4	-0.6	2.3	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	58	15	-	-	0.09	-
39.04	43.5	19.2	-	0.7	-0.7	1.6	4	clayy SILT to silty CLAY	115	2.0	22	10	-	-	3.0	9.9	37	15	-	-	0.09	-
39.21	68.2	43.9	83.5	0.9	-0.7	1.4	5	silty SAND to sandy SILT	120	4.0	17	11	40	38	-	-	22	16	2.71	-	0.09	51.2
39.37	76.1	48.9	98.9	1.3	-0.7	1.8	5	silty SAND to sandy SILT	120	4.0	19	12	43	38	-	-	23	16	2.36	-	0.09	45.5
39.54	86.4	55.4	119.4	2.0	-0.7	2.4	5	silty SAND to sandy SILT	120	4.0	22	14	47	39	-	-	25	16	2.02	-	0.09	38.4
39.70	96.2	61.5	149.8	3.1	-0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	48	31	-	-	6.7	9.9	28	15	1.29	-	0.08	28.6
39.86	108.1	69.0	180.2	4.4	-0.7	4.2	4	clayy SILT to silty CLAY	115	2.0	54	34	-	-	7.6	9.9	29	15	0.00	-	0.08	0.0
40.03	114.2	49.1	-	5.5	-0.7	4.9	4	clayy SILT to silty CLAY	115	2.0	57	25	-	-	8.0	9.9	36	15	-	-	0.08	-
40.19	111.7	47.8	-	5.3	-0.7	4.9	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.8	9.9	36	15	-	-	0.08	-
40.36	103.0	65.3	167.0	3.9	-0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	52	33	-	-	7.2	9.9	29	15	0.00	-	0.08	0.0
40.52	94.9	60.1	130.5	2.4	-0.6	2.6	5	silty SAND to sandy SILT	120	4.0	24	15	50	39	-	-	25	16	1.88	-	0.08	33.9
40.68	81.4	51.4	134.4	2.5	-0.7	3.2	4	clayy SILT to silty CLAY	115	2.0	41	26	-	-	5.7	9.9	29	15	1.83	-	0.08	42.6
40.85	88.8	37.4	-	3.8	-0.6	4.4	4	clayy SILT to silty CLAY	115	2.0	44	19	-	-	6.2	9.9	39	15	-	-	0.07	-
41.01	97.4	40.9	-	4.4	-0.6	4.6	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.18	97.1	40.6	-	4.2	-0.6	4.5	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.34	101.4	42.2	-	4.1	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	51	21	-	-	7.1	9.9	36	15	-	-	0.07	-
41.50	97.4	40.4	-	4.2	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.67	91.8	37.9	-	4.2	-0.5	4.6	4	clayy SILT to silty CLAY	115	2.0	46	19	-	-	6.4	9.9	39	15	-	-	0.07	-
41.83	95.4	39.2	-	3.9	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.7	9.9	37	15	-	-	0.07	-
42.00	99.9	40.9	-	4.0	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	50	20	-	-	7.0	9.9	36	15	-	-	0.07	-
42.16	96.7	39.4	-	3.8	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.7	9.9	37	15	-	-	0.07	-
42.32	98.9	40.2	-	4.1	-0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.9	9.9	37	15	-	-	0.07	-
42.49	110.3	68.2	176.1	4.4	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	55	34	-	-	7.7	9.9	29	15	0.00	-	0.07	0.0
42.65	115.7	71.4	182.8	4.7	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	58	36	-	-	8.1	9.9	29	15	0.00	-	0.07	0.0
42.82	115.5	71.1	181.5	4.7	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	58	36	-	-	8.1	9.9	29	15	0.00	-	0.07	0.0
42.98	111.7	68.6	172.6	4.3	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	56	34	-	-	7.8	9.9	28	15	0.00	-	0.07	0.0
43.15	103.9	63.8	155.1	3.5	-0.5	3.4	4	clayy SILT to silty CLAY	115	2.0	52	32	-	-	7.3	9.9	28	15	1.07	-	0.07	15.8
43.31	83.3	33.1	-	3.3	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	42	17	-	-	5.8	9.9	40	15	-	-	0.07	-
43.47	82.9	32.8	-	3.3	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.8	9.9	40	15	-	-	0.07	-
43.64	73.7	29.1	-	3.3	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	49	19	-	-	5.1	9.9	44	15	-	-	0.07	-
43.80	55.7	21.9	-	3.0	-0.4	5.6	3	silty CLAY to CLAY	115	1.5	37	15	-	-	3.8	9.9	53	15	-	-	0.07	-
43.97	46.7	18.3	-	2.4	-0.4	5.4	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.9	56	15	-	-	0.07	-
44.13	44.3	17.3	-	2.0	-0.4	4.9	3	silty CLAY to CLAY	115	1.5	30	12	-	-	3.0	9.9	56	15	-	-	0.07	-
44.29	42.9	16.7	-	1.9	-0.4	4.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	9.9	56	15	-	-	0.07	-
44.46	40.4	15.7	-	1.8	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	9.7	58	15	-	-	0.07	-
44.62	44.6	17.2	-	1.9	-0.7	4.4	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.1	9.9	54	15	-	-	0.07	-
44.79	49.2	18.9	-	1.9	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	9.9	50	15	-	-	0.07	-
44.95	41.4	15.9	-	1.9	-0.7	4.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.8	57	15	-	-	0.07	-
45.11	32.4	12.4	-	1.5	-0.7	5.0	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	7.5	64	15	-	-	0.07	-
45.28	27.5	10.4	-	1.1	-0.7	4.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.2	67	15	-	-	0.07	-
45.44	26.9	10.2	-	1.0	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.1	66	15	-	-	0.07	-
45.61	28.9	10.9	-	1.0	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.6	62	15	-	-	0.07	-
45.77	25.0	9.4	-	0.9	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.5	68	15	-	-	0.07	-
45.93	21.3	8.0	-	0.8	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	74	15	-	-	0.07	-
46.10	18.5	7.0	-	0.7	-0.7	4.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	79	15	-	-	0.07	-
46.26	19.1	7.2	-	0.7	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.0	77	15	-	-	0.07	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
46.43	20.5	7.7	-	0.7	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.4	73	15	-	-	0.07	-
46.59	20.1	7.6	-	0.7	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	75	15	-	-	0.07	-
46.75	21.0	7.9	-	0.7	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.5	73	15	-	-	0.07	-
46.92	26.0	9.8	-	0.8	-0.7	3.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.7	63	15	-	-	0.07	-
47.08	24.9	9.4	-	0.8	-0.7	3.4	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.4	65	15	-	-	0.07	-
47.25	21.9	8.3	-	0.6	-0.7	3.1	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.6	67	15	-	-	0.07	-
47.41	17.0	6.4	-	0.5	-0.7	3.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.4	78	15	-	-	0.07	-
47.57	15.9	6.0	-	0.5	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.2	83	15	-	-	0.07	-
47.74	16.6	6.3	-	0.5	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.3	79	15	-	-	0.07	-
47.90	16.5	6.2	-	0.5	-0.7	3.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.3	78	15	-	-	0.07	-
48.07	13.6	5.1	-	0.4	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.6	88	15	-	-	0.07	-
48.23	13.5	5.1	-	0.4	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.5	89	15	-	-	0.07	-
48.39	12.8	4.8	-	0.4	-0.7	4.5	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.8	2.4	94	15	-	-	0.07	-
48.56	12.1	4.6	-	0.4	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	94	15	-	-	0.07	-
48.72	11.4	4.3	-	0.3	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.7	2.0	95	15	-	-	0.07	-
48.89	12.0	4.5	-	0.3	-0.7	3.5	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.7	2.1	91	15	-	-	0.07	-
49.05	12.5	4.7	-	0.3	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.3	90	15	-	-	0.07	-
49.22	12.5	4.7	-	0.3	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	91	15	-	-	0.07	-
49.38	12.5	4.7	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	92	15	-	-	0.07	-
49.54	12.7	4.8	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.3	91	15	-	-	0.07	-
49.71	13.3	5.0	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.8	2.4	88	15	-	-	0.07	-
49.87	13.7	5.2	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.5	87	15	-	-	0.07	-
50.04	14.3	5.4	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.6	86	15	-	-	0.07	-
50.20	14.6	5.5	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.7	85	15	-	-	0.07	-
50.36	15.1	5.7	-	0.5	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.8	85	15	-	-	0.07	-
50.53	15.8	6.0	-	0.5	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.9	84	15	-	-	0.07	-
50.69	17.0	6.4	-	0.6	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.2	81	15	-	-	0.07	-
50.86	18.2	6.8	-	0.6	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	78	15	-	-	0.07	-
51.02	17.8	6.7	-	0.6	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	80	15	-	-	0.07	-
51.18	18.7	7.1	-	0.6	-0.6	3.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	77	15	-	-	0.07	-
51.35	17.8	6.7	-	0.6	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	78	15	-	-	0.07	-
51.51	17.8	6.7	-	0.5	-0.6	3.7	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	77	15	-	-	0.07	-
51.68	18.2	6.9	-	0.5	-0.6	3.6	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	76	15	-	-	0.07	-
51.84	18.5	7.0	-	0.6	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	77	15	-	-	0.07	-
52.00	19.6	7.4	-	0.7	-0.6	4.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.7	77	15	-	-	0.07	-
52.17	20.3	7.7	-	0.8	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.8	78	15	-	-	0.07	-
52.33	21.3	8.0	-	0.9	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.0	78	15	-	-	0.07	-
52.50	27.0	10.2	-	0.9	-0.6	3.9	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.3	65	15	-	-	0.07	-
52.66	22.2	8.4	-	0.8	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.2	73	15	-	-	0.07	-
52.82	22.9	8.6	-	0.7	-0.6	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.3	68	15	-	-	0.07	-
52.99	24.1	9.1	-	0.6	-0.6	3.1	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.6	64	15	-	-	0.07	-
53.15	23.8	9.0	-	0.6	-0.6	2.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.5	64	15	-	-	0.07	-
53.32	23.2	8.8	-	0.6	-0.6	3.1	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.4	66	15	-	-	0.07	-
53.48	23.3	8.8	-	0.7	-0.6	3.5	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	4.4	68	15	-	-	0.07	-
53.64	24.5	9.3	-	0.8	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.6	68	15	-	-	0.07	-
53.81	26.0	9.8	-	1.1	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.9	70	15	-	-	0.07	-
53.97	27.8	10.5	-	1.3	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	70	15	-	-	0.07	-
54.14	27.8	10.5	-	1.4	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	72	15	-	-	0.07	-
54.30	26.9	10.1	-	1.3	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.0	72	15	-	-	0.07	-
54.46	27.2	10.2	-	1.2	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.1	69	15	-	-	0.07	-
54.63	26.3	9.9	-	1.1	-0.5	4.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.9	70	15	-	-	0.07	-
54.79	26.3	9.9	-	1.0	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.9	68	15	-	-	0.07	-
54.96	26.2	9.9	-	1.0	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	68	15	-	-	0.07	-
55.12	25.9	9.8	-	1.0	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	69	15	-	-	0.07	-
55.28	25.9	9.8	-	1.1	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	70	15	-	-	0.07	-
55.45	25.9	9.8	-	1.0	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.7	69	15	-	-	0.07	-
55.61	26.4	10.0	-	0.9	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	67	15	-	-	0.07	-
55.78	26.9	10.1	-	1.0	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.9	66	15	-	-	0.07	-
55.94	27.8	10.5	-	1.0	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.8	5.1	66	15	-	-	0.07	-
56.11	28.9	10.9	-	1.1	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	65	15	-	-	0.07	-
56.27	31.2	11.8	-	1.0	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.8	60	15	-	-	0.07	-
56.43	33.0	12.4	-	1.0	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.1	57	15	-	-	0.07	-
56.60	30.9	11.6	-	0.9	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.6	59	15	-	-	0.07	-
56.76	27.0	10.2	-	0.9	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	65	15	-	-	0.07	-
56.93	28.2	10.6	-	0.9	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	64	15	-	-	0.07	-
57.09	27.7	10.4	-	1.0	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.0	66	15	-	-	0.07	-
57.25	28.0	10.6	-	1.1	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.0	67	15	-	-	0.07	-
57.42	29.7	11.2	-	1.0	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	20	7	-	-	2.0	5.3	62	15	-	-	0.07	-
57.58	28.5	10.8	-	1.0	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	64	15	-	-	0.07	-
57.75	28.8	10.9	-	1.1	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	66	15	-	-	0.07	-
57.91	30.3	11.4	-	1.2	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	5.4	64	15	-	-	0.07	-
58.07	32.5	12.3	-	1.2	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.8	62	15	-	-	0.07	-
58.24	29.5	11.1	-	1.3	-0.4	4.9	3	silty CLAY to CLAY	115	1.5	20	7	-	-	2.0	5.2	67	15	-	-	0.07	-
58.40	24.8	9.4	-	1.3	-0.4	5.9	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	4.3	76	15	-	-	0.07	-
58.57	25.9	9.8	-	1.1	-0.4	4.8	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.5	71	15	-	-	0.07	-
58.73	25.2	9.5	-	0.7	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.3	65	15	-	-	0.07	-
58.89	25.7	9.7	-	0.7	-0.4	3.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.4	62	15	-	-	0.07	-
59.06	33.4	12.6	-	1.1	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.9	59	15	-	-	0.07	-
59.22	34.8	13.1	-	1.4	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.1	62	15	-	-	0.07	-
59.39	36.8	13.9	-	1.5	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.5	59	15	-	-	0.07	-
59.55	37.1	14.0	-	1.5	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.6	60	15	-	-	0.07	-
59.71	39.0	14.7	-	1.3	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	6.9	54	15	-	-	0.07	-
59.88	39.9	15.1	-	1.5	-0.3	4.1	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.1	56	15	-	-	0.07	-
60.04	41.8	15.8	-	1.4	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	7.4	53	15	-	-	0.07	-
60.21	47.6	18.0	-	1.6	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	8.5	50	15	-	-	0.07	-
60.37	51.4	19.4	-	1.6	-0.3	3.3	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.2	47	15	-	-	0.07	-
60.53	49.3	18.6	-	1.7	-0.3	3.7	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	8.8	50	15	-	-	0.07	-
60.70	50.3	19.0	-	1.9	-0.3	4.1	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	9.0	51	15	-	-	0.07	-
60.86	67.1	25.3	-	1.9	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.6	9.9	40	15	-	-	0.07	-
61.03	62.7	23.6	-	1.5	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	39	15	-	-	0.07	-
61.19	59.8	22.6	-	1.5	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	41	15	-	-	0.07	-
61.35	59.9	22.6	-	1.7	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	43	15	-	-	0.07	-
61.52	64.7	24.4	-	1.7	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	40	15	-	-	0.07	-
61.68	59.3	22.4	-	1.5	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	41	15	-	-	0.07	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

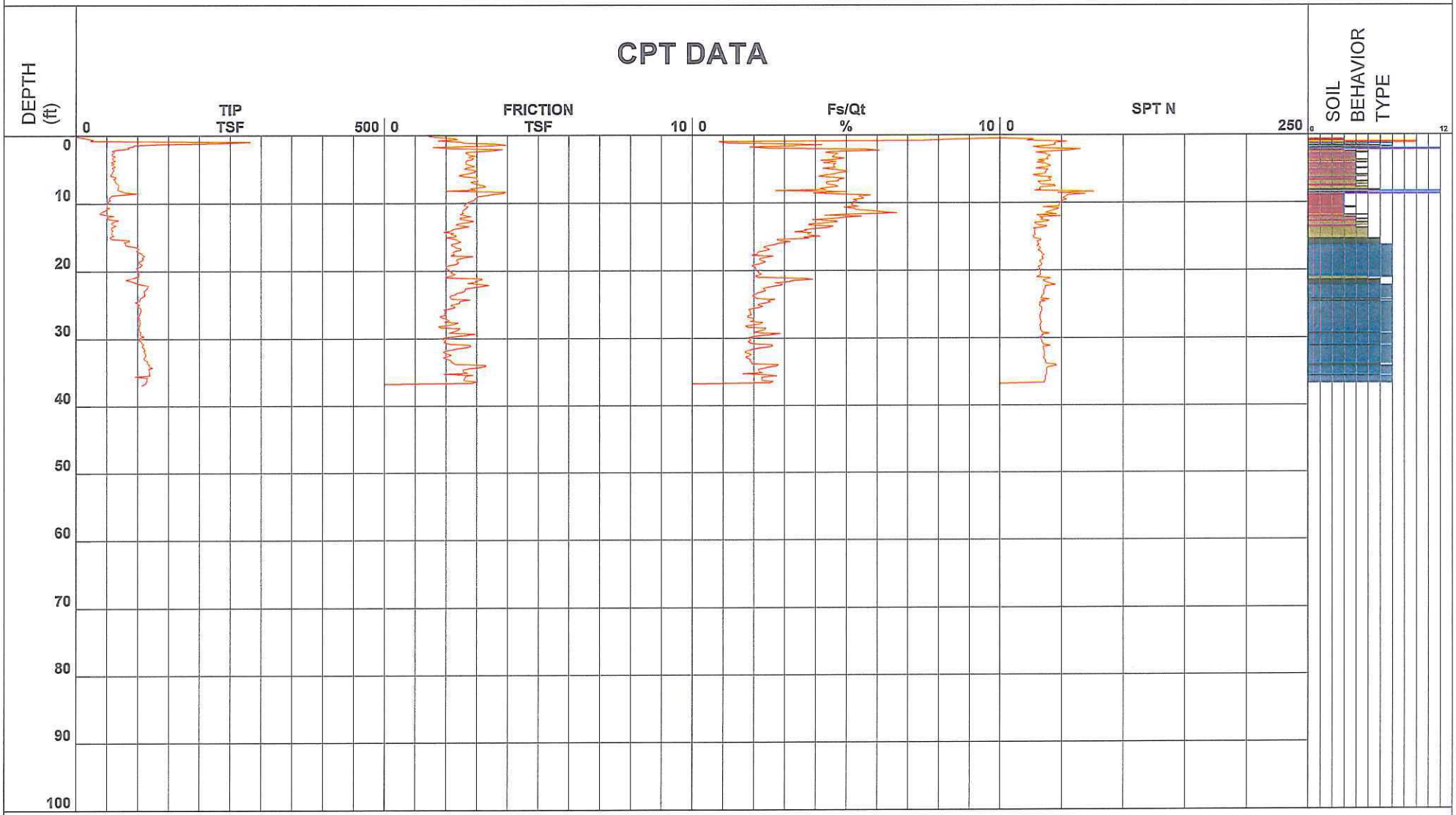
Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
61.85	56.0	21.1	-	1.3	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.8	9.9	41	15	-	-	0.07	-
62.01	56.7	21.4	-	1.2	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	40	15	-	-	0.07	-
62.17	57.8	21.8	-	1.2	-0.3	2.2	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	39	15	-	-	0.07	-
62.34	58.5	22.1	-	1.2	-0.3	2.1	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	38	15	-	-	0.07	-
62.50	58.1	21.9	-	1.2	-0.3	2.2	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	39	15	-	-	0.07	-
62.67	59.4	22.4	-	1.3	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	38	15	-	-	0.07	-
62.83	59.4	22.4	-	1.4	-0.3	2.5	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	40	15	-	-	0.07	-
63.00	64.0	24.2	-	1.5	-0.2	2.5	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	38	15	-	-	0.07	-
63.16	68.8	25.9	-	1.6	-0.3	2.4	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	37	15	-	-	0.07	-
63.32	74.4	28.1	-	1.8	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	36	15	-	-	0.07	-
63.49	72.4	36.7	101.0	1.6	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	36	18	-	-	5.0	9.9	31	15	2.32	-	0.07	51.2
63.65	74.7	28.2	-	2.4	-0.3	3.3	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.2	9.9	40	15	-	-	0.07	-
63.82	75.6	28.5	-	2.4	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	40	15	-	-	0.07	-
63.98	86.3	32.5	-	2.4	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	35	15	-	-	0.07	-
64.14	86.7	32.7	-	2.6	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	36	15	-	-	0.07	-
64.31	94.1	47.3	121.7	2.5	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	47	24	-	-	6.5	9.9	29	15	1.99	-	0.07	47.2
64.47	93.7	47.1	124.8	2.6	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	47	24	-	-	6.5	9.9	30	15	1.95	-	0.07	47.5
64.64	101.3	50.9	125.4	2.7	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	51	25	-	-	7.0	9.9	28	15	1.94	-	0.06	43.2
64.80	97.3	48.8	125.2	2.7	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	49	24	-	-	6.7	9.9	29	15	1.94	-	0.06	45.5
64.96	99.1	49.6	122.2	2.6	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	1.98	-	0.06	44.6
65.13	100.8	50.4	119.0	2.5	-0.3	2.5	5	silty SAND to sandy SILT	120	4.0	25	13	44	37	-	-	27	16	2.03	-	0.05	43.7
65.29	99.6	49.8	121.0	2.5	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	2.00	-	0.05	44.4
65.46	98.9	49.4	121.5	2.5	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	1.99	-	0.05	44.9
65.62	101.8	50.7	124.5	2.7	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	51	25	-	-	7.1	9.9	28	15	1.95	-	0.04	43.4
65.78	95.7	47.6	125.7	2.7	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	48	24	-	-	6.6	9.9	30	15	1.94	-	0.04	46.9
65.95	90.7	34.2	-	3.1	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	37	15	-	-	0.04	-
66.11	103.2	51.2	140.6	3.4	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	52	26	-	-	7.2	9.9	30	15	1.38	-	0.04	39.4
66.28	110.2	54.6	140.7	3.5	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	55	27	-	-	7.7	9.9	29	15	1.41	-	0.03	35.8
66.44	103.1	51.1	134.7	3.1	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	52	26	-	-	7.2	9.9	30	15	1.66	-	0.03	43.0
66.60	105.1	39.7	-	6.3	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	70	26	-	-	7.3	9.9	44	15	-	-	0.03	-
66.77	111.4	42.0	-	6.3	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	74	28	-	-	7.7	9.9	42	15	-	-	0.03	-
66.93	140.8	69.5	177.2	5.5	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	70	35	-	-	9.8	9.9	29	15	0.00	-	0.03	0.0
67.10	122.1	60.2	164.0	4.7	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.5	9.9	30	15	0.00	-	0.03	0.0
67.26	125.1	61.6	164.3	4.7	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	63	31	-	-	8.7	9.9	30	15	0.00	-	0.03	0.0
67.42	121.5	59.7	162.9	4.6	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.5	9.9	30	15	0.00	-	0.03	0.0
67.59	111.1	54.5	145.8	3.7	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	56	27	-	-	7.7	9.9	30	15	1.14	-	0.03	26.6
67.75	94.3	35.6	-	3.4	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.03	-
67.92	83.0	31.3	-	3.0	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.03	-
68.08	73.7	27.8	-	2.6	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.03	-
68.24	88.9	43.4	116.8	2.3	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	44	22	-	-	6.1	9.9	30	15	2.06	-	0.03	51.2
68.41	90.8	34.3	-	3.1	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	37	15	-	-	0.02	-
68.57	117.8	44.4	-	6.0	-0.2	5.2	3	silty CLAY to CLAY	115	1.5	79	30	-	-	8.2	9.9	39	15	-	-	0.02	-
68.74	126.1	61.4	169.6	5.0	-0.2	4.1	4	clayy SILT to silty CLAY	115	2.0	63	31	-	-	8.8	9.9	31	15	0.00	-	0.02	0.0
68.90	121.4	59.0	150.0	4.0	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.4	9.9	29	15	0.96	-	0.02	12.4
69.07	115.0	55.8	130.3	3.1	-0.3	2.8	5	silty SAND to sandy SILT	120	4.0	29	14	48	38	-	-	27	16	1.81	-	0.02	37.9
69.23	109.6	53.2	122.3	2.7	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	27	13	46	37	-	-	26	16	1.98	-	0.02	40.7
69.39	106.5	51.6	123.9	2.7	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	27	13	45	37	-	-	27	16	1.96	-	0.02	42.4
69.56	110.3	53.4	125.5	2.8	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	13	46	37	-	-	27	16	1.94	-	0.01	40.5
69.72	110.2	53.3	125.0	2.8	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	13	46	37	-	-	27	16	1.95	-	0.01	40.6
69.89	113.4	54.8	125.0	2.8	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	28	14	47	37	-	-	26	16	1.95	-	0.01	39.0
70.05	113.2	54.6	127.1	2.9	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	14	47	37	-	-	27	16	1.90	-	0.00	39.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(552).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-227	Date and Time	10/6/2011 11:09:49 PM	Maximum Depth	36.91 ft
Water Table Depth		>36.91 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(552).cpt
CPT Date: 10/6/2011 11:09:49 PM
GW During Test: No GW

Sounding ID: CPT-11-227
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.29	Cycl SStn %
0.33	10.3	16.5	-	1.8	0.0	9.9	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	70	15	N/A	0.00	N/A	N/A
0.49	15.3	30.9	-	2.3	-0.2	9.9	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	57	15	N/A	0.00	N/A	N/A
0.66	27.8	44.6	-	2.4	-0.1	8.6	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	47	15	N/A	0.00	N/A	N/A
0.82	23.2	37.2	-	1.7	0.0	7.6	3	silty CLAY to CLAY	115	1.5	15	25	-	-	1.6	9.9	48	15	N/A	0.00	N/A	N/A
0.98	283.2	454.1	454.1	2.5	-0.3	0.9	6	clean SAND to silty SAND	125	5.0	57	91	95	48	-	-	5	16	N/A	0.00	N/A	N/A
1.15	236.3	379.0	379.0	2.6	-0.1	1.1	6	clean SAND to silty SAND	125	5.0	47	76	95	48	-	-	5	16	N/A	0.00	N/A	N/A
1.31	138.4	221.9	284.8	3.6	0.1	2.6	5	silty SAND to sandy SILT	120	4.0	35	55	93	48	-	-	13	16	N/A	0.00	N/A	N/A
1.48	93.8	150.4	271.7	4.0	-0.1	4.2	9	very stiff fine SOIL	120	2.0	47	75	80	48	-	-	21	30	N/A	0.00	N/A	N/A
1.64	93.6	150.2	232.8	2.9	-0.3	3.1	5	silty SAND to sandy SILT	120	4.0	23	38	80	48	-	-	17	16	N/A	0.00	N/A	N/A
1.80	84.0	134.8	176.4	1.6	-0.4	1.9	5	silty SAND to sandy SILT	120	4.0	21	34	77	48	-	-	13	16	N/A	0.00	N/A	N/A
1.97	85.9	137.7	196.7	2.1	-0.3	2.4	5	silty SAND to sandy SILT	120	4.0	21	34	78	48	-	-	15	16	N/A	0.00	N/A	N/A
2.13	68.2	109.4	269.6	3.8	-0.9	5.6	9	very stiff fine SOIL	120	2.0	34	55	70	48	-	-	28	30	N/A	0.00	N/A	N/A
2.30	58.4	93.7	260.7	3.5	-1.3	6.1	9	very stiff fine SOIL	120	2.0	29	47	65	47	-	-	31	30	N/A	0.00	N/A	N/A
2.46	62.8	100.7	225.9	2.8	-1.4	4.5	9	very stiff fine SOIL	120	2.0	31	50	67	47	-	-	26	30	N/A	0.00	N/A	N/A
2.62	61.1	98.0	216.7	2.6	-0.5	4.3	9	very stiff fine SOIL	120	2.0	31	49	66	47	-	-	25	30	N/A	0.00	N/A	N/A
2.79	57.7	92.6	221.9	2.7	-0.5	4.7	9	very stiff fine SOIL	120	2.0	29	46	64	47	-	-	27	30	N/A	0.00	N/A	N/A
2.95	59.2	94.9	222.7	2.8	-0.6	4.7	9	very stiff fine SOIL	120	2.0	30	47	65	46	-	-	27	30	N/A	0.00	N/A	N/A
3.12	64.1	102.9	230.8	3.0	-0.7	4.6	9	very stiff fine SOIL	120	2.0	32	51	68	47	-	-	26	30	N/A	0.00	N/A	N/A
3.28	60.3	96.8	221.9	2.7	-0.4	4.6	9	very stiff fine SOIL	120	2.0	30	48	66	46	-	-	26	30	0.00	-	0.29	0.0
3.45	58.8	94.3	230.2	2.9	-0.6	5.0	9	very stiff fine SOIL	120	2.0	29	47	65	46	-	-	28	30	0.00	-	0.29	0.0
3.61	61.3	98.3	226.9	2.8	-0.6	4.7	9	very stiff fine SOIL	120	2.0	31	49	66	46	-	-	26	30	0.00	-	0.29	0.0
3.77	64.0	102.6	218.1	2.7	-0.6	4.2	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	24	30	0.00	-	0.29	0.0
3.94	56.9	91.2	219.2	2.7	-1.0	4.7	9	very stiff fine SOIL	120	2.0	28	46	64	45	-	-	27	30	0.00	-	0.29	0.0
4.10	62.1	99.7	217.4	2.7	-0.7	4.3	9	very stiff fine SOIL	120	2.0	31	50	67	46	-	-	25	30	0.00	-	0.29	0.0
4.27	57.3	91.9	219.7	2.7	-0.6	4.7	9	very stiff fine SOIL	120	2.0	29	46	64	45	-	-	27	30	0.00	-	0.29	0.0
4.43	60.9	97.7	224.4	2.8	-0.4	4.6	9	very stiff fine SOIL	120	2.0	30	49	66	45	-	-	26	30	0.00	-	0.29	0.0
4.59	64.2	102.9	230.8	2.9	-0.5	4.6	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	26	30	0.00	-	0.29	0.0
4.76	58.4	93.6	221.5	2.7	-0.5	4.7	9	very stiff fine SOIL	120	2.0	29	47	65	45	-	-	27	30	0.00	-	0.29	0.0
4.92	61.5	98.6	215.2	2.6	-1.0	4.3	9	very stiff fine SOIL	120	2.0	31	49	67	45	-	-	25	30	0.00	-	0.29	0.0
5.09	61.2	98.2	227.3	2.9	-0.8	4.7	9	very stiff fine SOIL	120	2.0	31	49	66	45	-	-	26	30	0.00	-	0.29	0.0
5.25	60.3	96.7	233.7	3.0	-0.7	5.0	9	very stiff fine SOIL	120	2.0	30	48	66	45	-	-	27	30	0.00	-	0.29	0.0
5.41	58.7	94.1	233.1	3.0	-0.7	5.1	9	very stiff fine SOIL	120	2.0	29	47	65	45	-	-	28	30	0.00	-	0.29	0.0
5.58	58.7	94.1	224.7	2.8	-0.9	4.8	9	very stiff fine SOIL	120	2.0	29	47	65	45	-	-	27	30	0.00	-	0.29	0.0
5.74	56.6	90.8	217.5	2.6	-0.9	4.6	9	very stiff fine SOIL	120	2.0	28	45	64	44	-	-	27	30	0.00	-	0.29	0.0
5.91	56.2	90.2	208.2	2.4	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	28	45	-	-	4.0	9.9	26	15	0.00	-	0.29	0.0
6.07	63.8	102.4	215.8	2.6	-0.9	4.1	9	very stiff fine SOIL	120	2.0	32	51	68	45	-	-	24	30	0.00	-	0.29	0.0
6.23	65.1	103.7	233.5	3.0	-0.8	4.7	9	very stiff fine SOIL	120	2.0	33	52	68	45	-	-	26	30	0.00	-	0.29	0.0
6.40	61.0	95.9	232.7	3.0	-0.7	5.0	9	very stiff fine SOIL	120	2.0	30	48	66	44	-	-	28	30	0.00	-	0.29	0.0
6.56	63.6	98.7	230.6	3.0	-0.8	4.8	9	very stiff fine SOIL	120	2.0	32	49	67	45	-	-	27	30	0.00	-	0.29	0.0
6.73	64.0	98.2	230.7	3.0	-0.9	4.8	9	very stiff fine SOIL	120	2.0	32	49	66	45	-	-	27	30	0.00	-	0.29	0.0
6.89	64.0	96.9	218.0	2.8	-0.9	4.4	9	very stiff fine SOIL	120	2.0	32	48	66	44	-	-	26	30	0.00	-	0.29	0.0
7.05	66.7	99.9	220.7	2.9	-0.8	4.4	9	very stiff fine SOIL	120	2.0	33	50	67	45	-	-	25	30	0.00	-	0.29	0.0
7.22	69.0	102.1	224.6	3.0	-0.8	4.4	9	very stiff fine SOIL	120	2.0	35	51	68	45	-	-	25	30	0.00	-	0.29	0.0
7.38	69.5	101.6	231.6	3.2	-0.9	4.7	9	very stiff fine SOIL	120	2.0	35	51	68	45	-	-	26	30	0.00	-	0.29	0.0
7.55	69.8	101.0	233.0	3.3	-0.9	4.7	9	very stiff fine SOIL	120	2.0	35	51	67	45	-	-	26	30	0.00	-	0.29	0.0
7.71	69.3	99.2	222.3	3.1	-0.9	4.5	9	very stiff fine SOIL	120	2.0	35	50	67	44	-	-	26	30	0.00	-	0.29	0.0
7.87	67.3	95.3	209.4	2.8	-0.9	4.2	4	clayy SILT to silty CLAY	115	2.0	34	48	-	-	4.7	9.9	25	15	0.00	-	0.29	0.0
8.04	68.4	95.9	215.6	3.0	-1.0	4.4	9	very stiff fine SOIL	120	2.0	34	48	66	44	-	-	26	30	0.00	-	0.29	0.0
8.20	74.0	102.7	173.2	2.0	-1.6	2.7	5	silty SAND to sandy SILT	120	4.0	18	26	68	45	-	-	19	16	0.00	-	0.29	0.0
8.37	79.0	108.5	250.5	3.9	-1.2	5.0	9	very stiff fine SOIL	120	2.0	39	54	70	45	-	-	26	30	0.00	-	0.29	0.0
8.53	98.4	133.9	245.0	3.9	-1.1	4.0	8	stiff SAND to clayy SAND	115	1.0	98	100	-	-	6.5	9.9	21	16	0.00	-	0.29	0.0
8.69	72.5	97.7	232.7	3.5	-1.0	4.9	9	very stiff fine SOIL	120	2.0	36	49	66	44	-	-	27	30	0.00	-	0.29	0.0
8.86	57.9	77.3	231.0	3.3	-1.0	5.8	9	very stiff fine SOIL	120	2.0	29	39	59	43	-	-	33	30	0.00	-	0.29	0.0
9.02	56.3	74.5	217.3	3.0	-1.4	5.4	4	clayy SILT to silty CLAY	115	2.0	28	37	-	-	4.0	9.9	32	15	0.00	-	0.29	0.0
9.19	54.6	71.7	216.4	3.0	-1.7	5.6	4	clayy SILT to silty CLAY	115	2.0	27	36	-	-	3.8	9.9	33	15	0.00	-	0.29	0.0
9.35	52.8	68.8	213.2	2.9	-2.8	5.6	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	34	15	0.00	-	0.29	0.0
9.51	56.4	72.7	210.7	2.9	-2.8	5.3	4	clayy SILT to silty CLAY	115	2.0	28	36	-	-	4.0	9.9	32	15	0.00	-	0.29	0.0
9.68	53.0	67.9	206.9	2.8	-1.9	5.4	4	clayy SILT to silty CLAY	115	2.0	27	34	-	-	3.7	9.9	33	15	0.00	-	0.29	0.0
9.84	52.0	66.0	201.1	2.7	-1.5	5.3	4	clayy SILT to silty CLAY	115	2.0	26	33	-	-	3.6	9.9	33	15	0.00	-	0.29	0.0
10.01	51.4	64.7	200.3	2.7	-1.6	5.3	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.6	9.9	33	15	0.00	-	0.29	0.0
10.17	50.5	63.1	196.3	2.6	-1.5	5.3	4	clayy SILT to silty CLAY	115	2.0	25	32	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
10.34	50.3	62.4	194.6	2.6	-1.5	5.2	4	clayy SILT to silty CLAY	115	2.0	25	31	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
10.50	50.4	62.0	199.5	2.7	-1.5	5.5	4	clayy SILT to silty CLAY	115	2.0	25	31	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
10.66	54.5	66.5	194.9	2.7	-1.5	5.0	4	clayy SILT to silty CLAY	115	2.0	27	33	-	-	3.8	9.9	32	15	0.00	-	0.29	0.0
10.83	50.1	60.7	194.5	2.6	-1.6	5.3	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
10.99	48.5	58.4	192.2	2.6	-1.6	5.4	4	clayy SILT to silty CLAY	115	2.0	24	29	-	-	3.4	9.9	35	15	0.00	-	0.29	0.0
11.16	43.4	57.0	-	2.6	-1.6	6.0	3	silty CLAY to CLAY	115	1.5	29	38	-	-	3.0	9.9	37	15	-	-	0.29	-
11.32	40.8	60.9	-	2.5	-1.6	6.3	3	silty CLAY to CLAY	115	1.5	27	41	-	-	2.9	9.9	37	15	-	-	0.29	-
11.48	38.9	57.2	-	2.6	-1.6	6.8	3	silty CLAY to CLAY	115	1.5	26	38	-	-	2.7	9.9	39	15	-	-	0.29	-
11.65	48.1	56.3	185.2	2.5	-1.7	5.2	4	clayy SILT to silty CLAY	115	2.0	24	28	-	-	3.4	9.9	35	15	0.00	-	0.29	0.0
11.81	61.8	71.7	186.2	2.7	-1.7	4.3	4	clayy SILT to silty CLAY	115	2.0	31	36	-	-	4.3	9.9	29	15	0.00	-	0.29	0.0
11.98	51.4	64.3	205.5	2.8	-1.4	5.6	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.6	9.9	34	15	0.00	-	0.29	0.0
12.14	50.3	57.6	182.7	2.5	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	25	29	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
12.30	54.4	62.0	179.7	2.5	-1.2	4.6	4	clayy SILT to silty CLAY	115	2.0	27	31	-	-	3.8	9.9	32	15	0.00	-	0.29	0.0
12.47	69.1	78.2	183.4	2.7	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	35	39	-	-	4.9	9.9	27	15	0.00	-	0.29	0.0
12.63	62.5	70.3	193.4	2.9	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	31	35	-	-	4.4	9.9	31	15	0.00	-	0.29	0.0
12.80	58.9	65.8	188.8	2.8	-1.1	4.8	4	clayy SILT to silty CLAY	115	2.0	29	33	-	-	4.1	9.9	32	15	0.00	-	0.29	0.0
12.96	57.5	63.9	177.0	2.5	-1.0	4.4	4	clayy SILT to silty CLAY	115	2.0	29	32	-	-	4.0	9.9	31	15	0.00	-	0.29	0.0
13.12	61.2	67.6	168.7	2.3	-1.0	3.9	4	clayy SILT to silty CLAY	115	2.0	31	34	-	-	4.3	9.9	28	15	0.00	-	0.29	0.0
13.29	64.8	71.0	172.1	2.4	-1.0	3.8	4	clayy SILT to silty CLAY	115	2.0	32	36	-	-	4.5	9.9	27	15	0.00	-	0.29	0.0
13.45	60.2	65.6	185.4	2.7	-1.1	4.6	4	clayy SILT to silty CLAY	115	2.0	30	33	-	-	4.2	9.9	31	15	0.00	-	0.29	0.0
13.62	57.0	61.9	177.2	2.5	-1.0	4.5	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.0	9.9	32	15	0.00	-	0.29	0.0
13.78	57.1	61.6	167.2	2.3	-1.0	4.1	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.0	9.9	30	15	0.00	-	0.29	0.0
13.94	60.3	64.6	161.3	2.2	-1.0	3.7	4	clayy SILT to silty CLAY	115	2.0	30	32	-	-	4.2	9.9	28	15	0.00	-	0.29	0.0
14.11	58.3	62.1	160.2	2.2	-0.9	3.8	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.1	9.9	29	15	0.00	-	0.29	0.0
14.27	58.2	61.6	150.3	1.9	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.1	9.9	28	15	0.80	-	0.29	6.9
14.44	58.3	61.4	163.4	2.3	-0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.1	9.9	30	15	0.00	-	0.29	0.0
14.60	57.7	60.5	159.0	2.2	-0.9	3.8	4	clayy SILT to silty CLAY	115	2.0	29	30	-	-	4.0	9.9	29	15	0.49	-	0.29	3.0
14.76	61.6	64.2	164.6	2.3	-0.9	3.8	4	clayy SILT to silty CLAY	115	2.0	31	32	-	-	4.3	9.9	29	15	0.00	-	0.29	0.0
14.93	56.2	58.2	166.1	2.3	-0.9	4.2	4	clayy SILT to silty CLAY	115	2.0	28	29	-	-	3.9	9.9	31	15	0.00	-	0.29	0.0
15.09	55.4	57.1	152.5	2.0	-0.8	3.7	4	clayy SILT to silty CLAY	115	2.0	28	29	-	-	3.9	9.9	30	15	0.73	-	0.29	12.8
15.26	58.5	60.0	159.7	2.2	-0.8	3.8	4	clayy SILT to silty CLAY	115	2.0	29	30	-	-	4.1	9.9	30	15	0.48	-	0.28	3.0
15.42	86.2	87.9	160.7	2.4	-0.9	2.8	5	silty SAND to sandy SILT	120	4.0	22	22	63	43	-	-	21	16	0.00	-	0.28	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(552).cpt
CPT Date: 10/6/2011 11:09:49 PM
GW During Test: No GW

Sounding ID: CPT-11-227
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.29	Cycl SStn %
15.58	86.4	87.7	162.0	2.4	-0.8	2.8	5	silty SAND to sandy SILT	120	4.0	22	22	63	43	-	-	21	16	0.00	-	0.28	0.0
15.75	78.3	79.1	164.5	2.5	-0.8	3.2	5	silty SAND to sandy SILT	120	4.0	20	20	59	43	-	-	24	16	0.00	-	0.28	0.0
15.91	80.9	81.2	159.4	2.4	-0.7	3.0	5	silty SAND to sandy SILT	120	4.0	20	20	60	43	-	-	23	16	0.50	-	0.28	2.9
16.08	80.2	80.1	152.6	2.2	-0.7	2.8	5	silty SAND to sandy SILT	120	4.0	20	20	60	43	-	-	22	16	0.74	-	0.28	4.8
16.24	82.7	82.1	152.3	2.2	-0.7	2.7	5	silty SAND to sandy SILT	120	4.0	21	21	61	43	-	-	21	16	0.76	-	0.28	4.8
16.40	94.7	93.6	156.1	2.3	-0.6	2.4	5	silty SAND to sandy SILT	120	4.0	24	23	65	43	-	-	19	16	0.61	-	0.28	3.5
16.57	100.4	98.7	157.9	2.3	-0.6	2.3	5	silty SAND to sandy SILT	120	4.0	25	25	67	44	-	-	18	16	0.55	-	0.28	3.2
16.73	102.3	100.1	162.7	2.5	-0.6	2.5	5	silty SAND to sandy SILT	120	4.0	26	25	67	44	-	-	18	16	0.00	-	0.28	0.0
16.90	99.7	97.1	162.2	2.5	-0.5	2.5	5	silty SAND to sandy SILT	120	4.0	25	24	66	43	-	-	19	16	0.00	-	0.28	0.0
17.06	98.0	95.0	156.6	2.3	-0.5	2.4	5	silty SAND to sandy SILT	120	4.0	24	24	65	43	-	-	19	16	0.60	-	0.28	3.5
17.23	102.8	99.2	154.0	2.2	-0.5	2.2	5	silty SAND to sandy SILT	120	4.0	26	25	67	43	-	-	17	16	0.70	-	0.28	3.9
17.39	106.8	102.5	155.2	2.3	-0.4	2.1	5	silty SAND to sandy SILT	120	4.0	27	26	68	44	-	-	17	16	0.66	-	0.28	3.6
17.55	107.6	102.8	155.6	2.3	-0.4	2.1	5	silty SAND to sandy SILT	120	4.0	27	26	68	44	-	-	17	16	0.65	-	0.28	3.6
17.72	111.4	105.9	152.9	2.2	-0.4	2.0	5	silty SAND to sandy SILT	120	4.0	28	26	69	44	-	-	16	16	0.76	-	0.27	4.0
17.88	110.0	104.0	172.3	2.9	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	27	26	68	44	-	-	19	16	0.00	-	0.27	0.0
18.05	107.2	101.0	162.7	2.6	-0.3	2.4	5	silty SAND to sandy SILT	120	4.0	27	25	67	43	-	-	18	16	0.00	-	0.27	0.0
18.21	110.1	103.2	159.1	2.4	-0.2	2.2	5	silty SAND to sandy SILT	120	4.0	28	26	68	44	-	-	17	16	0.54	-	0.27	3.1
18.37	108.1	100.9	155.8	2.4	-0.1	2.2	5	silty SAND to sandy SILT	120	4.0	27	25	67	43	-	-	17	16	0.67	-	0.27	3.7
18.54	104.1	96.7	153.8	2.3	-0.1	2.3	5	silty SAND to sandy SILT	120	4.0	26	24	66	43	-	-	18	16	0.75	-	0.27	4.3
18.70	101.8	94.1	155.4	2.4	-0.1	2.4	5	silty SAND to sandy SILT	120	4.0	25	24	65	43	-	-	19	16	0.70	-	0.27	4.1
18.87	104.3	96.0	154.9	2.4	-0.1	2.3	5	silty SAND to sandy SILT	120	4.0	26	24	66	43	-	-	18	16	0.72	-	0.27	4.2
19.03	107.2	98.3	153.1	2.3	-0.1	2.2	5	silty SAND to sandy SILT	120	4.0	27	25	66	43	-	-	17	16	0.81	-	0.27	4.6
19.19	106.1	96.8	146.6	2.1	0.0	2.0	5	silty SAND to sandy SILT	120	4.0	27	24	66	43	-	-	17	16	1.11	-	0.27	6.9
19.36	103.3	93.9	142.4	2.0	0.0	2.0	5	silty SAND to sandy SILT	120	4.0	26	23	65	43	-	-	17	16	1.31	-	0.26	9.5
19.52	98.3	88.9	141.0	2.0	0.0	2.1	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.39	-	0.26	11.5
19.69	99.2	89.4	141.7	2.0	0.0	2.1	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.37	-	0.26	11.1
19.85	100.8	90.5	143.5	2.1	0.1	2.1	5	silty SAND to sandy SILT	120	4.0	25	23	64	43	-	-	18	16	1.29	-	0.26	9.8
20.01	102.2	91.3	144.3	2.1	0.1	2.1	5	silty SAND to sandy SILT	120	4.0	26	23	64	43	-	-	18	16	1.26	-	0.26	9.3
20.18	102.6	91.3	146.8	2.2	0.1	2.2	5	silty SAND to sandy SILT	120	4.0	26	23	64	43	-	-	18	16	1.15	-	0.25	8.0
20.34	101.3	89.8	144.5	2.2	0.1	2.2	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.26	-	0.25	9.7
20.51	102.6	90.5	148.7	2.3	0.1	2.3	5	silty SAND to sandy SILT	120	4.0	26	23	64	43	-	-	19	16	1.07	-	0.25	7.3
20.67	102.0	89.6	145.2	2.2	0.1	2.2	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.24	-	0.25	9.5
20.83	100.6	88.1	140.5	2.1	0.2	2.1	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.47	-	0.25	13.5
21.00	93.4	81.4	137.1	2.0	0.2	2.2	5	silty SAND to sandy SILT	120	4.0	23	20	60	42	-	-	19	16	1.62	-	0.24	19.7
21.16	86.6	75.2	174.1	3.2	0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	43	38	-	-	6.1	9.9	26	15	0.00	-	0.24	0.0
21.33	81.0	70.1	175.3	3.2	0.2	4.0	4	clayy SILT to silty CLAY	115	2.0	41	35	-	-	5.7	9.9	28	15	0.00	-	0.24	0.0
21.49	90.5	78.0	166.5	3.0	0.3	3.3	5	silty SAND to sandy SILT	120	4.0	23	19	59	42	-	-	25	16	0.00	-	0.24	0.0
21.65	94.6	81.3	166.2	3.0	0.4	3.2	5	silty SAND to sandy SILT	120	4.0	24	20	60	42	-	-	24	16	0.00	-	0.24	0.0
21.82	101.0	86.4	157.5	2.7	0.5	2.7	5	silty SAND to sandy SILT	120	4.0	25	22	62	42	-	-	21	16	0.75	-	0.24	4.8
21.98	108.7	92.6	171.0	3.2	0.4	3.0	5	silty SAND to sandy SILT	120	4.0	27	23	64	43	-	-	21	16	0.00	-	0.24	0.0
22.15	117.5	99.7	177.0	3.4	0.5	2.9	5	silty SAND to sandy SILT	120	4.0	29	25	67	43	-	-	20	16	0.00	-	0.24	0.0
22.31	117.2	99.1	168.9	3.1	0.5	2.7	5	silty SAND to sandy SILT	120	4.0	29	25	67	43	-	-	19	16	0.00	-	0.24	0.0
22.47	116.2	97.9	161.4	2.8	0.5	2.5	5	silty SAND to sandy SILT	120	4.0	29	24	66	43	-	-	19	16	0.00	-	0.24	0.0
22.64	114.5	96.2	155.2	2.6	0.5	2.3	5	silty SAND to sandy SILT	120	4.0	29	24	66	43	-	-	18	16	0.88	-	0.24	5.4
22.80	112.6	94.2	154.8	2.6	0.6	2.4	5	silty SAND to sandy SILT	120	4.0	28	24	65	43	-	-	19	16	0.90	-	0.24	5.7
22.97	109.9	91.6	153.5	2.6	0.6	2.4	5	silty SAND to sandy SILT	120	4.0	27	23	64	43	-	-	19	16	0.96	-	0.24	6.4
23.13	111.6	92.7	150.9	2.5	0.6	2.3	5	silty SAND to sandy SILT	120	4.0	28	23	64	43	-	-	18	16	1.08	-	0.23	7.6
23.30	110.8	91.7	145.4	2.3	0.7	2.1	5	silty SAND to sandy SILT	120	4.0	28	23	64	43	-	-	18	16	1.33	-	0.23	10.9
23.46	112.5	92.8	145.6	2.3	0.7	2.1	5	silty SAND to sandy SILT	120	4.0	28	23	65	43	-	-	18	16	1.33	-	0.23	10.7
23.62	111.0	91.2	141.3	2.2	0.7	2.0	5	silty SAND to sandy SILT	120	4.0	28	23	64	42	-	-	17	16	1.53	-	0.23	14.7
23.79	107.9	88.3	138.5	2.1	0.8	2.0	5	silty SAND to sandy SILT	120	4.0	27	22	63	42	-	-	18	16	1.65	-	0.23	19.2
23.95	105.5	86.0	138.7	2.2	0.7	2.1	5	silty SAND to sandy SILT	120	4.0	26	22	62	42	-	-	18	16	1.64	-	0.22	19.8
24.12	103.8	84.4	139.1	2.2	0.8	2.1	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	19	16	1.63	-	0.22	20.3
24.28	104.1	84.4	155.6	2.8	0.8	2.7	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	21	16	0.90	-	0.22	6.6
24.44	102.4	82.7	147.3	2.5	0.8	2.5	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	21	16	1.27	-	0.22	11.9
24.61	96.1	77.4	145.3	2.4	0.9	2.6	5	silty SAND to sandy SILT	120	4.0	24	19	59	42	-	-	22	16	1.36	-	0.21	16.6
24.77	100.1	80.3	144.9	2.4	0.9	2.5	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	21	16	1.39	-	0.21	15.3
24.94	103.3	82.6	140.0	2.3	0.9	2.2	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	19	16	1.61	-	0.21	20.7
25.10	101.0	80.5	136.1	2.1	0.9	2.2	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	19	16	1.76	-	0.21	22.9
25.26	100.4	79.7	140.1	2.3	1.0	2.3	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	20	16	1.61	-	0.20	22.2
25.43	105.5	83.5	140.0	2.3	1.0	2.2	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	19	16	1.62	-	0.20	21.0
25.59	105.1	82.9	135.2	2.1	1.0	2.1	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	18	16	1.80	-	0.20	21.9
25.76	105.8	83.2	129.8	1.9	1.1	1.9	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	17	16	1.89	-	0.20	22.0
25.92	106.1	83.2	130.9	2.0	1.1	1.9	5	silty SAND to sandy SILT	120	4.0	27	21	61	42	-	-	18	16	1.87	-	0.19	21.9
26.08	105.0	82.1	130.3	2.0	1.1	1.9	5	silty SAND to sandy SILT	120	4.0	26	21	60	42	-	-	18	16	1.88	-	0.19	22.3
26.25	104.0	81.0	130.0	2.0	1.2	1.9	5	silty SAND to sandy SILT	120	4.0	26	20	60	42	-	-	18	16	1.88	-	0.19	22.7
26.41	103.2	80.2	128.8	1.9	1.2	1.9	5	silty SAND to sandy SILT	120	4.0	26	20	60	42	-	-	18	16	1.90	-	0.18	23.0
26.58	103.5	80.1	130.1	2.0	1.2	2.0	5	silty SAND to sandy SILT	120	4.0	26	20	60	42	-	-	18	16	1.88	-	0.18	23.1
26.74	100.7	77.7	124.1	1.8	1.3	1.8	5	silty SAND to sandy SILT	120	4.0	25	19	59	41	-	-	18	16	1.96	-	0.18	24.2
26.90	103.6	79.7	126.2	1.9	1.3	1.8	5	silty SAND to sandy SILT	120	4.0	26	20	59	42	-	-	18	16	1.93	-	0.17	23.3
27.07	101.0	77.5	129.4	2.0	1.3	2.0	5	silty SAND to sandy SILT	120	4.0	25	19	59	41	-	-	19	16	1.89	-	0.17	24.3
27.23	104.1	79.6	131.0	2.1	1.4	2.0	5	silty SAND to sandy SILT	120	4.0	26	20	59	42	-	-	19	16	1.87	-	0.17	23.3
27.40	104.0	79.3	132.3	2.1	1.4	2.1	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	19	16	1.86	-	0.17	23.5
27.56	103.6	78.7	127.6	2.0	1.4	1.9	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	18	16	1.91	-	0.16	23.7
27.72	104.9	79.5	140.0	2.4	1.5	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	20	16	1.66	-	0.16	23.4
27.89	104.0	78.5	137.2	2.3	1.5	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	20	16	1.77	-	0.16	23.8
28.05	103.8	78.2	129.7	2.0	1.7	2.0	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	19	16	1.89	-	0.15	24.0
28.22	101.7	76.3	121.2	1.8	1.7	1.8	5	silty SAND to sandy SILT	120	4.0	25	19	58	41	-	-	18	16	2.00	-	0.15	24.9
28.38	102.2	76.5	123.2	1.8	1.8	1.8	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	18	16	1.97	-	0.15	24.8
28.54	102.9	76.8	140.6	2.5	1.8	2.4	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	21	16	1.65	-	0.14	24.7
28.71	102.8	76.5	139.4	2.4	1.9	2.4	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	21	16	1.70	-	0.14	24.8
28.87	102.8	76.3	137.4	2.4	2.0	2.3	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	21	16	1.77	-	0.14	24.9
29.04	105.4	78.0	134.2	2.2	2.1	2.2	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	20	16	1.84	-	0.14	24.1
29.20	105.4	77.8	130.2	2.1	2.1	2.0	5	silty SAND to sandy SILT	120	4.0	26	19	59	41	-	-	19	16	1.88	-	0.13	24.2
29.36	103.5	76.2	153.1	3.0	2.2	2.9	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	23	16	1.13	-	0.13	12.4
29.53	105.9	77.7	144.9	2.7	2.2	2.6	5	silty SAND to sandy SILT	120	4.0	26	19	59	41	-	-	22	16	1.49	-	0.13	21.0
29.69	110.6	80.9	137.4	2.4	2.5	2.2	5	silty SAND to sandy SILT	120	4.0	28	20	60	41	-	-	19	16	1.79	-	0.13	22.7
29.86	104.3	76.1	126.3	2.0	2.5	2.0	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	19	16	1.93	-	0.12	25.0
30.02	103.9	75.6	122.5	1.9	2.6	1.8	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	18	16	1.98	-	0.12	25.2
30.19	103.2	74.9	124.4	1.9	2.6	1.9	5	silty SAND to sandy SILT	120	4.0	26	19	57	41	-	-	19	16	1.95	-	0.12	25.6
30.35	106.0	76.7	126.2	2.0	2.7	1.9	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	19	16	1.93	-	0.11	24.7
30.51	107.2	77.4	124.4	1.9	2.7	1.8	5	silty SAND to sandy SILT	120	4.0	27	19	59	41	-	-	18	16	1.95	-	0.11	24.4
30.68	106.9	77.0	125.5	2.0	2.8	1.9	5	silty SAND to sandy SILT	120	4.0	27	19	58	41	-	-	18	16	1.94	-	0.11	24.6
30.84	110.2	79.1	130.7	2.2	2.9	2.0	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	19	16	1.88	-	0.10	23.5

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(552).cpt
CPT Date: 10/6/2011 11:09:49 PM
GW During Test: No GW

Sounding ID: CPT-11-227
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.29	Cycl SStn %
31.01	108.8	77.9	146.6	2.8	2.9	2.6	5	silty SAND to sandy SILT	120	4.0	27	19	59	41	-	-	22	16	1.43	-	0.10	19.6
31.17	107.3	76.6	147.0	2.8	3.0	2.7	5	silty SAND to sandy SILT	120	4.0	27	19	58	41	-	-	22	16	1.41	-	0.10	20.0
31.33	109.9	78.3	143.6	2.7	3.1	2.5	5	silty SAND to sandy SILT	120	4.0	27	20	59	41	-	-	21	16	1.57	-	0.10	23.2
31.50	110.9	78.8	135.5	2.4	3.2	2.2	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	20	16	1.82	-	0.09	23.7
31.66	112.6	79.7	130.8	2.2	3.3	2.0	5	silty SAND to sandy SILT	120	4.0	28	20	60	41	-	-	19	16	1.87	-	0.09	23.2
31.83	109.9	77.7	126.2	2.0	3.3	1.9	5	silty SAND to sandy SILT	120	4.0	27	19	59	41	-	-	18	16	1.93	-	0.09	24.2
31.99	111.9	78.8	123.2	1.9	3.4	1.8	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	18	16	1.97	-	0.08	23.7
32.15	113.0	79.4	124.1	2.0	3.4	1.8	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	17	16	1.96	-	0.08	23.4
32.32	113.1	79.3	127.4	2.1	3.5	1.9	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	18	16	1.92	-	0.08	23.4
32.48	113.7	79.5	129.3	2.2	3.6	1.9	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	18	16	1.89	-	0.07	23.3
32.65	112.2	78.3	126.1	2.1	3.6	1.9	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	18	16	1.93	-	0.07	23.9
32.81	111.2	77.3	122.2	1.9	3.7	1.8	5	silty SAND to sandy SILT	120	4.0	28	19	59	41	-	-	18	16	1.98	-	0.07	24.4
32.97	110.3	76.6	123.1	2.0	3.8	1.8	5	silty SAND to sandy SILT	120	4.0	28	19	58	41	-	-	18	16	1.97	-	0.06	24.8
33.14	112.5	77.9	127.5	2.1	3.8	1.9	5	silty SAND to sandy SILT	120	4.0	28	19	59	41	-	-	19	16	1.91	-	0.06	24.1
33.30	116.4	80.4	128.7	2.2	3.8	1.9	5	silty SAND to sandy SILT	120	4.0	29	20	60	41	-	-	18	16	1.90	-	0.06	22.9
33.47	115.1	79.3	128.8	2.2	3.9	1.9	5	silty SAND to sandy SILT	120	4.0	29	20	59	41	-	-	18	16	1.90	-	0.05	23.5
33.63	116.4	80.0	130.2	2.2	4.0	2.0	5	silty SAND to sandy SILT	120	4.0	29	20	60	41	-	-	18	16	1.88	-	0.05	23.1
33.79	119.3	81.7	132.1	2.3	4.0	2.0	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	18	16	1.86	-	0.05	22.4
33.96	117.8	80.6	155.8	3.3	4.1	2.8	5	silty SAND to sandy SILT	120	4.0	29	20	60	41	-	-	22	16	1.07	-	0.05	9.8
34.12	120.0	81.9	156.1	3.3	4.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	22	16	1.06	-	0.04	9.5
34.29	124.3	84.6	150.8	3.1	4.5	2.5	5	silty SAND to sandy SILT	120	4.0	31	21	61	41	-	-	21	16	1.29	-	0.04	13.2
34.45	118.0	80.1	142.1	2.8	4.6	2.4	5	silty SAND to sandy SILT	120	4.0	29	20	60	41	-	-	20	16	1.65	-	0.04	23.1
34.61	118.7	80.4	137.1	2.6	4.7	2.2	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	20	16	1.80	-	0.04	22.9
34.78	119.2	80.5	137.2	2.6	4.8	2.2	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	19	16	1.80	-	0.03	22.9
34.94	118.9	80.1	137.4	2.6	4.9	2.2	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	20	16	1.80	-	0.03	23.0
35.11	119.3	80.2	140.5	2.7	5.0	2.3	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	20	16	1.71	-	0.03	23.0
35.27	119.0	79.8	121.6	2.0	5.1	1.7	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	17	16	1.99	-	0.03	23.2
35.43	120.3	80.5	144.3	2.9	5.2	2.4	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	21	16	1.56	-	0.02	22.3
35.60	96.4	64.4	138.8	2.6	5.3	2.8	5	silty SAND to sandy SILT	120	4.0	24	16	52	40	-	-	25	16	1.73	-	0.02	31.3
35.76	116.5	77.6	137.7	2.6	5.4	2.3	5	silty SAND to sandy SILT	120	4.0	29	19	59	41	-	-	20	16	1.80	-	0.02	24.3
35.93	114.7	76.3	137.1	2.6	5.4	2.3	5	silty SAND to sandy SILT	120	4.0	29	19	58	41	-	-	21	16	1.80	-	0.01	24.9
36.09	115.0	76.3	136.1	2.6	5.5	2.3	5	silty SAND to sandy SILT	120	4.0	29	19	58	41	-	-	21	16	1.82	-	0.01	24.9
36.26	115.9	76.6	137.1	2.6	5.6	2.3	5	silty SAND to sandy SILT	120	4.0	29	19	58	41	-	-	21	16	1.80	-	0.01	24.7
36.42	113.3	74.8	145.8	3.0	5.7	2.7	5	silty SAND to sandy SILT	120	4.0	28	19	57	41	-	-	23	16	1.49	-	0.01	23.1
36.58	113.3	74.6	142.9	2.9	5.8	2.6	5	silty SAND to sandy SILT	120	4.0	28	19	57	41	-	-	22	16	1.61	-	0.00	25.7

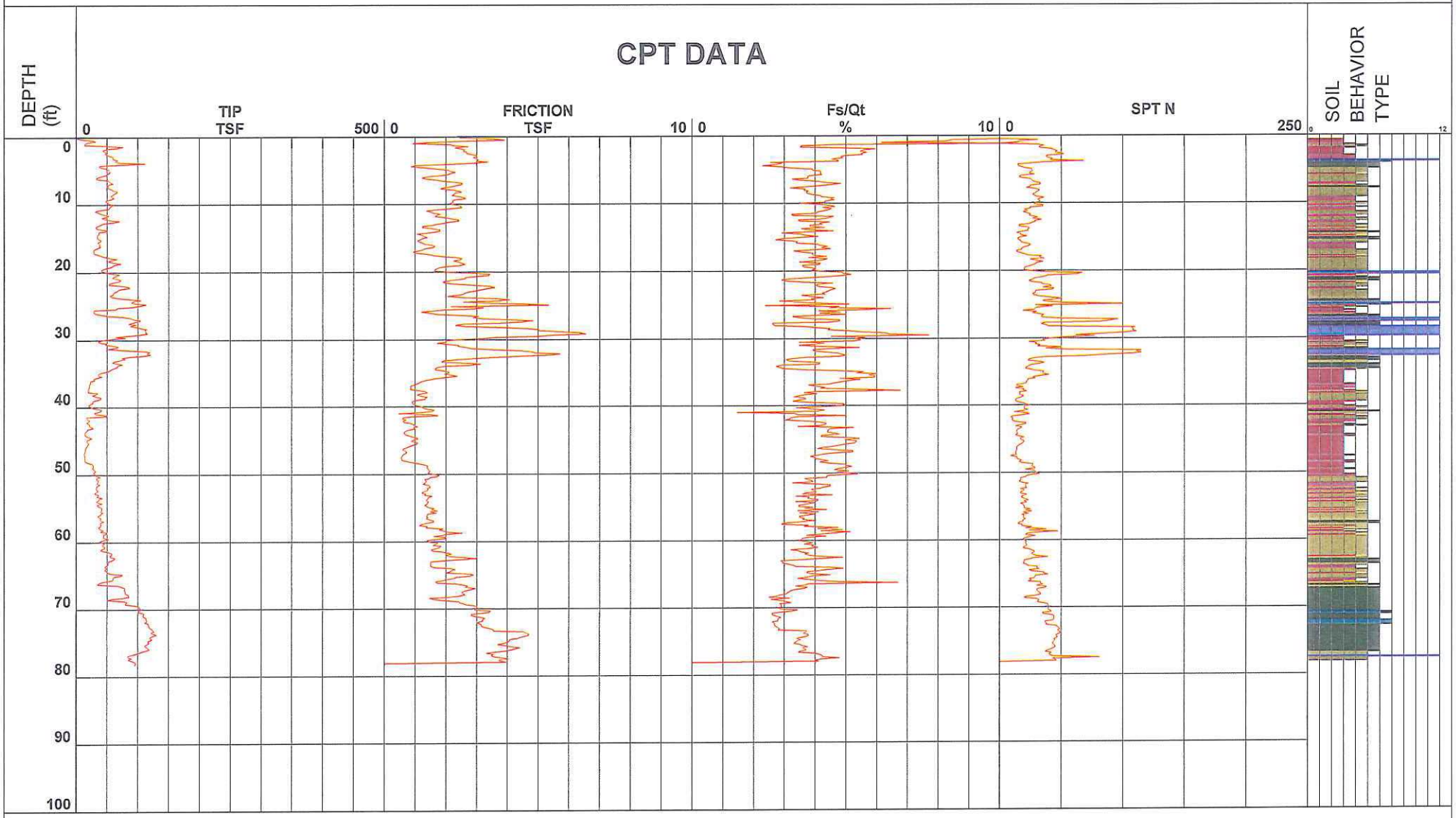
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(566)-45-5.cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-229	Date and Time	10/9/2011 10:38:59 PM	Maximum Depth	78.25 ft
Water Table Depth	45.50 ft				

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

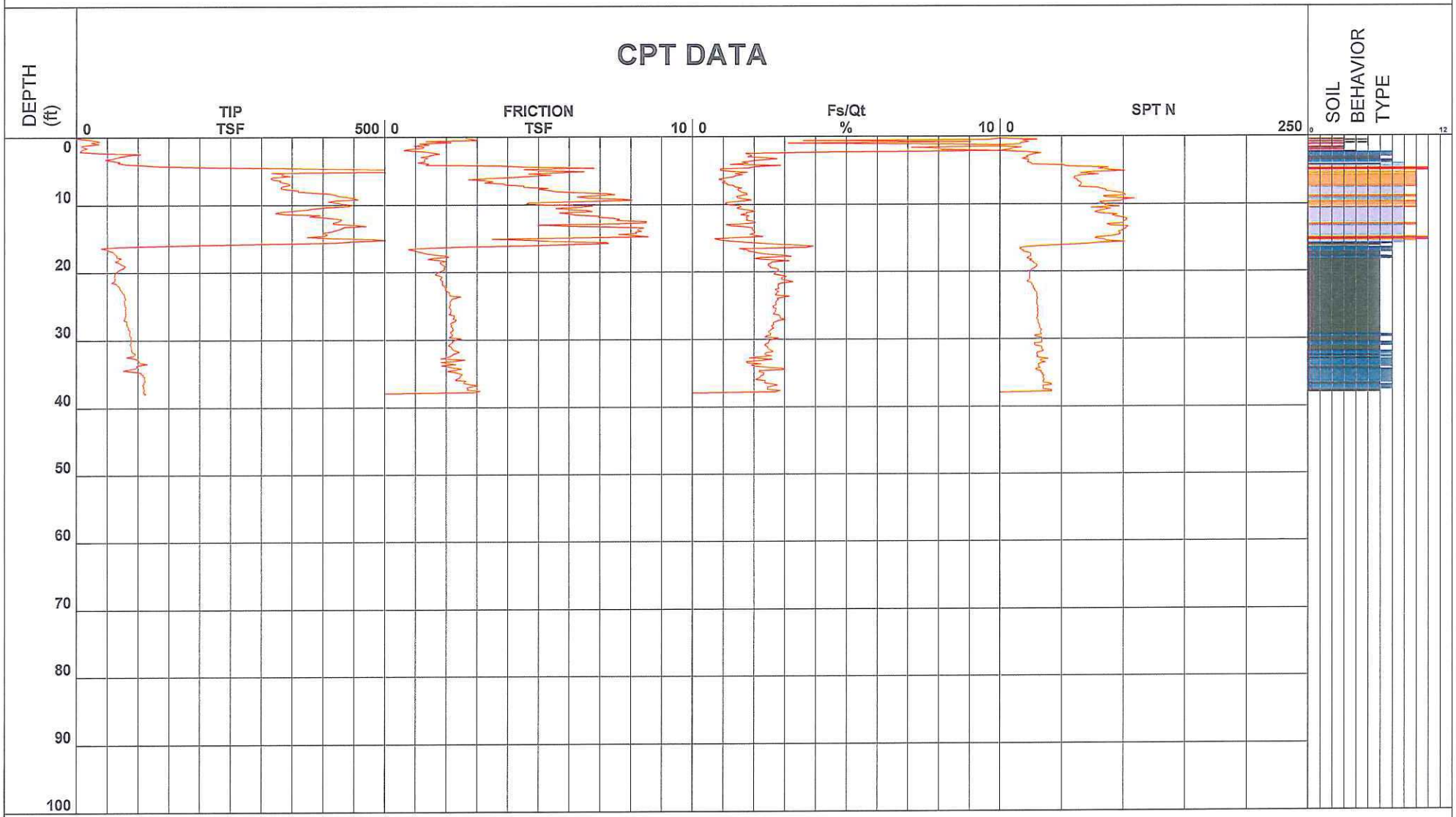
Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(554)-19.cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-234	Date and Time	10/7/2011 12:51:40 AM	Maximum Depth	38.06 ft
Water Table Depth	19.00 ft				

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
0.33	10.9	17.5	-	3.5	0.9	9.9	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	69	15	N/A	0.00	N/A	N/A
0.49	28.0	44.9	-	3.9	0.9	9.9	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	50	15	N/A	0.00	N/A	N/A
0.66	32.0	51.3	-	2.7	0.9	8.5	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.3	9.9	45	15	N/A	0.00	N/A	N/A
0.82	18.3	29.3	-	1.5	0.8	8.3	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	54	15	N/A	0.00	N/A	N/A
0.98	15.1	24.2	-	0.9	0.8	6.2	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	52	15	N/A	0.00	N/A	N/A
1.15	13.8	22.1	-	2.2	0.8	9.9	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	63	15	N/A	0.00	N/A	N/A
1.31	49.2	78.8	199.5	2.2	1.0	4.6	4	clayy SILT to silty CLAY	115	2.0	25	39	-	-	3.5	9.9	29	15	N/A	0.00	N/A	N/A
1.48	76.1	122.0	219.4	2.7	1.0	3.6	5	silty SAND to sandy SILT	120	4.0	19	31	74	48	-	-	21	16	N/A	0.00	N/A	N/A
1.64	65.8	105.6	200.2	2.3	1.1	3.5	5	silty SAND to sandy SILT	120	4.0	16	26	69	48	-	-	22	16	N/A	0.00	N/A	N/A
1.80	51.3	82.2	211.5	2.5	1.1	4.8	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	29	15	N/A	0.00	N/A	N/A
1.97	43.9	70.4	222.8	2.6	1.2	6.0	9	very stiff fine SOIL	120	2.0	22	35	55	47	-	-	34	30	N/A	0.00	N/A	N/A
2.13	46.1	74.0	219.6	2.6	1.3	5.6	9	very stiff fine SOIL	120	2.0	23	37	57	47	-	-	32	30	N/A	0.00	N/A	N/A
2.30	49.2	78.8	223.3	2.7	1.2	5.5	9	very stiff fine SOIL	120	2.0	25	39	59	47	-	-	31	30	N/A	0.00	N/A	N/A
2.46	47.4	76.1	224.7	2.7	0.5	5.7	9	very stiff fine SOIL	120	2.0	24	38	58	46	-	-	32	30	N/A	0.00	N/A	N/A
2.62	51.2	82.1	229.2	2.8	0.2	5.5	9	very stiff fine SOIL	120	2.0	26	41	61	46	-	-	31	30	N/A	0.00	N/A	N/A
2.79	54.1	86.7	236.6	3.0	0.2	5.6	9	very stiff fine SOIL	120	2.0	27	43	62	46	-	-	30	30	N/A	0.00	N/A	N/A
2.95	60.8	97.6	235.1	3.0	0.2	5.0	9	very stiff fine SOIL	120	2.0	30	49	66	47	-	-	27	30	N/A	0.00	N/A	N/A
3.12	60.1	96.3	229.8	2.9	0.1	4.9	9	very stiff fine SOIL	120	2.0	30	48	66	46	-	-	27	30	N/A	0.00	N/A	N/A
3.28	61.2	98.1	233.9	3.0	0.1	4.9	9	very stiff fine SOIL	120	2.0	31	49	66	46	-	-	27	30	0.00	-	0.16	0.0
3.45	67.6	108.4	235.6	3.1	-0.1	4.6	9	very stiff fine SOIL	120	2.0	34	54	70	47	-	-	25	30	0.00	-	0.16	0.0
3.61	63.6	102.0	233.8	3.0	-0.3	4.7	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	26	30	0.00	-	0.16	0.0
3.77	70.5	113.1	248.0	3.4	-1.3	4.8	9	very stiff fine SOIL	120	2.0	35	57	71	47	-	-	25	30	0.00	-	0.16	0.0
3.94	111.8	179.2	240.9	2.8	-1.1	2.6	5	silty SAND to sandy SILT	120	4.0	28	45	86	48	-	-	14	16	0.00	-	0.16	0.0
4.10	66.4	106.4	183.2	1.9	-1.1	2.9	5	silty SAND to sandy SILT	120	4.0	17	27	69	46	-	-	20	16	0.00	-	0.16	0.0
4.27	38.6	61.9	134.6	1.1	-1.0	2.8	5	silty SAND to sandy SILT	120	4.0	10	15	51	43	-	-	25	16	0.62	-	0.16	3.6
4.43	38.8	62.3	122.7	0.9	-1.0	2.3	5	silty SAND to sandy SILT	120	4.0	10	16	51	43	-	-	23	16	1.42	-	0.16	13.5
4.59	45.5	72.9	150.0	1.3	-1.0	2.9	5	silty SAND to sandy SILT	120	4.0	11	18	57	44	-	-	24	16	0.24	-	0.16	1.1
4.76	53.1	85.2	170.7	1.7	-1.0	3.2	5	silty SAND to sandy SILT	120	4.0	13	21	62	45	-	-	23	16	0.00	-	0.16	0.0
4.92	53.3	85.5	190.6	2.1	-1.0	3.9	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.7	9.9	26	15	0.00	-	0.16	0.0
5.09	55.1	88.3	194.8	2.2	-1.0	4.0	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	3.9	9.9	25	15	0.00	-	0.16	0.0
5.25	55.5	88.9	202.2	2.3	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	3.9	9.9	26	15	0.00	-	0.16	0.0
5.41	51.9	83.2	196.4	2.2	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	26	42	-	-	3.7	9.9	27	15	0.00	-	0.16	0.0
5.58	49.5	79.5	191.6	2.1	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	27	15	0.00	-	0.16	0.0
5.74	43.6	70.0	181.2	1.8	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	29	15	0.00	-	0.16	0.0
5.91	37.0	59.3	158.3	1.4	-1.0	3.8	4	clayy SILT to silty CLAY	115	2.0	18	30	-	-	2.6	9.9	30	15	0.21	-	0.16	0.7
6.07	32.9	52.7	149.2	1.2	-1.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	31	15	0.40	-	0.16	1.7
6.23	37.1	59.5	157.9	1.4	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	30	15	0.23	-	0.15	0.9
6.40	52.1	82.6	169.6	1.7	-1.1	3.3	5	silty SAND to sandy SILT	120	4.0	13	21	61	44	-	-	24	16	0.00	-	0.15	0.0
6.56	54.4	85.1	180.0	1.9	-1.1	3.6	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	24	15	0.00	-	0.15	0.0
6.73	56.4	87.1	199.0	2.3	-1.1	4.1	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	4.0	9.9	26	15	0.00	-	0.15	0.0
6.89	59.7	91.1	207.4	2.5	-1.1	4.3	4	clayy SILT to silty CLAY	115	2.0	30	46	-	-	4.2	9.9	26	15	0.00	-	0.15	0.0
7.05	52.4	79.1	208.7	2.5	-1.1	4.9	4	clayy SILT to silty CLAY	115	2.0	26	40	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
7.22	51.9	77.5	198.2	2.3	-1.1	4.5	4	clayy SILT to silty CLAY	115	2.0	26	39	-	-	3.6	9.9	29	15	0.00	-	0.15	0.0
7.38	53.1	78.4	188.9	2.2	-1.1	4.2	4	clayy SILT to silty CLAY	115	2.0	27	39	-	-	3.7	9.9	27	15	0.00	-	0.15	0.0
7.55	53.2	77.7	174.4	1.9	-1.1	3.6	4	clayy SILT to silty CLAY	115	2.0	27	39	-	-	3.7	9.9	26	15	0.00	-	0.15	0.0
7.71	57.7	83.3	168.7	1.8	-1.1	3.2	5	silty SAND to sandy SILT	120	4.0	14	21	61	44	-	-	23	16	0.00	-	0.15	0.0
7.87	60.2	86.1	185.7	2.2	-1.1	3.7	4	clayy SILT to silty CLAY	115	2.0	30	43	-	-	4.2	9.9	25	15	0.00	-	0.15	0.0
8.04	67.2	95.1	193.8	2.4	-1.1	3.7	5	silty SAND to sandy SILT	120	4.0	17	24	65	44	-	-	24	16	0.00	-	0.15	0.0
8.20	66.3	92.8	195.8	2.5	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	33	46	-	-	4.7	9.9	24	15	0.00	-	0.15	0.0
8.37	62.0	85.9	186.2	2.3	-1.1	3.7	4	clayy SILT to silty CLAY	115	2.0	31	43	-	-	4.4	9.9	25	15	0.00	-	0.15	0.0
8.53	60.5	83.2	184.5	2.3	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	30	42	-	-	4.3	9.9	25	15	0.00	-	0.15	0.0
8.69	56.3	76.7	182.0	2.2	-1.2	4.0	4	clayy SILT to silty CLAY	115	2.0	28	38	-	-	4.0	9.9	27	15	0.00	-	0.15	0.0
8.86	58.1	78.3	190.8	2.4	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	29	39	-	-	4.1	9.9	28	15	0.00	-	0.15	0.0
9.02	61.8	82.6	196.5	2.6	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	31	41	-	-	4.3	9.9	27	15	0.00	-	0.15	0.0
9.19	57.1	75.7	199.1	2.6	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	29	38	-	-	4.0	9.9	29	15	0.00	-	0.15	0.0
9.35	51.4	67.5	185.6	2.3	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.6	9.9	31	15	0.00	-	0.15	0.0
9.51	48.0	62.5	182.0	2.2	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	24	31	-	-	3.4	9.9	32	15	0.00	-	0.15	0.0
9.68	52.2	67.4	181.3	2.3	-1.2	4.4	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
9.84	50.3	64.4	177.4	2.2	-1.2	4.4	4	clayy SILT to silty CLAY	115	2.0	25	32	-	-	3.5	9.9	31	15	0.00	-	0.15	0.0
10.01	61.0	77.5	172.5	2.2	-1.2	3.6	4	clayy SILT to silty CLAY	115	2.0	31	39	-	-	4.3	9.9	26	15	0.00	-	0.15	0.0
10.17	58.3	73.4	184.3	2.4	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	29	37	-	-	4.1	9.9	28	15	0.00	-	0.15	0.0
10.34	55.4	69.3	188.0	2.5	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	28	35	-	-	3.9	9.9	30	15	0.00	-	0.15	0.0
10.50	54.2	67.2	188.9	2.5	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	27	34	-	-	3.8	9.9	31	15	0.00	-	0.15	0.0
10.66	52.4	64.5	175.8	2.2	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
10.83	38.6	52.3	166.5	1.7	-1.1	4.6	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	34	15	0.00	-	0.15	0.0
10.99	31.1	41.7	-	1.4	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.2	9.9	37	15	-	-	0.15	-
11.16	36.2	48.0	154.6	1.5	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.5	9.9	34	15	0.54	-	0.15	2.9
11.32	40.2	48.1	150.7	1.6	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.8	9.9	34	15	0.70	-	0.15	38.3
11.48	45.2	53.7	157.6	1.8	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	23	27	-	-	3.2	9.9	32	15	0.46	-	0.15	2.5
11.65	52.9	62.4	148.4	1.7	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	26	31	-	-	3.7	9.9	27	15	0.81	-	0.15	6.8
11.81	50.6	59.3	146.3	1.7	-1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.5	9.9	28	15	0.92	-	0.15	10.1
11.98	42.5	49.4	163.7	1.9	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	3.0	9.9	35	15	0.00	-	0.15	0.0
12.14	48.2	55.6	169.5	2.1	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	24	28	-	-	3.4	9.9	33	15	0.00	-	0.15	0.0
12.30	55.8	64.0	177.4	2.4	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	28	32	-	-	3.9	9.9	31	15	0.00	-	0.15	0.0
12.47	70.5	80.3	173.3	2.4	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	35	40	-	-	4.9	9.9	25	15	0.00	-	0.15	0.0
12.63	60.4	68.4	161.6	2.1	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	30	34	-	-	4.2	9.9	27	15	0.00	-	0.15	0.0
12.80	45.0	50.6	163.0	2.0	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	22	25	-	-	3.1	9.9	35	15	0.00	-	0.15	0.0
12.96	41.4	46.3	150.4	1.7	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	2.9	9.9	35	15	0.78	-	0.15	44.0
13.12	37.2	44.1	-	1.6	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	36	15	-	-	0.15	-
13.29	33.2	39.1	-	1.3	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.14	-
13.45	32.5	41.5	-	1.2	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.3	9.9	35	15	-	-	0.14	-
13.62	36.5	46.1	-	1.6	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	-	-	0.14	-
13.78	51.1	55.4	148.6	1.8	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	26	28	-	-	3.6	9.9	30	15	0.88	-	0.14	19.1
13.94	48.1	51.8	149.8	1.8	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.4	9.9	32	15	0.83	-	0.14	28.1
14.11	36.7	44.8	-	1.7	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.6	9.9	37	15	-	-	0.14	-
14.27	38.0	40.5	132.6	1.4	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	35	15	1.68	-	0.14	51.2
14.44	36.7	39.0	115.8	1.1	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.6	9.9	32	15	2.07	-	0.14	51.2
14.60	34.5	38.1	-	1.2	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.4	9.9	36	15	-	-	0.13	-
14.76	35.1	38.4	-	1.3	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.4	9.9	36	15	-	-	0.13	-
14.93	34.3	39.5	-	1.4	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.4	9.9	37	15	-	-	0.13	-
15.09	35.7	38.5	127.7	1.3	-1.4	3.6	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	35	15	1.87	-	0.13	51.2
15.26	40.2	41.5	119.6	1.2	-1.4	3.0	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	32	15	2.02	-	0.12	51.2
15.42	40.3	41.3	113.9	1.1	-1.4	2.8	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	31	15	2.10	-	0.12	51.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qc1n PS -	qincs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
15.58	35.5	36.3	119.7	1.2	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	35	15	2.02	-	0.12	51.2
15.75	36.4	38.1	125.3	1.2	-1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	35	15	1.94	-	0.11	51.2
15.91	39.1	39.5	125.9	1.3	-1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	20	20	-	-	2.7	9.9	34	15	1.93	-	0.11	51.2
16.08	38.2	40.9	-	1.6	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	37	15	-	-	0.11	-
16.24	39.8	42.2	-	1.6	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	36	15	-	-	0.11	-
16.40	36.4	38.2	-	1.6	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	39	15	-	-	0.11	-
16.57	31.7	33.0	-	1.3	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	16	-	-	2.2	9.9	41	15	-	-	0.11	-
16.73	28.3	29.1	-	1.3	-1.3	4.7	3	silty CLAY to CLAY	115	1.5	19	19	-	-	2.0	9.9	44	15	-	-	0.11	-
16.90	28.7	29.2	-	1.1	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	14	15	-	-	2.0	9.9	41	15	-	-	0.11	-
17.06	28.6	28.9	-	0.9	-1.3	3.4	4	clayy SILT to silty CLAY	115	2.0	14	14	-	-	2.0	9.9	39	15	-	-	0.11	-
17.23	29.7	29.7	-	1.1	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	15	15	-	-	2.1	9.9	40	15	-	-	0.11	-
17.39	36.2	35.9	-	1.4	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	38	15	-	-	0.11	-
17.55	41.3	40.6	-	1.6	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	36	15	-	-	0.11	-
17.72	47.5	45.5	146.8	1.9	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	24	23	-	-	3.3	9.9	35	15	1.06	-	0.11	47.3
17.88	53.8	51.3	162.4	2.4	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	27	26	-	-	3.8	9.9	34	15	0.00	-	0.11	0.0
18.05	66.6	63.2	163.7	2.5	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	33	32	-	-	4.7	9.9	29	15	0.00	-	0.11	0.0
18.21	56.6	53.4	165.7	2.5	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	28	27	-	-	4.0	9.9	34	15	0.00	-	0.11	0.0
18.37	52.5	49.4	158.3	2.3	-1.4	4.4	4	clayy SILT to silty CLAY	115	2.0	26	25	-	-	3.7	9.9	34	15	0.58	-	0.11	33.7
18.54	59.8	56.0	161.2	2.4	-1.4	4.1	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	32	15	0.00	-	0.11	0.0
18.70	72.4	67.5	161.1	2.5	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	36	34	-	-	5.1	9.9	27	15	0.00	-	0.11	0.0
18.87	62.9	58.4	167.2	2.6	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	31	29	-	-	4.4	9.9	31	15	0.00	-	0.11	0.0
19.03	59.6	55.1	162.2	2.5	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	32	15	0.00	-	0.11	0.0
19.19	57.0	52.5	146.6	2.0	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	29	26	-	-	4.0	9.9	31	15	1.12	-	0.11	30.7
19.36	49.9	45.7	138.9	1.8	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	25	23	-	-	3.5	9.9	33	15	1.49	-	0.10	49.2
19.52	44.7	39.5	-	1.7	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.1	9.9	36	15	-	-	0.10	-
19.69	40.9	35.9	-	1.6	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	20	18	-	-	2.8	9.9	38	15	-	-	0.10	-
19.85	42.7	37.1	-	1.7	-1.2	4.0	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	3.0	9.9	37	15	-	-	0.10	-
20.01	51.0	43.9	-	2.1	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	25	22	-	-	3.6	9.9	36	15	-	-	0.10	-
20.18	61.2	52.3	-	3.0	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	31	26	-	-	4.3	9.9	35	15	-	-	0.10	-
20.34	70.3	62.9	190.0	3.4	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	35	31	-	-	4.9	9.9	33	15	0.00	-	0.10	0.0
20.51	65.8	55.4	-	3.4	-1.2	5.3	4	clayy SILT to silty CLAY	115	2.0	33	28	-	-	4.6	9.9	35	15	-	-	0.10	-
20.67	60.9	50.8	-	3.0	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	30	25	-	-	4.3	9.9	36	15	-	-	0.10	-
20.83	59.4	52.5	166.4	2.7	-1.2	4.6	4	clayy SILT to silty CLAY	115	2.0	30	26	-	-	4.1	9.9	34	15	0.00	-	0.10	0.0
21.00	68.6	60.4	162.1	2.6	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	34	30	-	-	4.8	9.9	30	15	0.00	-	0.10	0.0
21.16	72.5	63.6	149.5	2.3	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	36	32	-	-	5.1	9.9	27	15	1.07	-	0.10	13.3
21.33	71.6	62.5	140.9	2.1	-1.2	3.0	5	silty SAND to sandy SILT	120	4.0	18	16	52	41	-	-	26	16	1.47	-	0.10	31.3
21.49	62.6	54.5	136.4	1.9	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.4	9.9	28	15	1.66	-	0.10	39.3
21.65	54.3	47.1	141.7	2.0	-1.4	3.7	4	clayy SILT to silty CLAY	115	2.0	27	24	-	-	3.8	9.9	33	15	1.42	-	0.09	47.2
21.82	53.3	42.2	-	2.4	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	27	21	-	-	3.7	9.9	38	15	-	-	0.09	-
21.98	73.6	63.4	171.4	3.0	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	37	32	-	-	5.2	9.9	30	15	0.00	-	0.09	0.0
22.15	85.4	73.3	182.1	3.4	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	43	37	-	-	6.0	9.9	28	15	0.00	-	0.09	0.0
22.31	87.4	74.6	185.9	3.6	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	44	37	-	-	6.1	9.9	28	15	0.00	-	0.09	0.0
22.47	73.9	62.9	181.6	3.3	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	37	31	-	-	5.2	9.9	32	15	0.00	-	0.09	0.0
22.64	68.6	58.2	178.5	3.2	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	34	29	-	-	4.8	9.9	33	15	0.00	-	0.09	0.0
22.80	67.0	56.7	173.3	3.0	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	34	28	-	-	4.7	9.9	33	15	0.00	-	0.09	0.0
22.97	62.5	47.0	-	2.8	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.4	9.9	36	15	-	-	0.09	-
23.13	60.4	45.1	-	2.6	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	30	23	-	-	4.2	9.9	36	15	-	-	0.09	-
23.30	61.1	45.3	-	2.6	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.3	9.9	35	15	-	-	0.09	-
23.46	55.5	40.8	-	2.4	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	28	20	-	-	3.9	9.9	37	15	-	-	0.09	-
23.62	58.0	48.1	141.2	2.1	-1.2	3.7	4	clayy SILT to silty CLAY	115	2.0	29	24	-	-	4.0	9.9	32	15	1.50	-	0.09	46.3
23.79	67.1	55.5	156.3	2.6	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	34	28	-	-	4.7	9.9	31	15	0.85	-	0.09	19.4
23.95	86.2	71.1	185.7	3.7	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	43	36	-	-	6.0	9.9	29	15	0.00	-	0.09	0.0
24.12	105.2	86.5	192.5	4.1	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	53	43	-	-	7.4	9.9	26	15	0.00	-	0.09	0.0
24.28	93.7	76.7	185.0	3.7	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	47	38	-	-	6.6	9.9	27	15	0.00	-	0.09	0.0
24.44	90.4	73.8	150.4	2.6	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	24	16	1.15	-	0.09	12.9
24.61	95.6	77.8	168.0	3.2	-1.3	3.4	4	clayy SILT to silty CLAY	115	2.0	48	39	-	-	6.7	9.9	25	15	0.00	-	0.09	0.0
24.77	113.8	92.3	202.6	4.5	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	57	46	-	-	8.0	9.9	25	15	0.00	-	0.09	0.0
24.94	104.5	84.5	224.8	5.3	-1.4	5.2	9	very stiff fine SOIL	120	2.0	52	42	61	42	-	-	30	30	0.00	-	0.09	0.0
25.10	91.5	73.7	137.3	2.2	-1.2	2.4	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	22	16	1.73	-	0.09	26.2
25.26	67.7	46.2	-	3.2	-1.2	4.9	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.7	9.9	37	15	-	-	0.08	-
25.43	65.4	44.4	-	2.9	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	33	22	-	-	4.6	9.9	37	15	-	-	0.08	-
25.59	30.3	20.4	-	2.0	-1.3	6.8	3	silty CLAY to CLAY	115	1.5	20	14	-	-	2.1	9.9	58	15	-	-	0.08	-
25.76	29.0	19.5	-	1.6	-1.3	5.7	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	9.9	56	15	-	-	0.08	-
25.92	29.4	19.6	-	1.2	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	20	13	-	-	2.0	9.9	51	15	-	-	0.08	-
26.08	31.2	20.7	-	1.5	-1.3	5.1	3	silty CLAY to CLAY	115	1.5	21	14	-	-	2.1	9.9	52	15	-	-	0.08	-
26.25	42.0	27.7	-	1.7	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	28	18	-	-	2.9	9.9	44	15	-	-	0.08	-
26.41	51.4	33.6	-	2.6	-1.3	5.2	3	silty CLAY to CLAY	115	1.5	34	22	-	-	3.6	9.9	43	15	-	-	0.08	-
26.58	75.9	59.4	166.4	3.1	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	38	30	-	-	5.3	9.9	31	15	0.00	-	0.08	0.0
26.74	88.5	69.0	157.5	2.9	-1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	44	35	-	-	6.2	9.9	26	15	0.90	-	0.08	9.2
26.90	92.1	71.7	165.7	3.2	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	36	-	-	6.5	9.9	26	15	0.00	-	0.08	0.0
27.07	104.7	81.2	189.8	4.2	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	52	41	-	-	7.3	9.9	27	15	0.00	-	0.08	0.0
27.23	100.6	77.8	207.8	4.8	-1.3	4.9	4	clayy SILT to silty CLAY	115	2.0	50	39	-	-	7.1	9.9	30	15	0.00	-	0.08	0.0
27.40	93.5	72.1	200.6	4.5	-1.3	4.9	4	clayy SILT to silty CLAY	115	2.0	47	36	-	-	6.6	9.9	31	15	0.00	-	0.08	0.0
27.56	85.9	66.1	183.9	3.8	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	43	33	-	-	6.0	9.9	31	15	0.00	-	0.08	0.0
27.72	97.5	74.8	145.6	2.6	-1.3	2.7	5	silty SAND to sandy SILT	120	4.0	24	19	57	41	-	-	22	16	1.45	-	0.08	21.8
27.89	88.6	67.7	138.6	2.3	-1.3	2.7	5	silty SAND to sandy SILT	120	4.0	22	17	54	41	-	-	24	16	1.72	-	0.08	29.4
28.05	98.0	74.7	147.5	2.7	-1.4	2.8	5	silty SAND to sandy SILT	120	4.0	25	19	57	41	-	-	23	16	1.37	-	0.08	20.4
28.22	105.6	80.2	181.3	3.9	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	53	40	-	-	7.4	9.9	26	15	0.00	-	0.07	0.0
28.38	114.8	87.0	199.3	4.7	-1.4	4.1	4	clayy SILT to silty CLAY	115	2.0	57	43	-	-	8.1	9.9	26	15	0.00	-	0.07	0.0
28.54	111.6	84.3	207.8	5.0	-1.4	4.6	4	clayy SILT to silty CLAY	115	2.0	56	42	-	-	7.8	9.9	28	15	0.00	-	0.07	0.0
28.71	114.0	85.9	208.0	5.0	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	57	43	-	-	8.0	9.9	27	15	0.00	-	0.07	0.0
28.87	112.5	84.5	223.7	5.7	-1.3	5.1	9	very stiff fine SOIL	120	2.0	56	42	61	42	-	-	30	30	0.00	-	0.07	0.0
29.04	116.2	87.0	238.6	6.4	-1.3	5.6	9	very stiff fine SOIL	120	2.0	58	44	62	42	-	-	30	30	0.00	-	0.07	0.0
29.20	104.2	61.6	-	6.6	-1.3	6.4	3	silty CLAY to CLAY	115	1.5	69	41	-	-	7.3	9.9	37	15	-	-	0.07	-
29.36	85.5	50.2	-	5.5	-1.2	6.6	3	silty CLAY to CLAY	115	1.5	57	33	-	-	6.0	9.9	41	15	-	-	0.07	-
29.53	64.8	37.9	-	5.0	-1.2	7.9	3	silty CLAY to CLAY	115	1.5	43	25	-	-	4.5	9.9	49	15	-	-	0.07	-
29.69	80.0	46.5	-	3.6	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	40	23	-	-	5.6	9.9	36	15	-	-	0.07	-
29.86	57.6	33.3	-	3.2	-1.2	5.8	3	silty CLAY to CLAY	115	1.5	38	22	-	-	4.0	9.9	45	15	-	-	0.07	-
30.02	44.2	25.4	-	2.3	-1.2	5.5	3	silty CLAY to CLAY	115	1.5	29	17	-	-	3.1	9.9	50	15	-	-	0.07	-
30.19	36.4	20.8	-	2.0	-1.2	5.8	3	silty CLAY to CLAY	115	1.5	24	14	-	-	2.5	9.9	55	15	-	-	0.07	-
30.35	38.4	21.8	-	2.0	-1.2	5.5	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.6	9.9	53	15	-	-	0.07	-
30.51	49.6	28.1	-	1.7	-1.2	3.6	4	clayy SILT to silty CLAY	115	2.0	25	14	-	-	3.4	9.9	41	15	-	-	0.07	-
30.68	47.6	26.8	-	2.0	-1.2	4.5	3	silty CLAY to CLAY	115	1.5	32	18	-	-	3.3	9.9	45	15	-	-	0.07	-
30.84	60.8	34.1	-	2.4	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	30	17	-	-	4.2	9.9	39	15	-	-	0.07	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qc1n PS -	qincs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
31.01	69.0	50.0	142.2	2.4	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	34	25	-	-	4.8	9.9	31	15	1.58	-	0.07	44.2
31.17	65.2	36.1	-	2.7	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	33	18	-	-	4.5	9.9	39	15	-	-	0.07	-
31.33	52.1	28.7	-	2.8	-1.4	5.6	3	silty CLAY to CLAY	115	1.5	35	19	-	-	3.6	9.9	48	15	-	-	0.07	-
31.50	80.1	43.9	-	3.5	-1.5	4.5	4	clayy SILT to silty CLAY	115	2.0	40	22	-	-	5.6	9.9	37	15	-	-	0.07	-
31.66	113.2	81.2	188.7	4.4	-1.5	4.0	4	clayy SILT to silty CLAY	115	2.0	57	41	-	-	7.9	9.9	27	15	0.00	-	0.07	0.0
31.83	120.4	86.1	195.3	4.8	-1.5	4.0	4	clayy SILT to silty CLAY	115	2.0	60	43	-	-	8.4	9.9	26	15	0.00	-	0.07	0.0
31.99	115.4	82.4	199.5	4.9	-1.5	4.3	4	clayy SILT to silty CLAY	115	2.0	58	41	-	-	8.1	9.9	27	15	0.00	-	0.07	0.0
32.15	120.5	85.8	217.0	5.7	-1.5	4.8	4	clayy SILT to silty CLAY	115	2.0	60	43	-	-	8.4	9.9	29	15	0.00	-	0.07	0.0
32.32	113.3	80.4	212.5	5.5	-1.4	4.9	4	clayy SILT to silty CLAY	115	2.0	57	40	-	-	7.9	9.9	30	15	0.00	-	0.07	0.0
32.48	88.8	47.2	-	4.4	-1.5	5.1	4	clayy SILT to silty CLAY	115	2.0	44	24	-	-	6.2	9.9	37	15	-	-	0.07	-
32.65	74.6	39.5	-	3.6	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	50	26	-	-	5.2	9.9	40	15	-	-	0.07	-
32.81	79.8	56.2	155.9	3.0	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	40	28	-	-	5.6	9.9	31	15	1.02	-	0.07	22.7
32.97	72.6	51.0	138.4	2.4	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	36	26	-	-	5.1	9.9	30	15	1.74	-	0.07	43.0
33.14	63.6	33.2	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	32	17	-	-	4.4	9.9	36	15	-	-	0.07	-
33.30	59.6	30.9	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.1	9.9	37	15	-	-	0.07	-
33.47	68.7	35.5	-	2.7	-1.4	4.0	4	clayy SILT to silty CLAY	115	2.0	34	18	-	-	4.8	9.9	38	15	-	-	0.07	-
33.63	75.5	38.8	-	3.1	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	38	19	-	-	5.3	9.9	38	15	-	-	0.07	-
33.79	67.1	34.3	-	2.8	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	34	17	-	-	4.7	9.9	40	15	-	-	0.07	-
33.96	67.8	47.0	126.4	2.0	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.7	9.9	30	15	1.93	-	0.07	47.7
34.12	63.6	44.0	118.7	1.7	-1.3	2.8	4	clayy SILT to silty CLAY	115	2.0	32	22	-	-	4.4	9.9	30	15	2.03	-	0.06	51.2
34.29	58.7	29.6	-	1.7	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.1	9.9	37	15	-	-	0.06	-
34.45	55.8	28.0	-	1.7	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	28	14	-	-	3.9	9.9	38	15	-	-	0.06	-
34.61	52.3	26.1	-	1.9	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	26	13	-	-	3.6	9.9	43	15	-	-	0.06	-
34.78	44.5	22.1	-	2.1	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	30	15	-	-	3.1	9.9	50	15	-	-	0.06	-
34.94	37.9	18.7	-	2.1	-1.5	5.9	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.6	9.9	57	15	-	-	0.06	-
35.11	36.8	18.1	-	2.0	-1.5	5.7	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.5	9.9	57	15	-	-	0.06	-
35.27	36.1	17.7	-	2.2	-1.5	6.4	3	silty CLAY to CLAY	115	1.5	24	12	-	-	2.5	9.9	60	15	-	-	0.06	-
35.43	41.4	20.2	-	2.4	-1.5	6.0	3	silty CLAY to CLAY	115	1.5	28	13	-	-	2.9	9.9	56	15	-	-	0.06	-
35.60	34.1	16.6	-	2.0	-1.5	6.3	3	silty CLAY to CLAY	115	1.5	23	11	-	-	2.3	9.9	62	15	-	-	0.06	-
35.76	28.3	13.7	-	1.7	-1.5	6.4	3	silty CLAY to CLAY	115	1.5	19	9	-	-	1.9	8.2	67	15	-	-	0.06	-
35.93	30.7	14.8	-	1.5	-1.5	5.2	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	9.0	60	15	-	-	0.06	-
36.09	24.1	11.5	-	1.3	-1.5	6.0	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.8	70	15	-	-	0.06	-
36.26	23.5	11.2	-	1.2	-1.5	5.6	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	69	15	-	-	0.06	-
36.42	23.5	11.1	-	1.1	-1.5	5.3	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	69	15	-	-	0.06	-
36.58	22.6	10.7	-	1.0	-1.5	5.1	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.3	69	15	-	-	0.06	-
36.75	21.4	10.1	-	0.9	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	70	15	-	-	0.06	-
36.91	22.6	10.6	-	0.9	-1.6	4.2	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.2	65	15	-	-	0.06	-
37.08	21.5	10.0	-	0.9	-1.6	4.5	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	68	15	-	-	0.06	-
37.24	20.2	9.4	-	0.9	-1.6	4.8	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.4	5.5	71	15	-	-	0.06	-
37.40	20.5	9.5	-	0.9	-1.6	4.7	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	71	15	-	-	0.06	-
37.57	20.8	9.6	-	1.1	-1.6	6.1	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.6	76	15	-	-	0.06	-
37.73	19.9	9.1	-	1.3	-1.7	7.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.3	82	15	-	-	0.06	-
37.90	34.9	15.9	-	1.4	-1.7	4.3	3	silty CLAY to CLAY	115	1.5	23	11	-	-	2.4	9.8	55	15	-	-	0.06	-
38.06	33.7	15.3	-	1.2	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.3	9.4	54	15	-	-	0.06	-
38.22	26.7	12.1	-	1.1	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	7.2	63	15	-	-	0.06	-
38.39	32.4	14.6	-	1.2	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.2	8.9	56	15	-	-	0.06	-
38.55	40.4	18.1	-	1.4	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	50	15	-	-	0.06	-
38.72	40.4	18.1	-	1.3	-1.7	3.5	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	49	15	-	-	0.06	-
38.88	36.4	16.2	-	1.3	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	53	15	-	-	0.06	-
39.04	29.3	13.0	-	1.1	-1.6	4.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.0	7.9	59	15	-	-	0.06	-
39.21	27.1	11.9	-	0.9	-1.6	3.8	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	7.2	60	15	-	-	0.06	-
39.37	27.8	12.2	-	0.9	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.4	59	15	-	-	0.06	-
39.54	23.9	10.4	-	0.9	-1.6	4.3	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.2	66	15	-	-	0.06	-
39.70	20.5	8.9	-	1.0	-1.6	5.5	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.2	76	15	-	-	0.06	-
39.86	21.5	9.3	-	1.1	-1.6	5.6	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	74	15	-	-	0.06	-
40.03	25.6	11.1	-	1.2	-1.6	5.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	6.6	69	15	-	-	0.06	-
40.19	31.4	13.5	-	1.3	-1.6	4.4	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.2	60	15	-	-	0.06	-
40.36	40.7	17.5	-	1.4	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	50	15	-	-	0.06	-
40.52	41.5	17.7	-	1.6	-1.6	4.2	3	silty CLAY to CLAY	115	1.5	28	12	-	-	2.9	9.9	52	15	-	-	0.06	-
40.68	36.7	15.6	-	1.6	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	24	10	-	-	2.5	9.6	57	15	-	-	0.06	-
40.85	29.8	12.6	-	1.2	-1.6	4.4	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	7.7	61	15	-	-	0.06	-
41.01	32.0	13.5	-	0.5	-1.6	1.6	4	clayy SILT to silty CLAY	115	2.0	16	7	-	-	2.2	8.2	44	15	-	-	0.06	-
41.18	45.7	19.2	-	1.5	-1.6	3.5	3	silty CLAY to CLAY	115	1.5	30	13	-	-	3.1	9.9	48	15	-	-	0.06	-
41.34	51.1	21.4	-	1.7	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	46	15	-	-	0.06	-
41.50	17.3	7.2	-	0.9	-1.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	4.1	84	15	-	-	0.06	-
41.67	18.0	7.5	-	0.6	-1.5	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.3	75	15	-	-	0.06	-
41.83	18.8	7.8	-	0.6	-0.9	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	4.5	72	15	-	-	0.06	-
42.00	22.2	9.1	-	0.7	-0.6	3.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	67	15	-	-	0.06	-
42.16	20.4	8.4	-	0.6	-0.6	3.4	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	4.9	68	15	-	-	0.06	-
42.32	17.5	7.2	-	0.7	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.1	78	15	-	-	0.06	-
42.49	20.4	8.3	-	0.8	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	4.8	75	15	-	-	0.06	-
42.65	22.1	8.9	-	1.0	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.2	73	15	-	-	0.06	-
42.82	22.0	8.9	-	1.0	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.2	73	15	-	-	0.06	-
42.98	25.9	10.4	-	1.1	-0.6	4.6	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	6.2	67	15	-	-	0.06	-
43.15	27.8	11.1	-	1.0	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.7	62	15	-	-	0.06	-
43.31	19.2	7.6	-	1.0	-0.6	6.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.4	83	15	-	-	0.06	-
43.47	18.0	7.2	-	0.8	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.1	82	15	-	-	0.06	-
43.64	15.9	6.3	-	0.7	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.5	86	15	-	-	0.06	-
43.80	14.9	5.9	-	0.7	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	89	15	-	-	0.06	-
43.97	14.7	5.8	-	0.6	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	90	15	-	-	0.06	-
44.13	14.8	5.8	-	0.7	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	91	15	-	-	0.06	-
44.29	16.1	6.3	-	0.8	-0.6	5.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.5	88	15	-	-	0.06	-
44.46	21.1	8.2	-	0.9	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.8	76	15	-	-	0.06	-
44.62	25.5	9.9	-	1.1	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.9	69	15	-	-	0.06	-
44.79	21.2	8.2	-	1.1	-0.6	5.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.8	80	15	-	-	0.06	-
44.95	17.9	6.9	-	1.0	-0.6	6.3	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	87	15	-	-	0.06	-
45.11	18.0	6.9	-	0.9	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	85	15	-	-	0.06	-
45.28	19.6	7.5	-	1.0	-0.6	6.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	84	15	-	-	0.06	-
45.44	20.4	7.8	-	1.1	-0.6	6.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.5	82	15	-	-	0.06	-
45.61	19.8	7.5	-	1.0	-0.6	6.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	83	15	-	-	0.06	-
45.77	18.3	6.9	-	0.9	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	85	15	-	-	0.06	-
45.93	17.1	6.5	-	0.8	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.6	87	15	-	-	0.06	-
46.10	15.9	6.0	-	0.7	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.3	89	15	-	-	0.06	-
46.26	15.0	5.7	-	0.6	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.1	90	15	-	-	0.06	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
46.43	14.8	5.6	-	0.6	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.0	90	15	-	-	0.06	-
46.59	15.0	5.7	-	0.7	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.0	92	15	-	-	0.06	-
46.75	14.1	5.3	-	0.7	-0.6	6.4	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.8	95	15	-	-	0.06	-
46.92	13.6	5.1	-	0.7	-0.6	6.5	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.7	95	15	-	-	0.06	-
47.08	13.8	5.2	-	0.6	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.7	95	15	-	-	0.06	-
47.25	14.0	5.3	-	0.6	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.7	94	15	-	-	0.06	-
47.41	14.2	5.4	-	0.6	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.8	92	15	-	-	0.06	-
47.57	14.4	5.4	-	0.6	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	90	15	-	-	0.06	-
47.74	14.4	5.4	-	0.6	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	91	15	-	-	0.06	-
47.90	14.3	5.4	-	0.6	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	92	15	-	-	0.06	-
48.07	15.5	5.9	-	0.7	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.1	89	15	-	-	0.06	-
48.23	19.0	7.2	-	0.8	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.9	82	15	-	-	0.06	-
48.39	25.5	9.6	-	1.1	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.4	70	15	-	-	0.06	-
48.56	28.0	10.6	-	1.3	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	69	15	-	-	0.06	-
48.72	28.2	10.6	-	1.4	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
48.89	28.3	10.7	-	1.4	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
49.05	26.8	10.1	-	1.4	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.6	73	15	-	-	0.06	-
49.22	28.9	10.9	-	1.4	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.1	70	15	-	-	0.06	-
49.38	30.6	11.5	-	1.5	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.5	67	15	-	-	0.06	-
49.54	32.3	12.2	-	1.5	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	65	15	-	-	0.06	-
49.71	28.8	10.9	-	1.5	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
49.87	30.1	11.4	-	1.4	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	6.3	68	15	-	-	0.06	-
50.04	31.7	12.0	-	1.6	-0.5	5.6	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	6.7	68	15	-	-	0.06	-
50.20	33.1	12.5	-	1.8	-0.5	5.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	7.0	68	15	-	-	0.06	-
50.36	38.7	14.6	-	1.7	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	8.2	60	15	-	-	0.06	-
50.53	34.4	13.0	-	1.5	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.2	62	15	-	-	0.06	-
50.69	33.3	12.6	-	1.5	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	6.9	63	15	-	-	0.06	-
50.86	36.0	13.6	-	1.3	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.5	58	15	-	-	0.06	-
51.02	36.3	13.7	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.6	58	15	-	-	0.06	-
51.18	34.9	13.2	-	1.4	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.4	7.2	60	15	-	-	0.06	-
51.35	34.1	12.9	-	1.3	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.0	61	15	-	-	0.06	-
51.51	38.6	14.6	-	1.3	-0.5	3.5	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	8.0	54	15	-	-	0.06	-
51.68	35.5	13.4	-	1.5	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.3	60	15	-	-	0.06	-
51.84	33.1	12.5	-	1.5	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.7	64	15	-	-	0.06	-
52.00	33.3	12.6	-	1.5	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.8	64	15	-	-	0.06	-
52.17	32.8	12.4	-	1.4	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.6	63	15	-	-	0.06	-
52.33	34.7	13.1	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.0	61	15	-	-	0.06	-
52.50	35.9	13.6	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.3	59	15	-	-	0.06	-
52.66	32.0	12.1	-	1.3	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	6.4	63	15	-	-	0.06	-
52.82	30.5	11.5	-	1.2	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.0	65	15	-	-	0.06	-
52.99	36.3	13.7	-	1.3	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.3	58	15	-	-	0.06	-
53.15	36.5	13.8	-	1.3	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.3	57	15	-	-	0.06	-
53.32	34.1	12.9	-	1.6	-0.5	5.0	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.8	64	15	-	-	0.06	-
53.48	42.6	16.1	-	1.4	-0.5	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.6	52	15	-	-	0.06	-
53.64	37.6	14.2	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.5	58	15	-	-	0.06	-
53.81	37.2	14.0	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.4	58	15	-	-	0.06	-
53.97	33.6	12.7	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	6.6	62	15	-	-	0.06	-
54.14	35.3	13.3	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	61	15	-	-	0.06	-
54.30	42.4	16.0	-	1.4	-0.5	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.4	53	15	-	-	0.06	-
54.46	34.9	13.2	-	1.4	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.4	6.8	61	15	-	-	0.06	-
54.63	35.5	13.4	-	1.3	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	59	15	-	-	0.06	-
54.79	39.8	15.0	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.8	55	15	-	-	0.06	-
54.96	42.5	16.0	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.3	53	15	-	-	0.06	-
55.12	41.3	15.6	-	1.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	8.1	56	15	-	-	0.06	-
55.28	42.2	15.9	-	1.5	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.2	54	15	-	-	0.06	-
55.45	39.6	14.9	-	1.7	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.7	59	15	-	-	0.06	-
55.61	43.6	16.4	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.5	52	15	-	-	0.06	-
55.78	41.1	15.5	-	1.7	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.9	57	15	-	-	0.06	-
55.94	40.2	15.2	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.7	55	15	-	-	0.06	-
56.11	35.5	13.4	-	1.4	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.7	60	15	-	-	0.06	-
56.27	36.6	13.8	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.9	58	15	-	-	0.06	-
56.43	41.0	15.5	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.8	54	15	-	-	0.06	-
56.60	39.1	14.8	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.4	55	15	-	-	0.06	-
56.76	40.7	15.4	-	1.5	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.7	55	15	-	-	0.06	-
56.93	44.5	16.8	-	1.6	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	8.5	52	15	-	-	0.06	-
57.09	40.4	15.2	-	1.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.6	57	15	-	-	0.06	-
57.25	39.3	14.8	-	1.4	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.3	56	15	-	-	0.06	-
57.42	40.7	15.4	-	1.2	-0.5	3.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.6	52	15	-	-	0.06	-
57.58	39.6	14.9	-	1.1	-0.5	3.2	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.4	52	15	-	-	0.06	-
57.75	36.8	13.9	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.8	58	15	-	-	0.06	-
57.91	37.7	14.2	-	1.4	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.6	6.9	57	15	-	-	0.06	-
58.07	40.2	15.2	-	1.9	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.4	60	15	-	-	0.06	-
58.24	44.1	16.6	-	1.8	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.2	55	15	-	-	0.06	-
58.40	39.9	15.0	-	1.9	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.3	61	15	-	-	0.06	-
58.57	49.6	18.7	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.2	53	15	-	-	0.06	-
58.73	49.3	18.6	-	2.5	-0.5	5.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.1	57	15	-	-	0.06	-
58.89	44.4	16.7	-	2.0	-0.5	5.0	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	8.1	57	15	-	-	0.06	-
59.06	45.4	17.1	-	1.9	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.1	8.3	55	15	-	-	0.06	-
59.22	43.5	16.4	-	1.6	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.9	54	15	-	-	0.06	-
59.39	46.0	17.4	-	2.0	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.4	55	15	-	-	0.06	-
59.55	52.5	19.8	-	2.0	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	50	15	-	-	0.06	-
59.71	43.6	16.5	-	1.6	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.9	53	15	-	-	0.06	-
59.88	38.7	14.6	-	1.4	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	6.9	56	15	-	-	0.06	-
60.04	42.3	16.0	-	1.5	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	7.6	53	15	-	-	0.06	-
60.21	46.3	17.5	-	1.7	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.3	53	15	-	-	0.06	-
60.37	43.2	16.3	-	1.7	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	7.7	55	15	-	-	0.06	-
60.53	43.4	16.4	-	1.6	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	7.7	54	15	-	-	0.06	-
60.70	46.7	17.6	-	1.9	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.4	53	15	-	-	0.06	-
60.86	46.6	17.6	-	1.8	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.3	53	15	-	-	0.06	-
61.03	41.2	15.5	-	1.7	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.2	57	15	-	-	0.06	-
61.19	40.5	15.3	-	1.5	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.1	56	15	-	-	0.06	-
61.35	49.2	18.6	-	1.6	-0.5	3.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	8.7	49	15	-	-	0.06	-
61.52	54.9	20.7	-	1.9	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.8	47	15	-	-	0.06	-
61.68	58.5	22.1	-	2.1	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	46	15	-	-	0.06	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qc1n PS -	qincs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
61.85	57.9	21.9	-	2.2	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	48	15	-	-	0.06	-
62.01	54.7	20.7	-	2.0	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.7	48	15	-	-	0.06	-
62.17	55.8	21.1	-	2.1	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	48	15	-	-	0.06	-
62.34	62.9	23.7	-	2.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	47	15	-	-	0.06	-
62.50	61.5	23.2	-	3.0	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	41	15	-	-	4.2	9.9	51	15	-	-	0.06	-
62.67	57.0	21.5	-	2.3	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	49	15	-	-	0.06	-
62.83	52.6	19.8	-	1.9	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.2	49	15	-	-	0.06	-
63.00	52.4	19.8	-	1.5	-0.4	3.1	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.6	9.1	45	15	-	-	0.06	-
63.16	51.6	19.5	-	1.5	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	8.9	46	15	-	-	0.06	-
63.32	52.0	19.6	-	1.5	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	9.0	46	15	-	-	0.06	-
63.49	48.8	18.4	-	1.5	-0.4	3.4	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	8.4	48	15	-	-	0.06	-
63.65	46.4	17.5	-	1.5	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	7.9	50	15	-	-	0.06	-
63.82	49.0	18.5	-	1.6	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	8.4	49	15	-	-	0.06	-
63.98	48.0	18.1	-	2.2	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.2	55	15	-	-	0.06	-
64.14	47.0	17.7	-	2.3	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.0	57	15	-	-	0.06	-
64.31	49.7	18.8	-	2.2	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	8.4	54	15	-	-	0.06	-
64.47	51.0	19.2	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	8.6	52	15	-	-	0.06	-
64.64	54.2	20.5	-	2.0	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.2	49	15	-	-	0.06	-
64.80	75.0	28.3	-	2.8	-0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	42	15	-	-	0.06	-
64.96	73.4	27.7	-	2.9	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	43	15	-	-	0.06	-
65.13	61.8	23.3	-	2.8	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	49	15	-	-	0.06	-
65.29	60.2	22.7	-	2.3	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.06	-
65.46	60.6	22.9	-	2.3	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	46	15	-	-	0.06	-
65.62	58.6	22.1	-	2.0	-0.4	3.7	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	46	15	-	-	0.06	-
65.78	50.6	19.1	-	1.9	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	8.4	51	15	-	-	0.06	-
65.95	40.2	15.2	-	1.7	-0.4	4.6	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	6.5	58	15	-	-	0.06	-
66.11	36.2	13.7	-	1.7	-0.4	5.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.8	64	15	-	-	0.06	-
66.28	34.6	13.1	-	2.3	-0.4	7.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	5.5	72	15	-	-	0.06	-
66.44	67.9	25.6	-	2.6	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.7	9.9	44	15	-	-	0.06	-
66.60	73.7	27.8	-	2.7	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.06	-
66.77	78.8	29.7	-	2.6	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	40	15	-	-	0.06	-
66.93	79.3	29.9	-	3.0	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	41	15	-	-	0.06	-
67.10	78.1	29.5	-	2.9	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	41	15	-	-	0.06	-
67.26	79.9	30.1	-	2.7	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
67.42	79.5	30.0	-	2.6	-0.4	3.4	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
67.59	80.0	30.2	-	2.5	-0.4	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.06	-
67.75	83.8	31.6	-	2.6	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	37	15	-	-	0.06	-
67.92	85.2	32.1	-	2.6	-0.3	3.2	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	37	15	-	-	0.06	-
68.08	85.1	32.1	-	2.4	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	36	15	-	-	0.06	-
68.24	75.7	28.6	-	2.1	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	37	15	-	-	0.06	-
68.41	58.7	22.2	-	1.5	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.5	41	15	-	-	0.06	-
68.57	51.5	19.4	-	1.6	-0.3	3.4	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	8.2	48	15	-	-	0.06	-
68.74	77.1	29.1	-	2.0	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.9	36	15	-	-	0.06	-
68.90	82.5	31.2	-	2.4	-0.2	3.1	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	37	15	-	-	0.06	-
69.07	80.3	30.3	-	2.5	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.06	-
69.23	80.3	30.3	-	2.6	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
69.39	94.3	50.8	130.2	2.7	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.5	9.9	29	15	1.73	-	0.06	43.3
69.56	101.6	54.6	135.6	2.9	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	27	-	-	7.0	9.9	28	15	1.50	-	0.06	36.8
69.72	102.9	55.3	136.5	3.0	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	28	-	-	7.1	9.9	28	15	1.46	-	0.06	34.1
69.89	104.2	56.0	137.3	3.0	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	52	28	-	-	7.2	9.9	28	15	1.42	-	0.05	31.5
70.05	105.5	56.6	134.7	2.9	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	53	28	-	-	7.3	9.9	27	15	1.55	-	0.05	37.2
70.21	101.9	54.7	135.4	2.9	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	27	-	-	7.1	9.9	28	15	1.50	-	0.05	36.4
70.38	101.0	38.1	-	3.5	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	36	15	-	-	0.05	-
70.54	106.2	56.9	145.9	3.4	-0.2	3.3	4	clayy SILT to silty CLAY	115	2.0	53	28	-	-	7.4	9.9	29	15	0.98	-	0.05	16.9
70.71	110.9	59.4	139.0	3.2	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	55	30	-	-	7.7	9.9	27	15	1.34	-	0.04	22.7
70.87	109.0	58.4	131.8	2.9	-0.2	2.7	5	silty SAND to sandy SILT	120	4.0	27	15	49	37	-	-	26	16	1.68	-	0.04	35.4
71.03	108.5	58.0	131.3	2.8	-0.2	2.7	5	silty SAND to sandy SILT	120	4.0	27	15	49	37	-	-	26	16	1.70	-	0.04	35.8
71.20	110.6	59.1	133.7	2.9	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	28	15	50	37	-	-	26	16	1.59	-	0.04	34.7
71.36	114.1	60.9	138.4	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.36	-	0.03	22.4
71.53	113.6	60.6	141.0	3.3	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	57	30	-	-	7.9	9.9	27	15	1.22	-	0.03	16.9
71.69	114.3	60.9	139.0	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.32	-	0.03	20.6
71.85	114.7	61.1	139.5	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.30	-	0.03	19.3
72.02	111.6	59.4	137.2	3.1	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	28	15	50	37	-	-	26	16	1.39	-	0.02	24.7
72.18	116.8	62.1	135.0	3.0	-0.1	2.7	5	silty SAND to sandy SILT	120	4.0	29	16	51	37	-	-	25	16	1.52	-	0.02	29.6
72.35	117.2	62.3	137.1	3.1	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	29	16	51	37	-	-	25	16	1.41	-	0.02	23.5
72.51	118.0	62.7	137.7	3.2	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	37	-	-	25	16	1.38	-	0.02	21.9
72.67	118.0	62.7	137.6	3.2	-0.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	37	-	-	25	16	1.38	-	0.02	21.8
72.84	120.4	63.9	139.8	3.3	-0.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	38	-	-	25	16	1.27	-	0.01	17.0
73.00	123.4	65.4	143.3	3.4	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	16	53	38	-	-	25	16	1.11	-	0.01	11.8
73.17	124.8	66.1	145.4	3.5	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	17	53	38	-	-	25	16	1.00	-	0.01	9.5
73.33	126.8	67.1	145.2	3.6	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	32	17	54	38	-	-	25	16	1.01	-	0.01	9.5
73.49	121.6	64.4	167.1	4.5	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	61	32	-	-	8.4	9.9	29	15	0.00	-	0.01	0.0
73.66	124.2	65.7	168.3	4.6	-0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	62	33	-	-	8.6	9.9	29	15	0.00	-	0.01	0.0
73.82	130.3	68.9	169.1	4.7	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	65	34	-	-	9.1	9.9	28	15	0.00	-	0.01	0.0
73.99	124.3	65.6	169.8	4.7	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	62	33	-	-	8.6	9.9	29	15	0.00	-	0.01	0.0
74.15	120.5	63.6	167.7	4.6	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.4	9.9	30	15	0.00	-	0.01	0.0
74.31	119.5	63.0	165.2	4.4	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.3	9.9	29	15	0.00	-	0.01	0.0
74.48	123.1	64.9	162.2	4.3	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	62	32	-	-	8.6	9.9	28	15	0.00	-	0.01	0.0
74.64	120.3	63.4	157.7	4.1	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.4	9.9	28	15	0.45	-	0.01	2.6
74.81	116.0	61.0	158.4	4.1	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	58	31	-	-	8.0	9.9	29	15	0.41	-	0.01	2.3
74.97	118.1	62.1	156.7	4.0	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.2	9.9	28	15	0.47	-	0.00	2.8
75.13	115.9	60.9	154.3	3.9	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	58	30	-	-	8.0	9.9	29	15	0.53	-	0.00	3.4
75.30	111.7	58.7	150.5	3.7	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	56	29	-	-	7.7	9.9	29	15	0.65	-	0.00	7.5
75.46	111.4	58.5	155.1	3.9	-0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	56	29	-	-	7.7	9.9	30	15	0.48	-	0.00	2.9
75.63	115.3	60.5	159.2	4.1	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	58	30	-	-	8.0	9.9	29	15	0.38	-	0.00	2.0
75.79	117.3	61.5	165.0	4.4	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.1	9.9	30	15	0.00	-	0.00	0.0
75.96	118.5	62.1	161.5	4.3	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.2	9.9	29	15	0.00	-	0.00	0.0
76.12	112.9	59.1	160.0	4.1	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	56	30	-	-	7.8	9.9	30	15	0.36	-	0.00	1.8
76.28	106.2	40.1	-	3.9	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	53	20	-	-	7.4	9.9	36	15	-	-	0.00	-
76.45	102.2	38.6	-	3.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.1	9.9	36	15	-	-	0.00	-
76.61	96.3	36.3	-	3.3	-0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	37	15	-	-	0.00	-
76.78	88.6	33.4	-	3.5	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	40	15	-	-	0.00	-
76.94	83.8	31.6	-	3.5	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	42	15	-	-	0.00	-
77.10	84.7	32.0	-	3.6	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	42	15	-	-	0.00	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
77.27	90.1	34.0	-	3.8	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	60	23	-	-	6.2	9.9	41	15	-	-	0.00	-
77.43	84.3	31.8	-	4.0	-0.3	5.1	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	44	15	-	-	0.00	-
77.60	89.1	33.6	-	3.7	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	41	15	-	-	0.00	-
77.76	93.4	35.2	-	3.7	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	39	15	-	-	0.00	-
77.92	96.3	36.3	-	4.0	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	39	15	-	-	0.00	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
0.33	17.4	27.9	-	2.8	0.0	9.9	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	59	15	N/A	0.00	N/A	N/A
0.49	31.3	50.2	-	3.0	0.1	9.7	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	48	15	N/A	0.00	N/A	N/A
0.66	37.4	60.0	152.4	1.3	0.1	3.6	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	29	15	N/A	0.00	N/A	N/A
0.82	23.9	38.3	-	2.2	0.1	9.1	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	51	15	N/A	0.00	N/A	N/A
0.98	36.4	58.4	138.8	1.1	0.1	3.1	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	27	15	N/A	0.00	N/A	N/A
1.15	17.0	27.3	-	1.4	0.1	8.5	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	56	15	N/A	0.00	N/A	N/A
1.31	7.7	12.4	-	1.0	0.2	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.48	11.7	18.8	-	1.3	0.2	9.9	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.64	17.6	28.2	-	1.3	0.2	7.1	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	52	15	N/A	0.00	N/A	N/A
1.80	10.5	16.9	-	0.8	0.2	8.1	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	65	15	N/A	0.00	N/A	N/A
1.97	7.7	12.4	-	0.6	0.2	8.2	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	73	15	N/A	0.00	N/A	N/A
2.13	5.6	9.0	-	1.2	0.2	9.9	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	86	15	N/A	0.00	N/A	N/A
2.30	35.0	56.2	167.6	1.6	0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	33	15	N/A	0.00	N/A	N/A
2.46	103.9	166.6	201.2	1.8	0.1	1.7	6	clean SAND to silty SAND	125	5.0	21	33	84	48	-	-	11	16	N/A	0.00	N/A	N/A
2.62	84.7	135.8	176.1	1.5	0.1	1.8	6	clean SAND to silty SAND	125	5.0	17	27	77	48	-	-	13	16	N/A	0.00	N/A	N/A
2.79	74.2	119.1	163.9	1.4	0.1	1.9	5	silty SAND to sandy SILT	120	4.0	19	30	73	48	-	-	14	16	N/A	0.00	N/A	N/A
2.95	65.9	105.6	147.5	1.2	0.2	1.8	5	silty SAND to sandy SILT	120	4.0	16	26	69	47	-	-	15	16	N/A	0.00	N/A	N/A
3.12	59.6	95.6	155.3	1.4	0.2	2.4	5	silty SAND to sandy SILT	120	4.0	15	24	66	46	-	-	18	16	N/A	0.00	N/A	N/A
3.28	46.8	75.1	147.2	1.3	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	12	19	58	45	-	-	23	16	0.18	-	0.33	0.7
3.45	59.5	95.5	150.1	1.3	0.2	2.2	5	silty SAND to sandy SILT	120	4.0	15	24	65	46	-	-	18	16	0.17	-	0.33	0.9
3.61	71.0	113.8	156.8	1.3	0.2	1.9	5	silty SAND to sandy SILT	120	4.0	18	28	71	47	-	-	14	16	0.13	-	0.33	0.9
3.77	67.5	108.2	144.2	1.1	0.2	1.6	5	silty SAND to sandy SILT	120	4.0	17	27	70	46	-	-	14	16	0.26	-	0.33	1.6
3.94	79.9	128.1	168.2	1.4	0.2	1.8	5	silty SAND to sandy SILT	120	4.0	20	32	75	47	-	-	13	16	0.00	-	0.33	0.0
4.10	110.4	177.1	194.8	1.3	0.2	1.2	6	clean SAND to silty SAND	125	5.0	22	35	86	48	-	-	8	16	0.00	-	0.33	0.0
4.27	133.4	213.9	286.6	3.8	0.1	2.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	8.8	9.9	14	16	0.00	-	0.33	0.0
4.43	227.9	365.4	398.6	4.6	0.0	2.0	6	clean SAND to silty SAND	125	5.0	46	73	95	48	-	-	8	16	0.00	-	0.33	0.0
4.59	367.0	588.5	588.3	6.8	-0.2	1.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.3	9.9	5	16	0.00	-	0.33	0.0
4.76	500.5	802.6	802.6	4.5	-0.3	0.9	7	grvly SAND to dense SAND	130	6.0	83	100	95	48	-	-	5	16	0.00	-	0.33	0.0
4.92	551.0	883.7	883.7	5.0	-1.9	0.9	7	grvly SAND to dense SAND	130	6.0	92	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.09	525.2	842.3	842.3	6.5	-1.6	1.2	6	clean SAND to silty SAND	125	5.0	100	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.25	316.9	508.2	512.2	5.6	-1.4	1.8	6	clean SAND to silty SAND	125	5.0	63	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.41	336.8	540.1	540.1	4.7	-1.4	1.4	6	clean SAND to silty SAND	125	5.0	67	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.58	332.7	533.5	533.5	5.4	-1.5	1.6	6	clean SAND to silty SAND	125	5.0	67	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.74	346.7	556.0	556.0	4.9	-1.5	1.4	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.91	319.5	512.4	512.4	4.2	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	64	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.07	315.0	505.2	505.2	3.4	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	63	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.23	319.4	507.8	507.8	2.7	-1.4	0.9	6	clean SAND to silty SAND	125	5.0	64	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.40	331.1	519.4	519.4	3.2	-1.4	1.0	6	clean SAND to silty SAND	125	5.0	66	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.56	329.7	510.4	510.4	3.5	-1.7	1.1	6	clean SAND to silty SAND	125	5.0	66	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.73	339.1	518.3	518.3	3.3	-1.8	1.0	6	clean SAND to silty SAND	125	5.0	68	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.89	344.2	519.5	519.5	3.9	-1.8	1.1	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
7.05	346.8	517.0	517.0	3.9	-1.8	1.1	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
7.22	337.0	496.5	496.5	4.5	-1.8	1.3	6	clean SAND to silty SAND	125	5.0	67	99	95	48	-	-	5	16	0.00	-	0.33	0.0
7.38	331.9	483.2	483.2	4.5	-1.7	1.4	6	clean SAND to silty SAND	125	5.0	66	97	95	48	-	-	5	16	0.00	-	0.33	0.0
7.55	332.1	478.1	478.1	5.3	-1.7	1.6	6	clean SAND to silty SAND	125	5.0	66	96	95	48	-	-	5	16	0.00	-	0.33	0.0
7.71	340.5	484.7	484.7	5.0	-1.7	1.5	6	clean SAND to silty SAND	125	5.0	68	97	95	48	-	-	5	16	0.00	-	0.33	0.0
7.87	360.4	507.5	507.5	5.3	-1.7	1.5	6	clean SAND to silty SAND	125	5.0	72	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.04	359.8	501.4	501.4	5.6	-1.8	1.5	6	clean SAND to silty SAND	125	5.0	72	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.20	382.2	527.0	527.0	6.1	-1.8	1.6	6	clean SAND to silty SAND	125	5.0	76	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.37	411.6	561.8	561.8	7.2	-1.9	1.8	6	clean SAND to silty SAND	125	5.0	82	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.53	420.3	567.9	567.9	7.5	-2.0	1.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.8	9.9	5	16	0.00	-	0.33	0.0
8.69	426.6	571.2	571.2	6.7	-2.0	1.6	6	clean SAND to silty SAND	125	5.0	85	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.86	438.7	581.8	581.8	6.3	-1.9	1.4	6	clean SAND to silty SAND	125	5.0	88	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.02	450.6	591.9	591.9	6.6	-1.9	1.5	6	clean SAND to silty SAND	125	5.0	90	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.19	456.8	594.5	594.5	7.7	-1.9	1.7	6	clean SAND to silty SAND	125	5.0	91	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.35	421.6	543.7	553.7	8.0	-1.7	1.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.9	9.9	6	16	0.00	-	0.33	0.0
9.51	409.5	523.8	523.8	6.5	-1.6	1.6	6	clean SAND to silty SAND	125	5.0	82	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.68	424.4	538.1	538.1	4.7	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	85	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.84	431.4	542.2	542.2	4.6	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	86	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.01	447.8	558.1	558.1	5.2	-1.2	1.2	6	clean SAND to silty SAND	125	5.0	90	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.17	442.0	546.3	546.3	6.8	-1.1	1.5	6	clean SAND to silty SAND	125	5.0	88	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.34	405.4	496.9	496.9	6.4	-1.2	1.6	6	clean SAND to silty SAND	125	5.0	81	99	95	48	-	-	5	16	0.00	-	0.33	0.0
10.50	385.6	468.9	468.9	5.6	-1.1	1.4	6	clean SAND to silty SAND	125	5.0	77	94	95	48	-	-	5	16	0.00	-	0.33	0.0
10.66	376.3	453.8	453.8	5.9	-1.0	1.6	6	clean SAND to silty SAND	125	5.0	75	91	95	48	-	-	5	16	0.00	-	0.33	0.0
10.83	355.3	425.2	443.9	6.6	-0.9	1.8	6	clean SAND to silty SAND	125	5.0	71	85	95	48	-	-	6	16	0.00	-	0.33	0.0
10.99	332.4	394.7	426.0	6.8	-0.8	2.0	6	clean SAND to silty SAND	125	5.0	66	79	95	48	-	-	7	16	0.00	-	0.33	0.0
11.16	322.8	380.5	399.0	5.7	-0.8	1.8	6	clean SAND to silty SAND	125	5.0	65	76	95	48	-	-	6	16	0.00	-	0.33	0.0
11.32	340.7	398.6	415.7	6.0	-2.6	1.8	6	clean SAND to silty SAND	125	5.0	68	80	95	48	-	-	6	16	0.00	-	0.33	0.0
11.48	395.6	459.3	459.3	6.2	-2.4	1.6	6	clean SAND to silty SAND	125	5.0	79	92	95	48	-	-	5	16	0.00	-	0.33	0.0
11.65	378.4	436.3	453.6	7.0	-2.7	1.8	6	clean SAND to silty SAND	125	5.0	76	87	95	48	-	-	6	16	0.00	-	0.33	0.0
11.81	401.5	459.5	467.1	7.0	-2.8	1.7	6	clean SAND to silty SAND	125	5.0	80	92	95	48	-	-	6	16	0.00	-	0.33	0.0
11.98	417.3	474.3	482.8	7.4	-2.7	1.8	6	clean SAND to silty SAND	125	5.0	83	95	95	48	-	-	6	16	0.00	-	0.33	0.0
12.14	430.4	485.7	492.8	7.6	-2.5	1.8	6	clean SAND to silty SAND	125	5.0	86	97	95	48	-	-	5	16	0.00	-	0.33	0.0
12.30	429.3	481.2	487.5	7.5	-2.4	1.8	6	clean SAND to silty SAND	125	5.0	86	96	95	48	-	-	5	16	0.00	-	0.33	0.0
12.47	423.7	471.7	495.8	8.5	-2.5	2.0	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	28.0	9.9	6	16	0.00	-	0.33	0.0
12.63	416.3	460.6	487.4	8.5	-2.4	2.0	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.5	9.9	7	16	0.00	-	0.33	0.0
12.80	417.4	459.0	473.3	7.7	-2.4	1.8	6	clean SAND to silty SAND	125	5.0	83	92	95	48	-	-	6	16	0.00	-	0.33	0.0
12.96	452.5	494.4	494.4	5.0	-2.7	1.1	6	clean SAND to silty SAND	125	5.0	91	99	95	48	-	-	5	16	0.00	-	0.33	0.0
13.12	470.3	510.5	510.5	5.9	-2.0	1.3	6	clean SAND to silty SAND	125	5.0	94	100	95	48	-	-	5	16	0.00	-	0.33	0.0
13.29	435.1	469.4	472.0	7.3	-1.8	1.7	6	clean SAND to silty SAND	125	5.0	87	94	95	48	-	-	5	16	0.00	-	0.33	0.0
13.45	431.4	462.4	483.8	8.4	-2.1	2.0	6	clean SAND to silty SAND	125	5.0	86	92	95	48	-	-	6	16	0.00	-	0.33	0.0
13.62	427.0	454.9	475.9	8.3	-1.9	1.9	6	clean SAND to silty SAND	125	5.0	85	91	95	48	-	-	6	16	0.00	-	0.33	0.0
13.78	419.5	444.2	467.7	8.2	-1.9	2.0	6	clean SAND to silty SAND	125	5.0	84	89	95	48	-	-	7	16	0.00	-	0.33	0.0
13.94	413.9	435.6	463.1	8.4	-1.8	2.0	6	clean SAND to silty SAND	125	5.0	83	87	95	48	-	-	7	16	0.00	-	0.33	0.0
14.11	401.7	420.2	449.5	8.1	-1.8	2.0	6	clean SAND to silty SAND	125	5.0	80	84	95	48	-	-	7	16	0.00	-	0.33	0.0
14.27	403.1	419.2	448.9	8.2	-1.7	2.0	6	clean SAND to silty SAND	125	5.0	81	84	95	48	-	-	7	16	0.00	-	0.33	0.0
14.44	407.4	421.2	441.5	7.6	-1.7	1.9	6	clean SAND to silty SAND	125	5.0	81	84	95	48	-	-	6	16	0.00	-	0.33	0.0
14.60	402.9	414.2	443.6	8.1	-1.7	2.0	6	clean SAND to silty SAND	125	5.0	81	83	95	48	-	-	7	16	0.00	-	0.33	0.0
14.76	374.7	382.9	427.3	8.6	-3.1	2.3	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.8	9.9	8	16	0.00	-	0.33	0.0
14.93	414.1	421.1	421.1	5.5	-3.1	1.3	6	clean SAND to silty SAND	125	5.0	83	84	95	48	-	-	5	16	0.00	-	0.33	0.0
15.09	481.0	486.3	486.3	3.5	-3.1	0.7	6	clean SAND to silty SAND	125	5.0	96	97	95	48	-	-	5	16	0.00	-	0.33	0.0
15.26	530.5	533.4	533.4	4.7	-3.3	0.9	6	clean SAND to silty SAND	125	5.0	100	100	95	48	-	-	5	16	0.00	-	0.33	0.0
15.42	448.7	448.7	448.7	5.5	-2.5	1.2	6	clean SAND to silty SAND	125	5.0	90	90	95	48	-	-	5	16	0.00	-	0.33	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
15.58	421.5	419.2	430.6	7.2	-3.2	1.7	6	clean SAND to silty SAND	125	5.0	84	84	95	48	-	-	6	16	0.00	-	0.33	0.0
15.75	338.1	334.5	375.2	7.3	-3.2	2.2	6	clean SAND to silty SAND	125	5.0	68	67	95	48	-	-	9	16	0.00	-	0.33	0.0
15.91	217.9	214.4	281.8	5.9	-2.1	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	14.4	9.9	13	16	0.00	-	0.33	0.0
16.08	129.0	126.4	223.7	4.6	-1.9	3.6	5	silty SAND to sandy SILT	120	4.0	32	32	75	45	-	-	20	16	0.00	-	0.33	0.0
16.24	67.4	65.7	170.0	2.6	-1.8	4.0	4	clayy SILT to silty CLAY	115	2.0	34	33	-	-	4.7	9.9	29	15	0.00	-	0.33	0.0
16.40	39.7	39.6	-	1.5	-1.9	3.8	4	clayy SILT to silty CLAY	115	2.0	20	20	-	-	2.8	9.9	36	15	-	-	0.33	-
16.57	50.5	48.8	92.2	0.8	-2.7	1.6	5	silty SAND to sandy SILT	120	4.0	13	12	43	40	-	-	22	16	2.50	-	0.33	45.6
16.73	52.9	50.8	100.3	0.9	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	13	13	45	40	-	-	23	16	2.33	-	0.33	43.3
16.90	58.9	56.3	106.2	1.1	-2.7	1.9	5	silty SAND to sandy SILT	120	4.0	15	14	48	40	-	-	22	16	2.22	-	0.32	37.4
17.06	60.7	57.7	112.3	1.2	-2.9	2.0	5	silty SAND to sandy SILT	120	4.0	15	14	49	41	-	-	22	16	2.12	-	0.32	36.0
17.23	62.9	59.6	118.0	1.4	-3.0	2.2	5	silty SAND to sandy SILT	120	4.0	16	15	50	41	-	-	23	16	2.04	-	0.32	34.3
17.39	65.2	61.4	128.2	1.6	-3.0	2.5	5	silty SAND to sandy SILT	120	4.0	16	15	51	41	-	-	24	16	1.83	-	0.31	33.1
17.55	66.1	62.0	142.4	2.0	-3.1	3.0	4	clayy SILT to silty CLAY	115	2.0	33	31	-	-	4.6	9.9	26	15	1.19	-	0.31	15.6
17.72	65.2	60.9	146.6	2.1	-3.4	3.3	4	clayy SILT to silty CLAY	115	2.0	33	30	-	-	4.6	9.9	27	15	1.00	-	0.31	10.7
17.88	72.5	67.5	126.8	1.6	-3.5	2.3	5	silty SAND to sandy SILT	120	4.0	18	17	54	41	-	-	22	16	1.89	-	0.31	29.5
18.05	68.8	63.8	118.7	1.4	-3.4	2.1	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	21	16	2.03	-	0.30	31.7
18.21	68.0	62.7	133.9	1.8	-3.3	2.7	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	25	16	1.64	-	0.30	31.6
18.37	62.9	57.7	141.7	2.0	-3.4	3.2	4	clayy SILT to silty CLAY	115	2.0	31	29	-	-	4.4	9.9	28	15	1.26	-	0.30	23.3
18.54	69.9	63.9	133.8	1.8	-3.3	2.6	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	24	16	1.65	-	0.30	30.7
18.70	71.7	65.3	133.8	1.8	-3.3	2.6	5	silty SAND to sandy SILT	120	4.0	18	16	53	41	-	-	24	16	1.66	-	0.29	29.7
18.87	76.7	69.5	135.5	1.9	-3.3	2.5	5	silty SAND to sandy SILT	120	4.0	19	17	55	41	-	-	23	16	1.59	-	0.29	25.7
19.03	79.5	71.9	137.5	2.0	-3.2	2.5	5	silty SAND to sandy SILT	120	4.0	20	18	56	41	-	-	22	16	1.50	-	0.29	22.4
19.19	78.2	70.6	138.1	2.0	-3.2	2.6	5	silty SAND to sandy SILT	120	4.0	20	18	55	41	-	-	23	16	1.47	-	0.28	22.3
19.36	76.2	68.7	136.5	1.9	-3.2	2.6	5	silty SAND to sandy SILT	120	4.0	19	17	55	41	-	-	23	16	1.56	-	0.28	26.0
19.52	72.0	64.8	138.4	2.0	-3.2	2.8	5	silty SAND to sandy SILT	120	4.0	18	16	53	41	-	-	25	16	1.47	-	0.28	27.1
19.69	68.7	61.6	137.1	1.9	-3.1	2.9	5	silty SAND to sandy SILT	120	4.0	17	15	51	41	-	-	26	16	1.53	-	0.28	32.3
19.85	66.2	59.2	134.6	1.8	-3.1	2.8	5	silty SAND to sandy SILT	120	4.0	17	15	50	40	-	-	26	16	1.65	-	0.27	34.6
20.01	64.4	57.5	130.9	1.7	-3.1	2.8	5	silty SAND to sandy SILT	120	4.0	16	14	49	40	-	-	26	16	1.79	-	0.27	36.3
20.18	62.8	56.0	128.6	1.7	-3.1	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	48	40	-	-	26	16	1.87	-	0.27	37.8
20.34	62.3	55.5	127.2	1.7	-3.1	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	48	40	-	-	26	16	1.91	-	0.27	38.3
20.51	62.5	55.5	133.0	1.8	-3.1	2.9	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.72	-	0.26	38.2
20.67	61.4	54.4	136.1	1.9	-3.1	3.1	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.3	9.9	28	15	1.60	-	0.26	39.3
20.83	63.3	56.0	135.3	1.9	-2.7	3.0	4	clayy SILT to silty CLAY	115	2.0	32	28	-	-	4.4	9.9	27	15	1.63	-	0.26	37.7
21.00	62.8	55.5	133.2	1.8	-2.6	2.9	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.72	-	0.25	38.2
21.16	63.0	55.5	134.5	1.8	-2.6	3.0	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.67	-	0.25	38.3
21.33	61.2	53.8	137.3	1.9	-2.6	3.2	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.3	9.9	29	15	1.56	-	0.25	40.0
21.49	57.2	50.2	136.9	1.9	-2.6	3.3	4	clayy SILT to silty CLAY	115	2.0	29	25	-	-	4.0	9.9	30	15	1.57	-	0.25	43.9
21.65	65.2	57.2	135.8	1.9	-2.6	3.0	4	clayy SILT to silty CLAY	115	2.0	33	29	-	-	4.6	9.9	27	15	1.63	-	0.24	36.5
21.82	66.7	58.4	133.9	1.9	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	17	15	49	40	-	-	26	16	1.70	-	0.24	35.3
21.98	68.9	60.2	136.1	1.9	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	17	15	50	40	-	-	26	16	1.62	-	0.24	33.7
22.15	70.1	61.1	135.9	1.9	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	26	16	1.63	-	0.24	33.0
22.31	70.9	61.8	137.2	2.0	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	25	16	1.58	-	0.23	32.3
22.47	71.2	61.9	138.0	2.0	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	26	16	1.55	-	0.23	32.1
22.64	73.3	63.6	136.3	2.0	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	18	16	52	40	-	-	25	16	1.63	-	0.23	31.1
22.80	74.3	64.3	138.4	2.0	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	19	16	52	40	-	-	25	16	1.54	-	0.23	29.9
22.97	75.1	64.9	140.8	2.1	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	19	16	53	40	-	-	25	16	1.43	-	0.22	26.7
23.13	77.1	66.5	140.6	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	19	17	54	40	-	-	24	16	1.44	-	0.22	26.1
23.30	78.1	67.2	140.7	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	24	16	1.44	-	0.22	25.6
23.46	78.6	67.5	140.5	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	24	16	1.45	-	0.22	26.0
23.62	78.7	67.5	152.5	2.5	-2.6	3.2	4	clayy SILT to silty CLAY	115	2.0	39	34	-	-	5.5	9.9	26	15	0.90	-	0.21	8.4
23.79	79.5	68.1	146.9	2.3	-2.6	3.0	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	25	16	1.16	-	0.21	14.2
23.95	79.8	68.2	142.4	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.37	-	0.21	21.7
24.12	77.6	66.2	142.0	2.2	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	19	17	53	40	-	-	25	16	1.39	-	0.21	24.3
24.28	78.2	66.6	141.0	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.44	-	0.21	26.8
24.44	78.5	66.8	140.2	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.48	-	0.20	27.4
24.61	79.0	67.0	140.1	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.20	27.3
24.77	79.1	67.0	140.7	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.47	-	0.20	27.1
24.94	79.0	66.8	140.3	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.20	27.5
25.10	80.4	67.9	138.7	2.1	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.57	-	0.19	27.5
25.26	80.8	68.1	138.8	2.1	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.56	-	0.19	27.2
25.43	79.3	66.7	140.4	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.19	27.6
25.59	79.9	67.1	140.7	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.48	-	0.19	27.2
25.76	80.6	67.5	140.6	2.2	-2.5	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.18	26.9
25.92	79.6	66.6	139.8	2.1	-2.5	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.53	-	0.18	28.1
26.08	80.8	67.5	140.0	2.2	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.52	-	0.18	27.3
26.25	79.8	66.5	137.7	2.1	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.62	-	0.18	29.2
26.41	80.9	67.3	143.7	2.3	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	25	16	1.35	-	0.17	22.3
26.58	79.1	65.7	142.8	2.2	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	16	53	40	-	-	25	16	1.39	-	0.17	25.6
26.74	79.7	66.1	143.5	2.3	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	17	53	40	-	-	25	16	1.36	-	0.17	23.9
26.90	77.8	64.4	141.9	2.2	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	19	16	52	40	-	-	25	16	1.44	-	0.17	29.7
27.07	77.5	64.1	145.7	2.3	-2.6	3.1	4	clayy SILT to silty CLAY	115	2.0	39	32	-	-	5.4	9.9	26	15	1.27	-	0.16	20.6
27.23	82.0	67.7	144.4	2.3	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	25	16	1.33	-	0.16	21.5
27.40	82.2	67.7	141.6	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	24	16	1.46	-	0.16	26.6
27.56	82.0	67.4	138.7	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.59	-	0.16	28.4
27.72	81.6	67.0	138.6	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.60	-	0.15	28.8
27.89	82.8	67.9	139.8	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	24	16	1.55	-	0.15	27.5
28.05	84.3	69.0	138.5	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	23	16	1.61	-	0.15	27.7
28.22	84.8	69.3	140.2	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	23	16	1.54	-	0.15	26.4
28.38	84.6	69.0	140.6	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	24	16	1.53	-	0.14	26.4
28.54	87.1	70.9	140.5	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.53	-	0.14	25.1
28.71	87.7	71.3	139.8	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.57	-	0.14	25.4
28.87	87.1	70.7	137.9	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.65	-	0.14	27.5
29.04	86.6	70.2	137.1	2.1	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	23	16	1.68	-	0.13	28.0
29.20	86.3	69.8	139.0	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	17	55	40	-	-	23	16	1.61	-	0.13	27.1
29.36	87.8	70.9	139.7	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.58	-	0.13	25.9
29.53	89.1	71.8	137.0	2.2	-2.5	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.69	-	0.13	27.2
29.69	89.3	71.9	135.6	2.1	-2.5	2.4	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.75	-	0.12	27.1
29.86	89.0	71.5	147.6	2.5	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	24	16	1.23	-	0.12	16.0
30.02	89.0	71.4	142.1	2.3	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.48	-	0.12	24.0
30.19	89.2	71.4	138.7	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.63	-	0.12	26.8
30.35	89.3	71.4	138.9	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.62	-	0.11	26.6
30.51	87.5	69.8	137.2	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	17	55	40	-	-	23	16	1.69	-	0.11	28.2
30.68	88.2	70.3	135.5	2.1	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	22	16	1.75	-	0.11	28.0
30.84	88.6	70.5	134.1	2.1	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	22	16	1.80	-	0.11	27.9

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
31.01	89.7	71.2	136.2	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.72	-	0.10	27.5
31.17	89.6	71.1	137.4	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.68	-	0.10	27.6
31.33	89.6	71.0	137.6	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.67	-	0.10	27.6
31.50	89.7	70.9	138.8	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.62	-	0.09	26.9
31.66	91.1	71.9	141.9	2.4	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	23	18	56	40	-	-	23	16	1.49	-	0.09	23.7
31.83	92.5	72.9	144.2	2.4	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	23	18	57	40	-	-	23	16	1.39	-	0.09	20.6
31.99	96.0	75.6	140.6	2.3	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	24	19	58	40	-	-	21	16	1.55	-	0.09	22.5
32.15	94.3	74.1	137.5	2.2	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	24	19	57	40	-	-	21	16	1.68	-	0.08	26.0
32.32	92.9	72.9	137.0	2.2	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	23	18	57	40	-	-	22	16	1.70	-	0.08	26.6
32.48	81.8	64.1	134.6	2.1	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	20	16	52	39	-	-	24	16	1.77	-	0.08	31.5
32.65	94.3	73.8	130.4	2.0	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	24	18	57	40	-	-	20	16	1.88	-	0.08	26.2
32.81	99.0	77.3	125.8	1.8	-2.6	1.9	5	silty SAND to sandy SILT	120	4.0	25	19	59	40	-	-	18	16	1.94	-	0.07	24.4
32.97	101.5	79.1	148.8	2.6	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	25	20	59	40	-	-	22	16	1.19	-	0.07	11.4
33.14	102.5	79.8	140.2	2.3	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.57	-	0.07	20.5
33.30	104.0	80.9	126.5	1.8	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	18	16	1.93	-	0.06	22.7
33.47	115.7	89.8	134.8	2.1	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	29	22	63	41	-	-	17	16	1.79	-	0.06	19.3
33.63	103.8	80.5	139.8	2.3	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.59	-	0.06	20.6
33.79	97.0	75.1	125.7	1.9	-2.6	2.0	5	silty SAND to sandy SILT	120	4.0	24	19	58	40	-	-	19	16	1.94	-	0.06	25.5
33.96	100.3	77.5	131.3	2.0	-2.6	2.1	5	silty SAND to sandy SILT	120	4.0	25	19	59	40	-	-	19	16	1.87	-	0.05	24.3
34.12	95.9	74.0	137.5	2.3	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	24	19	57	40	-	-	21	16	1.67	-	0.05	26.0
34.29	85.7	66.0	145.7	2.5	-2.6	3.0	5	silty SAND to sandy SILT	120	4.0	21	17	53	39	-	-	25	16	1.30	-	0.05	21.6
34.45	75.9	58.4	140.7	2.3	-2.6	3.1	4	clayy SILT to silty CLAY	115	2.0	38	29	-	-	5.3	9.9	27	15	1.52	-	0.05	35.4
34.61	94.1	72.3	131.1	2.1	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	24	18	56	40	-	-	21	16	1.87	-	0.04	26.9
34.78	105.3	80.8	138.4	2.3	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.65	-	0.04	22.7
34.94	104.3	79.9	142.0	2.4	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.50	-	0.04	18.0
35.11	108.8	83.3	145.2	2.5	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.36	-	0.03	13.4
35.27	108.0	82.5	144.1	2.5	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.40	-	0.03	14.6
35.43	111.2	84.8	143.0	2.5	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	19	16	1.45	-	0.03	15.2
35.60	110.6	84.2	142.7	2.4	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	19	16	1.47	-	0.03	15.6
35.76	110.9	84.4	140.4	2.4	-2.7	2.2	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	19	16	1.57	-	0.02	18.3
35.93	111.7	84.9	138.8	2.3	-2.6	2.1	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	19	16	1.63	-	0.02	20.3
36.09	112.0	84.9	148.0	2.7	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	20	16	1.23	-	0.02	10.7
36.26	109.1	82.6	145.9	2.6	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.32	-	0.02	12.8
36.42	110.5	83.6	146.3	2.6	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	20	16	1.30	-	0.02	12.2
36.58	107.2	81.0	151.7	2.8	-2.7	2.7	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	22	16	1.06	-	0.01	8.7
36.75	109.4	82.5	157.6	3.0	-2.7	2.8	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	22	16	0.80	-	0.01	5.7
36.91	109.4	82.4	152.2	2.8	-2.7	2.6	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	21	16	1.04	-	0.01	8.2
37.08	109.1	82.1	147.6	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	27	21	60	40	-	-	21	16	1.24	-	0.01	11.3
37.24	111.0	83.3	149.3	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	21	16	1.17	-	0.01	9.9
37.40	110.7	83.0	148.0	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	21	16	1.22	-	0.00	10.9
37.57	108.9	81.5	159.3	3.1	-2.7	2.9	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	23	16	0.74	-	0.00	5.1
37.73	109.2	81.6	155.0	3.0	-2.7	2.8	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	22	16	0.91	-	0.00	6.8

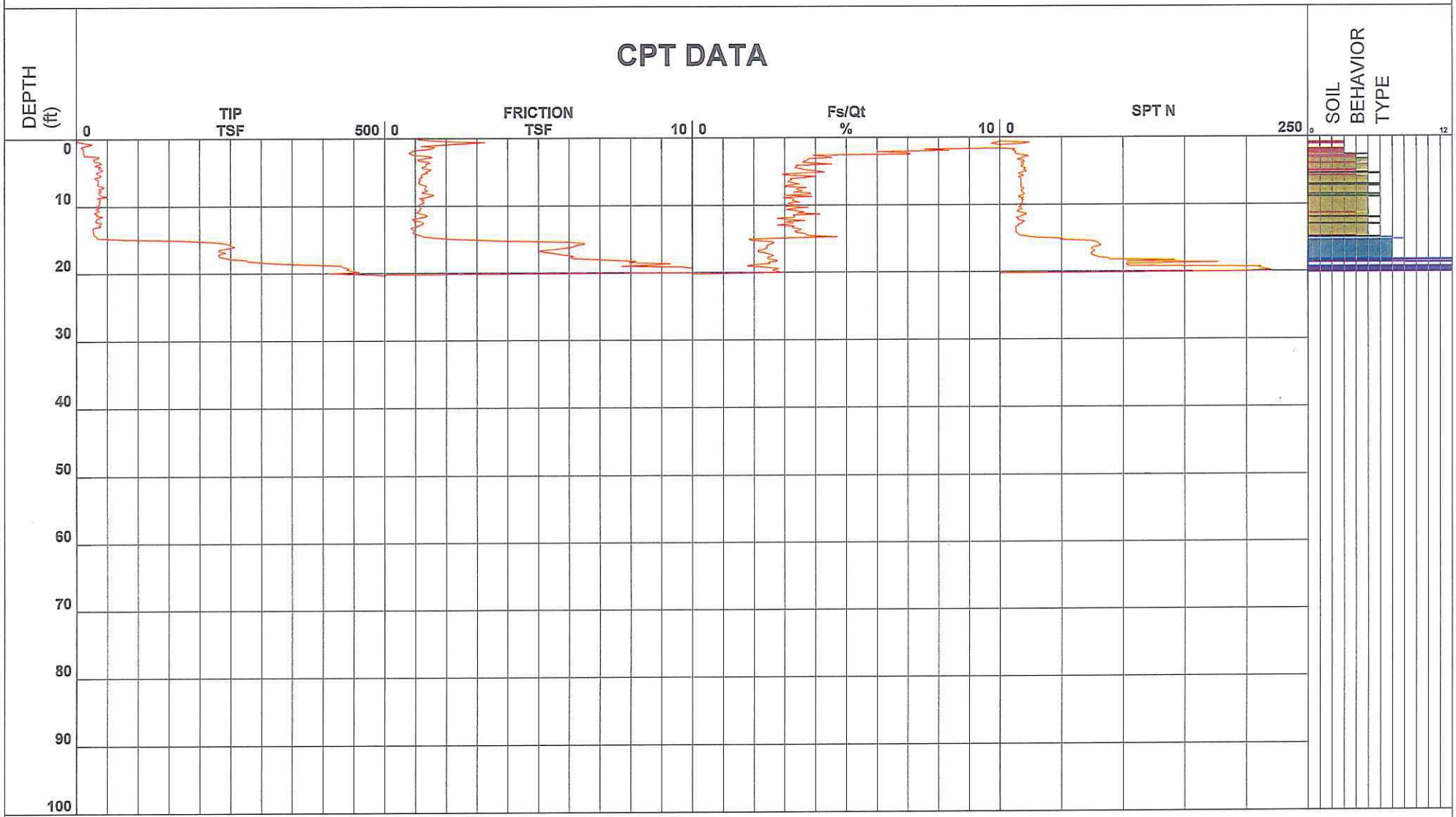
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(553).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-236	Date and Time	10/7/2011 12:08:14 AM	Maximum Depth	20.34 ft
Water Table Depth		>20.34 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(553).cpt
CPT Date: 10/7/2011 12:08:14 AM
GW During Test: No GW

Sounding ID: CPT-11-236
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.10	Cycl SStn %
0.33	1.1	1.6	-	1.5	0.0	9.9	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.49	7.1	11.4	-	2.2	0.1	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	79	15	N/A	0.00	N/A	N/A
0.66	15.9	25.5	-	3.3	0.1	9.9	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	60	15	N/A	0.00	N/A	N/A
0.82	25.5	40.9	-	2.5	0.2	9.9	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	52	15	N/A	0.00	N/A	N/A
0.98	18.3	29.4	-	1.8	0.2	9.8	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	57	15	N/A	0.00	N/A	N/A
1.15	9.5	15.3	-	1.2	0.2	9.9	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.7	9.9	72	15	N/A	0.00	N/A	N/A
1.31	7.7	12.3	-	1.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.48	11.5	18.5	-	1.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.64	12.0	19.2	-	1.3	0.3	9.9	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.80	12.3	19.7	-	0.9	1.2	7.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	60	15	N/A	0.00	N/A	N/A
1.97	10.9	17.6	-	0.9	1.2	8.4	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	65	15	N/A	0.00	N/A	N/A
2.13	13.2	21.2	-	0.8	1.2	6.1	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	54	15	N/A	0.00	N/A	N/A
2.30	12.4	19.9	-	0.9	1.2	7.0	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	59	15	N/A	0.00	N/A	N/A
2.46	13.9	22.3	-	1.0	0.9	7.2	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	57	15	N/A	0.00	N/A	N/A
2.62	36.9	59.1	159.7	1.4	0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	18	30	-	-	2.6	9.9	30	15	N/A	0.00	N/A	N/A
2.79	36.2	58.1	166.5	1.5	0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	32	15	N/A	0.00	N/A	N/A
2.95	28.8	46.1	-	1.3	1.7	4.5	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	36	15	N/A	0.00	N/A	N/A
3.12	28.3	45.4	140.0	1.1	2.0	3.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	33	15	N/A	0.00	N/A	N/A
3.28	29.9	48.0	142.5	1.1	2.0	3.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	32	15	0.22	-	0.10	0.5
3.45	39.1	62.6	158.3	1.4	2.1	3.7	4	clayy SILT to silty CLAY	115	2.0	20	31	-	-	2.7	9.9	28	15	0.10	-	0.10	0.2
3.61	41.2	66.1	159.8	1.5	2.1	3.6	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	27	15	0.10	-	0.10	0.2
3.77	35.1	56.2	154.4	1.3	2.1	3.8	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	30	15	0.16	-	0.10	0.3
3.94	30.3	48.6	159.5	1.4	2.1	4.6	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	35	15	0.13	-	0.10	0.1
4.10	40.4	64.9	152.9	1.4	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	27	15	0.19	-	0.10	0.6
4.27	35.5	57.0	145.9	1.2	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	0.29	-	0.10	1.1
4.43	37.7	60.5	147.9	1.3	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	28	15	0.27	-	0.10	1.1
4.59	42.9	68.9	161.7	1.5	2.0	3.5	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	27	15	0.00	-	0.10	0.0
4.76	39.6	63.4	160.0	1.5	2.0	3.7	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.16	-	0.10	0.4
4.92	33.1	53.1	155.7	1.3	2.1	4.1	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.3	9.9	32	15	0.20	-	0.10	0.5
5.09	32.8	52.5	160.4	1.4	1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	33	15	0.00	-	0.10	0.0
5.25	36.0	57.7	149.1	1.3	1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	0.34	-	0.10	1.4
5.41	40.3	64.7	142.1	1.2	1.0	3.0	5	silty SAND to sandy SILT	120	4.0	10	16	53	43	-	-	25	16	0.56	-	0.10	3.3
5.58	38.3	61.4	145.6	1.2	1.0	3.2	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	27	15	0.46	-	0.10	2.5
5.74	30.2	48.5	149.5	1.2	1.0	4.1	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	33	15	0.37	-	0.10	1.3
5.91	31.3	50.2	143.4	1.1	0.9	3.7	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	31	15	0.58	-	0.09	3.1
6.07	35.8	57.5	140.7	1.1	0.9	3.2	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.73	-	0.09	11.0
6.23	36.1	57.8	142.8	1.2	0.9	3.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.65	-	0.09	9.4
6.40	35.9	57.6	140.1	1.1	0.9	3.2	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.82	-	0.09	11.7
6.56	35.7	56.6	138.5	1.1	0.8	3.1	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	28	15	0.93	-	0.09	15.4
6.73	34.5	54.0	141.1	1.2	0.8	3.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	29	15	0.81	-	0.09	21.3
6.89	35.8	55.5	146.3	1.2	0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	30	15	0.59	-	0.09	3.6
7.05	44.7	68.3	150.2	1.4	0.8	3.1	5	silty SAND to sandy SILT	120	4.0	11	17	54	43	-	-	25	16	0.47	-	0.09	2.7
7.22	44.1	66.6	146.5	1.3	0.8	3.0	5	silty SAND to sandy SILT	120	4.0	11	17	54	43	-	-	25	16	0.61	-	0.09	3.9
7.38	35.8	53.4	149.2	1.3	0.8	3.8	4	clayy SILT to silty CLAY	115	2.0	18	27	-	-	2.5	9.9	31	15	0.53	-	0.08	2.9
7.55	38.7	57.2	145.5	1.3	0.8	3.4	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	29	15	0.69	-	0.08	11.7
7.71	40.6	59.3	150.1	1.4	0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.8	9.9	29	15	0.53	-	0.08	3.2
7.87	36.4	52.6	144.9	1.3	0.8	3.6	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.5	9.9	31	15	0.75	-	0.08	24.8
8.04	36.7	52.5	138.5	1.2	0.8	3.3	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.6	9.9	30	15	1.10	-	0.08	28.5
8.20	38.3	54.3	153.0	1.5	0.8	3.9	4	clayy SILT to silty CLAY	115	2.0	19	27	-	-	2.7	9.9	31	15	0.47	-	0.08	2.4
8.37	41.7	58.4	158.6	1.6	0.8	3.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	2.9	9.9	30	15	0.34	-	0.08	1.6
8.53	49.7	69.0	149.7	1.5	0.7	3.1	5	silty SAND to sandy SILT	120	4.0	12	17	55	43	-	-	25	16	0.60	-	0.08	3.8
8.69	34.4	47.4	145.4	1.3	0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	17	24	-	-	2.4	9.9	33	15	0.80	-	0.08	40.8
8.86	38.2	52.1	130.4	1.1	0.7	3.0	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	28	15	1.60	-	0.08	40.9
9.02	39.7	53.6	139.2	1.3	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	20	27	-	-	2.8	9.9	29	15	1.15	-	0.07	26.9
9.19	36.4	48.6	134.3	1.2	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.5	9.9	31	15	1.41	-	0.07	42.1
9.35	39.1	51.9	136.8	1.3	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	20	26	-	-	2.7	9.9	30	15	1.29	-	0.07	33.5
9.51	37.3	49.0	138.9	1.3	0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.6	9.9	31	15	1.20	-	0.07	38.8
9.68	37.8	49.3	130.5	1.2	0.7	3.1	4	clayy SILT to silty CLAY	115	2.0	19	25	-	-	2.6	9.9	30	15	1.64	-	0.06	45.0
9.84	35.0	45.2	128.1	1.1	0.7	3.2	4	clayy SILT to silty CLAY	115	2.0	17	23	-	-	2.4	9.9	31	15	1.76	-	0.06	49.9
10.01	33.2	42.6	129.0	1.1	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	17	21	-	-	2.3	9.9	33	15	1.73	-	0.06	51.2
10.17	38.3	48.7	127.6	1.1	0.6	3.0	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	29	15	1.79	-	0.06	45.7
10.34	31.8	45.1	140.5	1.2	0.7	3.8	4	clayy SILT to silty CLAY	115	2.0	16	23	-	-	2.2	9.9	34	15	1.16	-	0.05	48.6
10.50	35.1	43.9	128.1	1.1	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.5	9.9	32	15	1.78	-	0.05	51.2
10.66	38.0	47.1	127.7	1.2	0.7	3.1	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	30	15	1.80	-	0.05	47.5
10.83	32.2	39.7	125.5	1.1	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.3	9.9	34	15	1.88	-	0.05	51.2
10.99	29.4	39.9	131.5	1.1	0.7	3.7	4	clayy SILT to silty CLAY	115	2.0	15	20	-	-	2.1	9.9	35	15	1.66	-	0.04	51.2
11.16	35.3	42.8	129.9	1.2	0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.5	9.9	33	15	1.73	-	0.04	51.2
11.32	32.8	43.5	-	1.4	0.7	4.2	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.3	9.9	36	15	-	-	0.04	-
11.48	42.8	51.2	137.0	1.4	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	21	26	-	-	3.0	9.9	30	15	1.39	-	0.03	37.8
11.65	37.8	44.9	131.0	1.3	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	32	15	1.70	-	0.03	50.3
11.81	32.9	38.8	123.4	1.1	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	16	19	-	-	2.3	9.9	34	15	1.96	-	0.03	51.2
11.98	33.3	39.0	112.0	0.9	0.6	2.8	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	32	15	2.13	-	0.03	51.2
12.14	30.9	35.9	114.7	0.9	0.6	3.1	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.2	9.9	34	15	2.09	-	0.02	51.2
12.30	32.1	40.3	132.3	1.2	0.6	3.7	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.2	9.9	35	15	1.66	-	0.02	51.2
12.47	41.4	47.5	127.6	1.3	0.6	3.1	4	clayy SILT to silty CLAY	115	2.0	21	24	-	-	2.9	9.9	30	15	1.84	-	0.02	47.1
12.63	38.5	43.9	128.9	1.3	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	32	15	1.80	-	0.01	51.2
12.80	36.8	41.7	124.8	1.2	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.6	9.9	33	15	1.94	-	0.01	51.2
12.96	39.9	44.9	118.8	1.1	0.6	2.8	4	clayy SILT to silty CLAY	115	2.0	20	22	-	-	2.8	9.9	30	15	2.03	-	0.01	50.2
13.12	30.8	36.9	121.4	1.0	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.1	9.9	35	15	1.99	-	0.00	51.2
13.29	27.1	35.6	-	0.9	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	35	15	-	-	0.00	-
13.45	26.9	34.8	-	0.9	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	13	17	-	-	1.9	9.9	36	15	-	-	0.00	-
13.62	27.2	34.8	-	1.0	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	37	15	-	-	0.00	-
13.78	27.9	35.3	-	1.0	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	37	15	-	-	0.00	-
13.94	27.9	34.9	-	0.9	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	36	15	-	-	0.00	-
14.11	28.1	34.6	-	1.0	0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	37	15	-	-	0.00	-
14.27	29.1	35.5	-	1.1	0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.0	9.9	37	15	-	-	0.00	-
14.44	31.8	38.4	-	1.2	0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	16	19	-	-	2.2	9.9	36	15	-	-	0.00	-
14.60	33.7	40.1	-	1.3	0.6	3.9	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.00	-
14.76	34.6	40.8	-	1.6	0.6	4.8	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.4	9.9	39	15	-	-	0.00	-
14.93	77.4	81.2	152.8	2.1	0.5	2.7	5	silty SAND to sandy SILT	120	4.0	19	20	60	43	-	-	22	16	0.75	-	0.00	4.8
15.09	158.6	165.4	204.3	2.9	0.2	1.9	6	clean SAND to silty SAND	125	5.0	32	33	84	46	-	-	12	16	0.00	-	0.00	0.0
15.26	204.2	211.7	250.2	3.9	0.1	1.9	6	clean SAND to silty SAND	125	5.0	41	42	92	47	-	-	10	16	0.00	-	0.00	0.0
15.42	233.3	240.5	301.0	6.0	0.2	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	15.4	9.9	12	16	0.00	-	0.00	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(553).cpt
CPT Date: 10/7/2011 12:08:14 AM
GW During Test: No GW

Sounding ID: CPT-11-236
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.10	Cycl SStn %
15.58	243.4	249.5	313.3	6.4	0.2	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.1	9.9	12	16	0.00	-	0.00	0.0
15.75	250.9	255.9	317.6	6.5	0.4	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.6	9.9	12	16	0.00	-	0.00	0.0
15.91	251.6	255.4	312.6	6.2	0.5	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.6	9.9	11	16	0.00	-	0.00	0.0
16.08	256.7	259.2	313.3	6.2	0.7	2.4	6	clean SAND to silty SAND	125	5.0	51	52	95	48	-	-	11	16	0.00	-	0.00	0.0
16.24	249.7	250.7	306.3	6.1	0.8	2.4	6	clean SAND to silty SAND	125	5.0	50	50	95	48	-	-	11	16	0.00	-	0.00	0.0
16.40	237.7	237.4	292.8	5.8	0.9	2.4	6	clean SAND to silty SAND	125	5.0	48	47	95	48	-	-	11	16	0.00	-	0.00	0.0
16.57	230.7	229.2	281.6	5.4	1.1	2.3	6	clean SAND to silty SAND	125	5.0	46	46	94	47	-	-	11	16	0.00	-	0.00	0.0
16.73	234.2	231.3	276.9	5.0	1.2	2.2	6	clean SAND to silty SAND	125	5.0	47	46	95	48	-	-	11	16	0.00	-	0.00	0.0
16.90	242.0	237.8	282.4	5.2	1.2	2.1	6	clean SAND to silty SAND	125	5.0	48	48	95	48	-	-	10	16	0.00	-	0.00	0.0
17.06	237.5	232.2	283.0	5.4	1.3	2.3	6	clean SAND to silty SAND	125	5.0	48	46	95	47	-	-	11	16	0.00	-	0.00	0.0
17.23	230.8	224.4	280.9	5.6	1.3	2.4	6	clean SAND to silty SAND	125	5.0	46	45	94	47	-	-	12	16	0.00	-	0.00	0.0
17.39	231.1	223.6	284.6	5.9	1.4	2.6	5	silty SAND to sandy SILT	120	4.0	58	56	94	47	-	-	12	16	0.00	-	0.00	0.0
17.55	233.9	225.2	289.1	6.2	1.4	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	15.5	9.9	13	16	0.00	-	0.00	0.0
17.72	244.2	234.1	291.8	6.1	1.4	2.5	6	clean SAND to silty SAND	125	5.0	49	47	95	47	-	-	12	16	0.00	-	0.00	0.0
17.88	250.5	238.9	295.0	6.1	1.4	2.4	6	clean SAND to silty SAND	125	5.0	50	48	95	48	-	-	12	16	0.00	-	0.00	0.0
18.05	275.6	261.6	318.6	6.8	-1.8	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	18.2	9.9	11	16	0.00	-	0.00	0.0
18.21	278.6	263.2	331.0	7.7	-1.8	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	18.4	9.9	12	16	0.00	-	0.00	0.0
18.37	297.3	279.6	347.1	8.2	-1.9	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	19.7	9.9	12	16	0.00	-	0.00	0.0
18.54	321.4	301.0	356.5	7.9	-2.1	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	21.3	9.9	10	16	0.00	-	0.00	0.0
18.70	369.4	344.5	400.7	9.3	-2.4	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.4	9.9	10	16	0.00	-	0.00	0.0
18.87	429.7	399.0	430.3	8.8	-2.5	2.0	6	clean SAND to silty SAND	125	5.0	86	80	95	48	-	-	7	16	0.00	-	0.00	0.0
19.03	431.7	398.9	416.9	7.7	-2.2	1.8	6	clean SAND to silty SAND	125	5.0	86	80	95	48	-	-	6	16	0.00	-	0.00	0.0
19.19	437.3	402.2	442.5	9.7	-2.2	2.2	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	28.9	9.9	8	16	0.00	-	0.00	0.0
19.36	442.8	405.6	466.7	11.7	-2.3	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.3	9.9	9	16	0.00	-	0.00	0.0
19.52	438.2	399.7	469.1	12.3	-2.3	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.0	9.9	10	16	0.00	-	0.00	0.0
19.69	447.8	406.7	465.4	11.6	-2.3	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.6	9.9	9	16	0.00	-	0.00	0.0
19.85	459.4	415.5	482.4	12.7	-2.3	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	30.4	9.9	10	16	0.00	-	0.00	0.0
20.01	409.7	369.1	442.8	11.9	-2.3	2.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.1	9.9	11	16	0.00	-	0.00	0.0

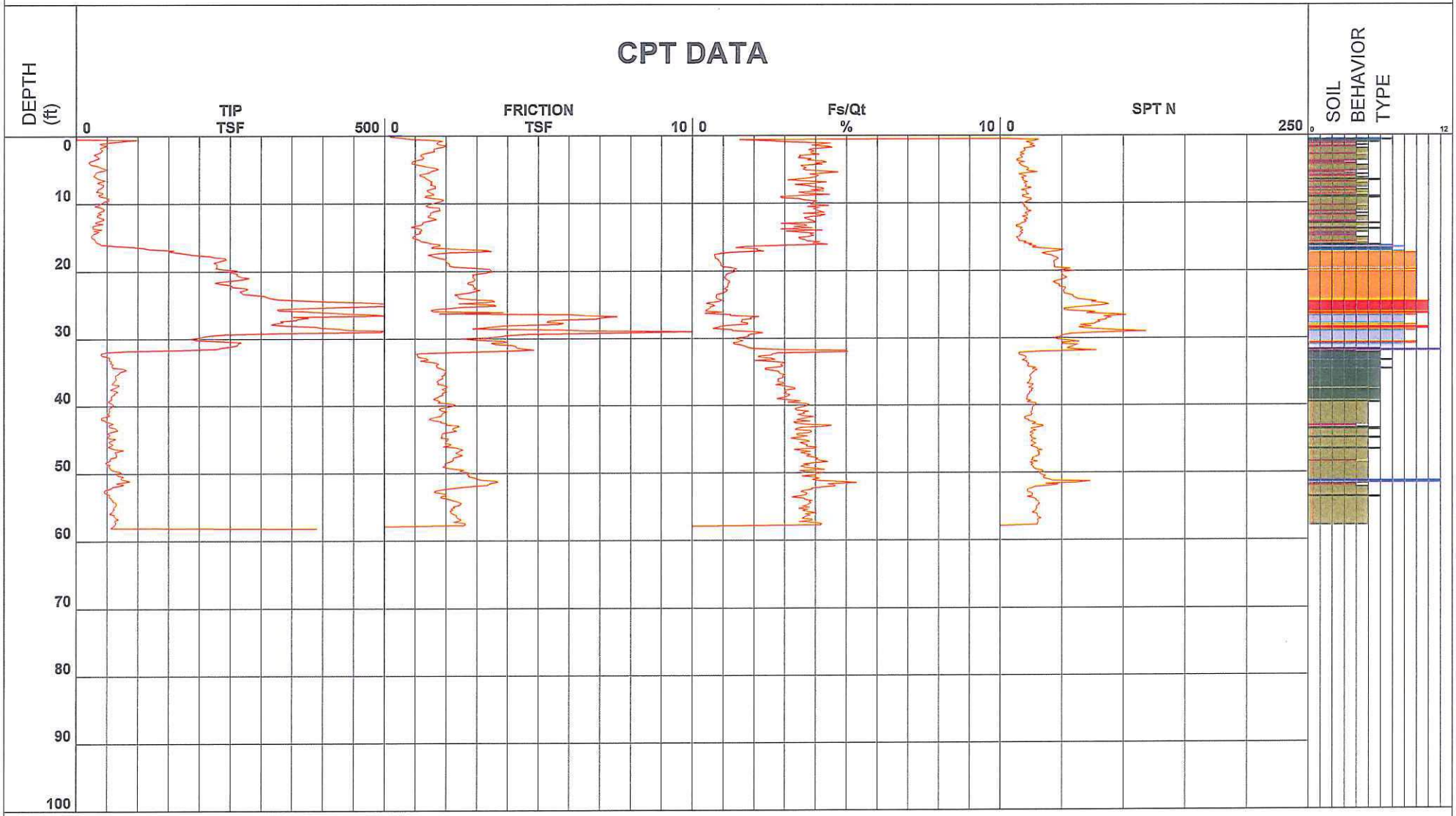
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JB	Filename	SDF(535).cpt
Job Number	11-136	Cone Number	DSG1104	GPS	
Hole Number	CPT-11-245	Date and Time	9/28/2011 12:46:01 PM	Maximum Depth	58.23 ft
Water Table Depth		>58.23 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
0.33	1.1	0.6	-	0.6	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.49	1.1	1.3	-	0.8	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.66	98.1	157.3	186.3	1.5	-0.1	1.5	6	clean SAND to silty SAND	125	5.0	20	31	82	48	-	-	10	16	N/A	0.00	N/A	N/A
0.82	73.6	118.1	182.9	1.9	-0.2	2.6	5	silty SAND to sandy SILT	120	4.0	18	30	72	48	-	-	17	16	N/A	0.00	N/A	N/A
0.98	54.0	86.6	171.3	1.7	-0.3	3.2	5	silty SAND to sandy SILT	120	4.0	14	22	62	48	-	-	23	16	N/A	0.00	N/A	N/A
1.15	38.1	61.2	174.8	1.7	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	31	15	N/A	0.00	N/A	N/A
1.31	41.8	67.1	176.2	1.8	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	29	15	N/A	0.00	N/A	N/A
1.48	51.1	81.9	185.0	2.0	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	26	15	N/A	0.00	N/A	N/A
1.64	43.9	70.4	185.5	1.9	-0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	29	15	N/A	0.00	N/A	N/A
1.80	38.9	62.3	177.7	1.8	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	31	15	N/A	0.00	N/A	N/A
1.97	40.5	64.9	167.6	1.6	0.0	4.0	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.9	9.9	29	15	N/A	0.00	N/A	N/A
2.13	42.8	68.6	167.2	1.6	-0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	28	15	N/A	0.00	N/A	N/A
2.30	41.2	66.1	169.0	1.6	0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	29	15	N/A	0.00	N/A	N/A
2.46	38.3	61.5	160.6	1.5	0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	29	15	N/A	0.00	N/A	N/A
2.62	33.9	54.4	152.4	1.3	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	31	15	N/A	0.00	N/A	N/A
2.79	29.1	46.7	147.9	1.2	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	15	23	-	-	2.0	9.9	34	15	N/A	0.00	N/A	N/A
2.95	33.6	53.9	142.9	1.2	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	30	15	N/A	0.00	N/A	N/A
3.12	35.6	57.1	148.0	1.3	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	N/A	0.00	N/A	N/A
3.28	37.4	60.0	149.3	1.3	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	28	15	0.17	-	0.10	0.4
3.45	32.2	51.7	149.0	1.2	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	32	15	0.18	-	0.10	0.3
3.61	28.1	45.0	138.0	1.0	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	14	22	-	-	2.0	9.9	33	15	0.37	-	0.10	1.0
3.77	22.2	35.6	-	0.9	0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	39	15	-	-	0.10	-
3.94	20.5	32.8	-	0.9	0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	41	15	-	-	0.10	-
4.10	22.9	36.6	-	0.9	0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	37	15	-	-	0.10	-
4.27	25.2	40.3	-	1.1	0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	37	15	-	-	0.10	-
4.43	35.4	56.7	147.8	1.2	0.1	3.5	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	29	15	0.27	-	0.10	1.0
4.59	39.7	63.7	157.3	1.4	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.17	-	0.10	0.5
4.76	44.9	72.0	169.8	1.7	0.0	3.7	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.2	9.9	27	15	0.00	-	0.10	0.0
4.92	49.0	78.6	174.1	1.8	-0.1	3.6	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	25	15	0.00	-	0.10	0.0
5.09	44.1	70.7	168.1	1.6	0.0	3.7	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	27	15	0.00	-	0.10	0.0
5.25	35.7	57.2	165.5	1.5	0.1	4.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	32	15	0.00	-	0.10	0.0
5.41	31.2	50.0	166.2	1.5	0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	35	15	0.00	-	0.10	0.0
5.58	31.8	51.0	156.0	1.3	0.0	4.2	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	33	15	0.23	-	0.10	0.7
5.74	30.4	48.8	145.2	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	32	15	0.50	-	0.10	2.3
5.91	28.4	45.5	147.0	1.2	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	35	15	0.45	-	0.10	1.8
6.07	32.5	52.1	154.5	1.3	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	32	15	0.29	-	0.10	1.0
6.23	34.9	55.9	154.8	1.3	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	31	15	0.29	-	0.10	1.2
6.40	39.8	63.9	156.4	1.4	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.28	-	0.10	1.2
6.56	46.9	74.4	156.7	1.5	0.0	3.1	5	silty SAND to sandy SILT	120	4.0	12	19	57	43	-	-	24	16	0.28	-	0.10	1.4
6.73	40.7	63.7	164.1	1.6	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.9	9.9	29	15	0.00	-	0.10	0.0
6.89	34.5	53.3	163.0	1.5	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	33	15	0.00	-	0.10	0.0
7.05	39.6	60.5	162.7	1.6	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.8	9.9	30	15	0.00	-	0.10	0.0
7.22	44.7	67.5	155.7	1.5	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.1	9.9	26	15	0.34	-	0.10	1.7
7.38	44.3	66.1	165.1	1.7	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	22	33	-	-	3.1	9.9	28	15	0.00	-	0.10	0.0
7.55	41.9	62.0	164.3	1.6	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	21	31	-	-	2.9	9.9	30	15	0.00	-	0.10	0.0
7.71	39.5	57.8	165.9	1.7	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	20	29	-	-	2.8	9.9	32	15	0.00	-	0.10	0.0
7.87	35.1	50.8	158.5	1.5	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	34	15	0.31	-	0.10	1.1
8.04	35.8	51.2	149.6	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.5	9.9	32	15	0.57	-	0.10	3.2
8.20	33.0	46.7	152.5	1.4	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	23	-	-	2.3	9.9	35	15	0.48	-	0.09	2.2
8.37	43.1	60.5	151.3	1.5	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	22	30	-	-	3.0	9.9	28	15	0.53	-	0.09	3.3
8.53	43.2	60.0	155.7	1.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	22	30	-	-	3.0	9.9	29	15	0.41	-	0.09	2.2
8.69	36.2	49.9	161.0	1.6	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	35	15	0.00	-	0.09	0.0
8.86	38.1	52.0	144.2	1.4	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	31	15	0.88	-	0.09	27.6
9.02	46.1	62.2	138.1	1.3	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	12	16	51	42	-	-	25	16	1.21	-	0.09	14.0
9.19	53.6	71.7	148.6	1.5	-0.4	2.9	5	silty SAND to sandy SILT	120	4.0	13	18	56	43	-	-	24	16	0.69	-	0.09	4.5
9.35	52.5	69.7	161.6	1.8	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.7	9.9	26	15	0.00	-	0.09	0.0
9.51	53.2	69.9	166.2	1.9	-0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	27	35	-	-	3.7	9.9	27	15	0.00	-	0.09	0.0
9.68	45.6	59.4	164.4	1.8	-0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	23	30	-	-	3.2	9.9	31	15	0.00	-	0.09	0.0
9.84	43.8	56.7	157.5	1.7	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	22	28	-	-	3.1	9.9	31	15	0.42	-	0.09	2.2
10.01	40.1	51.4	152.7	1.6	-0.2	4.0	4	clayy SILT to silty CLAY	115	2.0	20	26	-	-	2.8	9.9	32	15	0.57	-	0.09	3.4
10.17	37.0	47.0	144.2	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.6	9.9	33	15	0.97	-	0.09	42.5
10.34	30.6	43.3	-	1.3	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	15	22	-	-	2.1	9.9	37	15	-	-	0.08	-
10.50	39.1	48.9	144.6	1.5	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.7	9.9	32	15	0.96	-	0.08	37.0
10.66	43.4	53.9	159.6	1.8	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	22	27	-	-	3.0	9.9	32	15	0.39	-	0.08	1.9
10.83	45.8	56.5	158.0	1.8	-0.4	4.0	4	clayy SILT to silty CLAY	115	2.0	23	28	-	-	3.2	9.9	31	15	0.44	-	0.08	2.4
10.99	44.8	54.8	158.6	1.8	-0.4	4.1	4	clayy SILT to silty CLAY	115	2.0	22	27	-	-	3.1	9.9	32	15	0.43	-	0.08	2.3
11.16	38.9	47.3	150.8	1.6	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	34	15	0.71	-	0.08	40.9
11.32	35.1	46.7	153.7	1.5	-0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	0.59	-	0.08	3.5
11.48	41.4	49.5	142.4	1.5	-0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	2.9	9.9	32	15	1.12	-	0.08	37.0
11.65	35.2	45.8	-	1.5	-0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	-	-	0.08	-
11.81	33.9	43.7	-	1.4	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	17	22	-	-	2.4	9.9	36	15	-	-	0.07	-
11.98	37.3	43.7	139.8	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	34	15	1.27	-	0.07	51.2
12.14	44.3	51.5	145.6	1.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	22	26	-	-	3.1	9.9	31	15	0.99	-	0.07	30.6
12.30	45.3	52.4	148.7	1.7	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	23	26	-	-	3.2	9.9	31	15	0.85	-	0.07	26.7
12.47	38.8	44.5	142.0	1.5	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	34	15	1.18	-	0.07	50.3
12.63	33.2	40.9	-	1.3	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.07	-
12.80	31.0	42.2	-	1.2	-0.2	4.1	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.2	9.9	36	15	-	-	0.06	-
12.96	43.4	48.9	125.4	1.2	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	22	24	-	-	3.0	9.9	29	15	1.92	-	0.06	45.5
13.12	32.8	39.2	-	1.2	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.3	9.9	35	15	-	-	0.06	-
13.29	27.3	35.8	-	1.0	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	37	15	-	-	0.06	-
13.45	26.6	34.4	-	0.9	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	13	17	-	-	1.8	9.9	36	15	-	-	0.06	-
13.62	28.1	36.0	-	1.1	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	2.0	9.9	38	15	-	-	0.06	-
13.78	41.8	45.7	122.0	1.2	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	2.9	9.9	30	15	1.99	-	0.06	49.3
13.94	28.9	36.1	-	1.2	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	2.0	9.9	39	15	-	-	0.05	-
14.11	37.1	40.0	119.4	1.1	-0.1	3.1	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.6	9.9	33	15	2.02	-	0.05	51.2
14.27	33.6	38.0	-	1.2	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	35	15	-	-	0.05	-
14.44	28.8	34.7	-	1.1	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	2.0	9.9	39	15	-	-	0.05	-
14.60	26.6	31.7	-	1.0	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	13	16	-	-	1.8	9.9	40	15	-	-	0.05	-
14.76	24.8	29.2	-	1.0	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	12	15	-	-	1.7	9.9	42	15	-	-	0.05	-
14.93	24.7	28.8	-	0.9	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	12	14	-	-	1.7	9.9	41	15	-	-	0.05	-
15.09	26.4	30.5	-	0.9	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	13	15	-	-	1.8	9.9	39	15	-	-	0.05	-
15.26	30.1	34.3	-	1.0	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	15	17	-	-	2.1	9.9	37	15	-	-	0.05	-
15.42	31.5	35.5	-	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	18	-	-	2.2	9.9	37	15	-	-	0.05	-

` Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
15.58	31.9	35.6	-	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	18	-	-	2.2	9.9	37	15	-	-	0.05	-
15.75	33.5	37.0	-	1.4	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	38	15	-	-	0.05	-
15.91	38.6	40.4	-	1.5	0.0	4.0	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	36	15	-	-	0.05	-
16.08	41.0	44.4	-	1.8	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	21	22	-	-	2.9	9.9	36	15	-	-	0.05	-
16.24	59.9	60.2	141.4	1.8	0.0	3.1	4	clayy SILT to silty CLAY	115	2.0	30	30	-	-	4.2	9.9	27	15	1.31	-	0.05	22.3
16.40	91.8	91.9	134.3	1.6	-0.1	1.8	5	silty SAND to sandy SILT	120	4.0	23	23	64	43	-	-	16	16	1.65	-	0.04	15.2
16.57	109.1	108.6	139.4	1.5	-0.1	1.4	6	clean SAND to silty SAND	125	5.0	22	22	70	44	-	-	13	16	1.42	-	0.04	7.7
16.73	119.8	118.6	169.8	2.5	-0.3	2.1	5	silty SAND to sandy SILT	120	4.0	30	30	73	45	-	-	15	16	0.00	-	0.04	0.0
16.90	159.4	157.0	204.6	3.3	0.0	2.1	5	silty SAND to sandy SILT	120	4.0	40	39	82	46	-	-	13	16	0.00	-	0.04	0.0
17.06	150.7	147.7	203.2	3.5	0.2	2.3	5	silty SAND to sandy SILT	120	4.0	38	37	80	46	-	-	14	16	0.00	-	0.04	0.0
17.23	165.8	161.7	183.4	2.1	0.1	1.3	6	clean SAND to silty SAND	125	5.0	33	32	83	46	-	-	9	16	0.00	-	0.04	0.0
17.39	178.9	173.6	182.2	1.7	0.1	0.9	6	clean SAND to silty SAND	125	5.0	36	35	85	46	-	-	6	16	0.00	-	0.04	0.0
17.55	193.2	186.4	186.4	1.4	0.1	0.7	6	clean SAND to silty SAND	125	5.0	39	37	88	47	-	-	5	16	0.00	-	0.04	0.0
17.72	217.8	209.2	209.2	1.6	0.1	0.7	6	clean SAND to silty SAND	125	5.0	44	42	91	47	-	-	5	16	0.00	-	0.04	0.0
17.88	223.2	213.3	213.3	1.7	0.2	0.8	6	clean SAND to silty SAND	125	5.0	45	43	92	47	-	-	5	16	0.00	-	0.04	0.0
18.05	241.8	229.9	229.9	1.8	0.2	0.7	6	clean SAND to silty SAND	125	5.0	48	46	94	47	-	-	5	16	0.00	-	0.04	0.0
18.21	244.0	230.9	230.9	2.0	0.3	0.8	6	clean SAND to silty SAND	125	5.0	49	46	95	47	-	-	5	16	0.00	-	0.04	0.0
18.37	238.1	224.2	224.2	2.0	0.3	0.8	6	clean SAND to silty SAND	125	5.0	48	45	94	47	-	-	5	16	0.00	-	0.04	0.0
18.54	231.5	216.9	216.9	2.0	0.3	0.9	6	clean SAND to silty SAND	125	5.0	46	43	93	47	-	-	5	16	0.00	-	0.04	0.0
18.70	223.7	208.7	209.5	2.0	0.2	0.9	6	clean SAND to silty SAND	125	5.0	45	42	91	47	-	-	5	16	0.00	-	0.04	0.0
18.87	227.7	211.4	212.5	2.1	0.3	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.03	229.3	211.8	212.8	2.1	0.4	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.19	228.9	210.5	211.6	2.1	0.4	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.36	228.7	209.4	214.3	2.3	0.4	1.0	6	clean SAND to silty SAND	125	5.0	46	42	91	47	-	-	6	16	0.00	-	0.04	0.0
19.52	227.1	207.0	222.6	2.9	0.4	1.3	6	clean SAND to silty SAND	125	5.0	45	41	91	47	-	-	7	16	0.00	-	0.04	0.0
19.69	238.3	216.2	237.4	3.4	0.7	1.4	6	clean SAND to silty SAND	125	5.0	48	43	92	47	-	-	8	16	0.00	-	0.04	0.0
19.85	261.6	236.3	250.7	3.5	0.3	1.3	6	clean SAND to silty SAND	125	5.0	52	47	95	47	-	-	7	16	0.00	-	0.04	0.0
20.01	249.1	224.1	243.4	3.5	0.1	1.4	6	clean SAND to silty SAND	125	5.0	50	45	94	47	-	-	8	16	0.00	-	0.04	0.0
20.18	256.1	229.3	243.5	3.3	0.0	1.3	6	clean SAND to silty SAND	125	5.0	51	46	94	47	-	-	7	16	0.00	-	0.04	0.0
20.34	262.3	233.9	243.2	3.1	0.0	1.2	6	clean SAND to silty SAND	125	5.0	52	47	95	47	-	-	6	16	0.00	-	0.04	0.0
20.51	260.2	231.0	236.6	2.9	0.0	1.1	6	clean SAND to silty SAND	125	5.0	52	46	95	47	-	-	6	16	0.00	-	0.04	0.0
20.67	264.0	233.4	238.8	2.9	0.1	1.1	6	clean SAND to silty SAND	125	5.0	53	47	95	47	-	-	6	16	0.00	-	0.04	0.0
20.83	270.0	237.6	240.2	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	54	48	95	47	-	-	5	16	0.00	-	0.04	0.0
21.00	280.2	245.6	245.3	2.9	-0.2	1.0	6	clean SAND to silty SAND	125	5.0	56	49	95	47	-	-	5	16	0.00	-	0.04	0.0
21.16	270.1	235.8	240.2	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	54	47	95	47	-	-	6	16	0.00	-	0.04	0.0
21.33	258.7	224.9	233.1	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	52	45	94	47	-	-	6	16	0.00	-	0.04	0.0
21.49	239.7	207.5	221.2	2.9	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	48	42	91	47	-	-	7	16	0.00	-	0.04	0.0
21.65	225.4	194.4	209.8	2.7	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	45	39	89	46	-	-	7	16	0.00	-	0.04	0.0
21.82	234.4	201.3	214.0	2.7	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	47	40	90	46	-	-	7	16	0.00	-	0.04	0.0
21.98	248.7	212.7	223.9	2.9	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	50	43	92	47	-	-	7	16	0.00	-	0.04	0.0
22.15	253.2	215.7	225.8	2.9	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	51	43	92	47	-	-	6	16	0.00	-	0.04	0.0
22.31	252.8	214.6	225.0	2.9	-0.3	1.2	6	clean SAND to silty SAND	125	5.0	51	43	92	47	-	-	6	16	0.00	-	0.04	0.0
22.47	274.9	232.4	237.0	3.0	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	55	46	95	47	-	-	6	16	0.00	-	0.04	0.0
22.64	279.0	234.9	236.8	2.9	-0.3	1.0	6	clean SAND to silty SAND	125	5.0	56	47	95	47	-	-	5	16	0.00	-	0.04	0.0
22.80	272.9	228.9	236.7	3.1	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	55	46	94	47	-	-	6	16	0.00	-	0.04	0.0
22.97	265.8	222.1	229.6	2.9	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	53	44	93	47	-	-	6	16	0.00	-	0.04	0.0
23.13	269.1	224.0	228.0	2.8	-0.4	1.0	6	clean SAND to silty SAND	125	5.0	54	45	94	47	-	-	6	16	0.00	-	0.04	0.0
23.30	270.6	224.5	224.5	2.5	-0.4	0.9	6	clean SAND to silty SAND	125	5.0	54	45	94	47	-	-	5	16	0.00	-	0.04	0.0
23.46	285.7	236.1	236.1	2.3	-0.4	0.8	6	clean SAND to silty SAND	125	5.0	57	47	95	47	-	-	5	16	0.00	-	0.04	0.0
23.62	306.0	251.9	251.9	2.4	-0.5	0.8	6	clean SAND to silty SAND	125	5.0	61	50	95	47	-	-	5	16	0.00	-	0.04	0.0
23.79	310.2	254.4	254.4	2.4	-0.7	0.8	6	clean SAND to silty SAND	125	5.0	62	51	95	47	-	-	5	16	0.00	-	0.04	0.0
23.95	316.5	258.6	258.6	2.4	-0.7	0.8	6	clean SAND to silty SAND	125	5.0	63	52	95	47	-	-	5	16	0.00	-	0.04	0.0
24.12	328.6	267.6	267.6	2.8	-0.7	0.9	6	clean SAND to silty SAND	125	5.0	66	54	95	47	-	-	5	16	0.00	-	0.04	0.0
24.28	362.6	294.2	294.2	3.5	-0.8	1.0	6	clean SAND to silty SAND	125	5.0	73	59	95	48	-	-	5	16	0.00	-	0.04	0.0
24.44	406.0	328.3	328.3	3.6	-0.8	0.9	6	clean SAND to silty SAND	125	5.0	81	66	95	48	-	-	5	16	0.00	-	0.04	0.0
24.61	463.9	373.8	373.8	3.2	-0.9	0.7	6	clean SAND to silty SAND	125	5.0	93	75	95	48	-	-	5	16	0.00	-	0.04	0.0
24.77	528.6	424.4	424.4	2.4	-0.9	0.5	7	grvly SAND to dense SAND	130	6.0	88	71	95	48	-	-	5	16	0.00	-	0.04	0.0
24.94	550.5	440.3	440.3	3.5	-0.9	0.6	7	grvly SAND to dense SAND	130	6.0	92	73	95	48	-	-	5	16	0.00	-	0.04	0.0
25.10	505.4	402.8	402.8	3.6	-0.4	0.7	6	clean SAND to silty SAND	125	5.0	100	81	95	48	-	-	5	16	0.00	-	0.04	0.0
25.26	432.6	343.6	343.6	2.6	-0.6	0.6	6	clean SAND to silty SAND	125	5.0	87	69	95	48	-	-	5	16	0.00	-	0.04	0.0
25.43	364.3	288.4	288.4	2.1	-0.2	0.6	6	clean SAND to silty SAND	125	5.0	73	58	95	48	-	-	5	16	0.00	-	0.04	0.0
25.59	326.5	257.6	257.6	1.7	-0.3	0.5	6	clean SAND to silty SAND	125	5.0	65	52	95	47	-	-	5	16	0.00	-	0.04	0.0
25.76	328.3	258.1	258.1	1.5	-0.3	0.5	6	clean SAND to silty SAND	125	5.0	66	52	95	47	-	-	5	16	0.00	-	0.04	0.0
25.92	369.8	289.8	289.8	1.6	-0.3	0.4	7	grvly SAND to dense SAND	130	6.0	62	48	95	48	-	-	5	16	0.00	-	0.04	0.0
26.08	403.2	314.8	314.8	3.9	-0.3	1.0	6	clean SAND to silty SAND	125	5.0	81	63	95	48	-	-	5	16	0.00	-	0.04	0.0
26.25	438.6	341.4	341.4	1.8	-0.6	0.4	7	grvly SAND to dense SAND	130	6.0	73	57	95	48	-	-	5	16	0.00	-	0.04	0.0
26.41	487.1	377.8	377.8	6.0	-0.8	1.2	6	clean SAND to silty SAND	125	5.0	97	76	95	48	-	-	5	16	0.00	-	0.04	0.0
26.58	533.3	412.4	412.4	6.5	-1.1	1.2	6	clean SAND to silty SAND	125	5.0	100	82	95	48	-	-	5	16	0.00	-	0.04	0.0
26.74	352.1	271.3	314.9	7.5	-1.0	2.2	6	clean SAND to silty SAND	125	5.0	70	54	95	47	-	-	10	16	0.00	-	0.04	0.0
26.90	376.7	289.4	321.0	7.0	-1.0	1.9	6	clean SAND to silty SAND	125	5.0	75	58	95	48	-	-	8	16	0.00	-	0.04	0.0
27.07	359.0	274.9	309.3	6.9	-0.9	1.9	6	clean SAND to silty SAND	125	5.0	72	55	95	47	-	-	9	16	0.00	-	0.04	0.0
27.23	358.0	273.3	295.4	5.8	-0.9	1.6	6	clean SAND to silty SAND	125	5.0	72	55	95	47	-	-	7	16	0.00	-	0.04	0.0
27.40	331.7	252.4	276.4	5.3	-1.2	1.6	6	clean SAND to silty SAND	125	5.0	66	50	95	47	-	-	8	16	0.00	-	0.04	0.0
27.56	336.4	255.2	277.7	5.3	-1.3	1.6	6	clean SAND to silty SAND	125	5.0	67	51	95	47	-	-	8	16	0.00	-	0.04	0.0
27.72	324.6	245.4	277.1	5.8	-1.2	1.8	6	clean SAND to silty SAND	125	5.0	65	49	95	47	-	-	9	16	0.00	-	0.04	0.0
27.89	316.9	238.9	271.1	5.7	-1.2	1.8	6	clean SAND to silty SAND	125	5.0	63	48	95	47	-	-	9	16	0.00	-	0.04	0.0
28.05	339.2	254.9	260.5	4.0	-1.2	1.2	6	clean SAND to silty SAND	125	5.0	68	51	95	47	-	-	6	16	0.00	-	0.04	0.0
28.22	388.3	290.9	290.9	3.5	-1.2	0.9	6	clean SAND to silty SAND	125	5.0	78	58	95	48	-	-	5	16	0.00	-	0.04	0.0
28.38	399.1	298.1	298.1	3.2	-1.3	0.8	6	clean SAND to silty SAND	125	5.0	80	60	95	48	-	-	5	16	0.00	-	0.04	0.0
28.54	426.3	317.5	317.5	2.9	-1.4	0.7	6	clean SAND to silty SAND	125	5.0	85	63	95	48	-	-	5	16	0.00	-	0.04	0.0
28.71	440.0	326.7	325.7	5.7	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	88	65	95	48	-	-	5	16	0.00	-	0.04	0.0
28.87	501.8	371.5	371.5	6.5	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	100	74	95	48	-	-	5	16	0.00	-	0.04	0.0
29.04	494.6	365.0	398.0	10.0	-1.4	2.0	6	clean SAND to silty SAND	125	5.0	99	73	95	48	-	-	8	16	0.00	-	0.04	0.0
29.20	326.6	240.4	290.8	7.5	-1.3	2.3	6	clean SAND to silty SAND	125	5.0	65	48	95	47	-	-	11	16	0.00	-	0.04	0.0
29.36	241.4	177.1	218.1	4.6	-0.5	1.9	6	clean SAND to silty SAND	125	5.0	48	35	86	45	-	-	11	16	0.00	-	0.04	0.0
29.53	218.9	160.2	198.6	4.0	-1.3	1.8	6	clean SAND to silty SAND	125	5.0	44	32	83	45	-	-	12	16	0.00	-	0.04	0.0
29.69	208.1	151.8	192.0	3.8	-1.4	1.9	6	clean SAND to silty SAND	125	5.0	42	30	81	44	-	-	12	16	0.00	-	0.04	0.0
29.86	200.0	145.5	181.2	3.4	-1.6	1.7	6	clean SAND to silty SAND	125	5.0	40	29	79	44	-	-	12	16	0.00	-	0.04	0.0
30.02	185.6	134.6	161.7	2.5	-1.8	1.4	6	clean SAND to silty SAND	125	5.0	37	27	77	44	-	-	11	16	0.00	-	0.04	0.0
30.19	195.7	141.6	172.4	3.0	-1.9	1.5	6	clean SAND to silty SAND	125	5.0	39	28	78	44	-	-	11	16	0.00	-	0.04	0.0
30.35	234.0	168.8	201.1	3.8	-2.9	1.7	6	clean SAND to silty SAND	125	5.0	47	34	84	45	-	-	10	16	0.00	-	0.04	0.0
30.51	268.0	192.7	218.3	4.0	-3.1	1.5	6	clean SAND to silty SAND	125	5.0	54	39	89	46	-	-	9	16	0.00	-	0.04	0.0
30.68	263.9	189.3	209.2	3.5	-3.1	1.3	6	clean SAND to silty SAND	125	5.0	53	38	88	45	-	-	8	16	0.00	-	0.04	0.0
30.84	262.2	187.5	209.5	3.6	-3.1	1.4	6	clean SAND to silty SAND	125	5.0	52	38	88	45	-	-	8	16	0.00	-	0.04	0.0

' Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
31.01	261.2	186.3	215.4	4.1	-3.0	1.6	6	clean SAND to silty SAND	125	5.0	52	37	88	45	-	-	10	16	0.00	-	0.04	0.0
31.17	250.8	178.4	212.1	4.3	-3.0	1.7	6	clean SAND to silty SAND	125	5.0	50	36	86	45	-	-	10	16	0.00	-	0.04	0.0
31.33	236.4	167.7	205.6	4.3	-3.0	1.8	6	clean SAND to silty SAND	125	5.0	47	34	84	45	-	-	11	16	0.00	-	0.04	0.0
31.50	227.6	161.0	204.6	4.5	-3.0	2.0	6	clean SAND to silty SAND	125	5.0	46	32	83	45	-	-	12	16	0.00	-	0.04	0.0
31.66	161.5	113.9	194.8	4.9	-2.8	3.0	5	silty SAND to sandy SILT	120	4.0	40	28	71	43	-	-	20	16	0.00	-	0.04	0.0
31.83	81.0	42.5	-	4.0	-2.6	5.1	3	silty CLAY to CLAY	115	1.5	54	28	-	-	5.6	9.9	39	15	-	-	0.04	-
31.99	49.9	26.1	-	2.5	-2.6	5.2	3	silty CLAY to CLAY	115	1.5	33	17	-	-	3.5	9.9	48	15	-	-	0.04	-
32.15	41.3	21.5	-	1.1	-2.5	2.9	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	2.8	9.9	43	15	-	-	0.04	-
32.32	40.4	20.9	-	1.0	-2.3	2.7	4	clayy SILT to silty CLAY	115	2.0	20	10	-	-	2.8	9.9	42	15	-	-	0.04	-
32.48	42.3	21.7	-	1.1	-2.2	2.7	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	2.9	9.9	41	15	-	-	0.04	-
32.65	50.4	25.8	-	1.1	-2.0	2.2	4	clayy SILT to silty CLAY	115	2.0	25	13	-	-	3.5	9.9	36	15	-	-	0.04	-
32.81	55.0	38.2	99.3	1.2	-1.9	2.2	5	silty SAND to sandy SILT	120	4.0	14	10	35	37	-	-	29	16	2.35	-	0.04	51.2
32.97	54.0	27.4	-	1.4	-1.9	2.7	4	clayy SILT to silty CLAY	115	2.0	27	14	-	-	3.7	9.9	37	15	-	-	0.03	-
33.14	53.4	27.0	-	1.4	-1.9	2.8	4	clayy SILT to silty CLAY	115	2.0	27	13	-	-	3.7	9.9	38	15	-	-	0.03	-
33.30	57.3	39.5	98.1	1.2	-1.9	2.1	5	silty SAND to sandy SILT	120	4.0	14	10	36	37	-	-	28	16	2.37	-	0.03	51.2
33.47	57.2	28.6	-	1.5	-1.8	2.8	4	clayy SILT to silty CLAY	115	2.0	29	14	-	-	4.0	9.9	36	15	-	-	0.03	-
33.63	55.7	27.7	-	1.7	-1.9	3.1	4	clayy SILT to silty CLAY	115	2.0	28	14	-	-	3.9	9.9	39	15	-	-	0.03	-
33.79	60.8	30.1	-	1.8	-1.9	3.0	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.2	9.9	37	15	-	-	0.03	-
33.96	59.0	29.1	-	1.7	-1.9	3.0	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.1	9.9	37	15	-	-	0.03	-
34.12	58.1	28.5	-	1.7	-1.8	3.1	4	clayy SILT to silty CLAY	115	2.0	29	14	-	-	4.0	9.9	38	15	-	-	0.03	-
34.29	60.4	29.5	-	1.7	-1.7	3.0	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.2	9.9	37	15	-	-	0.03	-
34.45	76.9	52.1	118.1	1.8	-1.7	2.5	5	silty SAND to sandy SILT	120	4.0	19	13	45	39	-	-	26	16	2.04	-	0.03	41.9
34.61	81.9	55.3	120.2	1.9	-1.6	2.4	5	silty SAND to sandy SILT	120	4.0	20	14	47	39	-	-	25	16	2.01	-	0.03	38.5
34.78	77.9	52.5	123.2	2.0	-1.6	2.6	5	silty SAND to sandy SILT	120	4.0	19	13	46	39	-	-	27	16	1.97	-	0.02	41.4
34.94	72.0	48.4	124.8	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	36	24	-	-	5.0	9.9	29	15	1.95	-	0.02	45.9
35.11	70.2	47.1	123.6	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	35	24	-	-	4.9	9.9	29	15	1.96	-	0.02	47.6
35.27	68.6	45.9	123.4	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.8	9.9	30	15	1.97	-	0.01	49.0
35.43	64.9	30.7	-	2.0	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.5	9.9	37	15	-	-	0.01	-
35.60	63.9	30.1	-	1.9	-1.6	3.0	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.4	9.9	37	15	-	-	0.01	-
35.76	64.0	30.0	-	1.9	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.4	9.9	37	15	-	-	0.01	-
35.93	65.5	30.6	-	1.9	-1.6	3.0	4	clayy SILT to silty CLAY	115	2.0	33	15	-	-	4.5	9.9	37	15	-	-	0.01	-
36.09	65.4	30.4	-	1.8	-1.5	2.9	4	clayy SILT to silty CLAY	115	2.0	33	15	-	-	4.5	9.9	36	15	-	-	0.01	-
36.26	62.7	29.0	-	1.8	-1.5	2.9	4	clayy SILT to silty CLAY	115	2.0	31	15	-	-	4.4	9.9	37	15	-	-	0.01	-
36.42	62.0	28.6	-	1.7	-1.4	2.9	4	clayy SILT to silty CLAY	115	2.0	31	14	-	-	4.3	9.9	37	15	-	-	0.01	-
36.58	59.6	27.3	-	1.8	-1.4	3.1	4	clayy SILT to silty CLAY	115	2.0	30	14	-	-	4.1	9.9	39	15	-	-	0.01	-
36.75	58.6	26.8	-	1.7	-1.5	3.1	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.1	9.9	39	15	-	-	0.01	-
36.91	70.3	46.1	120.3	1.9	-1.4	2.8	4	clayy SILT to silty CLAY	115	2.0	35	23	-	-	4.9	9.9	29	15	2.01	-	0.01	48.8
37.08	68.0	30.8	-	2.0	-1.4	3.1	4	clayy SILT to silty CLAY	115	2.0	34	15	-	-	4.7	9.9	37	15	-	-	0.01	-
37.24	64.7	29.2	-	2.0	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.5	9.9	39	15	-	-	0.01	-
37.40	60.2	27.0	-	2.0	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	41	15	-	-	0.01	-
37.57	56.3	25.1	-	1.9	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	28	13	-	-	3.9	9.9	42	15	-	-	0.01	-
37.73	64.8	28.9	-	2.0	-1.2	3.1	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.5	9.9	38	15	-	-	0.01	-
37.90	68.3	30.2	-	2.0	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	34	15	-	-	4.7	9.9	37	15	-	-	0.01	-
38.06	63.1	27.8	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.4	9.9	39	15	-	-	0.01	-
38.22	63.1	27.7	-	1.9	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.4	9.9	39	15	-	-	0.01	-
38.39	60.4	26.4	-	1.9	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	40	15	-	-	0.01	-
38.55	57.3	24.9	-	1.8	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.0	9.9	41	15	-	-	0.01	-
38.72	58.2	25.3	-	1.8	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.0	9.9	41	15	-	-	0.01	-
38.88	57.4	24.8	-	1.7	-1.2	3.0	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.0	9.9	40	15	-	-	0.01	-
39.04	58.2	25.0	-	1.6	-1.1	2.9	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.0	9.9	39	15	-	-	0.01	-
39.21	55.0	23.6	-	1.7	-1.1	3.3	4	clayy SILT to silty CLAY	115	2.0	27	12	-	-	3.8	9.9	42	15	-	-	0.01	-
39.37	51.8	22.1	-	1.8	-1.2	3.7	3	silty CLAY to CLAY	115	1.5	35	15	-	-	3.6	9.9	46	15	-	-	0.01	-
39.54	56.1	23.9	-	1.7	-1.1	3.2	4	clayy SILT to silty CLAY	115	2.0	28	12	-	-	3.9	9.9	42	15	-	-	0.01	-
39.70	59.9	25.4	-	2.2	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.1	9.9	43	15	-	-	0.01	-
39.86	60.9	25.7	-	2.3	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	44	15	-	-	0.01	-
40.03	59.4	24.9	-	2.2	-0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	30	12	-	-	4.1	9.9	44	15	-	-	0.01	-
40.19	56.3	23.6	-	2.0	-0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	28	12	-	-	3.9	9.9	45	15	-	-	0.01	-
40.36	53.6	22.3	-	1.8	-0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	45	15	-	-	0.01	-
40.52	53.4	22.2	-	1.8	-0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	45	15	-	-	0.01	-
40.68	55.0	22.7	-	1.9	-0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	44	15	-	-	0.01	-
40.85	53.9	22.2	-	2.0	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	36	15	-	-	3.7	9.9	47	15	-	-	0.01	-
41.01	53.2	21.8	-	1.9	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	35	15	-	-	3.7	9.9	46	15	-	-	0.01	-
41.18	51.5	21.0	-	1.9	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	47	15	-	-	0.01	-
41.34	54.7	22.3	-	1.9	-0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	45	15	-	-	0.01	-
41.50	51.5	20.9	-	1.8	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	47	15	-	-	0.01	-
41.67	43.0	17.4	-	1.7	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	29	12	-	-	2.9	9.9	53	15	-	-	0.01	-
41.83	40.9	16.5	-	1.5	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	27	11	-	-	2.8	9.9	53	15	-	-	0.01	-
42.00	41.5	16.7	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.9	52	15	-	-	0.01	-
42.16	47.6	19.0	-	1.6	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	48	15	-	-	0.01	-
42.32	48.5	19.3	-	1.9	-0.3	4.0	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	50	15	-	-	0.01	-
42.49	55.6	22.0	-	1.8	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.8	9.9	45	15	-	-	0.01	-
42.65	60.6	23.9	-	2.0	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	30	12	-	-	4.2	9.9	43	15	-	-	0.01	-
42.82	54.0	21.2	-	2.0	-0.3	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	47	15	-	-	0.01	-
42.98	53.4	21.0	-	2.4	-0.2	4.7	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	51	15	-	-	0.01	-
43.15	55.4	21.7	-	2.4	-0.2	4.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	50	15	-	-	0.01	-
43.31	63.6	24.8	-	2.3	4.1	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	43	15	-	-	0.01	-
43.47	65.4	25.4	-	2.2	4.4	3.5	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.5	9.9	42	15	-	-	0.01	-
43.64	67.7	26.2	-	2.3	4.5	3.5	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	41	15	-	-	0.01	-
43.80	61.1	23.5	-	2.3	4.6	4.0	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	46	15	-	-	0.01	-
43.97	54.7	21.0	-	2.1	4.6	4.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	48	15	-	-	0.01	-
44.13	50.7	19.4	-	1.9	4.6	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.9	49	15	-	-	0.01	-
44.29	55.5	21.2	-	1.9	4.7	3.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	46	15	-	-	0.01	-
44.46	54.4	20.7	-	1.8	4.8	3.6	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	46	15	-	-	0.01	-
44.62	50.7	19.2	-	1.9	4.8	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.9	50	15	-	-	0.01	-
44.79	53.4	20.1	-	1.8	4.8	3.6	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.7	9.9	47	15	-	-	0.01	-
44.95	64.7	24.4	-	2.1	5.0	3.3	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	42	15	-	-	0.01	-
45.11	59.8	22.6	-	2.1	5.2	3.6	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	45	15	-	-	0.01	-
45.28	54.8	20.7	-	2.0	5.2	3.9	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	48	15	-	-	0.01	-
45.44	52.9	19.9	-	2.0	5.4	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
45.61	56.6	21.4	-	2.0	5.6	3.7	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	46	15	-	-	0.01	-
45.77	60.2	22.7	-	2.2	5.8	3.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	45	15	-	-	0.01	-
45.93	56.9	21.5	-	2.1	5.8	3.9	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	47	15	-	-	0.01	-
46.10	52.2	19.7	-	1.9	5.9	3.9	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
46.26	56.8	21.5	-	2.3	6.1	4.2	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	48	15	-	-	0.01	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
46.43	62.5	23.6	-	2.5	6.1	4.1	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
46.59	77.4	29.2	-	2.6	6.5	3.4	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	39	15	-	-	0.01	-
46.75	70.3	26.5	-	2.5	6.8	3.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.9	9.9	42	15	-	-	0.01	-
46.92	62.8	23.7	-	2.4	6.9	4.0	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
47.08	65.9	24.9	-	2.3	7.1	3.7	4	clayy SILT to silty CLAY	115	2.0	33	12	-	-	4.6	9.9	43	15	-	-	0.01	-
47.25	64.8	24.4	-	2.4	7.3	3.9	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
47.41	66.3	25.0	-	2.5	7.4	4.0	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	44	15	-	-	0.01	-
47.57	65.3	24.6	-	2.4	7.5	3.9	4	clayy SILT to silty CLAY	115	2.0	33	12	-	-	4.5	9.9	44	15	-	-	0.01	-
47.74	57.4	21.7	-	2.3	7.5	4.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	4.0	9.9	48	15	-	-	0.01	-
47.90	54.7	20.7	-	2.2	7.5	4.3	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	50	15	-	-	0.01	-
48.07	56.2	21.2	-	2.2	7.6	4.2	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.9	9.9	49	15	-	-	0.01	-
48.23	53.0	20.0	-	2.2	7.7	4.4	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	51	15	-	-	0.01	-
48.39	47.6	18.0	-	2.1	7.8	4.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	54	15	-	-	0.01	-
48.56	49.9	18.8	-	2.0	8.0	4.2	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	9.9	51	15	-	-	0.01	-
48.72	55.3	20.9	-	2.0	8.1	3.8	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	47	15	-	-	0.01	-
48.89	52.7	19.9	-	2.0	8.3	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
49.05	54.6	20.6	-	1.9	8.6	3.7	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	47	15	-	-	0.01	-
49.22	55.8	21.1	-	2.1	8.7	3.9	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	47	15	-	-	0.01	-
49.38	56.6	21.4	-	2.2	8.8	4.2	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	48	15	-	-	0.01	-
49.54	60.2	22.7	-	2.6	9.0	4.5	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	48	15	-	-	0.01	-
49.71	70.0	26.4	-	2.4	9.2	3.7	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	42	15	-	-	0.01	-
49.87	73.7	27.8	-	2.7	9.8	3.8	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.01	-
50.04	66.3	25.0	-	2.8	10.1	4.4	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	46	15	-	-	0.01	-
50.20	66.7	25.2	-	2.7	10.5	4.2	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	45	15	-	-	0.01	-
50.36	69.8	26.3	-	2.8	10.9	4.1	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.8	9.9	44	15	-	-	0.01	-
50.53	77.1	29.1	-	2.7	11.2	3.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.9	40	15	-	-	0.01	-
50.69	73.5	27.7	-	2.9	11.4	4.1	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	43	15	-	-	0.01	-
50.86	73.0	27.6	-	3.0	11.5	4.3	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	44	15	-	-	0.01	-
51.02	80.8	30.5	-	3.1	11.7	4.0	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	41	15	-	-	0.01	-
51.18	87.2	32.9	-	3.6	11.9	4.3	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	41	15	-	-	0.01	-
51.35	76.5	28.9	-	3.7	12.1	5.0	3	silty CLAY to CLAY	115	1.5	51	19	-	-	5.3	9.9	46	15	-	-	0.01	-
51.51	65.5	24.7	-	3.5	12.2	5.6	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	50	15	-	-	0.01	-
51.68	77.4	29.2	-	3.4	12.5	4.6	3	silty CLAY to CLAY	115	1.5	52	19	-	-	5.4	9.9	44	15	-	-	0.01	-
51.84	72.6	27.4	-	3.3	12.7	4.8	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	46	15	-	-	0.01	-
52.00	60.4	22.8	-	2.8	13.0	4.9	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	50	15	-	-	0.01	-
52.17	57.9	21.8	-	2.4	13.3	4.4	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	49	15	-	-	0.01	-
52.33	53.7	20.3	-	2.1	13.6	4.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	49	15	-	-	0.01	-
52.50	47.8	18.0	-	1.9	13.8	4.2	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.5	52	15	-	-	0.01	-
52.66	45.9	17.3	-	1.7	14.1	3.9	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	9.1	52	15	-	-	0.01	-
52.82	46.0	17.4	-	1.6	14.3	3.8	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	9.1	51	15	-	-	0.01	-
52.99	50.3	19.0	-	1.9	14.6	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	9.9	50	15	-	-	0.01	-
53.15	54.2	20.5	-	2.0	14.7	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	48	15	-	-	0.01	-
53.32	54.3	20.5	-	2.0	16.2	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	48	15	-	-	0.01	-
53.48	53.6	20.2	-	1.8	16.6	3.6	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.7	9.9	47	15	-	-	0.01	-
53.64	56.8	21.4	-	1.8	17.1	3.4	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	45	15	-	-	0.01	-
53.81	57.1	21.5	-	2.1	17.4	3.8	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	47	15	-	-	0.01	-
53.97	59.9	22.6	-	2.2	17.6	3.9	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
54.14	59.6	22.5	-	2.3	17.8	4.1	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.01	-
54.30	64.1	24.2	-	2.4	18.1	4.0	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	45	15	-	-	0.01	-
54.46	65.1	24.6	-	2.5	18.3	4.0	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.5	9.9	45	15	-	-	0.01	-
54.63	65.5	24.7	-	2.5	18.5	4.0	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	45	15	-	-	0.01	-
54.79	64.2	24.2	-	2.4	18.8	3.9	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	45	15	-	-	0.01	-
54.96	62.6	23.6	-	2.2	19.1	3.8	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	45	15	-	-	0.01	-
55.12	60.2	22.7	-	2.3	19.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.01	-
55.28	62.5	23.6	-	2.2	19.6	3.6	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	44	15	-	-	0.01	-
55.45	59.9	22.6	-	2.2	20.0	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
55.61	59.5	22.5	-	2.1	20.5	3.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
55.78	57.9	21.8	-	2.2	23.5	4.0	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	47	15	-	-	0.01	-
55.94	54.6	20.6	-	2.2	24.1	4.3	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	50	15	-	-	0.01	-
56.11	62.1	23.4	-	2.3	24.6	3.9	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	45	15	-	-	0.01	-
56.27	61.7	23.3	-	2.4	25.1	4.0	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	46	15	-	-	0.01	-
56.43	63.1	23.8	-	2.3	25.4	3.9	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	45	15	-	-	0.01	-
56.60	64.9	24.5	-	2.4	26.0	3.8	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
56.76	68.4	25.8	-	2.4	26.5	3.7	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	43	15	-	-	0.01	-
56.93	64.2	24.2	-	2.5	26.8	4.1	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	46	15	-	-	0.01	-
57.09	62.5	23.6	-	2.4	27.2	4.1	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
57.25	64.8	24.4	-	2.2	27.8	3.6	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
57.42	64.6	24.4	-	2.6	28.1	4.3	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	46	15	-	-	0.01	-
57.58	62.9	23.7	-	2.6	28.6	4.4	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	47	15	-	-	0.01	-
57.75	62.0	23.4	-	2.6	29.7	4.4	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	48	15	-	-	0.01	-
57.91	58.8	30.9	41.2	0.0	30.1	0.1	6	clean SAND to silty SAND	125	5.0	12	6	28	34	-	-	14	16	4.84	-	0.01	51.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

APPENDIX B
LABORATORY TEST RESULTS

MAXIMUM DENSITY, OPTIMUM MOISTURE, WASH, & ATTERBERG LIMITS

Borehole No.	Sample No.	Depth (feet)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Atterberg Limits		
					Liquid Limit	Plastic Limit	Plasticity Index
A-11-201	B-0	0 – 5	-	-	52	25	27
A-11-204	B-0	0 – 5	121.5	10.0	54	26	28
A-11-206	B-0	0 – 5	-	-	62	21	41
A-11-209	B-0	0 – 5	-	-	36	14	22
A-11-211	B-0	0 – 5	-	-	37	16	21
A-11-216	B-0	0 – 5	-	-	46	16	30
A-11-217	B-0	0 – 5	-	-	50	29	21
A-11-218	B-0	0 – 5	-	-	50	23	27
A-11-221	B-0	0 – 5	133.0	6.5	-	-	-
A-11-224	B-0	0 – 5	-	-	48	17	31
A-11-225	B-0	0 – 5	-	-	57	26	31
A-11-230	B-0	0 – 5	112.0	14.5	51	23	28
A-11-231	B-0	0 – 5	-	-	32	16	16
A-11-233	B-0	0 – 5	-	-	49	18	31
A-11-239	B-0	0 – 5	122.0	13.5	-	-	-
A-11-240	B-0	0 – 5	-	-	40	16	24
A-11-243	B-0	0 – 5	-	-	40	17	23
A-11-246	B-0	0 – 5	115.0	13.0	-	-	-
A-11-249	B-0	0 – 5	-	-	39	17	22
A-11-250	B-0	0 – 5	101.5	17.0	-	-	-
A-11-254	B-0	0 – 5	108.0	11.5	40	15	25
A-11-257	B-0	0 – 5	114.0	9.0	-	-	-

EXPANSION INDEX

Borehole No.	Depth (feet)	Description	Expansion Index	Expansion Potential
A-11-201	15/20	Elastic Silt (MH)	126	High
A-11-206	0 – 5	Sandy Fat Clay (CH)	157	Very High
A-11-225	20/25	Elastic Silt (MH)	95	High
A-11-232	15/20	Fat Clay (CH)	118	High
A-11-254	45/50	Elastic Silt (MH)	98	High
A-11-258	0 – 5	Lean Clay with Sand (CL)	99	High

SOIL CORROSION TEST RESULTS

Borehole No.	Sample Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
A-11-201	0 – 5	CL	255	7.7	2,914	1,800
A-11-201	10	MH	220	7.9	980	1,616
A-11-203	10	CL	160	4.5	1,060	4,391
A-11-206	5	CH	280	5.0	1,160	1,498
HA-11-207	0 – 5	SM	1,103	7.4	437	300
A-11-210	5	MH	320	6.2	1,320	673
A-11-212	5	MH	300	7.4	980	1,340
A-11-214	10	CL	290	7.6	260	2,216
A-11-216	20	CL	270	6.8	550	1,084
HA-11-217	0 – 5	CL	122	7.2	8,636	540
A-11-219	40	MH	300	8.1	550	768
A-11-220	15	CL	540	7.2	380	505
A-11-221	0 – 5	SM	909	7.8	636	120
A-11-221	20	CL	440	7.5	390	845
A-11-222	5	CL	400	6.8	510	1,011
A-11-224	10	CL	210	7.2	1,180	3,824
A-11-225	10	MH	380	4.3	930	1,004
A-11-226	35	MH	240	5.9	1,550	1,616
A-11-228	5	CL	320	6.4	710	2,435
A-11-230	5	MH	420	3.5	1,350	1,760
A-11-232	10	CH	320	6.6	570	1,253
A-11-235	20	MH	300	6.9	500	2,119
HA-11-241	0 – 5	CL	1,706	7.9	2,857	120
A-11-244	5	CL	380	6.2	530	1,392
A-11-247	40	MH	300	6.5	1,840	1,561
HA-11-250	0 – 5	SM	2,260	7.8	3,751	180
A-11-254	5	MH	310	6.8	600	907
A-11-254	25	CH	280	6.6	1,200	1,163
A-11-255	0 – 5	CL	749	7.5	1,791	1,200
A-11-255	5	CL	290	7.4	780	1,254
A-11-258	20	CL	390	7.6	220	1,239
A-11-259	15	CL	900	7.2	430	402

SOIL CORROSION TEST RESULTS (CONTINUED)

Borehole No.	Sample Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
A-11-260	10	CH	140	6.1	3,260	4,642
A-11-261	20	MH	250	7.3	960	1,874
A-11-262	10	CL	220	6.5	230	3,143
A-11-264	15	MH	270	6.1	1,090	1,271

R-VALUE TEST RESULTS

Borehole No.	*Sample Depth (feet)*	*Soil Type*	*R-Value*
A-11-201	0 – 5	CH	12
HA-11-204	0 – 5	CH	28
A-11-206	0 – 5	CH	7
HA-11-207	0 – 5	SP	81
A-11-209	0 – 5	CL	7
A-11-211	0 – 5	CL	10
A-11-216	0 – 5	CL	8
HA-11-217	0 – 5	MH	20
HA-11-218	0 – 5	ML	20
A-11-224	0 – 5	CL	8
A-11-225	0 – 5	CH	30
A-11-230	0 – 5	CH	19
HA-11-231	0 – 5	CL	19
A-11-233	0 – 5	CL	6
A-11-235	0 – 5	SP-SM	64
A-11-240	0 – 5	CL	12
HA-11-241	0 – 5	ML	12
HA-11-243	0 – 5	CL	6
A-11-247	0 – 5	CL	7
A-11-249	0 – 5	CL	12
HA-11-250	0 – 5	SM	74
A-11-254	0 – 5	CL	6
A-11-255	0 – 5	CL	17
HA-11-257	0 – 5	CL	16

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-201	D-1	5	MH	27.0	121.5	>4.5								
A-11-201	S-2	10	MH	26.7						65/33/32	220	7.9	980	1616
A-11-201	D-3	15	MH	24.9	122.8	>4.5								
A-11-201	S-4	20	MH	23.4				0:4:96						
A-11-201	D-5	25	MH	24.5	122.9	>4.5								
A-11-201	S-6	30	MH	25.1										
A-11-202	S-1	5	CL	26.6				2:5:93						
A-11-202	D-2	10	CL	28.8	111.8	3.5								
A-11-202	S-3	15	CH	32.9						56/27/29				
A-11-202	D-4	20	CL	26.4	117.8	3.25								
A-11-202	S-5	25	CH	28.3										
A-11-202	D-6	30	CH	30.8	119.6	>4.5								
A-11-203	D-1	5	CL	28.7	119.7	>4.5								
A-11-203	S-2	10	CL	30.5							160	4.6	1060	4391
A-11-203	D-3	15	CL	31.7	118.2	>4.5								
A-11-203	S-4	20	CL	27.9										
A-11-203	D-5	25	MH	27.3	120.7	>4.5								
A-11-203	S-6	30	MH	28.2						63/33/30				
A-11-205	S-1	5	CH	33.0						69/36/33				
A-11-206	S-1	5	CH	29.2						64/29/35	280	5.0	1160	1498
A-11-206	D-2	10	CH	30.4	115.7	>4.5								
A-11-206	S-3	15	MH	28.7						67/33/34				
A-11-206	D-4	20	MH	23.8	121.7	>4.5								
A-11-206	S-5	25	MH	27.1										
A-11-206	D-6	30	MH	26.0	120.5	>4.5								
A-11-209	S-1	5	SC	12.2				8:59:33						
A-11-210	D-1	2.5	SC	12.9	126.6			1:66:33						
A-11-210	S-2	5	MH	28.7							320	6.2	1320	673
A-11-210	D-3	10	MH	26.7	118.7	>4.5								
A-11-210	S-4	15	MH	28.3				0:4:96		66/41/25				
A-11-210	D-5	20	MH	24.6	121.2	>4.5								
A-11-210	S-6	25	MH	25.8										
A-11-210	D-7	30	MH	23.7	125.8	>4.5								
A-11-210	S-8	35	MH	25.1										
A-11-210	D-9	40	MH	26.7	120.8	>4.5								
A-11-210	S-10	45	MH	24.2										
A-11-210	D-11	50	MH	24.3	122.5	>4.5								
A-11-211	S-1	2.5	SM to CL	22.5										
A-11-211	D-2	5	MH	28.4	118.9	>4.5								
A-11-211	S-3	10	MH	29.6				0:3:97		69/38/31				

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-211	D-4	15	MH	26.5	121.5	>4.5								
A-11-211	S-5	20	MH	34.2										
A-11-211	D-6	25	MH	24.3	121.7	>4.5								
A-11-211	S-7	30	MH	25.2										
A-11-212	D-1	2.5	SM	5.3	121.2			0:81:19						
A-11-212	S-2	5	MH	27.6							300	7.4	980	1340
A-11-212	D-3	10	MH	26.9	118.8	>4.5								
A-11-212	S-4	15	MH	26.6										
A-11-212	D-5	20	MH	26.3	121.1	>4.5								
A-11-212	S-6	25	MH	27.3										
A-11-212	D-7	30	MH	23.6	121.8	>4.5								
A-11-214	S-1	2.5	CL	10.7										
A-11-214	D-2	5	SC	5.3	119.7									
A-11-214	S-3	10	CL	21.5							290	7.6	260	2216
A-11-214	D-4	15	CH	21.0	118.5	>4.5								
A-11-214	S-5	20	CH	22.3						64/30/34				
A-11-214	D-6	25	CH	22.1	121.8	>4.5								
A-11-214	S-7	30	CH	30.2										
A-11-214	D-8	35	MH	25.8	121.6	>4.5								
A-11-214	S-9	40	MH	28.0						74/37/37				
A-11-214	D-10	45	MH	27.0	120.1	>4.5								
A-11-214	S-11	50	MH	25.8										
A-11-216	S-1	2.5	CL	13.0										
A-11-216	D-2	5	SM	3.9	118.6			26:60:14						
A-11-216	S-3	10	CL	24.7										
A-11-216	D-4	15	CH	31.2	119.4	3.25								
A-11-216	S-5	20	CL	26.2							270	6.8	550	1084
A-11-216	D-6	25	CL	27.5	119.8	2.25								
A-11-216	S-7	30	CH	23.8				0:11:89		54/21/33				
A-11-216	D-8	35	CH	21.1	123.7	4.0								
A-11-216	S-9	40	CL	25.4										
A-11-216	D-10	45	CL	23.1	123.6	2.25								
A-11-216	S-11	50	CL	23.9										
A-11-219	D-3	15	CH	25.7	122.9	>4.5								
A-11-219	S-4	20	MH	27.3				0:1:99		71/36/35				
A-11-219	D-5	25	MH	28.6	118.9	>4.5								
A-11-219	S-6	30	MH	26.2										
A-11-219	D-7	35	MH	28.7	116.6	>4.5								
A-11-219	S-8	40	MH	23.8							300	8.1	550	768

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-219	D-9	45	MH	24.7	121.1	>4.5								
A-11-219	S-10	50	MH	24.2										
A-11-219	D-11	55	MH	30.9	114.4	>4.5								
A-11-219	S-12	60	MH	30.8										
A-11-219	D-13	65	MH	24.7	123.6	>4.5								
A-11-219	S-14	70	MH	21.7										
A-11-219	D-15	75	MH	23.9	122.9	>4.5								
A-11-219	S-16	80	MH	20.8										
A-11-219	D-17	85	MH	22.9	122.7	>4.5								
A-11-219	S-18	90	MH	25.3										
A-11-220	S-1	5	CL	28.9										
A-11-220	D-2	10	CH	30.6	119.4	>4.5								
A-11-220	S-3	15	CL	29.9							540	7.2	380	505
A-11-220	D-4	20	CL	17.8	126.4	2.5								
A-11-220	S-5	25	CH	31.7				0:6:94		80/27/53				
A-11-220	D-6	30	CL	26.3	121.5	>4.5								
A-11-220	S-7	35	CL	34.3										
A-11-220	D-8	40	CH	30.4	117.4	>4.5								
A-11-220	S-9	45	MH	27.8										
A-11-220	D-10	50	MH	27.1	122.2									
A-11-220	S-11	55	MH	31.8				0:2:98		78/45/33				
A-11-220	D-12	60	MH	36.6	112.8	>4.5								
A-11-220	S-13	65	MH	25.0										
A-11-220	D-14	70	MH	22.3	123.7	>4.5								
A-11-220	S-15	75	MH	24.2										
A-11-220	D-16	80	MH	20.8	124.7	>4.5								
A-11-220	S-17	85	MH	23.0										
A-11-220	D-18	90	MH	24.8	123.7	>4.5								
A-11-221	S-2	10	ML	12.3										
A-11-221	D-3	15	CL/CH	15.1	131.1	>4.5								
A-11-221	S-4	20	CL	14.2						43/18/25	440	7.5	390	845
A-11-221	D-5	25	CH	35.7	116.9	3.75								
A-11-221	S-6	30	CL	18.1										
A-11-221	D-7	35	CH	11.7	134.9	>4.5								
A-11-221	S-8	40	CL	15.9						40/17/23				
A-11-221	D-9	45	SM	7.7	115.4			6:74:20						
A-11-221	S-10	50	CH	18.4										
A-11-221	D-11	55	CL	20.3	129.9	2.25								
A-11-221	S-12	60	CH	25.6										
A-11-221	D-13	65	SC to SM	12.2	121.7									

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-221	S-14	70	CL	26.7										
A-11-221	D-15	75	CH	24.9	123.7	2.5								
A-11-221	S-16	80	CH	37.9										
A-11-221	D-17	85	CH	33.9	117.7	4.5								
A-11-221	S-18	90	MH	26.0				0:5:95		64/34/30				
A-11-222	S-1	5	CL	14.0							400	6.8	510	1011
A-11-222	D-2	10	CL	14.8	122.2	>4.5								
A-11-222	D-4	20	CH	33.7	111.2	>4.5								
A-11-222	S-5	25	CH	11.4						84/37/47				
A-11-222	D-6	30	CL	14.1	130.3	>4.5								
A-11-222	S-7	35	CL	16.7										
A-11-222	D-8	40	SC to CL	12.6	131.4	3.5								
A-11-222	S-9	45	CL	16.8										
A-11-222	D-10	50	CL	23.5	118.5	1.5								
A-11-222	S-11	55	CL	25.5										
A-11-222	D-12	60	CL	24.4	124.8	1.75								
A-11-222	S-13	65	CL	26.7				0:18:82						
A-11-222	D-14	70	CL	24.5	128.1	2.25								
A-11-222	S-15	75	CL	28.0										
A-11-222	D-16	80	CL	27.4	123.5	0.75								
A-11-222	S-17	85	CH	33.1										
A-11-222	D-18	90	CH to MH	31.7	122.2	3.5 to >4.5								
A-11-224	D-1	5	SP-SM to CL	14.2	121.9	>4.5								
A-11-224	S-2	10	CL	12.5				0:13:87			210	7.2	1180	3824
A-11-224	D-3	15	SC	6.4	129.8									
A-11-224	S-4	20	CL	30.1										
A-11-224	D-5	25	CL	28.1	121.4	3.5								
A-11-224	S-6	30	CL	14.1				2:35:63		44/17/27				
A-11-224	D-7	35	CL	11.5	127.9									
A-11-224	S-8	40	CL	14.4										
A-11-224	D-9	45	SP-SM to SC to CL	16.5	129.5	4.5								
A-11-224	S-10	50	CL	25.8										
A-11-225	D-1	5	MH	26.2	119.2	>4.5								
A-11-225	S-2	10	MH	26.8						69/36/33	380	4.4	930	1004
A-11-225	D-3	15	MH	31.9	117.1	>4.5								
A-11-225	S-4	20	MH	33.0										
A-11-225	D-5	25	MH	26.2	126.7	>4.5								
A-11-225	S-6	30	MH	27.5						63/36/27				
A-11-226	D-1	2.5	CL/CH	23.8	117.7	>4.5								
A-11-226	S-2	5	MH	28.2										

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-226	D-3	10	MH	28.9	118.2	>4.5								
A-11-226	S-4	15	MH	27.0				0:8:92		60/31/29				
A-11-226	D-5	20	MH	28.1	118.8	>4.5								
A-11-226	S-6	25	MH	35.2										
A-11-226	D-7	30	MH	26.6	119.2	>4.5								
A-11-226	S-8	35	MH	25.6						58/31/27	240	6.0	1550	1616
A-11-226	D-9	40	MH	26.7	122.0	>4.5								
A-11-226	S-10	45	MH	28.7										
A-11-226	D-11	50	MH	25.2	120.3	>4.5								
A-11-228	S-1	5	CL	22.5							320	6.5	710	2435
A-11-228	D-2	10	ML	12.4	105.8	>4.5								
A-11-228	S-3	15	CL	12.4				0:14:86		40/16/24				
A-11-228	D-4	20	CL-ML	11.5	118.5	>4.5		0:22:78						
A-11-228	S-5	25	CL	10.0										
A-11-228	D-6	30	CL	10.6	126.8	>4.5								
A-11-228	S-7	35	CH	14.9						54/23/31				
A-11-228	D-8	36.5	CH	14.4	129.6	>4.5								
A-11-230	D-1	2.5	CH	22.7	122.4	>4.5								
A-11-230	S-2	5	CH	21.3							420	3.5	1350	1760
A-11-230	D-3	10	CH	26.8	117.9	>4.5								
A-11-230	S-4	15	MH	30.3				0:1:99		76/37/39				
A-11-230	D-5	20	MH	32.0	114.5	>4.5								
A-11-230	S-6	25	MH	30.5										
A-11-230	D-7	30	MH	23.7	114.1	>4.5								
A-11-230	S-8	35	MH	29.7						65/35/30				
A-11-230	D-9	40	MH	26.1	119.7	>4.5								
A-11-230	S-10	45	MH	30.3										
A-11-230	D-11	50	CH	19.5										
A-11-232	S-1	5	SP-SM	3.8				26:66:8						
A-11-232	D-2	10	SP-SM	2.4	115.4			34:55:11						
A-11-232	S-3	15	CH	33.0						69/32/37	320	6.6	570.0	1253
A-11-232	D-4	20	CH	34.3	114.4	>4.5								
A-11-232	S-5	25	MH	34.4										
A-11-232	D-6	30	MH	32.2	115.1	>4.5								
A-11-232	S-7	35	MH	28.9						70/36/34				
A-11-232	D-8	40	MH	36.6	112.2	>4.5								
A-11-232	S-9	45	MH	29.3										
A-11-232	D-10	50	MH	27.2	115.0	>4.5								
A-11-233	S-1	2.5	CL	14.6										
A-11-233	D-2	5	CL	21.3	155.1	3.0		0:13:87						

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-233	S-3	10	SC	14.2				1:50:49						
A-11-233	D-4	15	GP	1.0										
A-11-233	S-5	20	SP to CL	40.4										
A-11-233	D-6	25	CH	26.3	116.0	>4.5								
A-11-233	S-7	30	MH	26.3						58/30/28				
A-11-233	D-8	35	MH	26.7	121.1	>4.5								
A-11-233	S-9	40	MH	25.9				0:13:87						
A-11-233	D-10	45	MH	31.1	116.4	>4.5								
A-11-233	S-11	50	MH	26.7										
A-11-235	S-1	2.5	SM	6.4										
A-11-235	D-2	5	SP	1.2	100.5									
A-11-235	S-3	10	SP	1.5				0:97:3						
A-11-235	D-4	15	SP	4.0	101.4									
A-11-235	S-5	20	MH	40.6						72/38/34	300	6.9	500	2119
A-11-235	D-6	25	MH	34.3	112.0	>4.5								
A-11-235	S-7	30	MH	41.9				0:3:97						
A-11-235	D-8	35	MH	34.1	112.2	>4.5								
A-11-235	S-9	40	MH	32.9						64/35/29				
A-11-235	D-10	45	MH	29.2	115.1	>4.5								
A-11-235	S-11	50	MH	27.1										
A-11-239	S-1	2.5	CL	15.5				0:13:87						
A-11-239	D-2	5	CL	23.5	121.3	3.5				49/24/25				
A-11-240	D-1	2.5	CL	20.2	122.4	3.25								
A-11-240	S-2	5	CL	21.2				0:14:86		39/18/21				
A-11-244	S-1	5	CL	18.5						41/21/20	388	6.2	530	1392
A-11-244	D-2	10	CL	23.0	121.9	2.5								
A-11-244	S-3	15	SP-SM	2.0				0:95:5						
A-11-244	D-4	20	SP-SM	1.6	124.5									
A-11-244	S-5	25	SP-SM	21.1										
A-11-244	D-6	30	MH	28.5	118.4	>4.5				61/33/28				
A-11-246	S-1	5	ML	18.0				0:9:91						
A-11-246	D-2	10	ML	24.5	121.2	4.25								
A-11-246	S-3	15	SP	1.1				1:96:3						
A-11-246	D-4	20	SP	1.4	110.4									
A-11-246	S-5	25	SP	5.7										
A-11-246	D-6	30	CH	30.9		4.25				57/27/30				
A-11-247	D-1	5	ML	20.5	124.9	4.0								
A-11-247	S-2	10	ML	21.9				0:16:84						
A-11-247	D-3	15	CL	23.2	123.1	1.75								
A-11-247	S-4	20	SP	2.0				29:67:4						

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-247	D-5	25	SP	2.7	101.6									
A-11-247	S-6	30	SP	21.1										
A-11-247	D-7	35	MH	30.1	115.6	>4.5								
A-11-247	S-8	40	MH	33.4						71/39/32	300	6.5	1840	1561
A-11-247	D-9	45	MH	30.2	117.4	>4.5								
A-11-247	S-10	50	MH	26.4										
A-11-248	D-1	2.5	SC to CL	12.5	126.1			6:19:75						
A-11-248	S-2	5	CL	13.4						37/15/22				
A-11-249	S-1	2.5	ML to CL	18.9						43/15/28				
A-11-249	D-2	5	CL	14.6	131.8	>4.5		0:7:93						
A-11-253	S-1	2.5	ML	13.4										
A-11-253	D-2	5	CL-ML	6.7	118.2	4.5								
A-11-253	S-3	10	ML	17.8				0:10:90						
A-11-253	D-4	15	SM	4.1	113.8			0:86:14						
A-11-253	S-5	20	SP	9.5										
A-11-253	D-6	25	SP-SM	25.7	125.0									
A-11-253	S-7	30	MH	37.7										
A-11-253	D-8	35	MH	31.5	116.6	>4.5								
A-11-253	S-9	40	MH	32.5						67/33/34				
A-11-253	D-10	45	MH	32.5	113.9	>4.5								
A-11-253	S-11	50	MH	33.8										
A-11-254	D-1	2.5	CL	15.5	123.7	>4.5								
A-11-254	S-2	5	CL	19.5						45/18/27	310	6.8	600	907
A-11-254	D-3	10	SP	2.8	106.7									
A-11-254	S-4	15	SP-SM	12.7										
A-11-254	D-5	20	SM	12.9	124.4									
A-11-254	S-6	25	CH	33.8							280	6.6	1200	1163
A-11-254	D-7	30	MH	27.8	118.4	>4.5								
A-11-254	S-8	35	MH	28.4				0:4:96		60/37/23				
A-11-254	D-9	40	MH	34.9	111.7	>4.5								
A-11-254	S-10	45	MH	26.7										
A-11-254	D-11	50	MH	26.8	119.6	>4.5								
A-11-255	D-1	2.5	CL	10.2	126.2	>4.5								
A-11-255	S-2	5	CL	13.1				0:9:91			300	7.4	780	1254
A-11-255	D-3	10	CL	18.5	126.2	>4.5								
A-11-255	S-4	15	CL	22.3						41/21/20				
A-11-255	D-5	20	GP-GM	1.8										
A-11-255	S-6	25	SP-SM	10.0				31:63:6						
A-11-255	D-7	30	CL	27.8	116.6	4.0								

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

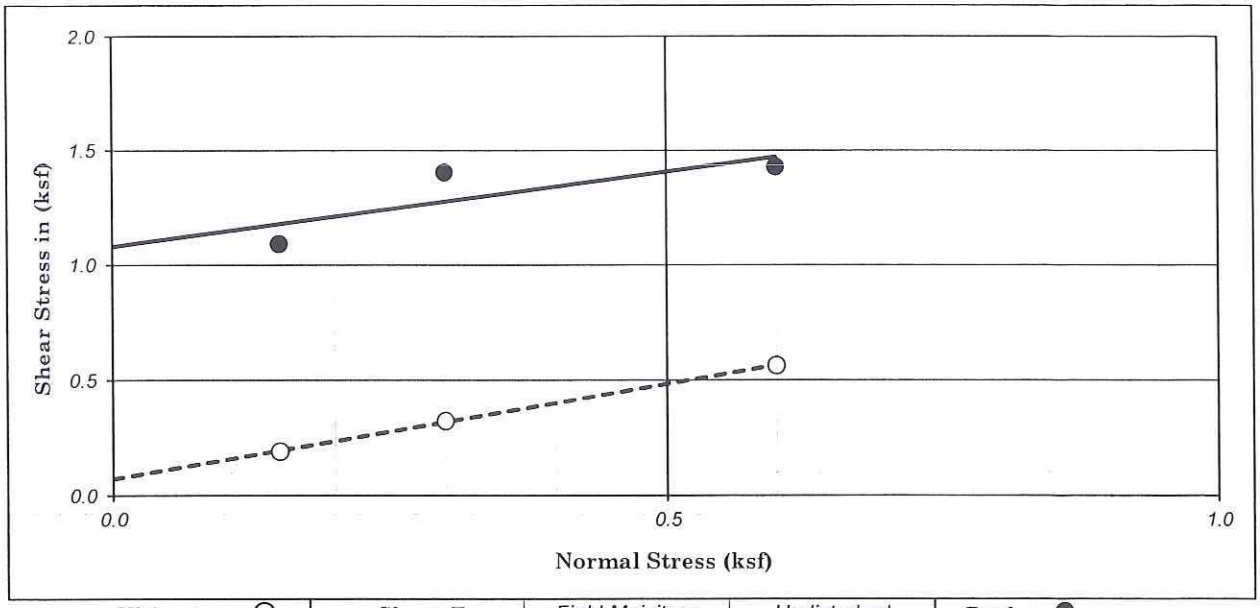
Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-256	S-1	2.5	CL	9.9				5:31:64						
A-11-256	D-2	5	CL	14.3	124.0	>4.5		1:15:84		42/19/23				
A-11-258	D-1	5	CL	20.3	118.0	>4.5								
A-11-258	S-2	10	CL	16.7				0:10:90		43/19/24				
A-11-258	D-3	15	CL	11.3	116.2	>4.5								
A-11-258	S-4	20	CL	16.0							390	7.6	220	1239
A-11-258	D-5	25	CL	13.5	115.2	2.0								
A-11-258	S-6	30	CL	23.1						41/22/19				
A-11-259	S-1	5	CL	4.6										
A-11-259	D-2	10	CL	13.8										
A-11-259	S-3	15	CL	13.0						36/19/17	900	7.2	430	402
A-11-259	D-4	20	CL	13.7	127.8	>4.5								
A-11-259	S-5	25	CL	20.4				0:13:87		35/21/14				
A-11-259	D-6	30	CL	22.8	113.1	3.50								
A-11-260	S-1	2.5	CL	21.7										
A-11-260	D-2	5	CL	25.9	110.7	3.0		3:10:87						
A-11-260	S-3	10	CH	29.7						60/28/32	140	6.2	3260	4642
A-11-260	D-4	15	MH	29.2	104.2	>4.5				55/36/19				
A-11-260	S-5	20	MH	39.4										
A-11-260	D-6	25	MH	26.8										
A-11-260	S-7	30	MH	26.1										
A-11-261	S-1	2.5	CL	31.6										
A-11-261	D-2	5	MH	28.3	116.4	>4.5								
A-11-261	S-3	10	MH	30.0				0:2:98		73/35/38				
A-11-261	D-4	15	MH	26.6	114.3	>4.5								
A-11-261	S-5	20	MH	25.8							250	7.3	960	1874
A-11-261	D-6	25	MH	24.0	110.3	4.5								
A-11-261	S-7	30	MH	25.3				0:2:98		54/31/23				
A-11-262	S-1	2.5	CL	16.4										
A-11-262	D-2	5	CL	11.7	121.2	>4.5								
A-11-262	S-3	10	CL	14.9						44/21/23	220	6.6	230	3143
A-11-262	D-4	15	ML to CL	15.3	121.9	>4.5				37/21/16				
A-11-262	S-5	20	ML	12.9										
A-11-262	D-6	25	ML	12.9	116.2	>4.5								
A-11-262	S-7	30	CH	18.4				0:2:98		74/32/42				
A-11-262	D-8	35	SP	1.1	100.2									
A-11-263	D-1	2.5	ML	12.3	116.7	>4.5								
A-11-263	S-2	5	CL	14.9				0:30:70						
A-11-263	D-3	10	CL	12.6	115.4	>4.5				29/19/10				
A-11-263	S-4	15	ML/CL	18.5										

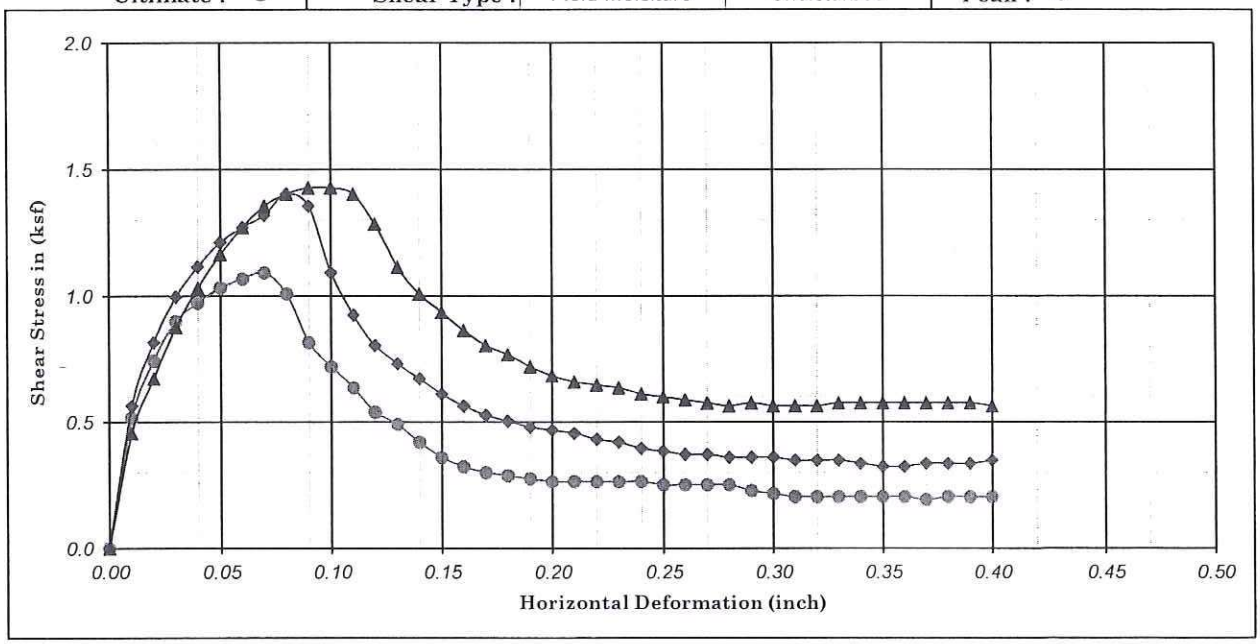
TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-263	D-5	20	SP	1.0	107.6									
A-11-263	S-6	25	SM	2.6				2:81:17						
A-11-263	D-7	30	CH	31.4	118.7	2.25				64/29/35				
A-11-263	S-8	35	MH	31.4						79/37/42				
A-11-264	S-1	5	MH	29.2						69/36/33				
A-11-264	D-2	10	MH	27.7	118.7	>4.5								
A-11-264	S-3	15	MH	31.2							270	6.1	1090	1271
A-11-264	D-4	20	MH	27.0	119.3	>4.5								
A-11-264	S-5	25	MH	27.0										
A-11-264	D-6	30	MH	25.7	119.0	>4.5								
A-11-264	D-7	40	MH	27.7	118.2	>4.5								
A-11-264	D-8	50	MH	26.4	120.3	>4.5								



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-210		Strength Intercept (C) :	1.08	(ksf)		0.07	(ksf)		
Sample No. : D-1			51.71	(kPa)	Peak	3.45	(kPa)	Ultimate	
Depth (ft/m) : 2.5	0.00	Friction Angle (ϕ) :	33.08	Degree		39.45	Degree		
Description : Pale brown, CLAYEY SAND (SC)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	12.74	117.84	18.55	0.43	0.15	7.18	1.09	52.28	0.19	9.19
◆	12.66	120.43	18.96	0.40	0.30	14.36	1.40	67.22	0.32	15.51
▲	13.45	114.73	18.06	0.47	0.60	28.73	1.43	68.37	0.56	27.00

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DIRECT SHEAR TEST (ASTM D-3080)

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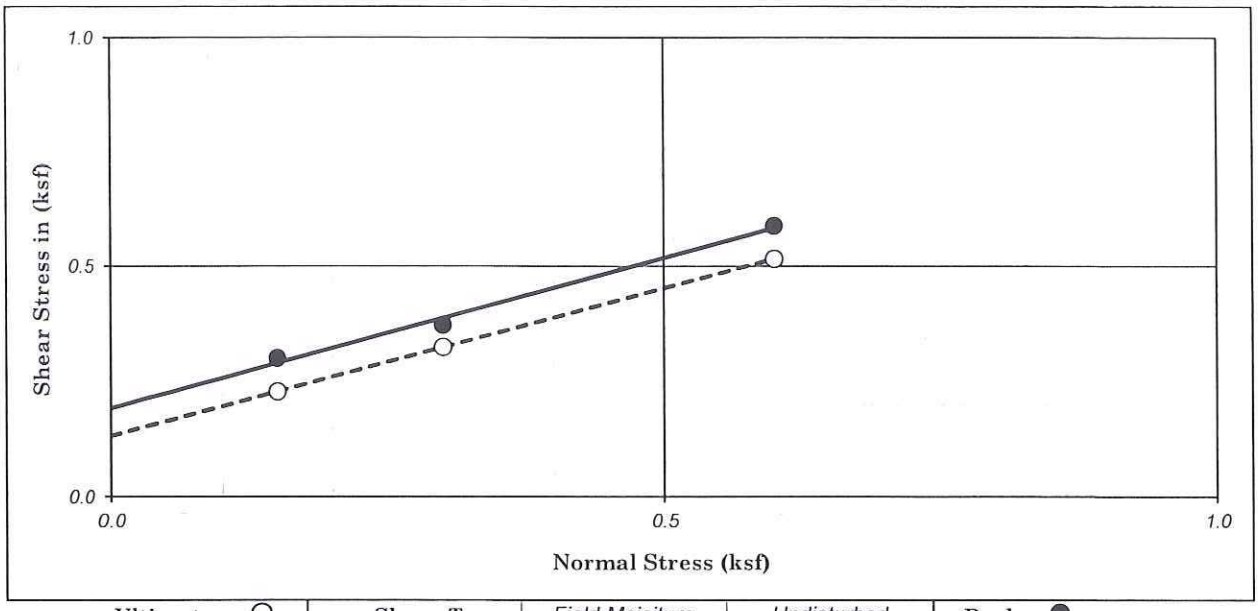
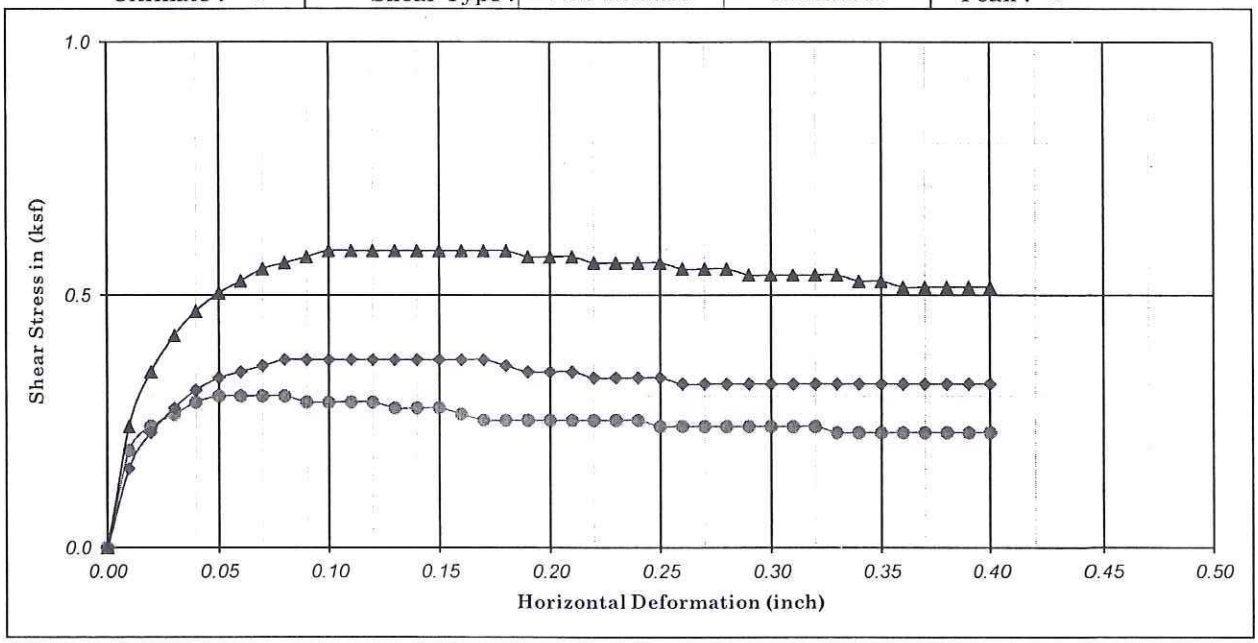


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-212		Strength Intercept (C) :	0.19	(ksf)	Peak	0.13	(ksf)	Ultimate
Sample No. : D-1			9.19	(kPa)		6.32	(kPa)	
Depth (ft/m) : 2.5	0.00	Friction Angle (ϕ) :	33.08	Degree		32.62	Degree	
Description : Olive-brown, SILTY SAND (SM)					Shear Rate (inch/minute) :			0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	20.75	100.82	15.87	0.67	0.15	7.18	0.30	14.36	0.23	10.92
◆	20.72	98.79	15.55	0.71	0.30	14.36	0.37	17.81	0.32	15.51
▲	20.95	98.79	15.55	0.71	0.60	28.73	0.59	28.15	0.52	24.71

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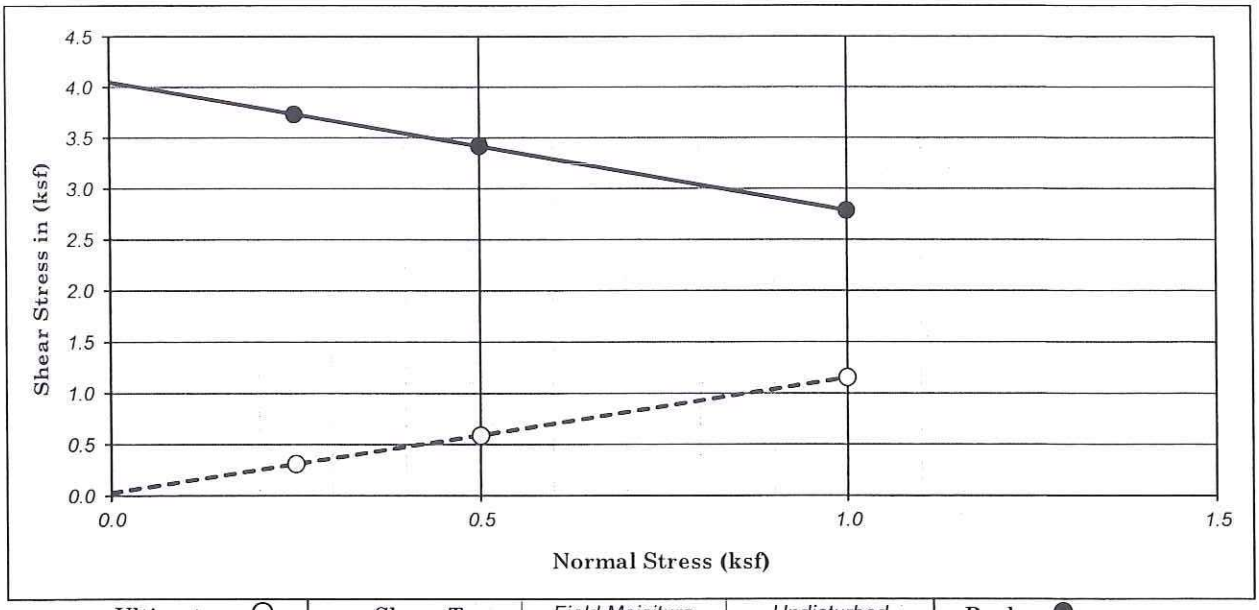
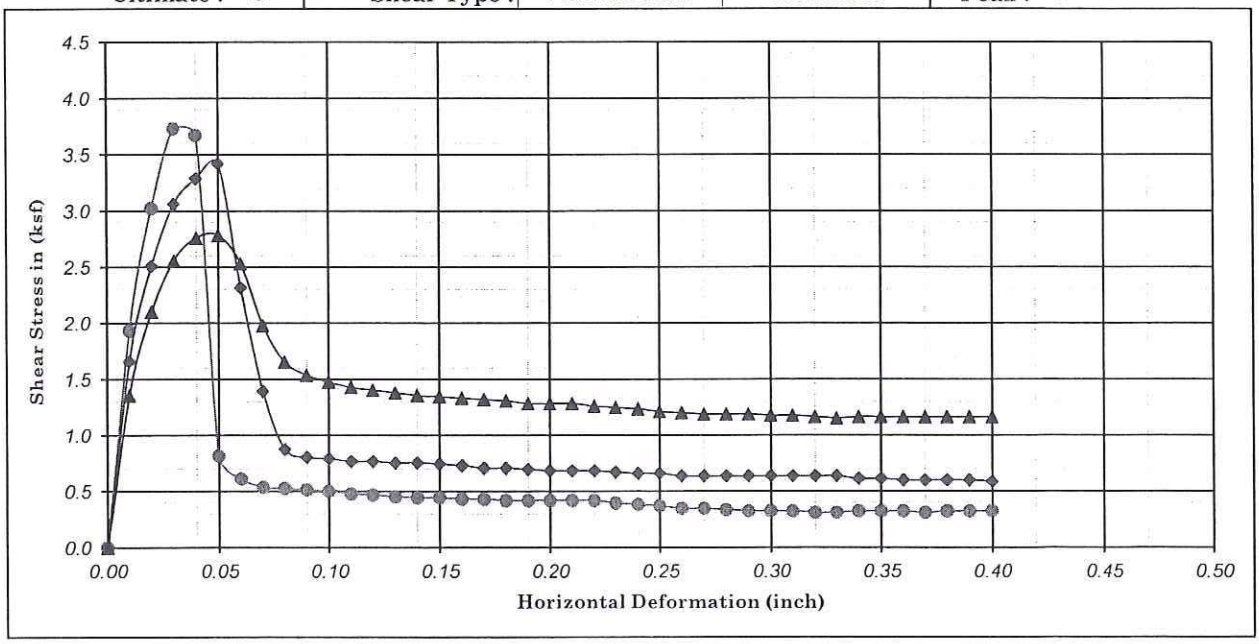


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-214		Strength Intercept (C) :	4.05	(ksf)	Peak	0.03	(ksf)	Ultimate	
Sample No. : D-2			193.91	(kPa)		1.44	(kPa)		
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	-51.68	Degree		48.27	Degree		
Description : Dark brown, CLAYEY SAND (SC)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	8.16	117.71	18.53	0.43	0.25	11.97	3.73	178.69	0.31	14.94
◆	7.98	114.14	17.97	0.48	0.50	23.94	3.42	163.75	0.59	28.15
▲	6.90	105.33	16.58	0.60	1.00	47.88	2.78	133.30	1.15	55.16

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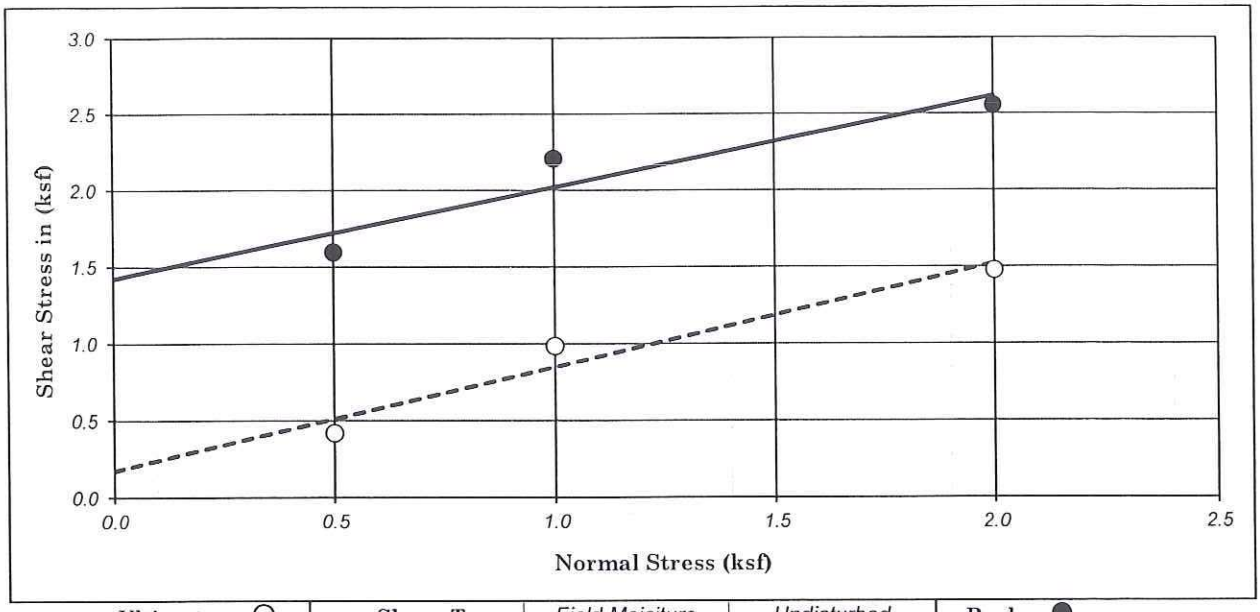
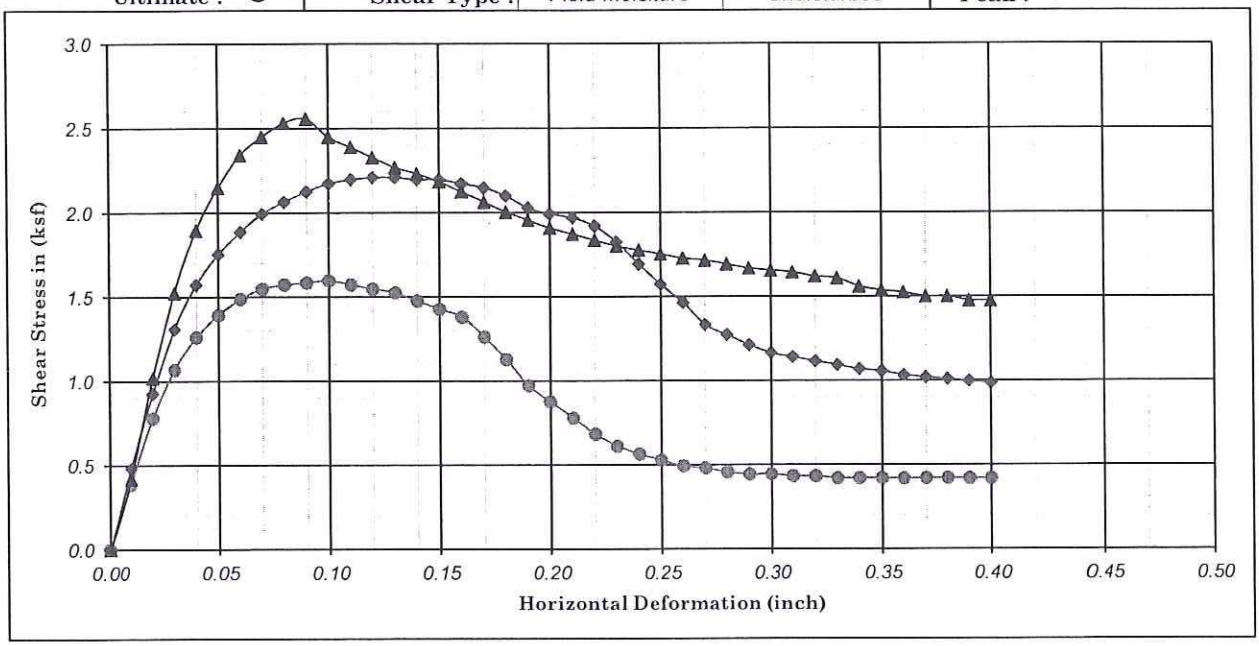


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-220		Strength Intercept (C) :	1.42	(ksf)	Peak	0.17	(ksf)	Ultimate	
Sample No. : D-2			68.09	(kPa)		8.33	(kPa)		
Depth (ft/m) : 10.0	0.00	Friction Angle (ϕ) :	30.89	Degree		33.97	Degree		
Description : Olive-gray, Fat CLAY (CH)					Shear Rate (inch/minute) :			0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	27.16	94.91	14.94	0.78	0.50	23.94	1.60	76.42	0.42	20.11
◆	24.83	94.24	14.83	0.79	1.00	47.88	2.21	105.72	0.98	47.11
▲	28.91	93.53	14.72	0.80	2.00	95.76	2.56	122.38	1.48	70.67

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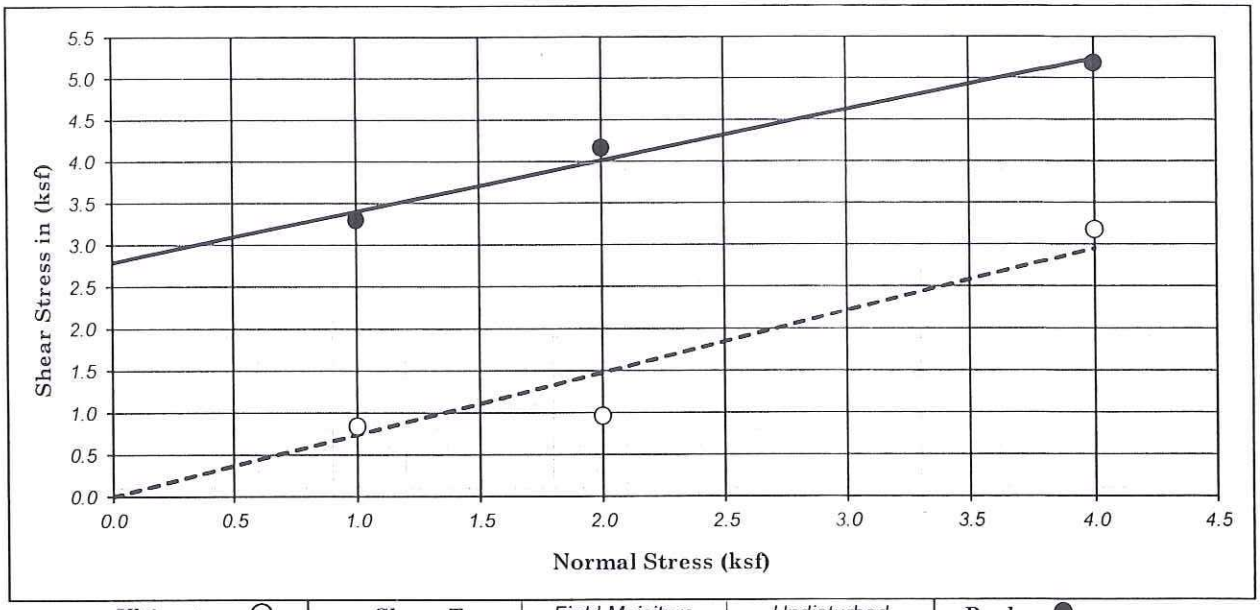
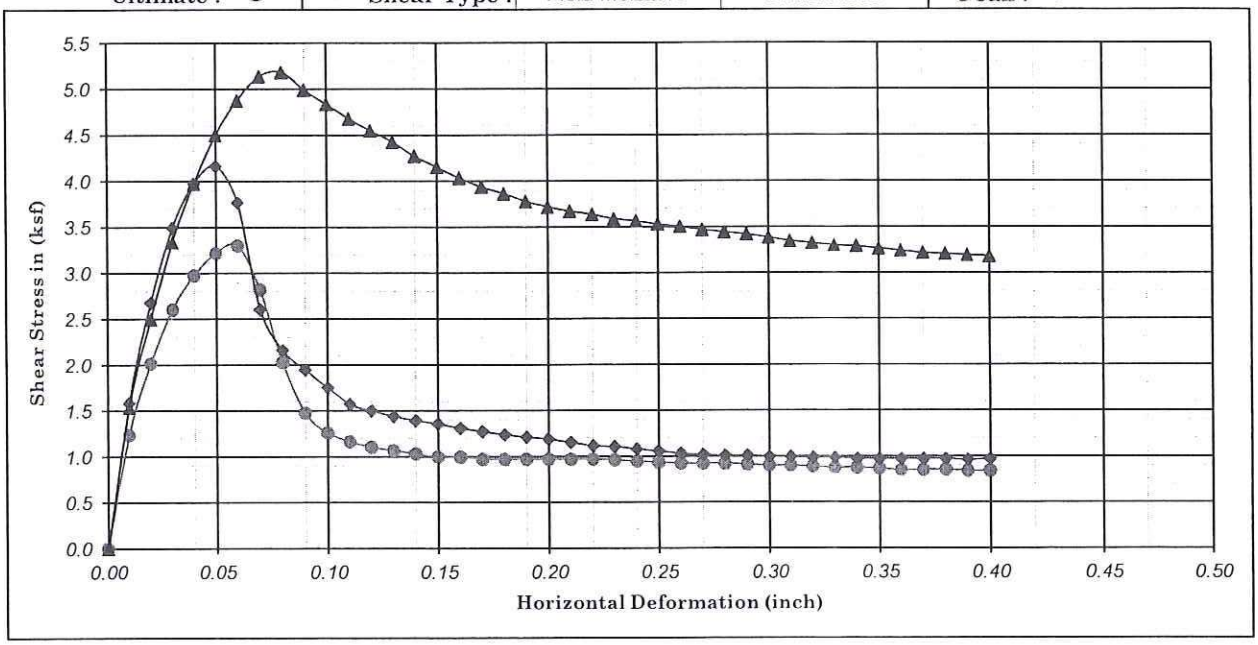


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-221		Strength Intercept (C) :	2.79	(ksf)	Peak	0.00	(ksf)	Ultimate	
Sample No. : D-3			133.59	(kPa)		0.00	(kPa)		
Depth (ft/m) : 15.0	0.00	Friction Angle (ϕ) :	31.43	Degree		36.40	Degree		
Description : Dark brown to olive-brown, Lean CLAY with SAND (CL)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	15.08	116.33	18.31	0.45	1.00	47.88	3.30	158.00	0.84	40.22
◆	17.09	110.07	17.32	0.53	2.00	95.76	4.16	199.37	0.96	45.96
▲	13.85	113.84	17.92	0.48	4.00	191.52	5.18	248.21	3.18	152.26

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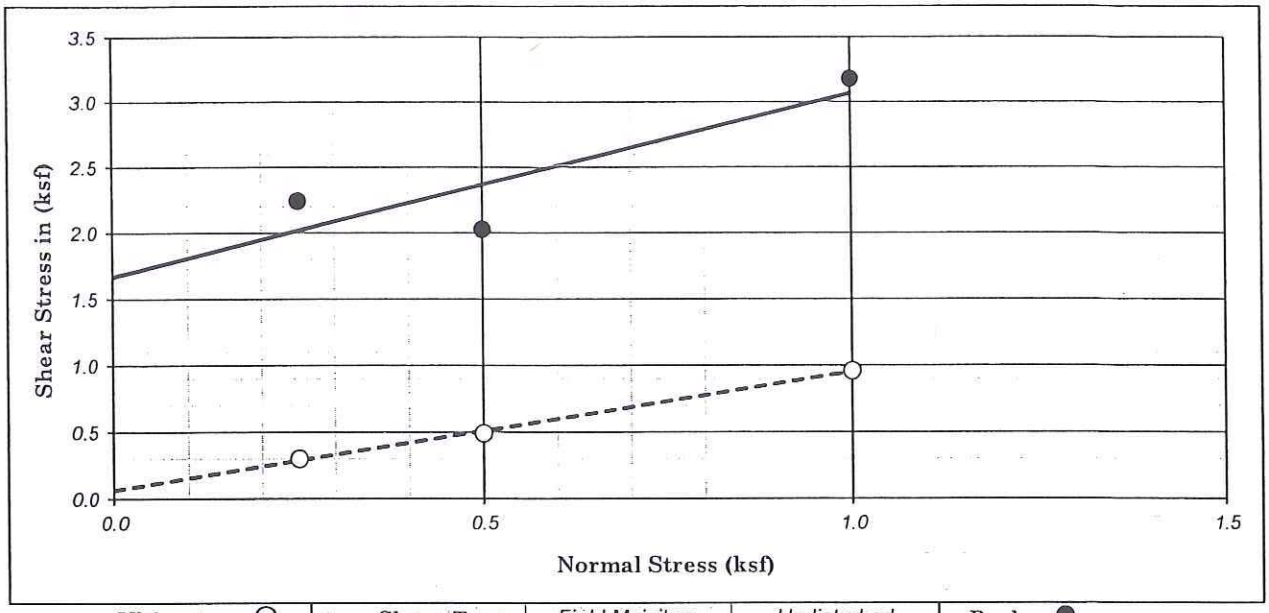
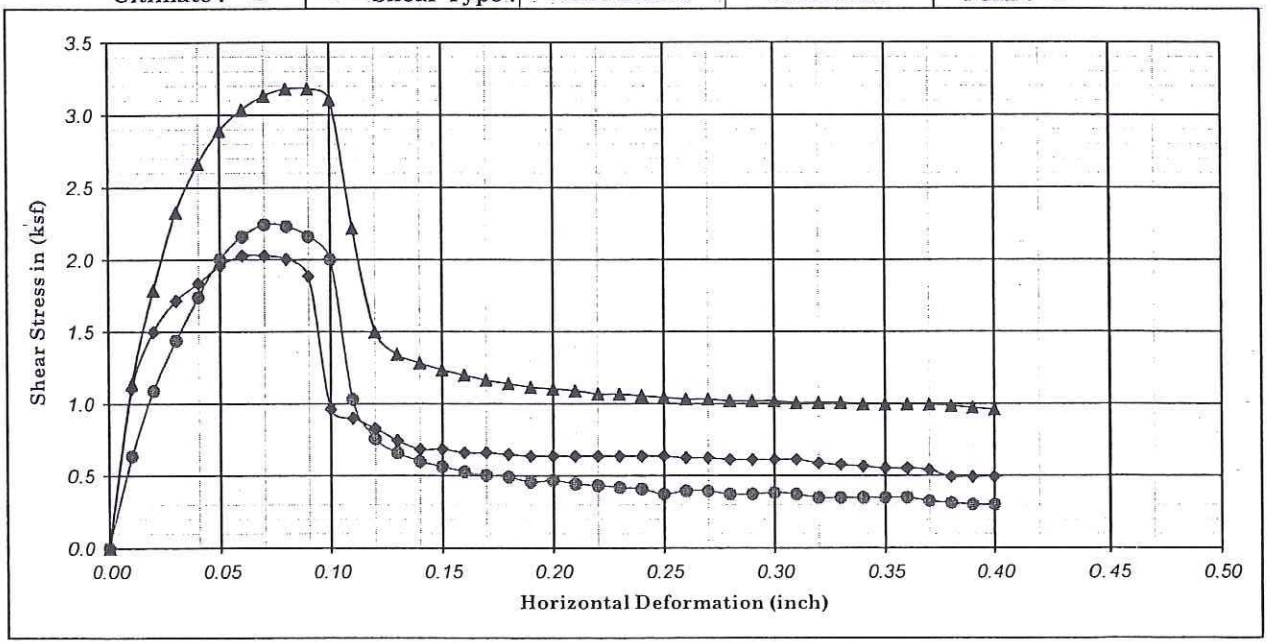
Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-224		Strength Intercept (C) :	1.67	(ksf)	Peak	0.07	(ksf)	Ultimate
Sample No. : D-1			79.86	(kPa)		3.16	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	54.44	Degree		41.61	Degree	

Description : Dark brown, Lean CLAY with SAND (CL) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	17.09	106.68	16.79	0.58	0.25	11.97	2.24	107.44	0.30	14.36
◆	23.87	96.36	15.17	0.75	0.50	23.94	2.03	97.10	0.49	23.56
▲	22.41	100.94	15.89	0.67	1.00	47.88	3.18	152.26	0.96	45.96

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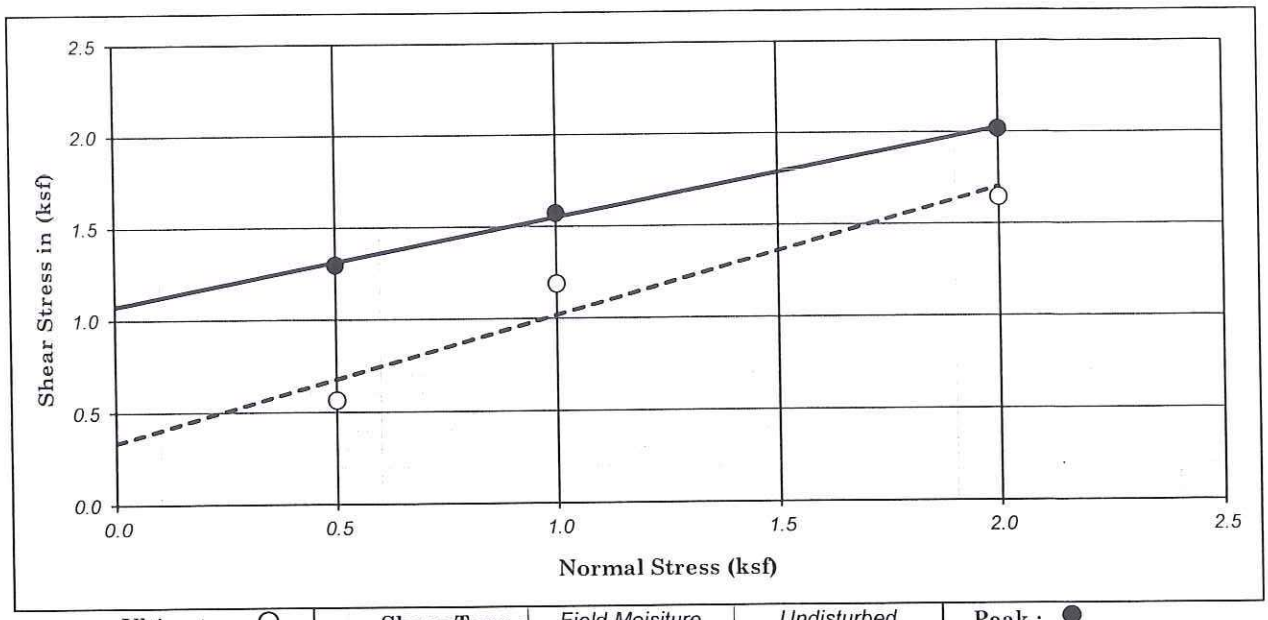
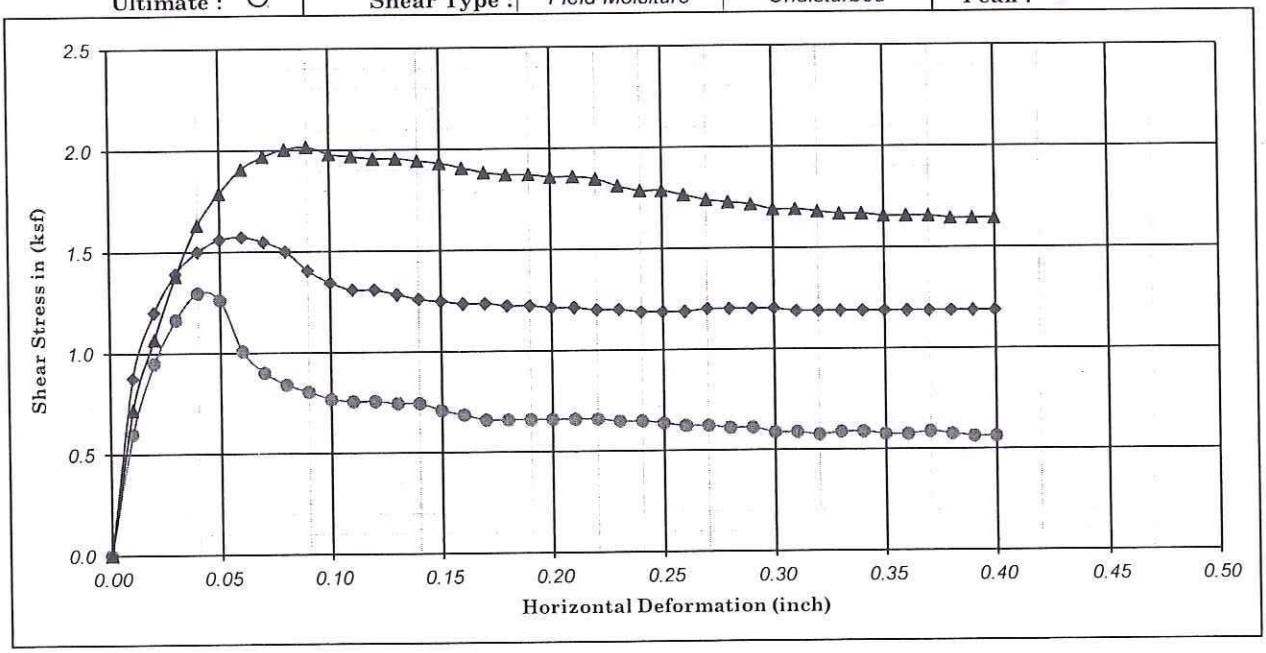


Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-228		Strength Intercept (C) :	1.07	(ksf)	Peak	0.34	(ksf)	Ultimate
Sample No. : D-2			51.42	(kPa)		16.09	(kPa)	
Depth (ft/m) : 10.0	0.00	Friction Angle (ϕ) :	25.40	Degree		34.31	Degree	
Description : Olive-brown, SILT with SAND (ML)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	11.13	100.27	15.78	0.68	0.50	23.94	1.30	62.05	0.56	27.00
◆	11.39	98.84	15.56	0.71	1.00	47.88	1.57	75.27	1.19	56.88
▲	12.68	90.38	14.23	0.86	2.00	95.76	2.02	96.53	1.64	78.71

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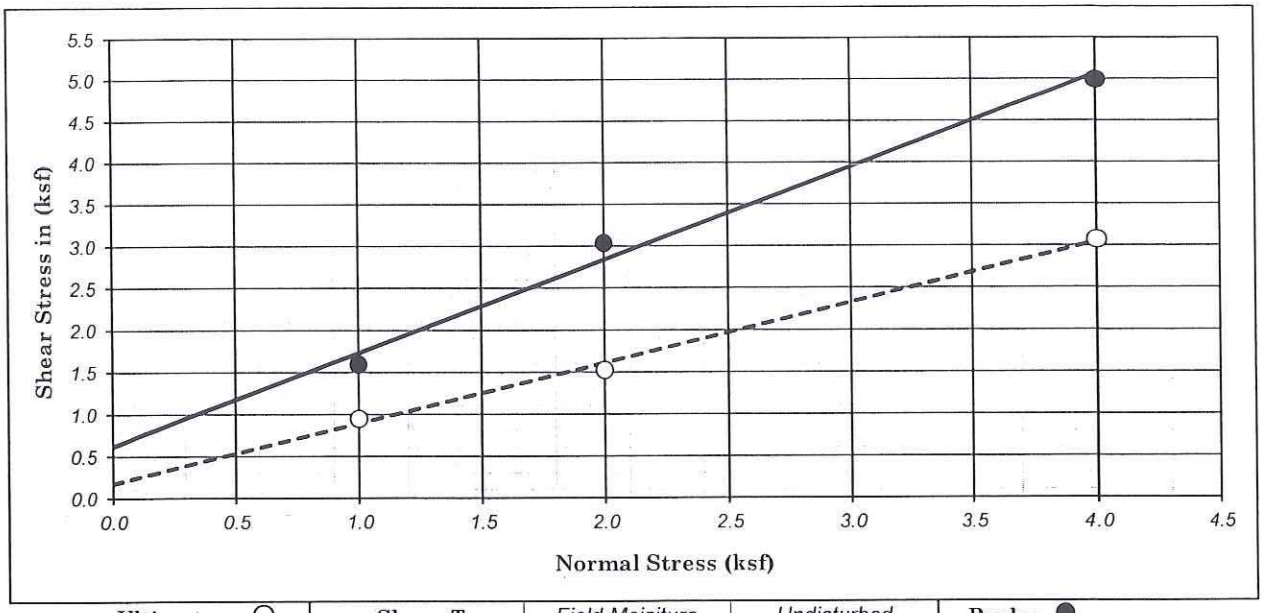
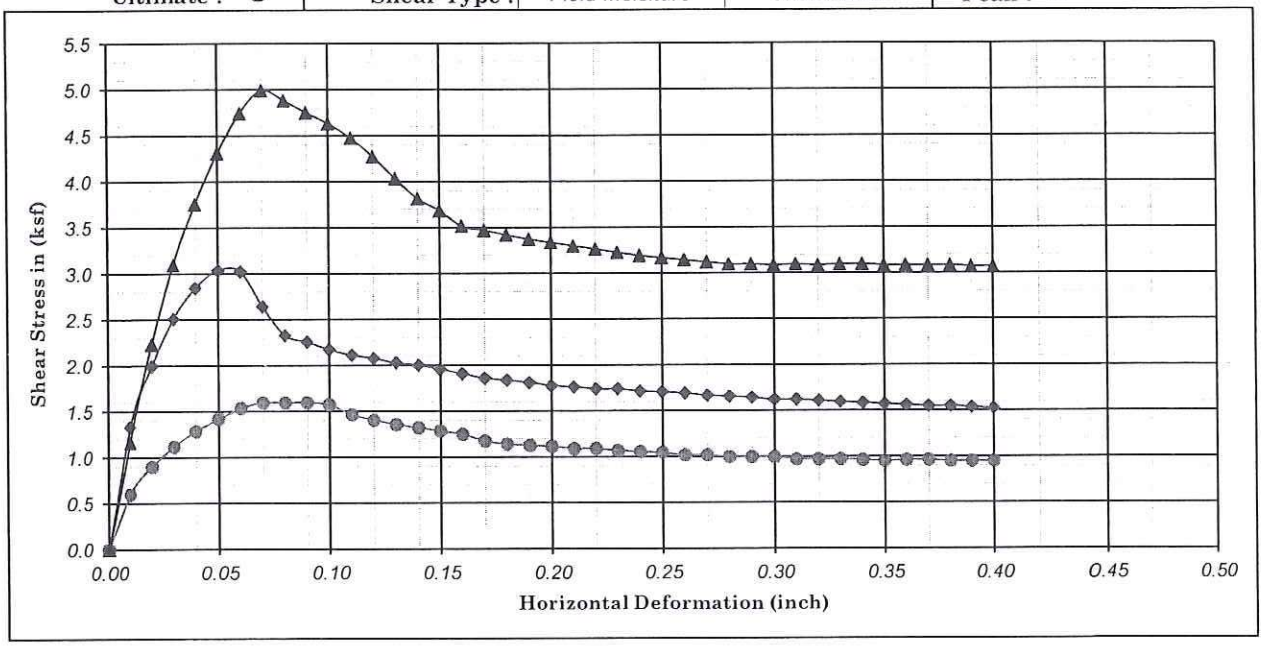


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-228		Strength Intercept (C) :	0.62	(ksf)	Peak	0.17	(ksf)	Ultimate	
Sample No. : D-4			29.59	(kPa)		8.33	(kPa)		
Depth (ft/m) : 20.0	0.00	Friction Angle (ϕ) :	47.98	Degree		35.66	Degree		
Description : Olive-brown, SILTY CLAY (CL-ML)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	11.81	92.34	14.54	0.83	1.00	47.88	1.60	76.42	0.95	45.39
◆	12.69	99.60	15.68	0.69	2.00	95.76	3.04	145.36	1.52	72.97
▲	12.93	105.36	16.58	0.60	4.00	191.52	4.99	239.02	3.07	147.09

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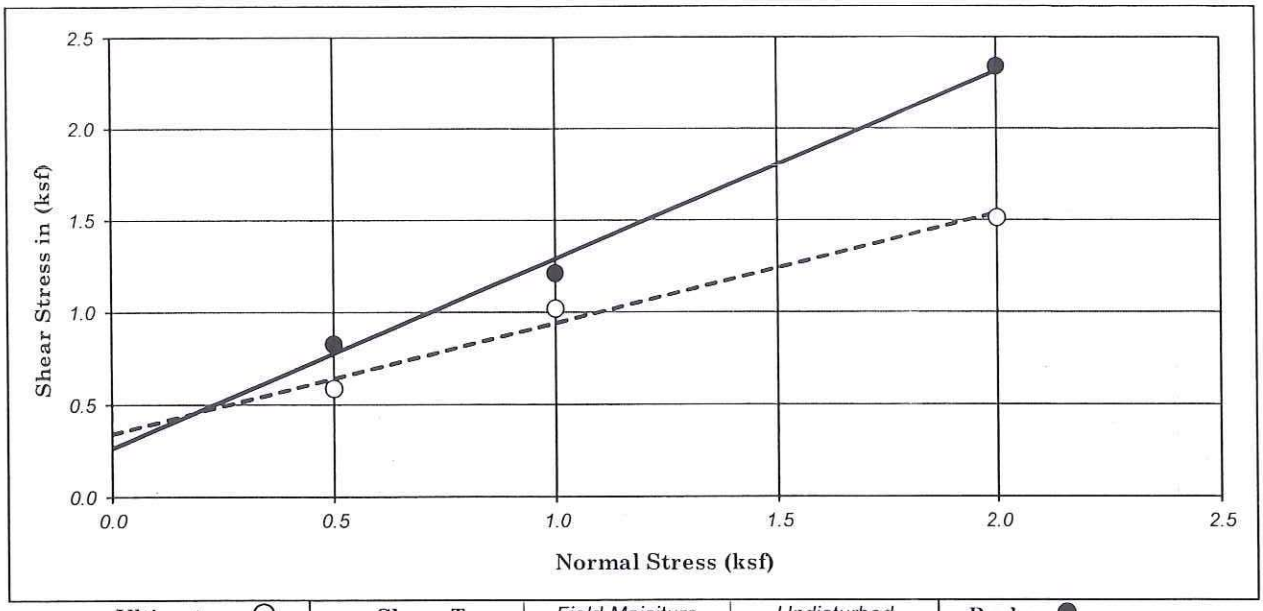
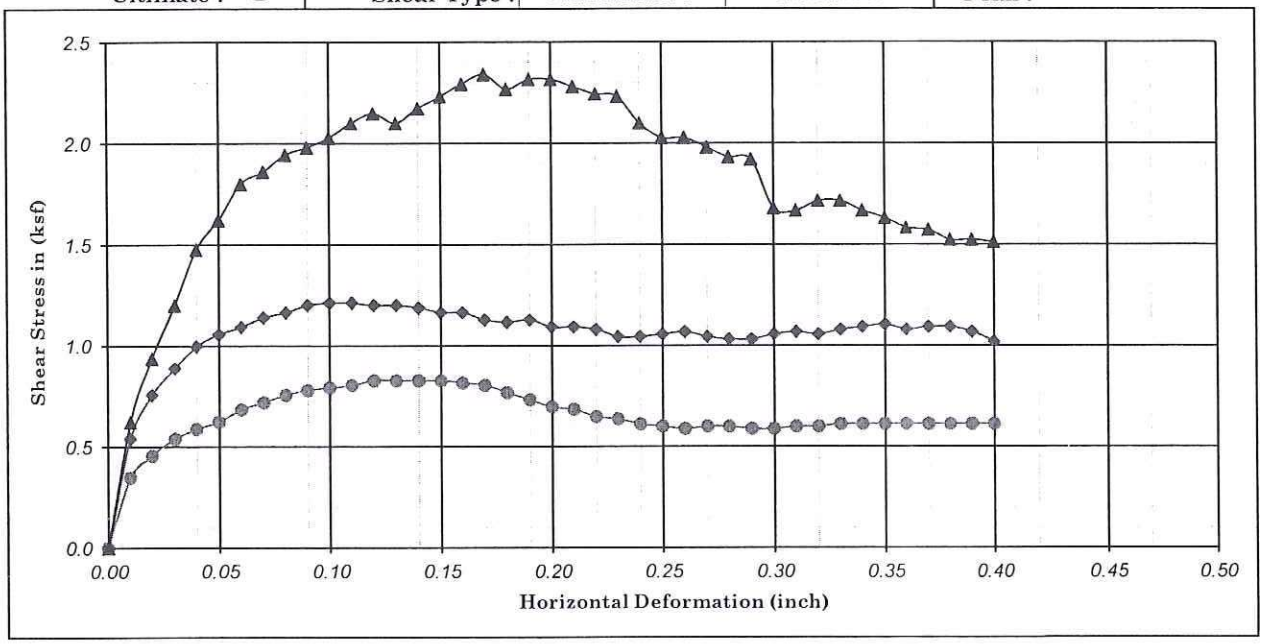


Ultimate : ○ | Shear Type : Field Moisiture | Undisturbed | Peak : ●



Boring No. : A-11-232		Strength Intercept (C) :	0.26	(ksf)	Peak	0.34	(ksf)	Ultimate
Sample No. : D-2			12.64	(kPa)		16.37	(kPa)	
Depth (ft/m) : 10.0	0.00	Friction Angle (ϕ) :	45.71	Degree		30.89	Degree	
Description : Olive-brown, Poorly graded SAND with SILT (SP-SM)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	3.84	106.86	16.82	0.58	0.50	23.94	0.83	39.64	0.59	28.15
◆	2.33	118.75	18.69	0.42	1.00	47.88	1.21	58.03	1.02	48.84
▲	1.27	119.78	18.85	0.41	2.00	95.76	2.34	112.04	1.51	72.39

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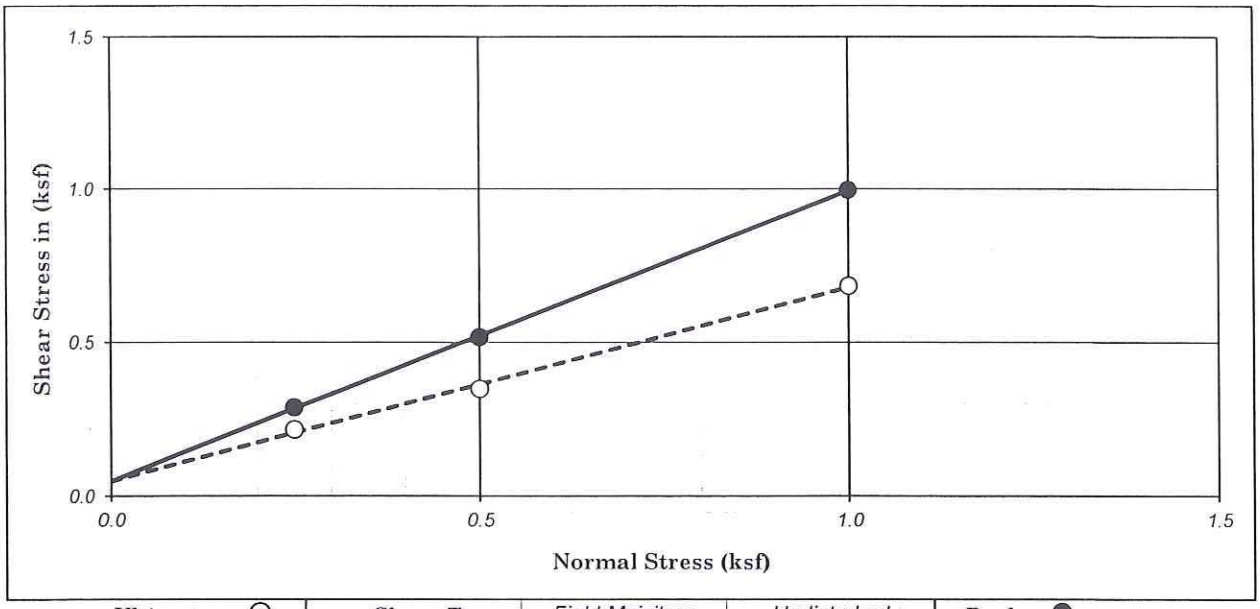
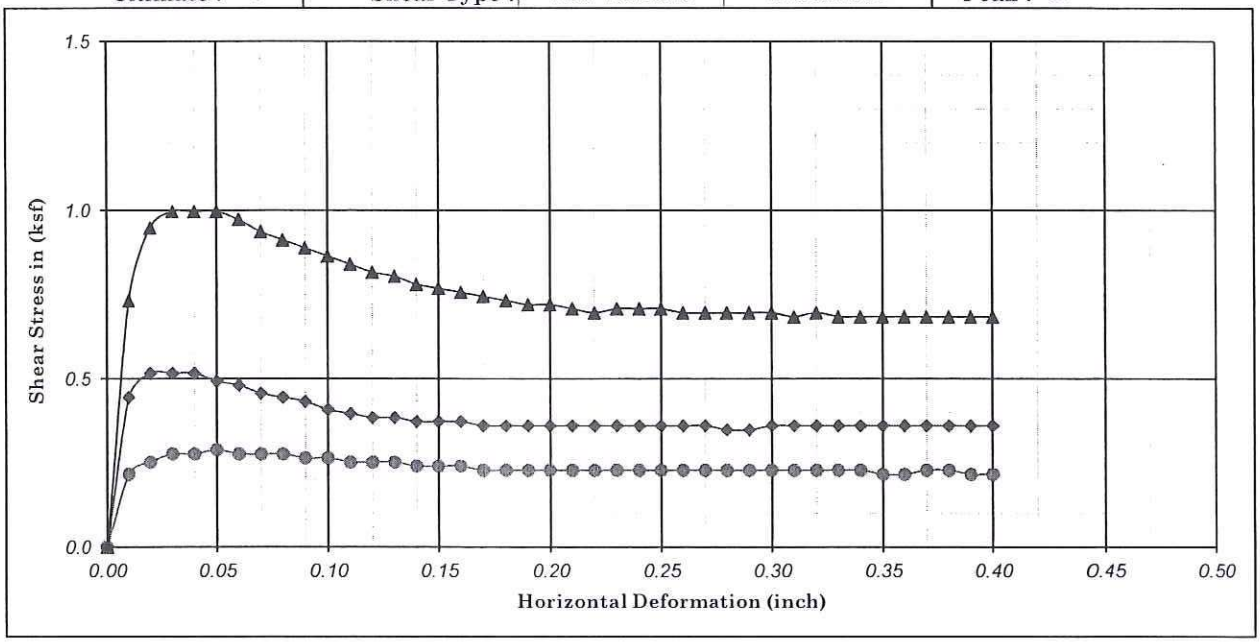


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-235		Strength Intercept (C) :	0.05	(ksf)	Peak	0.05	(ksf)	Ultimate
Sample No. : D-2			2.30	(kPa)		2.30	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	43.42	Degree		32.25	Degree	

Description : Olive-brown, Poorly graded SAND (SP) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.94	98.37	15.48	0.71	0.25	11.97	0.29	13.79	0.22	10.34
◆	1.51	98.51	15.50	0.71	0.50	23.94	0.52	24.71	0.35	16.66
▲	2.57	99.69	15.69	0.69	1.00	47.88	1.00	47.69	0.68	32.75

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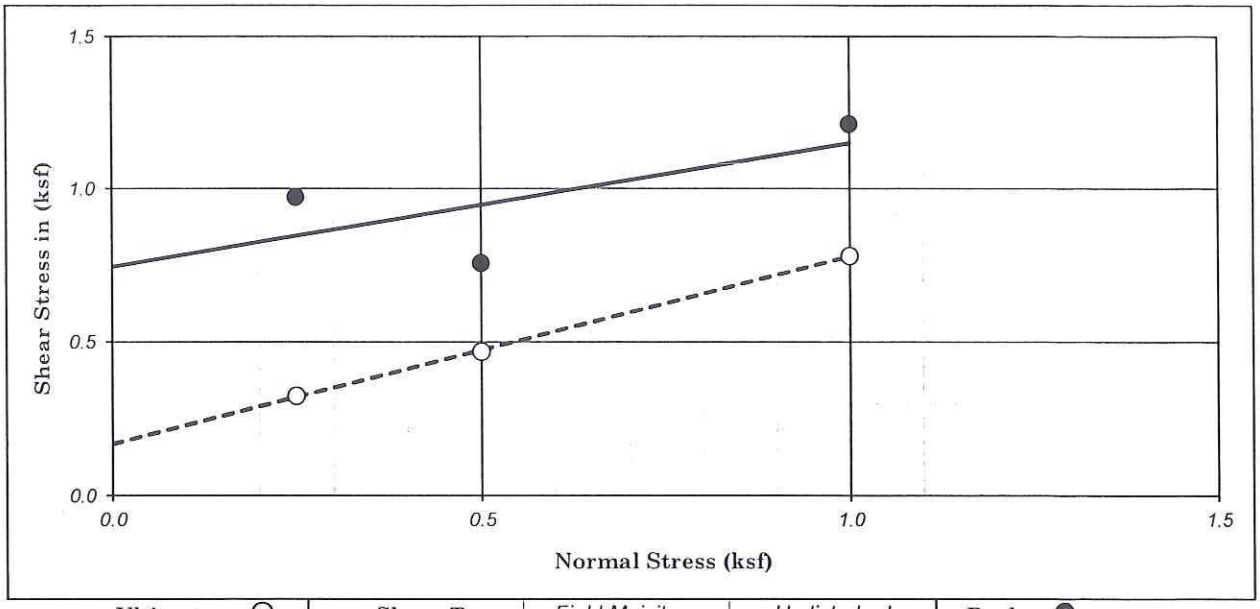
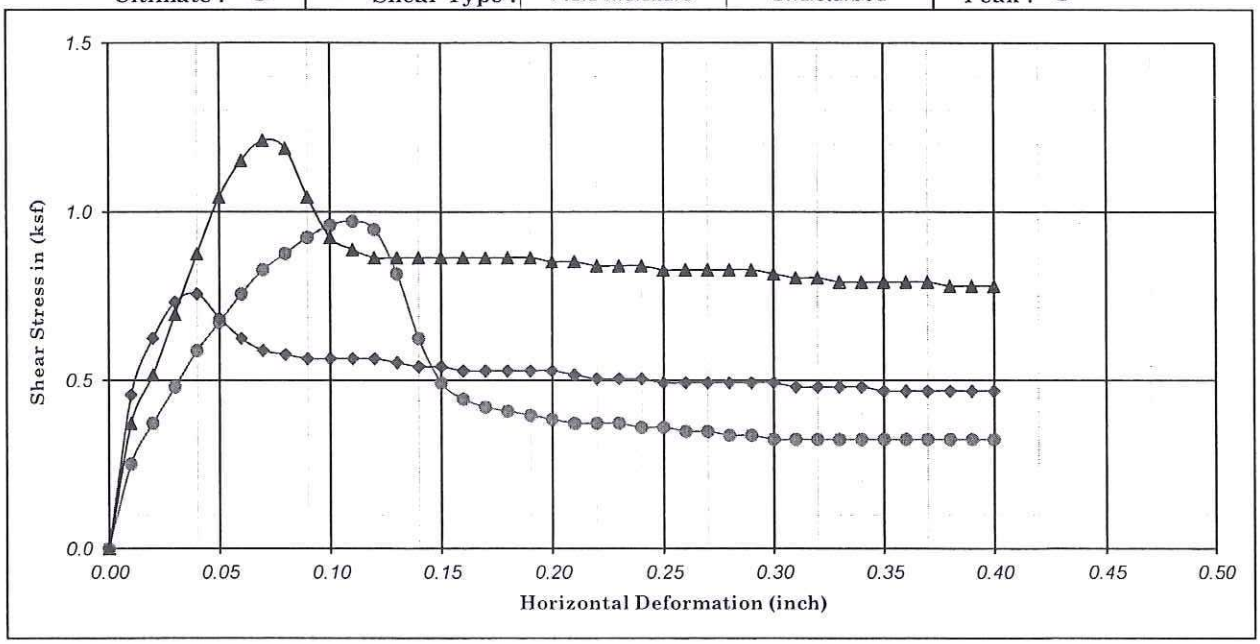


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-253		Strength Intercept (C) :	0.74	(ksf)	Peak	0.17	(ksf)	Ultimate
Sample No. : D-2			35.62	(kPa)		8.04	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	22.03	Degree		31.40	Degree	
Description : Olive-brown, SILTY CLAY with SAND (CL-ML)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	14.04	114.44	18.01	0.47	0.25	11.97	0.97	46.54	0.32	15.51
◆	10.31	109.42	17.22	0.54	0.50	23.94	0.76	36.20	0.47	22.41
▲	12.09	104.83	16.50	0.61	1.00	47.88	1.21	58.03	0.78	37.35

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DIRECT SHEAR TEST (ASTM D-3080)

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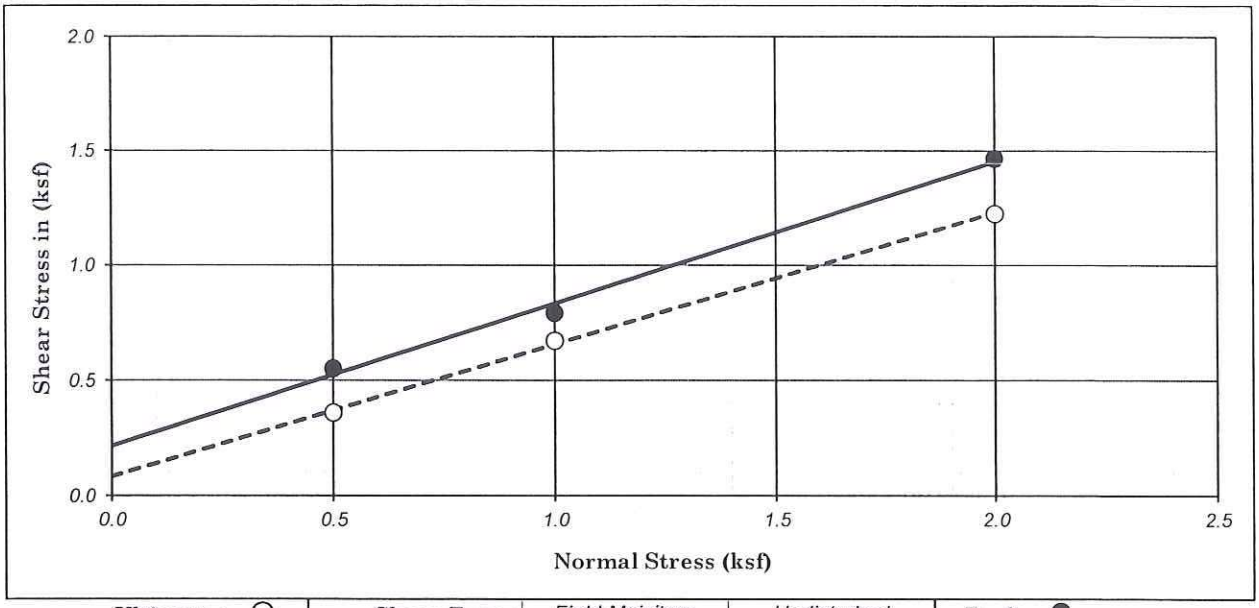
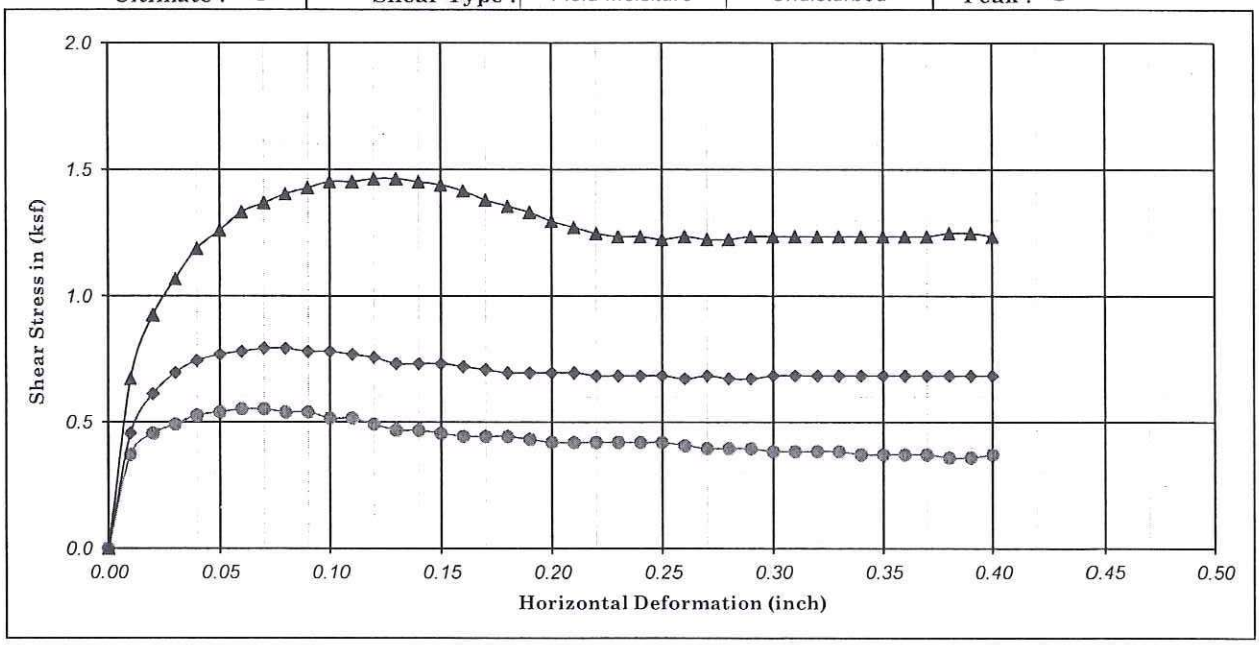


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-254		Strength Intercept (C) :	0.22	(ksf)	Peak	0.08	(ksf)	Ultimate
Sample No. : D-3			10.34	(kPa)		4.02	(kPa)	
Depth (ft/m) : 10.0	0.00	Friction Angle (ϕ) :	31.68	Degree		29.79	Degree	
Description : Olive-brown, Poorly graded SAND (SP)					Shear Rate (inch/minute) :			0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	2.70	105.83	16.66	0.59	0.50	23.94	0.55	26.43	0.36	17.24
◆	2.86	105.23	16.56	0.60	1.00	47.88	0.79	37.92	0.67	32.18
▲	2.83	100.34	15.79	0.68	2.00	95.76	1.46	70.10	1.22	58.61

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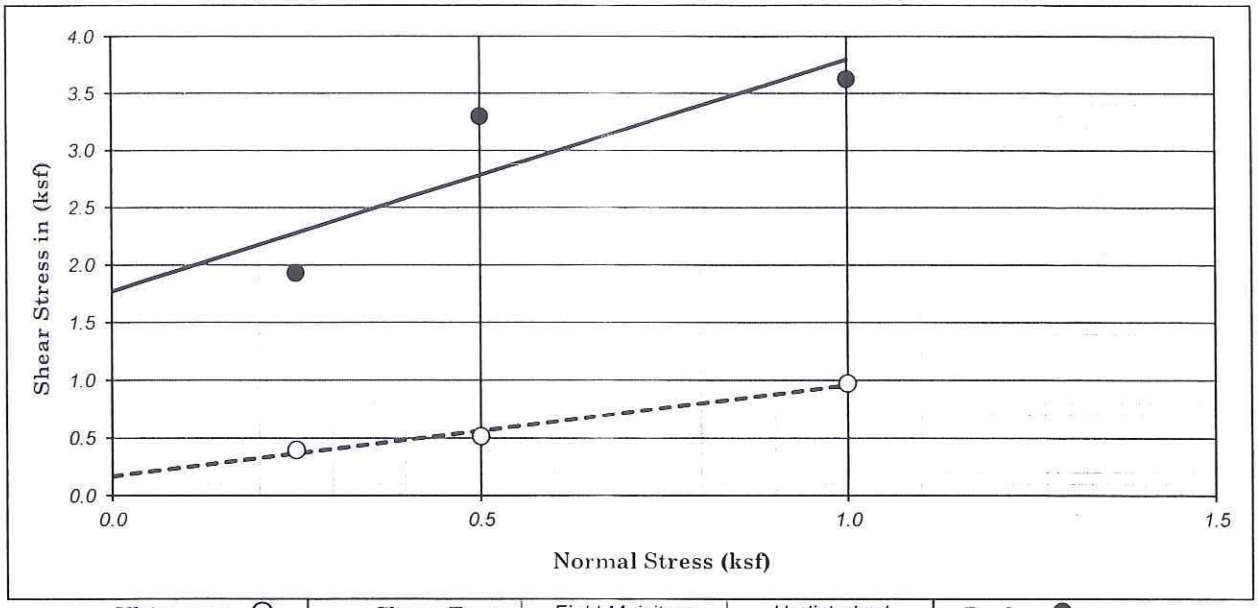
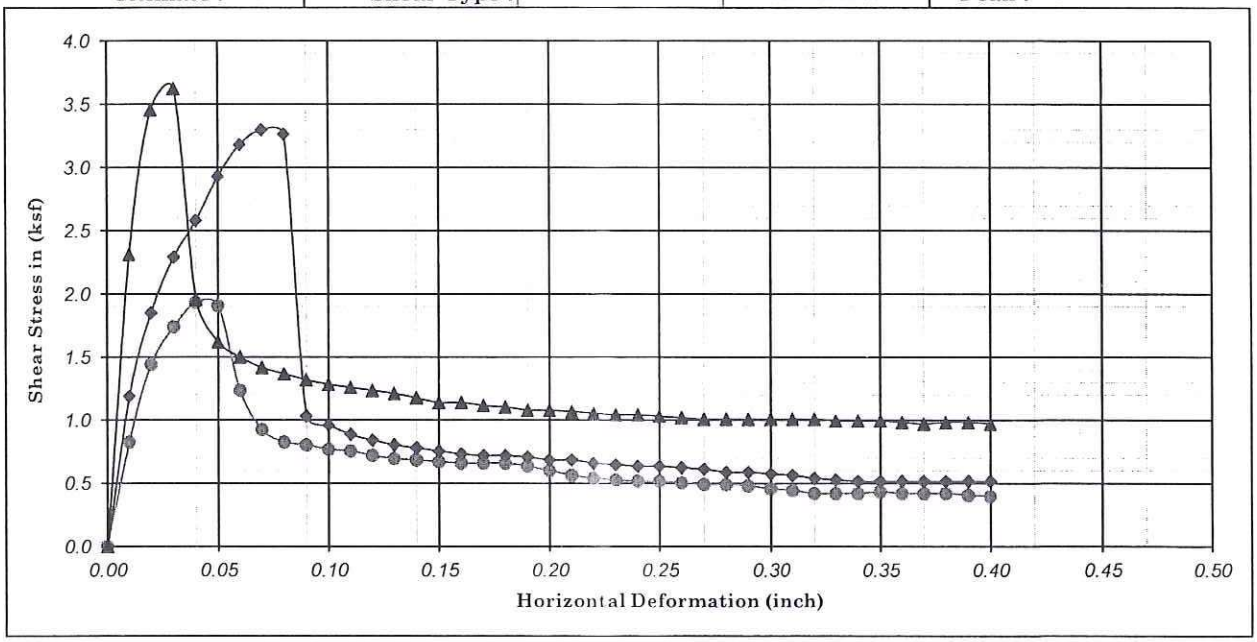
Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-255		Strength Intercept (C) :	1.77	(ksf)	Peak	0.17	(ksf)	Ultimate	
Sample No. : D-1			84.75	(kPa)		8.04	(kPa)		
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	63.73	Degree		38.26	Degree		
Description : Olive-brown, SANDY lean CLAY (CL)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	10.77	112.06	17.64	0.50	0.25	11.97	1.93	92.50	0.40	18.96
◆	10.38	117.84	18.55	0.43	0.50	23.94	3.30	158.00	0.52	24.71
▲	9.74	117.32	18.47	0.44	1.00	47.88	3.62	173.52	0.97	46.54

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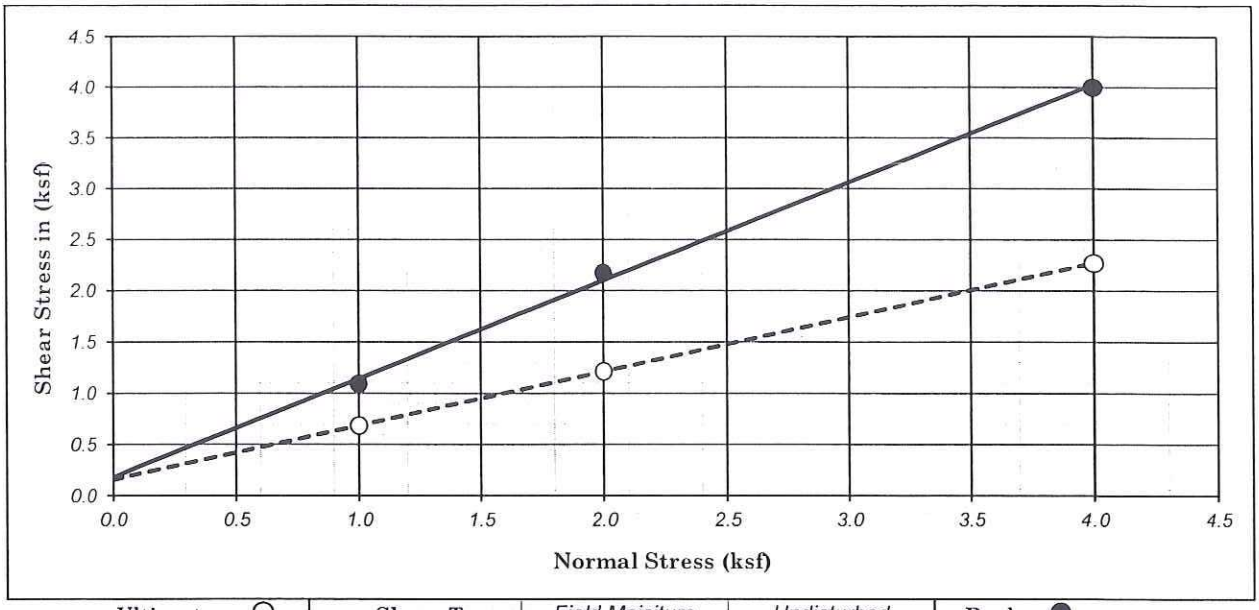
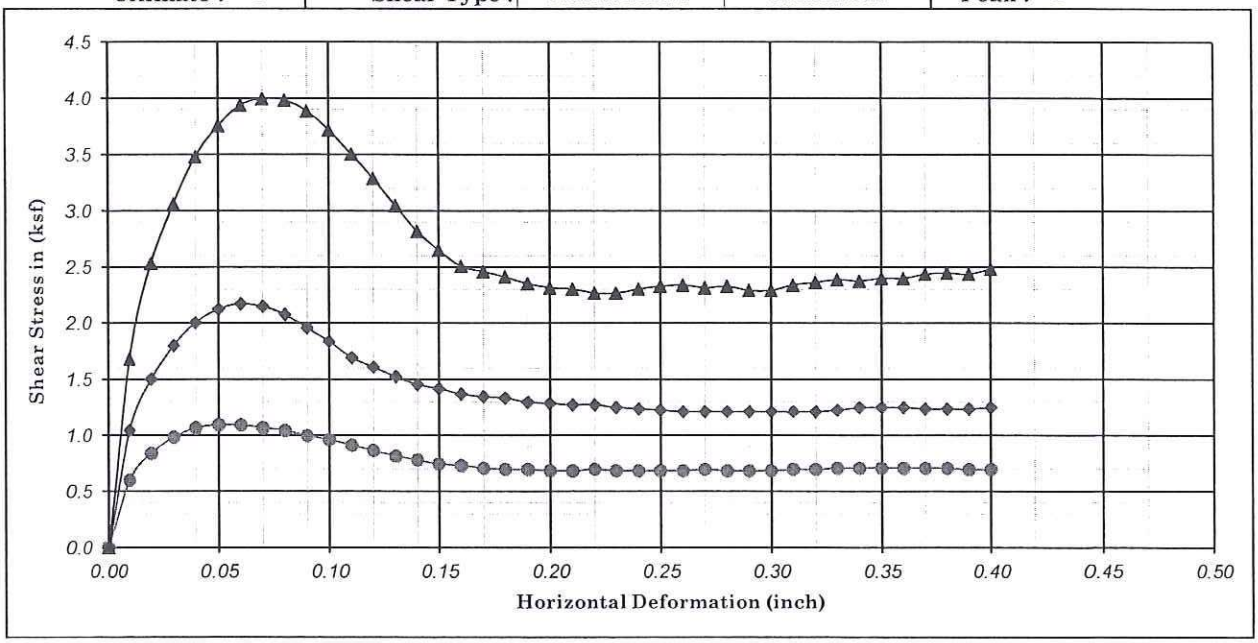


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-246		Strength Intercept (C) :	0.18	(ksf)	Peak	0.16	(ksf)	Ultimate
Sample No. : D-4			8.62	(kPa)		7.47	(kPa)	
Depth (ft/m) : 20.0	0.00	Friction Angle (ϕ) :	43.83	Degree		27.83	Degree	
Description : Olive-brown, Poorly graded SAND (SP)					Shear Rate (inch/minute) :			0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.95	112.27	17.67	0.50	1.00	47.88	1.09	52.28	0.68	32.75
◆	0.78	104.25	16.41	0.62	2.00	95.76	2.17	104.00	1.21	58.03
▲	0.79	105.22	16.56	0.60	4.00	191.52	4.00	191.33	2.27	108.59

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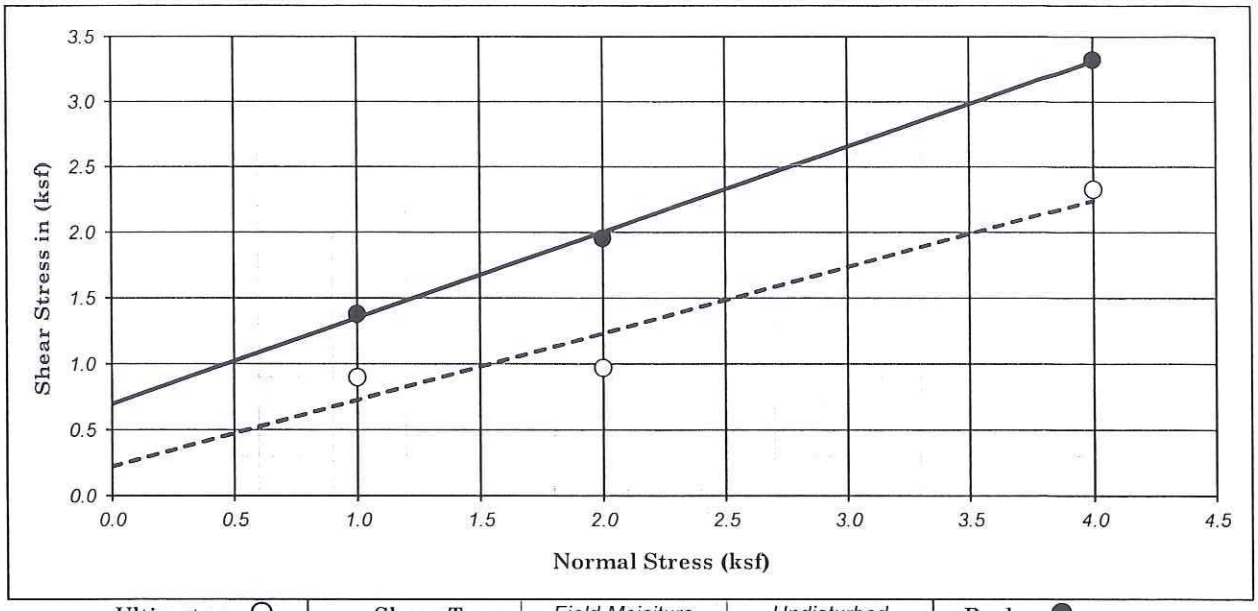
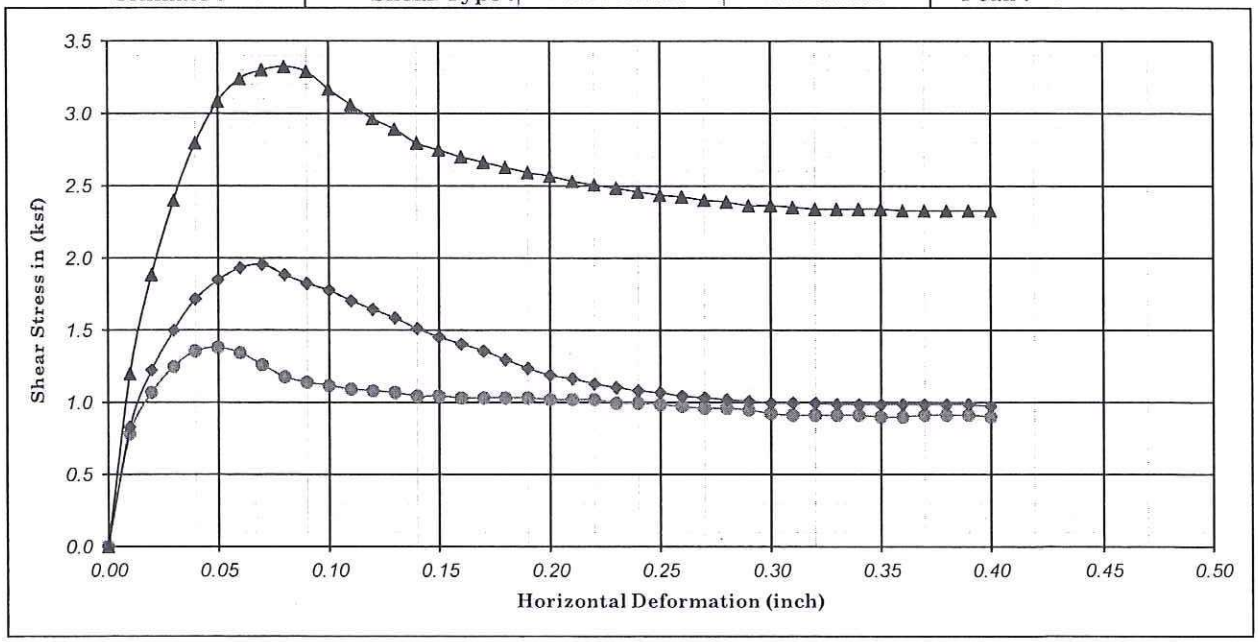


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-258		Strength Intercept (C) :	0.70	(ksf)	Peak	0.22	(ksf)	Ultimate	
Sample No. : D-5			33.32	(kPa)		10.63	(kPa)		
Depth (ft/m) : 25.0	0.00	Friction Angle (ϕ) :	33.15	Degree		26.79	Degree		
Description : Olive-brown, SILTY CLAY (CL-ML)							Shear Rate (inch/minute) :	0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	15.07	103.44	16.28	0.63	1.00	47.88	1.38	66.07	0.90	43.09
◆	17.59	104.17	16.40	0.62	2.00	95.76	1.96	93.65	0.97	46.54
▲	15.42	100.50	15.82	0.68	4.00	191.52	3.32	159.15	2.33	111.46

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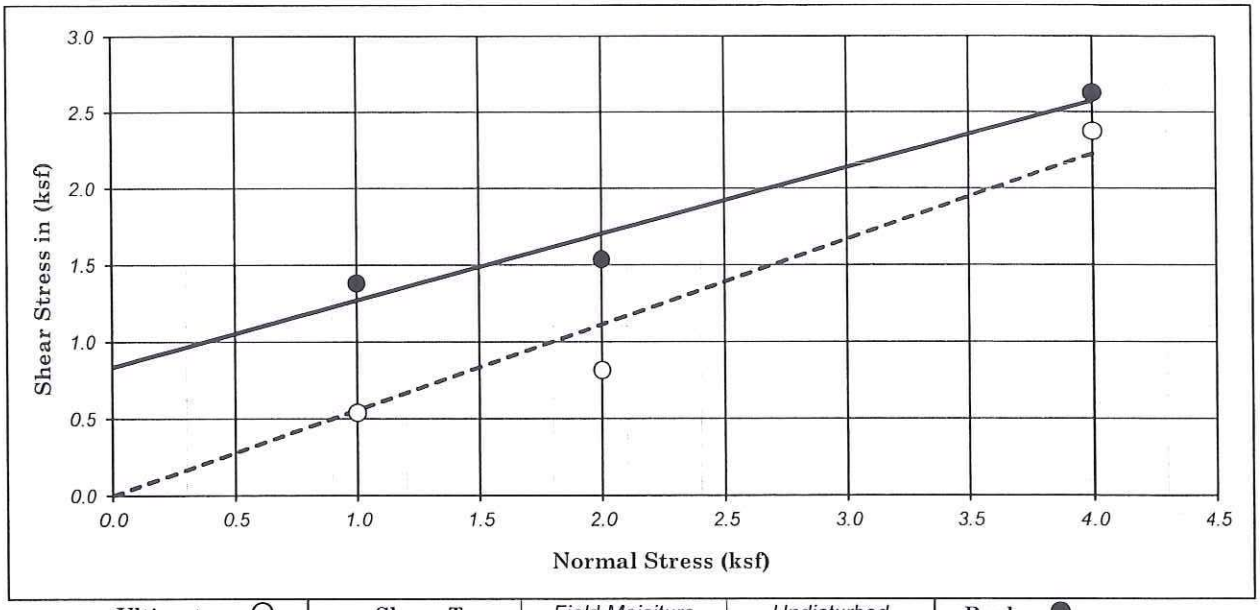
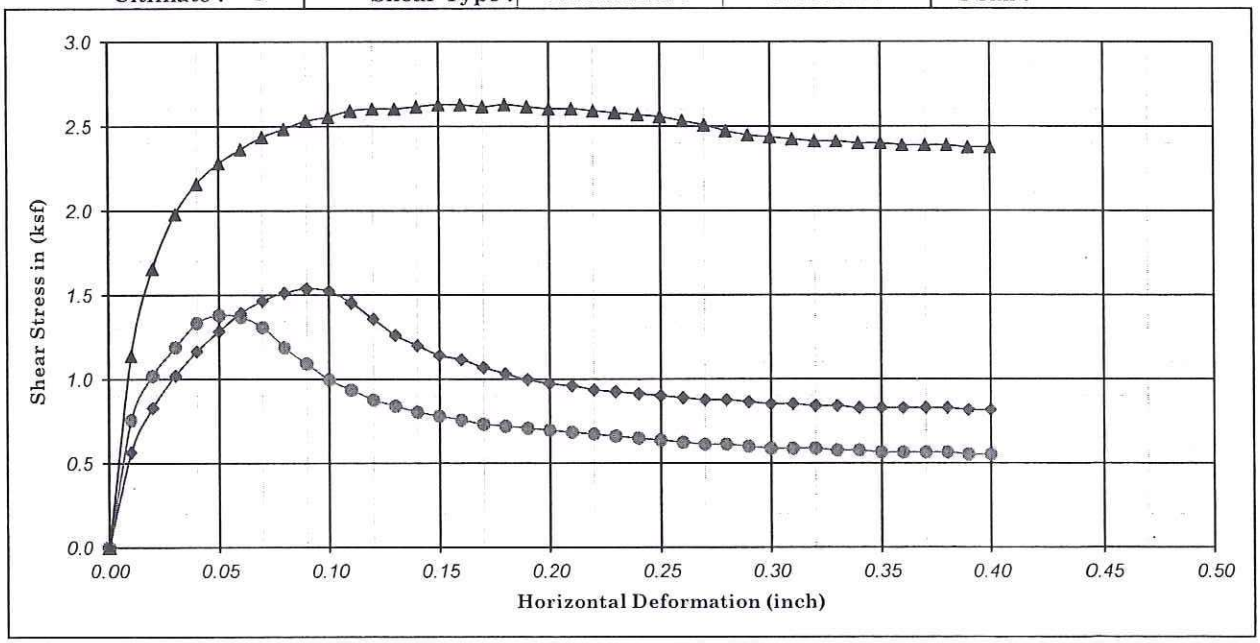
Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-247		Strength Intercept (C) :	0.83	(ksf)	Peak	0.00	(ksf)	Ultimate	
Sample No. : D-3			39.93	(kPa)		0.00	(kPa)		
Depth (ft/m) : 15.0	0.00	Friction Angle (ϕ) :	23.49	Degree		29.07	Degree		
Description : Olive-brown, Lean CLAY with SAND (CL)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	23.36	99.67	15.69	0.69	1.00	47.88	1.38	66.07	0.54	25.86
◆	27.60	95.82	15.08	0.76	2.00	95.76	1.54	73.54	0.82	39.07
▲	20.32	106.03	16.69	0.59	4.00	191.52	2.63	125.83	2.38	113.76

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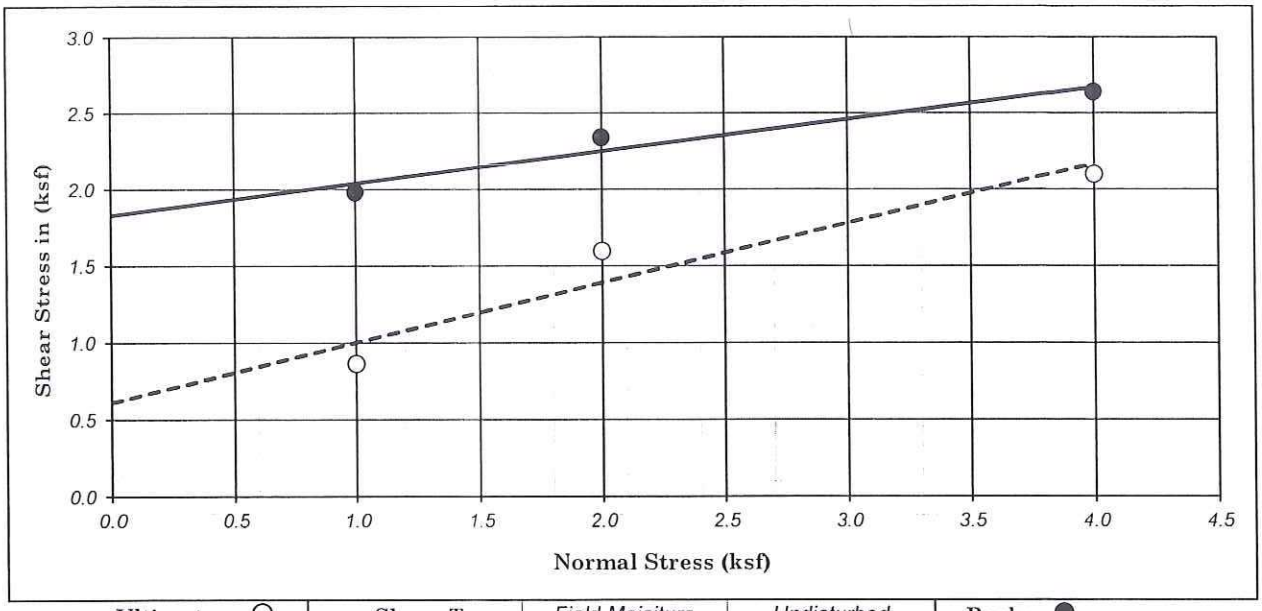
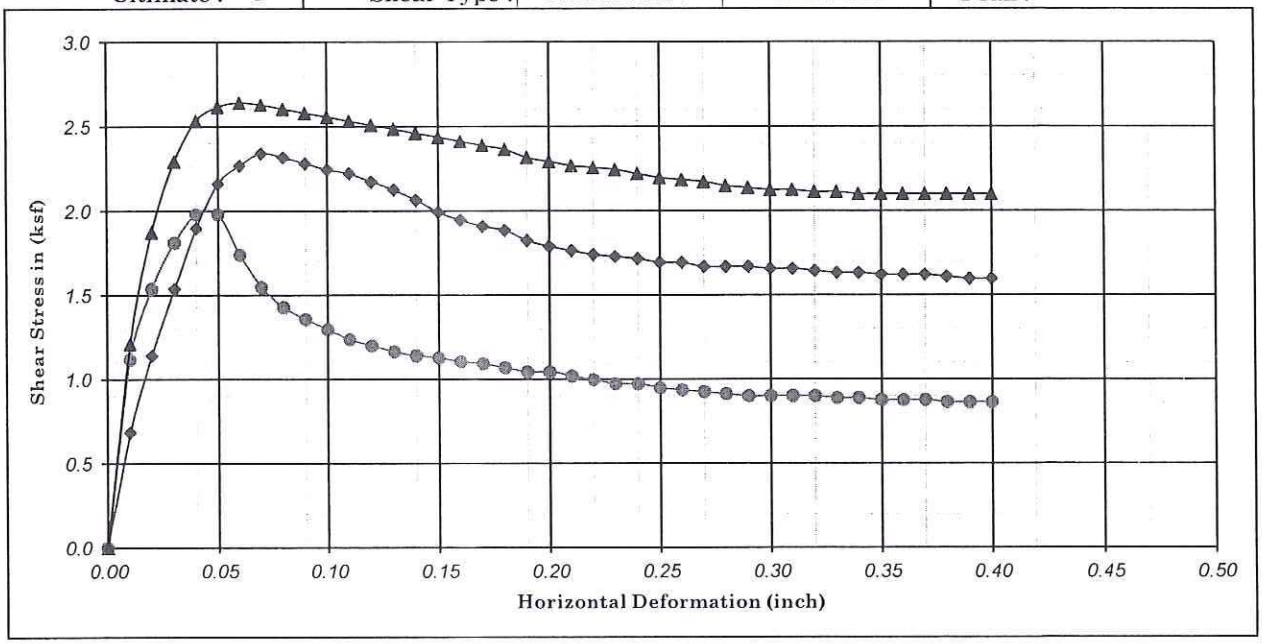


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-259	Strength Intercept (C) :	1.83	(ksf)	Peak	0.61	(ksf)	Ultimate
Sample No. : D-4		87.62	(kPa)		29.30	(kPa)	
Depth (ft/m) : 20.0 | 0.00	Friction Angle (ϕ) :	11.86	Degree		21.26	Degree	
Description : Olive-brown, Lean CLAY with SAND (CL)					Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	38.60	90.32	14.22	0.87	1.00	47.88	1.98	94.80	0.86	41.37
◆	13.07	111.62	17.57	0.51	2.00	95.76	2.34	112.04	1.60	76.42
▲	17.03	110.17	17.34	0.53	4.00	191.52	2.64	126.40	2.10	100.55

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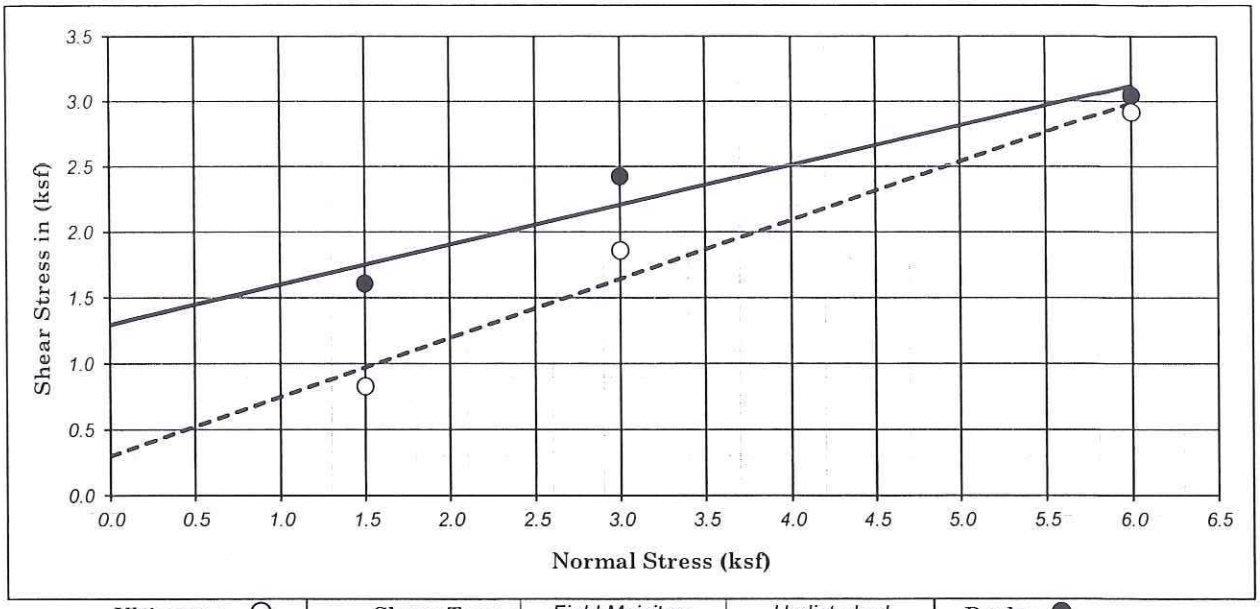
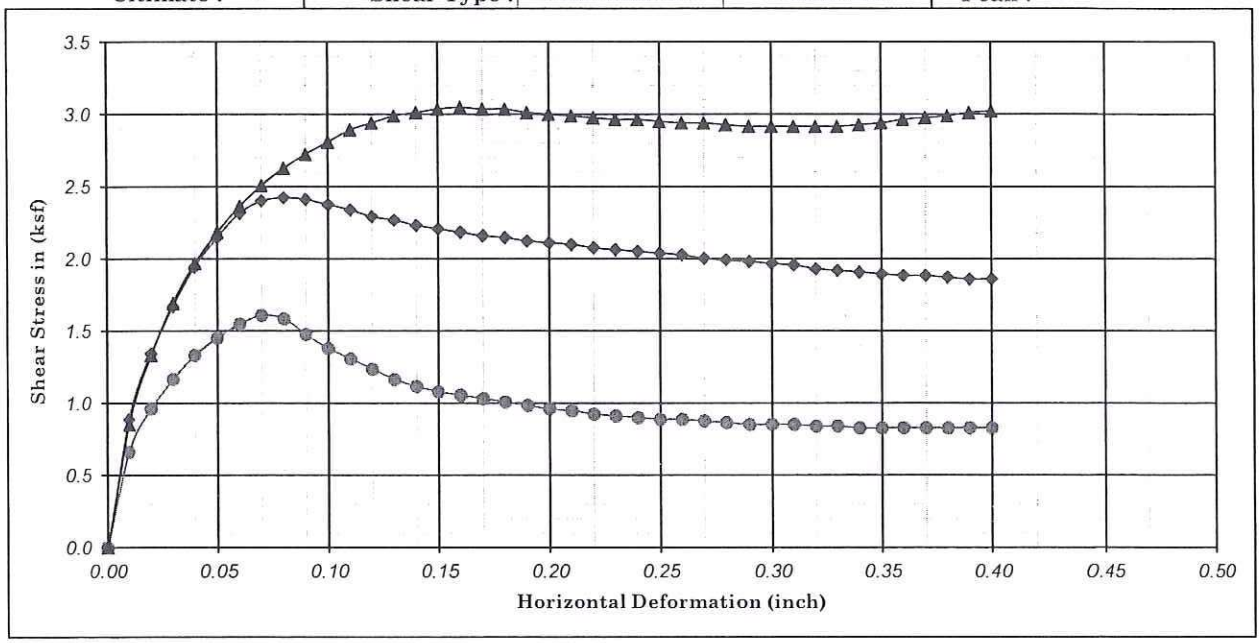


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-259		Strength Intercept (C) :	1.30	(ksf)	Peak	0.30	(ksf)	Ultimate
Sample No. : D-6			62.05	(kPa)		14.36	(kPa)	
Depth (ft/m) : 30.0	0.00	Friction Angle (ϕ) :	16.91	Degree		24.13	Degree	
Description : Olive-brown, Lean CLAY with SAND (CL)					Shear Rate (inch/minute) :			0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	24.75	97.00	15.27	0.74	1.50	71.82	1.61	76.99	0.83	39.64
◆	20.10	97.38	15.33	0.73	3.00	143.64	2.42	116.06	1.86	89.06
▲	23.48	98.20	15.46	0.72	6.00	287.28	3.05	145.94	2.92	139.62

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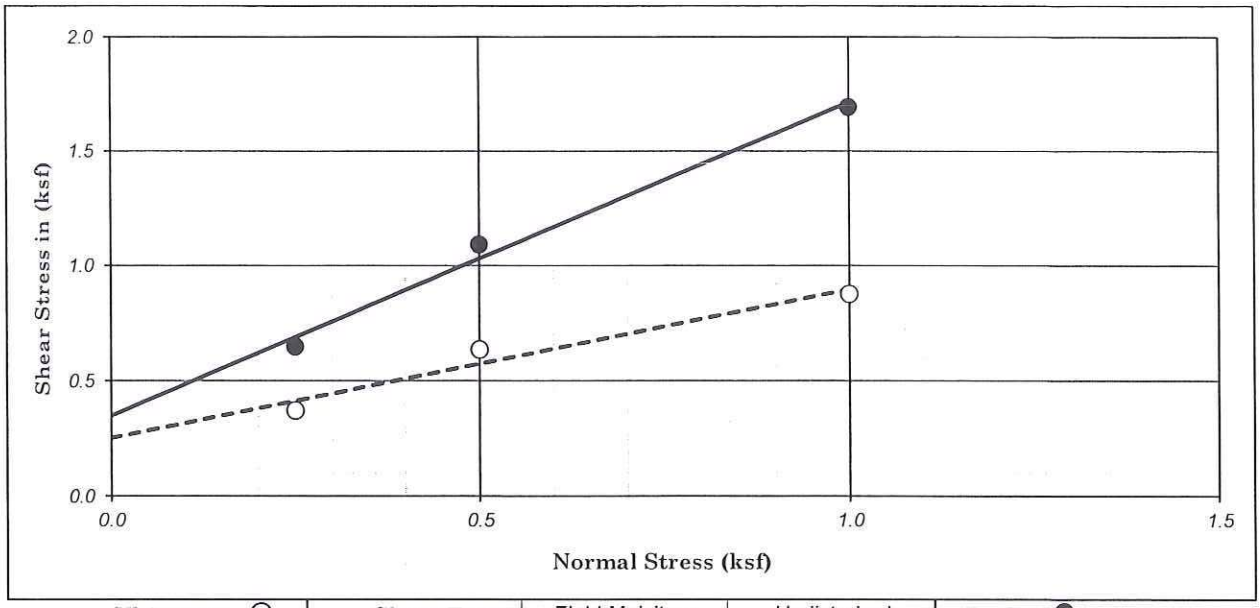
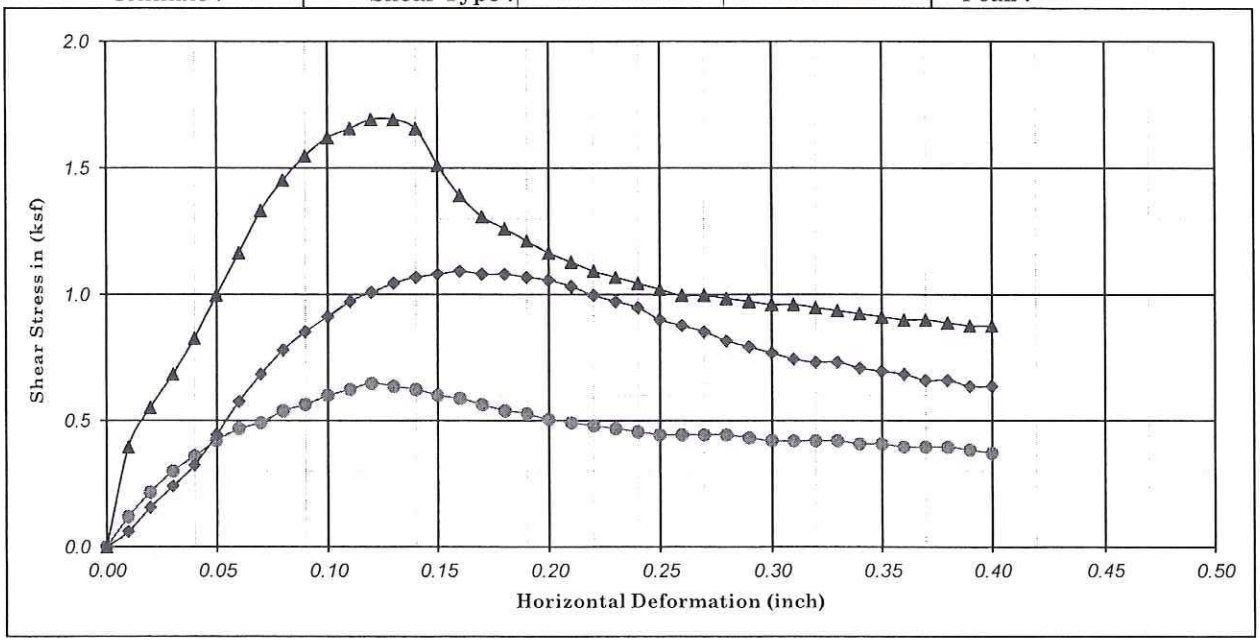
Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-260		Strength Intercept (C) :	0.35	(ksf)	Peak	0.25	(ksf)	Ultimate	
Sample No. : D-2			16.66	(kPa)		12.07	(kPa)		
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	53.76	Degree		32.80	Degree		
Description : Dark brown, Lean CLAY with SAND (CL)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	25.21	87.89	13.83	0.92	0.25	11.97	0.65	31.03	0.37	17.81
◆	26.43	87.50	13.77	0.93	0.50	23.94	1.09	52.28	0.64	30.45
▲	26.28	85.27	13.42	0.98	1.00	47.88	1.69	81.01	0.88	41.94

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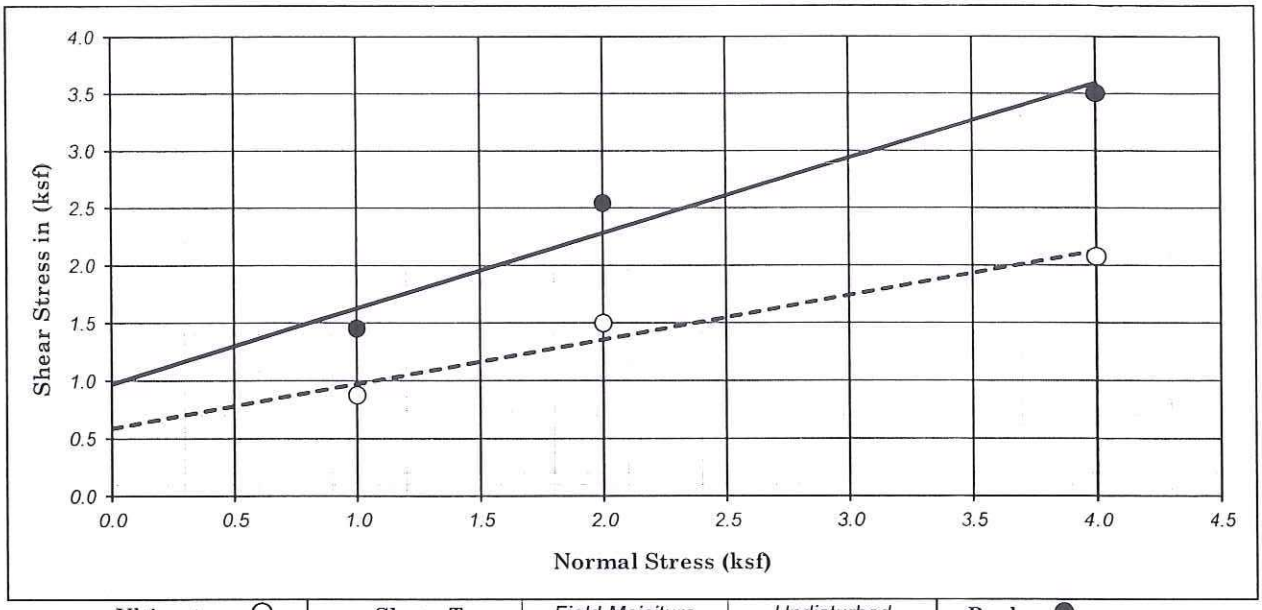
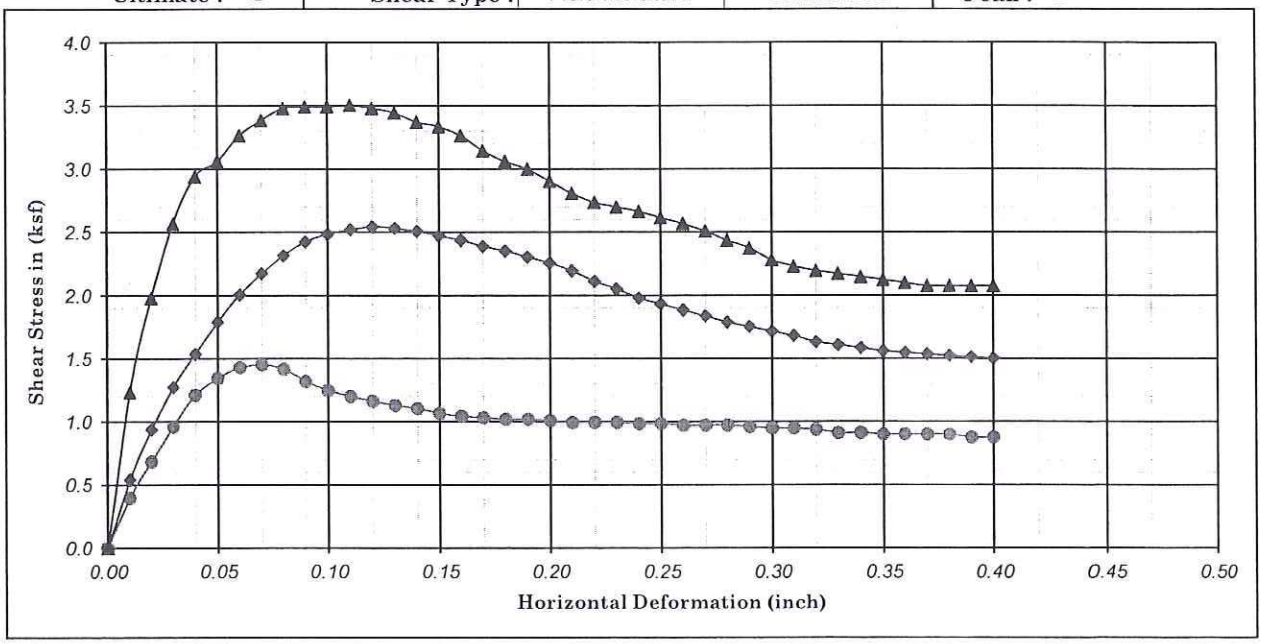


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-260		Strength Intercept (C) :	0.97	(ksf)	Peak	0.59	(ksf)	Ultimate
Sample No. : D-4			46.54	(kPa)		28.15	(kPa)	
Depth (ft/m) : 15.0	0.00	Friction Angle (ϕ) :	33.22	Degree		21.01	Degree	
Description : Dark brown, Elastic SILT (MH)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	29.59	84.97	13.37	0.98	1.00	47.88	1.45	69.52	0.88	41.94
◆	28.31	83.62	13.16	1.02	2.00	95.76	2.54	121.81	1.50	71.82
▲	28.72	84.00	13.22	1.01	4.00	191.52	3.50	167.77	2.08	99.40

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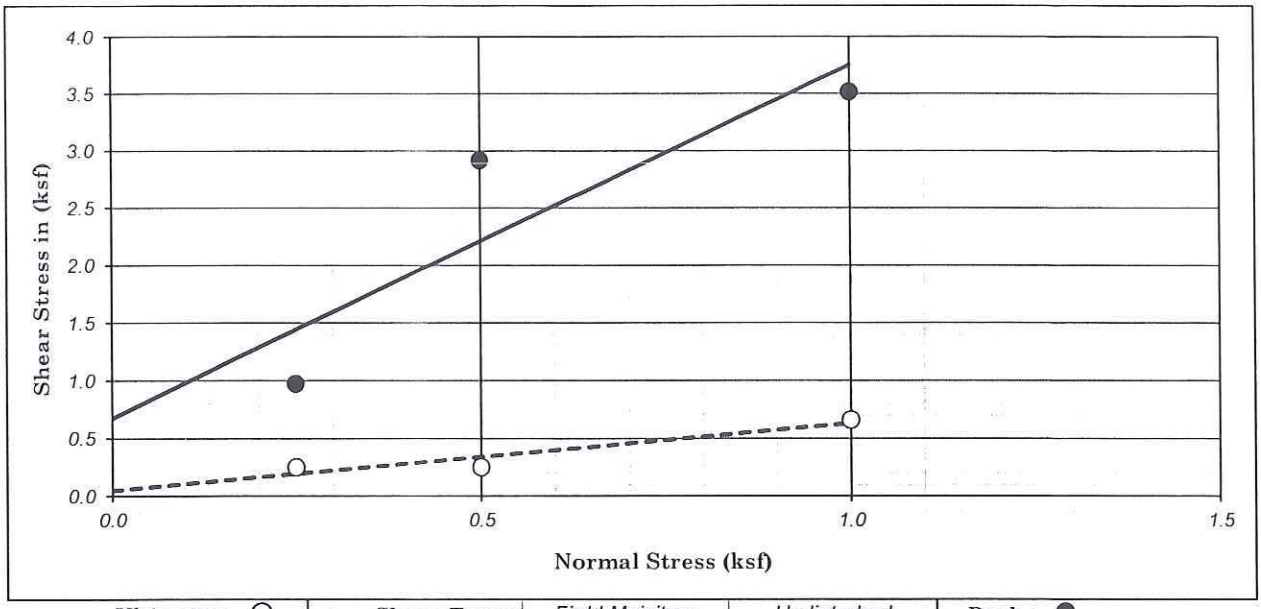
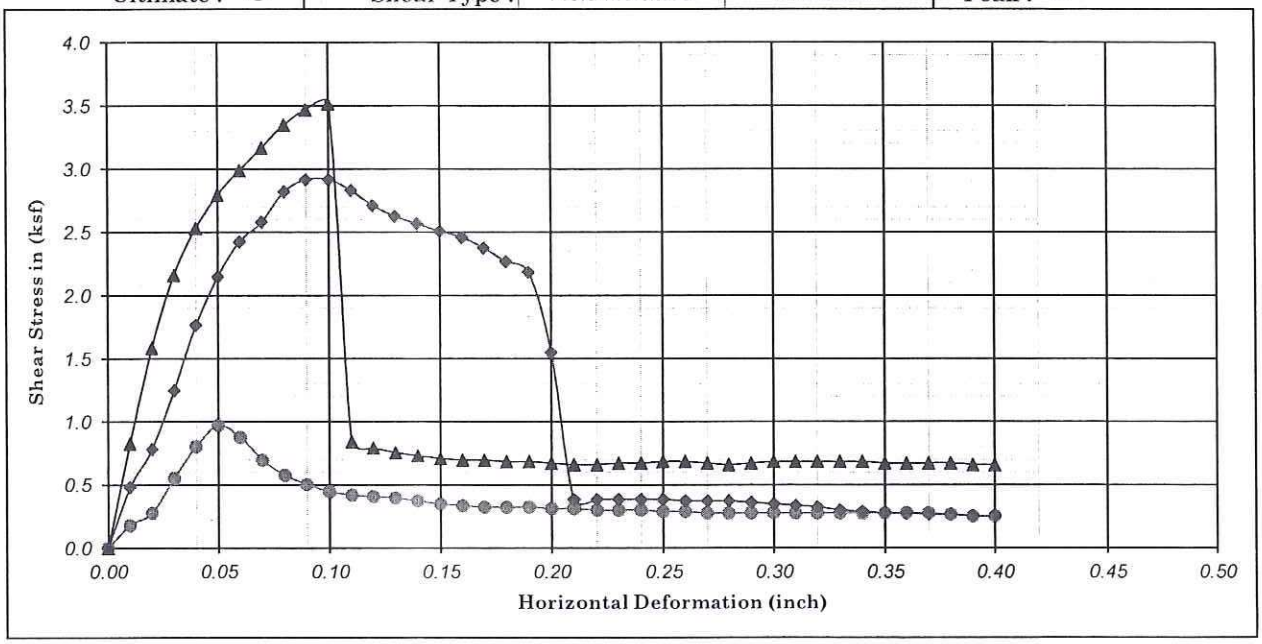


Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-261		Strength Intercept (C) :	0.67	(ksf)	Peak	0.05	(ksf)	Ultimate	
Sample No. : D-2			32.18	(kPa)		2.30	(kPa)		
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	72.01	Degree		30.24	Degree		
Description : Very dark grayish brown, Elastic SILT (MH)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	28.66	88.86	13.99	0.90	0.25	11.97	0.97	46.54	0.25	12.07
◆	28.51	91.26	14.36	0.85	0.50	23.94	2.92	139.62	0.25	12.07
▲	28.38	92.11	14.50	0.83	1.00	47.88	3.52	168.35	0.66	31.60

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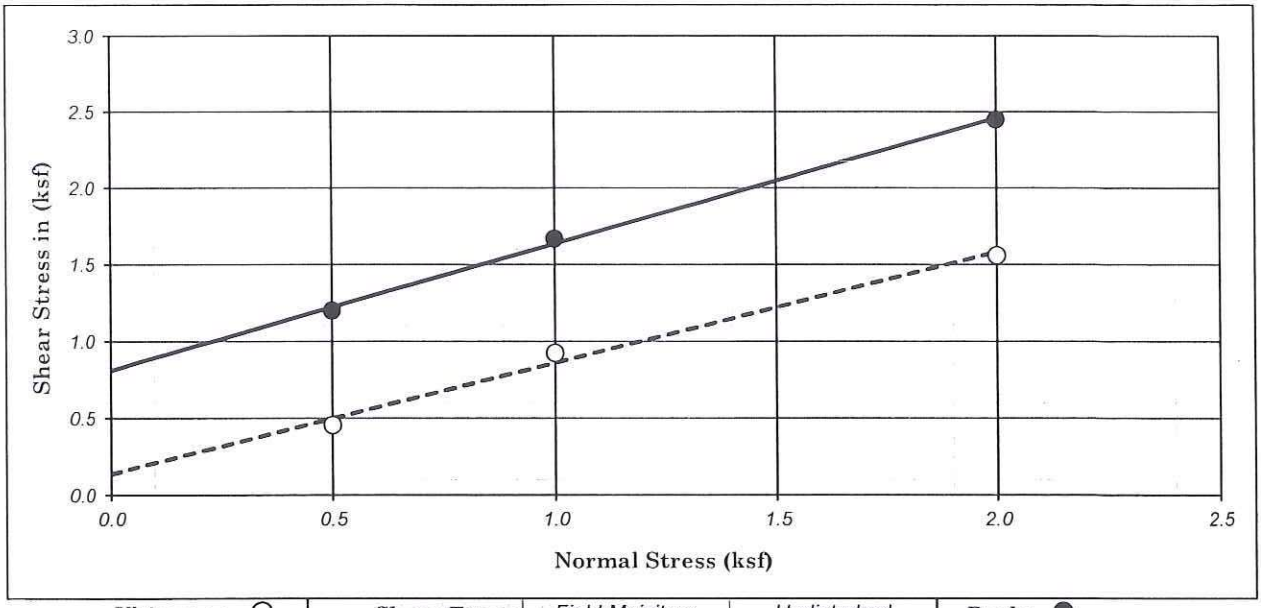
Geotechnical and Earthquake Engineering

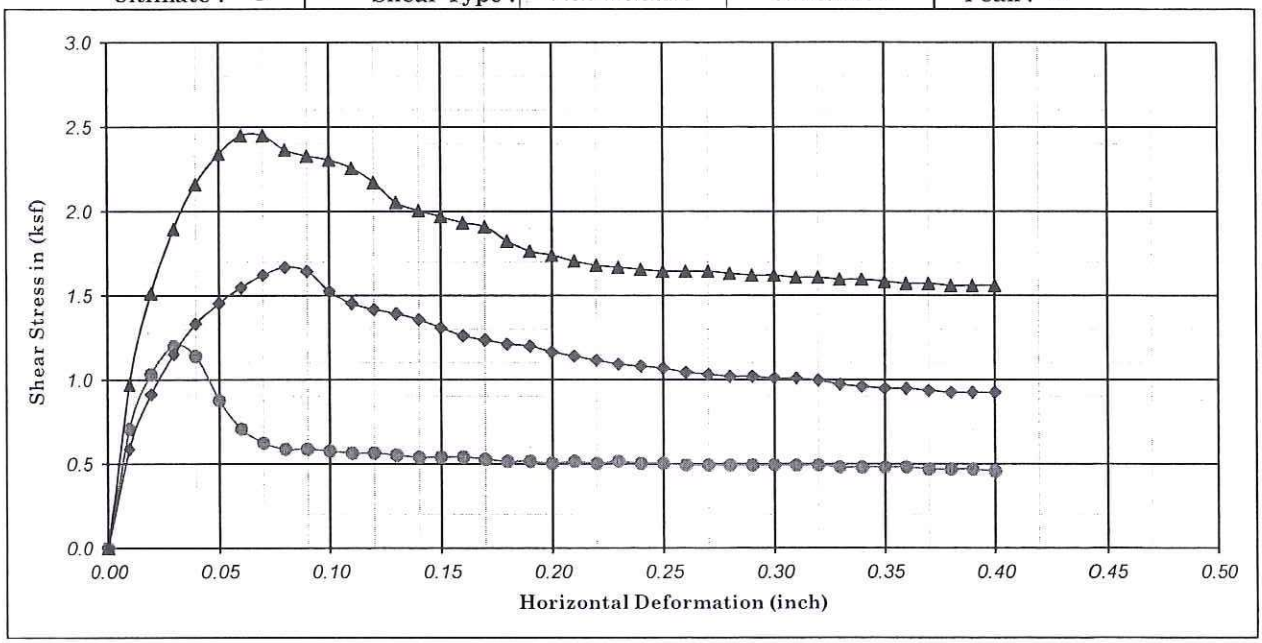
AECOM/I-5 HOV Widening Segment 2

DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/19/11 | Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-263	Strength Intercept (C) :	0.81	(ksf)	Peak	0.14	(ksf)	Ultimate		
Sample No. : D-3		38.78	(kPa)		6.61	(kPa)			
Depth (ft/m) : 10.0 / 0.00	Friction Angle (ϕ) :	39.51	Degree		35.82	Degree			
Description : Olive-brown, SANDY lean CLAY (CL)							Shear Rate (inch/minute) :	0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m³)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	11.83	104.40	16.43	0.61	0.50	23.94	1.20	57.46	0.46	21.83
◆	12.71	103.78	16.33	0.62	1.00	47.88	1.67	79.86	0.92	44.24
▲	12.31	100.98	15.89	0.67	2.00	95.76	2.45	117.21	1.56	74.69

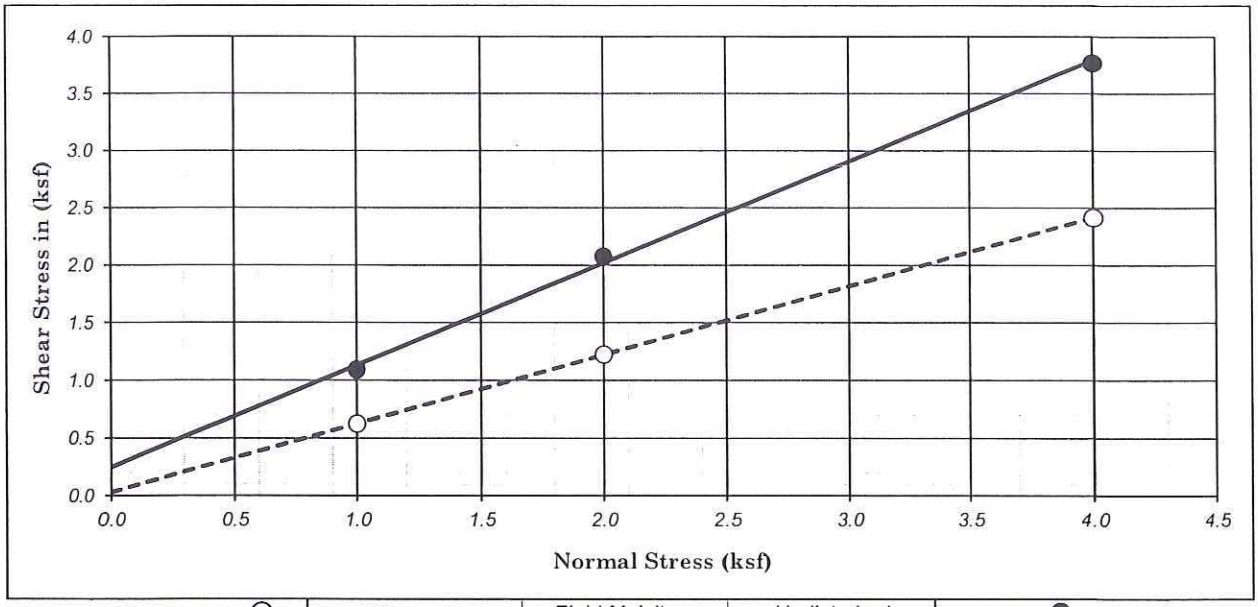
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

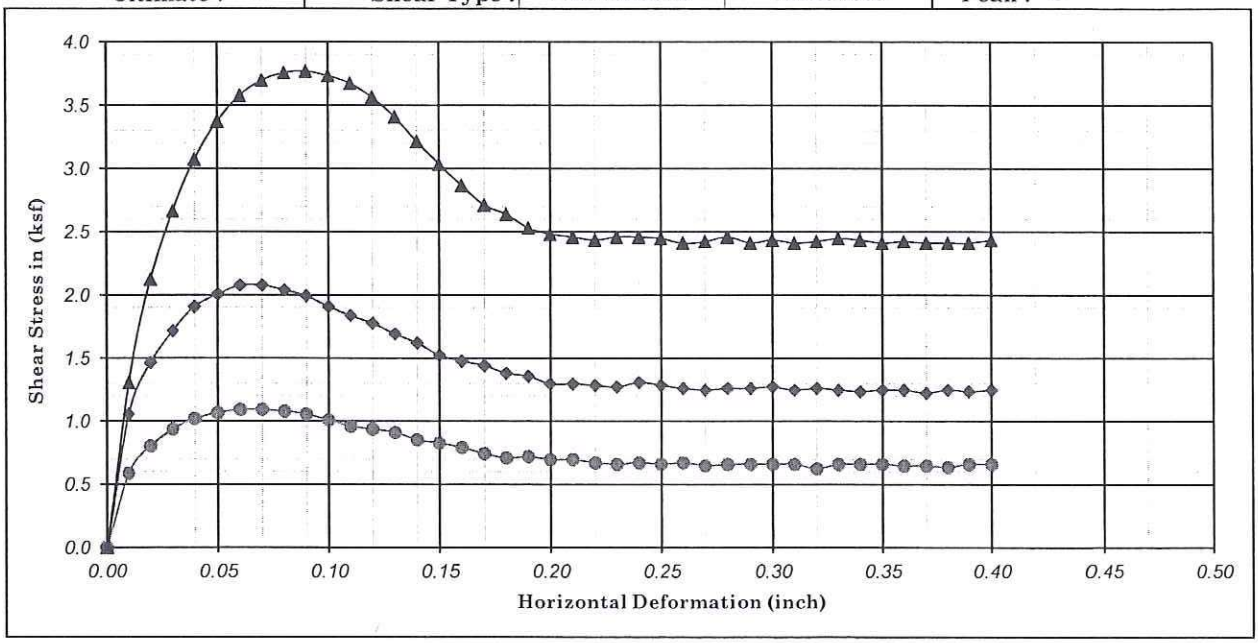
Project No. : 11-136 | Date : 11/19/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-263		Strength Intercept (C) :	0.25	(ksf)	Peak	0.03	(ksf)	Ultimate		
Sample No. : D-5			11.78	(kPa)		1.44	(kPa)			
Depth (ft/m) : 20.0	0.00	Friction Angle (ϕ) :	41.52	Degree		30.78	Degree			
Description : Olive-brown, Poorly graded SAND (SP)						Shear Rate (inch/minute) :		0.02		

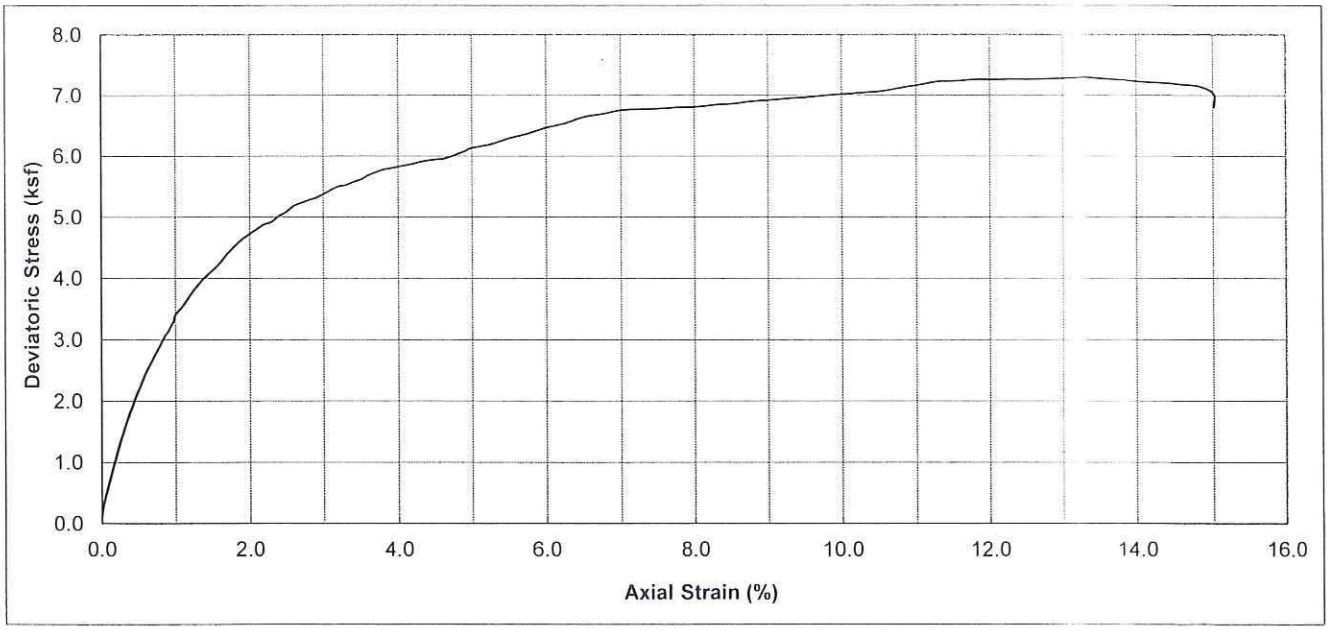
SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m³)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.90	108.17	17.03	0.56	1.00	47.88	1.09	52.28	0.62	29.88
◆	0.90	107.84	16.97	0.56	2.00	95.76	2.08	99.40	1.22	58.61
▲	0.95	108.23	17.04	0.56	4.00	191.52	3.77	180.41	2.41	115.49

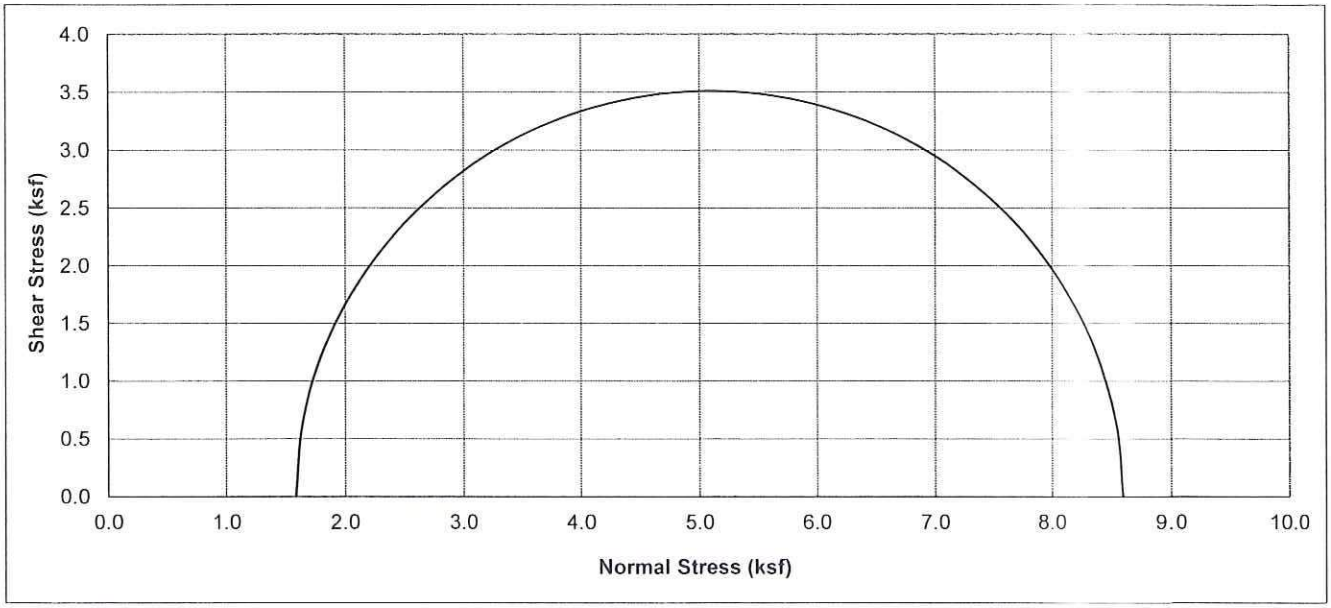
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

DIRECT SHEAR TEST (ASTM D-3080)

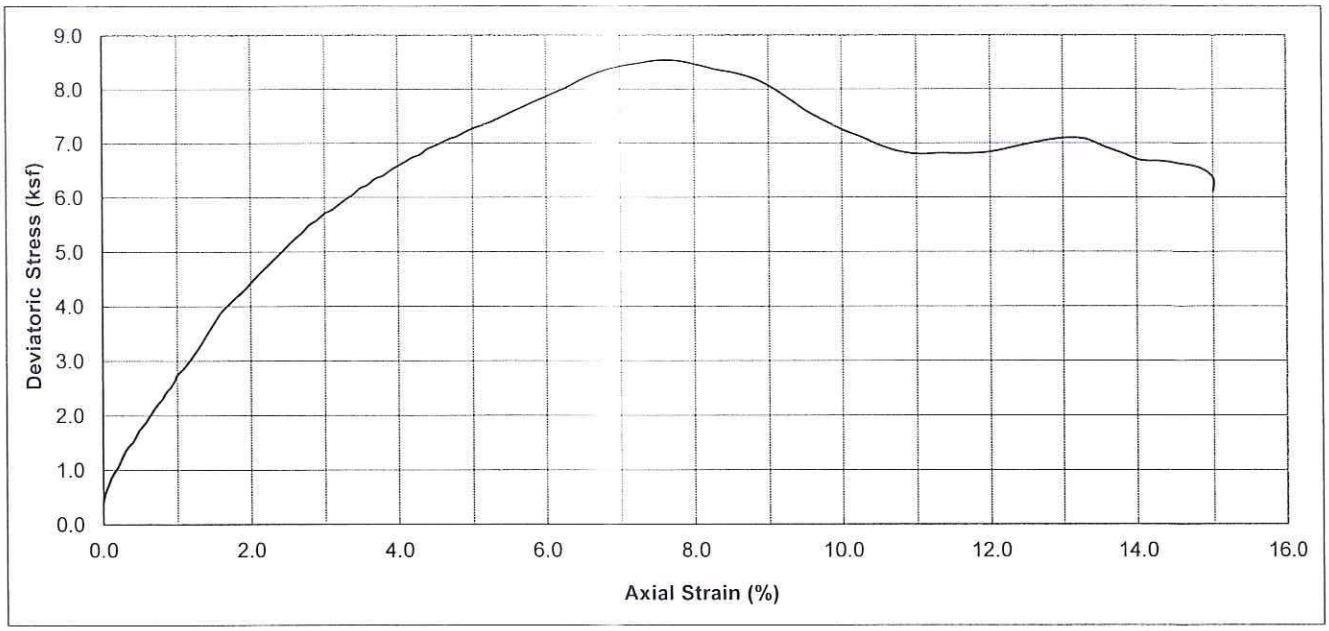
Project No. : 11-136 | Date : 11/19/11 | Figure No. :

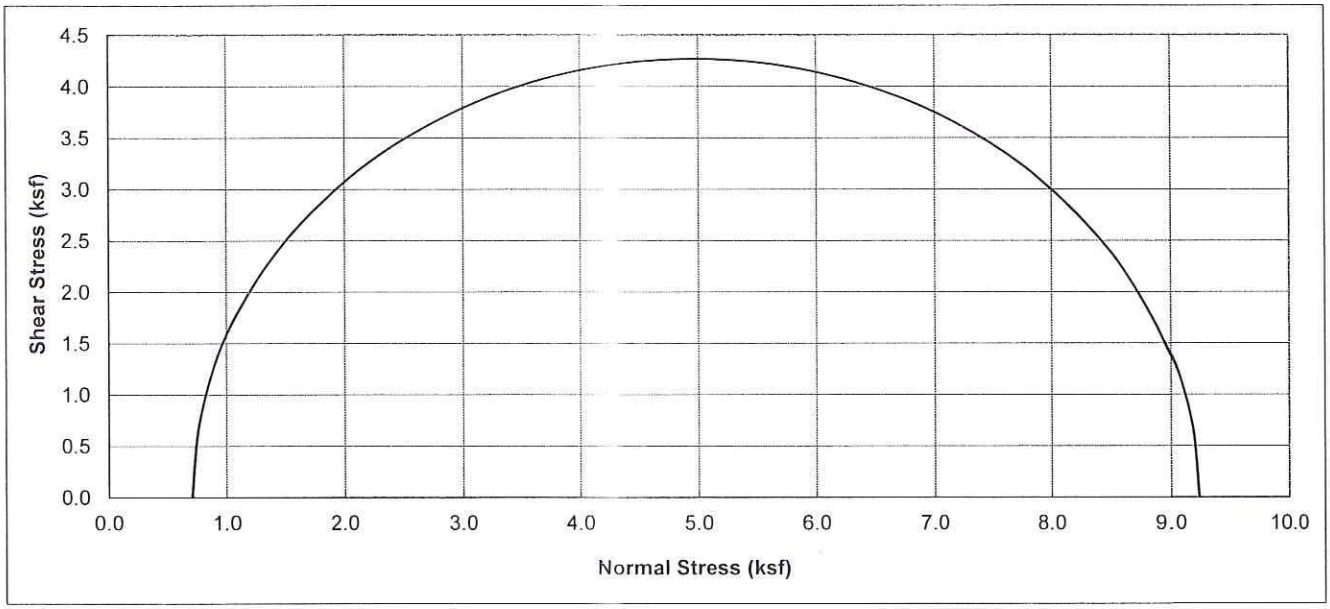




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-202	D-4	20	Dark gray , Lean CLAY (CL)	93.8	26.34	1.58	7.02	89.3

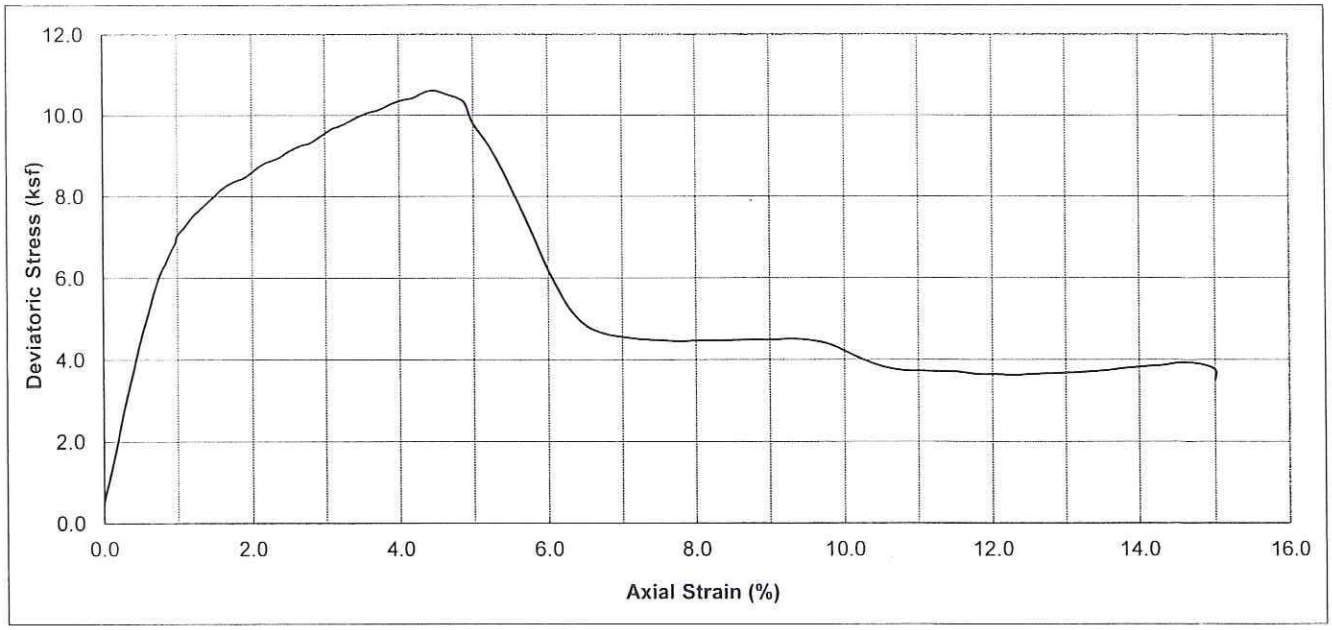
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 Date : 11/06/11	Figure No. :

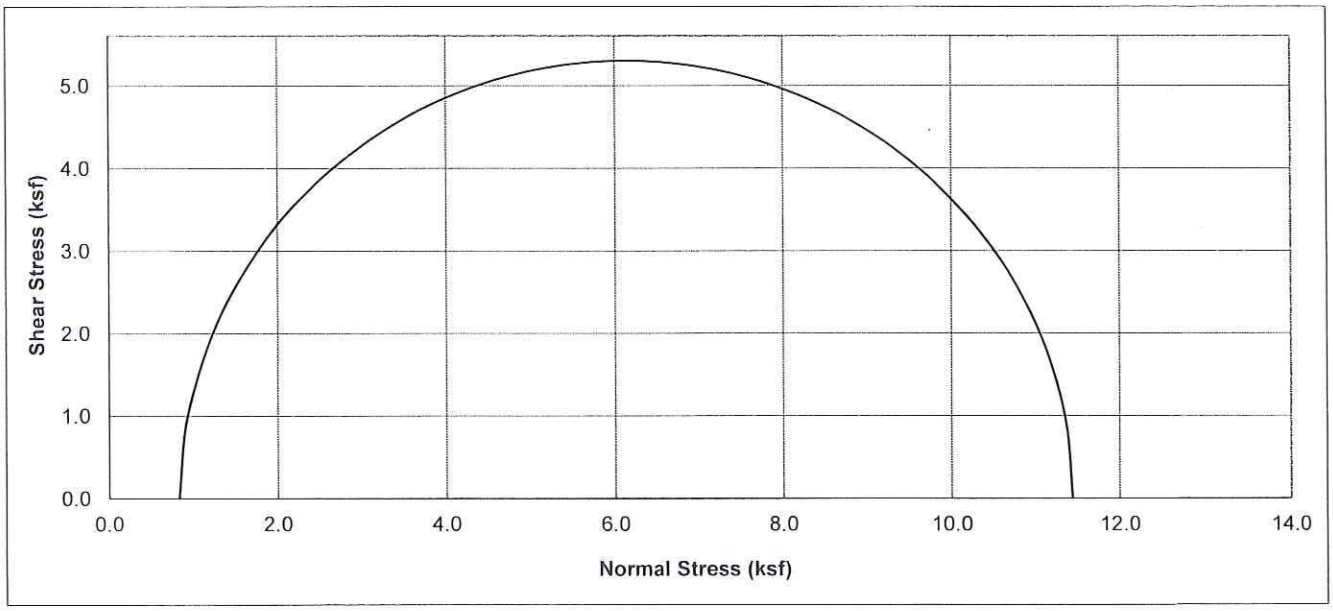




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-203	D-1	5	Olive-brown, Lean CLAY(CL)	93.3	28.72	0.69	8.54	96.2

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 Date : 11/06/11	Figure No. :





Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-206	D-2	10	Olive brown , Fat CLAY (CH)	90.2	30.46	0.83	10.60	94.8

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
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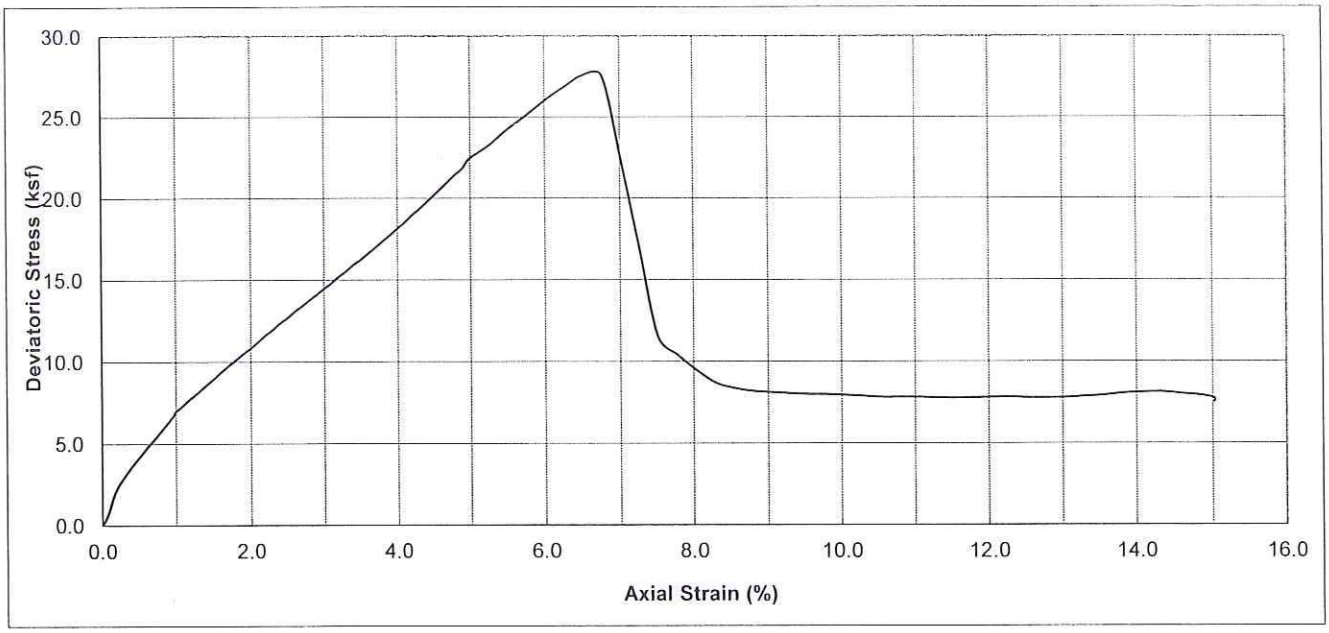
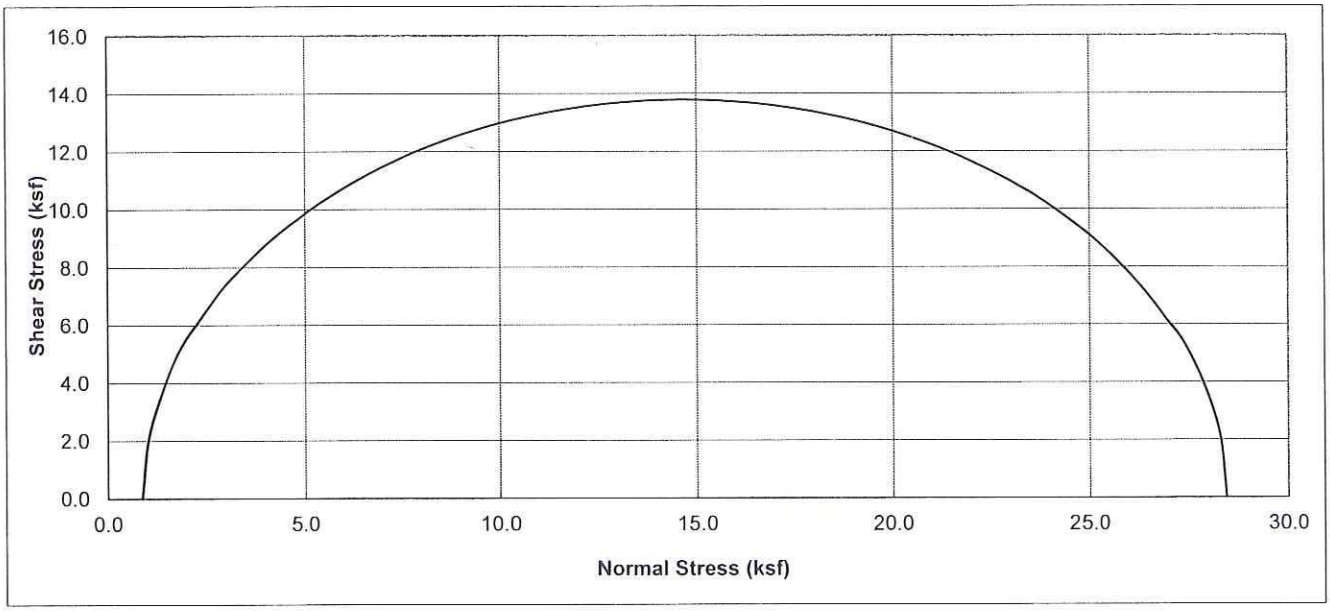
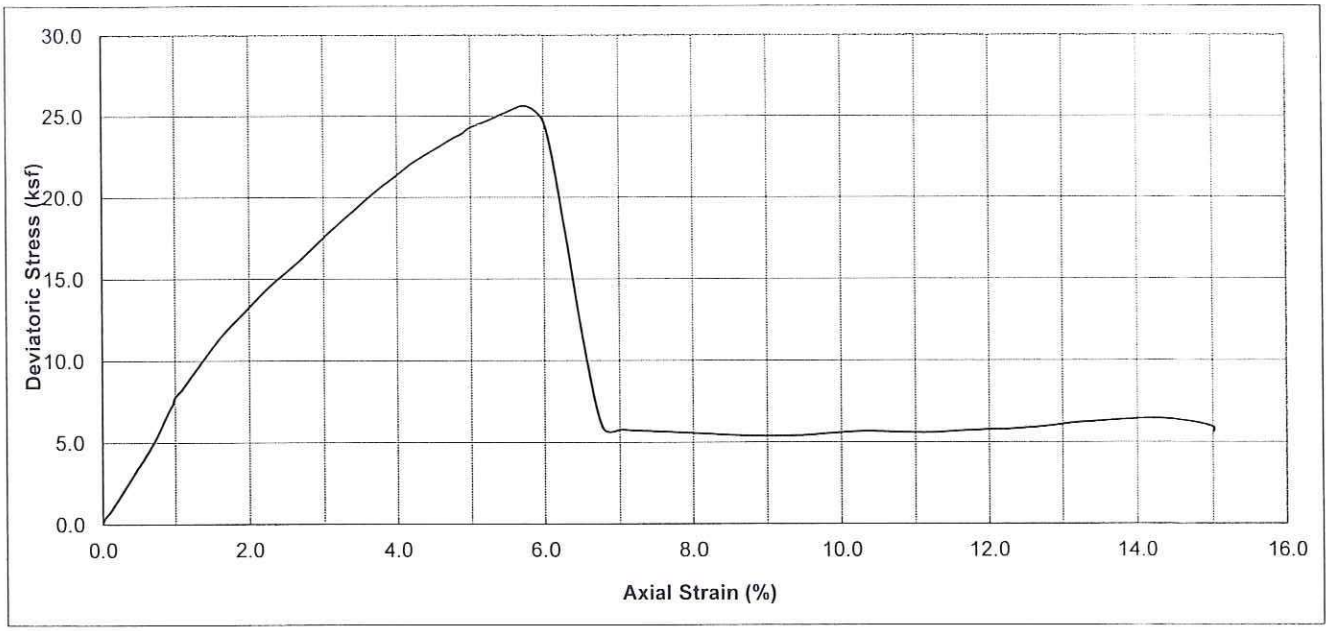
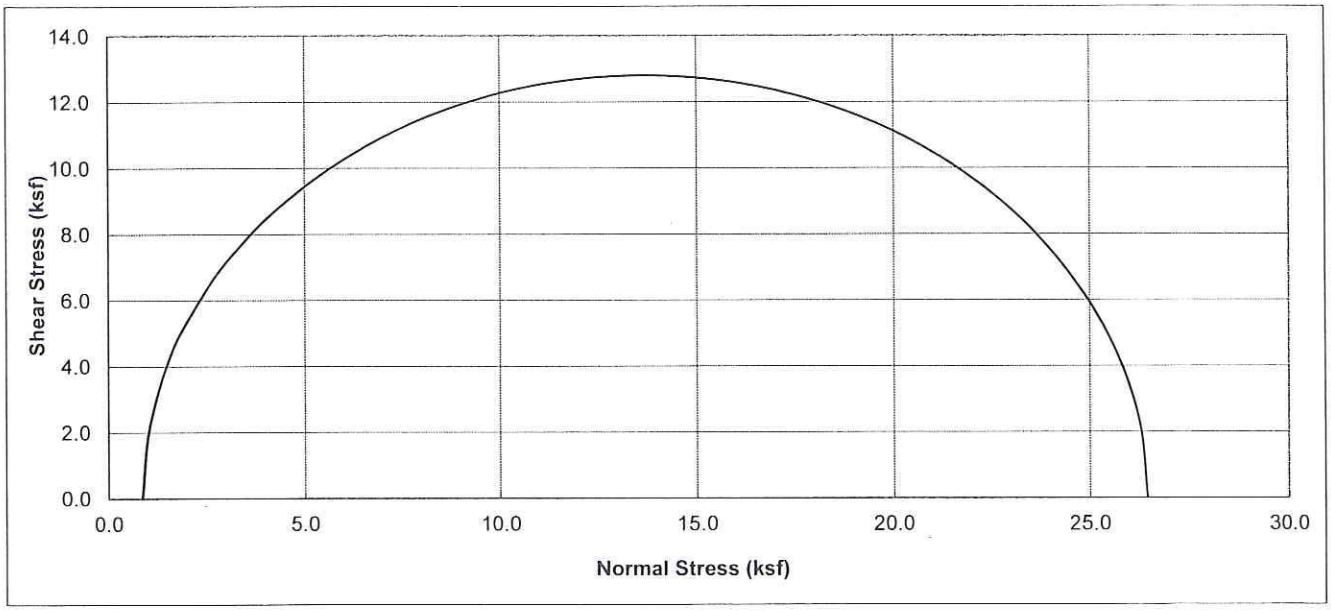




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-210	D-3	10	Very dark gray , Elastic SILT (MH)	95.1	26.67	0.86	27.57	93.2

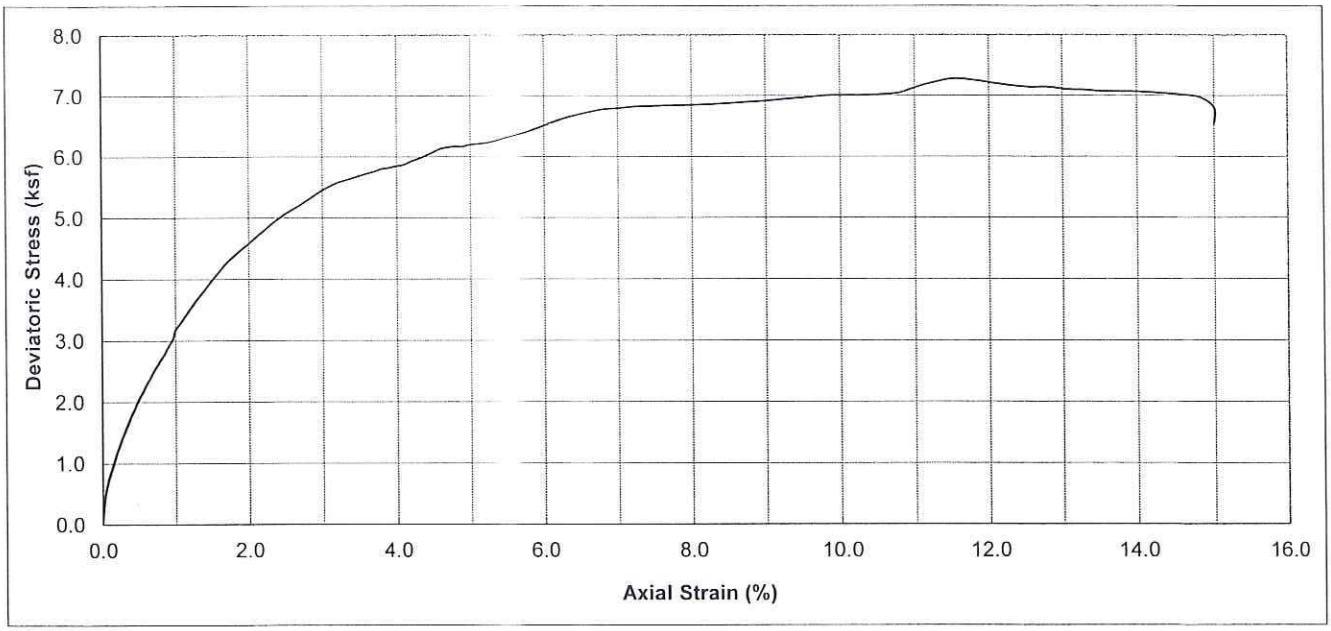
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :
Project No. : 11-136	Date : 11/06/11

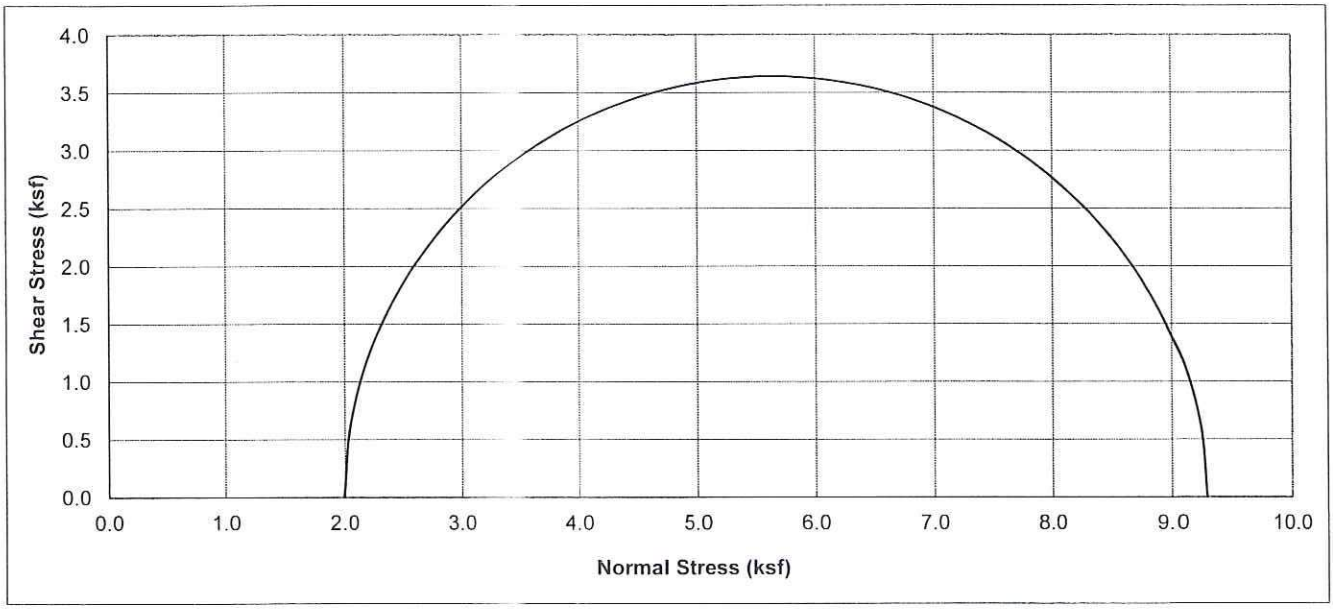




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-212	D-3	10	Very dark gray , Elastic SILT (MH)	95.1	26.94	0.85	25.61	94.2

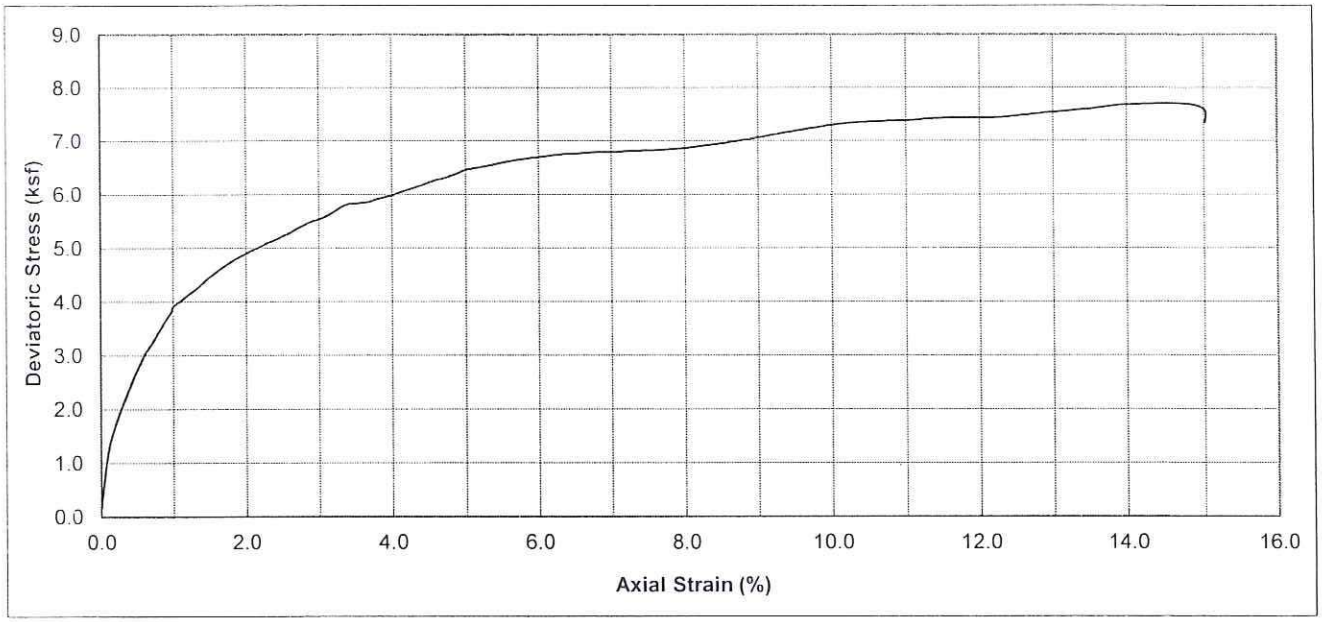
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/06/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

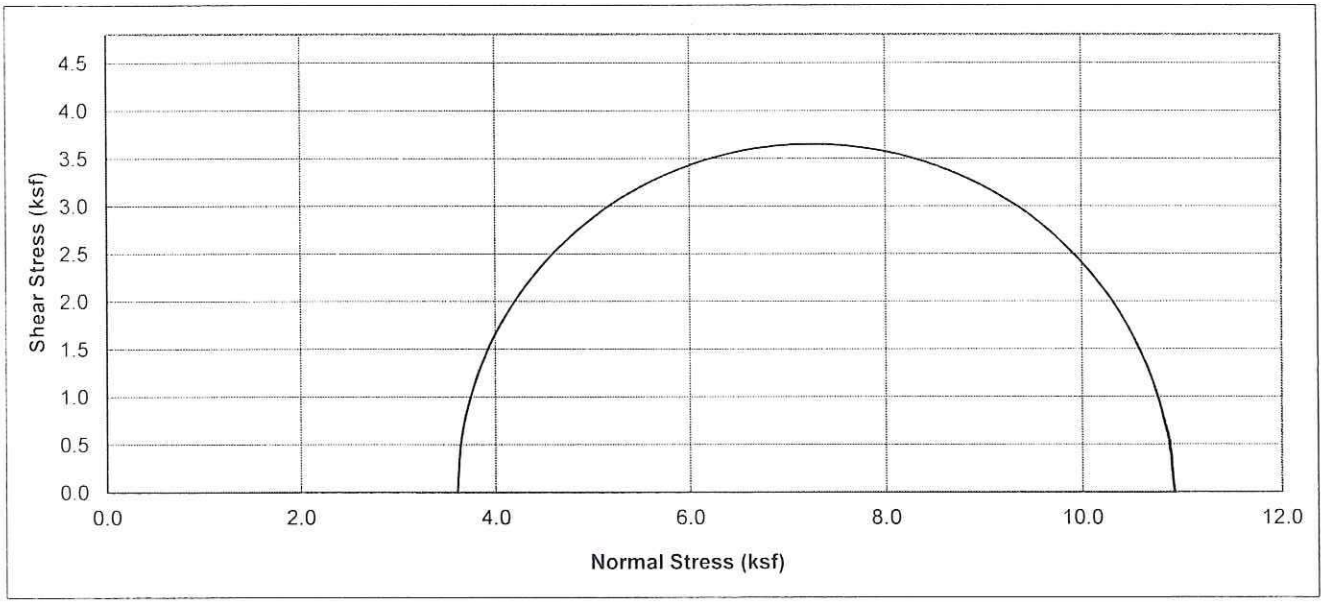




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-216	D-6	25	Olive-brown , Lean CLAY (CL)	92.9	27.84	1.99	7.28	92.4

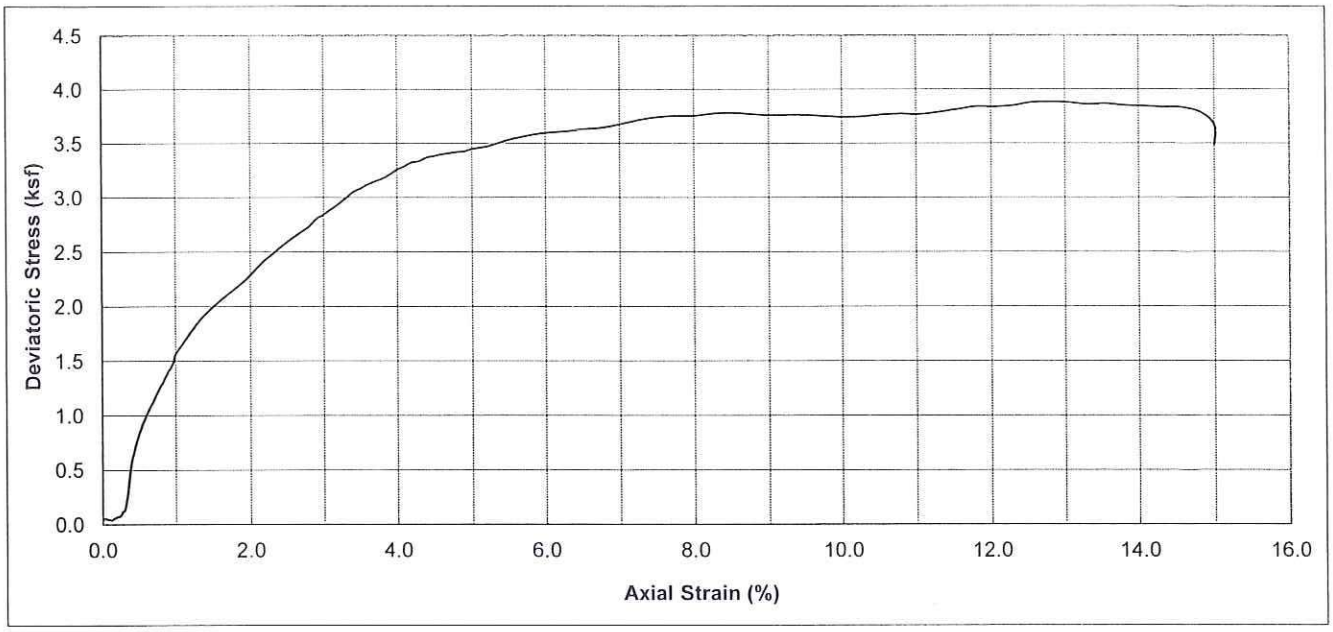
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

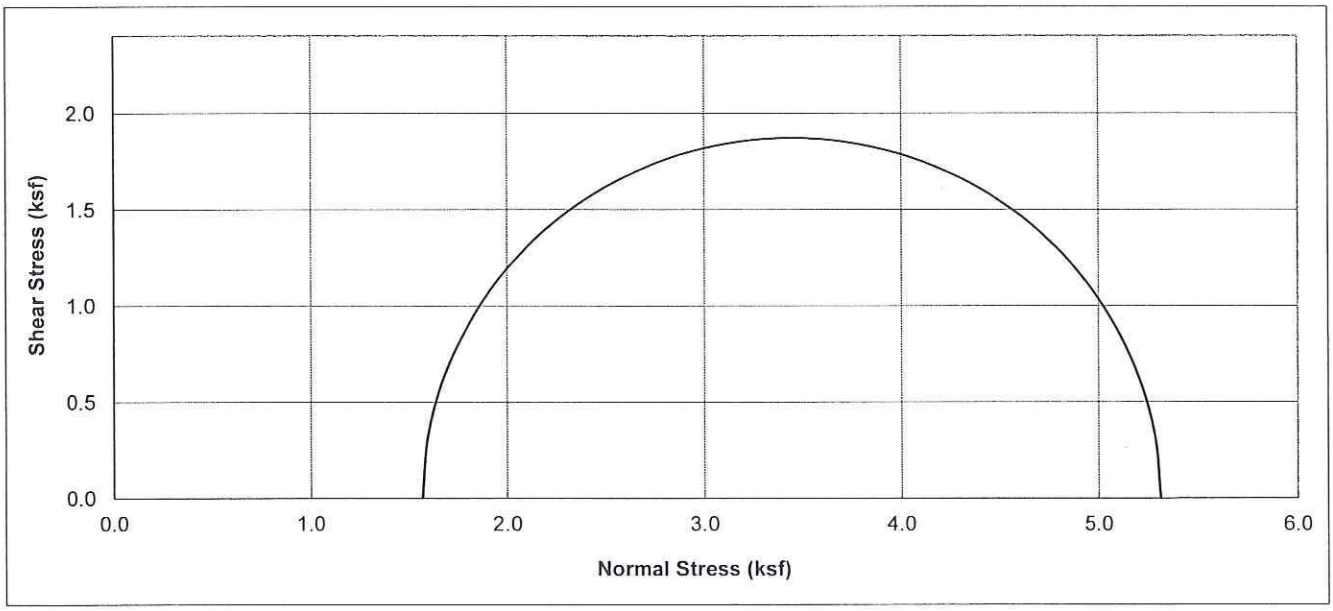




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-216	D-10	45	Olive-brown , Lean CLAY (CL)	101.9	23.06	3.60	7.31	95.4

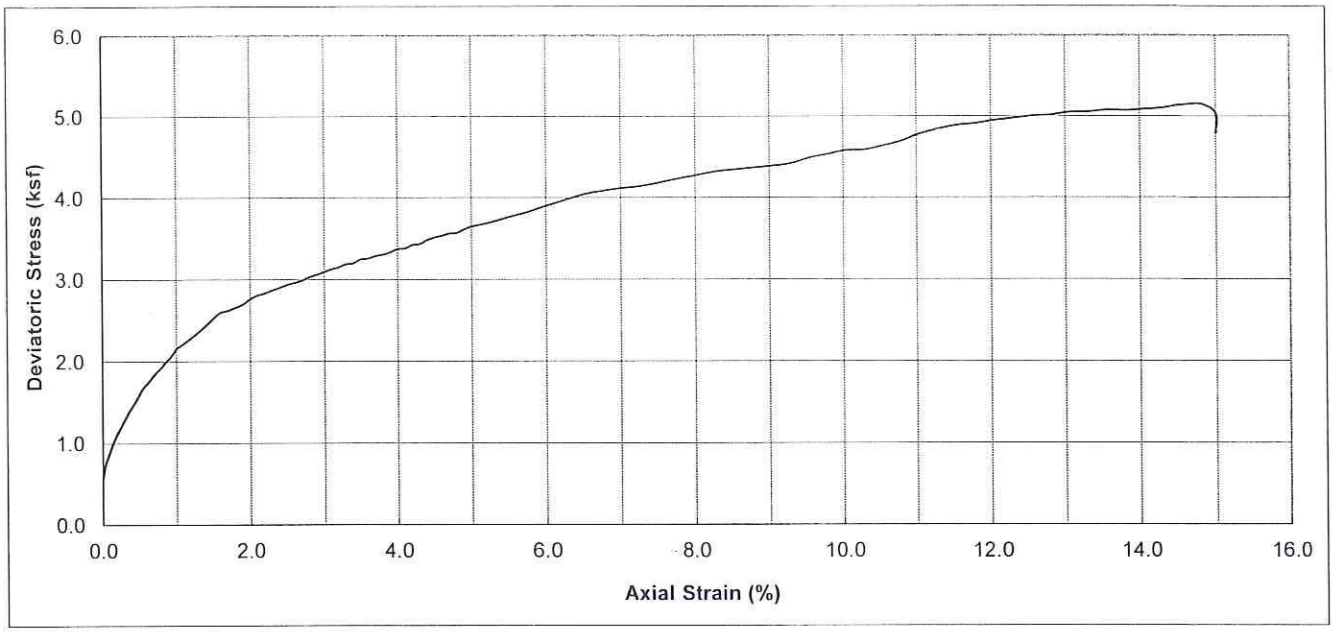
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :
Project No. : 11-136	Date : 11/07/11

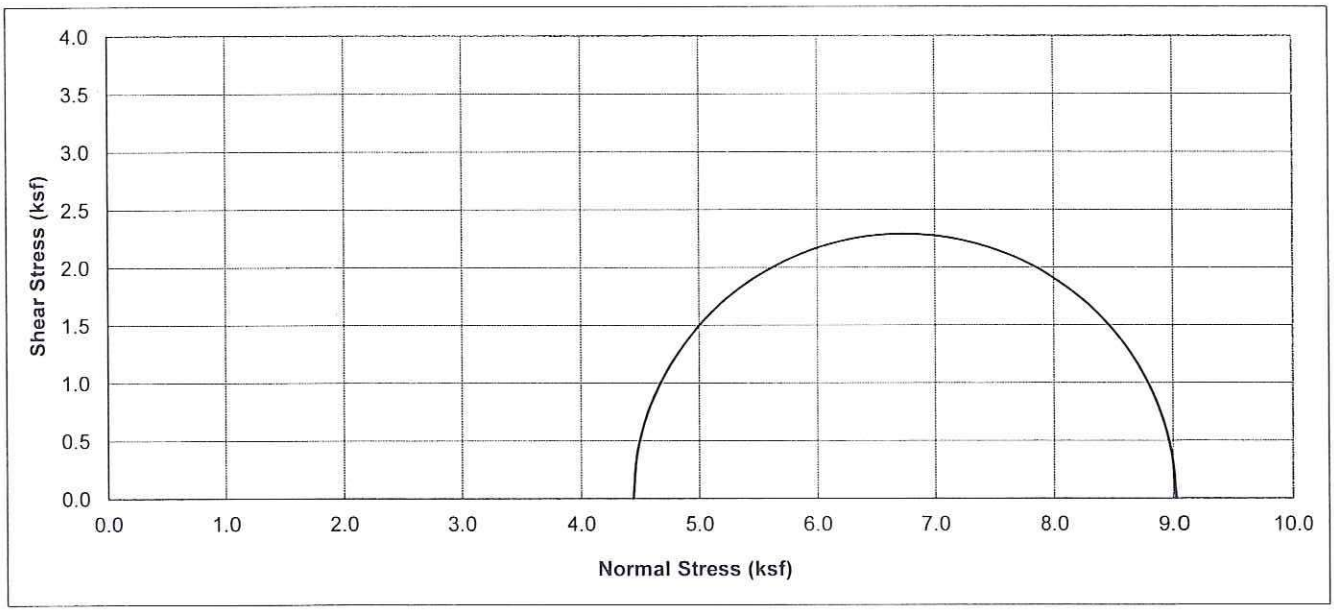




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-220	D-4	20	Olive-brown , SANDY lean CLAY (CL)	106.2	17.83	1.57	3.74	82.2

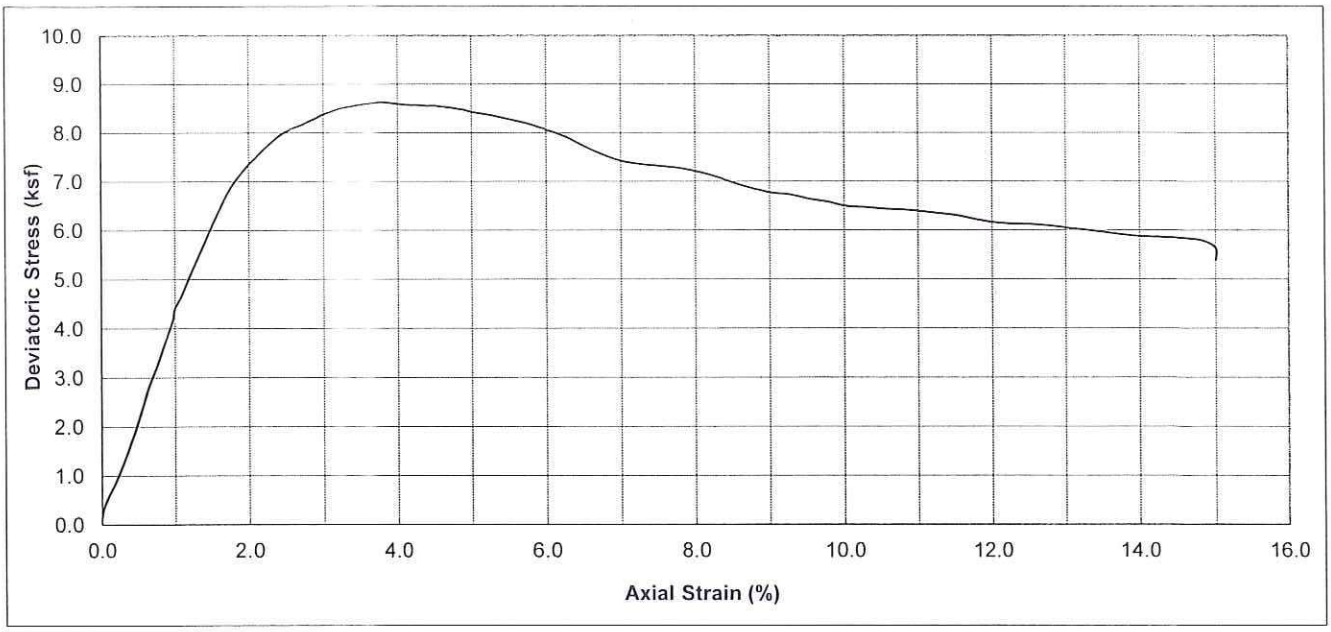
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136	Date : 11/07/11	(ASTM D2850) Figure No. :

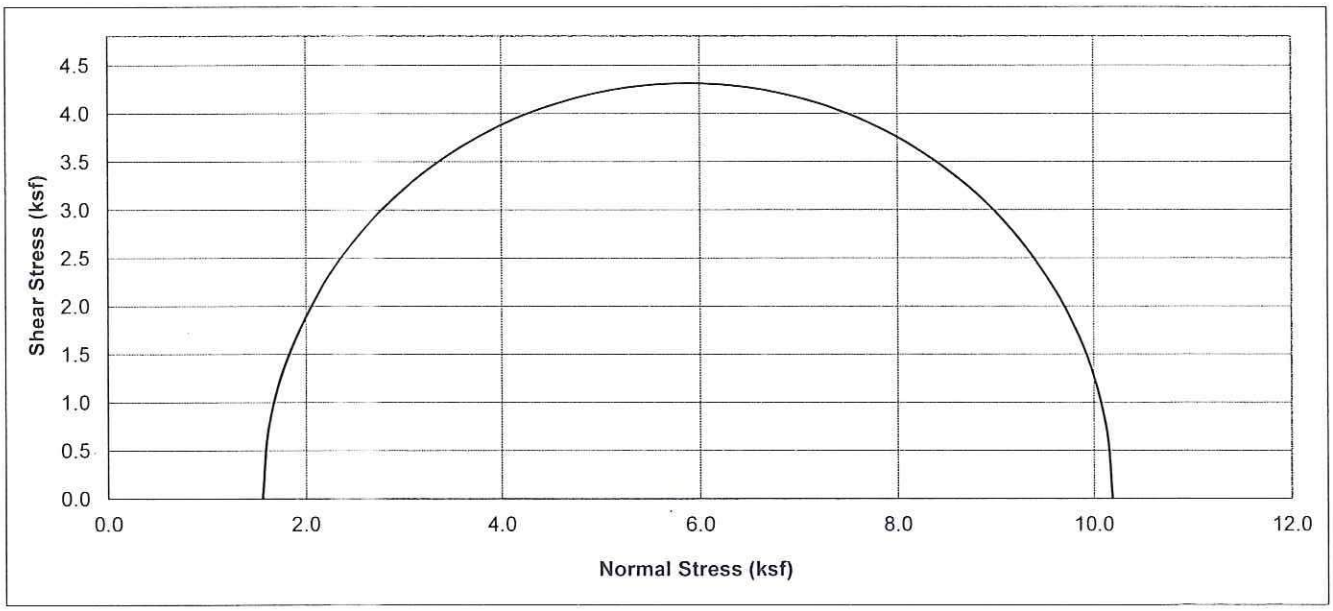




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-221	D-11	55	Dark brown , Lean CLAY (CL)	108.3	20.29	4.44	4.58	98.7

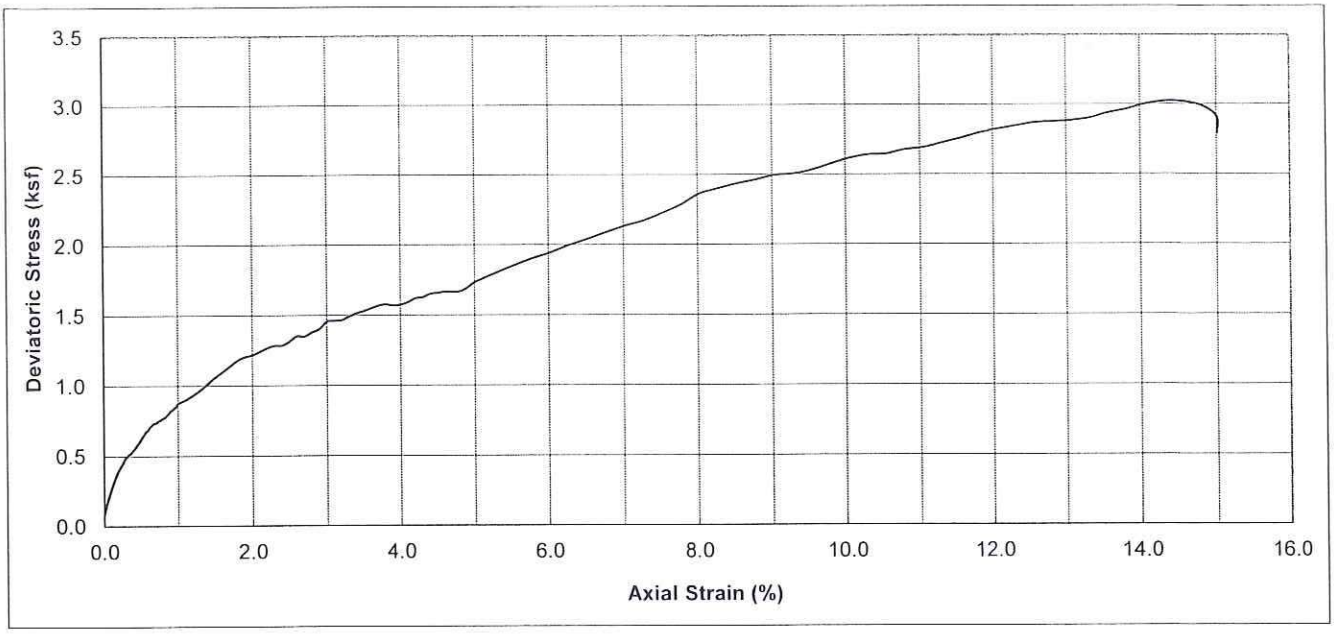
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136	Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

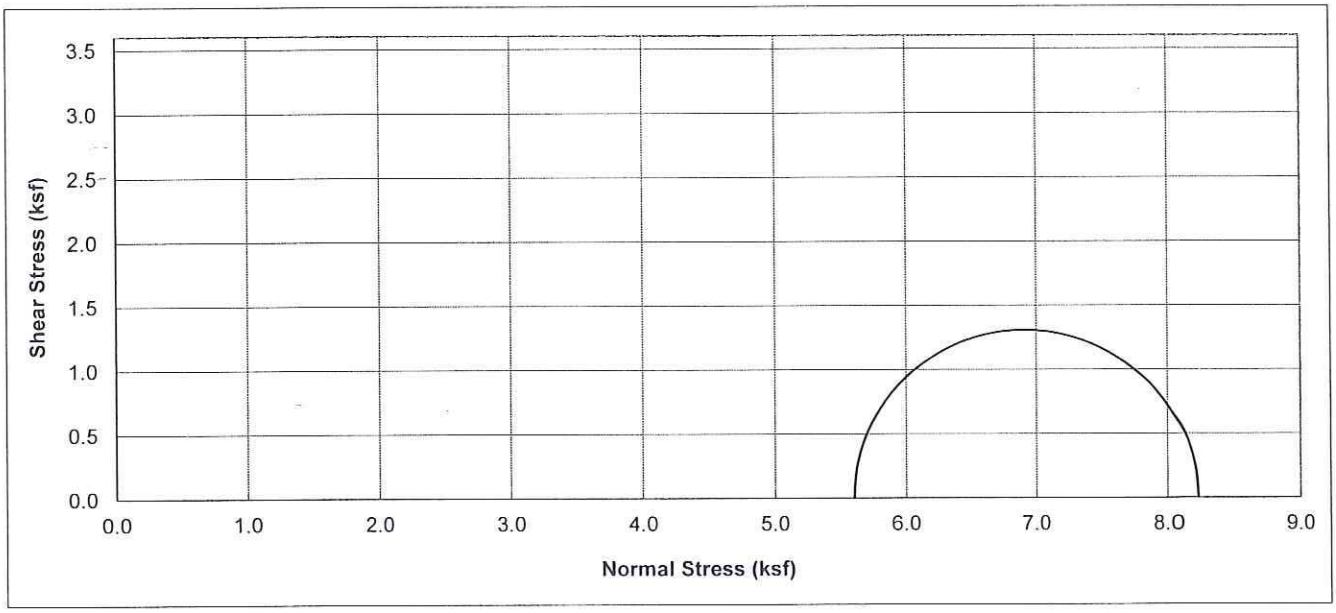




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-222	D-4	20	Dk. Olive-brown to Dk. gray, Elastic SILT (MH)	83.0	33.70	1.57	8.63	88.4

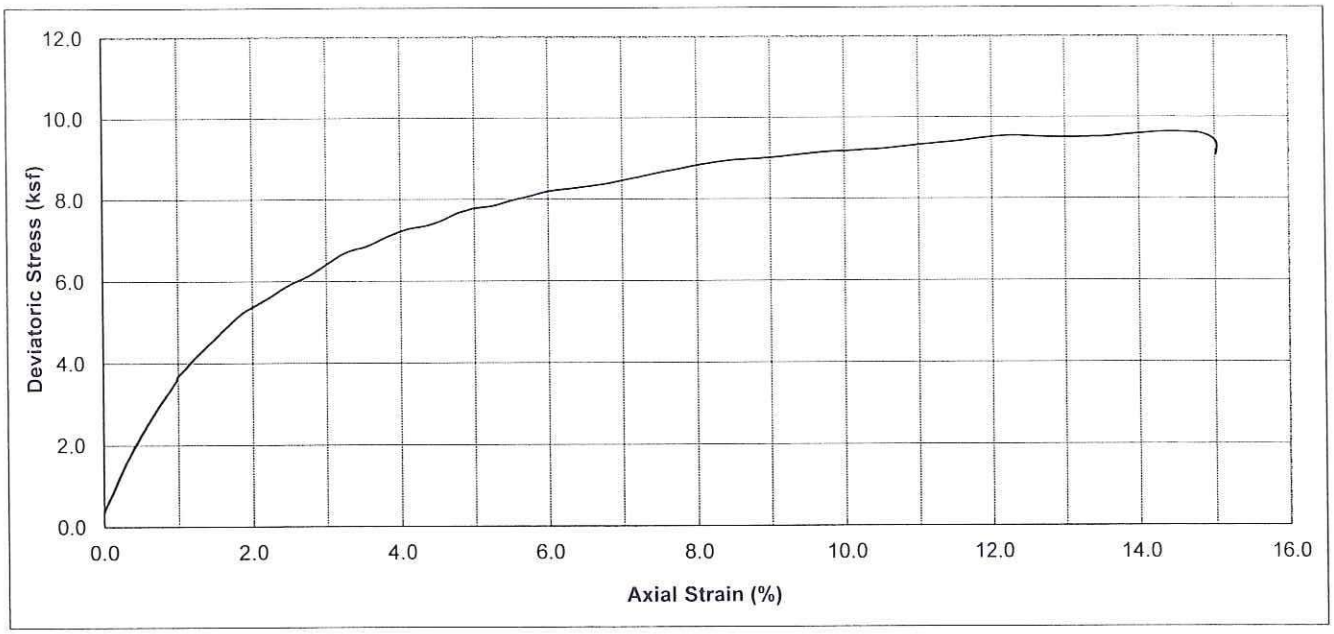
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 Date : 11/07/11	Figure No. :

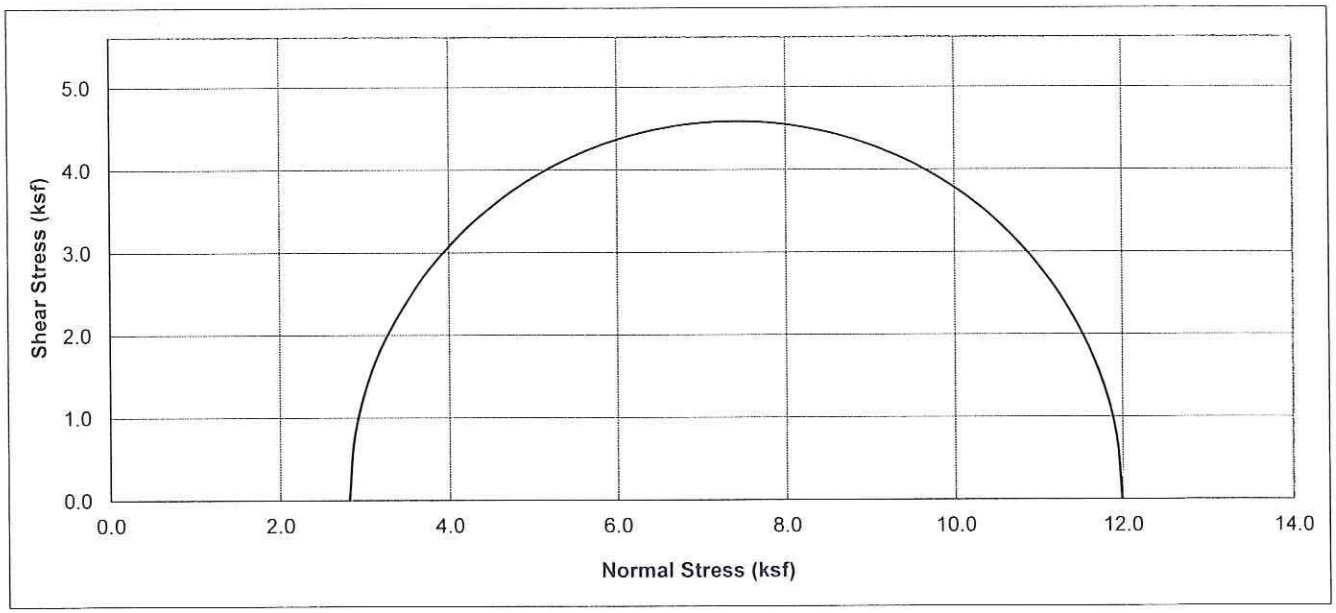




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-222	D-14	70	Olive-brown , Lean CLAY(CL)	99.8	24.54	5.60	2.61	96.2

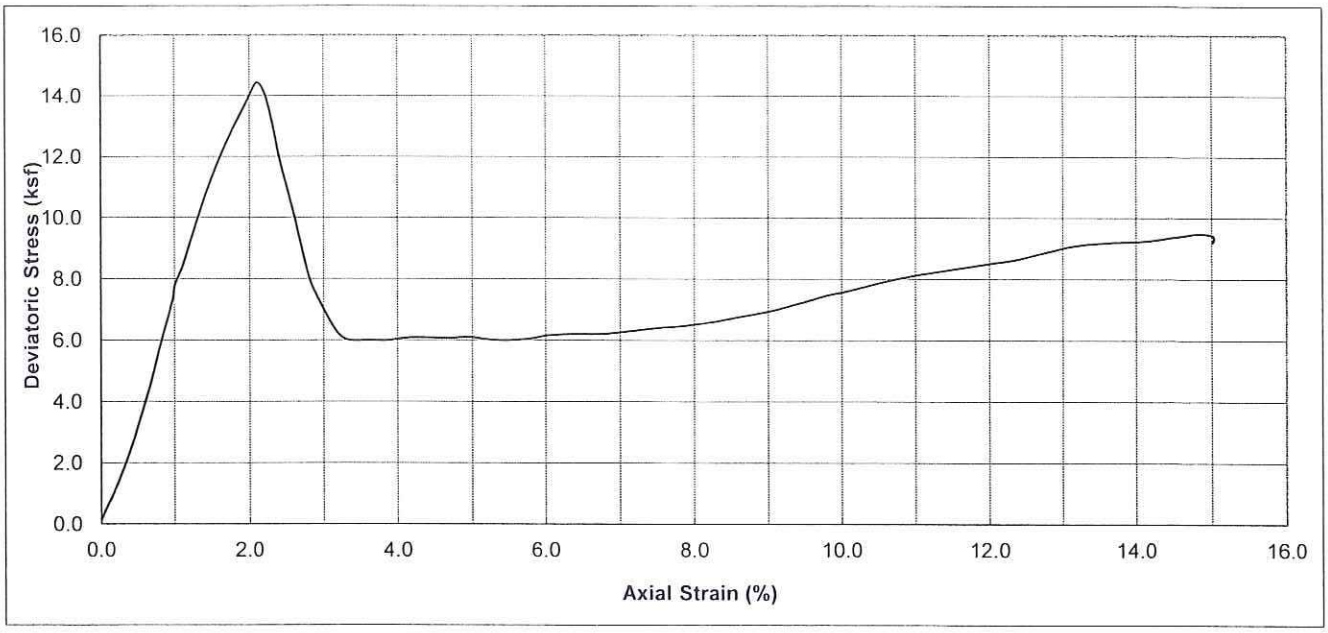
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 Date : 11/07/11	Figure No. :

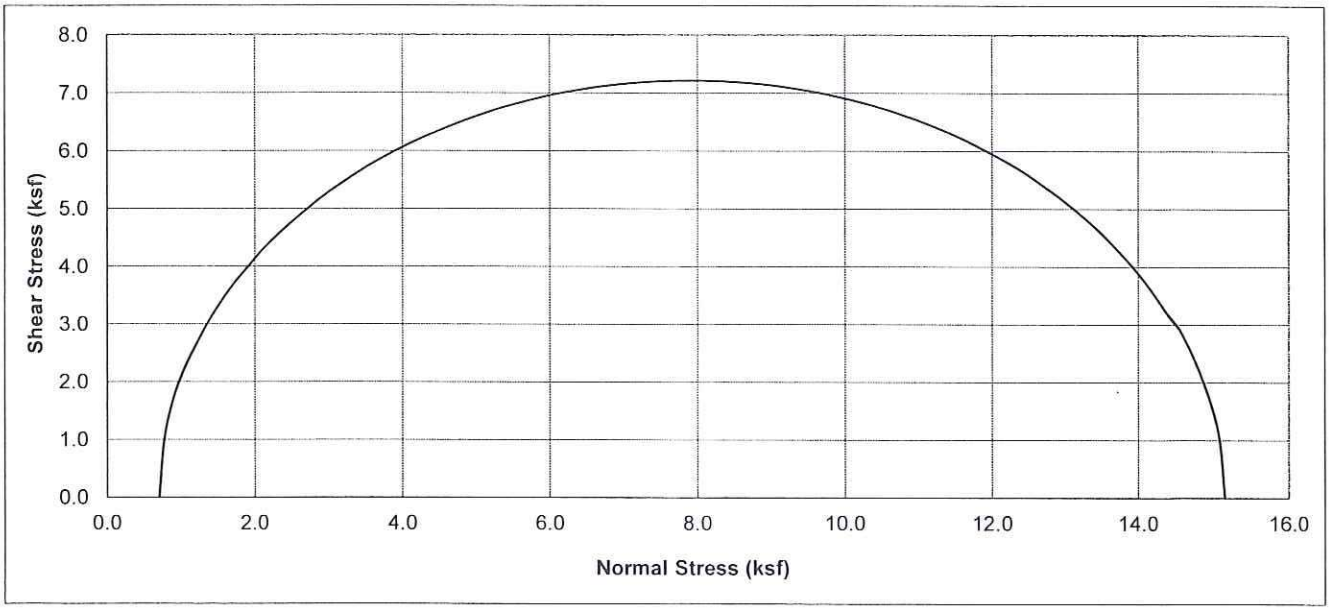




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-224	D-7	35	Olive-brown , SANDY lean CLAY (CL)	113.6	11.49	2.82	9.17	64.1

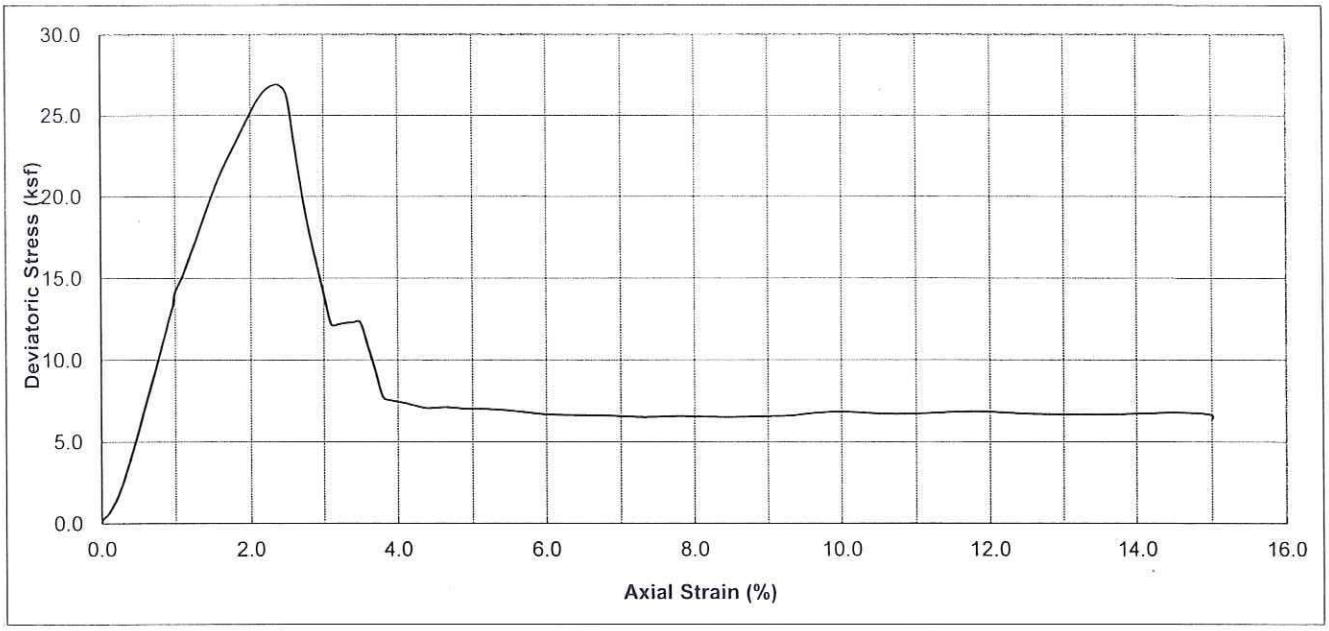
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136	Date : 11/08/11	(ASTM D2850) Figure No. :

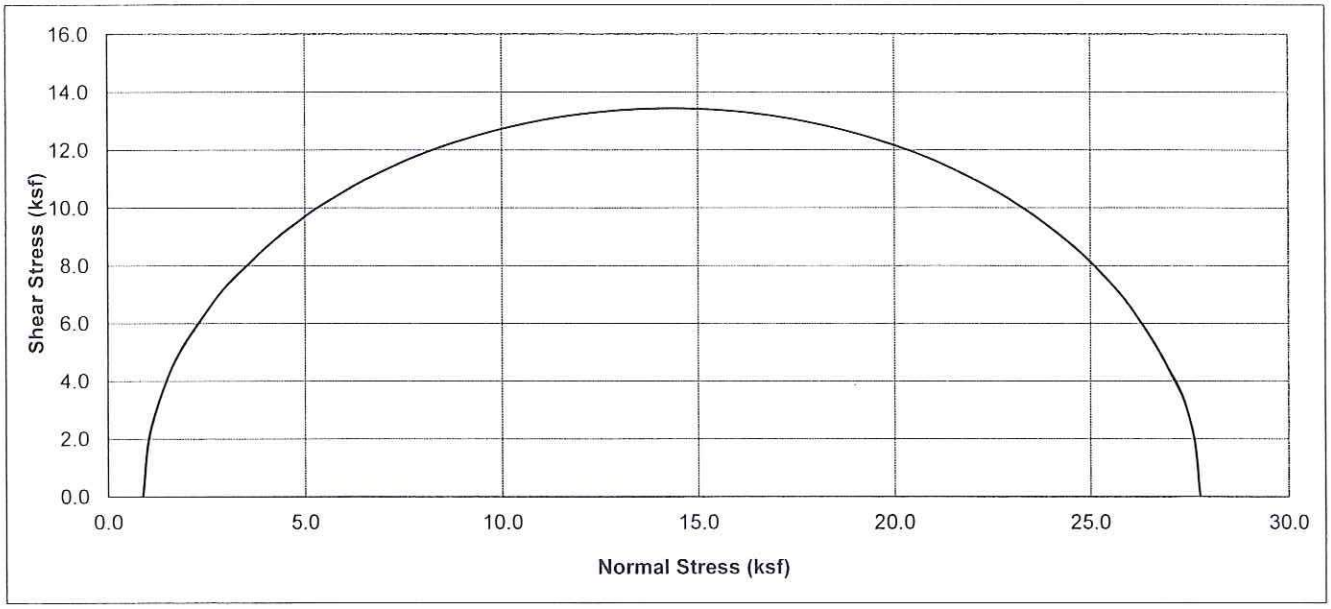




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-225	D-1	5	Olive-brown , Fat CLAY (CH)	79.0	26.21	0.70	14.44	62.6

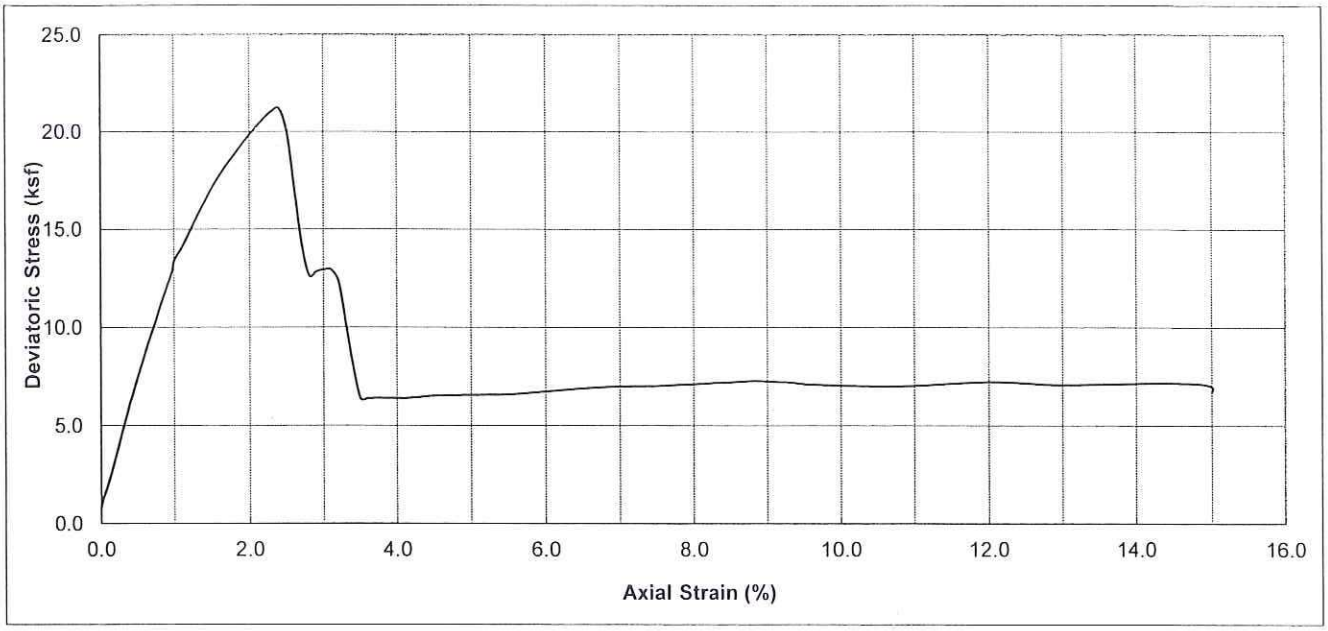
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136	Date : 11/08/11	(ASTM D2850) Figure No. :

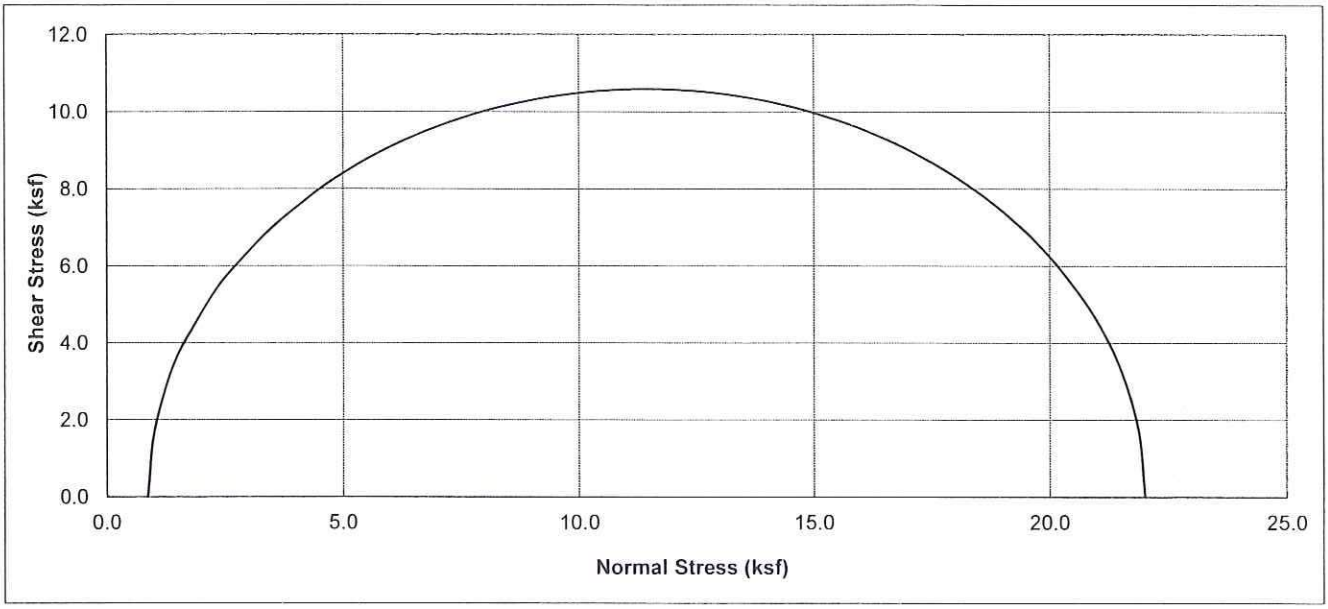




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-226	D-1	2.5	Dk. Greyish Brown, Lean CLAY (CL-CH)	95.6	23.79	0.86	26.88	84.2

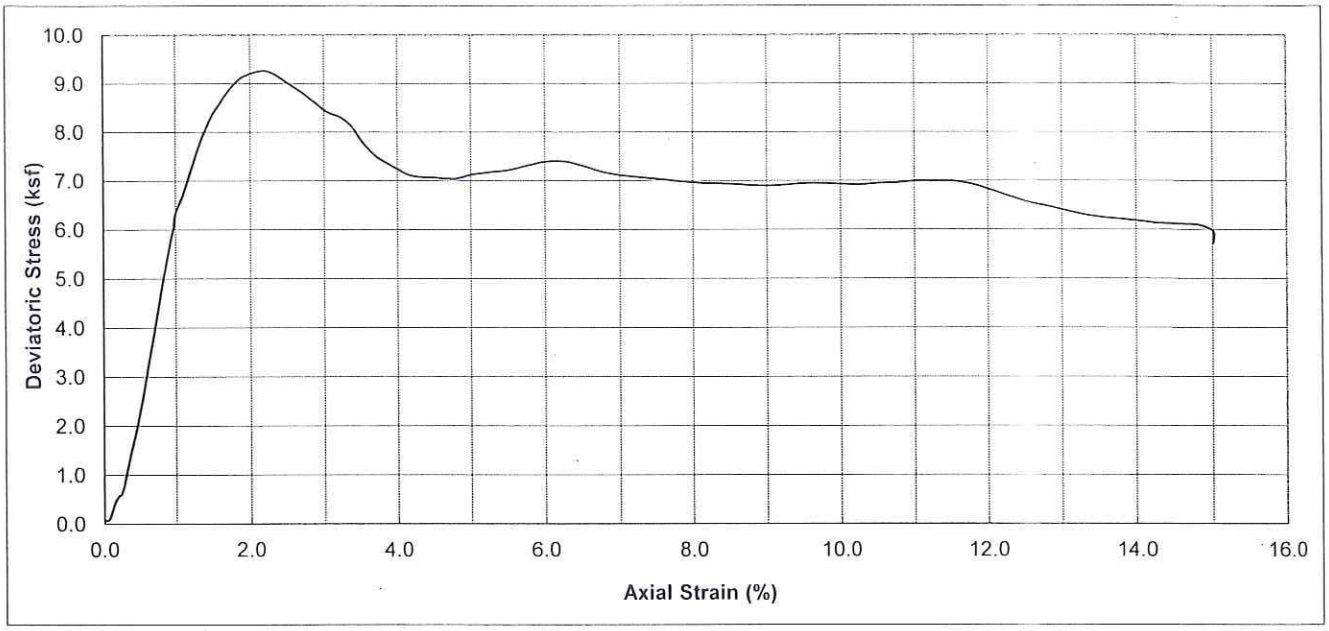
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 / Date : 11/23/11	Figure No. :





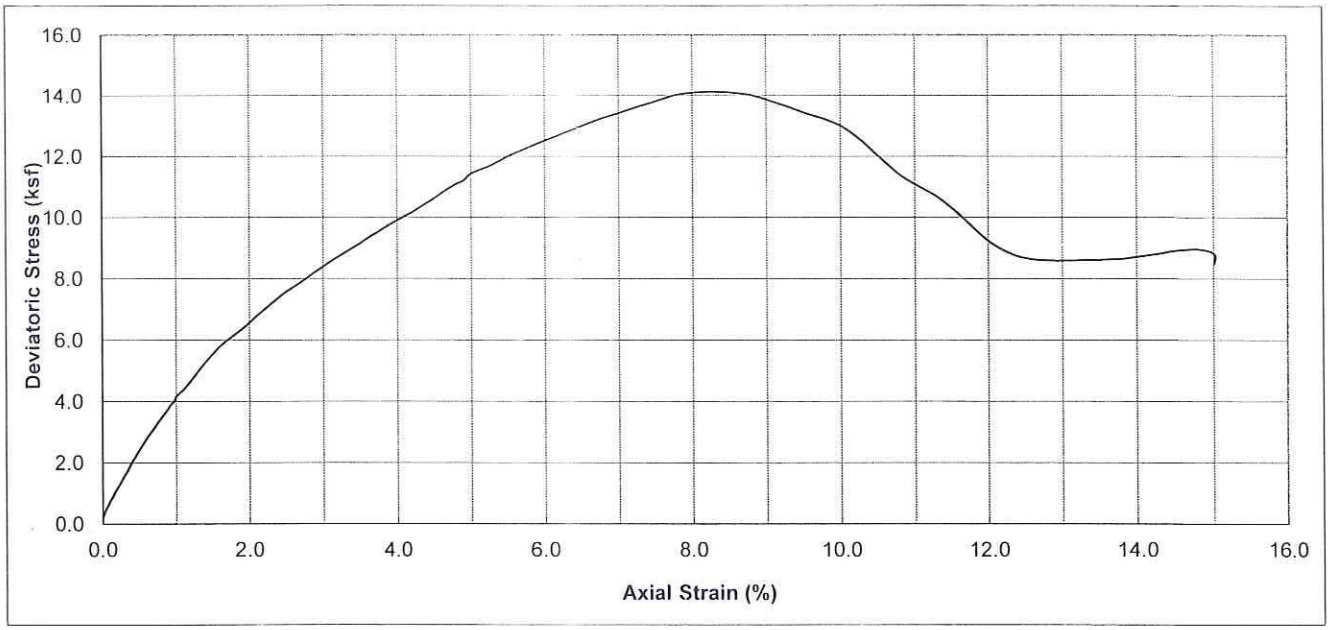
Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-230	D-3	10	Very dark gray , Elastic SILT (MH)	95.0	26.83	0.86	21.18	93.7

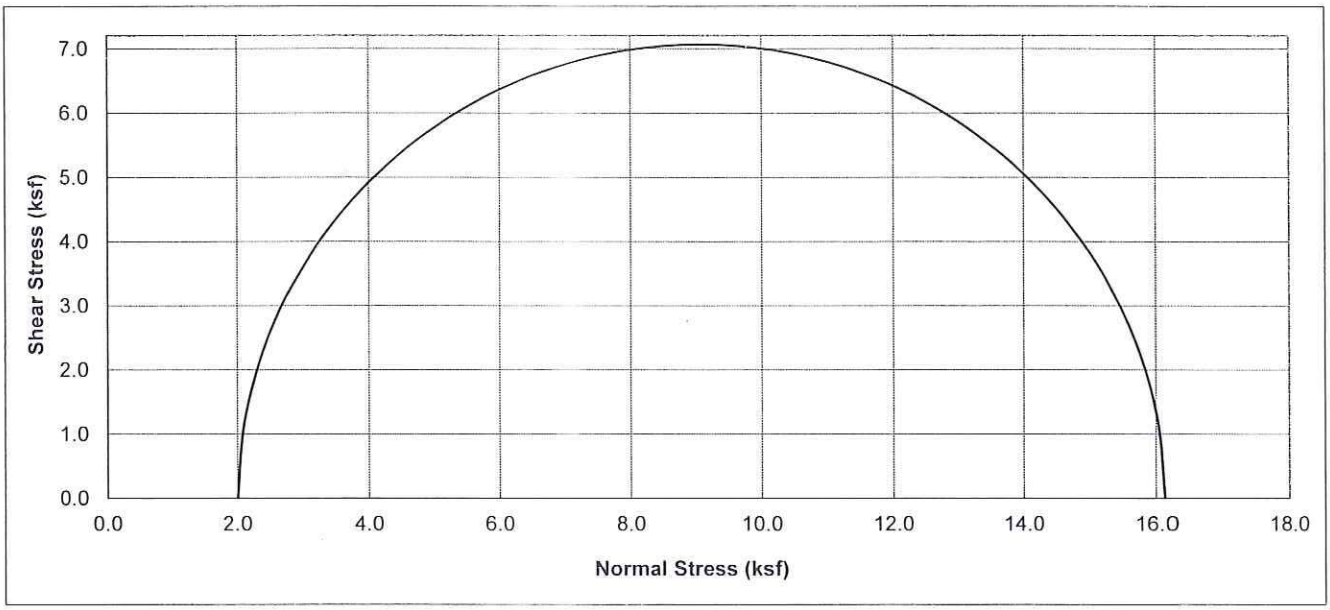
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136	Date : 11/08/11	Figure No. :



Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-232	D-4	20	Olive-brown , Fat CLAY (CH)	85.2	34.95	1.58	9.26	96.4

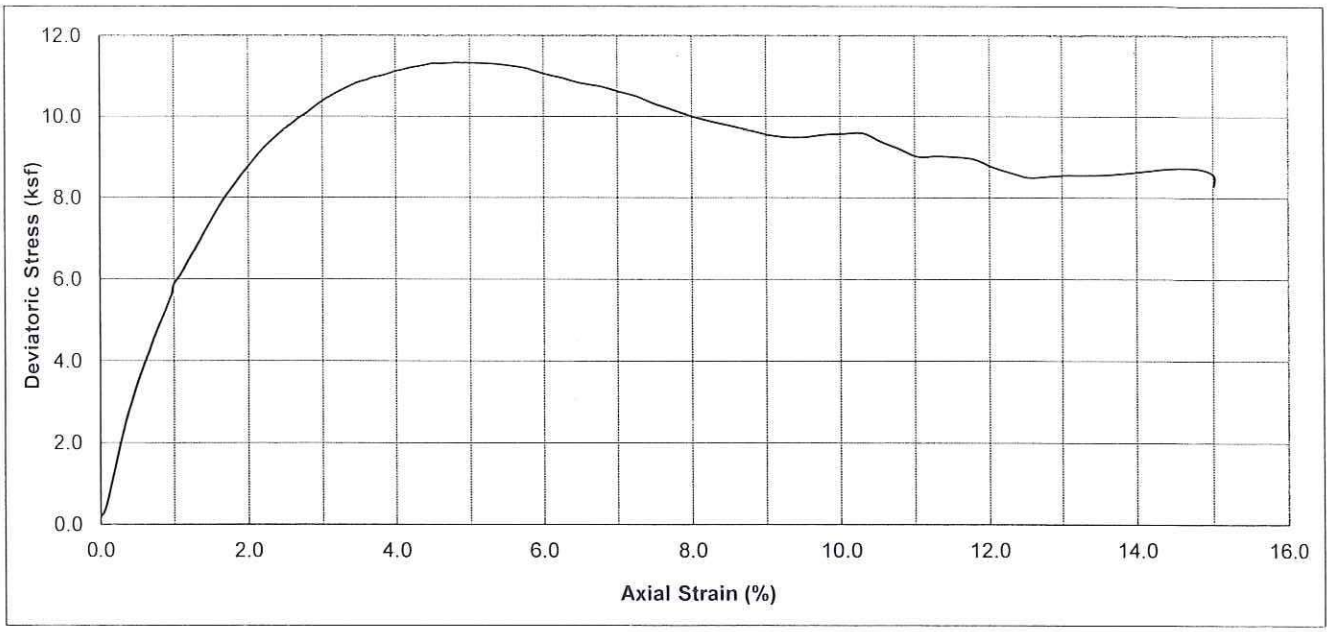
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136	Date : 11/08/11	Figure No. :

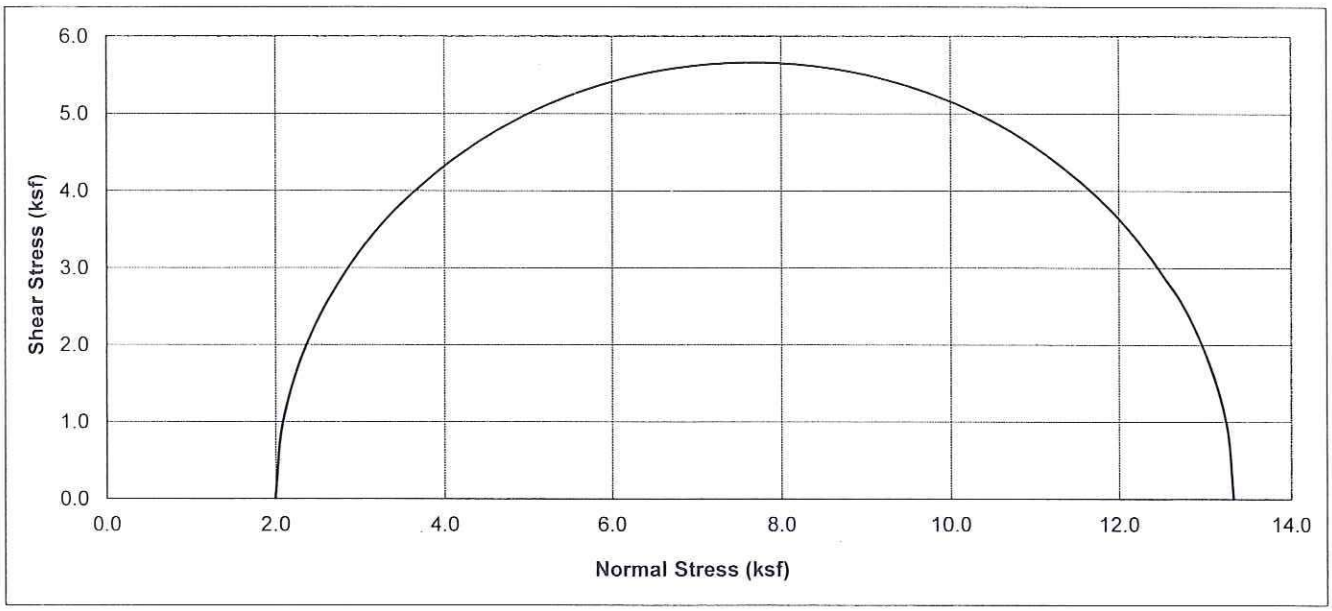




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-233	D-6	25	Dk. brown, Elastic SILT (MH)	91.6	26.32	2.00	14.13	84.7

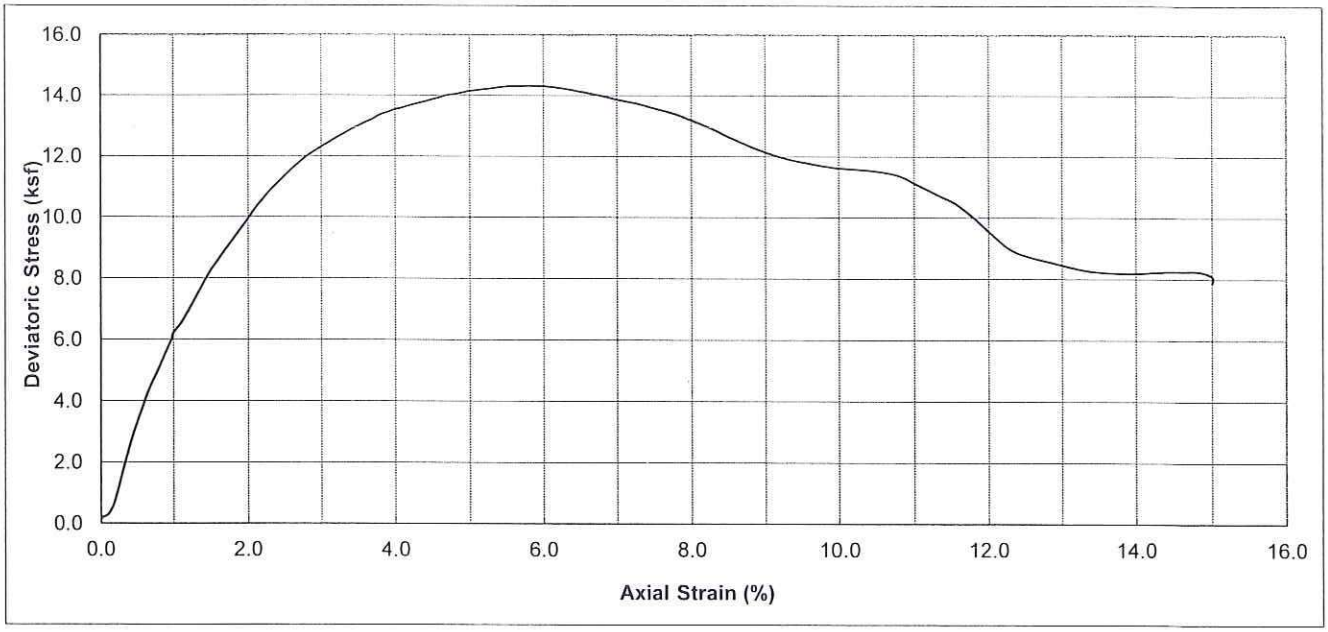
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 Date : 11/08/11	Figure No. :

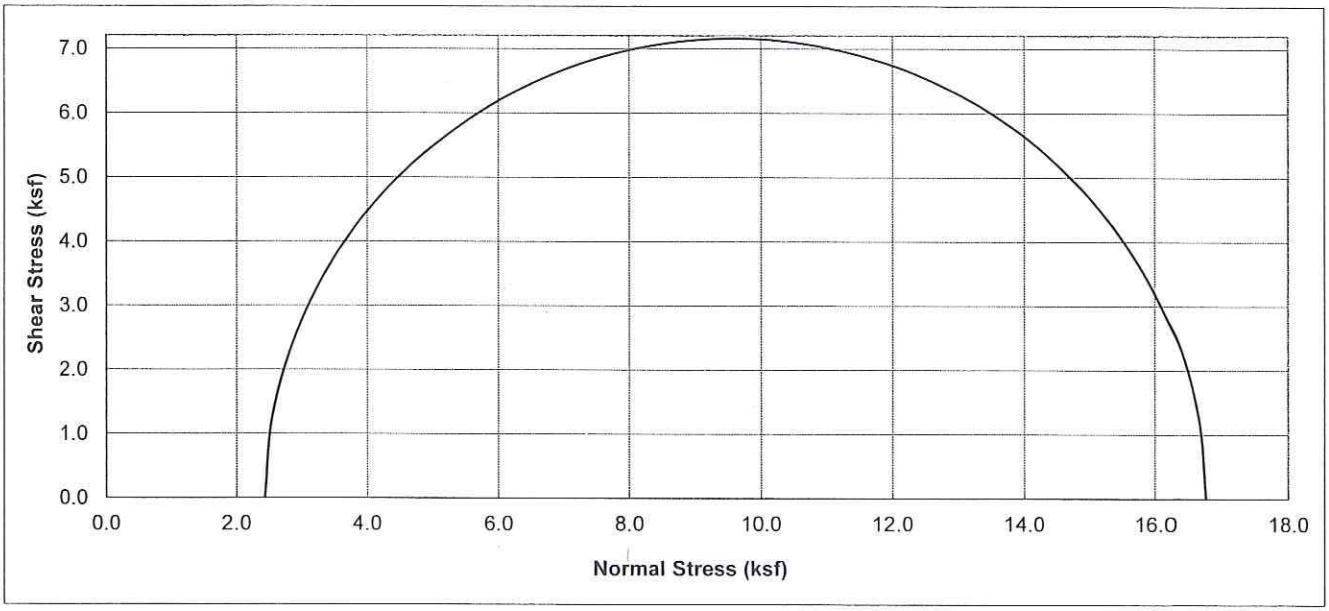




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-235	D-6	25	Very dark gray , Elastic SILT (MH)	83.4	34.27	2.00	11.33	90.8

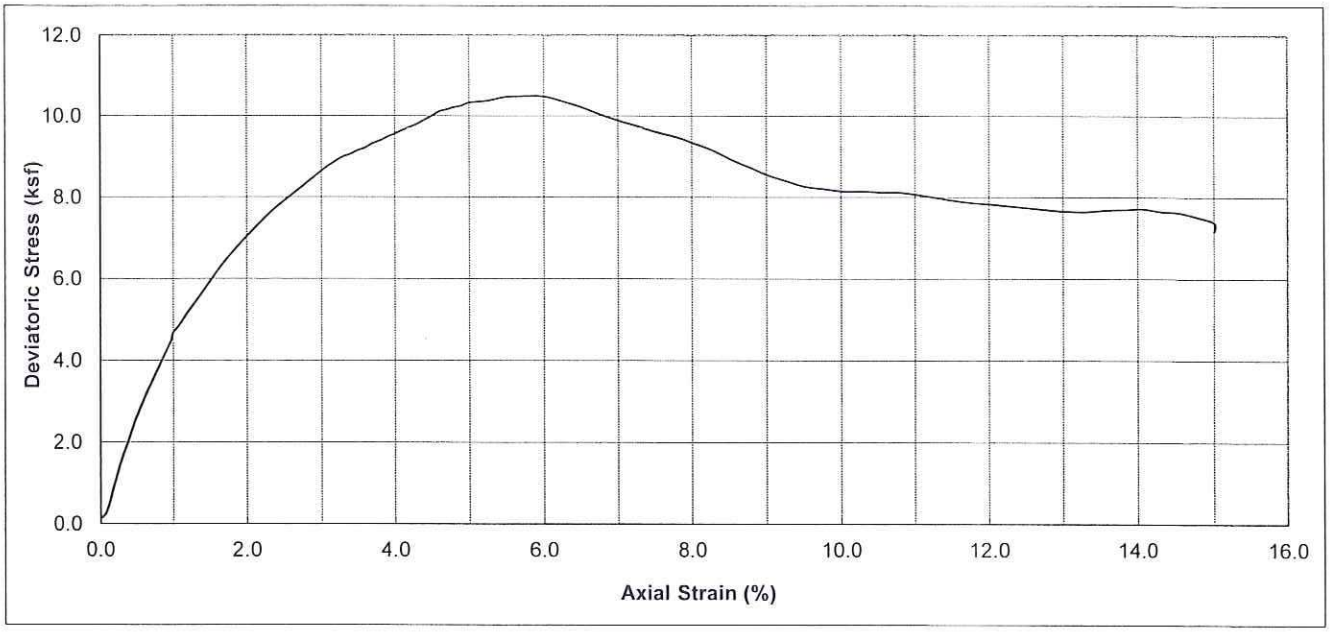
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136	Date : 11/08/11	(ASTM D2850) Figure No. :

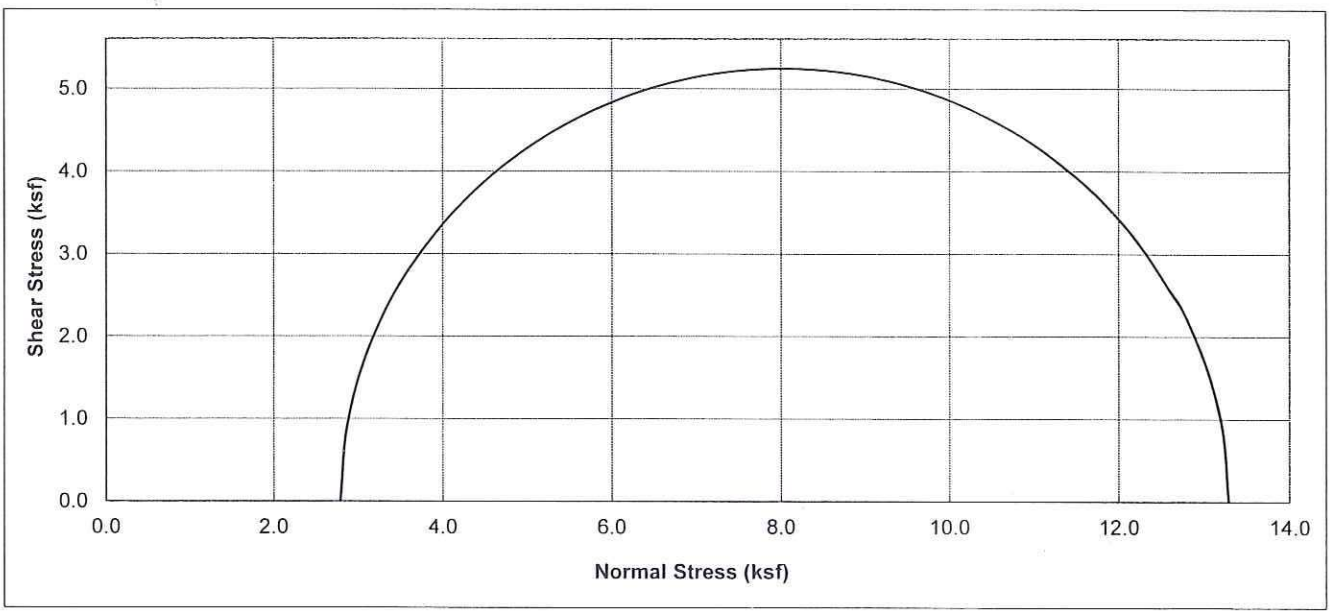




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-244	D-8	30	Very dark gray , Elastic SILT (MH)	92.8	28.48	2.44	14.32	94.3

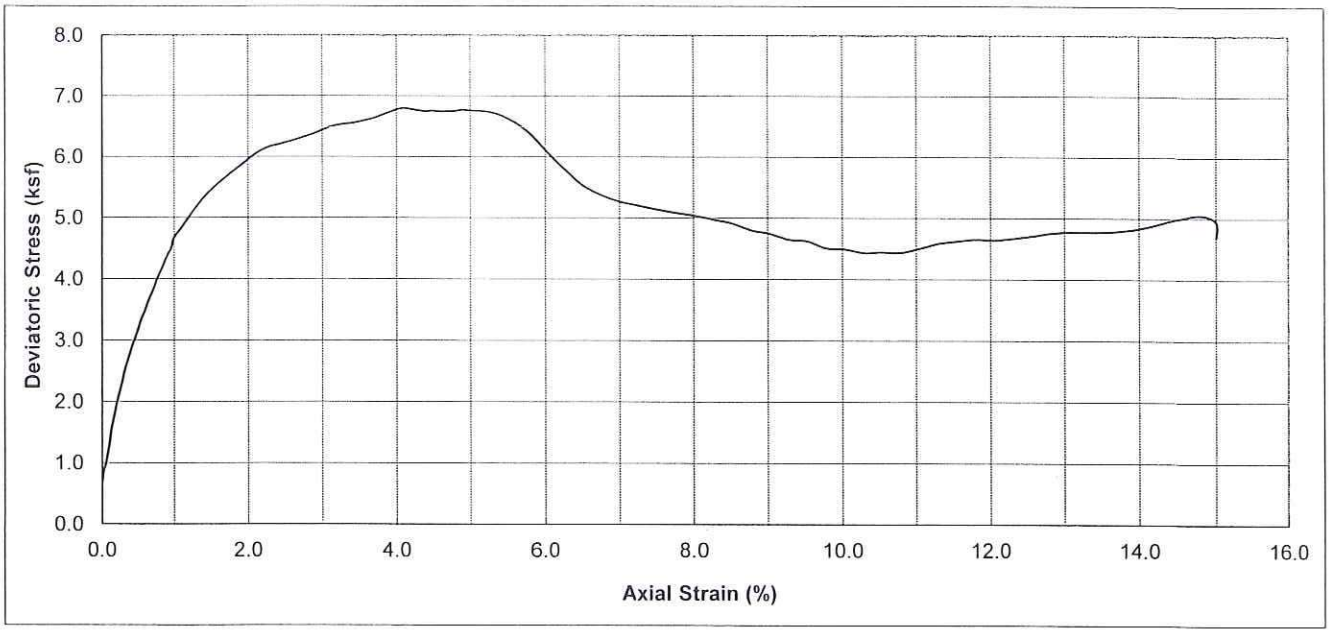
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :
Project No. : 11-136	Date : 11/09/11

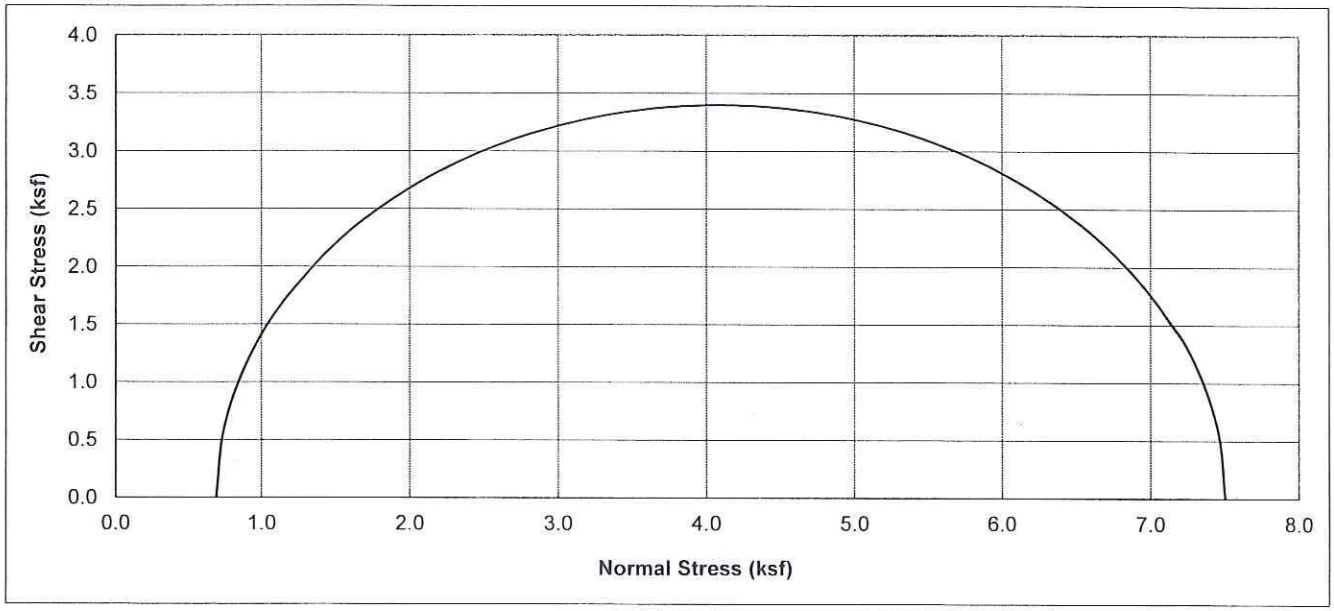




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-253	D-8	35	Very dark gray , Elastic SILT (MH)	88.2	31.54	2.79	10.49	93.5

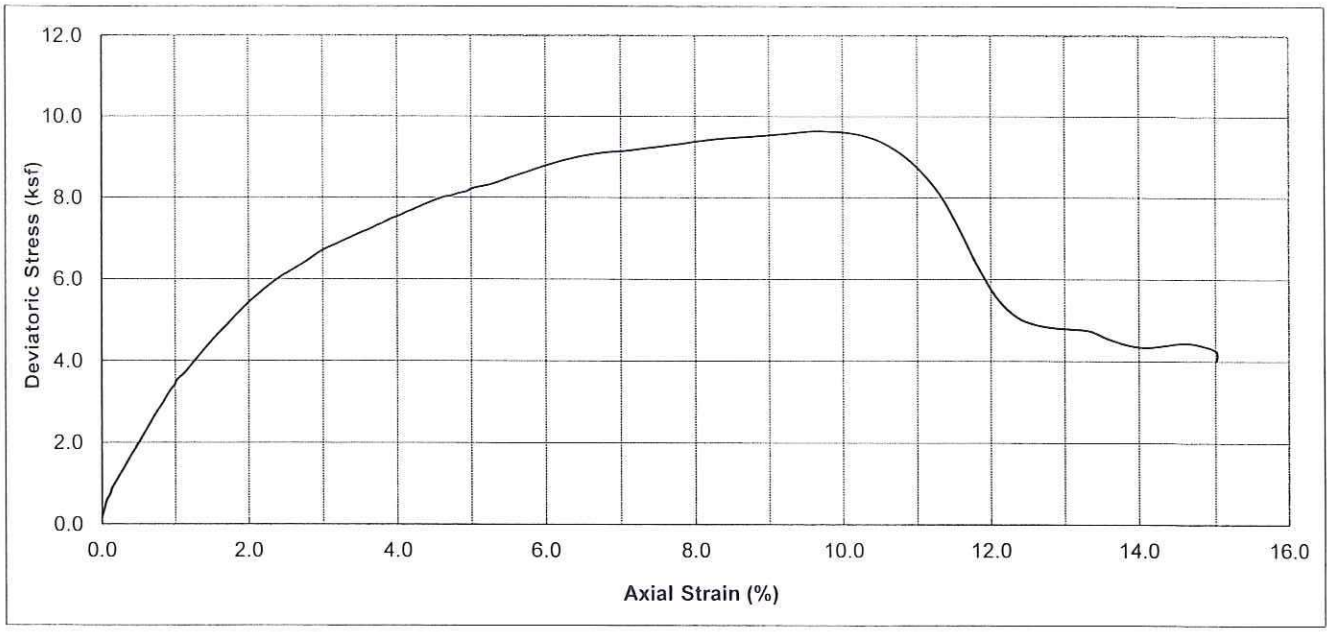
Earth Mechanics, Inc.	AECOM/I-5 HOV Widening Segment 2
Geotechnical and Earthquake Engineering	UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136 / Date : 11/10/11	(ASTM D2850) Figure No. :

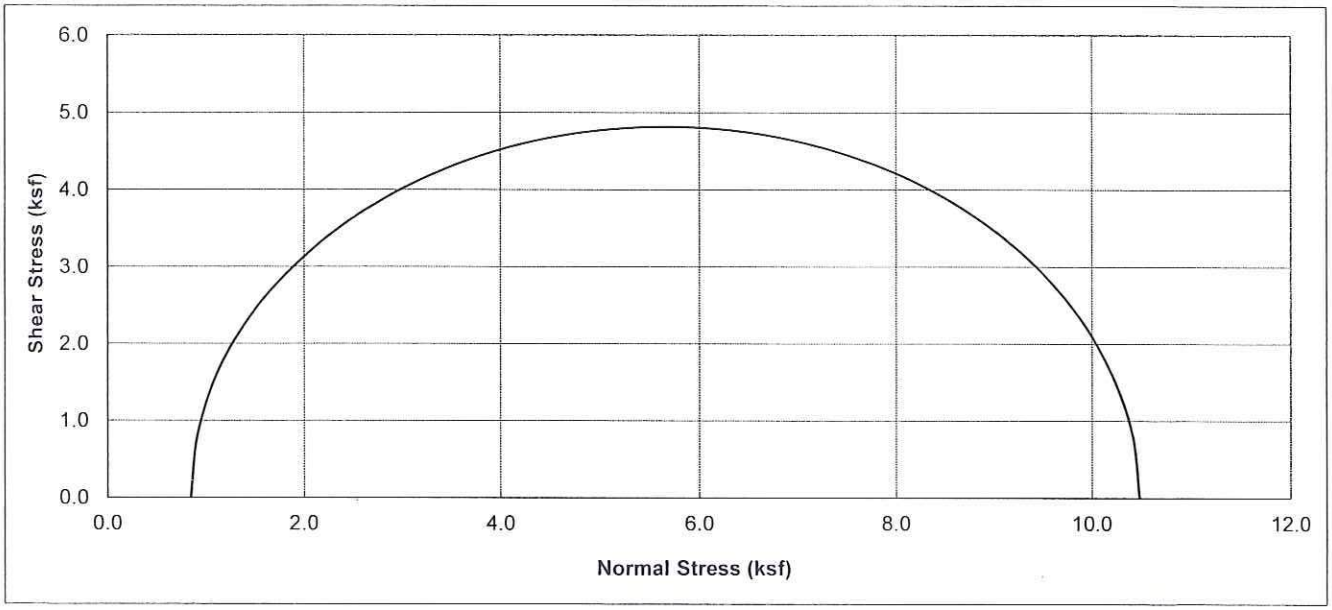




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-254	D-1	2.5	Olive-brown , SANDY lean CLAY (CL)	107.9	15.54	0.69	6.80	74.7

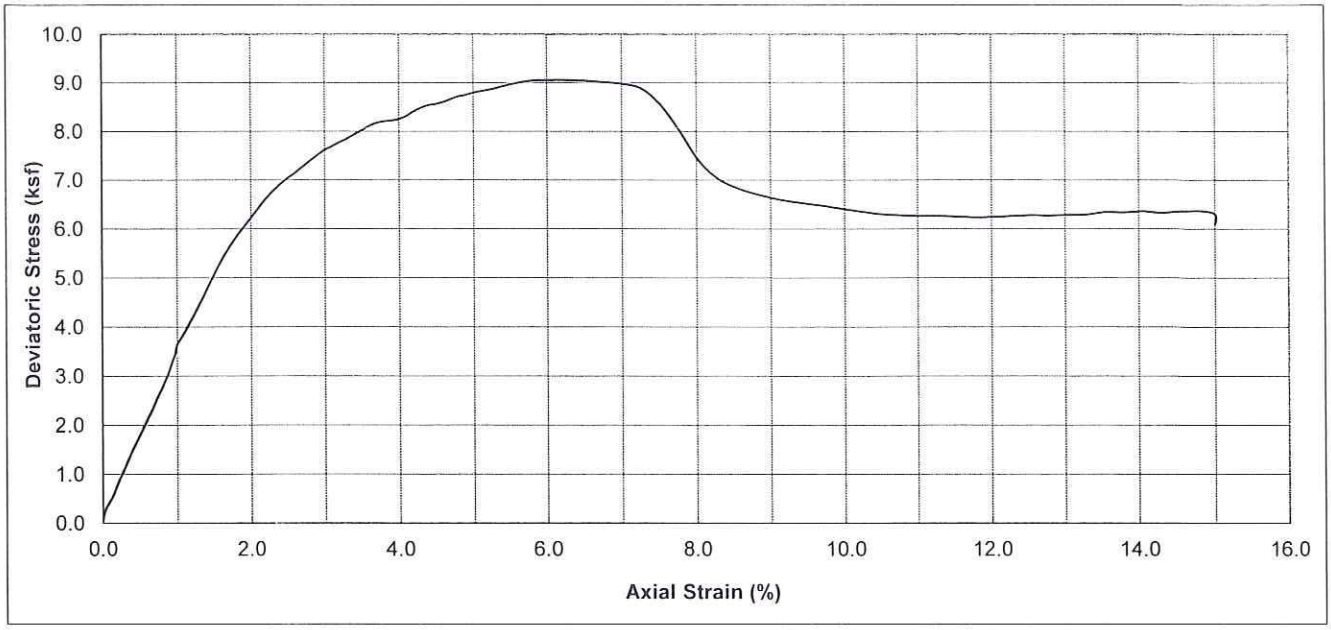
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/10/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

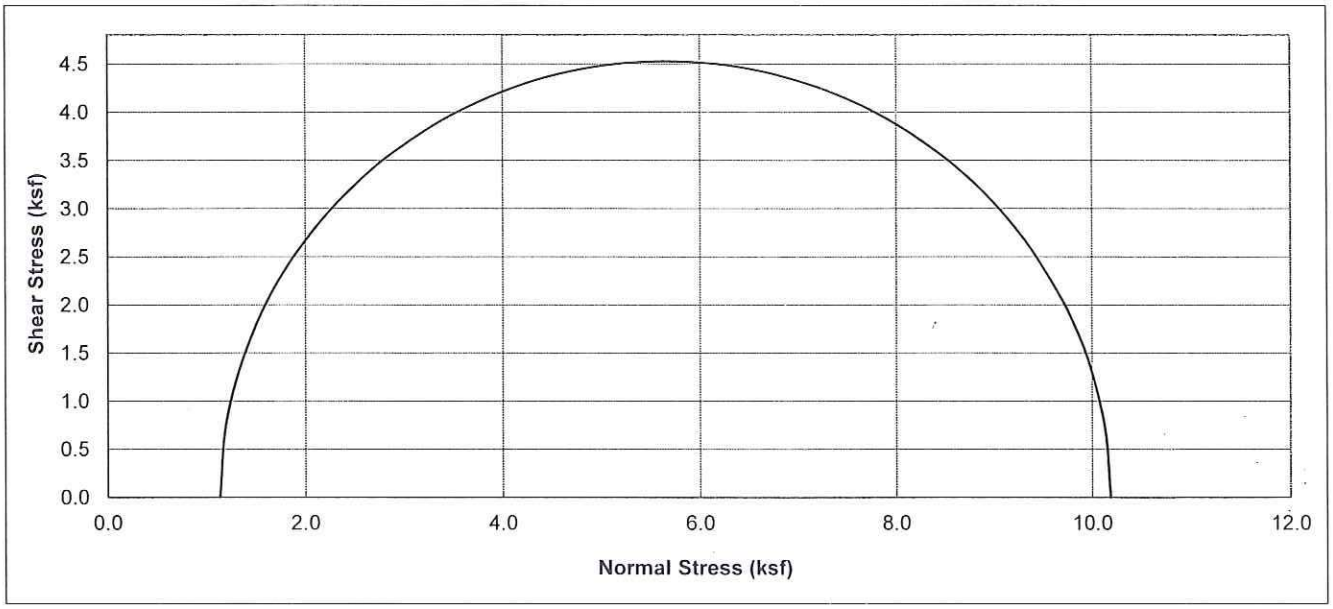




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-255	D-3	10	Olive-brown , Lean CLAY (CL)	104.8	18.54	0.85	9.63	82.4

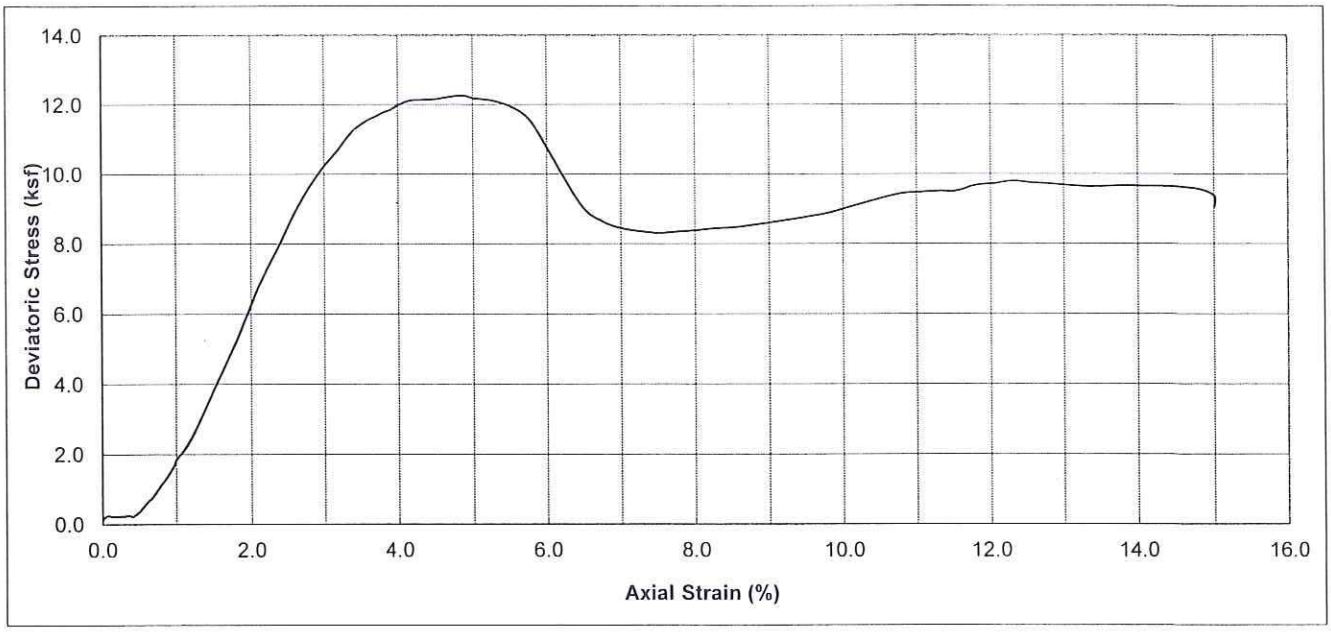
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :
Project No. : 11-136	Date : 11/10/11

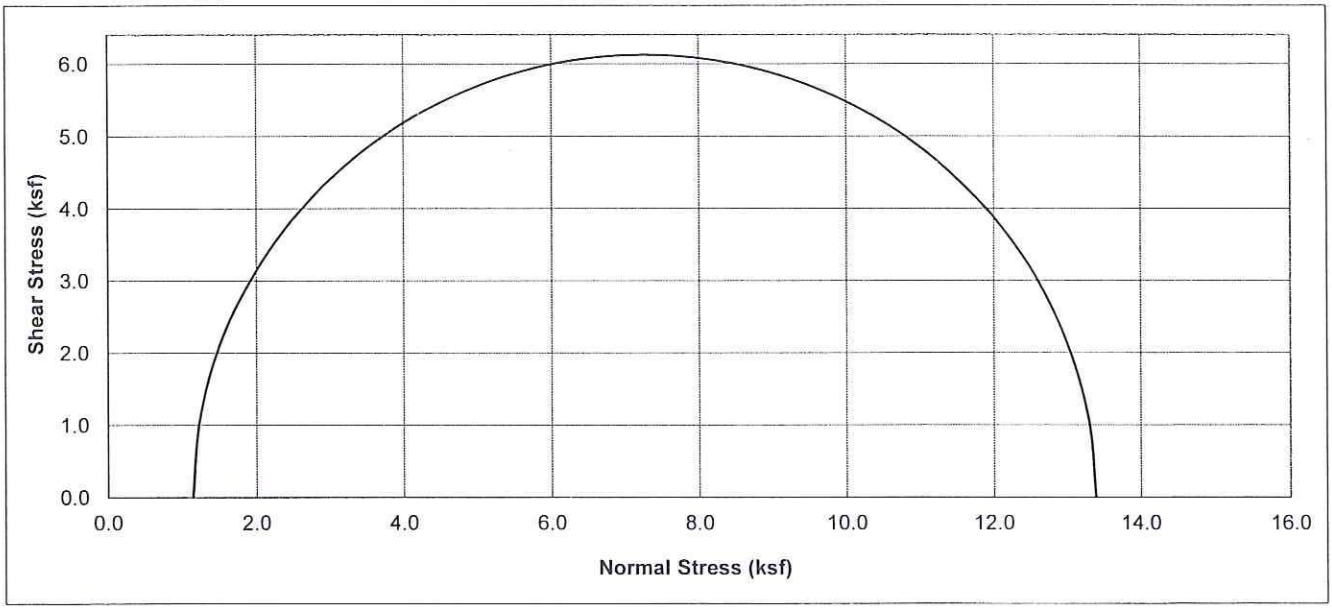




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-258	D-3	15	Olive-brown , SANDY lean CLAY (CL)	105.6	11.26	1.13	9.06	51.1

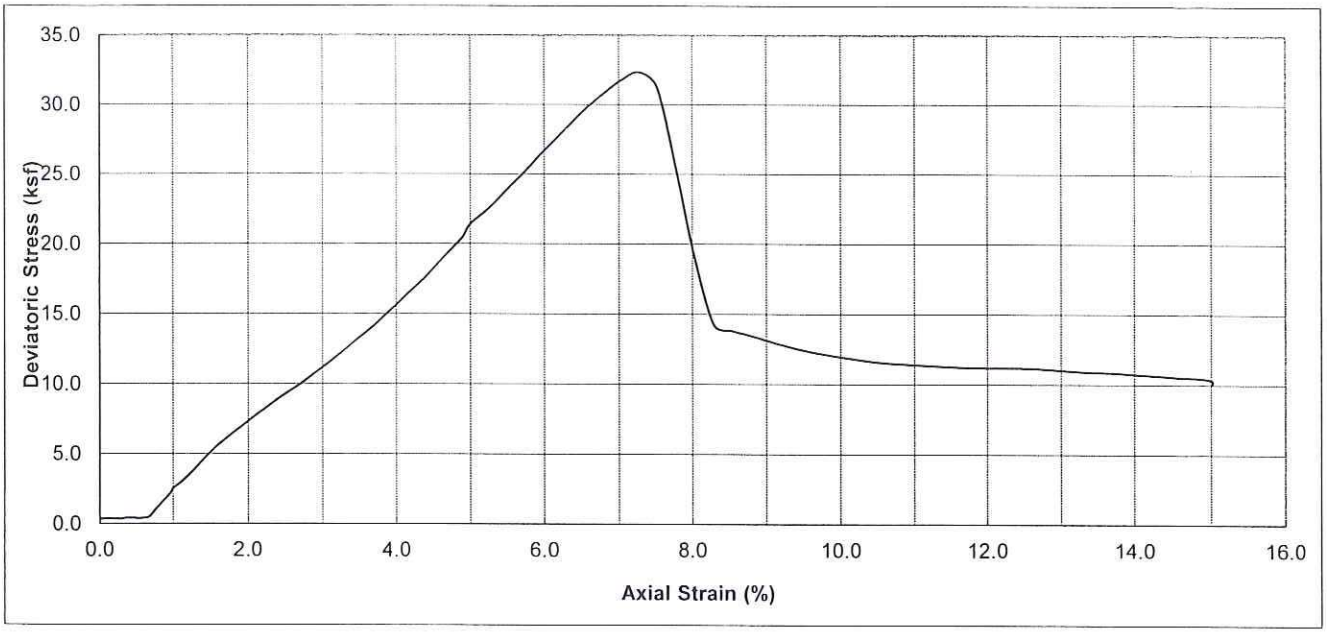
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/10/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

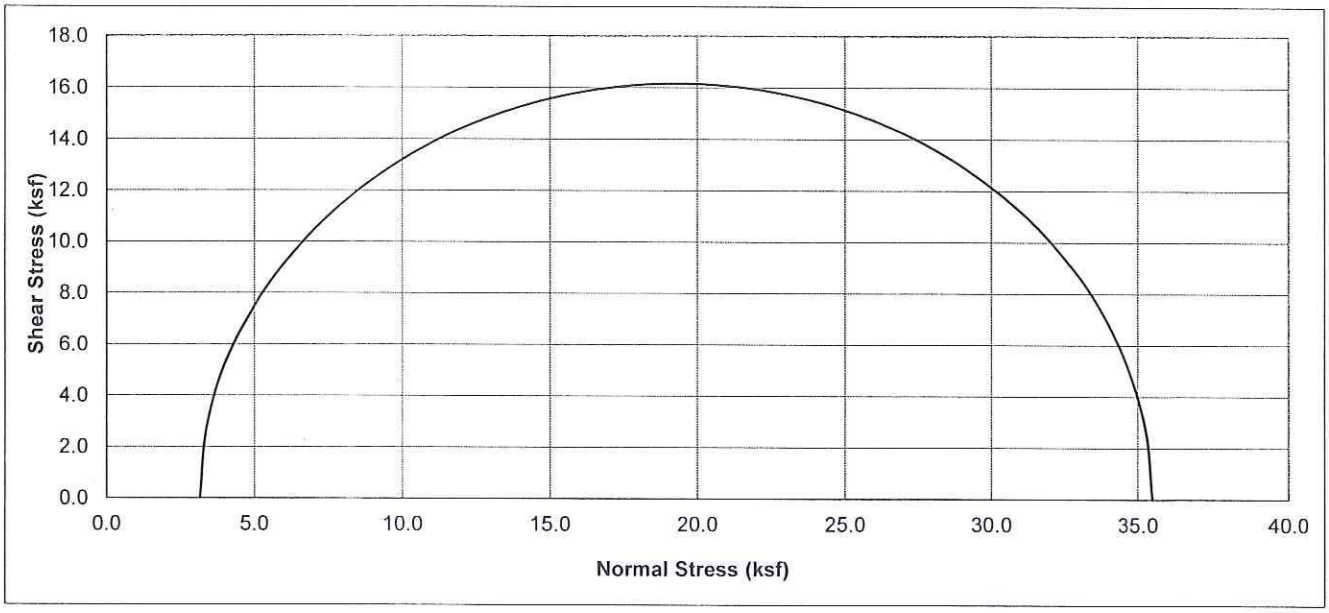




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-262	D-4	15	Olive Brown, SILT With CLAY (ML) to Lean CLAY (CL)	106.2	15.31	1.13	12.25	70.6

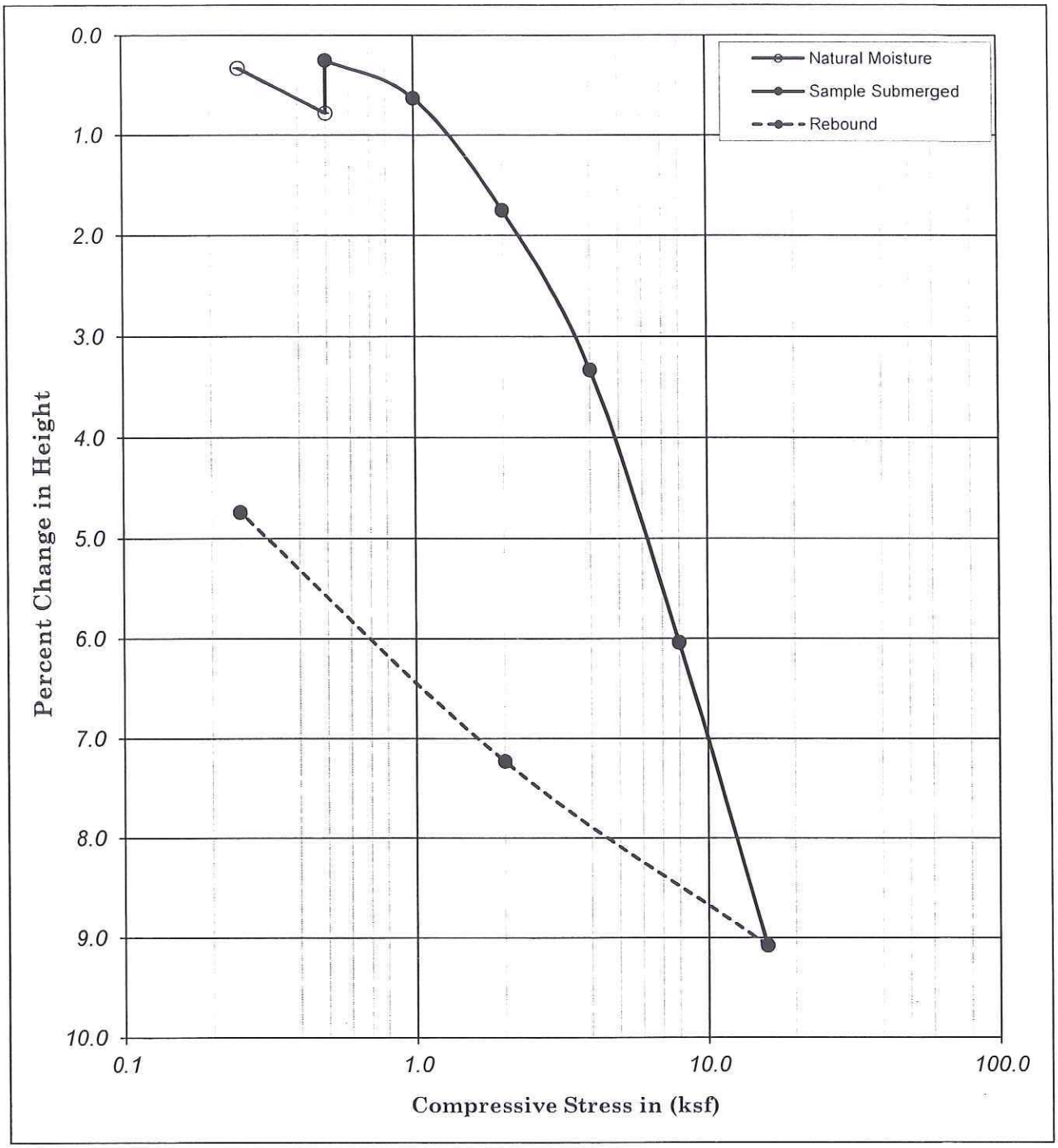
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 Date : 11/23/11	Figure No. :





Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-264	D-7	40	Dk. Grey, Elastic SILT (MH)	92.7	27.71	3.16	32.33	91.5

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/23/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :



Boring No.	: A-11-202		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-2		Plastic Limit :	-						
Depth (ft)	: 10.0	11.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
Depth (m)	: 3.05	3.51	Specific Gravity :	2.70	Final	31.08	91.60	14.42	99.88	0.84

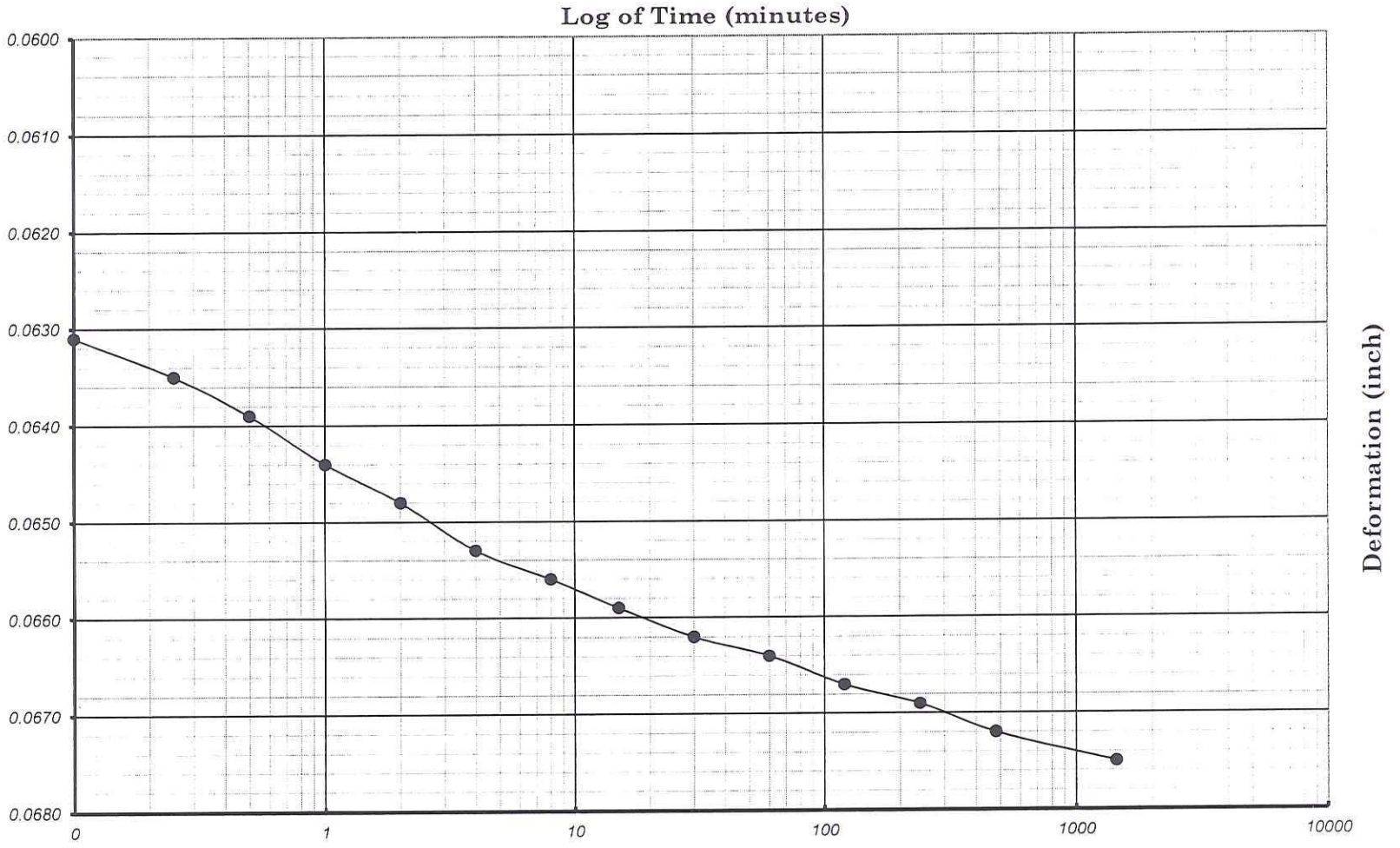
Description : *Dark olive-brown with yellowish brown , Lean CLAY (CL)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

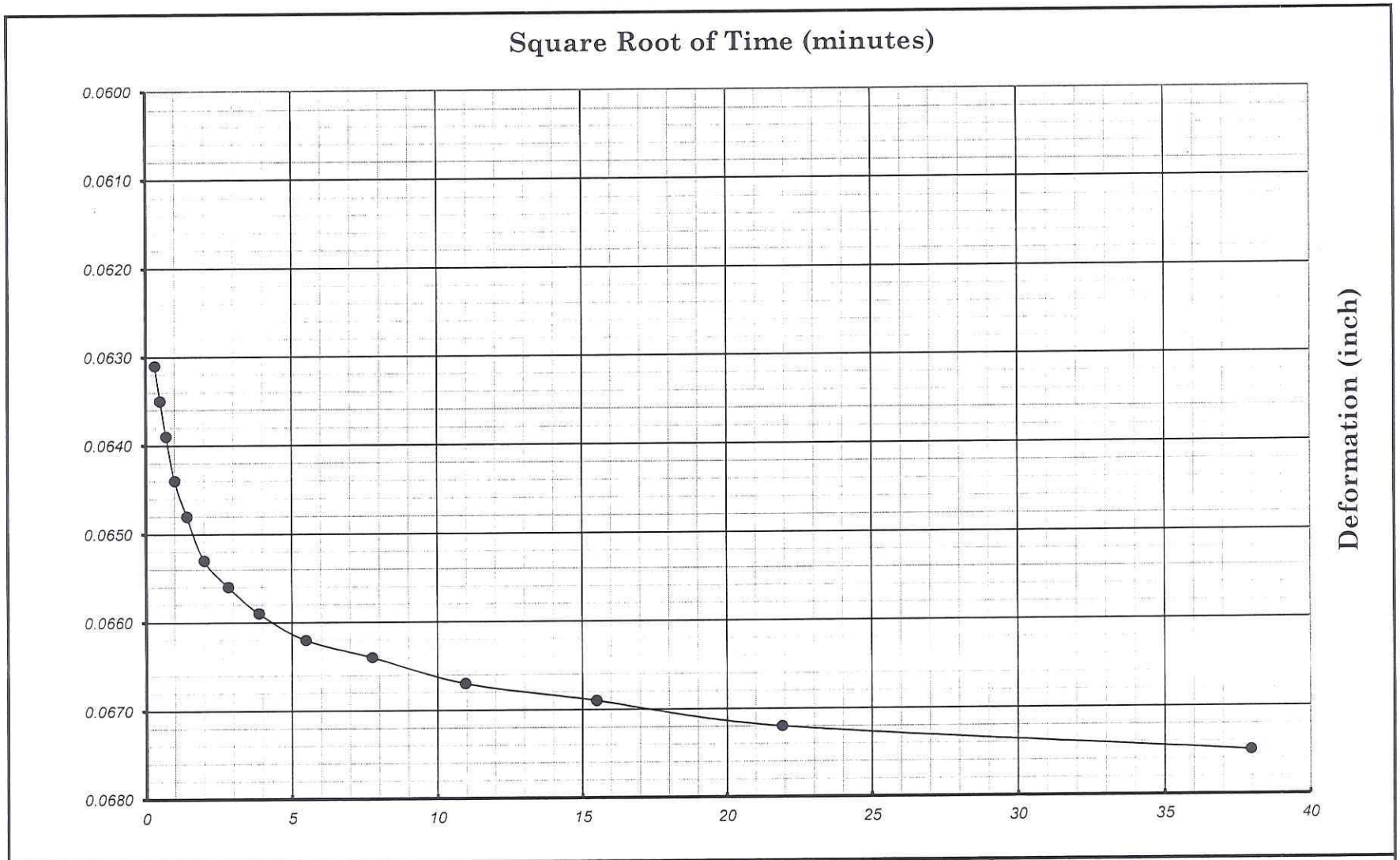
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

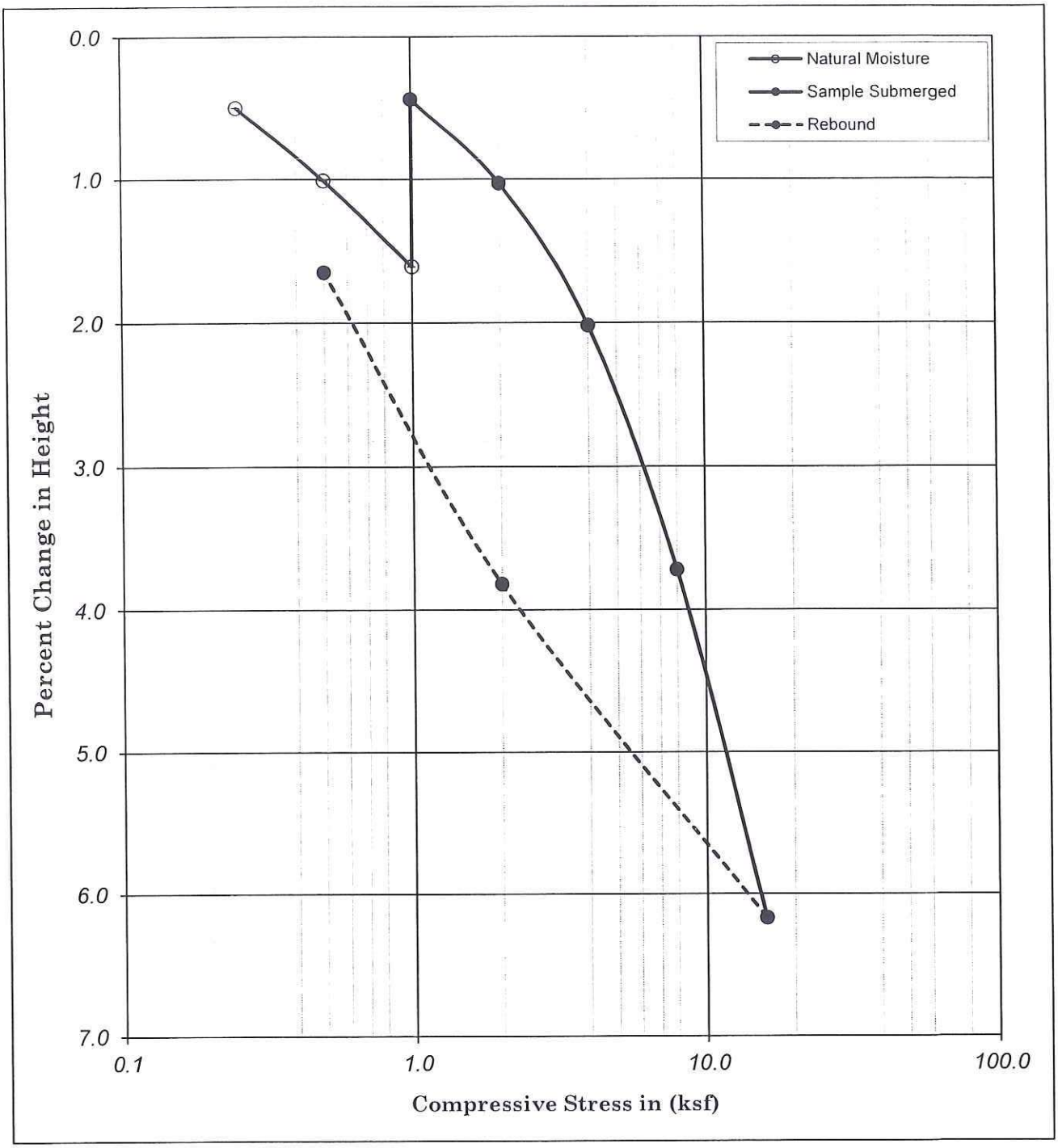
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-202*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.00* *95.8*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-202*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No. : A-11-216				Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-4				Plastic Limit :	-						
Depth	(ft) :	15.0	16.5	Plastic Index :	-	Initial	28.27	94.25	14.84	96.81	0.79
	(m) :	4.58	5.03	Specific Gravity :	2.70	Final	28.77	95.86	15.09	102.43	0.76

Description : *Mottled very dark brown, yellowish brown, white, olive-gray, Fat CLAY (CH)*

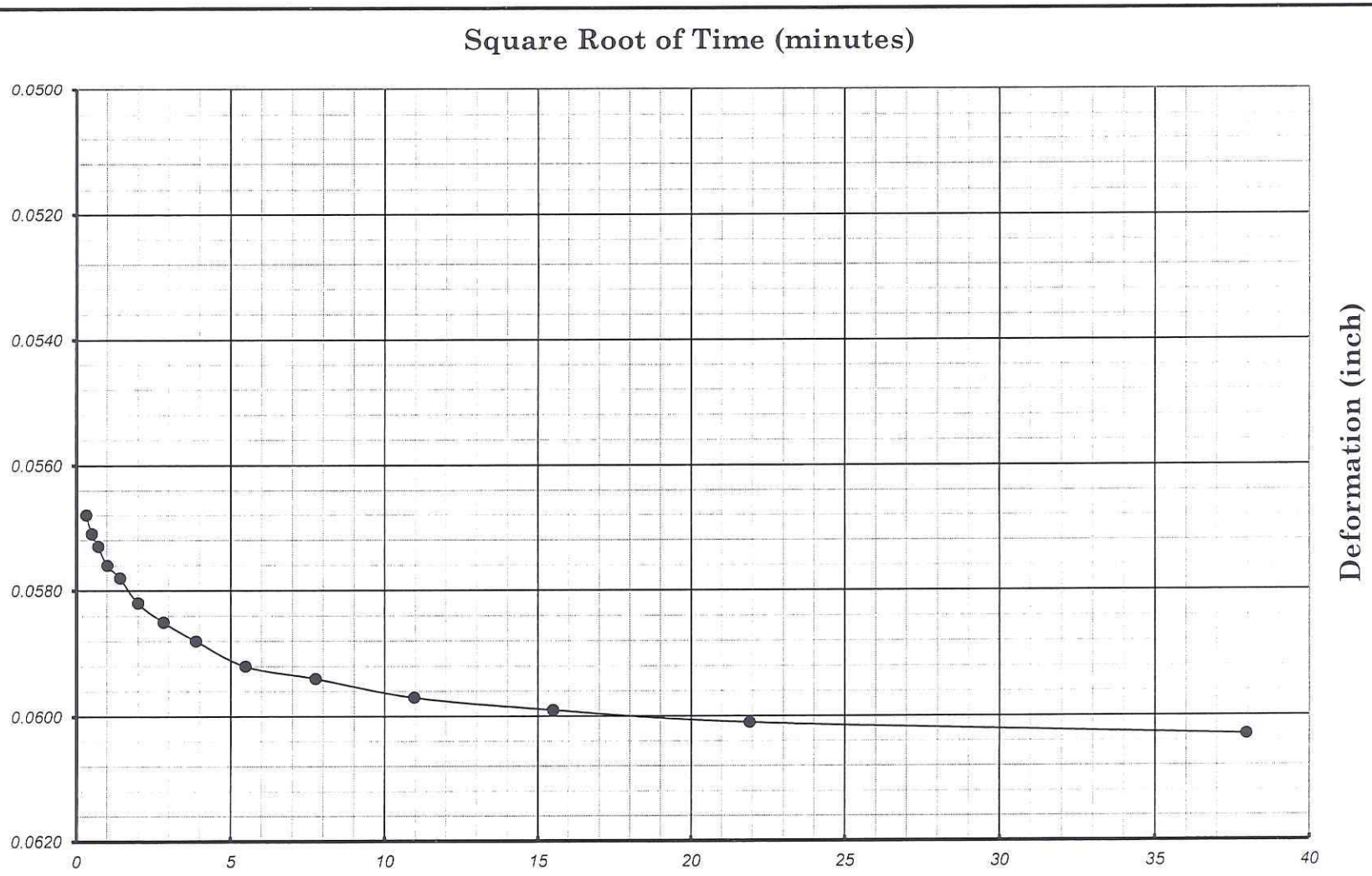
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

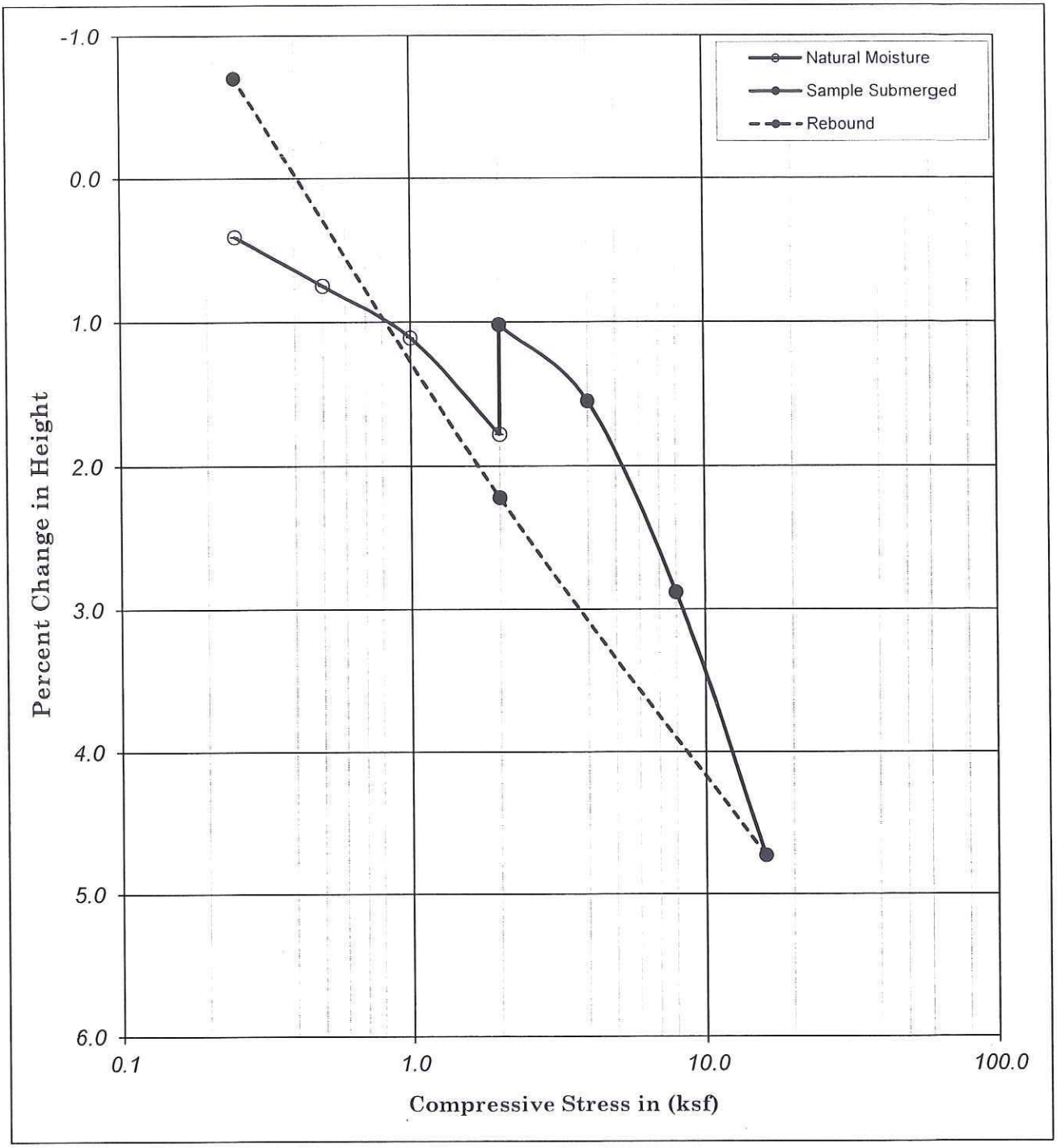
Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-216	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-4	
EMI Project No. : 11-136		Depth (ft/m) : 15.0 4.6	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-216*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-4*	
EMI Project No. : *11-136*		Depth (ft/m) : *15.0* *4.6*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



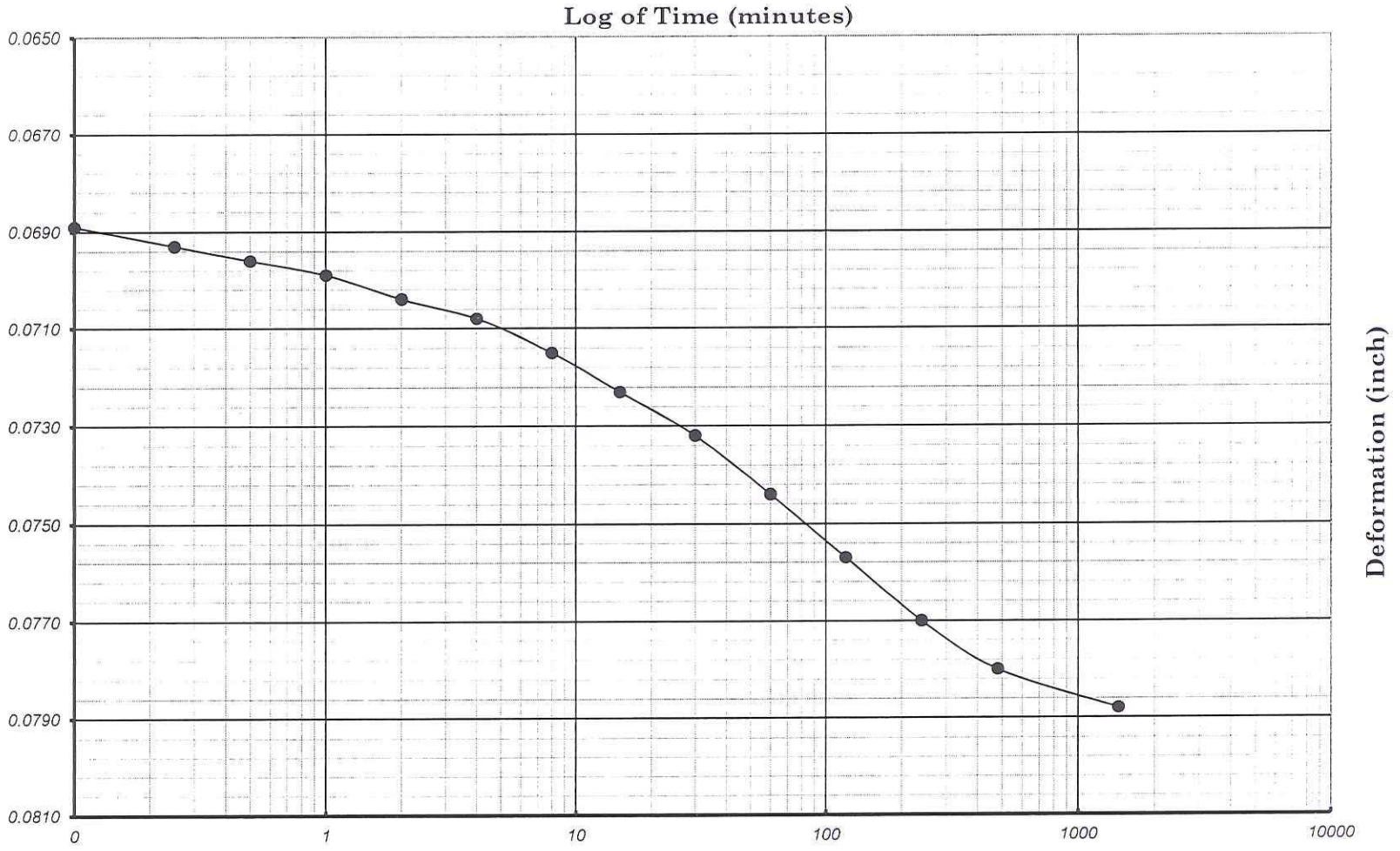
Boring No. : A-11-221			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-7			Plastic Limit :	-						
Depth	(ft) : 35.0	36.5	Plastic Index :	-	Initial	20.34	107.64	16.94	97.05	0.57
	(m) : 10.68	11.13	Specific Gravity :	2.70	Final	22.15	106.90	16.83	103.69	0.58
Description : Olive-brown, Fat CLAY (CH)										

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

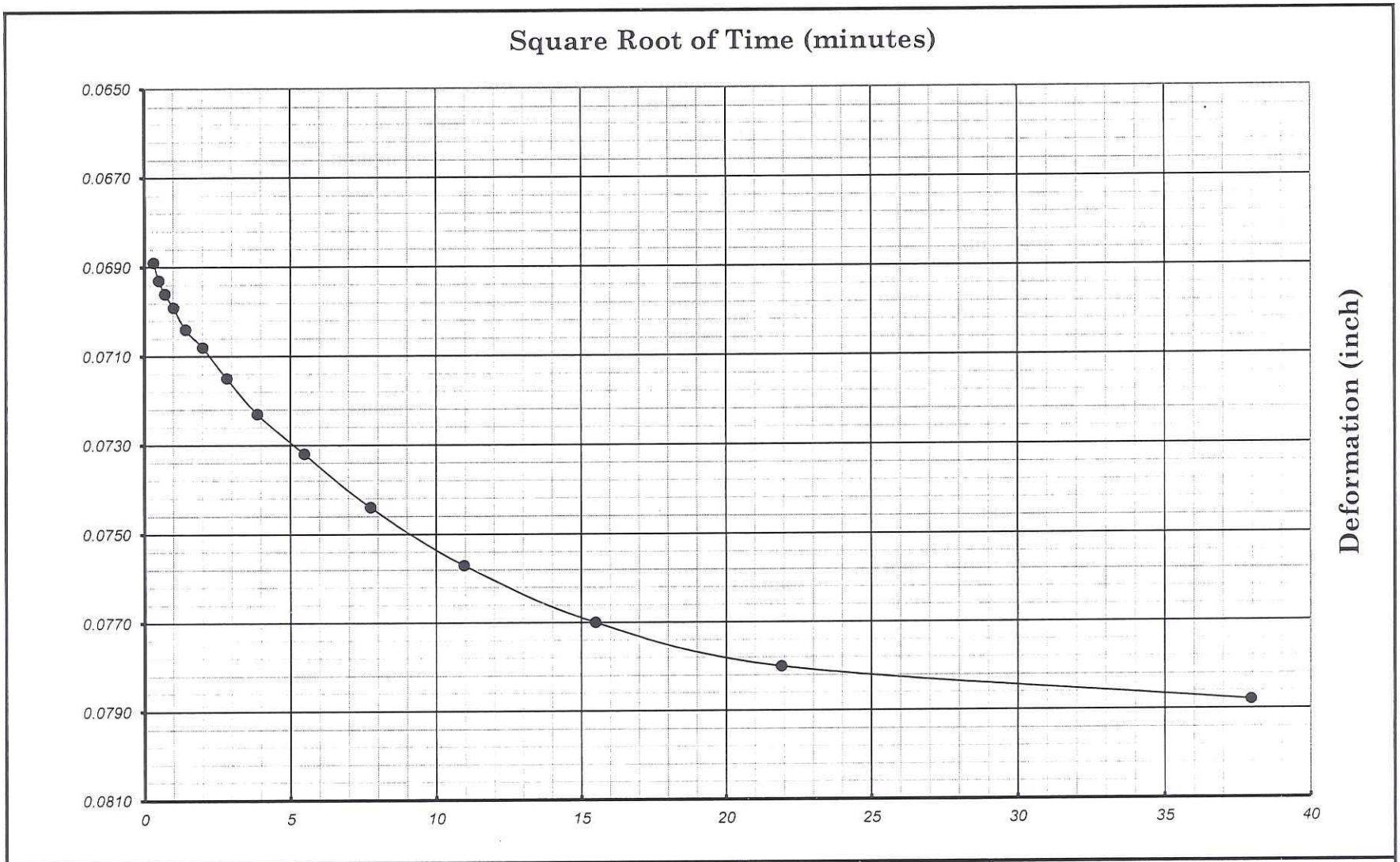
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

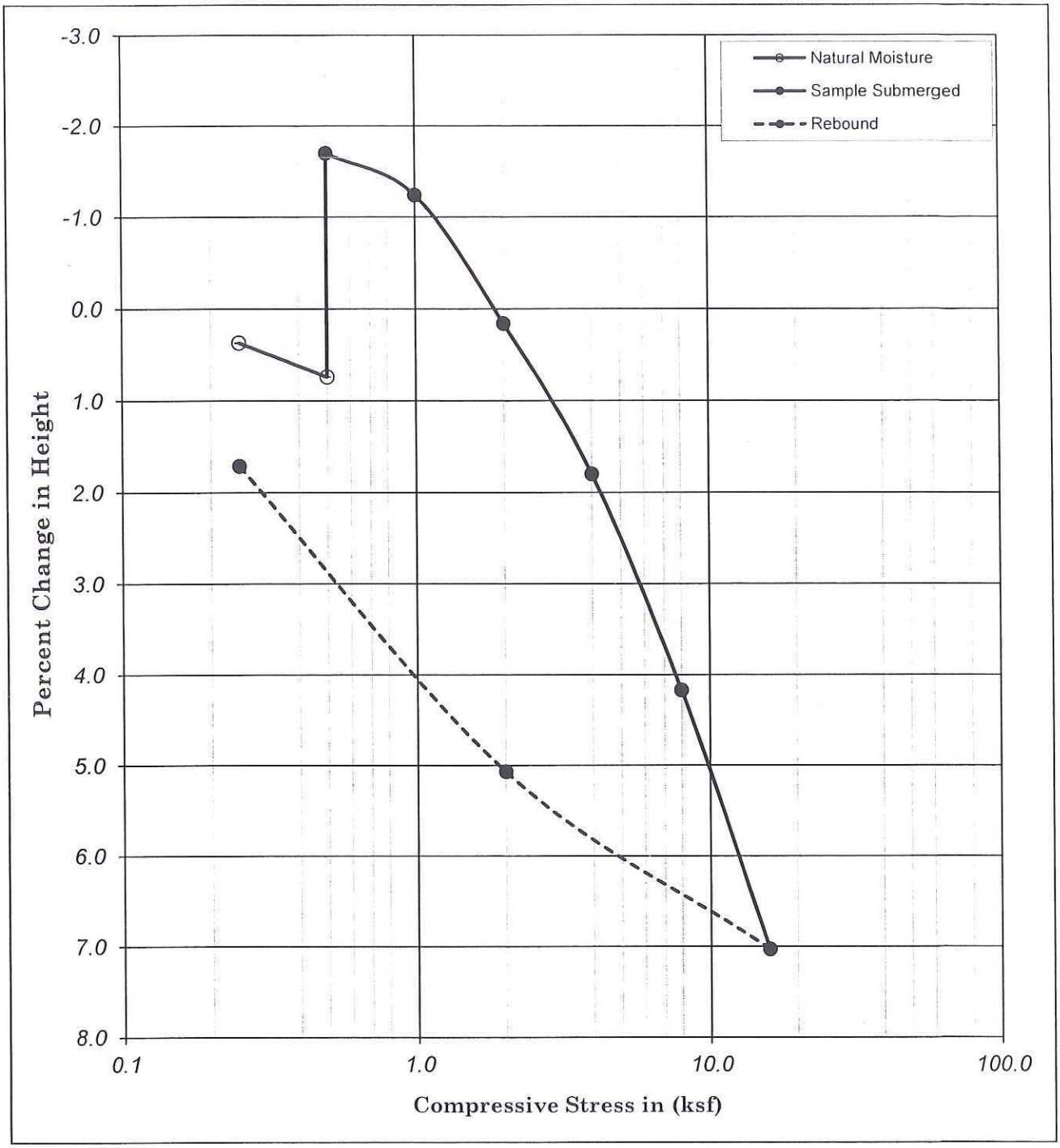
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-221*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-7*	
EMI Project No. : *11-136*		Depth (ft/m) : *35.0* *10.7*	Veritcal Load (ksf/kpa) : *8.00* *383.0*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-221	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-7	
EMI Project No. : 11-136		Depth (ft/m) : 35.0 10.7	Veritcal Load (ksf/kpa) : 8.0 383.0



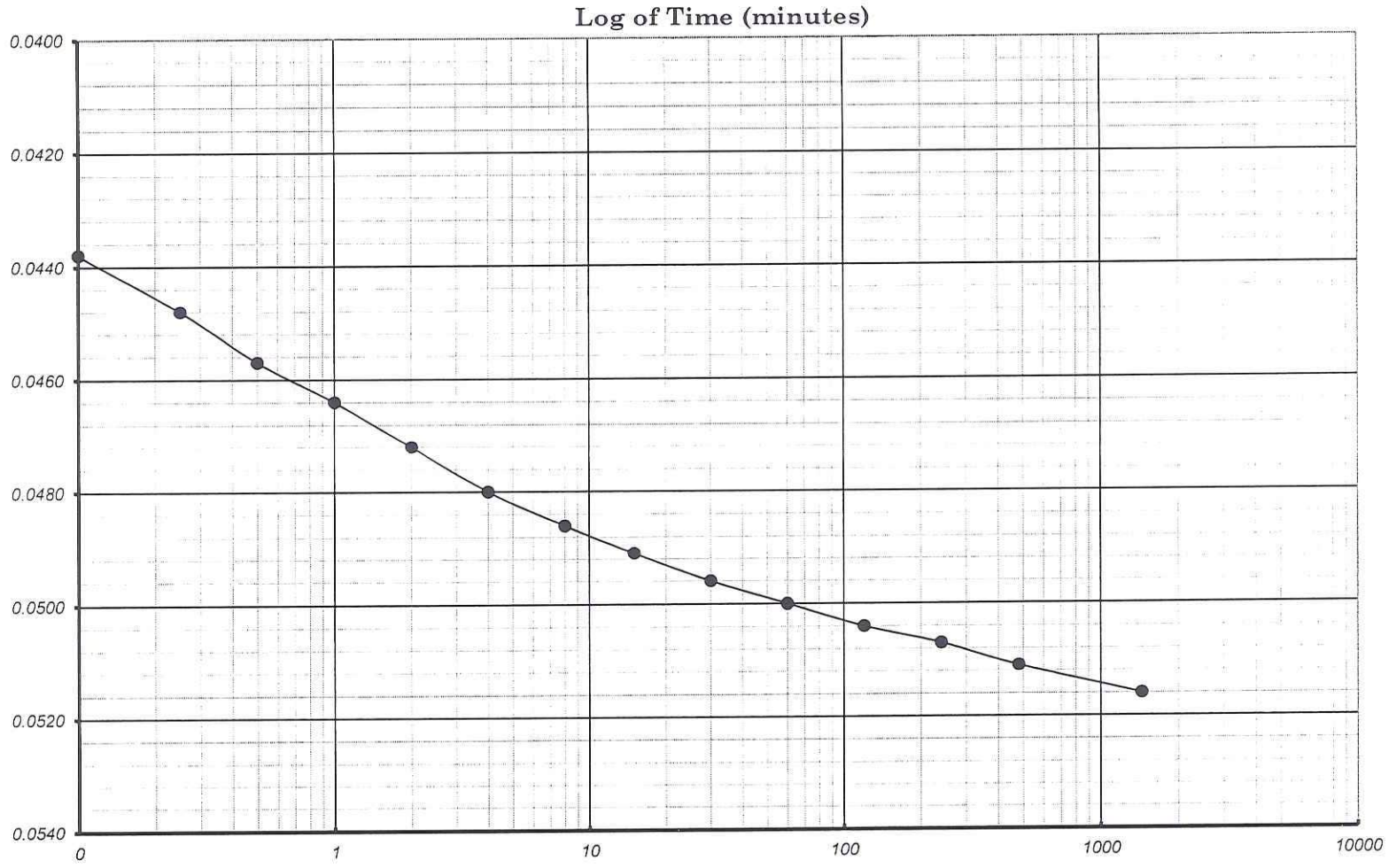
Boring No. : A-11-222				Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-2				Plastic Limit :	-						
Depth	(ft) :	10.0	11.5	Plastic Index :	-	Initial	15.04	102.99	16.21	63.77	0.64
	(m) :	3.05	3.51	Specific Gravity :	2.70	Final	22.36	104.79	16.49	99.19	0.61
Description : Olive-yellow with olive-brown, Lean CLAY (CL)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

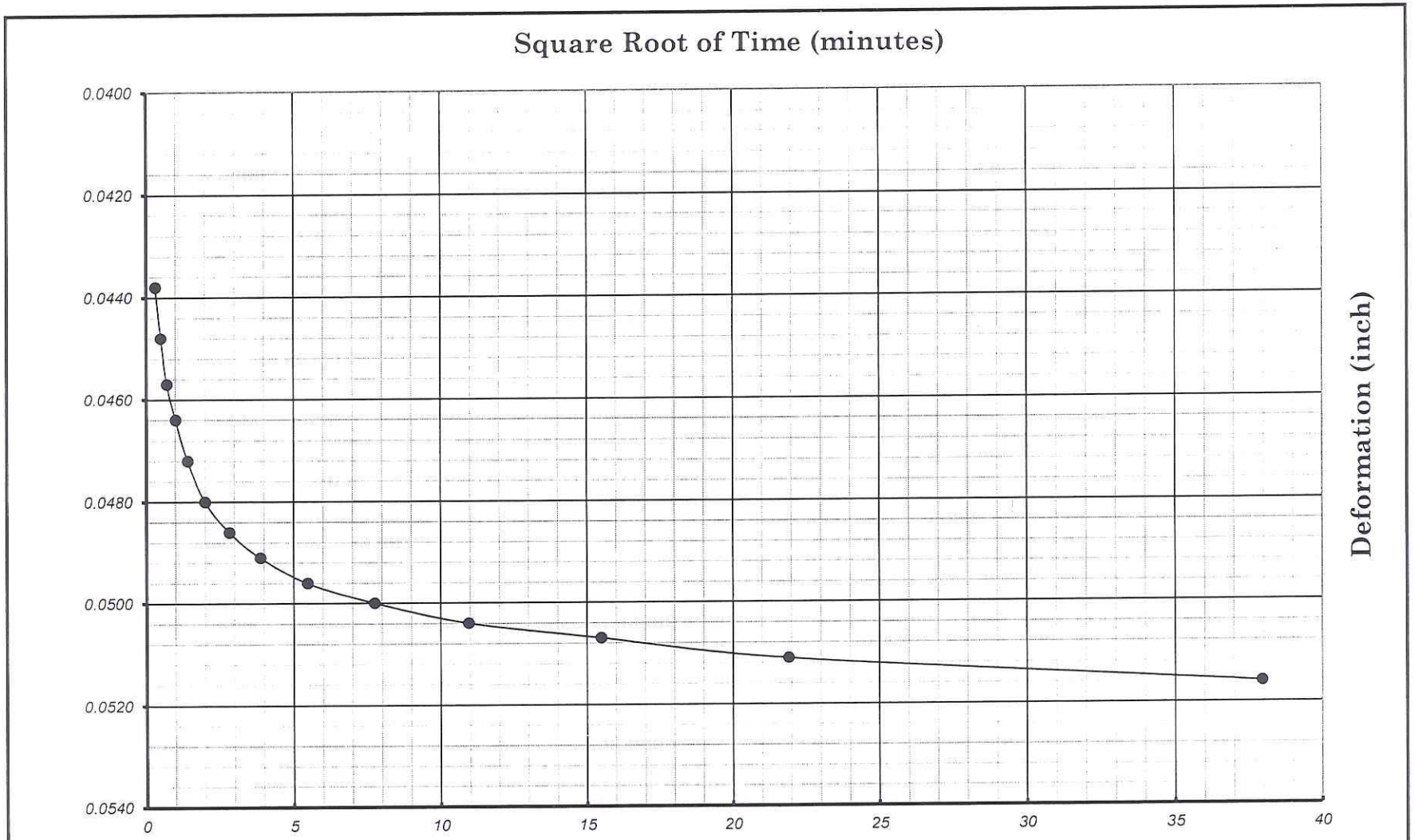
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

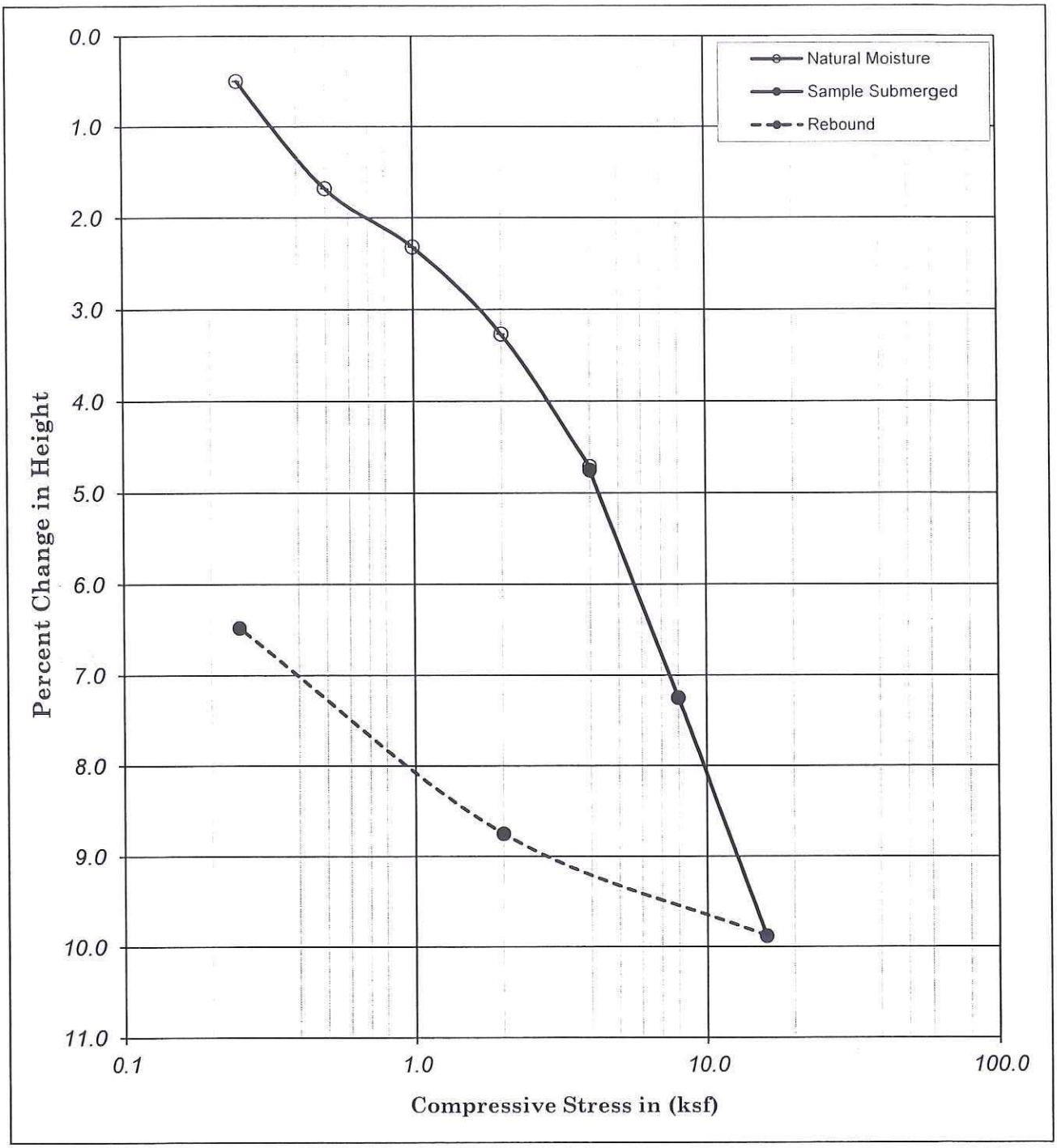
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-222	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 10.0 3.1	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-222*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



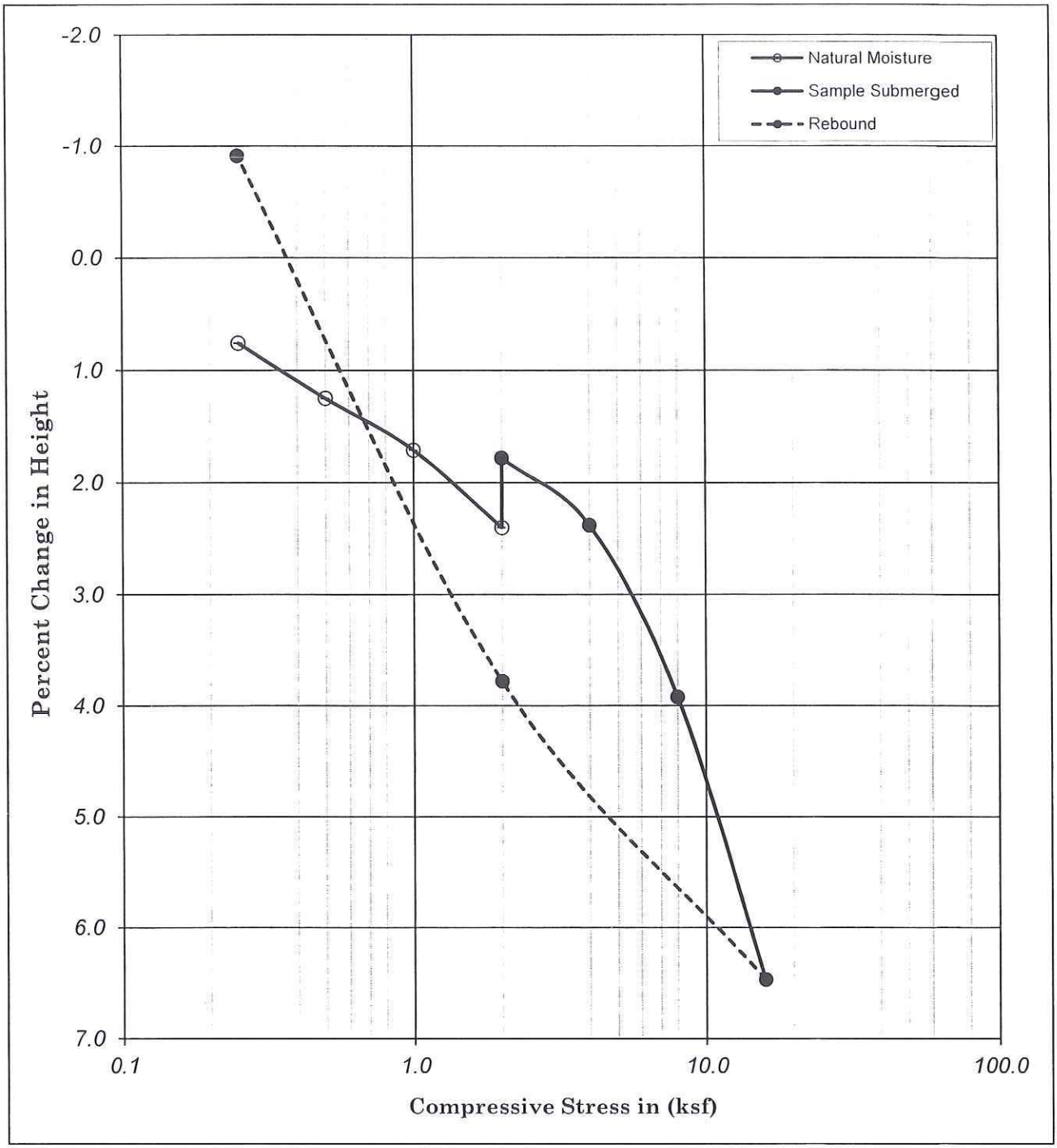
Boring No. : A-11-222			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-12			Plastic Limit :	-						
Depth	(ft) : 60.0	61.5	Plastic Index :	-	Initial	24.48	100.83	15.87	98.39	0.67
	(m) : 18.30	18.76	Specific Gravity :	2.70	Final	21.87	107.83	16.97	104.85	0.56
Description : Olive-brown with white, Lean CLAY with SAND (CL)										

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Boring No.	: A-11-224		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-5		Plastic Limit :	-						
Depth (ft)	: 25.0	26.5	Plastic Index :	-	Initial	32.66	87.85	13.83	95.97	0.92
Depth (m)	: 7.63	8.08	Specific Gravity :	2.70	Final	34.90	87.08	13.71	100.72	0.94

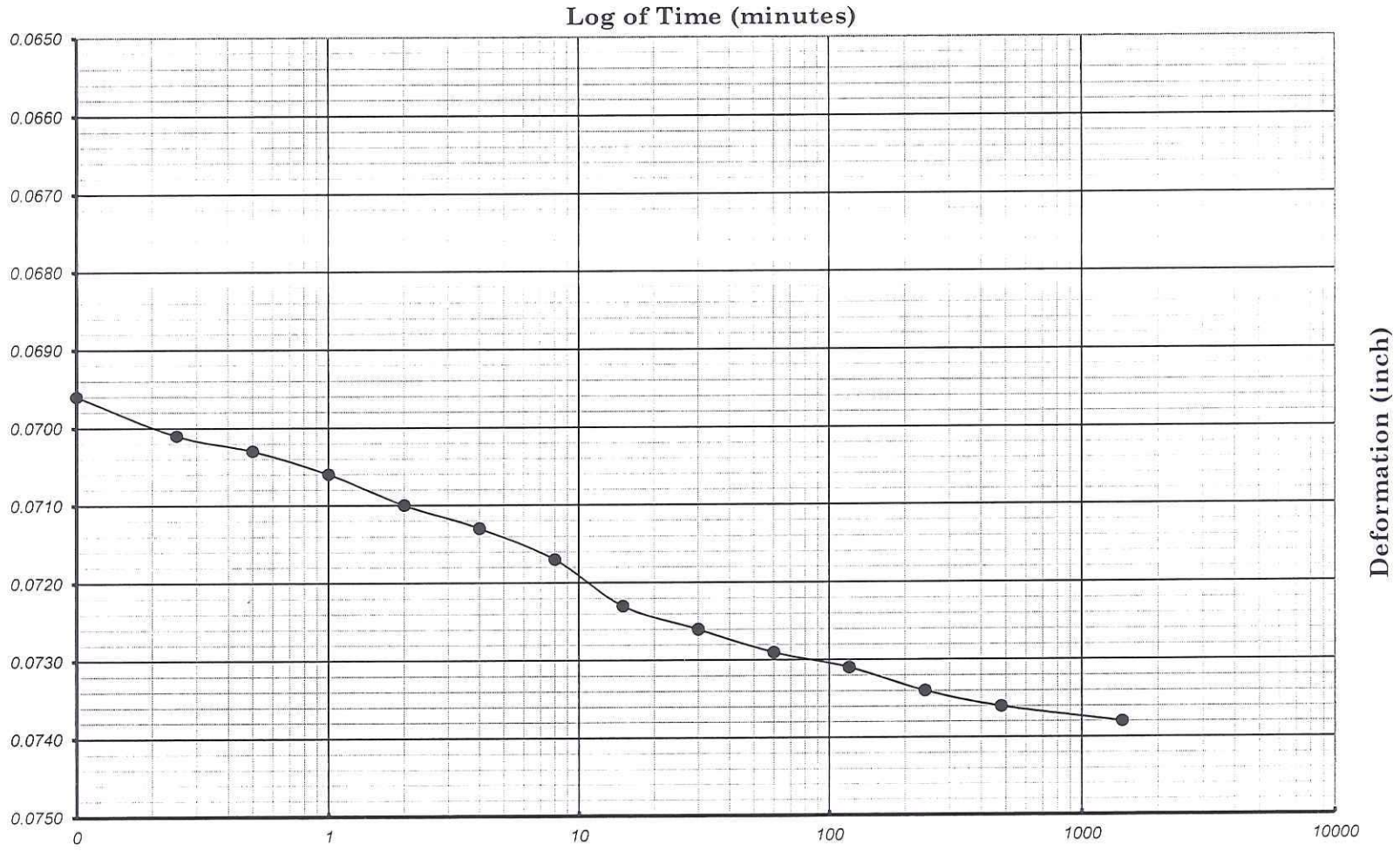
Description : *Olive-yellow with olive-brown, Lean CLAY (CL)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

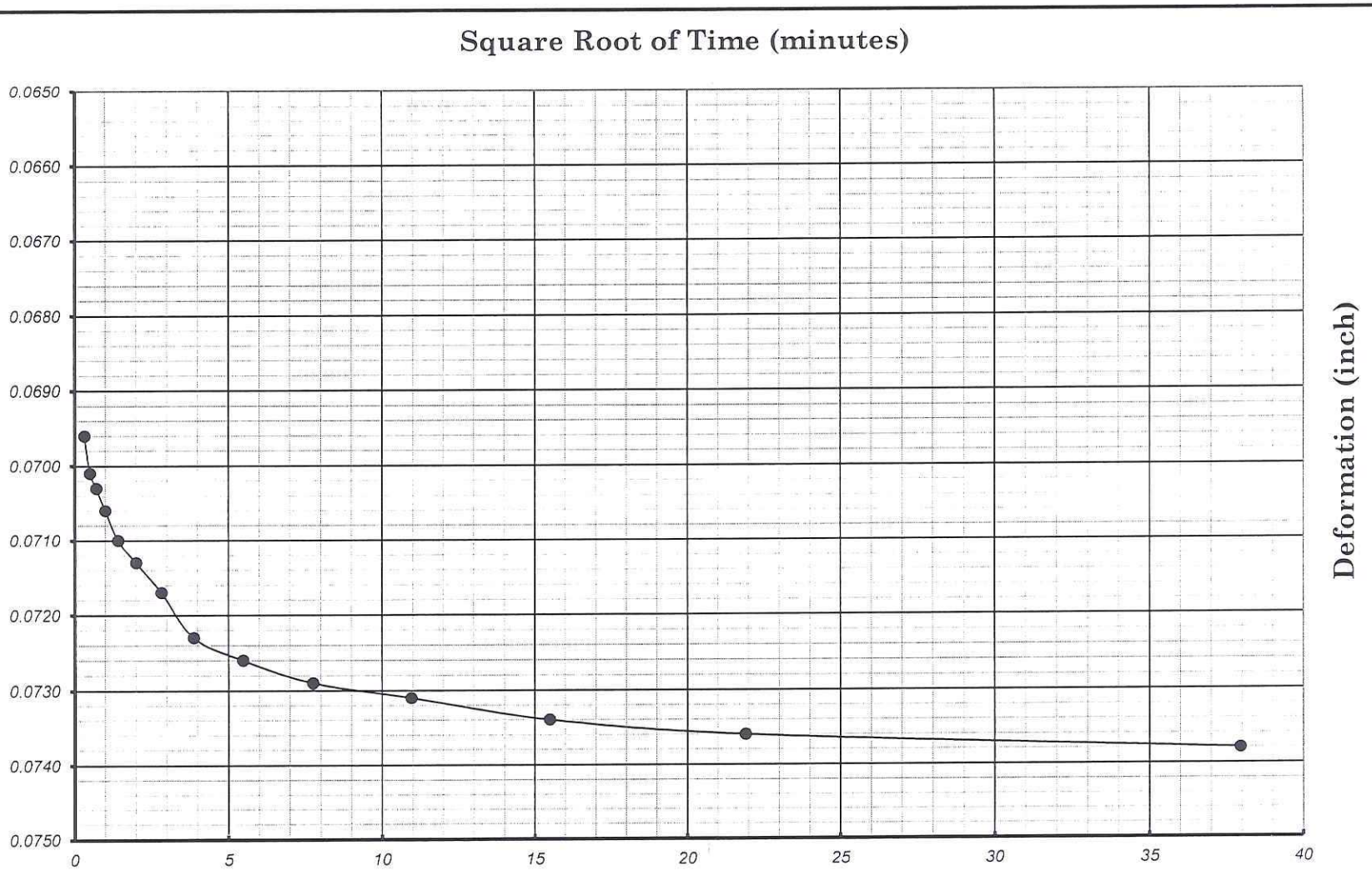
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

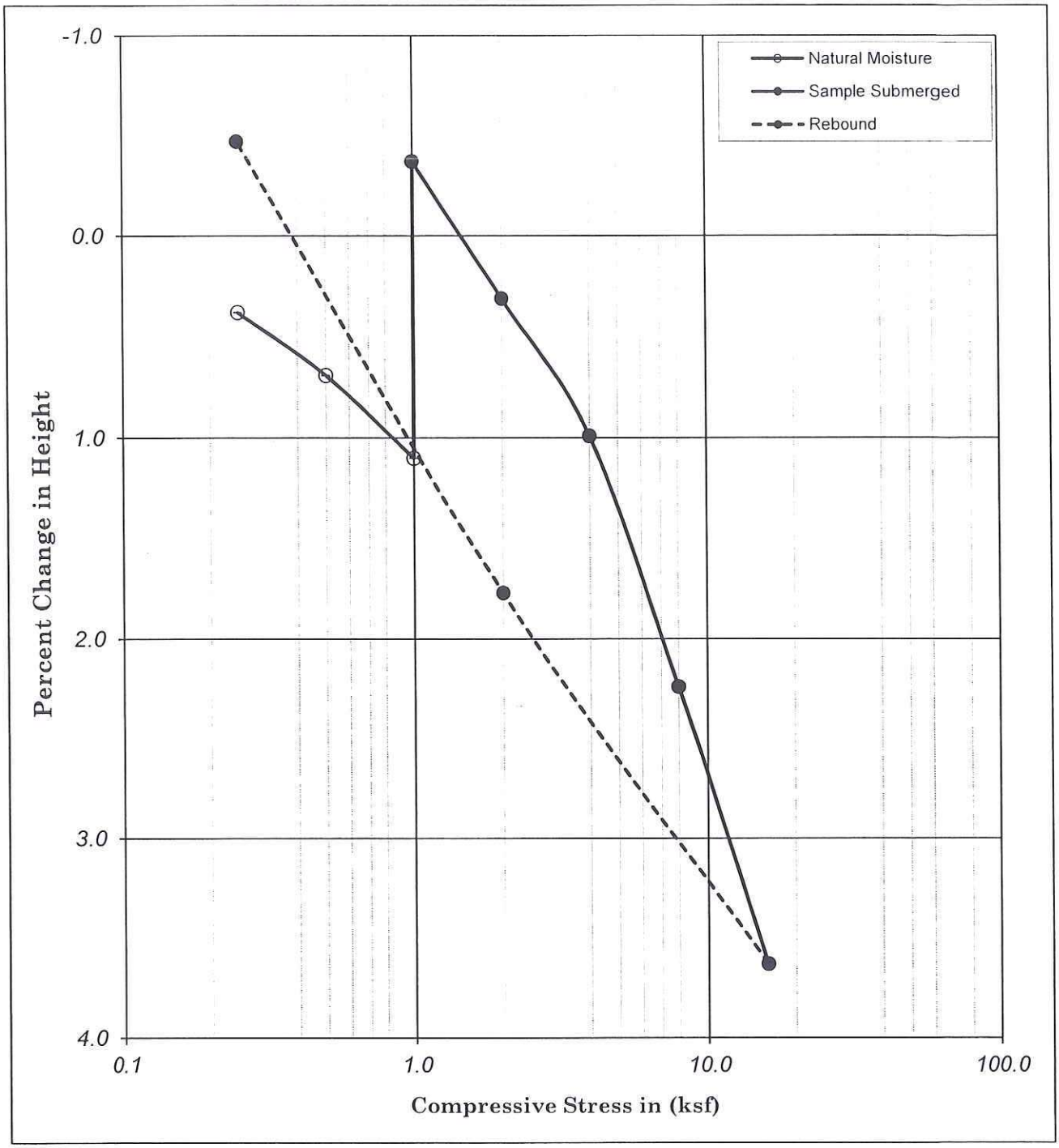
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-224	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-5	
EMI Project No. : 11-136		Depth (ft/m) : 25.0 7.6	Veritcal Load (ksf/kpa) : 4.00 191.5



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-224*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-5*	
EMI Project No. : *11-136*		Depth (ft/m) : *25.0* *7.6*	Veritcal Load (ksf/kpa) : *4.0* *191.5*



Boring No.	: A-11-226		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m^3)	Percent Saturation	Void Ratio
Sample No.	: D-3		Plastic Limit :	-						
Depth (ft)	: 10.0	11.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
Depth (m)	: 3.05	3.51	Specific Gravity :	2.70	Final	31.08	86.87	13.67	89.23	0.94
Description : Dark olive-gray, Elastic SILT (MH)										

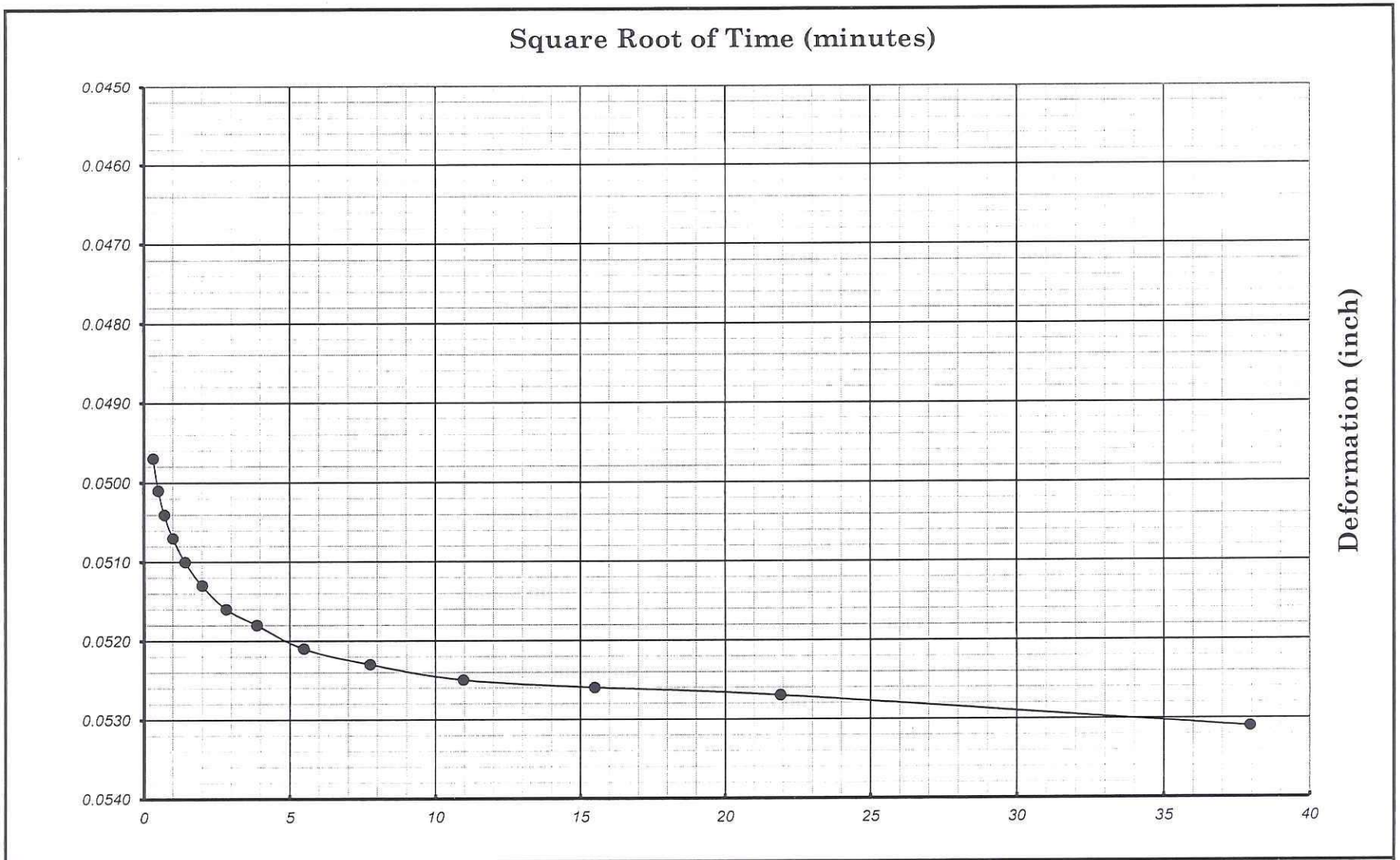
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

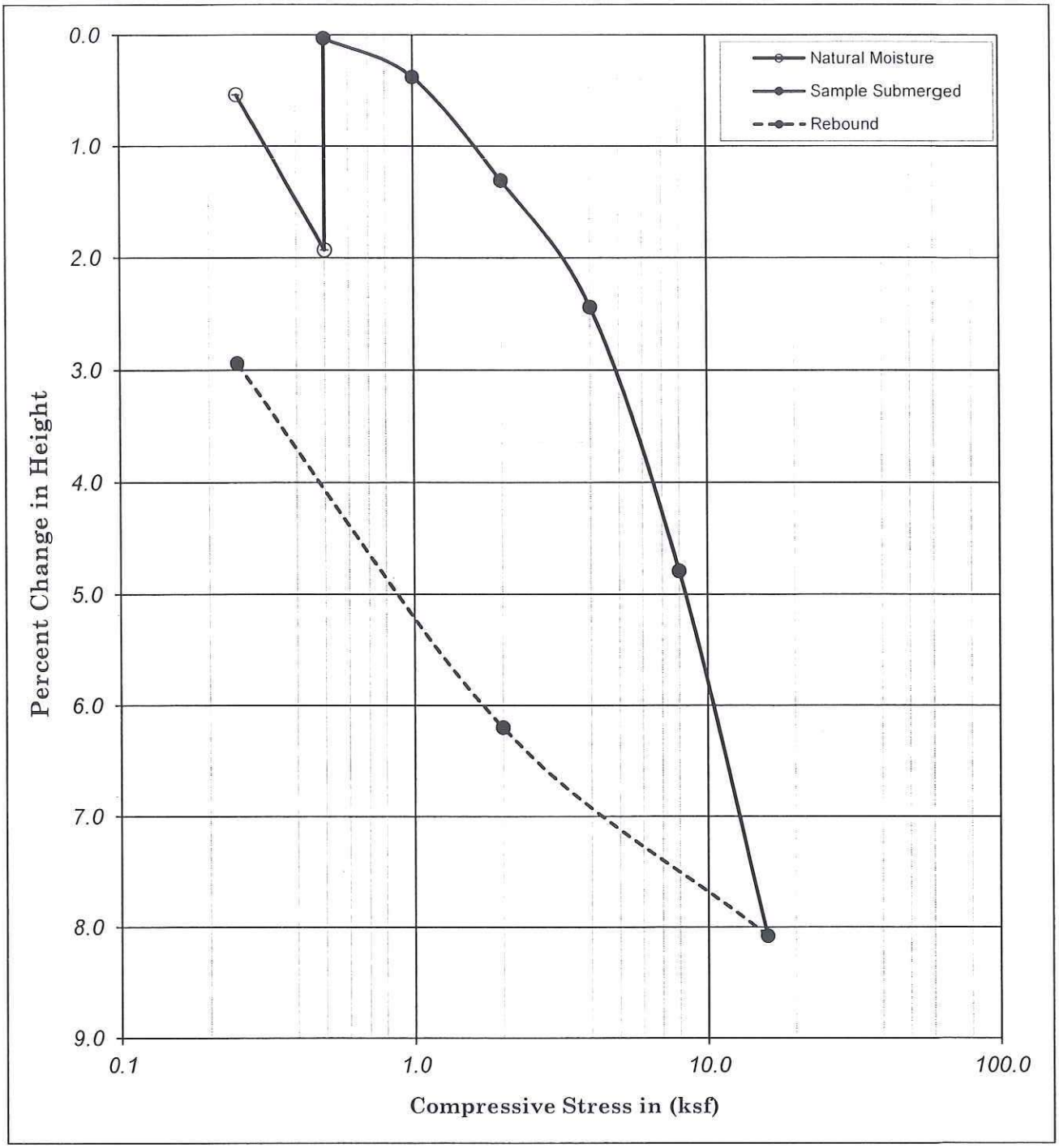
Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-226	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-3	
EMI Project No. : 11-136		Depth (ft/m) : 10.0 3.1	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-226*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-3*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No.	: A-11-233		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-2		Plastic Limit :	-						
Depth (ft)	: 5.0	6.5	Plastic Index :	-	Initial	19.80	105.16	16.55	88.67	0.60
Depth (m)	: 1.53	1.98	Specific Gravity :	2.70	Final	21.27	108.45	17.07	103.61	0.55

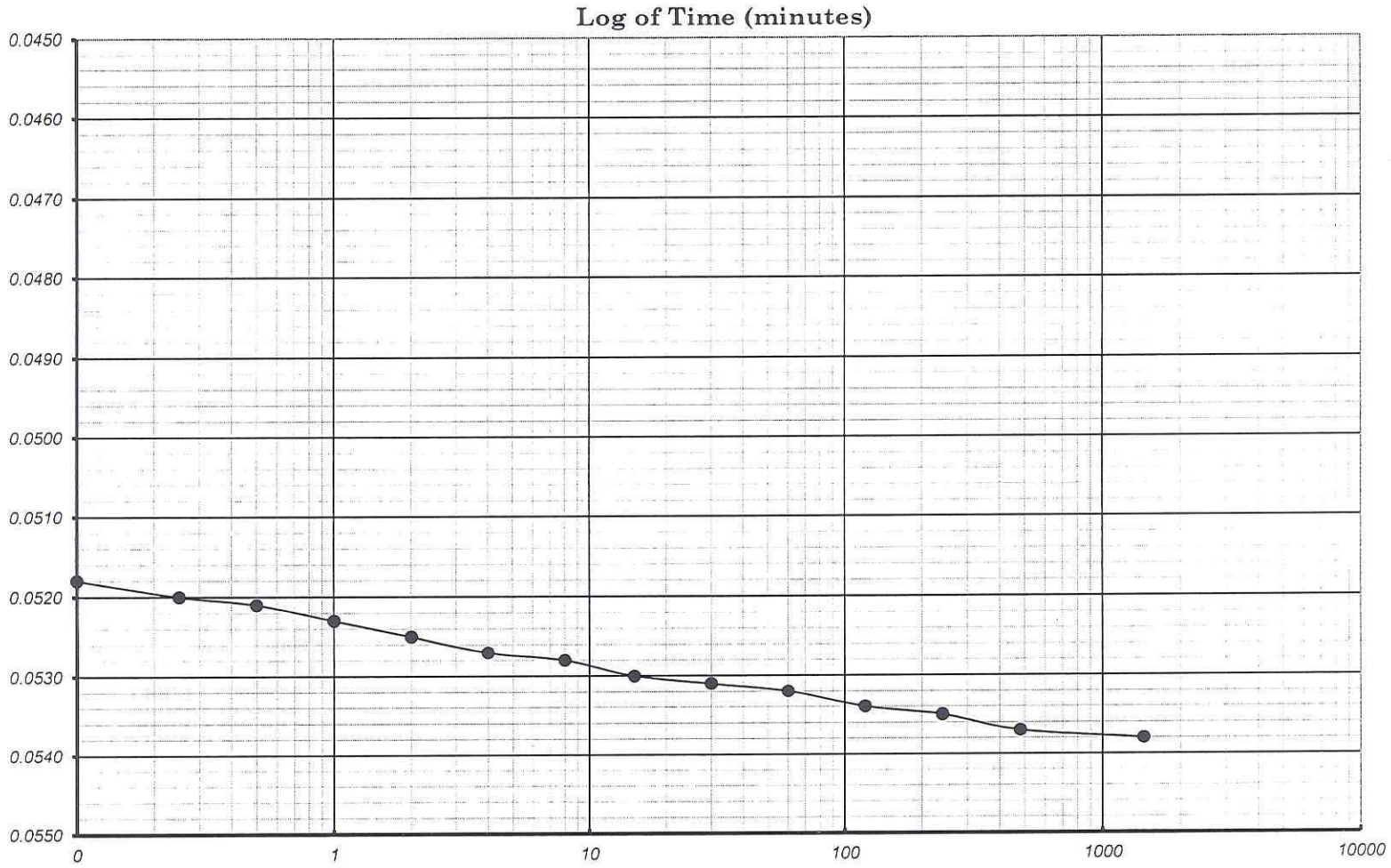
Description : Olive-brown, Lean CLAY with SAND (CL)

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

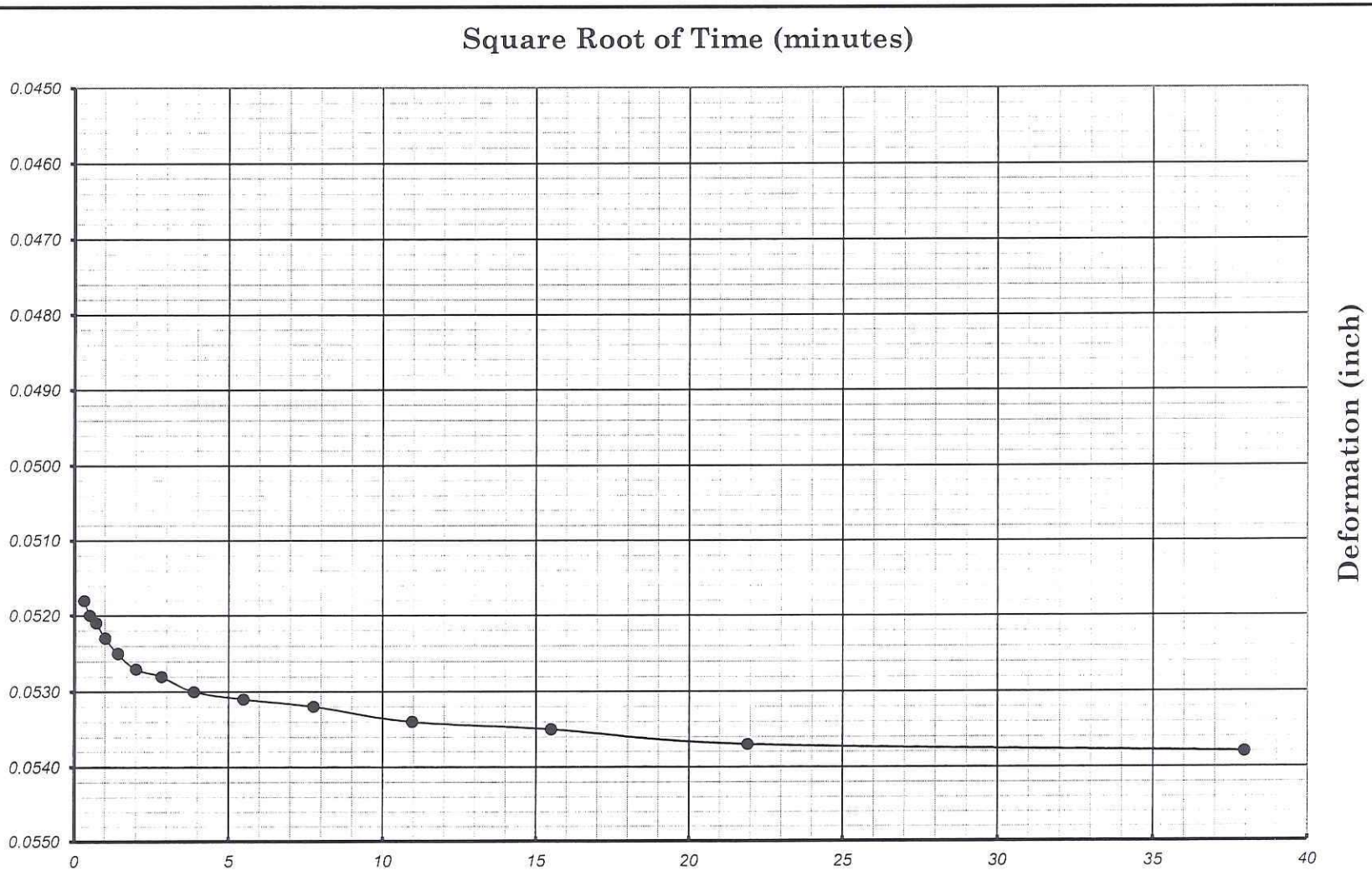
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

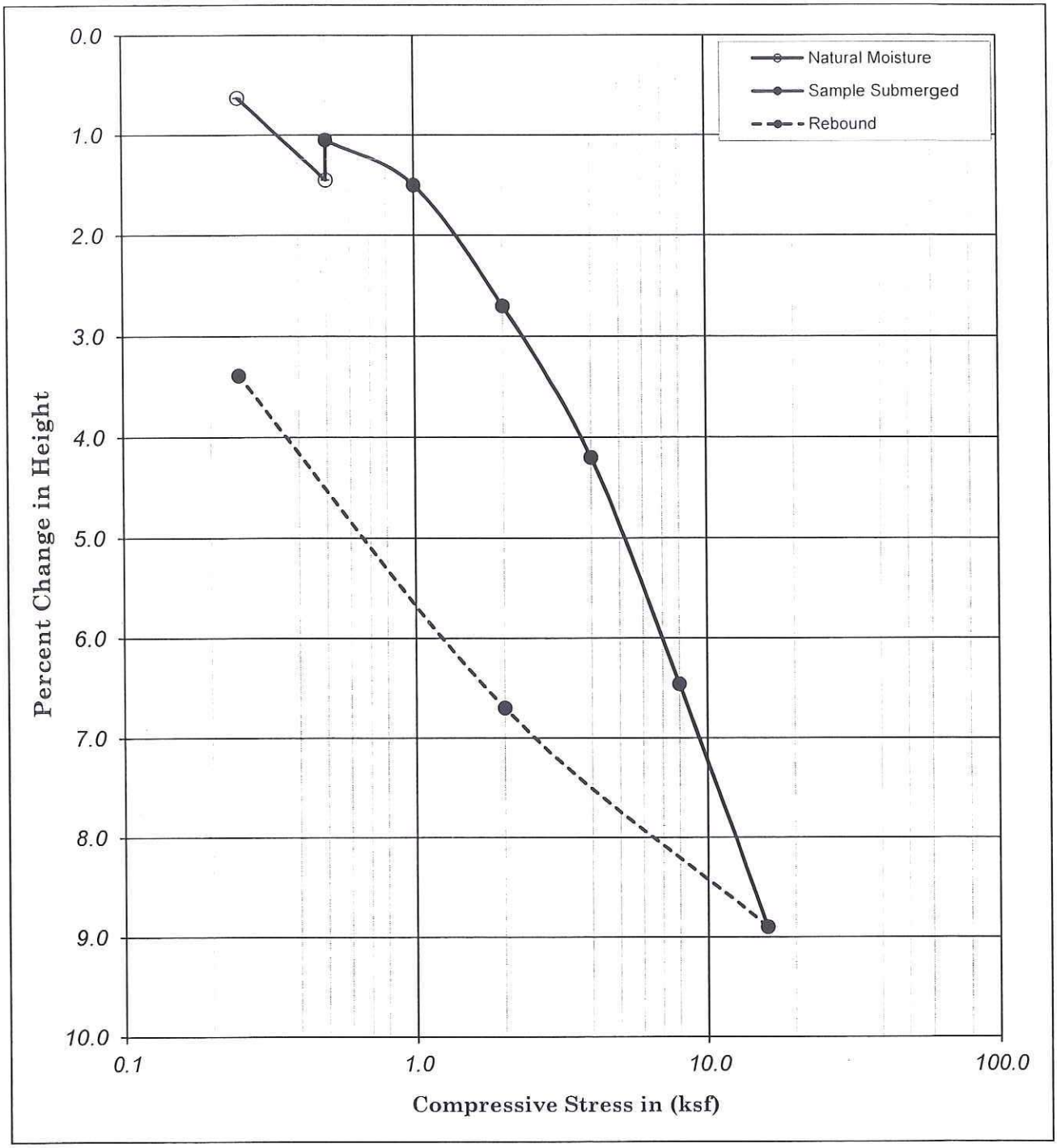
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-233	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 1.00 47.9



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-233*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *1.0* *47.9*



Boring No. : A-11-244			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-2			Plastic Limit :	-						
Depth	(ft) : 5.0	6.5	Plastic Index :	-	Initial	22.16	100.26	15.78	87.84	0.68
	(m) : 1.53	1.98	Specific Gravity :	2.70	Final	22.81	103.85	16.35	98.83	0.62
Description : Olive-brown, Lean CLAY with SAND (CL)										

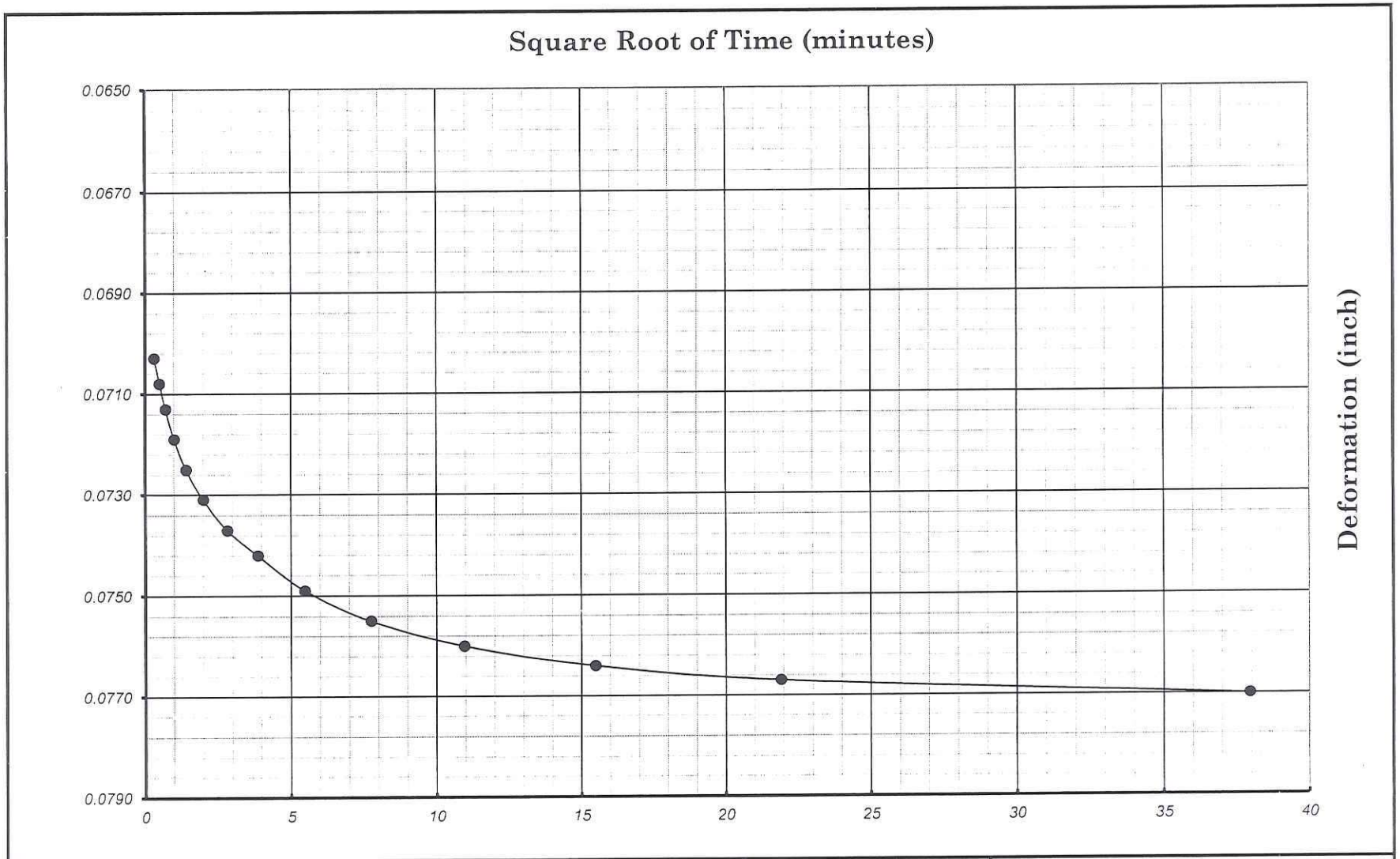
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

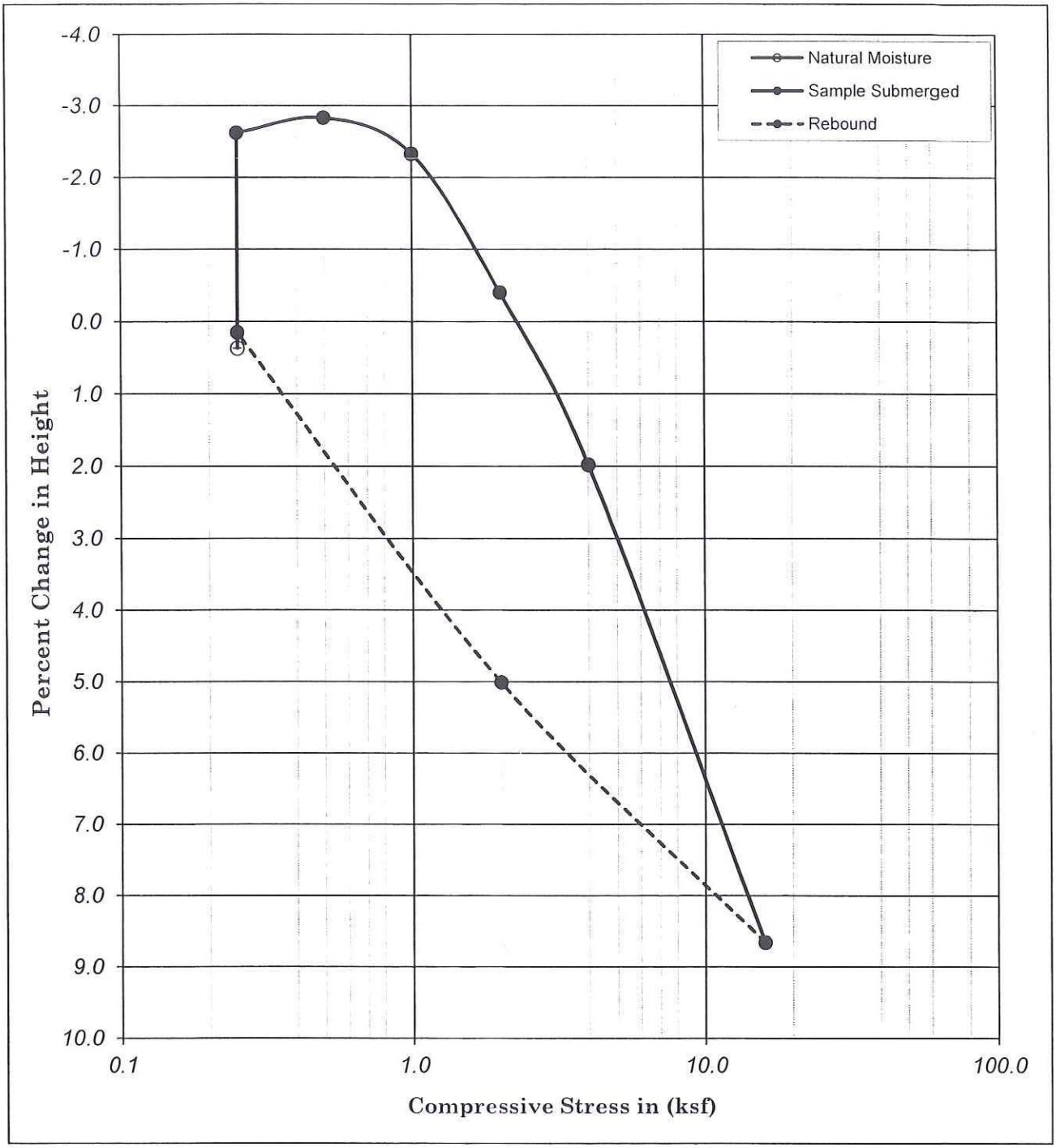
Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-244	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-244*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No.	: A-11-258		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-1		Plastic Limit :	-						
Depth (ft)	: 5.0	6.5	Plastic Index :	-	Initial	22.02	98.48	15.50	83.54	0.71
Depth (m)	: 1.53	1.98	Specific Gravity :	2.70	Final	28.57	98.69	15.53	108.95	0.71

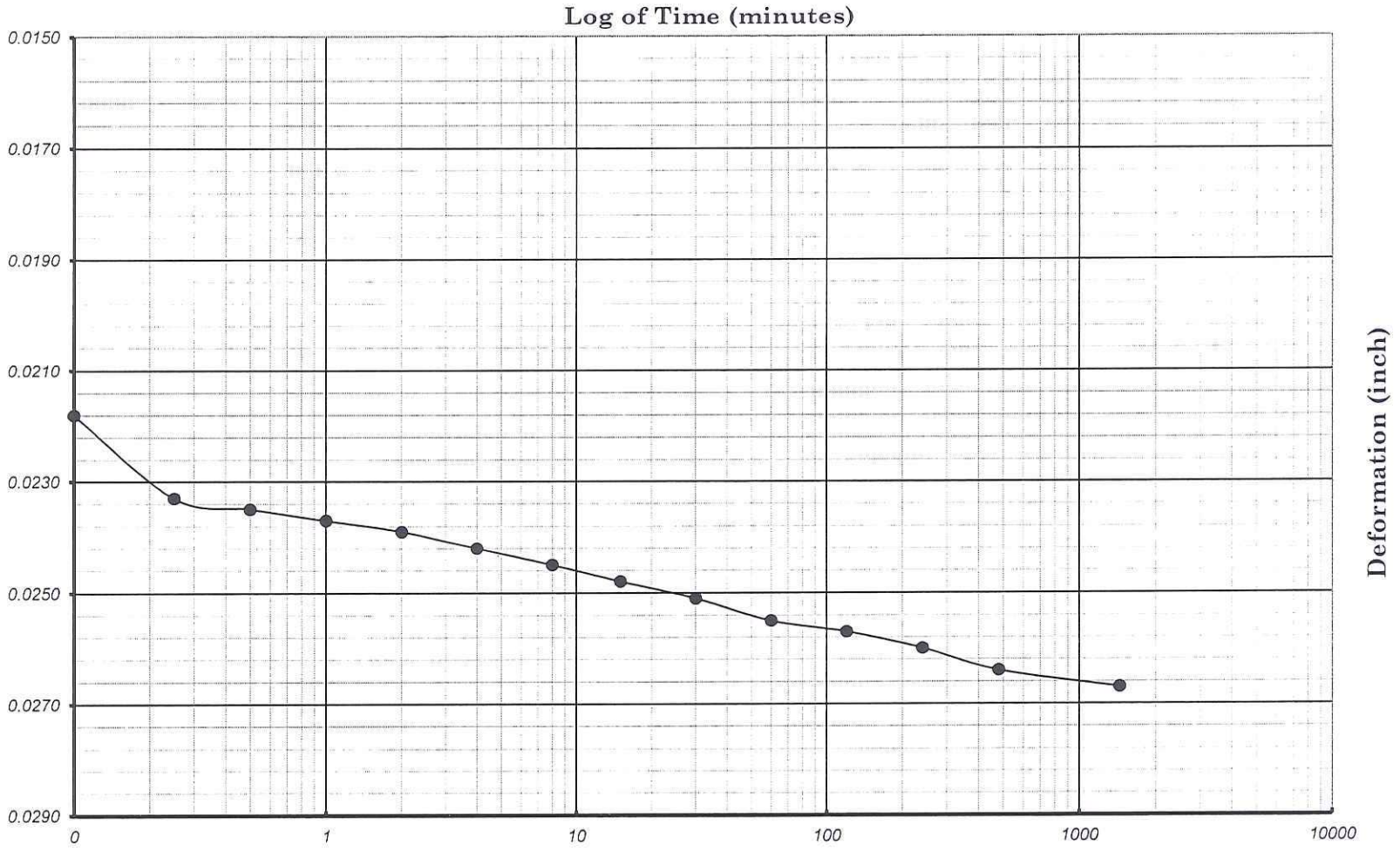
Description : *Dark olive-brown, Lean CLAY (CL)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

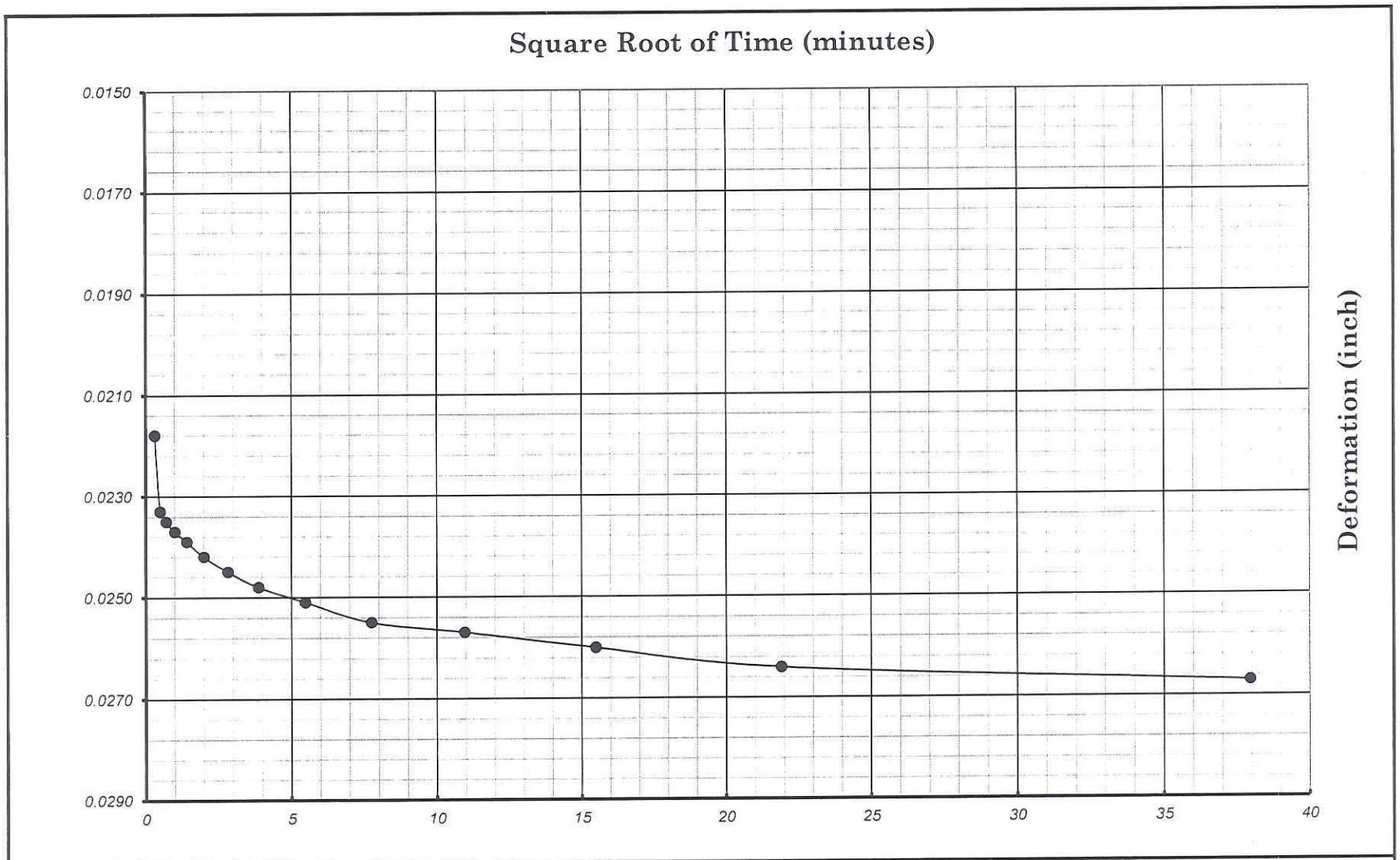
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

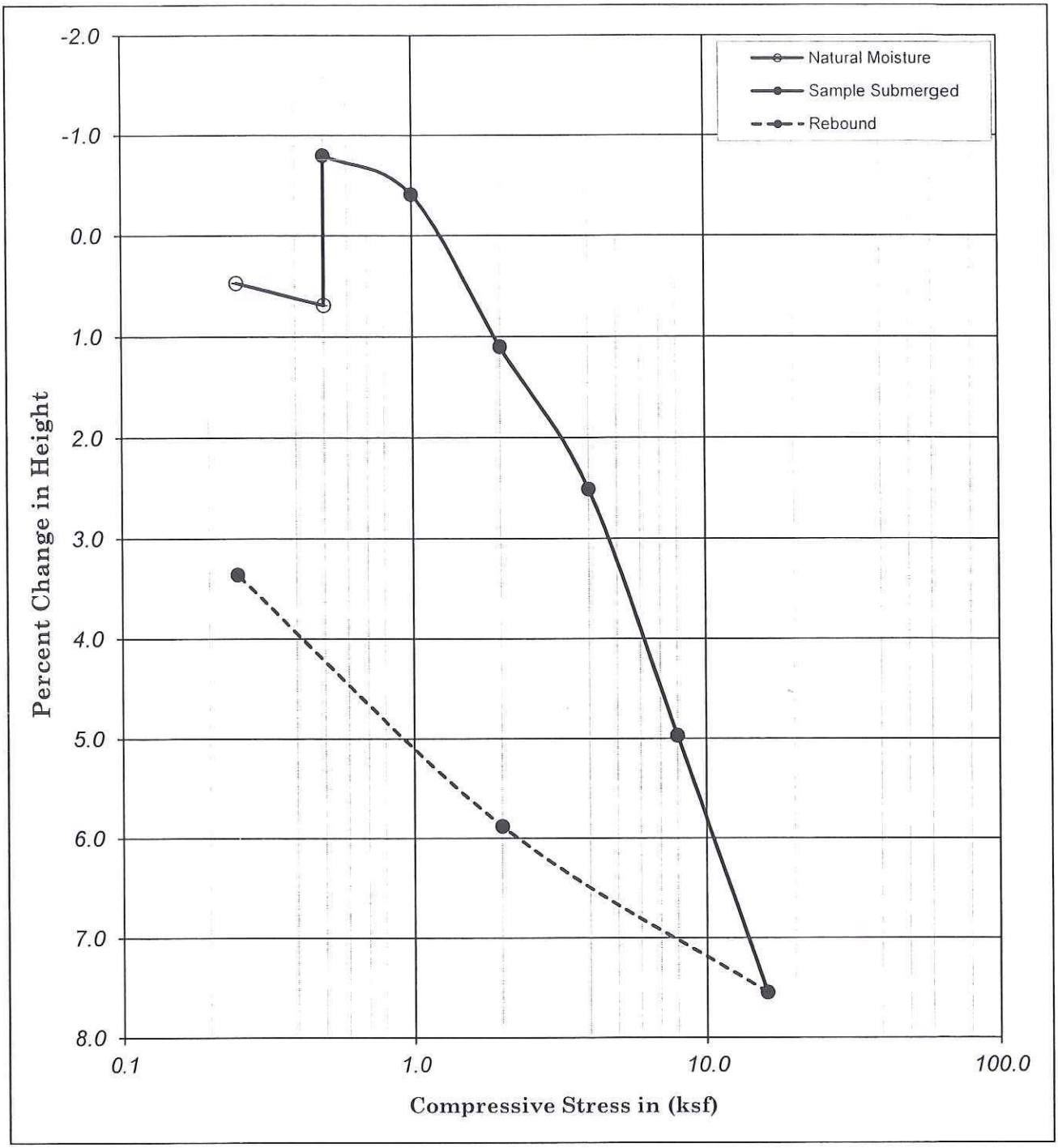
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-258*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-1*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *1.00* *47.9*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-258	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-1	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 1.0 47.9



Boring No. : A-11-262			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-2			Plastic Limit :	-						
Depth	(ft) : 5.0	6.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
	(m) : 1.53	1.98	Specific Gravity :	2.70	Final	31.08	90.30	14.21	96.81	0.87
Description : Olive-brown, Lean CLAY with SAND (CL)										

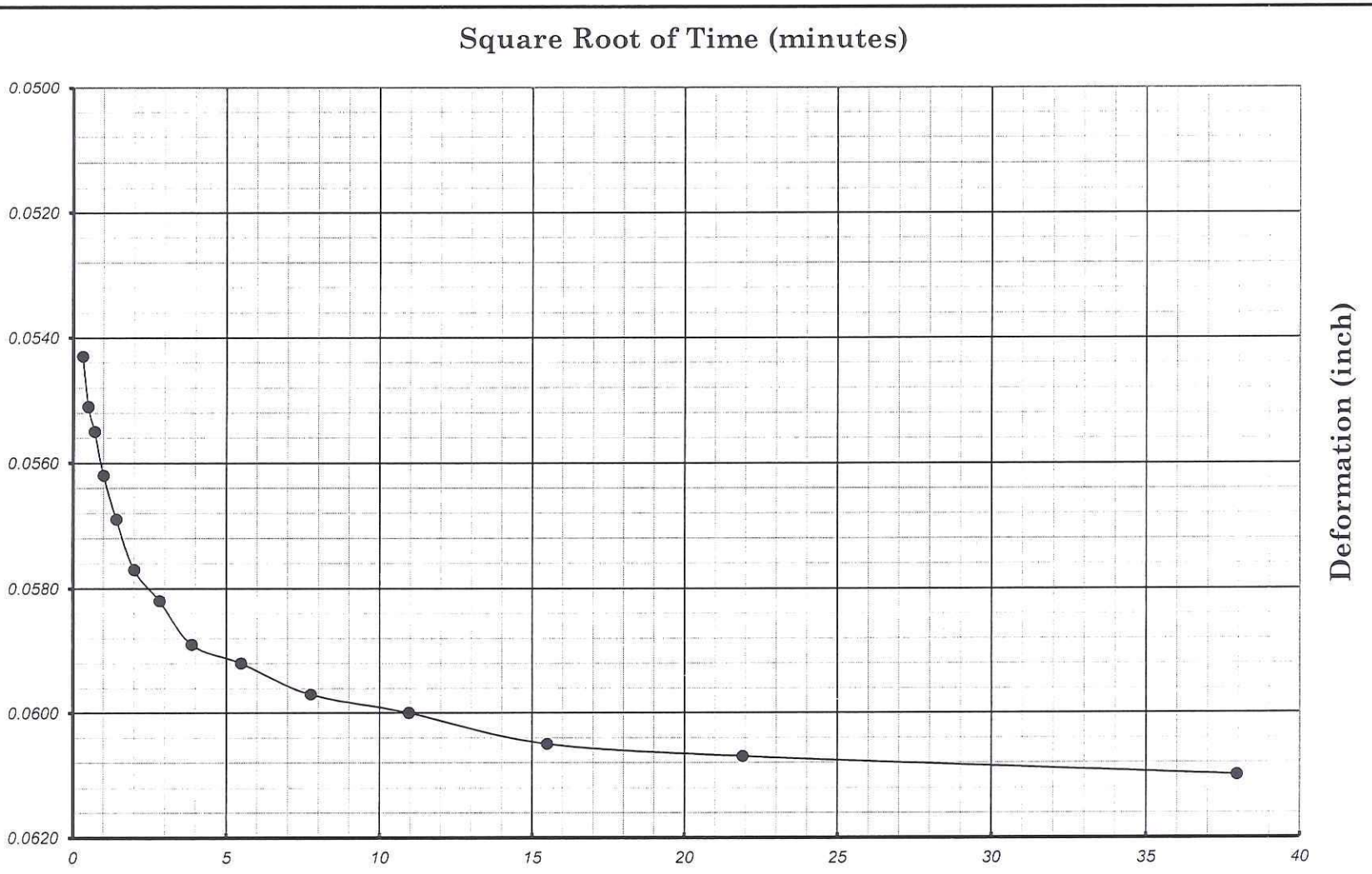
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

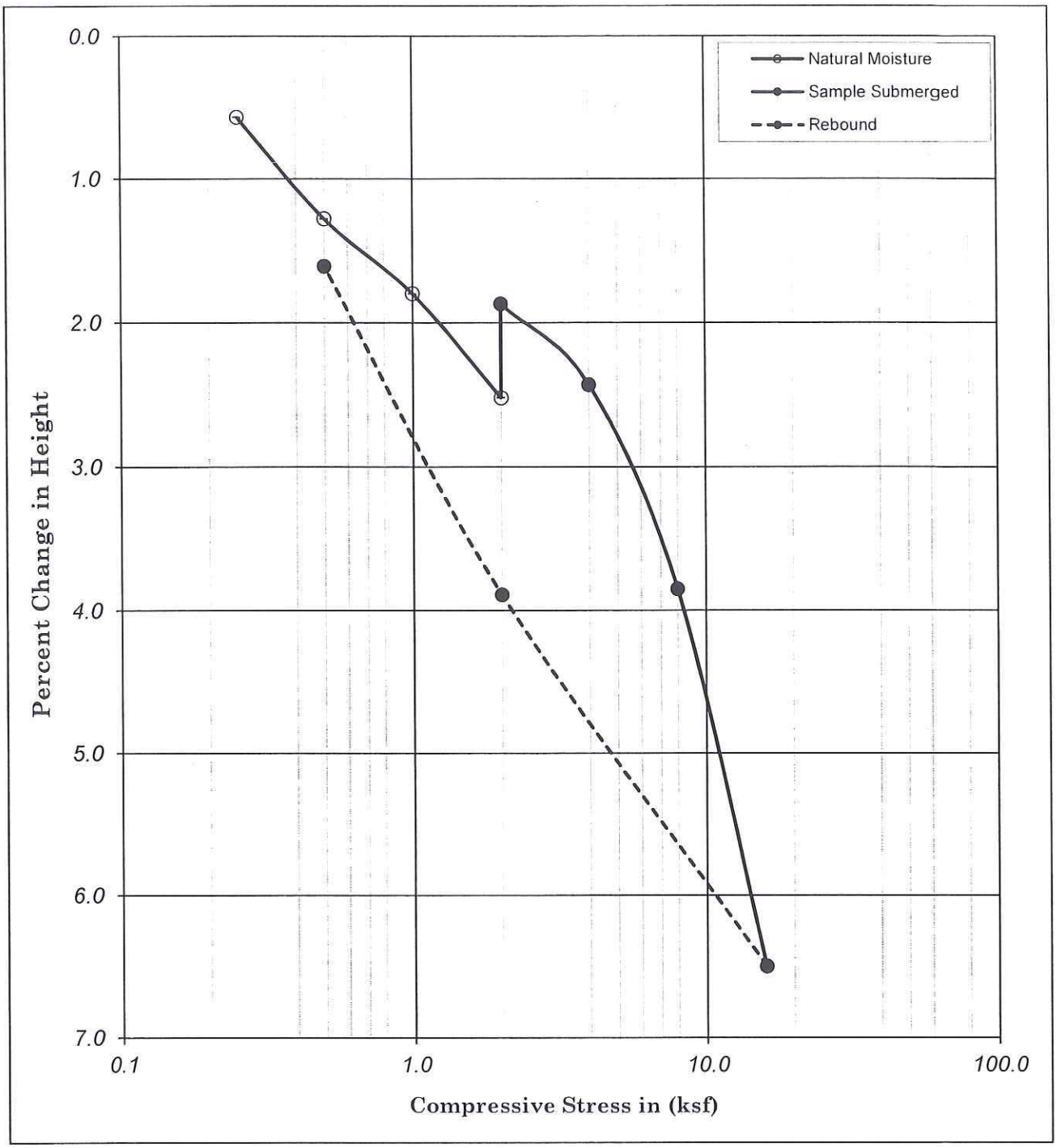
Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-262	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-262*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No.	: A-11-263		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-7		Plastic Limit :	-						
Depth (ft)	: 30.0	31.5	Plastic Index :	-	Initial	33.60	88.28	13.90	99.75	0.91
Depth (m)	: 9.15	9.61	Specific Gravity :	2.70	Final	34.08	89.78	14.13	104.87	0.88

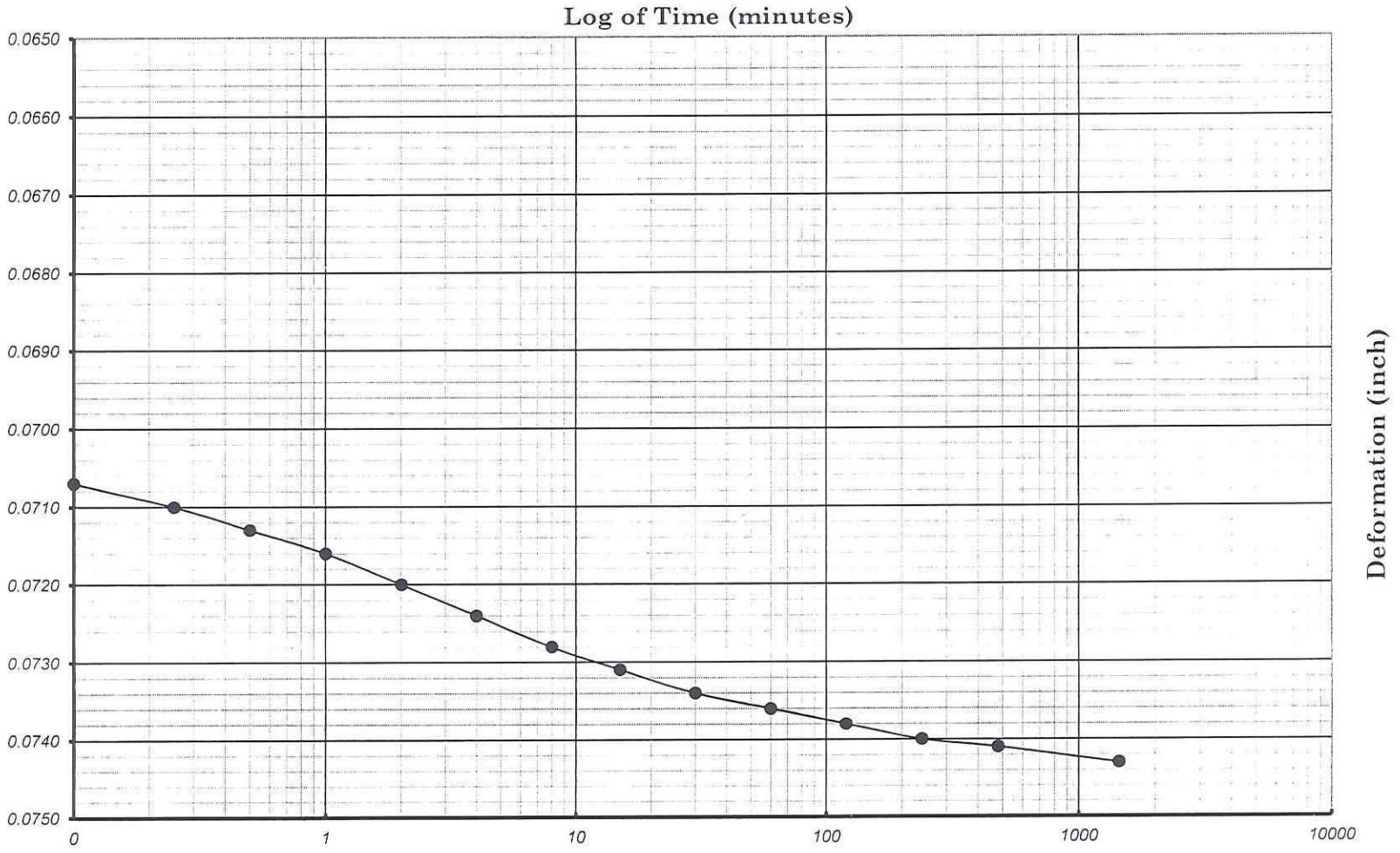
Description : *Gray with yellowish brown, Fat CLAY (CH)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

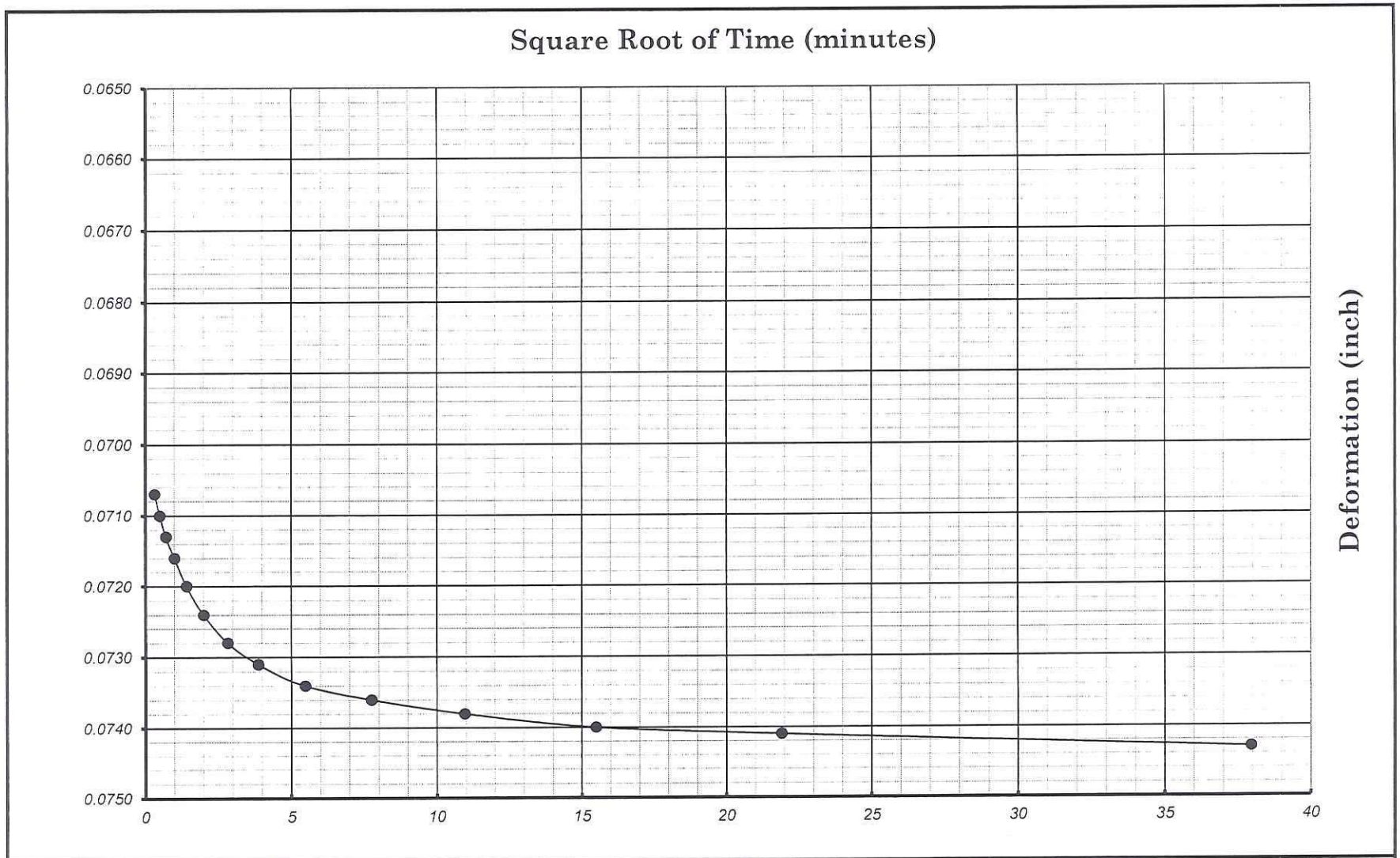
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-263	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-7	
EMI Project No. : 11-136		Depth (ft/m) : 30.0 9.2	Veritcal Load (ksf/kpa) : 4.00 191.5



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-263*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-7*	
EMI Project No. : *11-136*		Depth (ft/m) : *30.0* *9.2*	Veritcal Load (ksf/kpa) : *4.0* *191.5*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

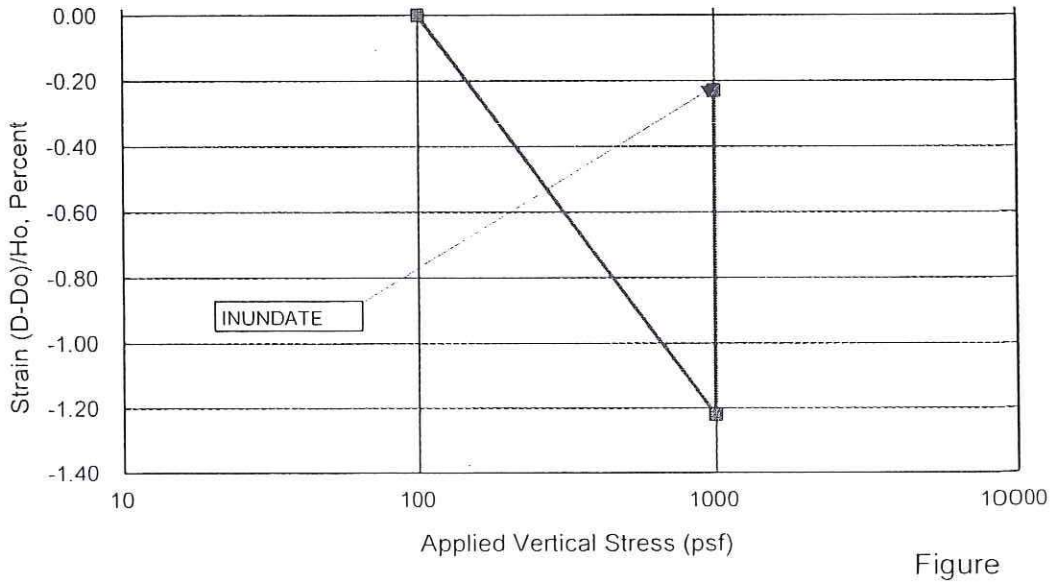
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	28.3	Final Moisture (%) :	33.5
Initial Dry Density (pcf):	89.7	Final Dry Density (pcf) :	92.8
Initial Void Ratio:	0.880	Final Void Ratio:	0.884
Initial Saturation (%)	87	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.880
1000	0.0622	1.0122	-1.22	0.903
H2O	0.0523	1.0023	-0.23	0.884

Percent Swell (+) / Collapse (-) 0.99

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

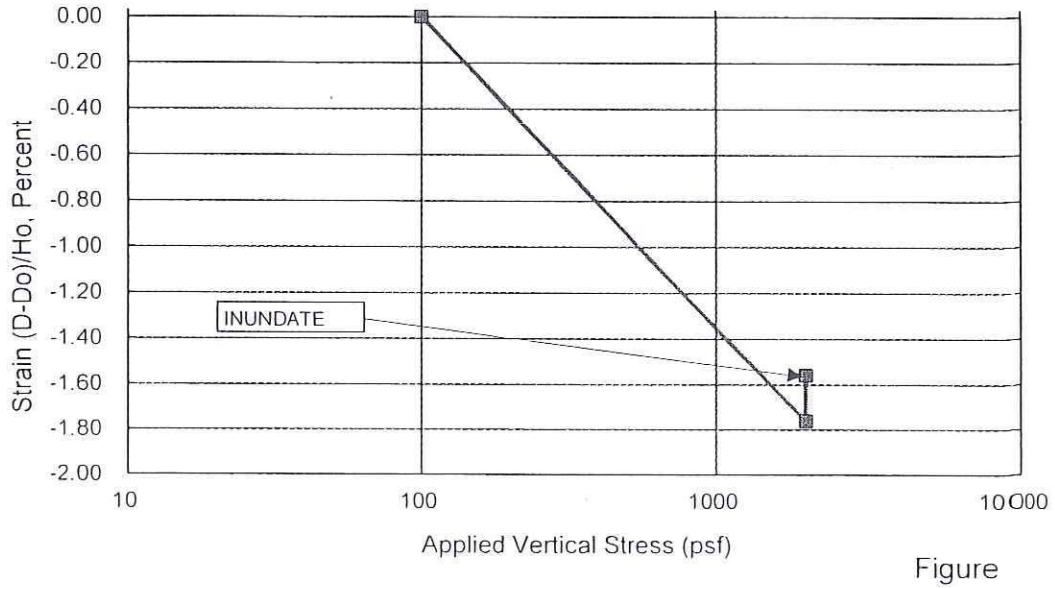
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	28.4	Final Moisture (%) :	33.1
Initial Dry Density (pcf):	88.8	Final Dry Density (pcf) :	91.9
Initial Void Ratio:	0.898	Final Void Ratio:	0.928
Initial Saturation (%)	86	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.898
2000	0.0676	1.0176	-1.76	0.931
H2O	0.0656	1.0156	-1.56	0.928

Percent Swell (+) / Collapse (-) 0.20

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

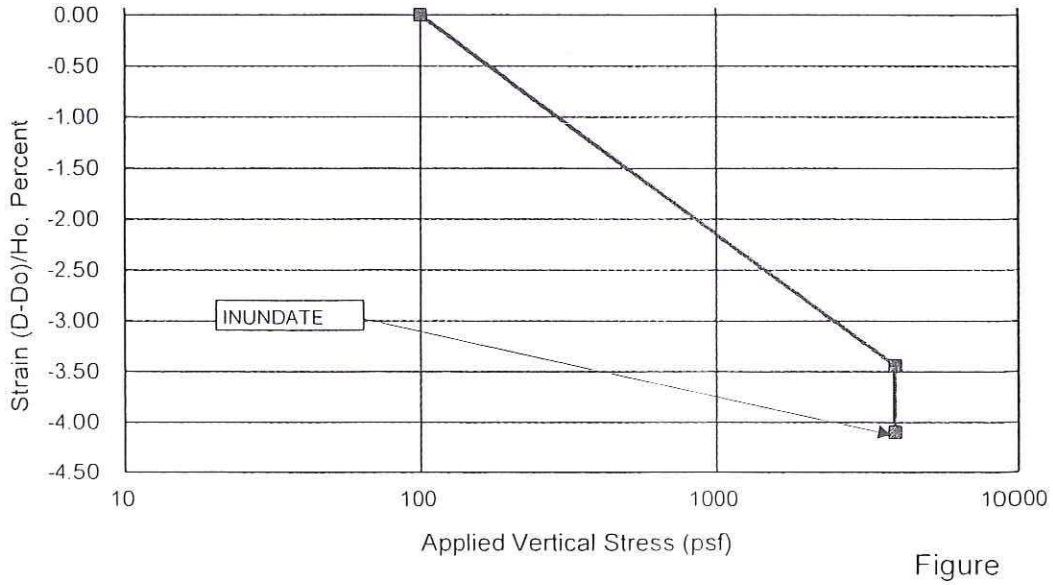
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	26.0	Final Moisture (%) :	33.0
Initial Dry Density (pcf):	88.6	Final Dry Density (pcf) :	91.8
Initial Void Ratio:	0.901	Final Void Ratio:	0.979
Initial Saturation (%)	78	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.901
4000	0.0844	1.0344	-3.44	0.967
H2O	0.0910	1.0410	-4.10	0.979

Percent Swell (+) / Collapse (-) -0.66

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

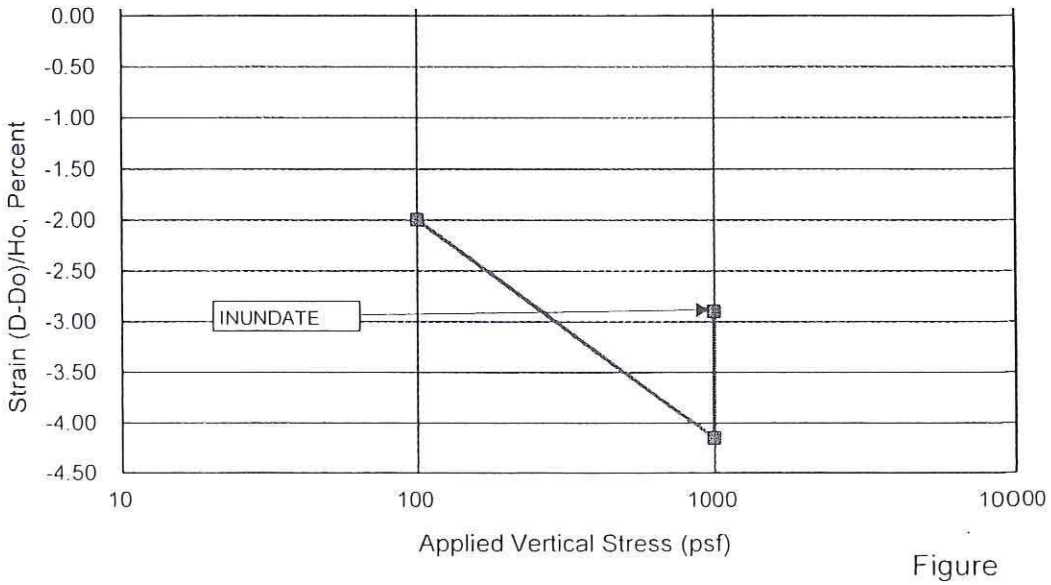
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	25.4	Final Moisture (%) :	34.2
Initial Dry Density (pcf):	85.6	Final Dry Density (pcf) :	88.6
Initial Void Ratio:	0.970	Final Void Ratio:	1.027
Initial Saturation (%)	71	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	1.009
1000	0.0915	1.0415	-4.15	1.051
H2O	0.0790	1.0290	-2.90	1.027

Percent Swell (+) / Collapse (-) 1.25

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils
(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

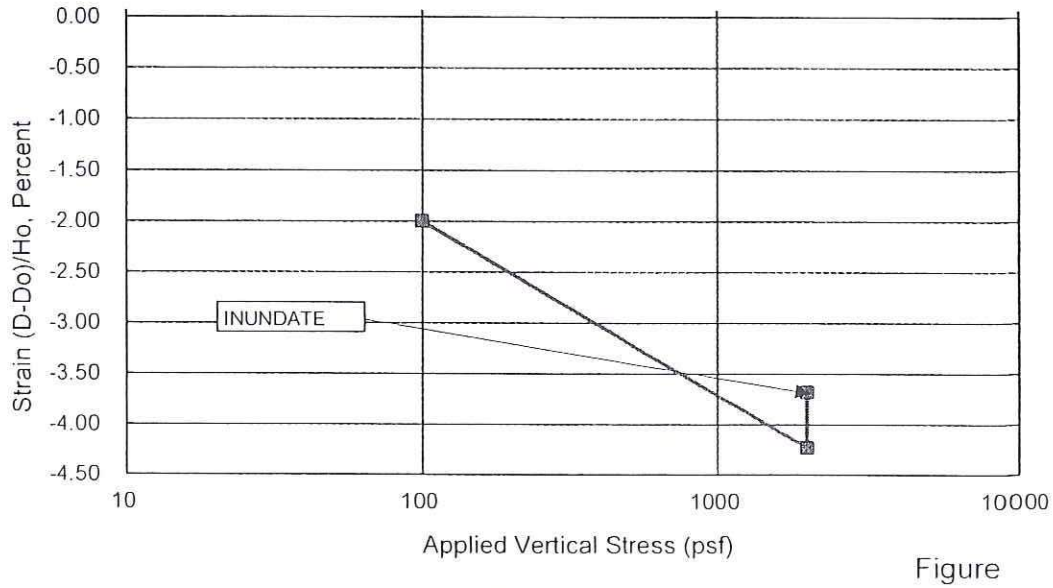
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	25.3	Final Moisture (%) :	32.8
Initial Dry Density (pcf):	89.6	Final Dry Density (pcf) :	92.7
Initial Void Ratio:	0.882	Final Void Ratio:	0.951
Initial Saturation (%)	77	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	0.920
2000	0.0923	1.0423	-4.23	0.961
H2O	0.0868	1.0368	-3.68	0.951

Percent Swell (+) / Collapse (-) 0.55

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

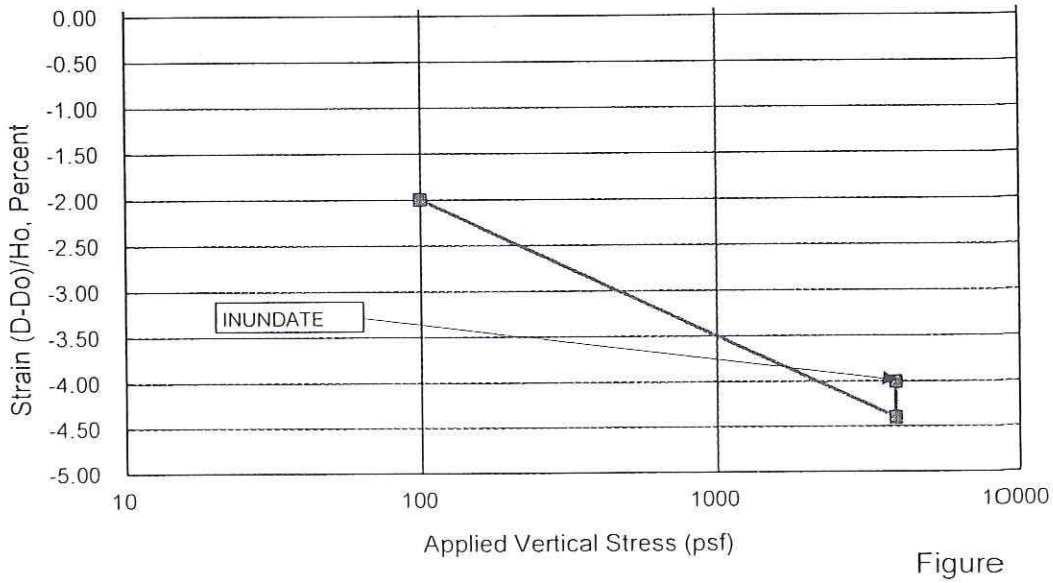
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	24.7	Final Moisture (%) :	31.4
Initial Dry Density (pcf):	88.8	Final Dry Density (pcf) :	92.0
Initial Void Ratio:	0.897	Final Void Ratio:	0.973
Initial Saturation (%)	74	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	0.935
4000	0.0940	1.0440	-4.40	0.981
H2O	0.0901	1.0401	-4.01	0.973

Percent Swell (+) / Collapse (-) 0.39

Compression Curve of the Swell Potential



Figure

APPENDIX C
ANALYSES AND CALCULATIONS

LATERAL PILE CAPACITY

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

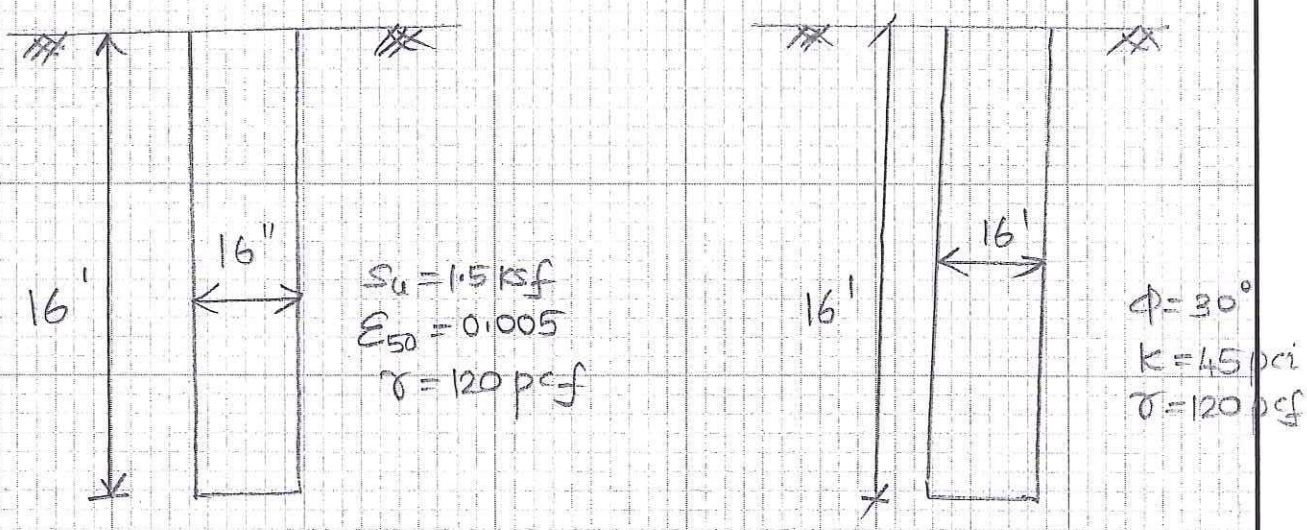
Project I-5 HOV Widening - Segment 2 **Project No.** 11-136

By Ranjan **Date** 9/18/12 **Checked By** Andy **Date** 9/19/12 **Sheet** 1 **of** 1

SOUNDWALL PILES (CALTRANS STANDARD)

CAPACITY COMPARISON BETWEEN SITE-SPECIFIC SOIL CONDITION VS. CALTRANS STANDARD PLAN SOIL (ϕ=30°) CONDITION

Per Standard Plan Sheet B 15-8;



Site-Specific Soil

Standard Soil

Free head condition

pile head deflection = 0.25" (δ)

Per LPILE analyses,

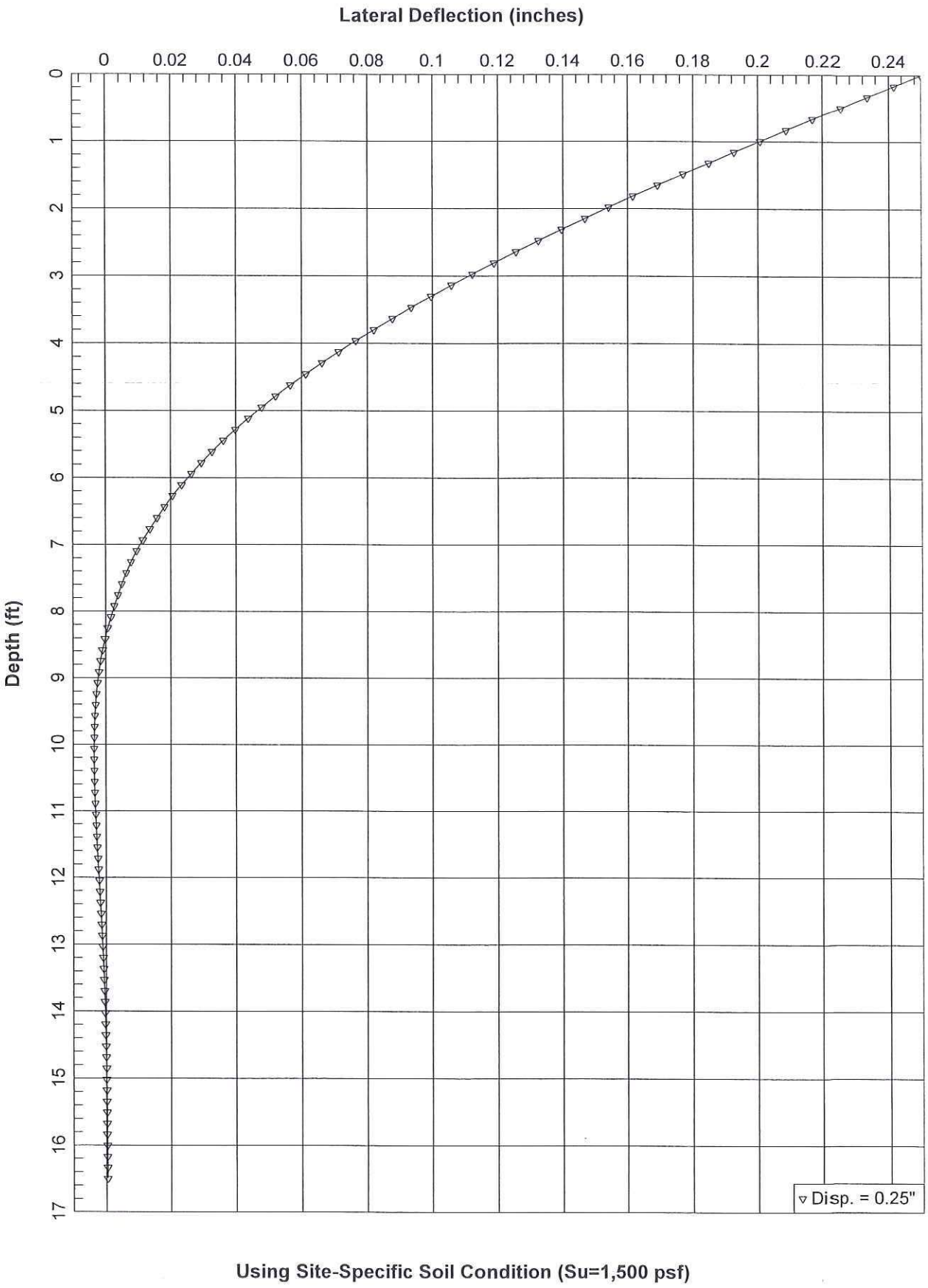
@ δ = 0.25",

V = 16.5 kips for site-specific soil condition (S_u = 1.5 ksf)

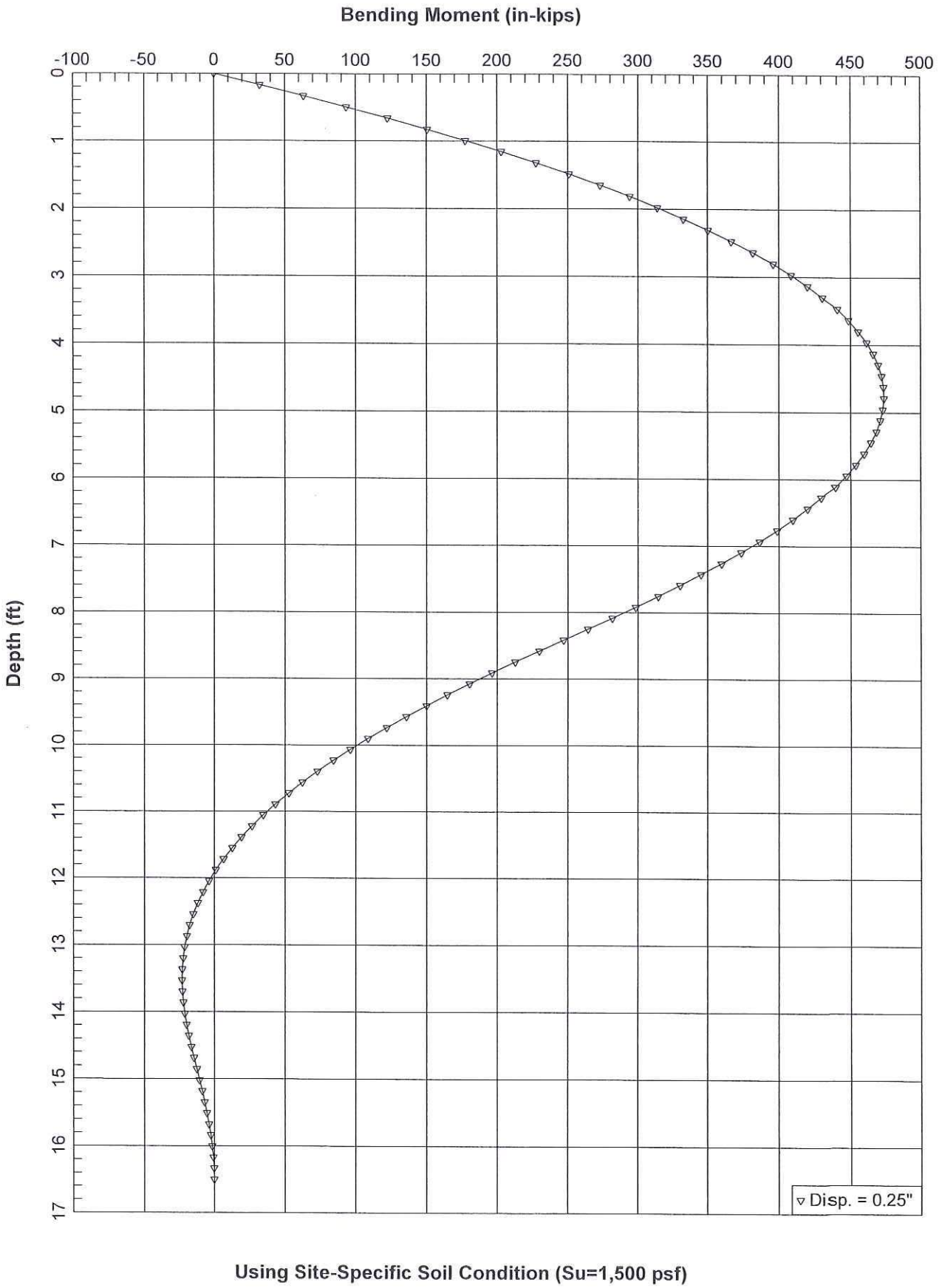
V = 9.1 kips for CT standard Plan soil condition (ϕ = 30°)

=> Std Plan can be used. //

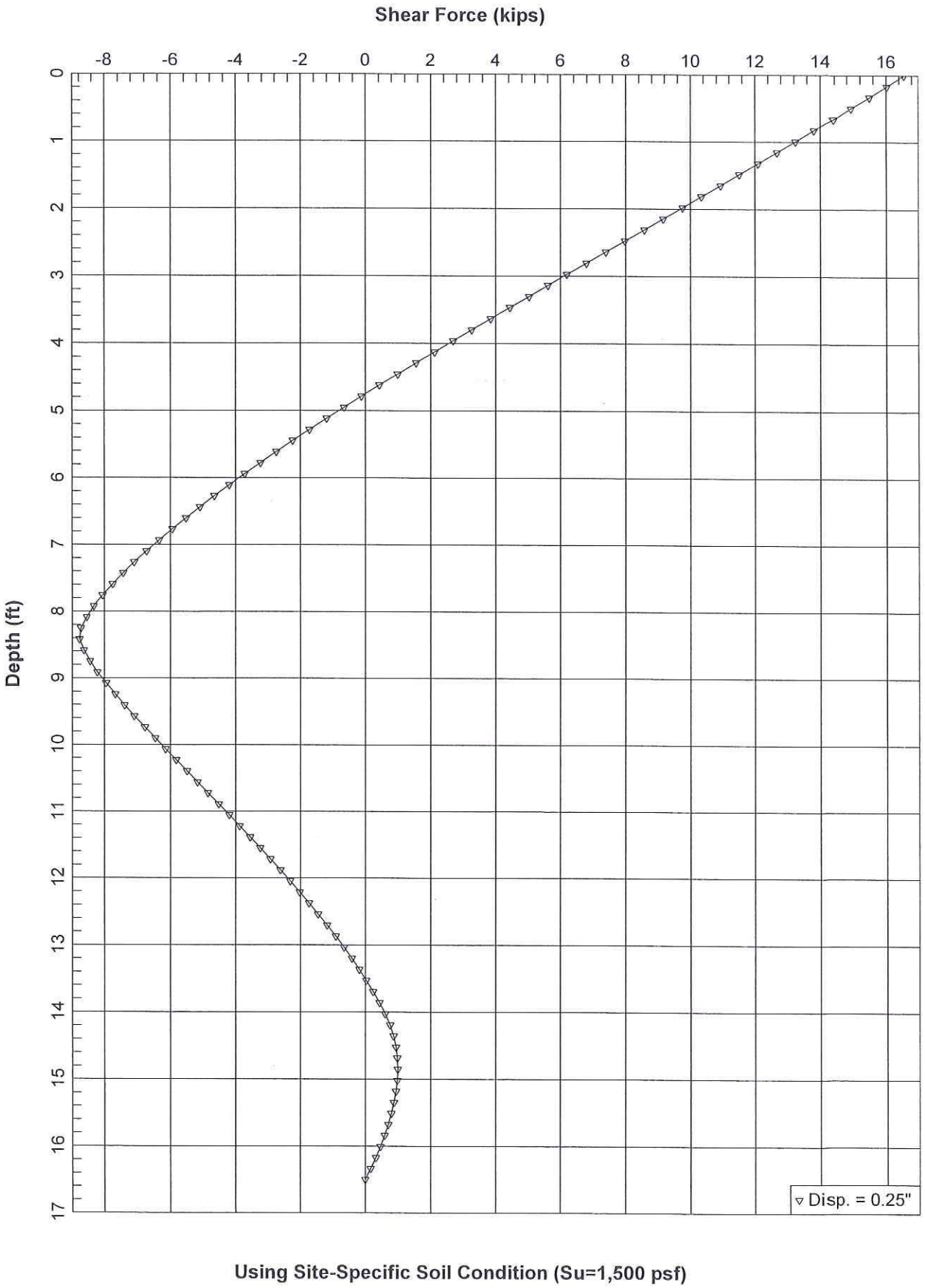
SITE-SPECIFIC SOIL CONDITION



Using Site-Specific Soil Condition (Su=1,500 psf)



Using Site-Specific Soil Condition (Su=1,500 psf)



Using Site-Specific Soil Condition (Su=1,500 psf)

LPile Plus for Windows, Version 6.0 (6.0.09)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2010 by Ensoft, Inc.
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This program is licensed to:

Files Used for Analysis

Path to file locations: X:\Projects\2011\11-136 - AECOM, I-5 HOV Widening - Segment 2\ANALYSIS\LPILE\LPILE for SW by Ranjan\Actual\
Name of input data file: Actual 16 inch.lp6d
Name of output file: Actual 16 inch.lp6o
Name of plot output file: Actual 16 inch.lp6p
Name of runtime file: Actual 16 inch.lp6r

Date and Time of Analysis

Date: September 20, 2012 Time: 16:57:04

Problem Title

New LPILE Plus 5.0 Data File

Job Number:

Client:

Engineer:

Description:

Program Options

Units Used - US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal Moment Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in

- Maximum allowable deflection = 100.0000 in

Pile Response Output Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total Number of Sections = 1

Total Pile Length = 16.50 ft

Depth of ground surface below top of pile = 0.00 ft

Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.
p-y curves are computed using values of pile diameter interpolated over the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	16.0000000
2	16.500000	16.0000000

Input Structural Properties:

Section No. 1:

Section Type	=	Elastic Pile
Cross-sectional Shape	=	Circular
Section Length	=	16.500 in
Top Width	=	16.000 in
Bottom Width	=	16.000 in
Top Area	=	201.000000 sq. in
Bottom Area	=	201.000000 sq. in
Moment of Inertia at Top	=	3.217E+03 in^4
Moment of Inertia at Bottom	=	3.217E+03 in^4
Elastic Modulus	=	2880000.000 lbs/in

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 0.000 ft
Distance from top of pile to bottom of layer = 50.000 ft

(Depth of lowest layer extends 33.50 ft below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 2 points

Point No.	Depth X ft	Eff. Unit Weight pcf
1	0.00	120.00000
2	50.00	120.00000

Summary of Soil Properties

Layer No.	Soil Type (p-y Curve Criteria)	kpy pci	Rock Emass psi	Depth krm ft	Eff. Unit Wt., pcf	Cohesion Test Type Test Prop. psf	Friction Ang., deg.	Elas. Subgr. pci	qu psi	RQD percent	Epsilon 50
1	Soft Clay			0.00	120.000	1500.000	--		--	--	0.00500
		--	--	50.000	120.000	1500.000	--		--	--	0.00500

Loading Type

p-y criteria for static loading was used for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs
1	4	y = 0.250 in	M = 0.000 in-lbs	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust values were determined from pile-head loading conditions

Number of Sections = 1

Section No. 1:

Moment-Curvature properties derived from elastic section properties

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 0.250000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 0.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	0.000	16561.	-0.004186	0.000	9.265E+09	-269.3043	1066.4452	0.000
1.980	0.2417	32263.	16024.	-0.004182	80.2307	9.265E+09	-272.9592	2235.9603	0.000
3.960	0.2334	63455.	15480.	-0.004172	157.8002	9.265E+09	-276.3958	2344.3605	0.000
5.940	0.2252	93564.	14930.	-0.004155	232.6752	9.265E+09	-279.6107	2458.4842	0.000
7.920	0.2170	122577.	14373.	-0.004132	304.8241	9.265E+09	-282.6004	2578.7595	0.000
9.900	0.2088	150482.	13811.	-0.004103	374.2179	9.265E+09	-285.3617	2705.6532	0.000
11.880	0.2007	177269.	13243.	-0.004068	440.8296	9.265E+09	-287.8914	2839.6750	0.000

13.860	0.1927	202926.	12671.	-0.004027	504.6347	9.265E+09	-290.1864	2981.3825	0.000
15.840	0.1848	227446.	12094.	-0.003981	565.6106	9.265E+09	-292.2436	3131.3868	0.000
17.820	0.1770	250820.	11514.	-0.003930	623.7374	9.265E+09	-294.0601	3290.3588	0.000
19.800	0.1692	273042.	10930.	-0.003874	678.9974	9.265E+09	-295.6328	3459.0365	0.000
21.780	0.1616	294104.	10344.	-0.003814	731.3752	9.265E+09	-296.9590	3638.2335	0.000
23.760	0.1541	314002.	9754.5468	-0.003749	780.8578	9.265E+09	-298.0358	3828.8480	0.000
25.740	0.1468	332732.	9163.6196	-0.003680	827.4349	9.265E+09	-298.8604	4031.8746	0.000
27.720	0.1396	350290.	8571.3118	-0.003607	871.0982	9.265E+09	-299.4303	4248.4162	0.000
29.700	0.1325	366675.	7978.1307	-0.003530	911.8424	9.265E+09	-299.7426	4479.6995	0.000
31.680	0.1256	381884.	7384.5888	-0.003450	949.6644	9.265E+09	-299.7947	4727.0913	0.000
33.660	0.1188	395918.	6791.2039	-0.003367	984.5635	9.265E+09	-299.5840	4992.1195	0.000
35.640	0.1122	408777.	6198.4990	-0.003281	1016.5420	9.265E+09	-299.1078	5276.4957	0.000
37.620	0.1058	420464.	5607.0023	-0.003192	1045.6044	9.265E+09	-298.3636	5582.1434	0.000
39.600	0.0996	430981.	5017.2473	-0.003101	1071.7580	9.265E+09	-297.3486	5911.2307	0.000
41.580	0.0935	440332.	4429.7727	-0.003008	1095.0127	9.265E+09	-296.0601	6266.2089	0.000
43.560	0.0877	448523.	3845.1228	-0.002913	1115.3810	9.265E+09	-294.4954	6649.8594	0.000
45.540	0.0820	455559.	3263.8473	-0.002817	1132.8782	9.265E+09	-292.6516	7065.3494	0.000
47.520	0.0765	461447.	2686.5017	-0.002719	1147.5223	9.265E+09	-290.5258	7516.2993	0.000
49.500	0.0712	466197.	2113.6475	-0.002619	1159.3340	9.265E+09	-288.1148	8006.8649	0.000
51.480	0.0662	469817.	1545.8528	-0.002519	1168.3368	9.265E+09	-285.4153	8541.8384	0.000
53.460	0.0613	472319.	983.6923	-0.002419	1174.5571	9.265E+09	-282.4237	9126.7717	0.000
55.440	0.0566	473713.	427.7481	-0.002318	1178.0239	9.265E+09	-279.1361	9768.1311	0.000
57.420	0.0521	474013.	-121.3893	-0.002216	1178.7694	9.265E+09	-275.5482	10473.	0.000
59.400	0.0478	473232.	-663.1208	-0.002115	1176.8285	9.265E+09	-271.6553	11252.	0.000
61.380	0.0437	471387.	-1196.8368	-0.002014	1172.2392	9.265E+09	-267.4518	12114.	0.000
63.360	0.0398	468493.	-1721.9162	-0.001914	1165.0425	9.265E+09	-262.9315	13072.	0.000
65.340	0.0361	464568.	-2237.7246	-0.001814	1155.2823	9.265E+09	-258.0871	14141.	0.000
67.320	0.0326	459631.	-2743.6119	-0.001715	1143.0061	9.265E+09	-252.9101	15341.	0.000
69.300	0.0293	453703.	-3238.9093	-0.001618	1128.2641	9.265E+09	-247.3903	16693.	0.000
71.280	0.0262	446805.	-3722.9260	-0.001522	1111.1103	9.265E+09	-241.5154	18226.	0.000
73.260	0.0233	438960.	-4194.9438	-0.001427	1091.6019	9.265E+09	-235.2703	19977.	0.000
75.240	0.0206	430193.	-4654.2112	-0.001334	1069.7998	9.265E+09	-228.6362	21991.	0.000
77.220	0.0180	420530.	-5099.9349	-0.001243	1045.7687	9.265E+09	-221.5898	24327.	0.000
79.200	0.0157	409998.	-5531.2685	-0.001154	1019.5773	9.265E+09	-214.1007	27065.	0.000
81.180	0.0135	398626.	-5947.2967	-0.001068	991.2985	9.265E+09	-206.1298	30313.	0.000
83.160	0.0114	386446.	-6347.0136	-0.000984	961.0102	9.265E+09	-197.6247	34223.	0.000
85.140	0.009567	373492.	-6729.2908	-0.000903	928.7951	9.265E+09	-188.5139	39016.	0.000
87.120	0.007858	359798.	-7092.8296	-0.000825	894.7422	9.265E+09	-178.6970	45026.	0.000
89.100	0.006302	345404.	-7436.0858	-0.000749	858.9472	9.265E+09	-168.0265	52795.	0.000
91.080	0.004891	330351.	-7757.1445	-0.000677	821.5140	9.265E+09	-156.2752	63261.	0.000
93.060	0.003621	314686.	-8053.4927	-0.000608	782.5573	9.265E+09	-143.0664	78237.	0.000
95.040	0.002483	298459.	-8321.5569	-0.000543	742.2058	9.265E+09	-127.7055	101824.	0.000
97.020	0.001472	281732.	-8555.5593	-0.000481	700.6092	9.265E+09	-108.6606	146146.	0.000
99.000	0.000580	264579.	-8743.3413	-0.000422	657.9533	9.265E+09	-81.0182	276471.	0.000
100.980	-0.000200	247109.	-8782.4214	-0.000368	614.5076	9.265E+09	41.5434	411832.	0.000
102.960	-0.000875	229801.	-8648.6913	-0.000317	571.4668	9.265E+09	93.5374	211631.	0.000
104.940	-0.001453	212860.	-8444.9696	-0.000269	529.3380	9.265E+09	112.2420	152922.	0.000
106.920	-0.001941	196359.	-8210.0392	-0.000226	488.3034	9.265E+09	125.0614	127550.	0.000
108.900	-0.002346	180348.	-7952.8779	-0.000185	448.4881	9.265E+09	134.6974	113665.	0.000
110.880	-0.002675	164866.	-7678.7126	-0.000148	409.9860	9.265E+09	142.2372	105280.	0.000
112.860	-0.002934	149941.	-7391.1379	-0.000115	372.8706	9.265E+09	148.2423	100041.	0.000
114.840	-0.003129	135597.	-7092.8627	-8.424E-05	337.2004	9.265E+09	153.0458	96831.	0.000
116.820	-0.003268	121853.	-6786.0522	-5.673E-05	303.0223	9.265E+09	156.8638	95052.	0.000
118.800	-0.003354	108724.	-6472.5099	-3.209E-05	270.3735	9.265E+09	159.8456	94360.	0.000
120.780	-0.003395	96222.	-6153.7843	-1.019E-05	239.2831	9.265E+09	162.0995	94548.	0.000
122.760	-0.003394	84355.	-5831.2361	9.105E-06	209.7730	9.265E+09	163.7068	95491.	0.000
124.740	-0.003359	73130.	-5506.0831	2.593E-05	181.8589	9.265E+09	164.7306	97114.	0.000
126.720	-0.003292	62551.	-5179.4310	4.043E-05	155.5508	9.265E+09	165.2211	99381.	0.000
128.700	-0.003198	52619.	-4852.2951	5.274E-05	130.8535	9.265E+09	165.2191	102278.	0.000
130.680	-0.003083	43336.	-4525.6174	6.299E-05	107.7669	9.265E+09	164.7583	105815.	0.000
132.660	-0.002949	34698.	-4200.2782	7.133E-05	86.2866	9.265E+09	163.8672	110021.	0.000
134.640	-0.002800	26703.	-3877.1055	7.789E-05	66.4039	9.265E+09	162.5699	114941.	0.000
136.620	-0.002641	19345.	-3556.8829	8.281E-05	48.1061	9.265E+09	160.8874	120638.	0.000
138.600	-0.002473	12617.	-3240.3547	8.623E-05	31.3769	9.265E+09	158.8380	127197.	0.000
140.580	-0.002299	6512.8723	-2928.2314	8.827E-05	16.1961	9.265E+09	156.4380	134723.	0.000
142.560	-0.002123	1021.6238	-2621.1932	8.907E-05	2.5406	9.265E+09	153.7016	143349.	0.000
144.540	-0.001946	-3867.0528	-2319.8935	8.877E-05	9.6165	9.265E+09	150.6415	153241.	0.000
146.520	-0.001771	-8165.1544	-2024.9621	8.748E-05	20.3050	9.265E+09	147.2689	164605.	0.000
148.500	-0.001600	-11886.	-1737.0083	8.534E-05	29.5577	9.265E+09	143.5935	177700.	0.000
150.480	-0.001434	-15044.	-1456.6237	8.246E-05	37.4105	9.265E+09	139.6233	192851.	0.000
152.460	-0.001273	-17654.	-1184.3860	7.897E-05	43.9021	9.265E+09	135.3644	210475.	0.000
154.440	-0.001121	-19734.	-920.8629	7.498E-05	49.0740	9.265E+09	130.8205	231110.	0.000
156.420	-0.000977	-21301.	-666.6182	7.059E-05	52.9705	9.265E+09	125.9923	255466.	0.000
158.400	-0.000841	-22374.	-422.2986	6.592E-05	55.6386	9.265E+09	120.7952	284309.	0.000
160.380	-0.000715	-22973.	-189.4264	6.108E-05	57.1291	9.265E+09	114.4292	316681.	0.000
162.360	-0.000599	-23124.	30.6336	5.615E-05	57.5040	9.265E+09	107.8536	356288.	0.000
164.340	-0.000493	-22852.	237.4363	5.124E-05	56.8275	9.265E+09	101.0381	405722.	0.000
166.320	-0.000396	-22184.	430.4539	4.643E-05	55.1658	9.265E+09	93.9291	469096.	0.000
168.300	-0.000309	-21147.	607.3641	4.180E-05	52.5885	9.265E+09	84.7681	542771.	0.000
170.280	-0.000231	-19778.	753.9593	3.742E-05	49.1847	9.265E+09	63.3078	542771.	0.000
172.260	-0.000161	-18161.	860.3344	3.337E-05	45.1637	9.265E+09	44.1418	542771.	0.000
174.240	-9.879E-05	-16371.	930.8463	2.968E-05	40.7124	9.265E+09	27.0823	542771.	0.000
176.220	-4.349E-05	-14475.	969.4605	2.638E-05	35.9971	9.265E+09	11.9219	542771.	0.000
178.200	5.689E-06	-12532.	979.7193	2.350E-05	31.1655	9.265E+09	-1.5595	542771.	0.000

180.180	4.957E-05	-10596.	964.7241	2.103E-05	26.3491	9.265E+09	-13.5871	542771.	0.000
182.160	8.896E-05	-8712.1072	927.1309	1.896E-05	21.6652	9.265E+09	-24.3858	542771.	0.000
184.140	0.000125	-6924.1890	869.1569	1.729E-05	17.2190	9.265E+09	-34.1739	542771.	0.000
186.120	0.000157	-5270.2460	792.5975	1.599E-05	13.1060	9.265E+09	-43.1588	542771.	0.000
188.100	0.000188	-3785.5028	698.8533	1.502E-05	9.4137	9.265E+09	-51.5324	542771.	0.000
190.080	0.000217	-2502.7871	588.9640	1.435E-05	6.2239	9.265E+09	-59.4669	542771.	0.000
192.060	0.000245	-1453.2054	463.6518	1.393E-05	3.6138	9.265E+09	-67.1111	542771.	0.000
194.040	0.000272	-666.7259	323.3711	1.370E-05	1.6580	9.265E+09	-74.5867	542771.	0.000
196.020	0.000299	-172.6560	168.3651	1.361E-05	0.4294	9.265E+09	-81.9850	542771.	0.000
198.000	0.000326	0.000	0.000	1.359E-05	0.000	9.265E+09	-88.0808	267491.	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
The above values of total stress are computed for combined axial stress and do not equal the
actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection	=	0.2500000 inches
Computed slope at pile head	=	-0.0041857 radians
Maximum bending moment	=	474013. inch-lbs
Maximum shear force	=	16561. lbs
Depth of maximum bending moment	=	57.4200000 inches below pile head
Depth of maximum shear force	=	0.000000 inches below pile head
Number of iterations	=	14
Number of zero deflection points	=	2

Summary of Pile Response(s)

Definitions of Pile-Head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

Load Case	Load Type	Condition 1 V(lbs) or y(inches)	Condition 2 in-lb, rad., or in-lb/rad.	Axial Load lbs	Pile-Head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-Head Rotation radians
1	4	y = 0.2500	M = 0.000	0.0000000	0.25000000	474013.	16561.	0.00000000

Summary of Warning Messages

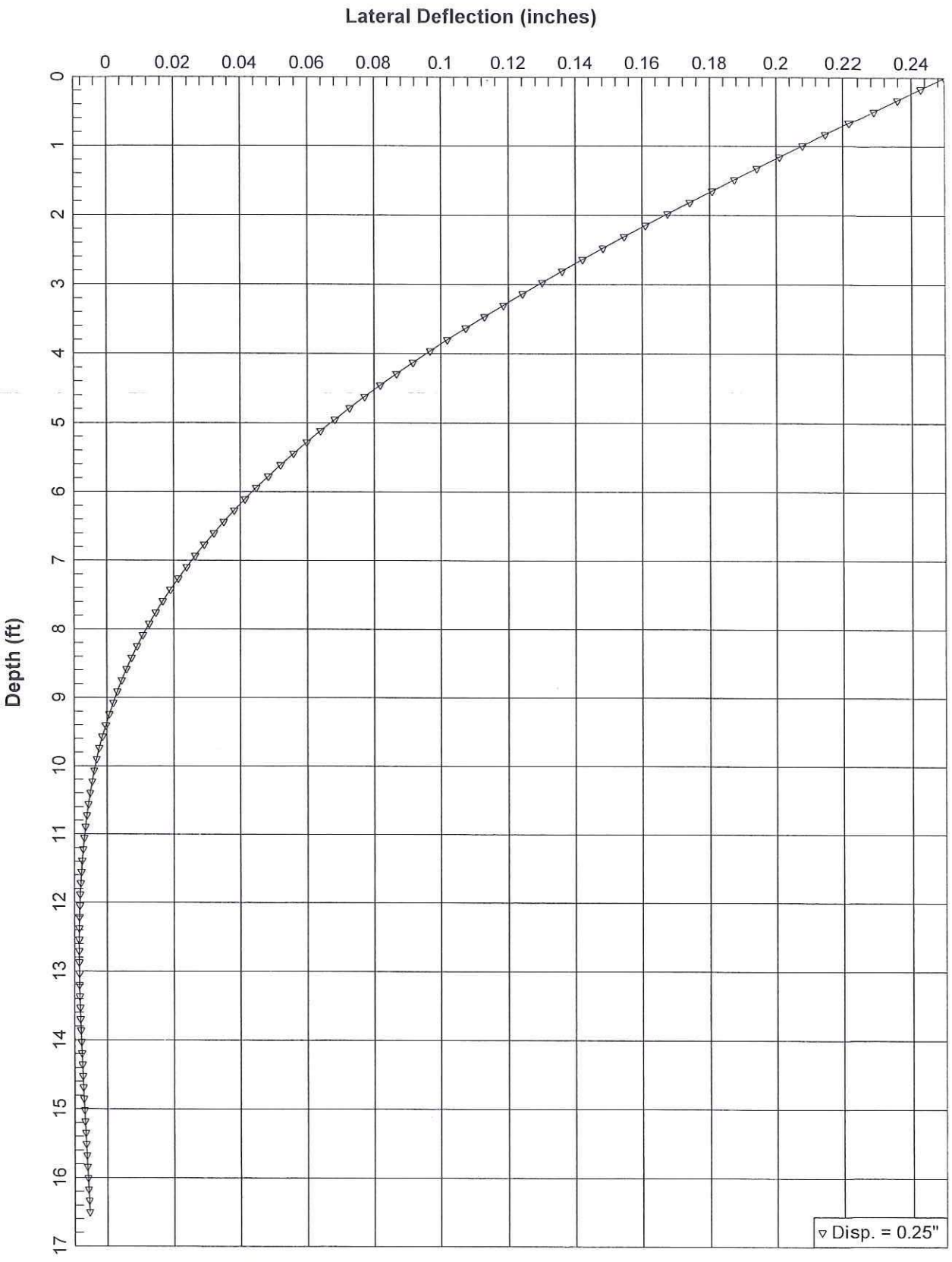
The following warning was reported 1313 times

**** Warning ****

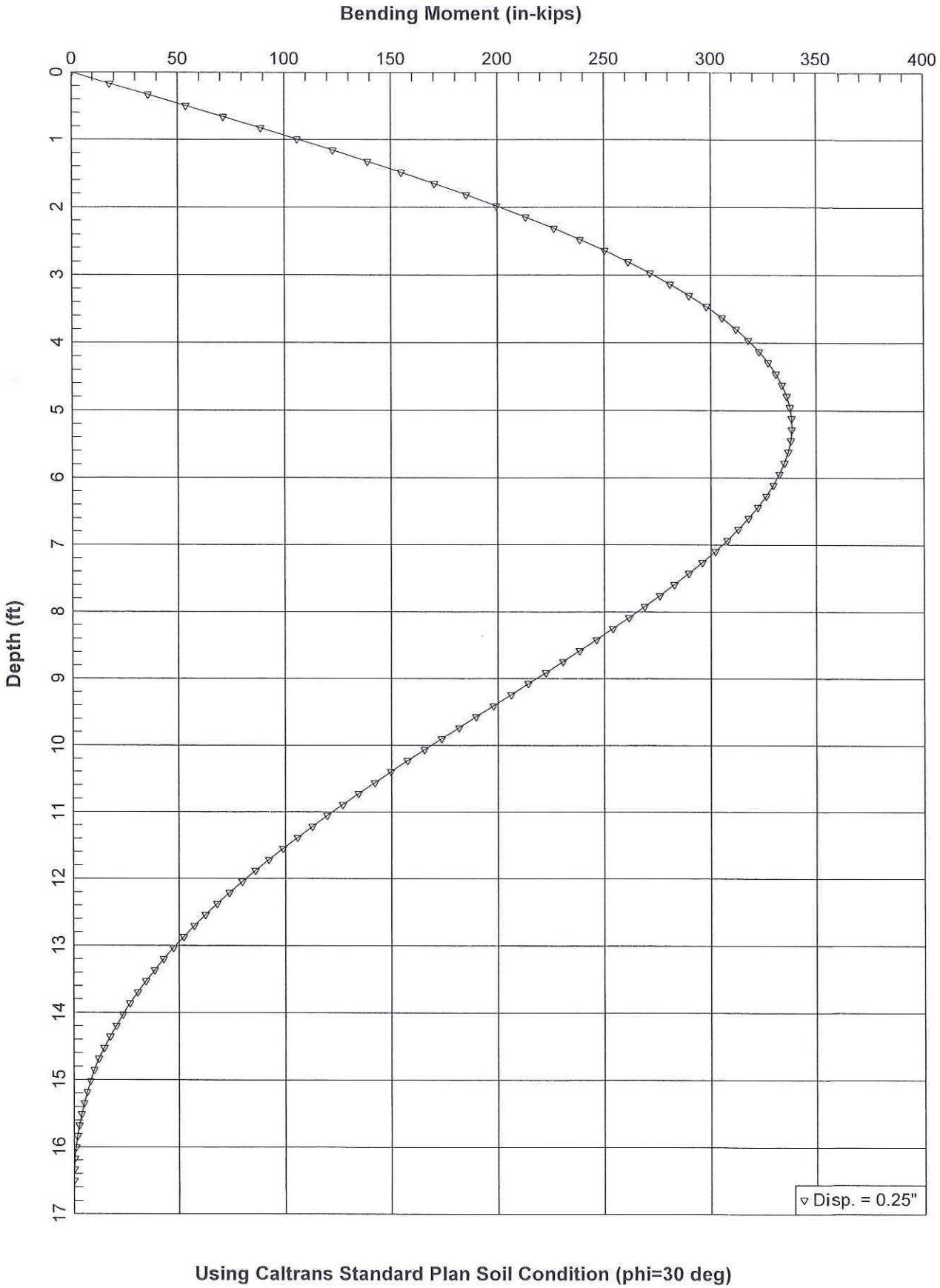
An unreasonable input value for shear strength has been specified for a soil
defined using the soft clay criteria. The input value is greater than 8.68
psi (1,250 psf). You should check your input data for correctness.

CALTRANS STANDARD PLAN SOIL CONDITION

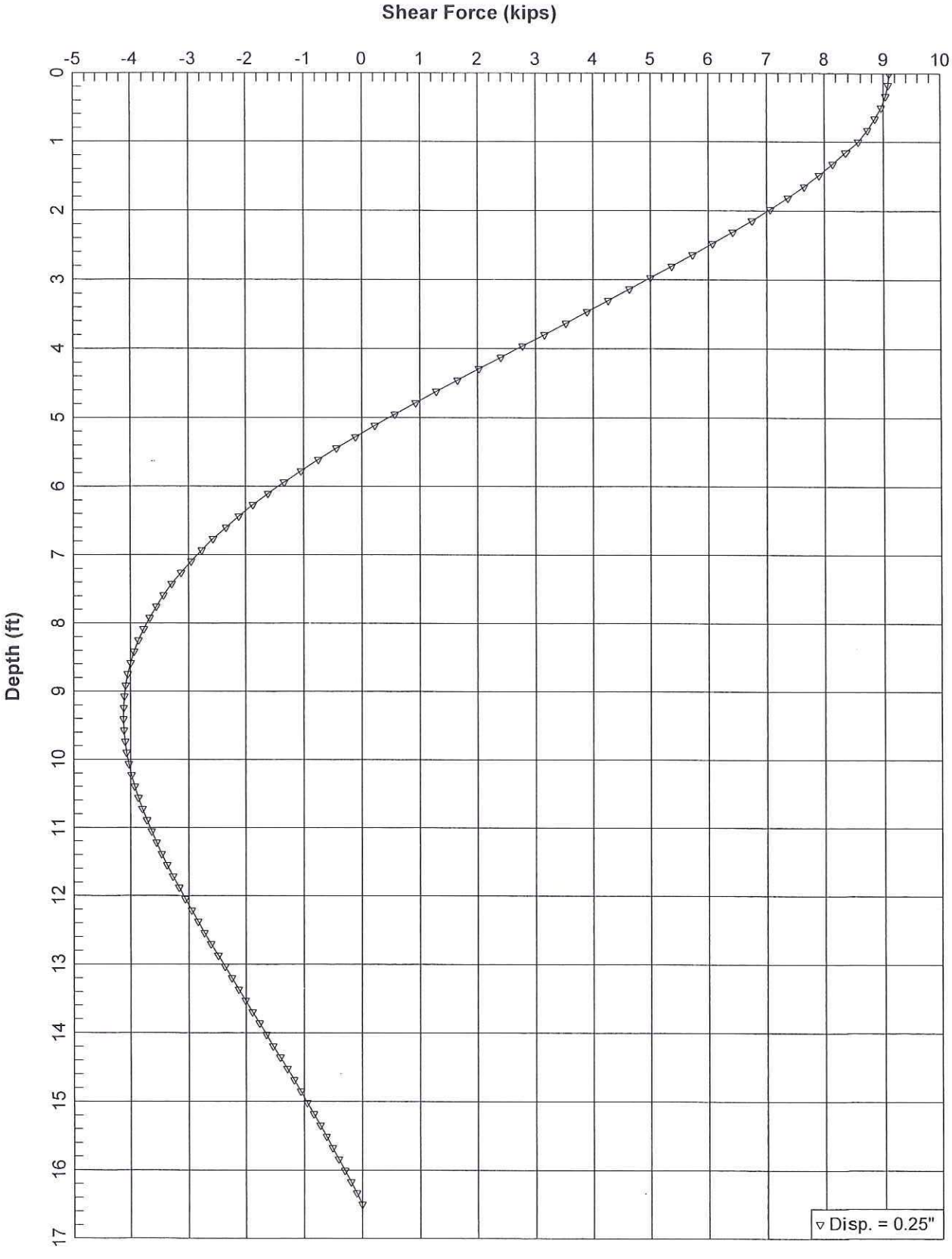
30 DEGREE COHESIONLESS SOILS



Using Caltrans Standard Plan Soil Condition (phi=30 deg)



Using Caltrans Standard Plan Soil Condition (phi=30 deg)



Using Caltrans Standard Plan Soil Condition (phi=30 deg)

LPile Plus for Windows, Version 6.0 (6.0.09)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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This program is licensed to:

Files Used for Analysis

Path to file locations: X:\Projects\2011\11-136 - AECOM, I-5 HOV Widening - Segment 2\ANALYSIS\LPILE\LPILE for SW by Ranjan\Standard\
Name of input data file: CT Standard 16 inch.lp6d
Name of output file: CT Standard 16 inch.lp6o
Name of plot output file: CT Standard 16 inch.lp6p
Name of runtime file: CT Standard 16 inch.lp6r

Date and Time of Analysis

Date: September 20, 2012 Time: 16:58:02

Problem Title

New LPILE Plus 5.0 Data File

Job Number:

Client:

Engineer:

Description:

Program Options

Units Used - US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal Moment Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in

- Maximum allowable deflection = 100.0000 in

Pile Response Output Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total Number of Sections = 1

Total Pile Length = 16.50 ft

Depth of ground surface below top of pile = 0.00 ft

Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.
p-y curves are computed using values of pile diameter interpolated over the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	16.0000000
2	16.500000	16.0000000

Input Structural Properties:

Section No. 1:

Section Type	=	Elastic Pile
Cross-sectional Shape	=	Circular
Section Length	=	16.500 in
Top Width	=	16.000 in
Bottom Width	=	16.000 in
Top Area	=	201.000000 sq. in
Bottom Area	=	201.000000 sq. in
Moment of Inertia at Top	=	3.217E+03 in^4
Moment of Inertia at Bottom	=	3.217E+03 in^4
Elastic Modulus	=	2880000.000 lbs/in

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is sand, p-y criteria by API RP-2A, 1987

Distance from top of pile to top of layer = 0.000 ft
Distance from top of pile to bottom of layer = 50.000 ft
p-y subgrade modulus k for top of soil layer = 45.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 45.000 lbs/in**3

(Depth of lowest layer extends 33.50 ft below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 2 points

Point No.	Depth X ft	Eff. Unit Weight pcf
1	0.00	120.00000
2	50.00	120.00000

Summary of Soil Properties

Layer No.	Soil Type (p-y Curve Criteria)	kpy pci	Rock Emass psi	Depth krm ft	Eff. Unit Wt., pcf	Cohesion Test Type	Friction Test Prop.	qu Elas. Subgr. Ang., deg.	Subgr. pci	qu psi
1	API Sand			0.00	120.000	--		30.000		--
--	--	45.000	--	--	--		--	--		
				50.000	120.000	--		30.000		--
--	--	45.000	--	--	--		--	--		

Loading Type

p-y criteria for static loading was used for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1		Condition 2		Axial Thrust Force, lbs
1	4	y =	0.250 in	M =	0.000 in-lbs	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust values were determined from pile-head loading conditions

Number of Sections = 1

Section No. 1:

Moment-Curvature properties derived from elastic section properties

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = 0.250000 in
Moment at pile head = 0.000 in-lbs
Axial load at pile head = 0.000 lbs

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	0.000	9099.8328	-0.003562	0.000	9.265E+09	0.000	0.000	0.000
1.980	0.2429	18018.	9084.7229	-0.003560	44.8061	9.265E+09	-15.2626	124.3887	0.000
3.960	0.2359	35976.	9039.1307	-0.003554	89.4635	9.265E+09	-30.7901	258.4298	0.000
5.940	0.2289	53813.	8962.8455	-0.003544	133.8206	9.265E+09	-46.2656	400.2467	0.000
7.920	0.2219	71468.	8856.2189	-0.003531	177.7268	9.265E+09	-61.4380	548.2883	0.000

9.900	0.2149	88883.	8720.0460	-0.003514	221.0339	9.265E+09	-76.1105	701.2808	0.000
11.880	0.2080	106000.	8555.4668	-0.003493	263.5990	9.265E+09	-90.1312	858.1776	0.000
13.860	0.2011	122763.	8363.8868	-0.003469	305.2854	9.265E+09	-103.3840	1018.1154	0.000
15.840	0.1942	139121.	8146.9128	-0.003441	345.9639	9.265E+09	-115.7817	1180.3749	0.000
17.820	0.1874	155025.	7906.3014	-0.003409	385.5137	9.265E+09	-127.2601	1344.3474	0.000
19.800	0.1807	170430.	7643.9184	-0.003374	423.8227	9.265E+09	-137.7733	1509.5066	0.000
21.780	0.1741	185295.	7361.7057	-0.003336	460.7885	9.265E+09	-147.2899	1675.3837	0.000
23.760	0.1675	199582.	7061.6566	-0.003295	496.3184	9.265E+09	-155.7900	1841.5440	0.000
25.740	0.1610	213259.	6745.7949	-0.003251	530.3295	9.265E+09	-163.2622	2007.5653	0.000
27.720	0.1546	226295.	6416.1606	-0.003204	562.7489	9.265E+09	-169.7017	2173.0145	0.000
29.700	0.1483	238667.	6074.7992	-0.003155	593.5138	9.265E+09	-175.1078	2337.4203	0.000
31.680	0.1421	250352.	5723.7553	-0.003102	622.5716	9.265E+09	-179.4820	2500.2400	0.000
33.660	0.1360	261333.	5365.0709	-0.003048	649.8796	9.265E+09	-182.8254	2660.8130	0.000
35.640	0.1301	271597.	5000.7895	-0.002991	675.4051	9.265E+09	-185.1356	2818.2955	0.000
37.620	0.1242	281136.	4632.9664	-0.002932	699.1258	9.265E+09	-186.4028	2971.5595	0.000
39.600	0.1185	289944.	4263.6900	-0.002871	721.0291	9.265E+09	-186.6036	3119.0343	0.000
41.580	0.1128	298020.	3895.1181	-0.002808	741.1132	9.265E+09	-185.6913	3258.4423	0.000
43.560	0.1073	305369.	3525.7103	-0.002743	759.3870	9.265E+09	-187.4479	3457.6954	0.000
45.540	0.1020	311982.	3152.8383	-0.002677	775.8333	9.265E+09	-189.1905	3673.5219	0.000
47.520	0.0967	317854.	2777.5022	-0.002610	790.4352	9.265E+09	-189.9369	3887.5989	0.000
49.500	0.0916	322981.	2401.6268	-0.002542	803.1853	9.265E+09	-189.7352	4099.6312	0.000
51.480	0.0867	327364.	2027.0349	-0.002472	814.0856	9.265E+09	-188.6405	4309.4214	0.000
53.460	0.0818	331008.	1655.4351	-0.002402	823.1469	9.265E+09	-186.7127	4516.8541	0.000
55.440	0.0772	333920.	1288.4154	-0.002331	830.3878	9.265E+09	-184.0143	4721.8820	0.000
57.420	0.0726	336110.	927.4382	-0.002259	835.8348	9.265E+09	-180.6092	4924.5125	0.000
59.400	0.0682	337592.	573.8394	-0.002187	839.5209	9.265E+09	-176.5614	5124.7958	0.000
61.380	0.0640	338382.	228.8288	-0.002115	841.4858	9.265E+09	-171.9342	5322.8148	0.000
63.360	0.0598	338499.	-106.5072	-0.002043	841.7744	9.265E+09	-166.7891	5518.6757	0.000
65.340	0.0559	337961.	-431.2021	-0.001970	840.4369	9.265E+09	-161.1856	5712.5013	0.000
67.320	0.0520	336791.	-744.4051	-0.001898	837.5280	9.265E+09	-155.1810	5904.4246	0.000
69.300	0.0484	335013.	-1045.3758	-0.001826	833.1063	9.265E+09	-148.8297	6094.5838	0.000
71.280	0.0448	332651.	-1333.4788	-0.001755	827.2335	9.265E+09	-142.1834	6283.1187	0.000
73.260	0.0414	329732.	-1608.1783	-0.001684	819.9746	9.265E+09	-135.2909	6470.1676	0.000
75.240	0.0381	326283.	-1869.0326	-0.001614	811.3967	9.265E+09	-128.1982	6655.8651	0.000
77.220	0.0350	322331.	-2115.6879	-0.001545	801.5689	9.265E+09	-120.9486	6840.3405	0.000
79.200	0.0320	317905.	-2347.8736	-0.001476	790.5621	9.265E+09	-113.5824	7023.7163	0.000
81.180	0.0292	313033.	-2565.3962	-0.001409	778.4478	9.265E+09	-106.1374	7206.1080	0.000
83.160	0.0264	307746.	-2768.1345	-0.001343	765.2988	9.265E+09	-98.6488	7387.6231	0.000
85.140	0.0238	302072.	-2956.0345	-0.001278	751.1881	9.265E+09	-91.1492	7568.3615	0.000
87.120	0.0214	296040.	-3129.1047	-0.001214	736.1887	9.265E+09	-83.6691	7748.4149	0.000
89.100	0.0190	289680.	-3287.4111	-0.001151	720.3737	9.265E+09	-76.2364	7927.8672	0.000
91.080	0.0168	283022.	-3431.0732	-0.001090	703.8154	9.265E+09	-68.8769	8106.7950	0.000
93.060	0.0147	276093.	-3560.2595	-0.001030	686.5855	9.265E+09	-61.6143	8285.2674	0.000
95.040	0.0127	268923.	-3675.1834	-0.000972	668.7550	9.265E+09	-54.4704	8463.3468	0.000
97.020	0.0109	261539.	-3776.0993	-0.000915	650.3935	9.265E+09	-47.4649	8641.0892	0.000
99.000	0.009119	253970.	-3863.2992	-0.000860	631.5692	9.265E+09	-40.6158	8818.5445	0.000
100.980	0.007470	246241.	-3937.1085	-0.000807	612.3490	9.265E+09	-33.9391	8995.7571	0.000
102.960	0.005925	238379.	-3997.8830	-0.000755	592.7978	9.265E+09	-27.4493	9172.7661	0.000
104.940	0.004481	230409.	-4046.0053	-0.000705	572.9791	9.265E+09	-21.1592	9349.6061	0.000
106.920	0.003134	222357.	-4081.8820	-0.000656	552.9540	9.265E+09	-15.0799	9526.3072	0.000
108.900	0.001882	214245.	-4105.9403	-0.000610	532.7820	9.265E+09	-9.2213	9702.8957	0.000
110.880	0.000720	206097.	-4118.6251	-0.000565	512.5200	9.265E+09	-3.5916	9879.3944	0.000
112.860	-0.000355	197935.	-4120.3966	-0.000522	492.2231	9.265E+09	1.8023	10056.	0.000
114.840	-0.001346	189780.	-4111.7270	-0.000480	471.9437	9.265E+09	6.9549	10232.	0.000
116.820	-0.002256	181653.	-4093.0984	-0.000441	451.7321	9.265E+09	11.8618	10409.	0.000
118.800	-0.003090	173572.	-4065.0004	-0.000403	431.6361	9.265E+09	16.5200	10585.	0.000
120.780	-0.003851	165555.	-4027.9273	-0.000366	411.7012	9.265E+09	20.9275	10761.	0.000
122.760	-0.004541	157621.	-3982.3766	-0.000332	391.9704	9.265E+09	25.0833	10937.	0.000
124.740	-0.005164	149785.	-3928.8462	-0.000299	372.4840	9.265E+09	28.9878	11114.	0.000
126.720	-0.005725	142063.	-3867.8330	-0.000268	353.2803	9.265E+09	32.6418	11290.	0.000
128.700	-0.006225	134469.	-3799.8306	-0.000238	334.3948	9.265E+09	36.0475	11466.	0.000
130.680	-0.006668	127016.	-3725.3279	-0.000210	315.8608	9.265E+09	39.2077	11643.	0.000
132.660	-0.007057	119716.	-3644.8075	-0.000184	297.7090	9.265E+09	42.1261	11819.	0.000
134.640	-0.007396	112582.	-3558.7439	-0.000159	279.9679	9.265E+09	44.8069	11995.	0.000
136.620	-0.007687	105624.	-3467.6023	-0.000136	262.6636	9.265E+09	47.2553	12171.	0.000
138.600	-0.007934	98850.	-3371.8373	-0.000114	245.8200	9.265E+09	49.4769	12348.	0.000
140.580	-0.008138	92271.	-3271.8920	-9.349E-05	229.4588	9.265E+09	51.4779	12524.	0.000
142.560	-0.008304	85894.	-3168.1966	-7.445E-05	213.5995	9.265E+09	53.2650	12701.	0.000
144.540	-0.008433	79725.	-3061.1676	-5.675E-05	198.2594	9.265E+09	54.8452	12877.	0.000
146.520	-0.008529	73771.	-2951.2070	-4.035E-05	183.4541	9.265E+09	56.2261	13053.	0.000
148.500	-0.008593	68038.	-2838.7018	-2.520E-05	169.1969	9.265E+09	57.4155	13230.	0.000
150.480	-0.008628	62530.	-2724.0232	-1.125E-05	155.4994	9.265E+09	58.4215	13406.	0.000
152.460	-0.008637	57251.	-2607.5262	1.554E-06	142.3715	9.265E+09	59.2523	13583.	0.000
154.440	-0.008622	52204.	-2489.5492	1.325E-05	129.8213	9.265E+09	59.9164	13759.	0.000
156.420	-0.008585	47393.	-2370.4137	2.389E-05	117.8552	9.265E+09	60.4224	13936.	0.000
158.400	-0.008528	42818.	-2250.4244	3.353E-05	106.4782	9.265E+09	60.7789	14112.	0.000
160.380	-0.008452	38481.	-2129.8690	4.222E-05	95.6938	9.265E+09	60.9944	14288.	0.000
162.360	-0.008360	34383.	-2009.0178	5.000E-05	85.5040	9.265E+09	61.0775	14465.	0.000
164.340	-0.008254	30525.	-1888.1248	5.694E-05	75.9096	9.265E+09	61.0367	14641.	0.000
166.320	-0.008135	26906.	-1767.4270	6.308E-05	66.9103	9.265E+09	60.8803	14818.	0.000
168.300	-0.008004	23526.	-1647.1453	6.847E-05	58.5045	9.265E+09	60.6164	14994.	0.000
170.280	-0.007864	20384.	-1527.4846	7.316E-05	50.6897	9.265E+09	60.2530	15171.	0.000
172.260	-0.007715	17477.	-1408.6344	7.720E-05	43.4624	9.265E+09	59.7977	15347.	0.000
174.240	-0.007558	14805.	-1290.7694	8.065E-05	36.8180	9.265E+09	59.2578	15524.	0.000

176.220	-0.007395	12366.	-1174.0502	8.356E-05	30.7513	9.265E+09	58.6404	1570O.	0.000
178.200	-0.007227	10156.	-1058.6238	8.596E-05	25.2563	9.265E+09	57.9519	15877.	0.000
180.180	-0.007055	8173.7040	-944.6247	8.792E-05	20.3263	9.265E+09	57.1987	16053.	0.000
182.160	-0.006879	6415.4678	-832.1755	8.948E-05	15.9539	9.265E+09	56.3863	16230.	0.000
184.140	-0.006701	4878.2888	-721.3881	9.069E-05	12.1313	9.265E+09	55.5202	164O6.	0.000
186.120	-0.006520	3558.7710	-612.3642	9.159E-05	8.8499	9.265E+09	54.6049	16583.	0.000
188.100	-0.006338	2453.3264	-505.1971	9.223E-05	6.1009	9.265E+09	53.6447	16759.	0.000
190.080	-0.006155	1558.1903	-399.9722	9.266E-05	3.8749	9.265E+09	52.6431	16935.	0.000
192.060	-0.005971	869.4364	-296.7683	9.292E-05	2.1621	9.265E+09	51.6032	17112.	0.000
194.040	-0.005787	382.9877	-195.6591	9.305E-05	0.9524	9.265E+09	50.5273	17288.	0.000
196.020	-0.005602	94.6263	-96.7141	9.310E-05	0.2353	9.265E+09	49.4172	17465.	0.000
198.000	-0.005418	0.000	0.000	9.311E-05	0.000	9.265E+09	48.2738	8820.6478	0.000

* This analysis makes computations of pile response using nonlinear moment-curvature relationships.
The above values of total stress are computed for combined axial stress and do not equal the
actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =      0.2500000 inches
Computed slope at pile head      =     -0.0035617 radians
Maximum bending moment           =        338499. inch-lbs
Maximum shear force              =   9099.8328312 lbs
Depth of maximum bending moment  =     63.3600000 inches below pile head
Depth of maximum shear force     =      0.000000 inches below pile head
Number of iterations             =              5
Number of zero deflection points =              1
```

Summary of Pile Response(s)

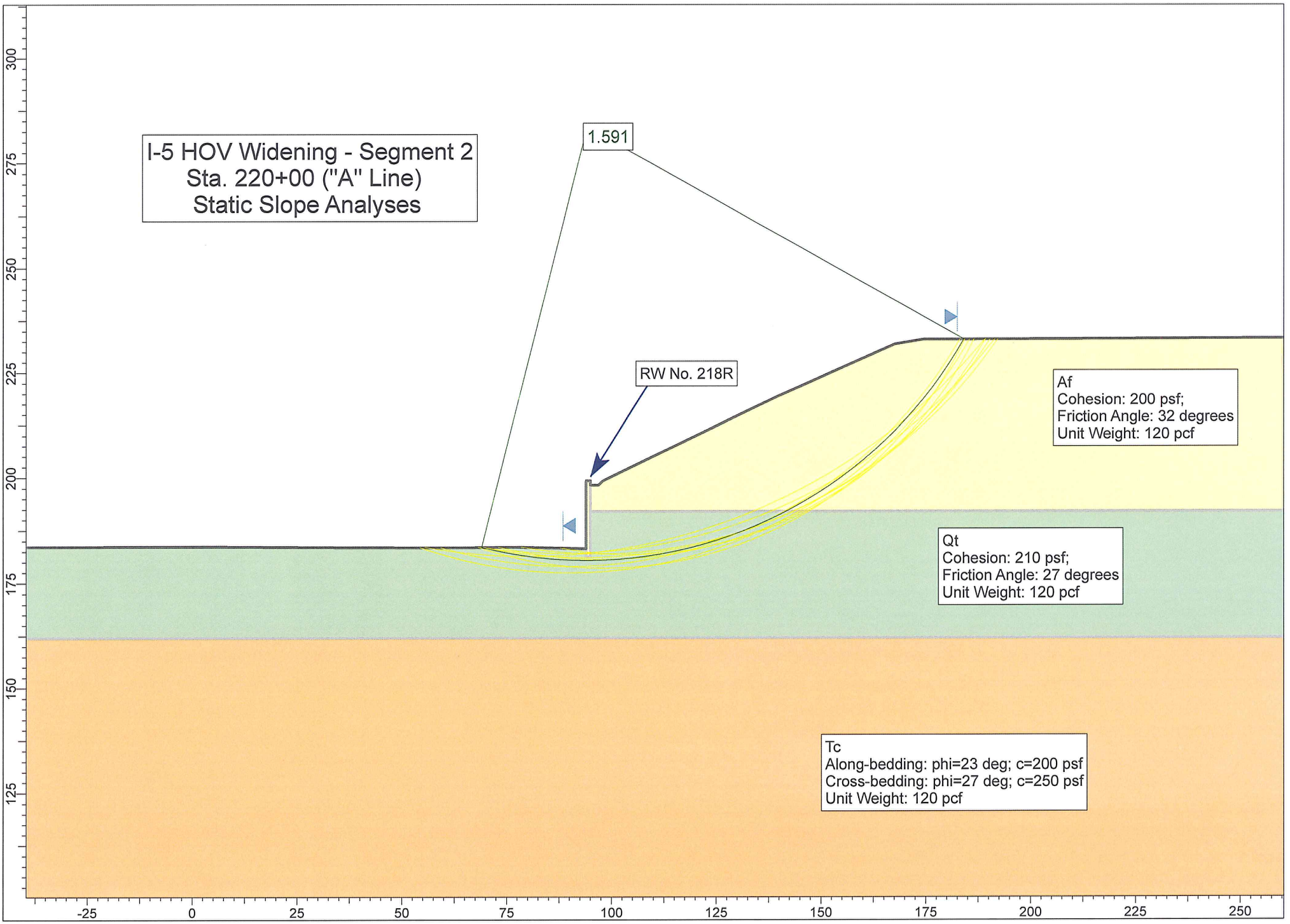
Definitions of Pile-Head Loading Conditions:

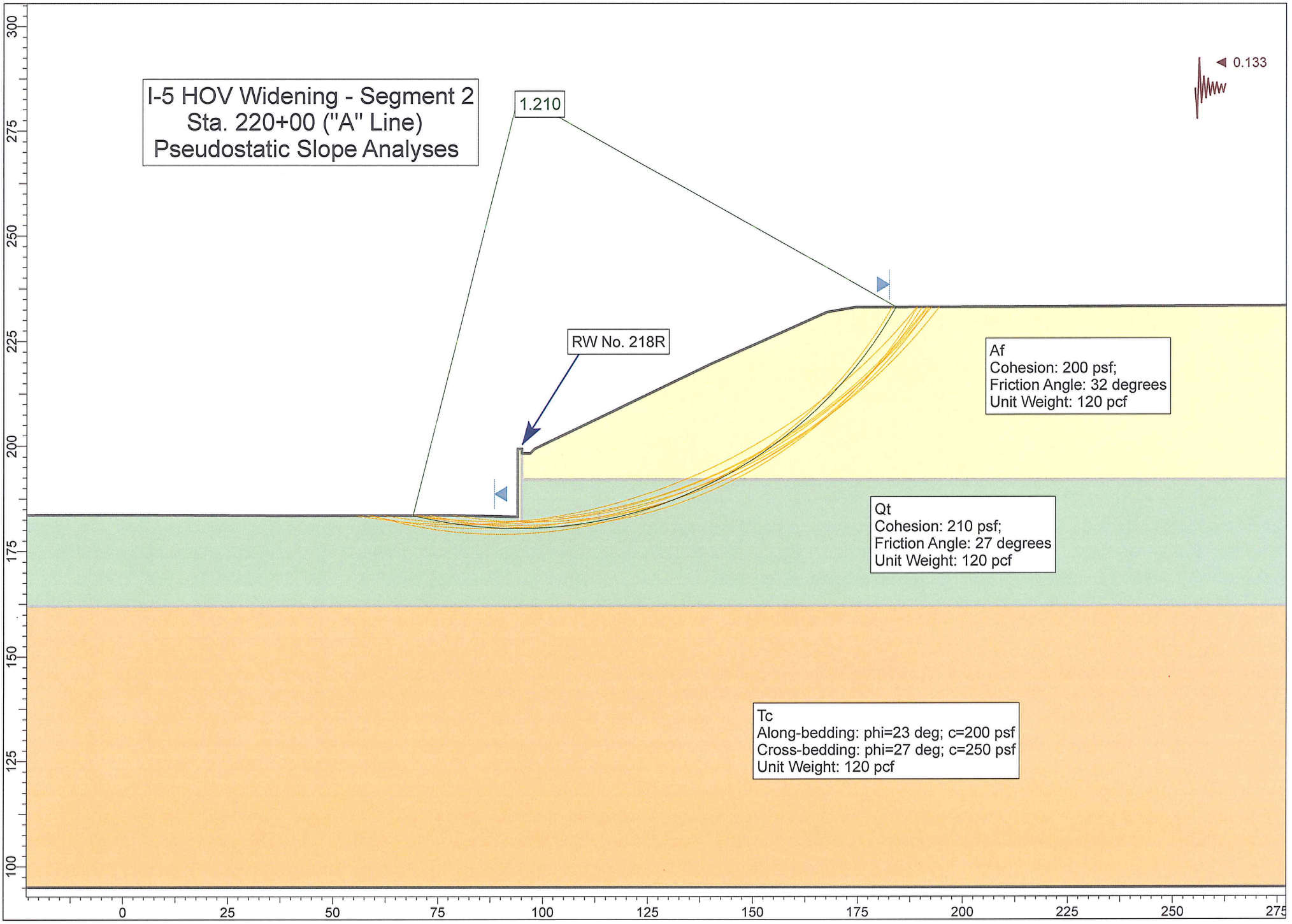
Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

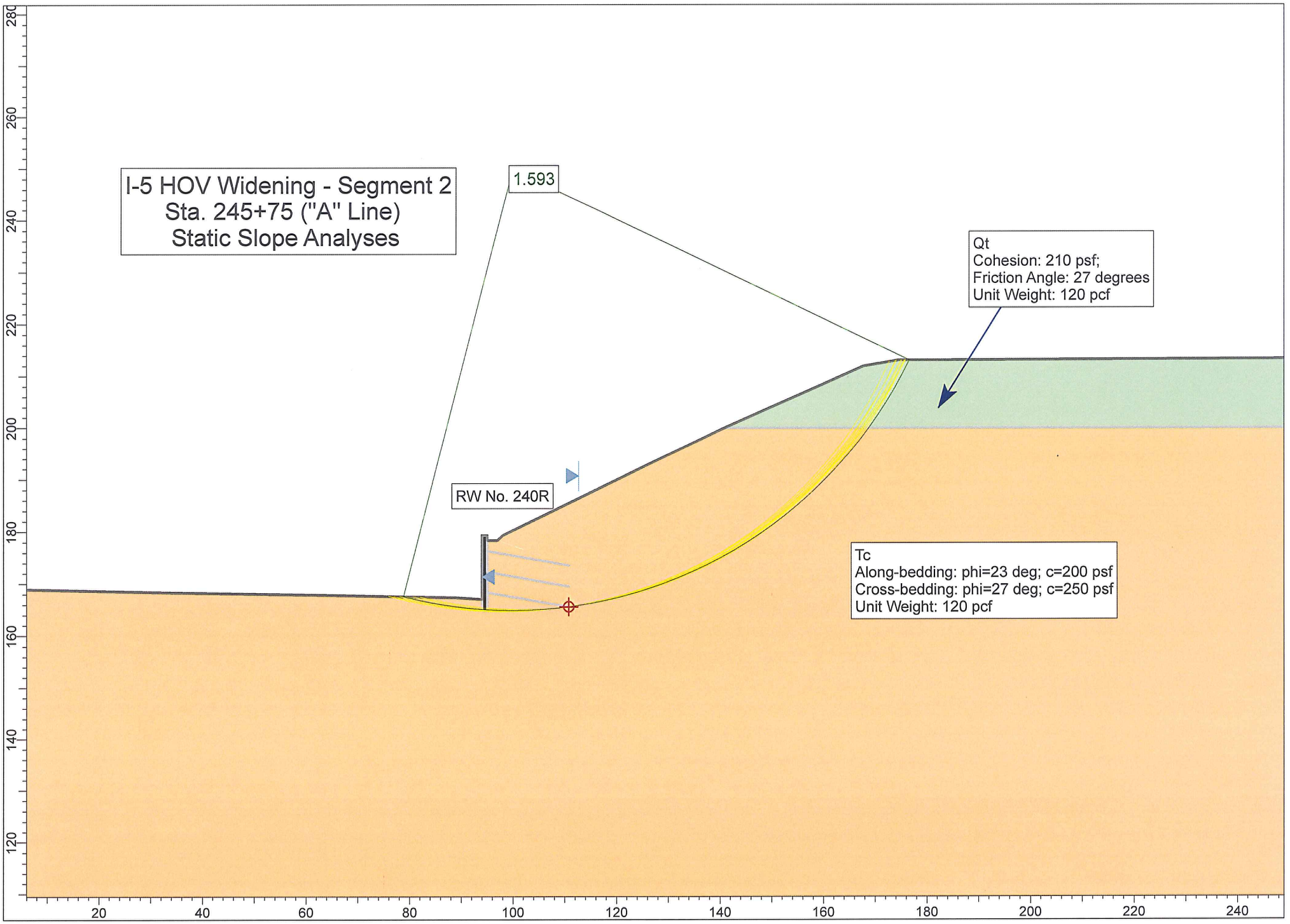
Load Case No.	Load Type No.	Condition 1 V(lbs) or y(inches)	Condition 2 in-lb, rad., or in-lb/rad.	Axial Load lbs	Pile-Head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-Head Rotation radians
1	4	y = 0.2500	M = 0.000	0.0000000	0.25000000	338499.	9099.8328	0.00000000

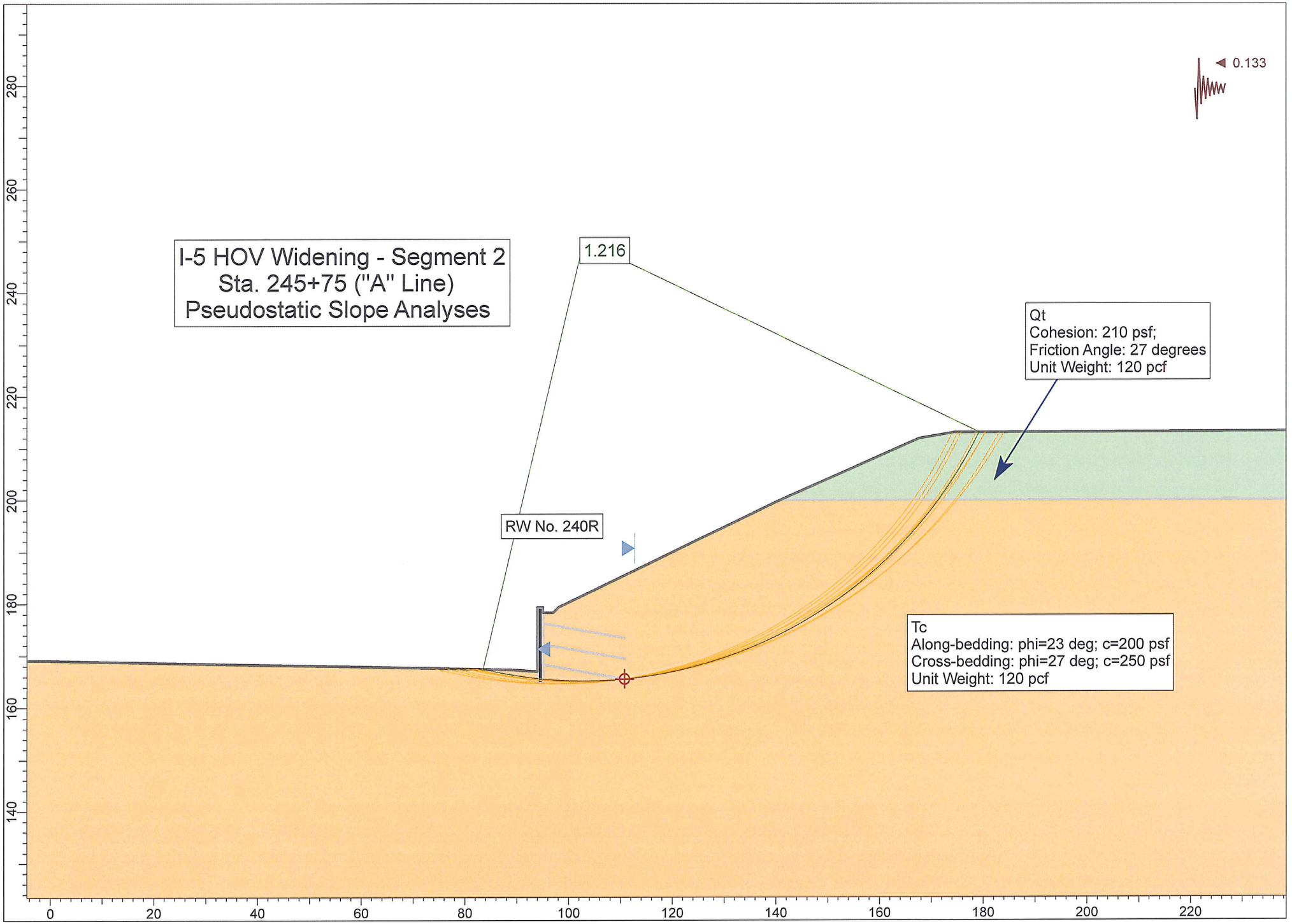
The analysis ended normally.

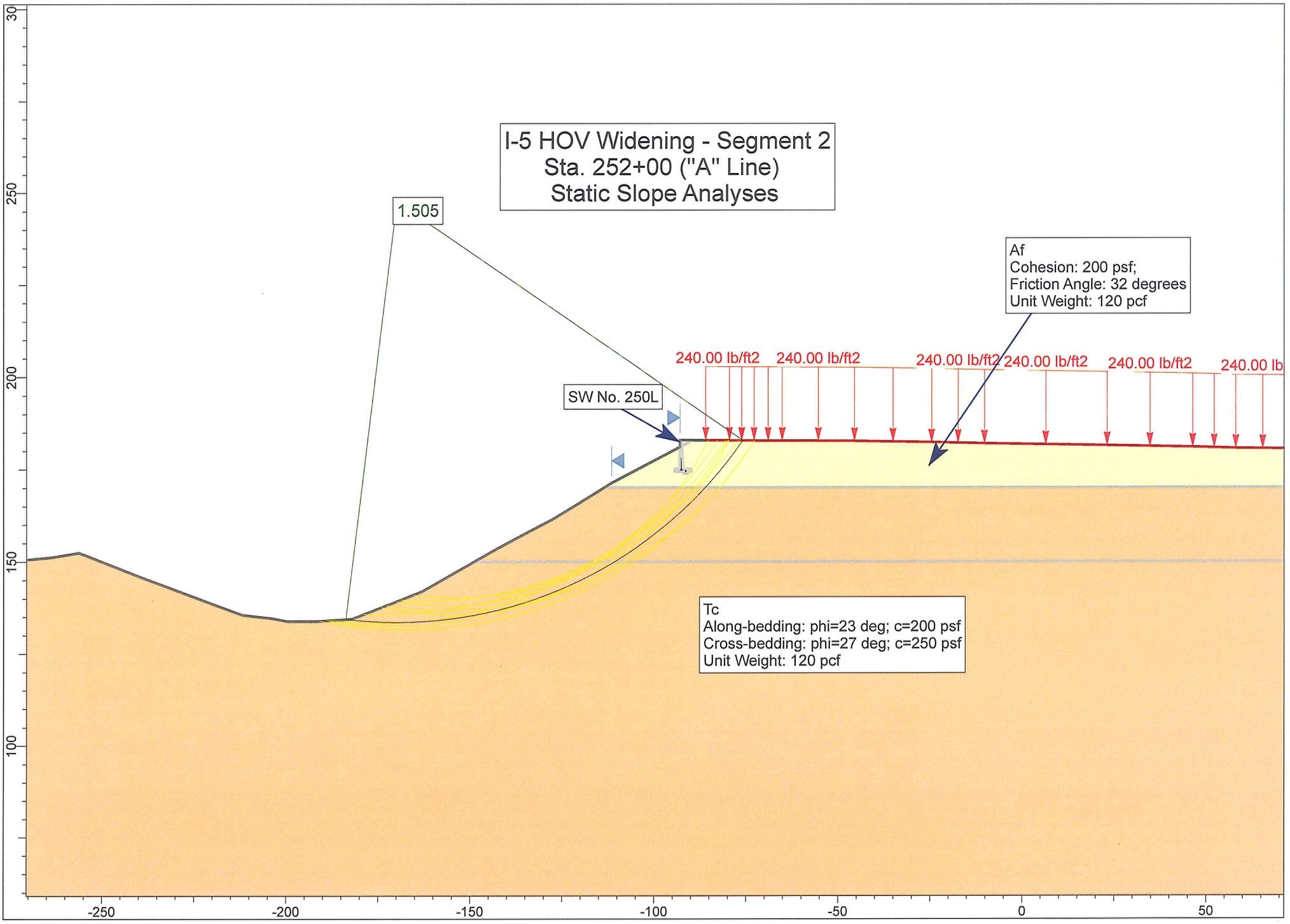
SLOPE STABILITY

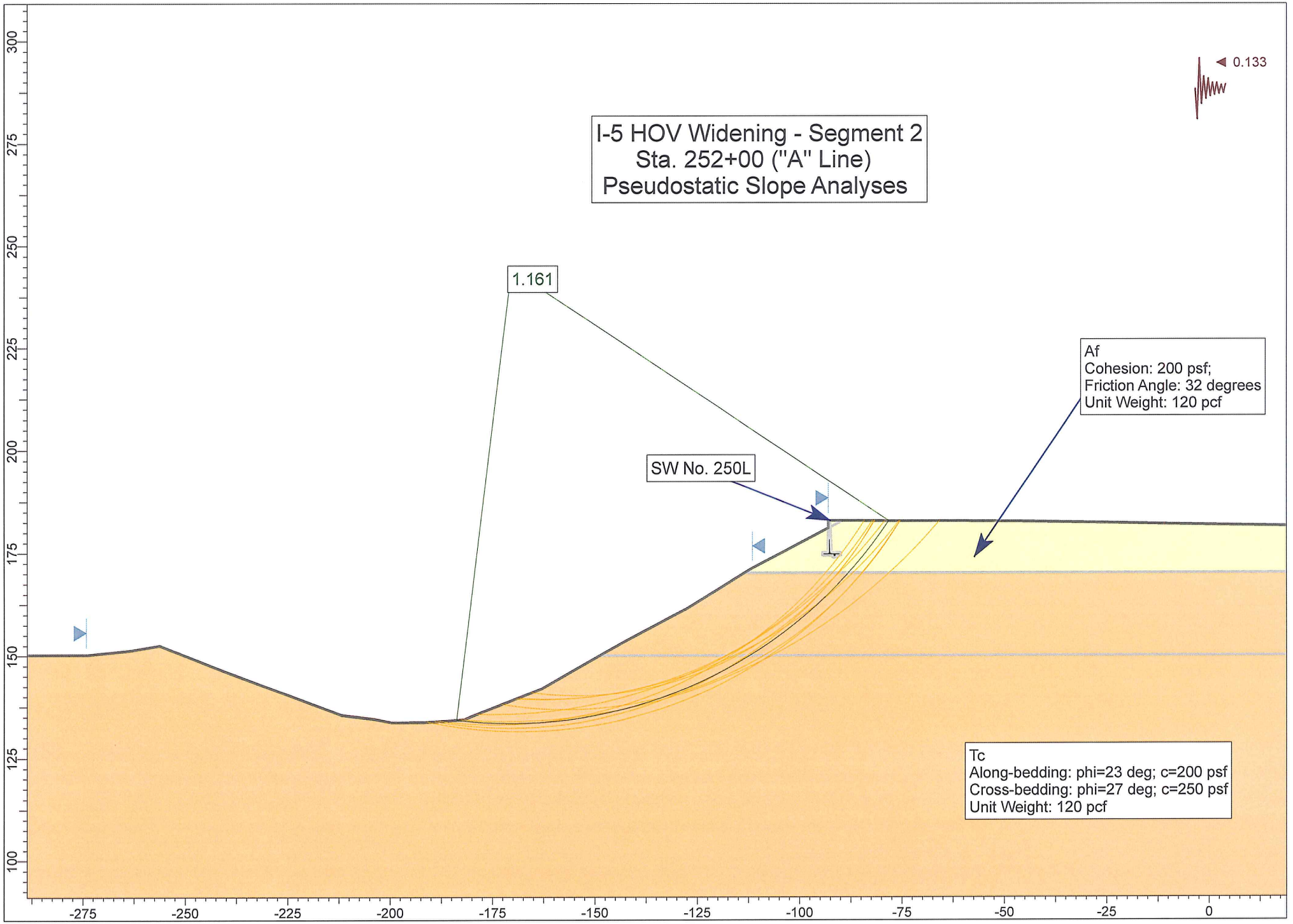

I-5 HOV Widening - Segment 2
Sta. 220+00 ("A" Line)
Static Slope Analyses
1.591
RW No. 218R
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
275
250
225
200
175
150
125
-25
0
25
50
75
100
125
150
175
200
225
250

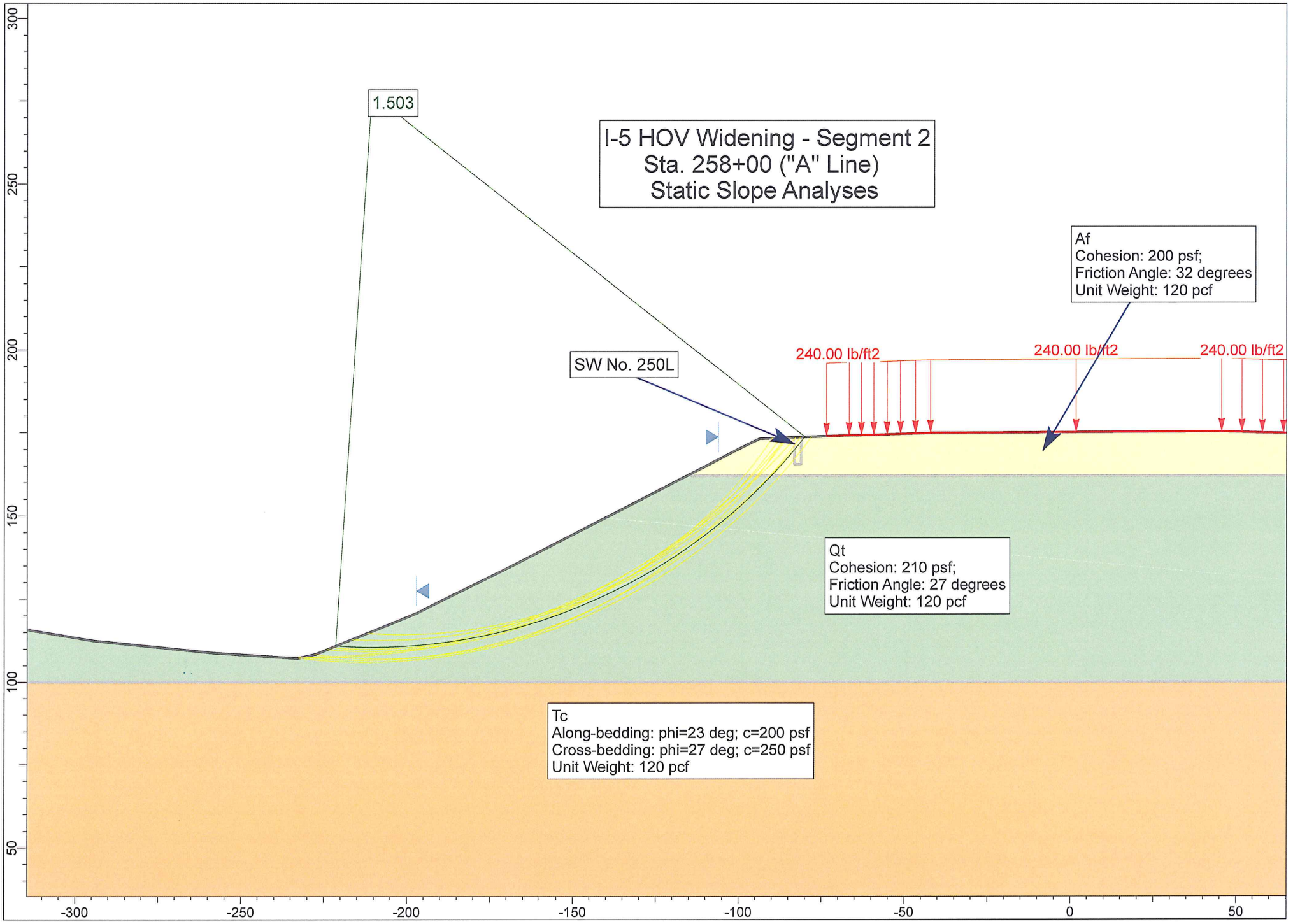

I-5 HOV Widening - Segment 2
Sta. 220+00 ("A" Line)
Pseudostatic Slope Analyses
1.210
0.133
RW No. 218R
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
275
250
225
200
175
150
125
100
0
25
50
75
100
125
150
175
200
225
250
275

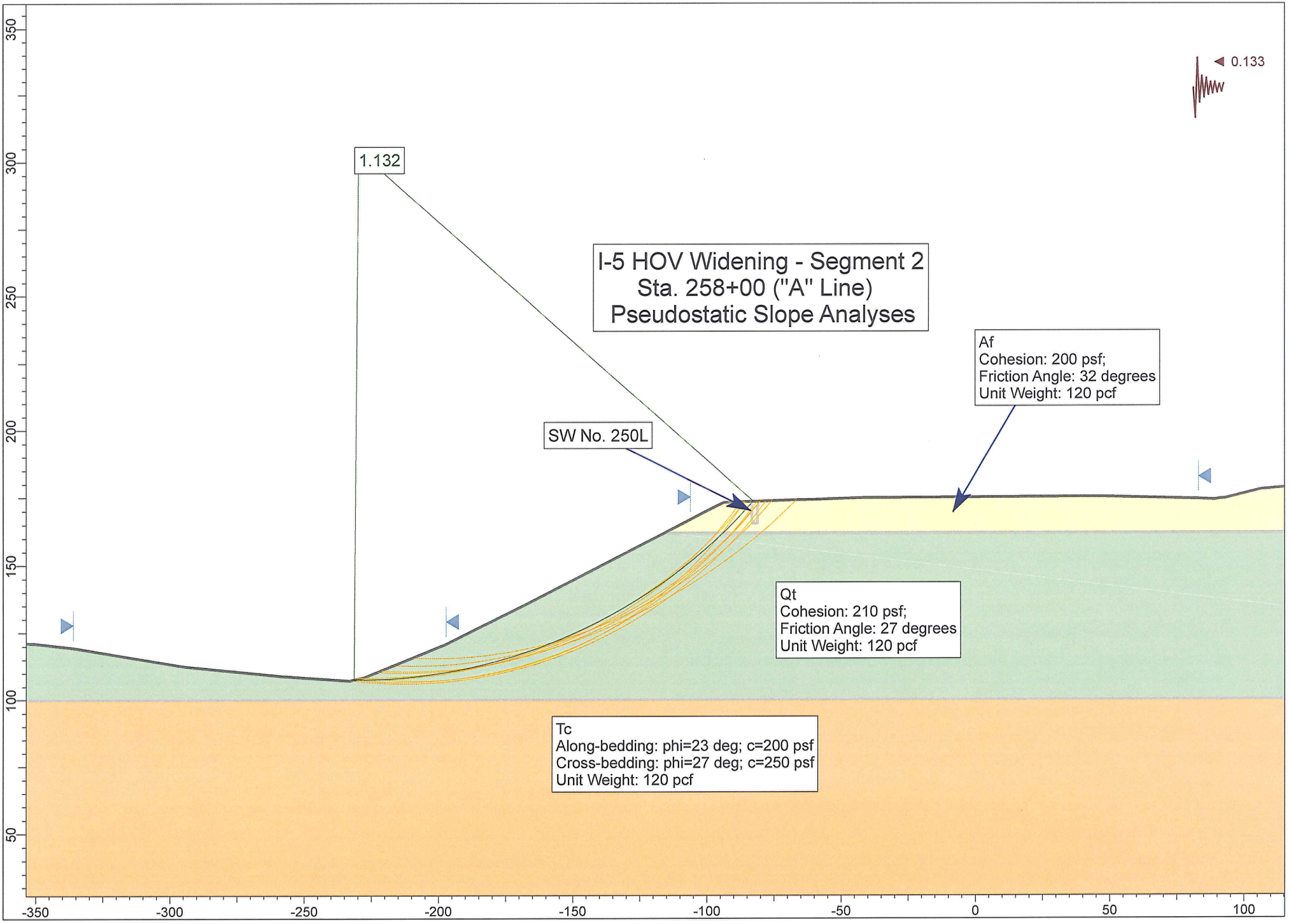

I-5 HOV Widening - Segment 2
Sta. 245+75 ("A" Line)
Static Slope Analyses
1.593
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
RW No. 240R
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
280
260
240
220
200
180
160
140
120
20
40
60
80
100
120
140
160
180
200
220
240

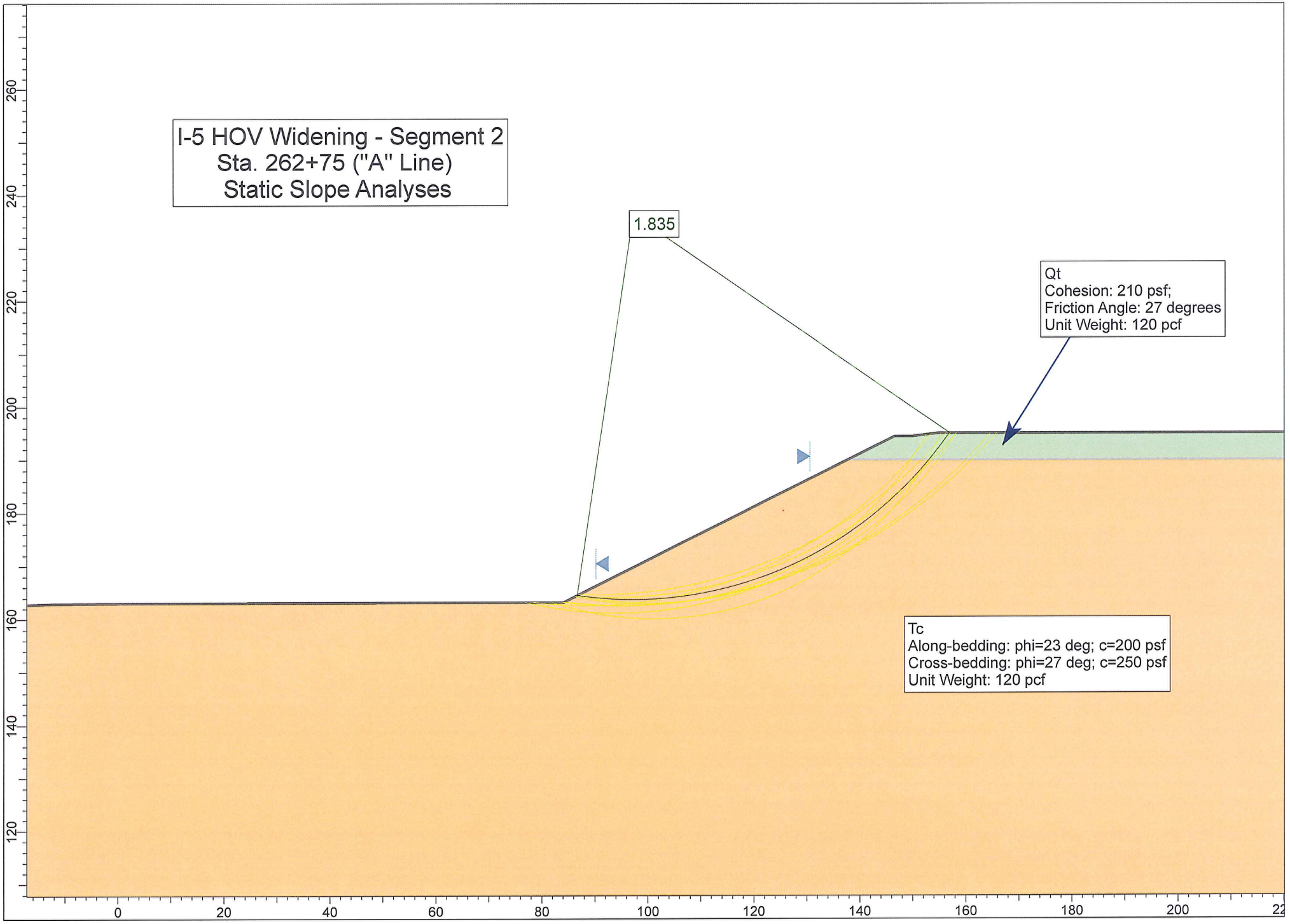

I-5 HOV Widening - Segment 2
Sta. 245+75 ("A" Line)
Pseudostatic Slope Analyses
1.216
0.133
RW No. 240R
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
280
260
240
220
200
180
160
140
0
20
40
60
80
100
120
140
160
180
200
220

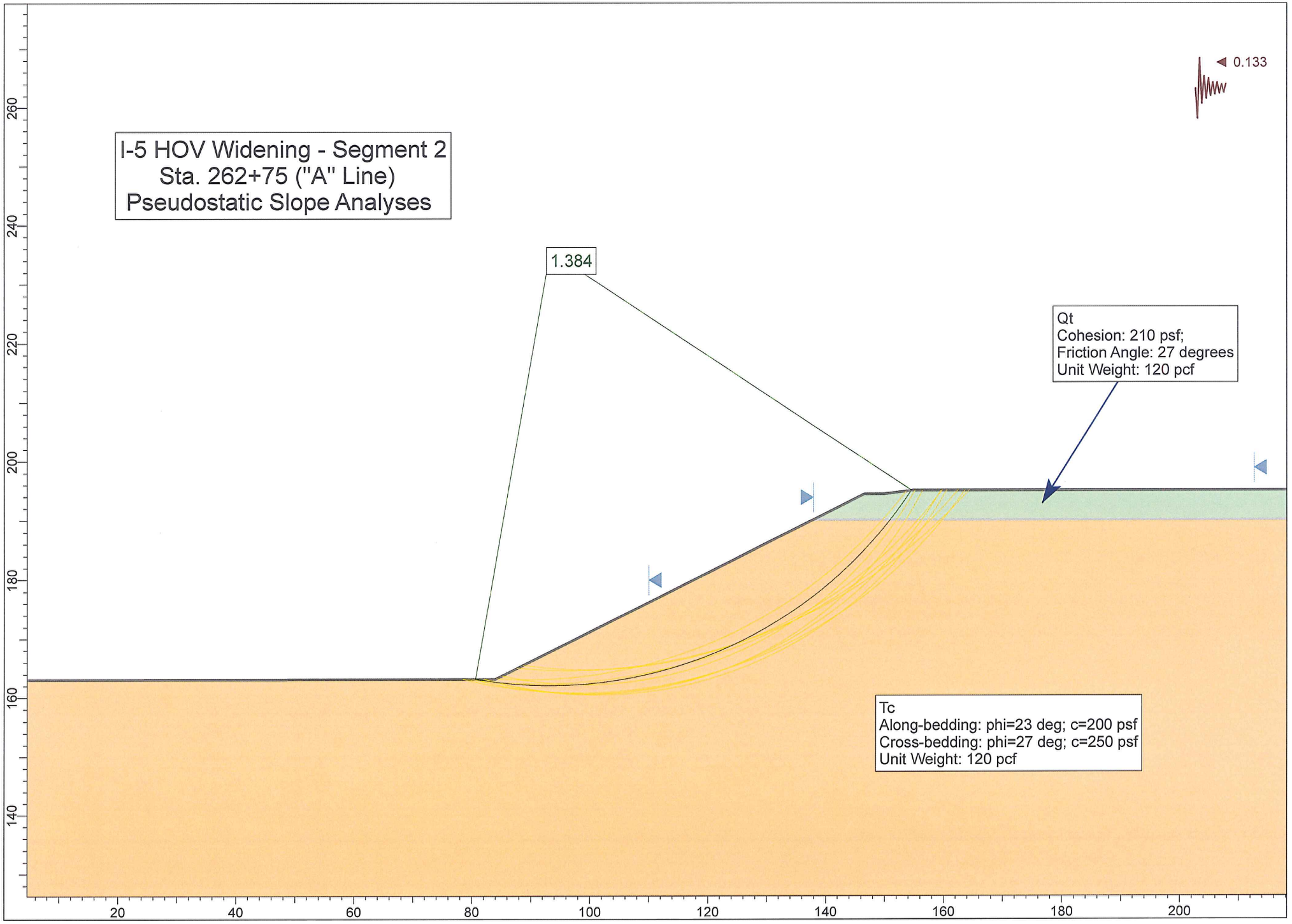

I-5 HOV Widening - Segment 2
Sta. 252+00 ("A" Line)
Static Slope Analyses
1.505
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb
SW No. 250L
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
30
250
200
150
100
-250
-200
-150
-100
-50
0
50

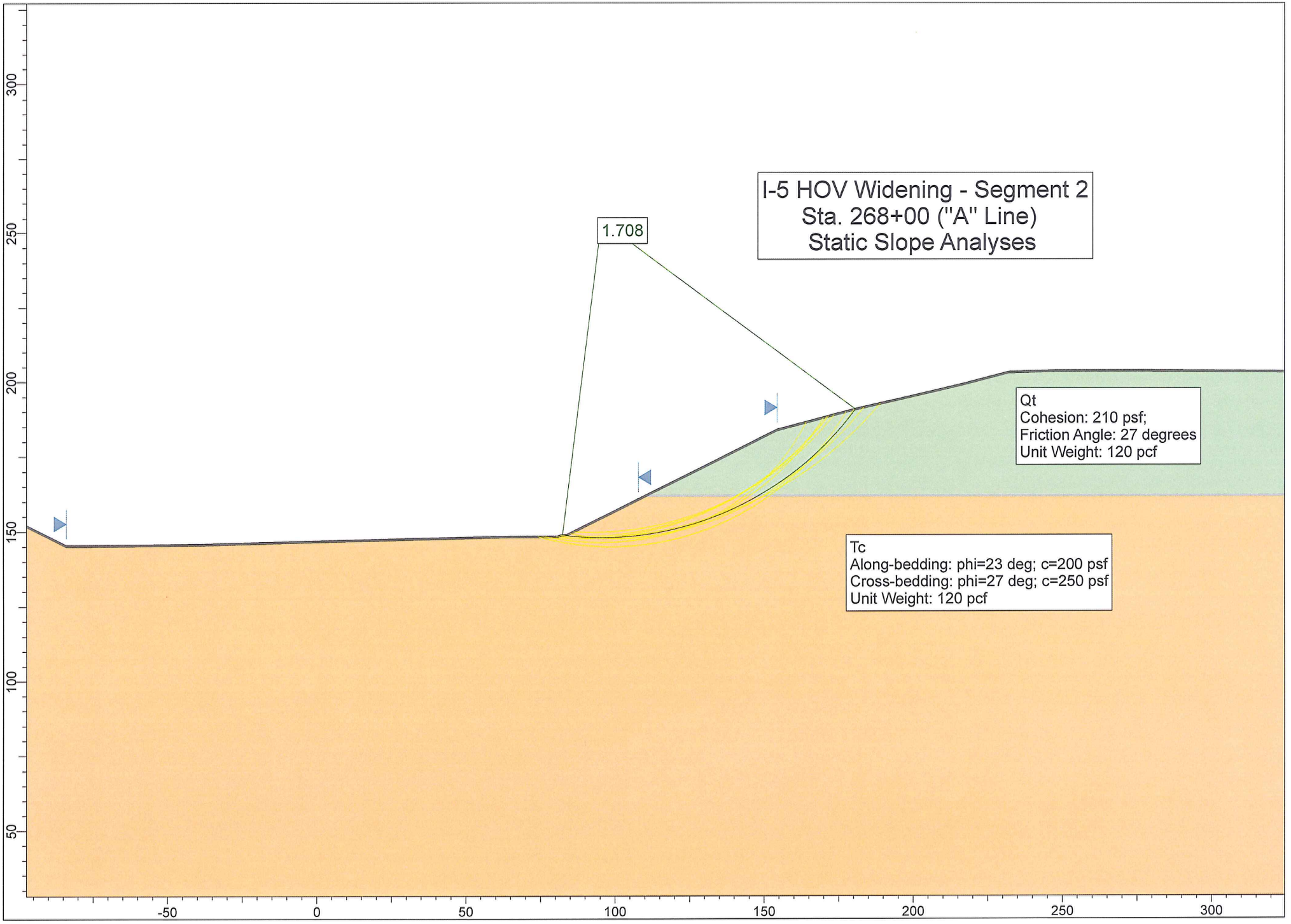

I-5 HOV Widening - Segment 2
Sta. 252+00 ("A" Line)
Pseudostatic Slope Analyses
0.133
1.161
SW No. 250L
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
275
250
225
200
175
150
125
100
-275
-250
-225
-200
-175
-150
-125
-100
-75
-50
-25
0

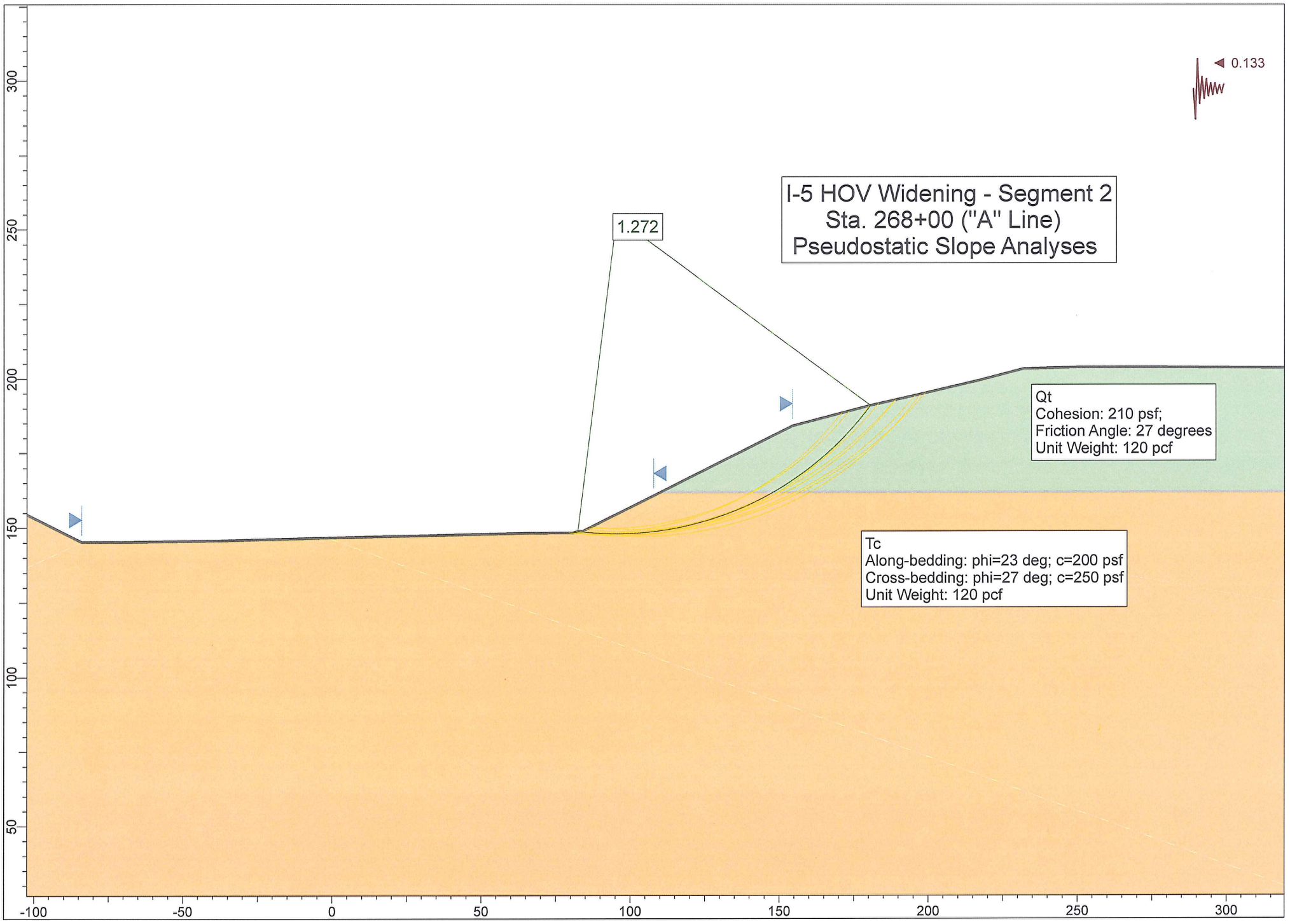

I-5 HOV Widening - Segment 2
Sta. 258+00 ("A" Line)
Static Slope Analyses
1.503
SW No. 250L
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
250
200
150
100
50
-300
-250
-200
-150
-100
-50
0
50


0.133
1.132
I-5 HOV Widening - Segment 2
Sta. 258+00 ("A" Line)
Pseudostatic Slope Analyses
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
SW No. 250L
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
350
300
250
200
150
100
50
-350
-300
-250
-200
-150
-100
-50
0
50
100


I-5 HOV Widening - Segment 2
Sta. 262+75 ("A" Line)
Static Slope Analyses
1.835
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
260
240
220
200
180
160
140
120
0
20
40
60
80
100
120
140
160
180
200


I-5 HOV Widening - Segment 2
Sta. 262+75 ("A" Line)
Pseudostatic Slope Analyses
0.133
1.384
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
260
240
220
200
180
160
140
20
40
60
80
100
120
140
160
180
200


I-5 HOV Widening - Segment 2
Sta. 268+00 ("A" Line)
Static Slope Analyses
1.708
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
250
200
150
100
50
-50
0
50
100
150
200
250
300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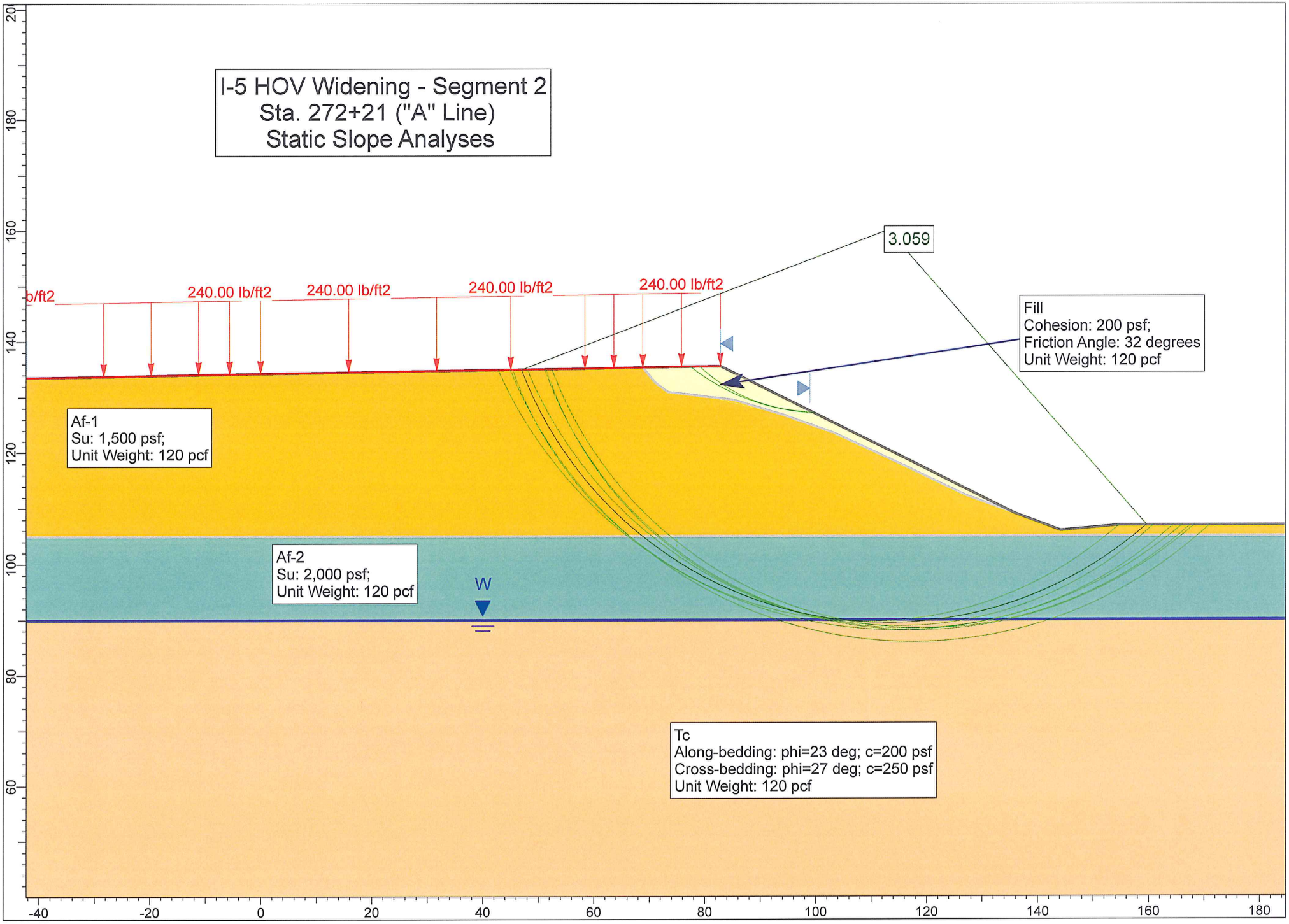
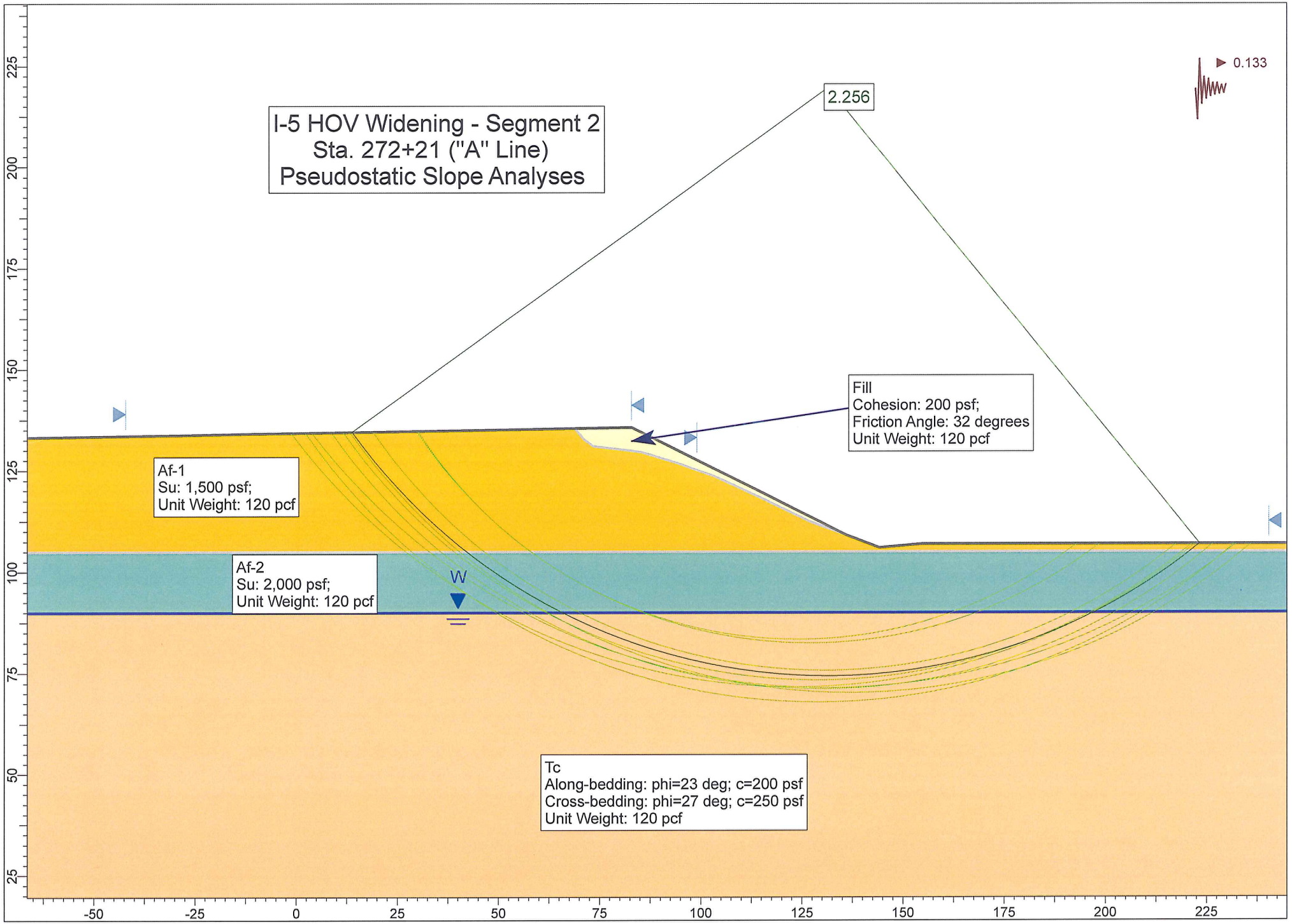
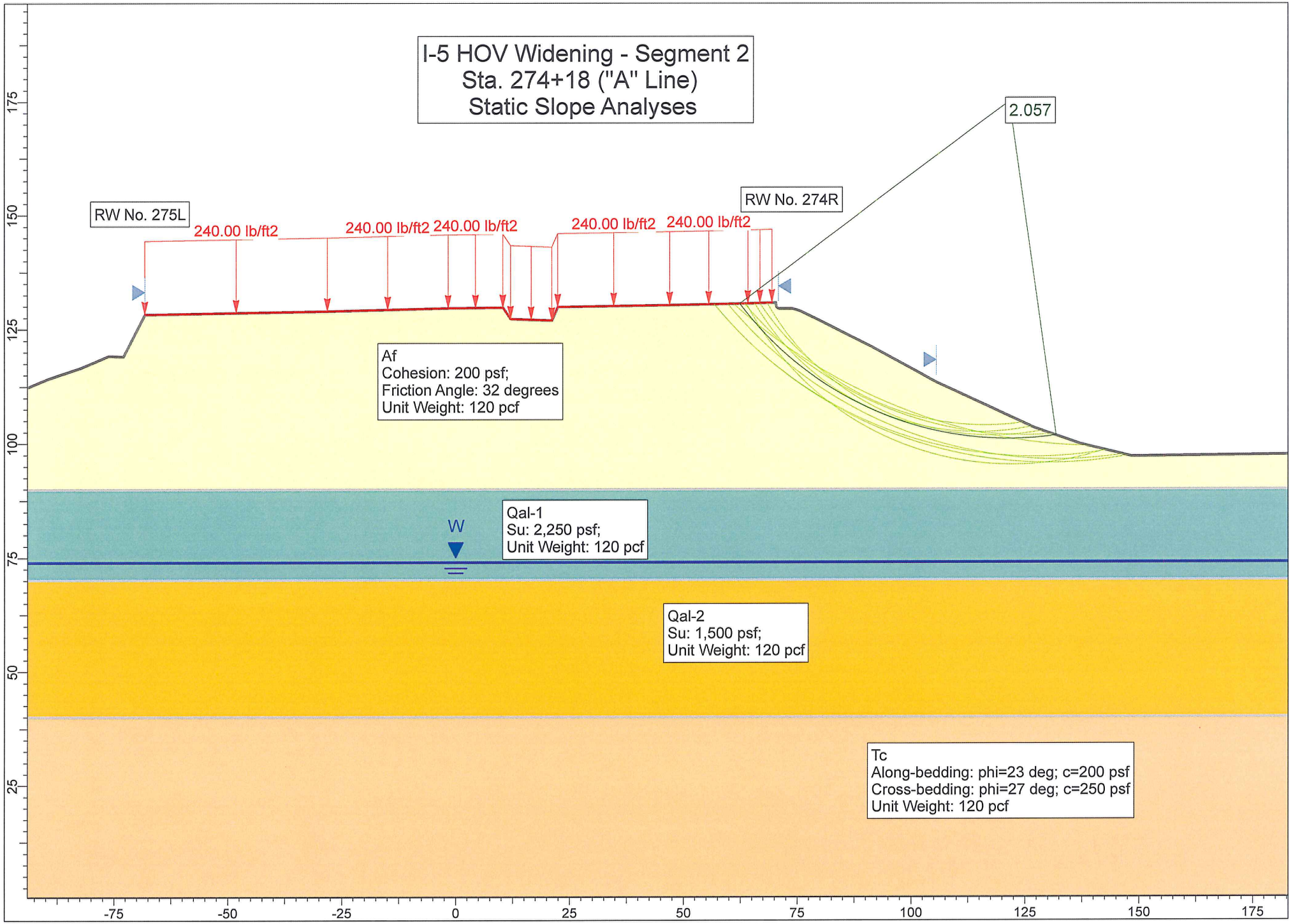
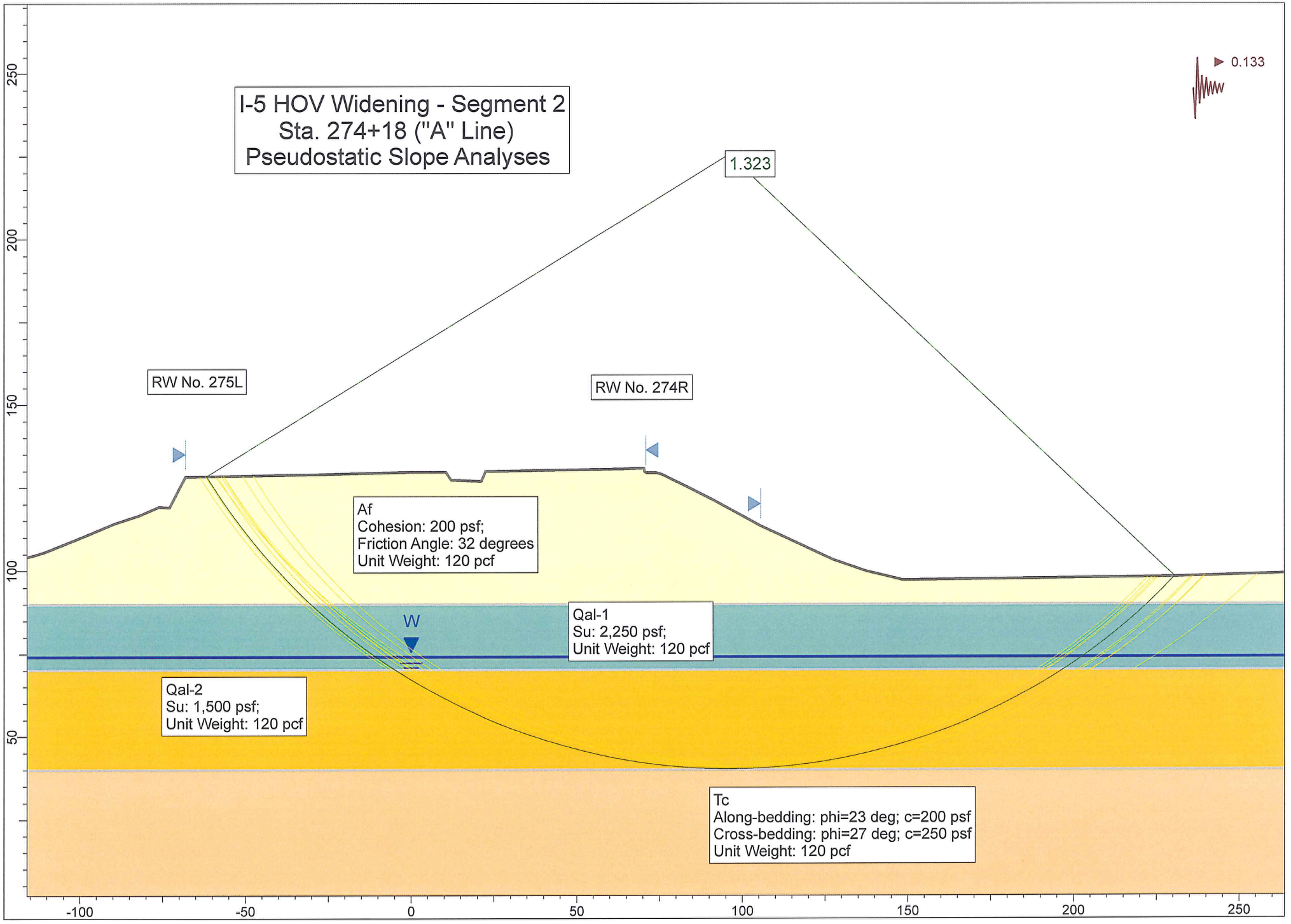
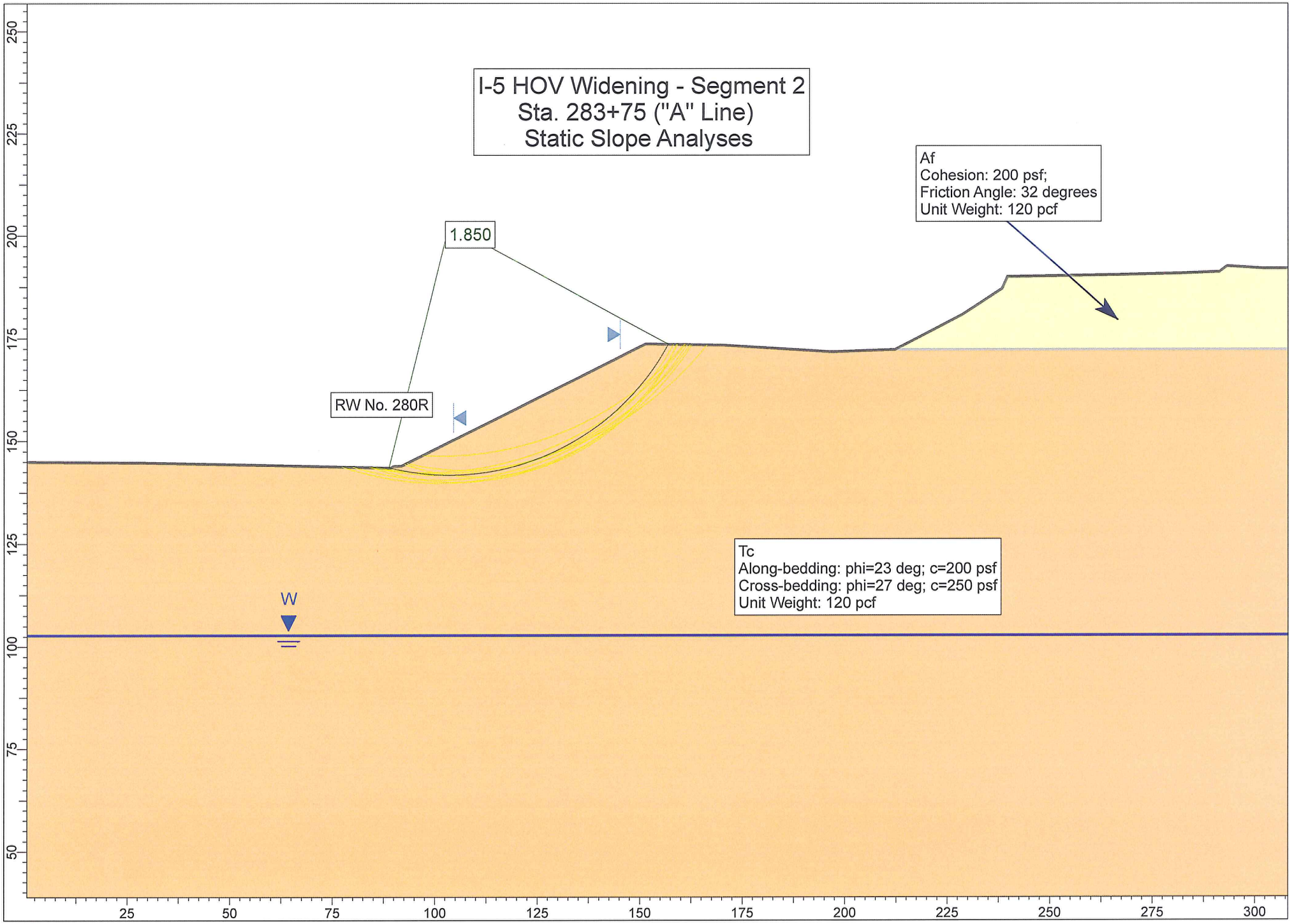
I-5 HOV Widening - Segment 2
Sta. 268+00 ("A" Line)
Pseudostatic Slope Analyses
1.272
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
250
200
150
100
50
-100
-50
0
50
100
150
200
250
300

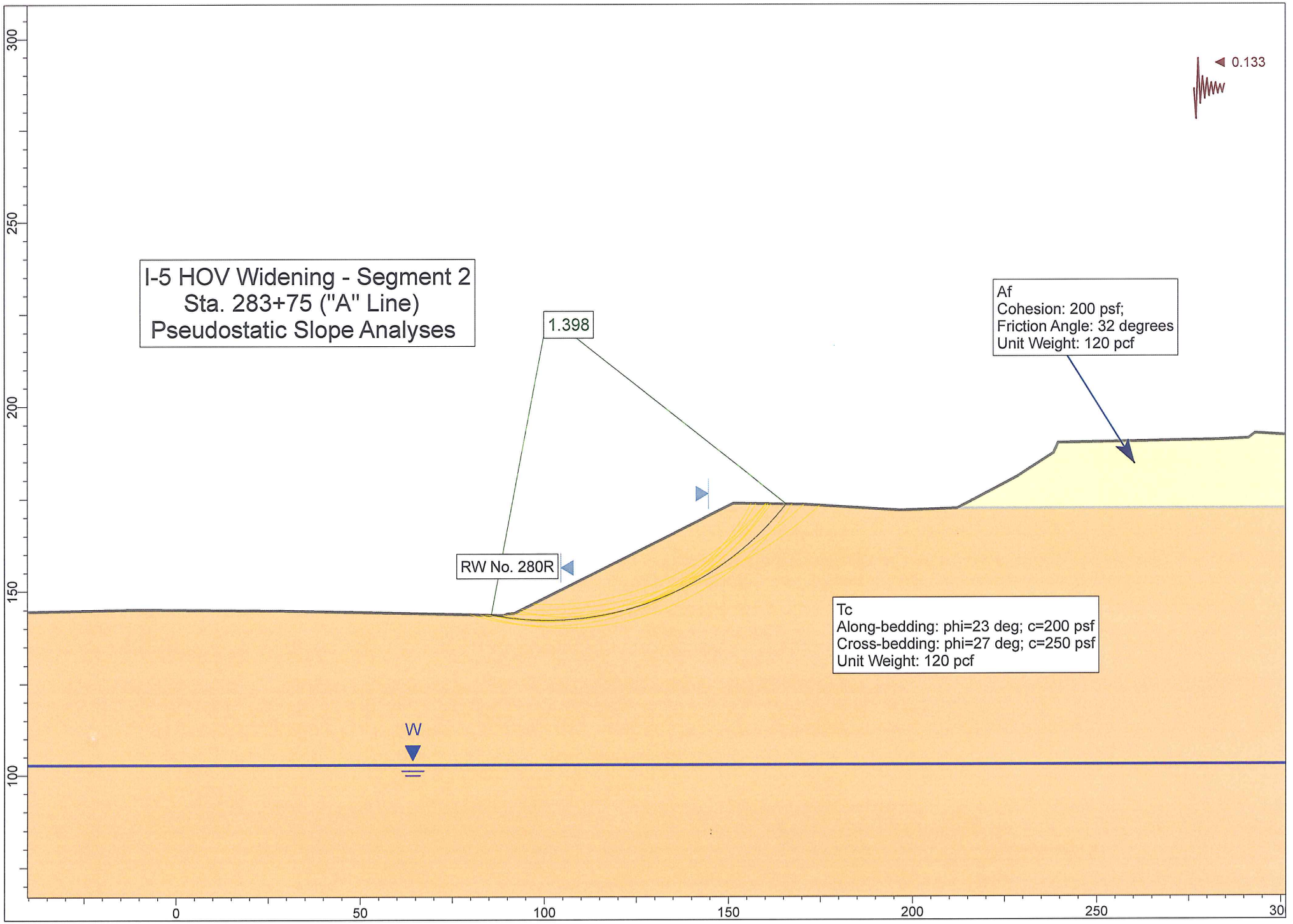

I-5 HOV Widening - Segment 2
Sta. 272+21 ("A" Line)
Static Slope Analyses
3.059
b/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
Fill
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Af-1
Su: 1,500 psf;
Unit Weight: 120 pcf
Af-2
Su: 2,000 psf;
Unit Weight: 120 pcf
W
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
20
180
160
140
120
100
80
60
-40
-20
0
20
40
60
80
100
120
140
160
180

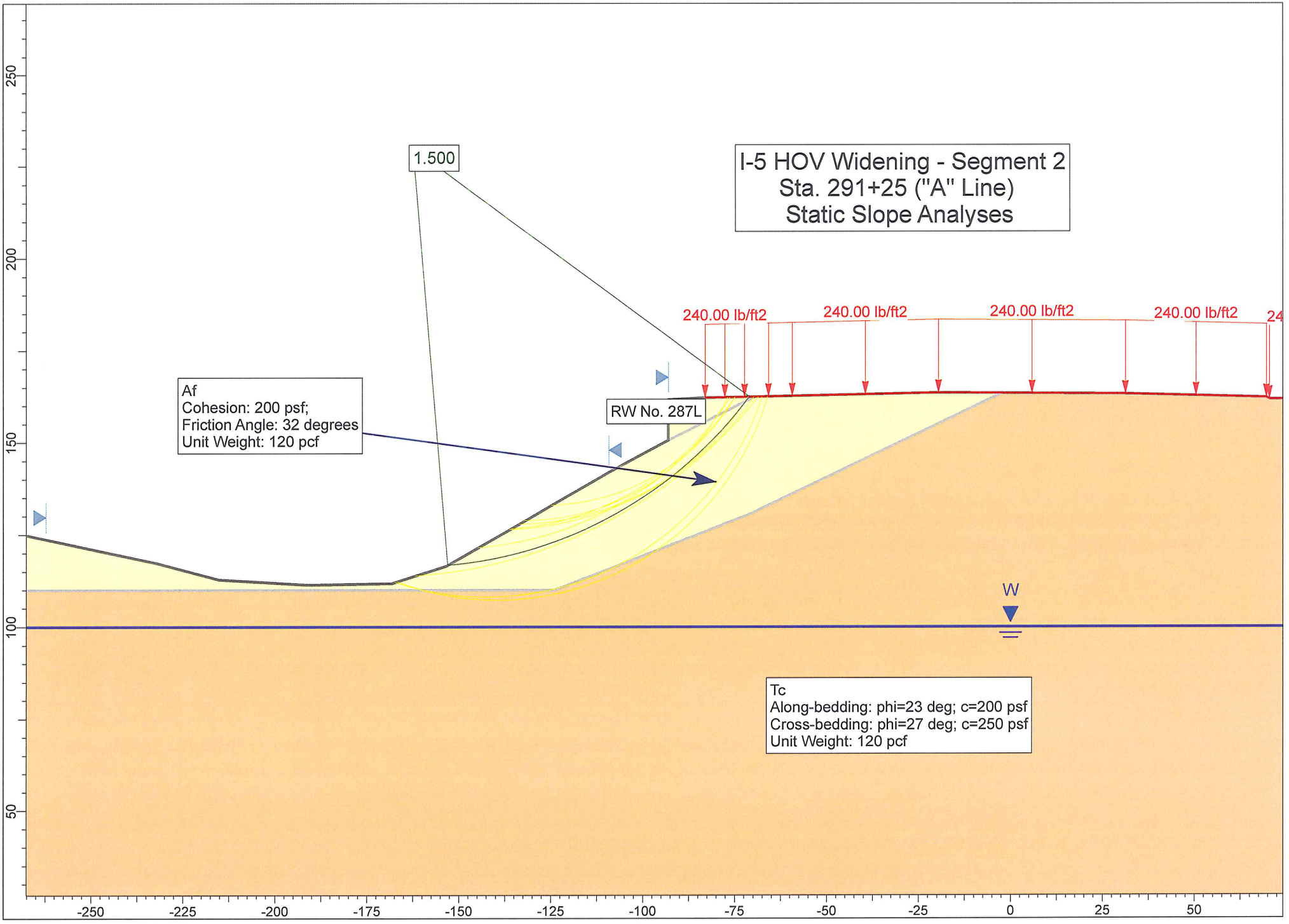

I-5 HOV Widening - Segment 2
Sta. 272+21 ("A" Line)
Pseudostatic Slope Analyses
0.133
2.256
Fill
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Af-1
Su: 1,500 psf;
Unit Weight: 120 pcf
Af-2
Su: 2,000 psf;
Unit Weight: 120 pcf
W
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
225
200
175
150
125
100
75
50
25
-50
-25
0
25
50
75
100
125
150
175
200
225

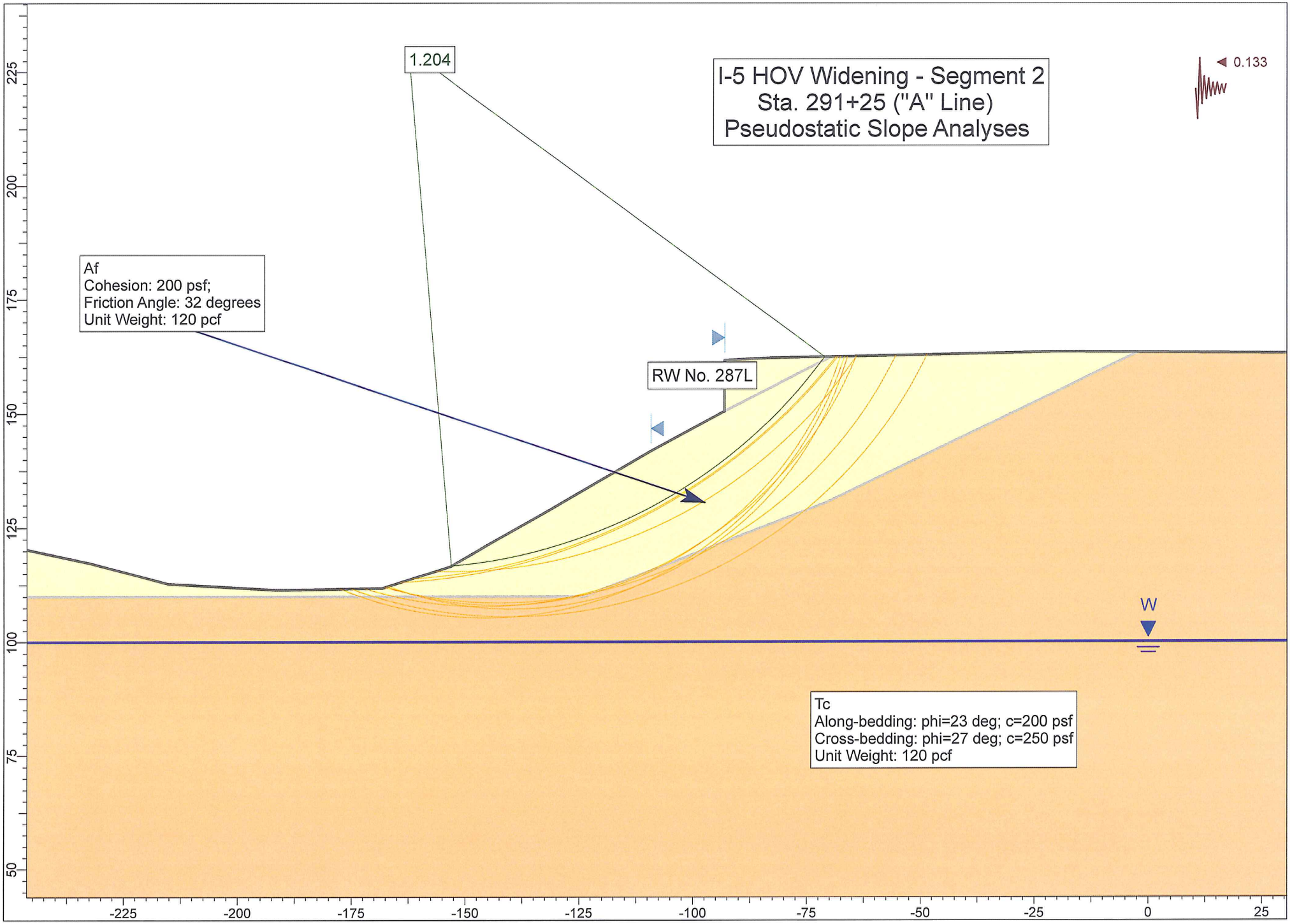

I-5 HOV Widening - Segment 2
Sta. 274+18 ("A" Line)
Static Slope Analyses
2.057
RW No. 275L
RW No. 274R
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
W
Qal-1
Su: 2,250 psf;
Unit Weight: 120 pcf
Qal-2
Su: 1,500 psf;
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
175
150
125
100
75
50
25
-75
-50
-25
0
25
50
75
100
125
150
175

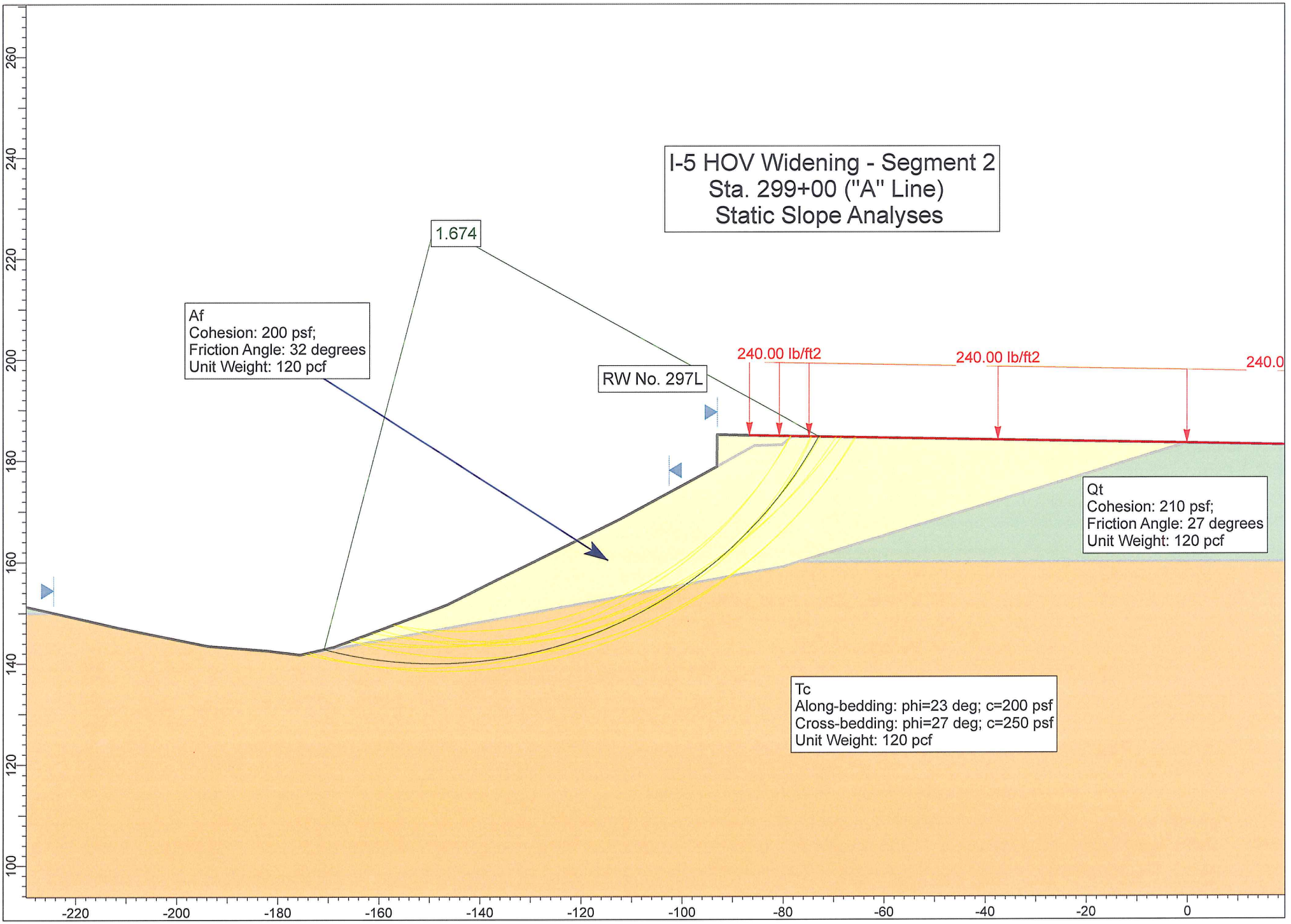

I-5 HOV Widening - Segment 2
Sta. 274+18 ("A" Line)
Pseudostatic Slope Analyses
0.133
1.323
RW No. 275L
RW No. 274R
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
W
Qal-1
Su: 2,250 psf;
Unit Weight: 120 pcf
Qal-2
Su: 1,500 psf;
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
250
200
150
100
50
-100
-50
0
50
100
150
200
250

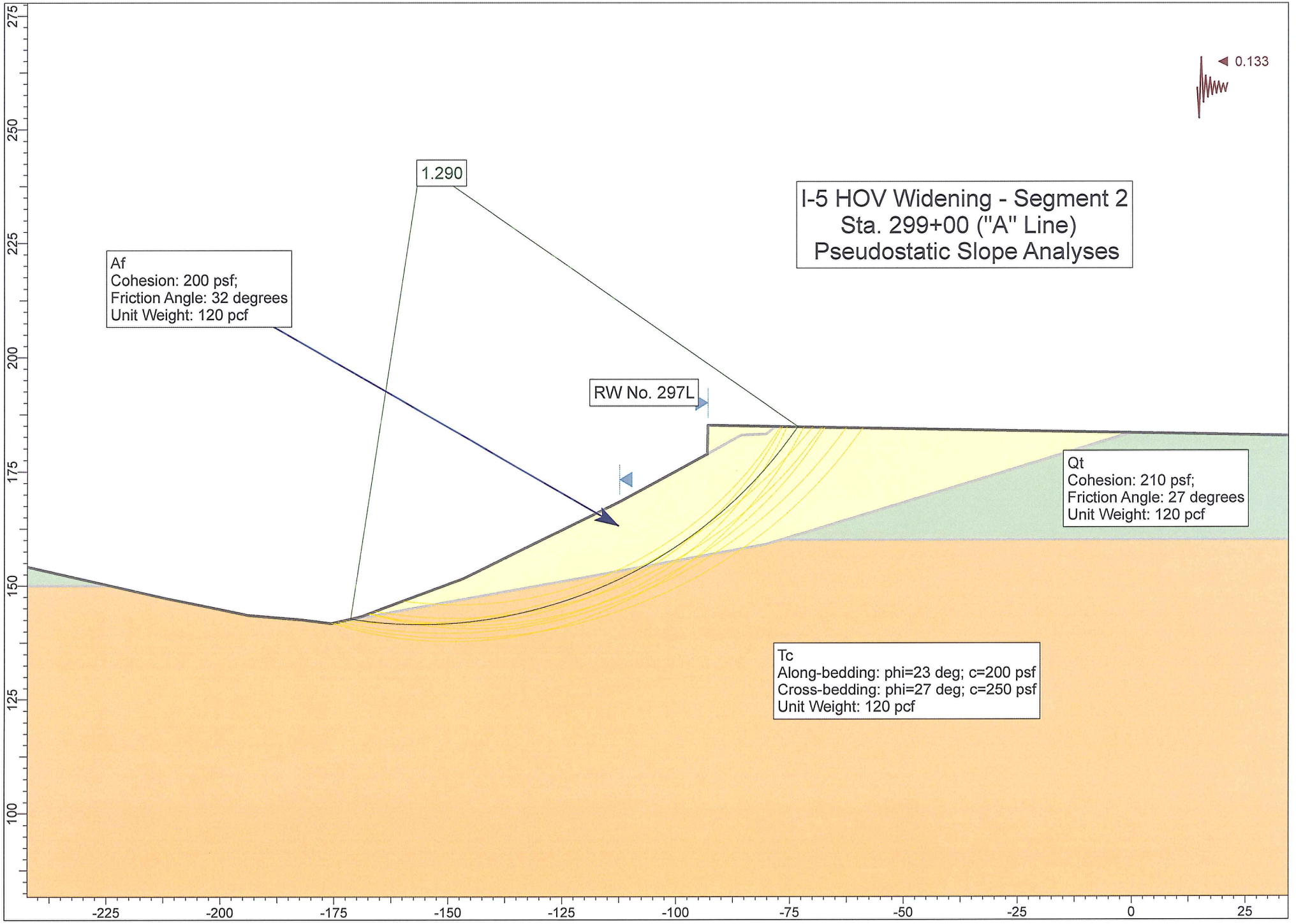

I-5 HOV Widening - Segment 2
Sta. 283+75 ("A" Line)
Static Slope Analyses
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
1.850
RW No. 280R
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
W
250
225
200
175
150
125
100
75
50
25
50
75
100
125
150
175
200
225
250
275
300

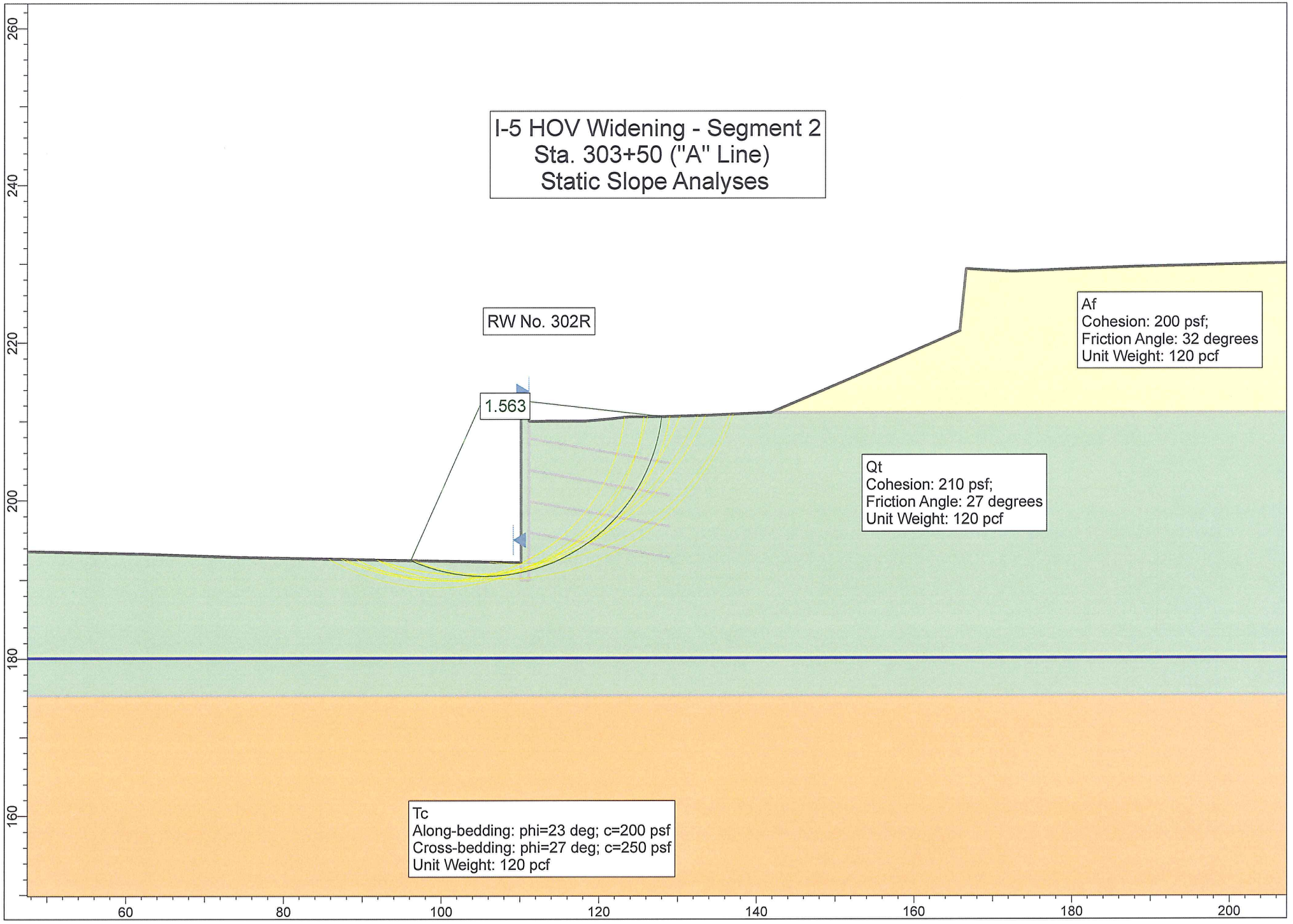

I-5 HOV Widening - Segment 2
Sta. 283+75 ("A" Line)
Pseudostatic Slope Analyses
0.133
1.398
RW No. 280R
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
W
300
250
200
150
100
0
50
100
150
200
250
30

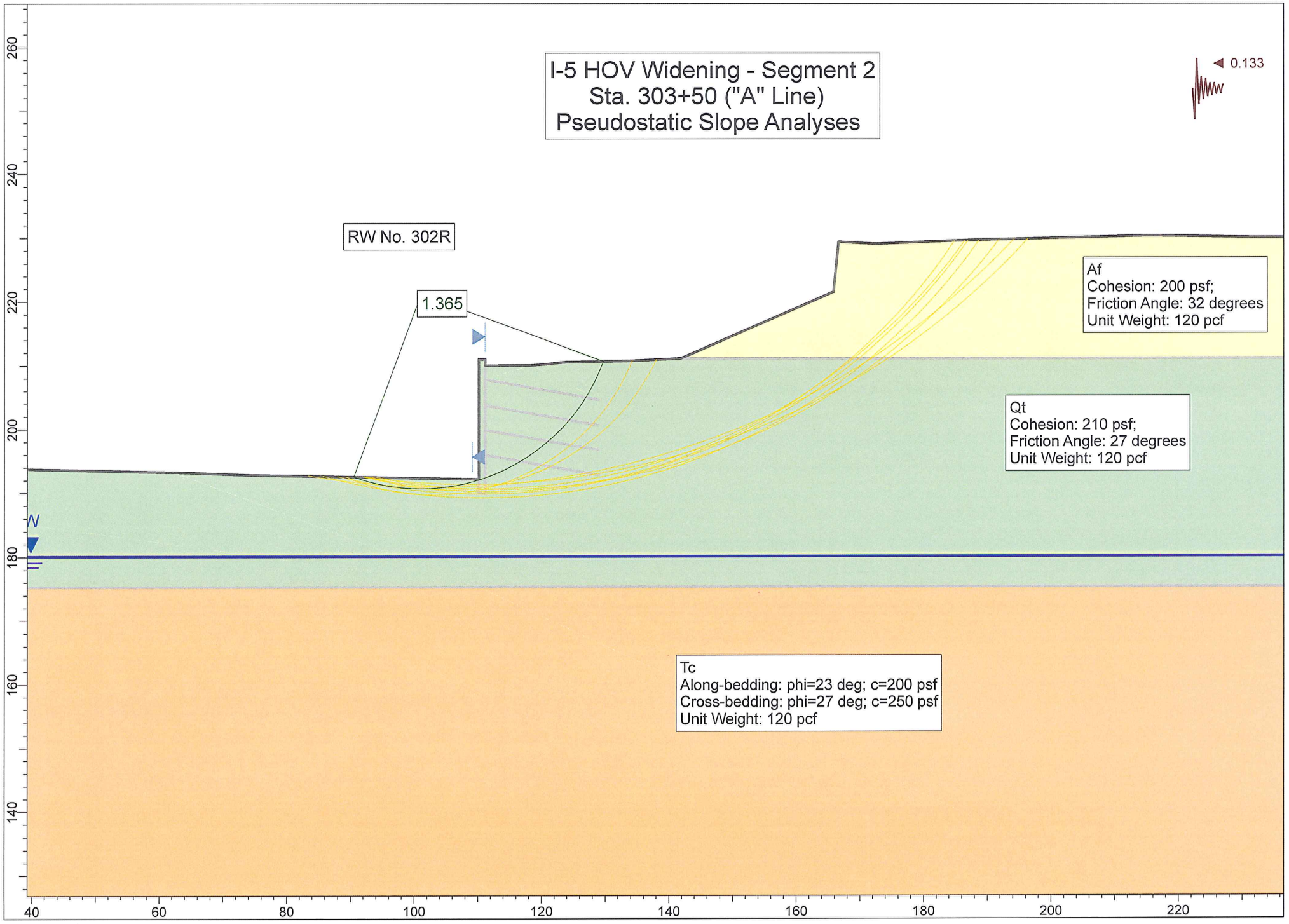

I-5 HOV Widening - Segment 2
Sta. 291+25 ("A" Line)
Static Slope Analyses
1.500
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
240.00 lb/ft2
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 287L
W
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
250
200
150
100
50
-250
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25
50

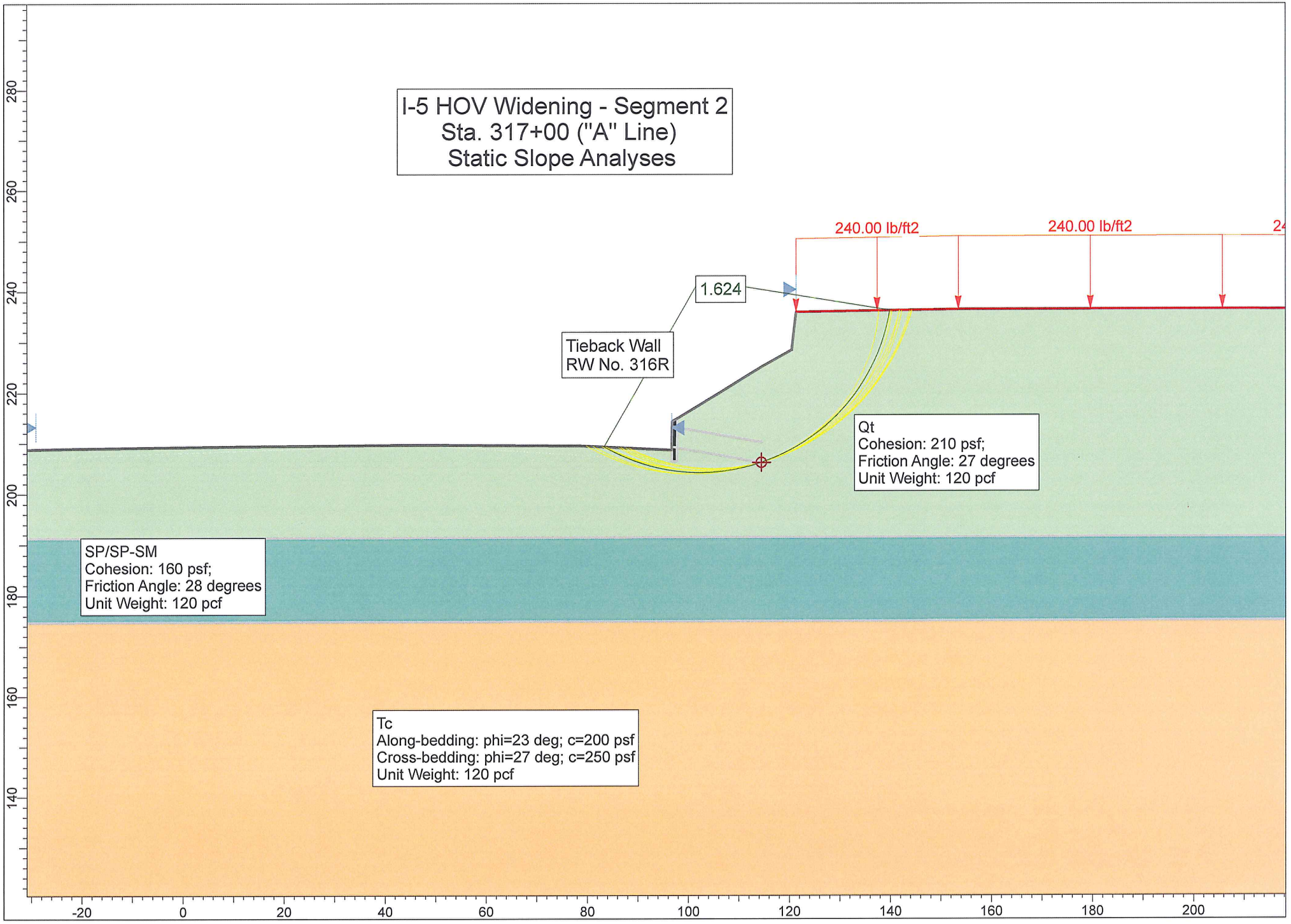

I-5 HOV Widening - Segment 2
Sta. 291+25 ("A" Line)
Pseudostatic Slope Analyses
1.204
0.133
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 287L
W
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
225
200
175
150
125
100
75
50
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25


I-5 HOV Widening - Segment 2
Sta. 299+00 ("A" Line)
Static Slope Analyses
1.674
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 297L
240.00 lb/ft2
240.00 lb/ft2
240.0
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
260
240
220
200
180
160
140
120
100
-220
-200
-180
-160
-140
-120
-100
-80
-60
-40
-20
0


0.133
1.290
I-5 HOV Widening - Segment 2
Sta. 299+00 ("A" Line)
Pseudostatic Slope Analyses
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
RW No. 297L
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
275
250
225
200
175
150
125
100
-225
-200
-175
-150
-125
-100
-75
-50
-25
0
25


I-5 HOV Widening - Segment 2
Sta. 303+50 ("A" Line)
Static Slope Analyses
RW No. 302R
1.563
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
260
240
220
200
180
160
60
80
100
120
140
160
180
200


I-5 HOV Widening - Segment 2
Sta. 303+50 ("A" Line)
Pseudostatic Slope Analyses
0.133
RW No. 302R
1.365
Af
Cohesion: 200 psf;
Friction Angle: 32 degrees
Unit Weight: 120 pcf
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
260
240
220
200
180
160
140
40
60
80
100
120
140
160
180
200
220


I-5 HOV Widening - Segment 2
Sta. 317+00 ("A" Line)
Static Slope Analyses
240.00 lb/ft2
240.00 lb/ft2
1.624
Tieback Wall
RW No. 316R
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
SP/SP-SM
Cohesion: 160 psf;
Friction Angle: 28 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
280
260
240
220
200
180
160
140
-20
0
20
40
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120
140
160
180
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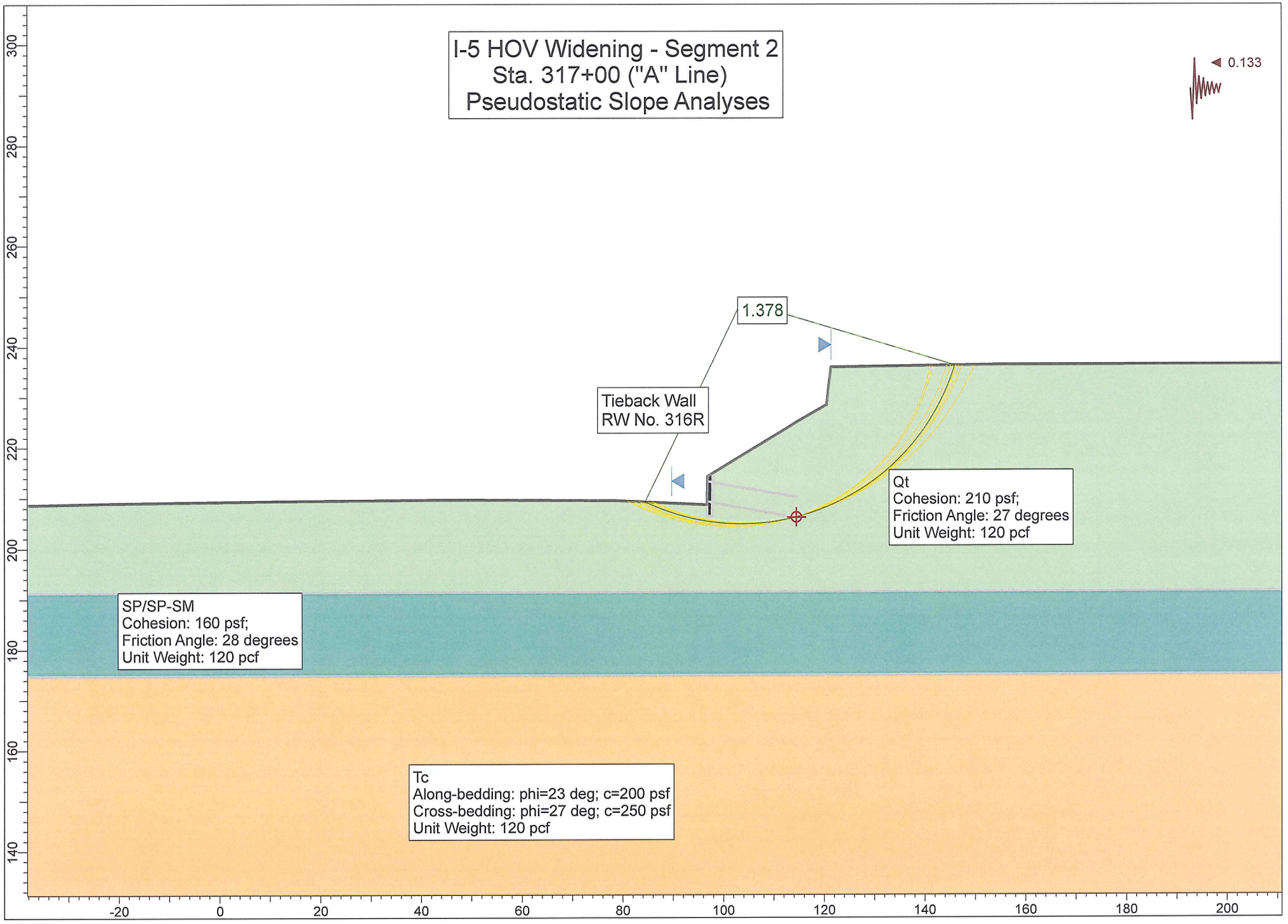
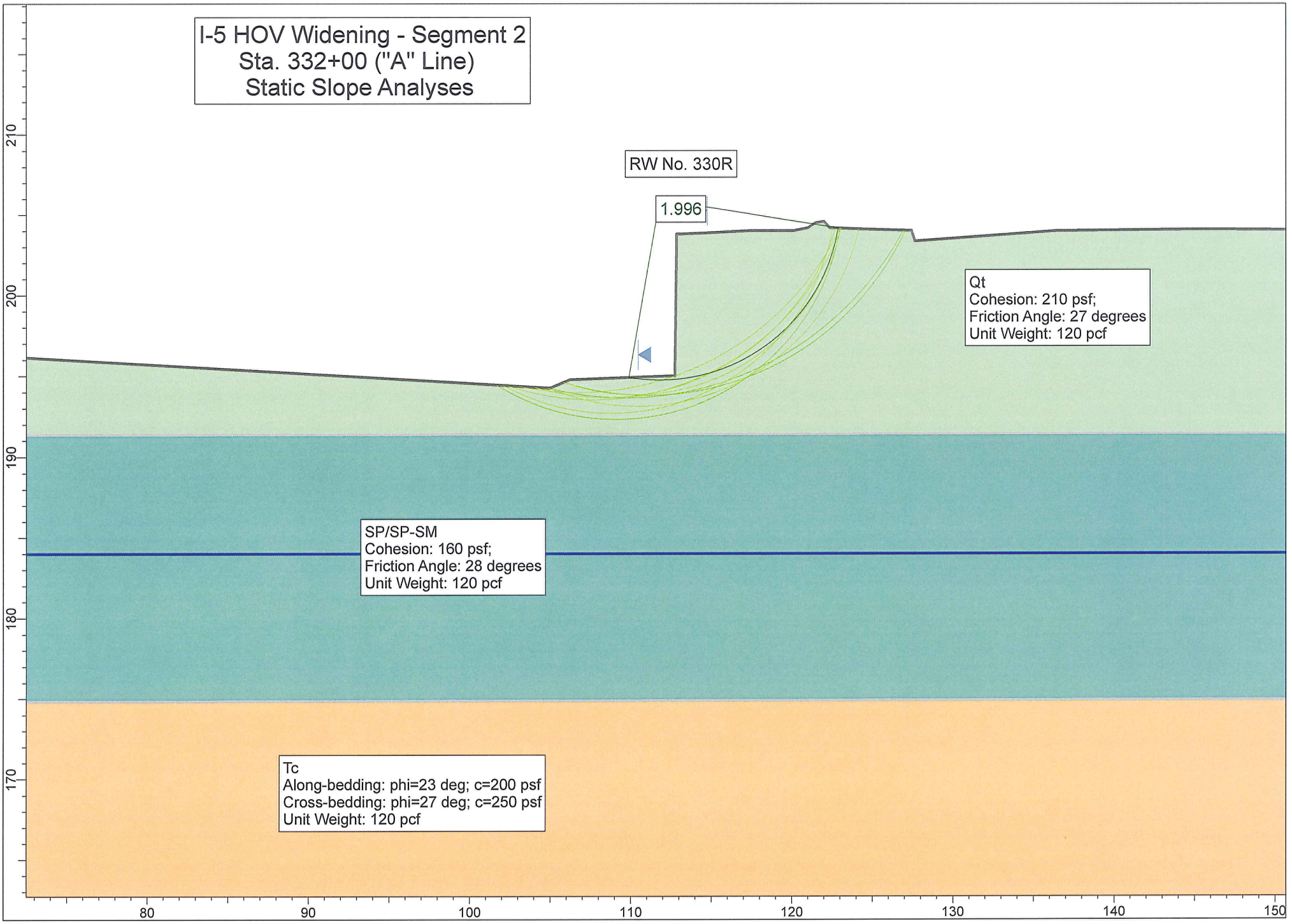
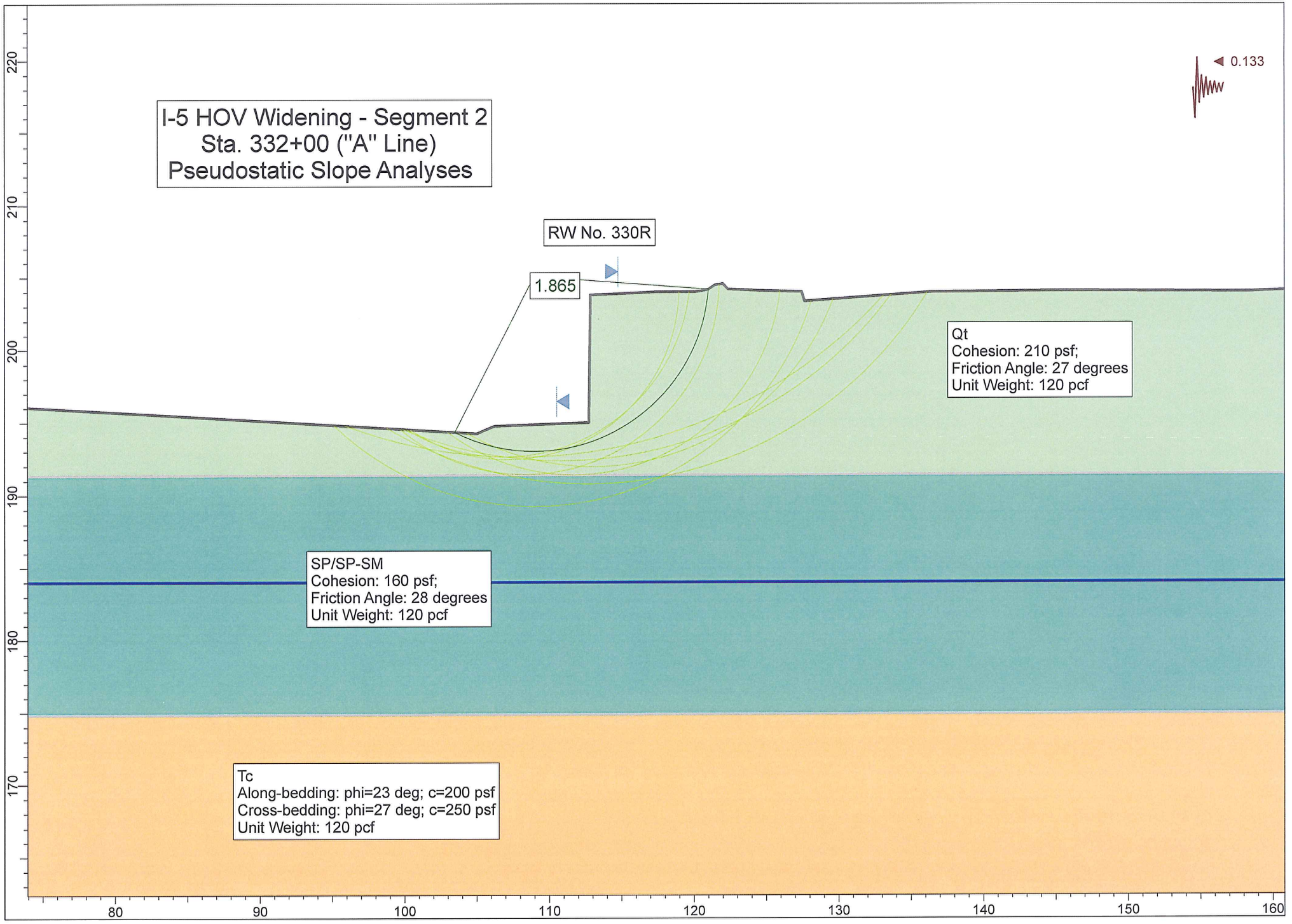

I-5 HOV Widening - Segment 2
Sta. 317+00 ("A" Line)
Pseudostatic Slope Analyses
0.133
1.378
Tieback Wall
RW No. 316R
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
SP/SP-SM
Cohesion: 160 psf;
Friction Angle: 28 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
300
280
260
240
220
200
180
160
140
-20
0
20
40
60
80
100
120
140
160
180
200


I-5 HOV Widening - Segment 2
Sta. 332+00 ("A" Line)
Static Slope Analyses
RW No. 330R
1.996
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
SP/SP-SM
Cohesion: 160 psf;
Friction Angle: 28 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
210
200
190
180
170
80
90
100
110
120
130
140
150


I-5 HOV Widening - Segment 2
Sta. 332+00 ("A" Line)
Pseudostatic Slope Analyses
0.133
RW No. 330R
1.865
Qt
Cohesion: 210 psf;
Friction Angle: 27 degrees
Unit Weight: 120 pcf
SP/SP-SM
Cohesion: 160 psf;
Friction Angle: 28 degrees
Unit Weight: 120 pcf
Tc
Along-bedding: phi=23 deg; c=200 psf
Cross-bedding: phi=27 deg; c=250 psf
Unit Weight: 120 pcf
220
210
200
190
180
170
80
90
100
110
120
130
140
150
160

APPENDIX D
CALTRANS REVIEW COMMENTS AND EMI RESPONSES

Ranjan Gunaranjan

From: Andrew Korkos
Sent: Tuesday, September 18, 2012 10:08 AM
To: Ranjan Gunaranjan
Subject: FW: I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report
Attachments: EA12-0F96C_Review Comments_FR for RWs218R-330R_ I-5 HOV_8-13-12 EMI RESPONSES_REV 9-11-12.xls; EA0F96C_Review Comments_GDR for I-5 HOV Segment 2 _PM3.8-6.2_7-24-12 WITH RESPONSES REV_9-11-12.xls

EARTH MECHANICS, INC.
17800 Newhope Street, Suite B, Fountain Valley, California 92708
Tel: (714) 751-3826
Fax: (714) 751-3928
www.earthmech.com
****

-----Original Message-----
From: Haitao Liu [mailto:haitao_liu@dot.ca.gov]
Sent: Tuesday, September 11, 2012 2:46 PM
To: Andrew Korkos
Cc: Luqi Yang (luqi_yang@dot.ca.gov); casey.weber@aecom.com; Deh-Jeng Jang; Sungro Cho
Subject: Re: I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report

Andrew,

We've reviewed the response attached based on our previous discussion, and concur with you for the proposed revisions on applicable items.

Please let us know if you have any question.

Best Regards,

Haitao Liu, P.E.

Transportation Engineer - Civil
Office of Geotechnical Design South - 1
Division of Engineering Services
Department of Transportation, California

5900 Folsom Blvd.
Sacramento, CA 95819
Office phone: (916) 227-0992
Cell phone: (916) 704-6519

Andrew Korkos
<A.Korkos@earthmech.com>
09/11/2012 02:26 PM

To
"haitao_liu@dot.ca.gov"
<haitao_liu@dot.ca.gov>
cc
"Luqi Yang (luqi_yang@dot.ca.gov)"
<luqi_yang@dot.ca.gov>,
"casey.weber@aecom.com"
<casey.weber@aecom.com>
Subject
I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report

Haitao,

Attached are the revised comment/response tables for the GDR and the Non-Standard Walls Foundation Report. A few of the responses were revised, per our telephone conversation this morning. We will incorporate the responses into the Final version of the reports.

Please let me know if the responses are ok.

Thanks,
Andy
EARTH MECHANICS, INC.
17800 Newhope Street, Suite B, Fountain Valley, California 92708
Tel: (714) 751-3826
Fax: (714) 751-3928
www.earthmech.com
****

(See attached file: EA12-0F96C_Review Comments_FR for RWs218R-330R_ I-5 HOV_8-13-12 EMI RESPONSES_REV 9-11-12.xls)(See attached file: EA0F96C_Review Comments_GDR for I-5 HOV Segment 2_PM3.8-6.2_7-24-12 WITH RESPONSES REV_9-11-12.xls)

EXTERNAL SUBMITTAL REVIEW

PROJECT: INTERSTATE 5 HOV IMPROVEMENT
PROJECT No. 1200020278

EA No.: 12-0F96C1	
Agency: CalTrans	
Submittal No.	Title: GDR for I-5 HOV Segment 2 PM3.8-6.2, 3/29/2012

Lead:	Date: 7/24/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review
30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only
CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal
FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING			For RFC Use Only	
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
1	Section 1.0, Figure 1	H.Liu	1	Please show limits of project site on Site Location Map	RI		The limits of the project area will be shown on the the Site Location Map.					
2	Section 8.2.1, Page 38, Global Stability	H.Liu	2	Factor of safety of 1.3 for static, 1.0 for for seismic conditions should be adequate for general cut slope.	RI		Proposed cut slopes provide support for existing adjacent developments, at the top of slopes, including residential and commercial properties and associated infrastructure. Therefore, factors-of-safety of 1.5 and 1.1 are suitable requirements for long-term cut slope stability.					
3	Section 8.3.3, Page 40, Global Stability	H.Liu	3	Factor of safety of 1.3 for static, 1.0 for for seismic conditions should be adequate for general embankment.	RI		For consistency, EMI is using factors-of-safety of 1.5 and 1.1 for static and pseudo-static conditions, respectively, for long-term stability of fill slopes.					
4	Appendix A LOTBS	H.Liu	4	LOTBS for Soundwall 278L, please specify the borehole number (A-11-228?) on top of the boring log.	RI		The borehole ID number (A-11-228) will be added to the LOTB for Sound Wall No. 278L.					

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

EA No.: 12-0F96C1	
Agency: CalTrans	
Submittal No.	Title: GDR for I-5 HOV Segment 2 PM3.8-6.2, 3/29/2012

Lead:	Date: 7/24/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submittal

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING			For RFC Use Only	
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)	Verify (3)	Verify (4)
5	Appendix B Lab Test Results	H.Liu	5	Unconsolidated Undrained Test for Sample D-10, A-11-216. UU test is generaally conducted on saturated soil sample. For non-saturated sample, comfining pressure should be less than existing overburden to make the test results usable.	RI		The UU test was conducted in accordance with the ASTM standard. ASTM does not require saturating the samples for UU tests. The measured degree of saturation of the sample (95.4%) shows that the sample is close to a saturated condition. In reviewing the test result, it was noticed that the depth and confining stress were incorrectly shown; they should be 45 feet and 3.6 ksf, respectively. The revised UU test result will be included in Appendix B.					
6	Appendix C Calculations	H.Liu	6	For all stability calcs, please specify the exact shear parameter (not a range) used for Capistrano formation (Tc) to reach the FOS shown on the graphs of the analyses	RI		To clarify, a range for Tc was not used for stability analysis. Two different sets of shear strengths were used, one for along-bedding and one for cross-bedding, to account for anisotropic strength of the bedded formation (refer to Table 3 in the GDR). The slope stability plots will be revised to show along-bedding and cross-bedding strengths.					
7												

(1) Responder's Initials - concur with response.
(2) Reviewer's Initials - concur with response.
(3) Kiewit/HNTB initials that comment was satisfied.
(4) Agency initials that comment was satisfied.

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

January 11, 2013

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Addendum No. 1 for Final Geotechnical Design Report***
Interstate 5 HOV Widening, Segment 2 Project
Cities of San Clemente and Dana Point, Orange County, California
12-Ora-5, PM 3.8/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

Dear Mr. Montes:

Earth Mechanics, Inc. (EMI) prepared the Geotechnical Design Report (GDR), dated March 30, 2012, and submitted the report to Caltrans for review. The Caltrans Office of Geotechnical Design South 1 (OGDS-1) reviewed the GDR and provided their comments in a spreadsheet dated July 24, 2012. EMI prepared responses to the OGDS-1 review comments, which were reviewed and concurred with by the OGDS-1 reviewer. EMI prepared the Final GDR, dated September 21, 2012, by incorporating the responses into the report. A copy of the approval email from Caltrans OGDS-1 is provided in Attachment 1.

Based on recent information provided by AECOM, we understand that "SoundSorb" panels were added on the following three sound walls: Sound Wall (SW) Nos. 250L, 278L, and 294L. The sound wall on concrete barriers are now identified as "Concrete Barrier Type 736S (Modified 2)" and "Concrete Barrier Type 736SV (Modified)". Therefore, the Caltrans Standard Plan sheets B15-6, B15-7, and B15-8 are no longer applicable. The portion of the SW No. 278L, where pile footing spans over utility, is now identified as "Pile Footing for Spanning Utilities (Mod)". Therefore, the Caltrans Standard Plan sheet B15-15 is no longer applicable. Furthermore, for SW Nos. 250L, 278L, and 294L, the CIDH pile diameter was increased from 16 to 18 inches in order to provide required concrete cover for pile reinforcing due to the corrosive nature of the soils at the project site. For the portion of SW No. 278L spanning over utility, the diameter of the CIDH pile (24 inches) remains the same.

This addendum is intended to amend geotechnical information for SW Nos. 250L, 278L, and 294L. Using the new Service-I Limit, Strength Limit, and Extreme Limit State load conditions provided by AECOM (Attachment 2) due to the placement of SoundSorb (sound absorptive material), the pile foundations for SW Nos. 250L, 278L, and 294L were reevaluated.

This addendum is a supplement to the Final GDR and should be attached to the front of the Final GDR.

Sections 8.5, 8.5.1, 8.5.2, and 8.5.3 of the Final GDR (EMI, 2012) are amended as follows.

8.5 Sound Walls

8.5.1 SW No. 250L

Proposed Sound Wall (SW) No. 250L will be located on the south side of the mainline between the Avenida Vista Hermosa Interchange and the Avenida Vaquero UC. The wall will extend from about Station 249+50 to Station 259+64 and will be located near the top of an existing descending slope. The proposed wall is about 1,020 feet long, has heights between 10.33 feet and 11.67 feet, and is a Caltrans standard masonry block sound wall on barrier. Based on recent information provided by AECOM, SoundSorb panels (sound absorptive material) will be placed on SW No. 250L (sound wall on concrete barrier) which is now identified as "Concrete Barrier Type 736S (Modified 2)" wall on the plans.

Two exploratory boreholes and one CPT sounding were performed near the proposed alignment of SW No. 250L. The boreholes and CPT sounding are identified as A-11-214, CPT-11-215, and A-11-216. Based on observations from the boreholes and CPT, the stratigraphy along the wall alignment can be described as about 10 feet of stiff clay with interbedded medium dense to dense silty and clayey sand (fill) overlying about 20 to 30 feet of stiff to very stiff lean clay and fat clay (terrace deposits) overlying clayey siltstone/claystone of the Capistrano formation. The design shear strengths of the earth materials, used in geotechnical analysis, are provided in Table 3. Groundwater was not encountered in the two boreholes drilled near the proposed wall.

Due to the placement of SoundSorb panels on the sound wall, the Caltrans Standard Plan sheets B15-6, B15-7, and B15-8 are not applicable. Based on recent information provided by AECOM, the SW No. 250L will be supported on 18-inch diameter Cast-in-Drilled-Hole (CIDH) piles. The CIDH pile diameter was increased from 16 to 18 inches in order to provide required concrete cover for pile reinforcing due to the corrosive nature of the soils at the project site. The wall layout plans show that the bottom of the barrier will be situated between about elevations +180.5 and +169.6 ft. Lateral pile solutions were generated using the computer program LPILE (Ensoft, 2010), the in-situ soil strength parameters, and the new combined pile-head shear and overturning moment due to the placement of SoundSorb, which was provided by AECOM. The soil resistance versus pile deflection (p-y) curves for sandy soils were developed using the API criteria (API, 2000), and the p-y curves for clayey soils were developed using the Matlock criteria (1970). A cracked sectional modulus (EI) of the CIDH pile was used.

In order to verify the use of the pile lengths and spacing shown on the standard plans, lateral pile analyses were performed to determine the pile-head deflection under the Service-I Limit State condition. Results of the lateral pile analyses show that the pile-head deflection under the Service-I Limit State condition is within the allowable deflection of 0.25 inch. Lateral pile analyses were also performed under the Strength and Extreme Limit State load conditions. Results of the lateral pile analyses in terms of maximum shear, bending moment, and lateral deflection along the pile length for a free-head condition under Service-I Limit, Strength, and Extreme Limit State load conditions are included in Attachment 2.

8.5.2 SW No. 278L

Proposed SW No. 278L will be located on the south side of the mainline just northwest of the Avenida Vaquero UC; the sound wall will adjoin proposed RW No. 275L and proposed RW No.

287L at both ends. The wall extends from about Station 277+72 to Station 288+56. The proposed wall is about 1,082 feet long, has heights between 11.67 feet and 14.33 feet, and is a Caltrans standard masonry block sound wall on barrier. Based on recent information provided by AECOM, SoundSorb panels (sound absorptive material) will be placed on SW No. 278L (sound wall on concrete barriers) which is now identified as "Concrete Barrier Type 736S (Modified 2)" and "Concrete Barrier Type 736SV (Modified)" walls on the plans. The portion of the sound wall, where the pile footing spans over utility, is now identified as "Pile Footing for Spanning Utilities (Mod)" on the plans.

Two exploratory boreholes and one CPT sounding were performed near the proposed alignment of SW No. 278L. The boreholes and CPT sounding are identified as CPT-11-223, A-11-225, and A-11-228. Based on observations from the boreholes and CPT, the stratigraphy along the wall alignment varies from about 4 feet to 40 feet of stiff to very stiff clayey soil (fill) overlying very stiff to hard clayey siltstone/claystone of the Capistrano formation. The design shear strengths of the earth materials, used in geotechnical analysis, are provided in Table 3. Groundwater was not encountered in the boreholes drilled near the proposed wall.

Due to the placement of SoundSorb panels on the sound wall, the Caltrans Standard Plan sheets B15-6, B15-7, B15-8, and B15-15 are not applicable. Based on recent information provided by AECOM, the SW No. 278L will be supported on 18-inch diameter Cast-in-Drilled-Hole (CIDH) piles. The CIDH pile diameter was increased from 16 to 18 inches in order to provide required concrete cover for pile reinforcing due to the corrosive nature of the soils at the project site. For the portion of SW No. 278L spanning over utility, the diameter of the CIDH pile (24 inches) remains the same. The wall layout plans show that the bottom of the barrier will be situated between about elevations +124.5 and +154.0 ft. Like SW No 250L described above, lateral pile solutions were generated using the computer program LPILE (Ensoft, 2010), the in-situ soil strength parameters, and the new combined pile-head shear and overturning moment due to the placement of SoundSorb, which was provided by AECOM.

In order to verify the use of the pile lengths and spacing shown on the standard plans, lateral pile analyses were performed to determine the pile-head deflection under the Service-I Limit State condition. Results of the lateral pile analyses show that the pile-head deflection under the Service-I Limit State condition is within the allowable deflection of 0.25 inch. Lateral pile analyses were also performed under the Strength and Extreme Limit State load conditions. Results of the lateral pile analyses in terms of maximum shear, bending moment, and lateral deflection along the pile length for a free-head condition under Service-I Limit, Strength, and Extreme Limit State load conditions are included in Attachment 2.

8.5.3 SW No. 294L

Proposed SW No. 294L will be located on the south side of the mainline between the Avenida Vaquero UC and the Camino de Estrella Interchange. The wall will extend from about Station 293+36 to Station 294+74 and will be located within relatively flat ground. The proposed wall is about 138 feet long, has a constant height of 14.33 feet, and is a Caltrans standard masonry block sound wall on barrier. Based on recent information provided by AECOM, SoundSorb panels (sound absorptive material) will be placed on SW No. 294L (sound wall on concrete barrier) which is now identified as "Concrete Barrier Type 736S (Modified 2)" wall on the plans.

One exploratory borehole and one CPT sounding were performed near proposed SW No. 294L, which are identified as CPT-11-229 and A-11-230. At the CPT location, the subsurface is believed to consist of about 30 feet of stiff to very stiff clayey and silty soil (fill) overlying Capistrano formation. At the borehole location, the stratigraphy was observed to be about 12 feet of very stiff terrace deposits overlying stiff to hard clayey siltstone/claystone of the Capistrano formation. The design shear strengths of the earth materials, used in geotechnical analysis, are provided in Table 3. Groundwater was encountered at a depth of about 45 feet in the exploratory borehole.

Due to the placement of SoundSorb panels on the sound wall, the Caltrans Standard Plan sheets B15-6, B15-7, and B15-8 are not applicable. Based on recent information provided by AECOM, the SW No. 294L will be supported on 18-inch diameter Cast-in-Drilled-Hole (CIDH) piles. The CIDH pile diameter was increased from 16 to 18 inches in order to provide required concrete cover for pile reinforcing due to the corrosive nature of the soils at the project site. The wall layout plans show that the bottom of the barrier will be situated between about elevations +167.6 and +171.7 ft. Like SW No 250L described above, lateral pile solutions were generated using the computer program LPILE (Ensoft, 2010), the in-situ soil strength parameters, and the new combined pile-head shear and overturning moment due to the placement of SoundSorb, which was provided by AECOM.

In order to verify the use of the pile lengths and spacing shown on the standard plans, lateral pile analyses were performed to determine the pile-head deflection under the Service-I Limit State condition. Results of the lateral pile analyses show that the pile-head deflection under the Service-I Limit State condition is within the allowable deflection of 0.25 inch. Lateral pile analyses were also performed under the Strength and Extreme Limit State load conditions. Results of the lateral pile analyses in terms of maximum shear, bending moment, and lateral deflection along the pile length for a free-head condition under Service-I Limit, Strength Limit, and Extreme Limit State load conditions are included in Attachment 2.

Earthwork and construction recommendations in the Final GDR (EMI, 2012) are applicable to the SW Nos. 250L, 278L, and 294L unless specifically superseded by recommendations herein.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions please call us.

Sincerely,
EARTH MECHANICS, INC.

REGISTERED PROFESSIONAL ENGINEER
GNANAPRAGASAM J. GUNARANJAN
No. GE2970
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(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

17800 Newhope Street, Suite B, Fountain Valley, California 92708 Tel: (714) 751-3826 Fax: (714) 751-3928

Attachments:

Attachment 1 - Approval Email from Caltrans Office of Geotechnical South 1 (OGDS-1) on September 11, 2012 for EMI responses to OGDS-1 Review Comments.

Attachment 2 - Revised Design Calculations.

Reference:

Earth Mechanics, Inc., 2012. Final Geotechnical Design Report, I-5 HOV Widening, Segment 2 Project, Cities of San Clemente and Dana Point, Orange County, California; 12-Ora-5, PM 3.8/6.2; Caltrans Project No. 1200020278 (EA No. 12-0F96C01), September 21.

ATTACHMENT 1

APPROVAL EMAIL FROM CALTRANS OFFICE OF GEOTECHNICAL SOUTH 1 (OGDS-1) ON SEPTEMBER 11, 2012 FOR EMI RESPONSES TO OGDS-1 REVIEW COMMENTS

Ranjan Gunaranjan

From:	Andrew Korkos
Sent:	Tuesday, September 18, 2012 10:08 AM
To:	Ranjan Gunaranjan
Subject:	FW: I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report
Attachments:	EA12-0F96C_Review Comments_FR for RWs218R-330R_I-5 HOV_8-13-12 EMI RESPONSES_REV 9-11-12.xls; EA0F96C_Review Comments_GDR for I-5 HOV Segment 2 _PM3.8-6.2_7-24-12 WITH RESPONSES REV_9-11-12.xls

EARTH MECHANICS, INC.
17800 Newhope Street, Suite B, Fountain Valley, California 92708
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www.earthmech.com
****

-----Original Message-----
From: Haitao Liu [mailto:haitao_liu@dot.ca.gov]
Sent: Tuesday, September 11, 2012 2:46 PM
To: Andrew Korkos
Cc: Luqi Yang (luqi_yang@dot.ca.gov); casey.weber@aecom.com; Deh-Jeng Jang; Sungro Cho
Subject: Re: I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report

Andrew,

We've reviewed the response attached based on our previous discussion, and concur with you for the proposed revisions on applicable items.

Please let us know if you have any question.

Best Regards,

Haitao Liu, P.E.

Transportation Engineer - Civil
Office of Geotechnical Design South - 1
Division of Engineering Services
Department of Transportation, California

5900 Folsom Blvd.
Sacramento, CA 95819
Office phone: (916) 227-0992
Cell phone: (916) 704-6519

Andrew Korkos
<A.Korkos@earthmech.com>
09/11/2012 02:26 PM

To: "haitao_liu@dot.ca.gov" <haitao_liu@dot.ca.gov>
cc: "Luqi Yang (luqi_yang@dot.ca.gov)" <luqi_yang@dot.ca.gov>, "casey.weber@aecom.com" <casey.weber@aecom.com>
Subject: I-5 HOV Segment 2 - Revised Comment/Response Tables for GDR and Non-Standard Walls Foundation Report

Haitao,

Attached are the revised comment/response tables for the GDR and the Non-Standard Walls Foundation Report. A few of the responses were revised, per our telephone conversation this morning. We will incorporate the responses into the Final version of the reports.

Please let me know if the responses are ok.

Thanks,
Andy
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Fax: (714) 751-3928
www.earthmech.com
****

(See attached file: EA12-0F96C_Review Comments_FR for RWs218R-330R_ I-5 HOV_8-13-12 EMI RESPONSES_REV 9-11-12.xls)(See attached file: EA0F96C_Review Comments_GDR for I-5 HOV Segment 2_PM3.8-6.2_7-24-12 WITH RESPONSES REV_9-11-12.xls)

ATTACHMENT 2

REVISED DESIGN CALCULATIONS

SUMMARY OF CONCRETE BARRIER TYPES AND WALL HEIGHTS FOR SOUND WALL (SW) NOS. 250L, 278L, AND 294L PROVIDED BY AECOM

Concrete Barrier Type 736S (Mod)

Sound Wall No.	Design H
250L	10'-4", 12'-4"
278L	14'-4", 16'-4"
294L	14'-4"

Concrete Barrier Type 736SV (Mod)

Sound Wall No.	Design H	Design H_e
250L	n/a	n/a
278L	14'-4"	2'-0", 4'-0"
294L	n/a	n/a

Pile Footing for Spanning Utilities (Mod)

Sound Wall No.	Design H
250L	n/a
278L	16'-4"
294L	n/a

AECOM

				SHEET	C1-1	OF	
JOB TITLE	Sound Wall (Mod) Check		ORIGINATOR	CW		DATE	12/18/2012
JOB No.	60218935	CALCULATION No. S-18	REVIEWER			DATE	

Concrete Barrier Type 736S (Mod) Summary

Introduction

Loads tabulated below are per pile at top of pile head.

Pile spacing similar to Caltrans Standard Plan B15-8 with $\Phi = 30°$.

Pile length provided by Geotech recommendation and is shown for informational purposes only; not used in calculations.

			Service Loads			Strength Loads			Extreme Event Loads		
Design H (ft)	S (ft)	L (ft)	$P_{service}$ (kips)	$V_{service}$ (kips)	$M_{service}$ (k-ft)	$P_{strength}$ (kips)	$V_{strength}$ (kips)	$M_{strength}$ (k-ft)	$P_{extreme}$ (kips)	$V_{extreme}$ (kips)	$M_{extreme}$ (k-ft)
10.33	10.00	9.00	14.45	1.24	7.27	18.06	3.97	23.75	14.45	11.34	47.35
12.33	10.00	9.50	16.55	1.40	9.89	20.69	4.73	33.28	16.55	11.34	56.97
14.33	10.00	10.50	18.65	1.57	12.82	23.32	5.48	44.34	18.65	11.34	74.31
16.33	10.00	11.50	20.75	1.73	16.09	25.94	6.24	56.90	20.75	11.94	94.04

Load Combinations

Load combinations per LRFD Table 3.4.1-1 (CA Ammendments).

Service Load Combinations

Ser I: 1.00 DC + 1.00 EH + 1.00 LS + 0.30 WS

Ser II: 1.00 DC + 1.00 EH + 1.30 LS

Strength Load Combinations

Str I: 1.25 DC + 1.50 EH + 1.75 LS

Str III: 1.25 DC + 1.50 EH + 1.40 WS

Str V: 1.25 DC + 1.50 EH + 1.35 LS + 0.40 WS

Extreme Event Load Combinations

Ext I: 1.00 DC + 1.00 EH + 1.00 EQD + 1.00 EQE

Ext II: 1.00 DC + 1.00 EH + 0.50 LS + 1.00 CT

Concrete Barrier Type 736SV (Mod) Summary

Introduction

Loads tabulated below are per pile at top of pile head.

Pile spacing similar to Caltrans Standard Plan B15-8 with $\Phi = 30°$.

Pile length provided by Geotech recommendation and is shown for informational purposes only; not used in calculations.

				Service Loads			Strength Loads			Extreme Event Loads		
Design H (ft)	H_e (ft)	S (ft)	L (ft)	$P_{service}$ (kips)	$V_{service}$ (kips)	$M_{service}$ (k-ft)	$P_{strength}$ (kips)	$V_{strength}$ (kips)	$M_{strength}$ (k-ft)	$P_{extreme}$ (kips)	$V_{extreme}$ (kips)	$M_{extreme}$ (k-ft)
14.33	2.00	4.50	16.00	9.91	1.49	6.59	12.39	2.92	20.27	9.91	6.48	41.76
14.33	4.00	3.00	16.25	7.96	2.08	6.70	9.95	2.93	15.03	7.96	6.74	39.69

Load Combinations

Load combinations per LRFD Table 3.4.1-1 (CA Ammendments).

Service Load Combinations

Ser I: 1.00 DC + 1.00 EH + 1.00 LS + 0.30 WS

Ser II: 1.00 DC + 1.00 EH + 1.30 LS

Strength Load Combinations

Str I: 1.25 DC + 1.50 EH + 1.75 LS

Str III: 1.25 DC + 1.50 EH + 1.40 WS

Str V: 1.25 DC + 1.50 EH + 1.35 LS + 0.40 WS

Extreme Event Load Combinations

Ext I: 1.00 DC + 1.00 EH + 1.00 EQD + 1.00 EQE

Ext II: 1.00 DC + 1.00 EH + 0.50 LS + 1.00 CT

Pile Footing for Spanning Utilities (Mod) Summary

Introduction

Loads tabulated below are per pile at top of pile head.

Tributary width = S/2 + 4'/2 (see Caltrans Standard Plan B15-15).

Pile spacing similar to Caltrans Standard Plan B15-15 with $\Phi = 30°$.

Pile length provided by Geotech recommendation and is shown for informational purposes only; not used in calculations.

			Service Loads			Strength Loads			Extreme Event Loads		
Design H (ft)	S (ft)	L (ft)	$P_{service}$ (kips)	$V_{service}$ (kips)	$M_{service}$ (k-ft)	$P_{strength}$ (kips)	$V_{strength}$ (kips)	$M_{strength}$ (k-ft)	$P_{extreme}$ (kips)	$V_{extreme}$ (kips)	$M_{extreme}$ (k-ft)
16.33	16.00	11.50	28.25	4.25	19.18	35.32	7.86	58.29	28.25	18.98	137.90

Load Combinations

Load combinations per LRFD Table 3.4.1-1 (CA Ammendments).

Service Load Combinations

Ser I: 1.00 DC + 1.00 EH + 1.00 LS + 0.30 WS

Ser II: 1.00 DC + 1.00 EH + 1.30 LS

Strength Load Combinations

Str I: 1.25 DC + 1.50 EH + 1.75 LS

Str III: 1.25 DC + 1.50 EH + 1.40 WS

Str V: 1.25 DC + 1.50 EH + 1.35 LS + 0.40 WS

Extreme Event Load Combinations

Ext I: 1.00 DC + 1.00 EH + 1.00 EQD + 1.00 EQE

Ext II: 1.00 DC + 1.00 EH + 0.50 LS + 1.00 CT

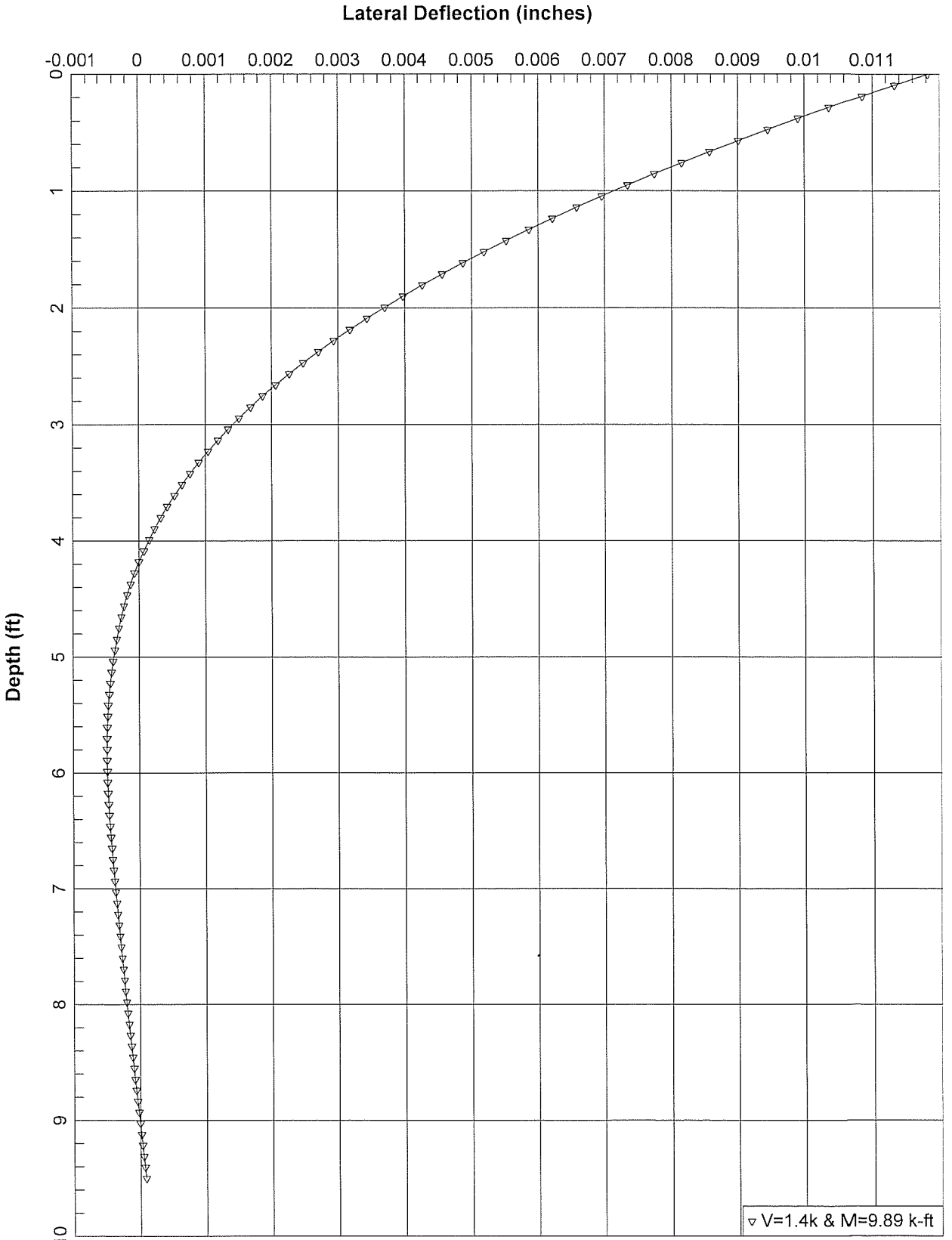
LATERAL PILE CAPACITY

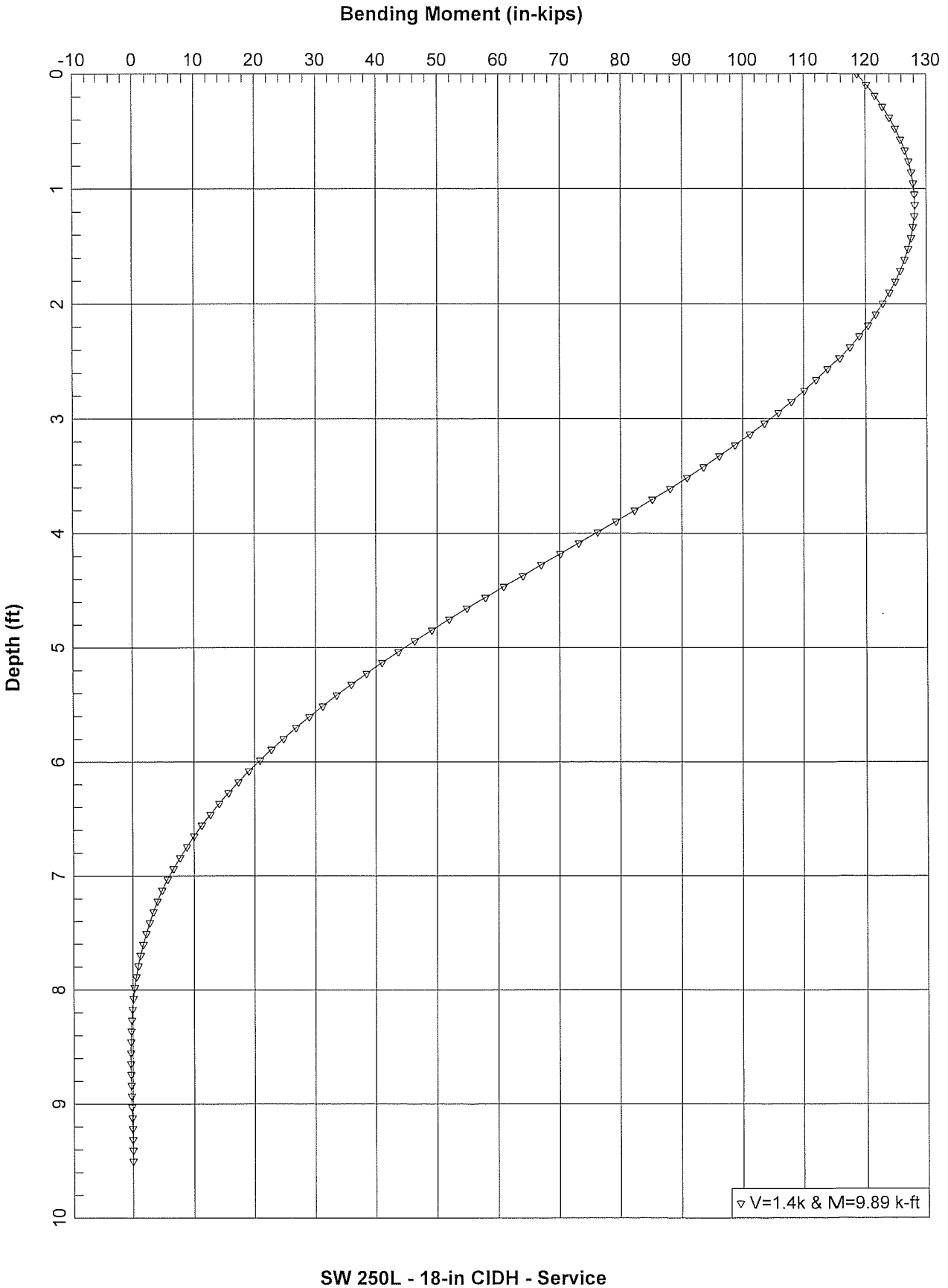
SITE-SPECIFIC SOIL CONDITION

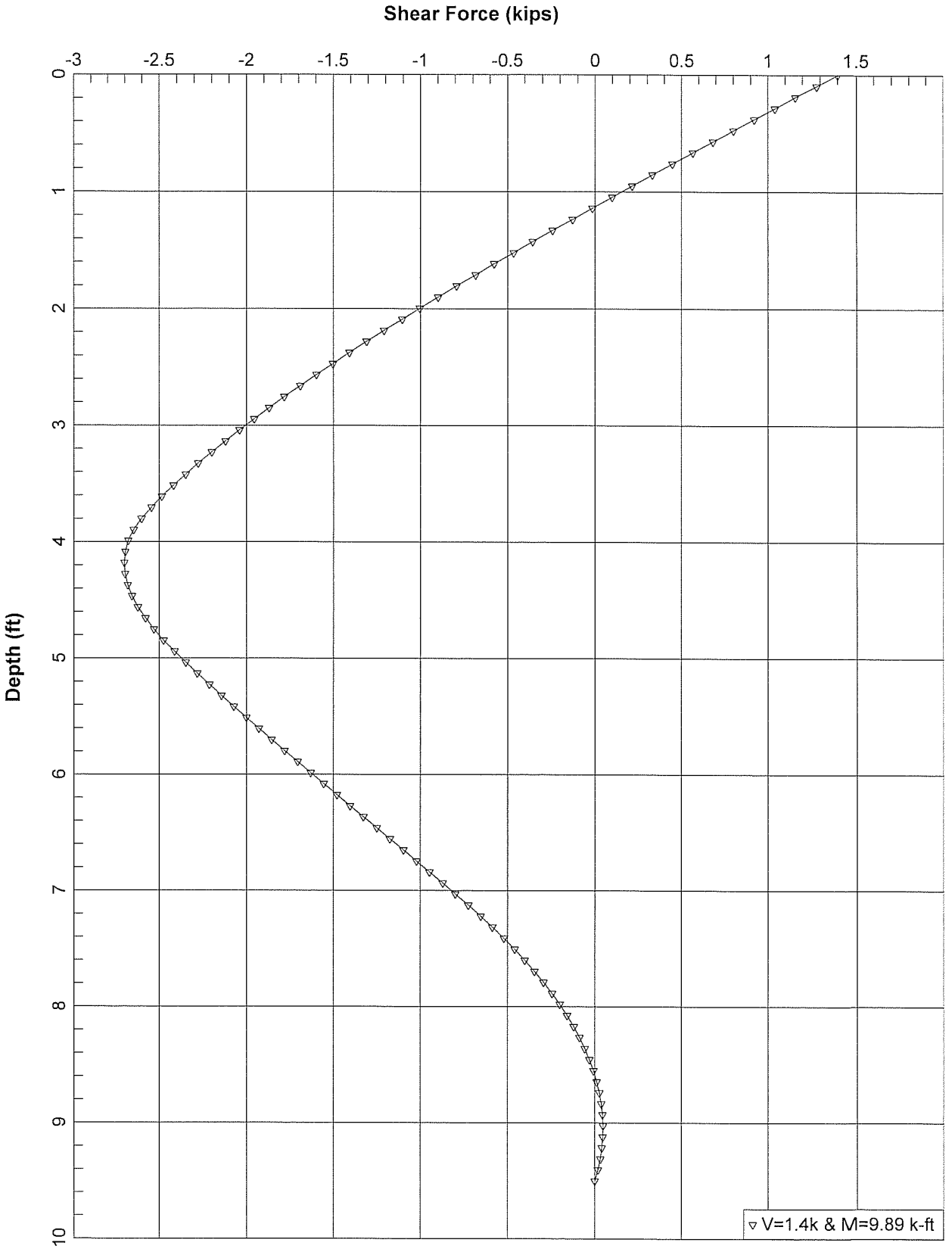
UNDRAINED SHEAR STRENGTH OF 1500 PSF

SW NO. 250L

CONCRETE BARRIER TYPE 736S (MOD)


Lateral Deflection (inches)
-0.001
0
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
0.009
0.01
0.011
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
▽ V=1.4k & M=9.89 k-ft
SW 250L - 18-in CIDH - Service


Bending Moment (in-kips)
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
▽ V=1.4k & M=9.89 k-ft
SW 250L - 18-in CIDH - Service



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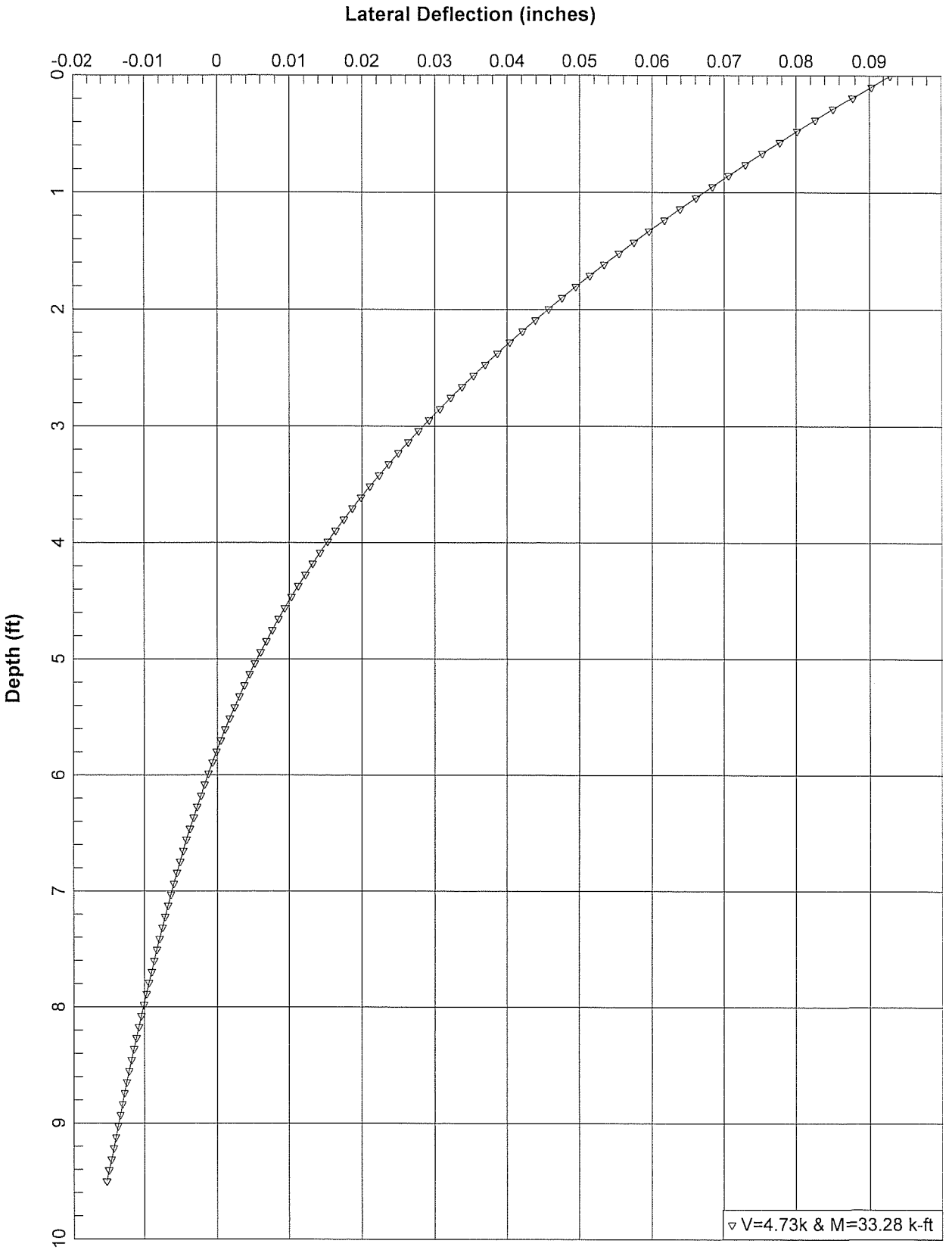
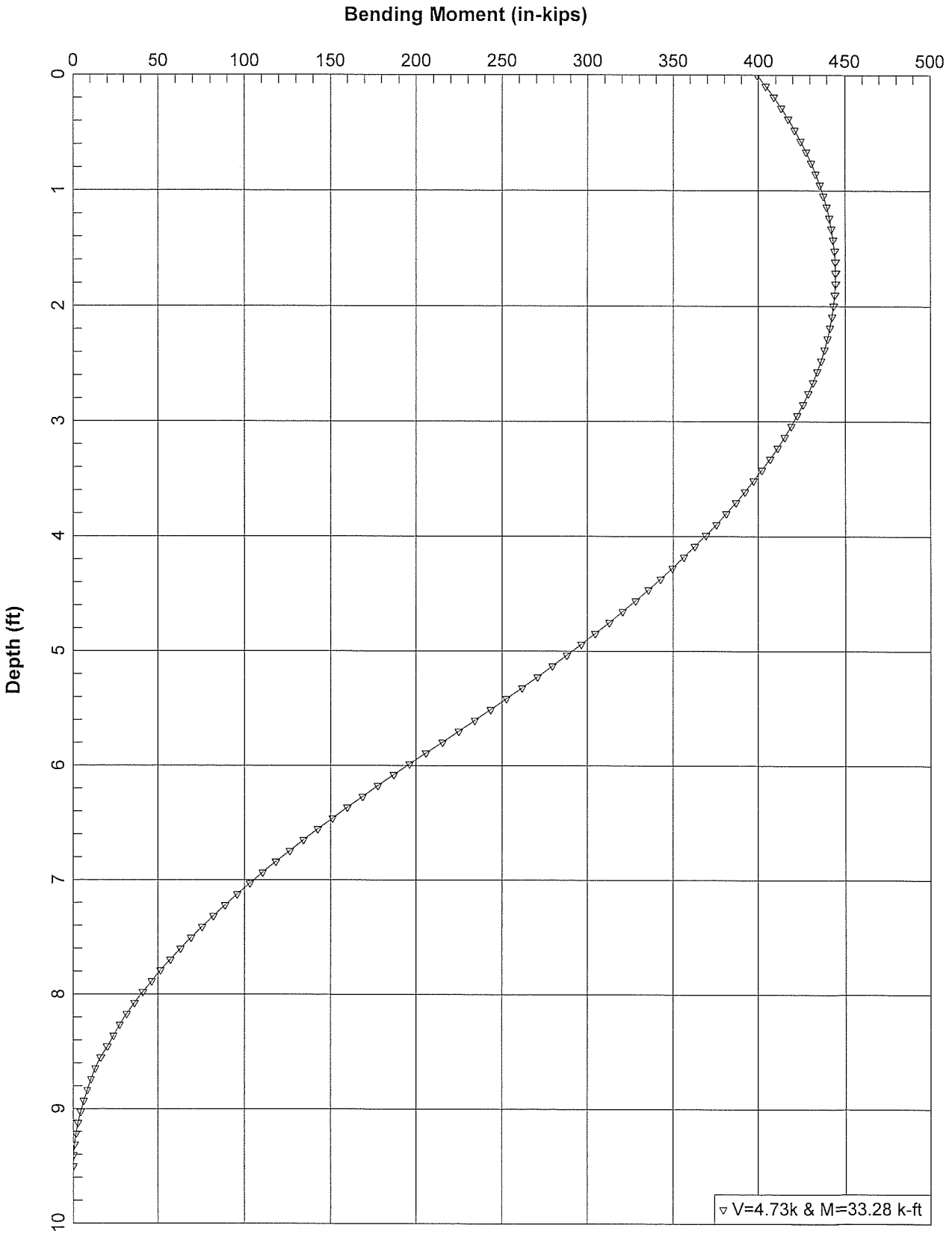
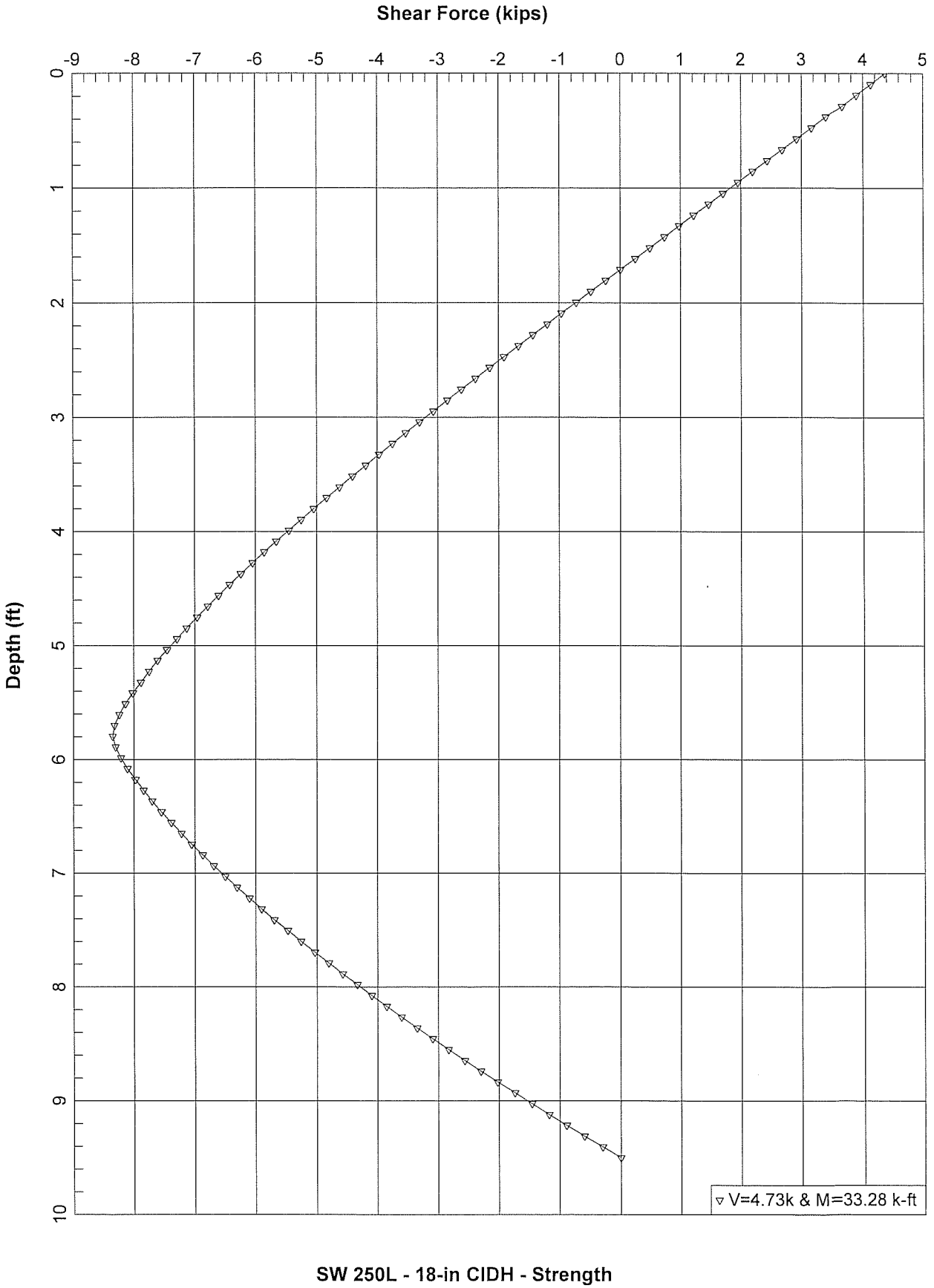


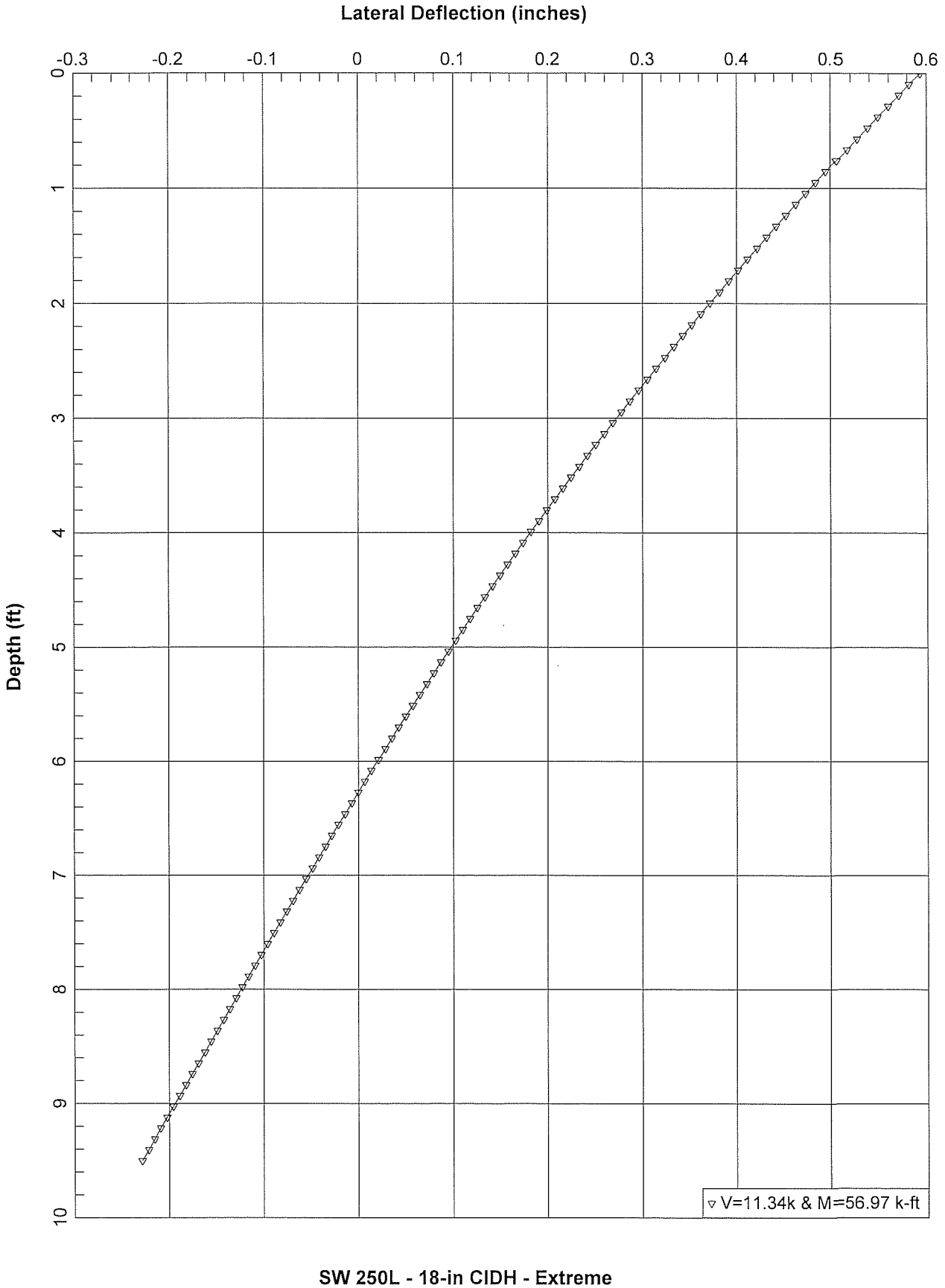
SW 250L - 18-in CIDH - Strength

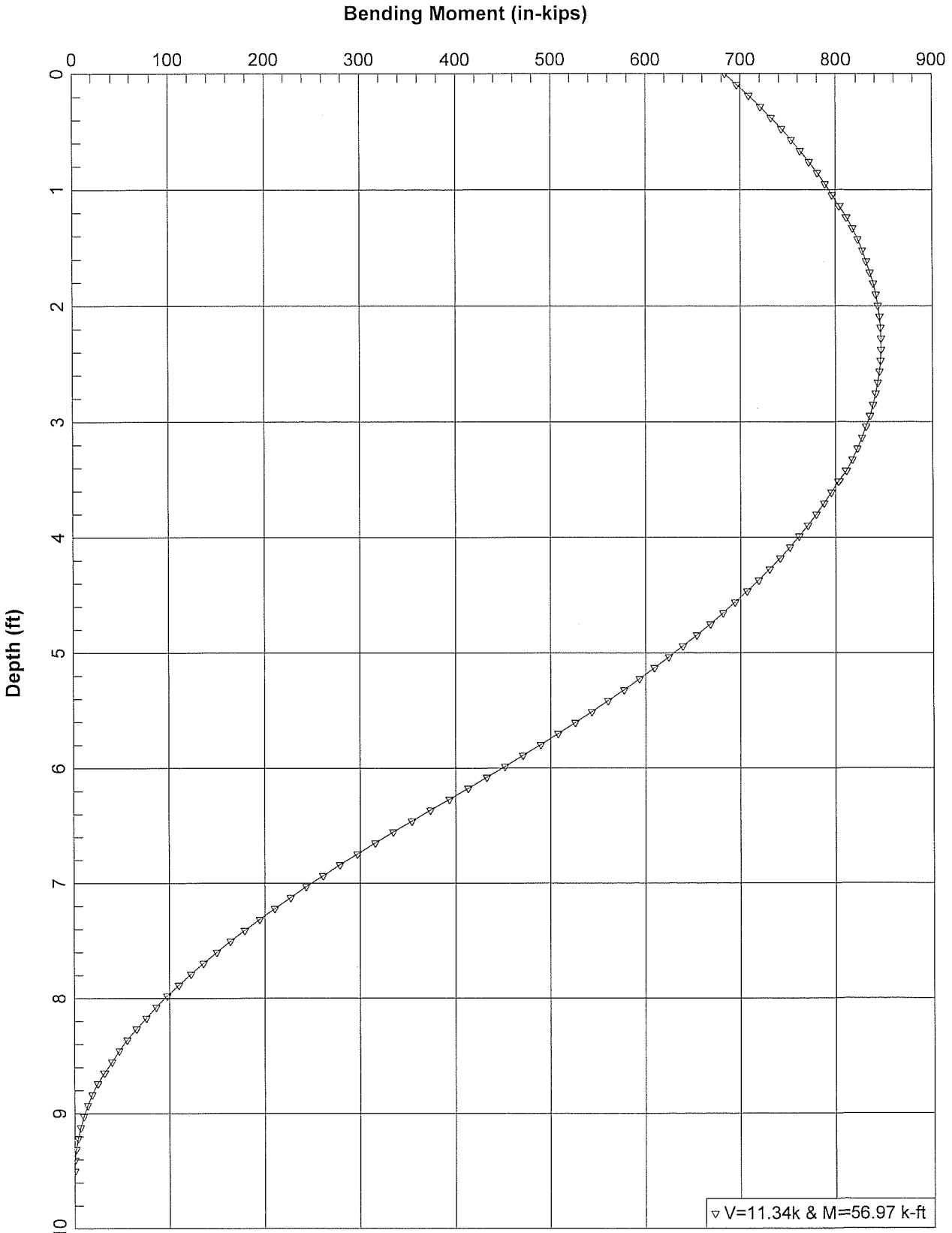


SW 250L - 18-in CIDH - Strength



SW 250L - 18-in CIDH - Strength


Lateral Deflection (inches)
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
▽ V=11.34k & M=56.97 k-ft
SW 250L - 18-in CIDH - Extreme



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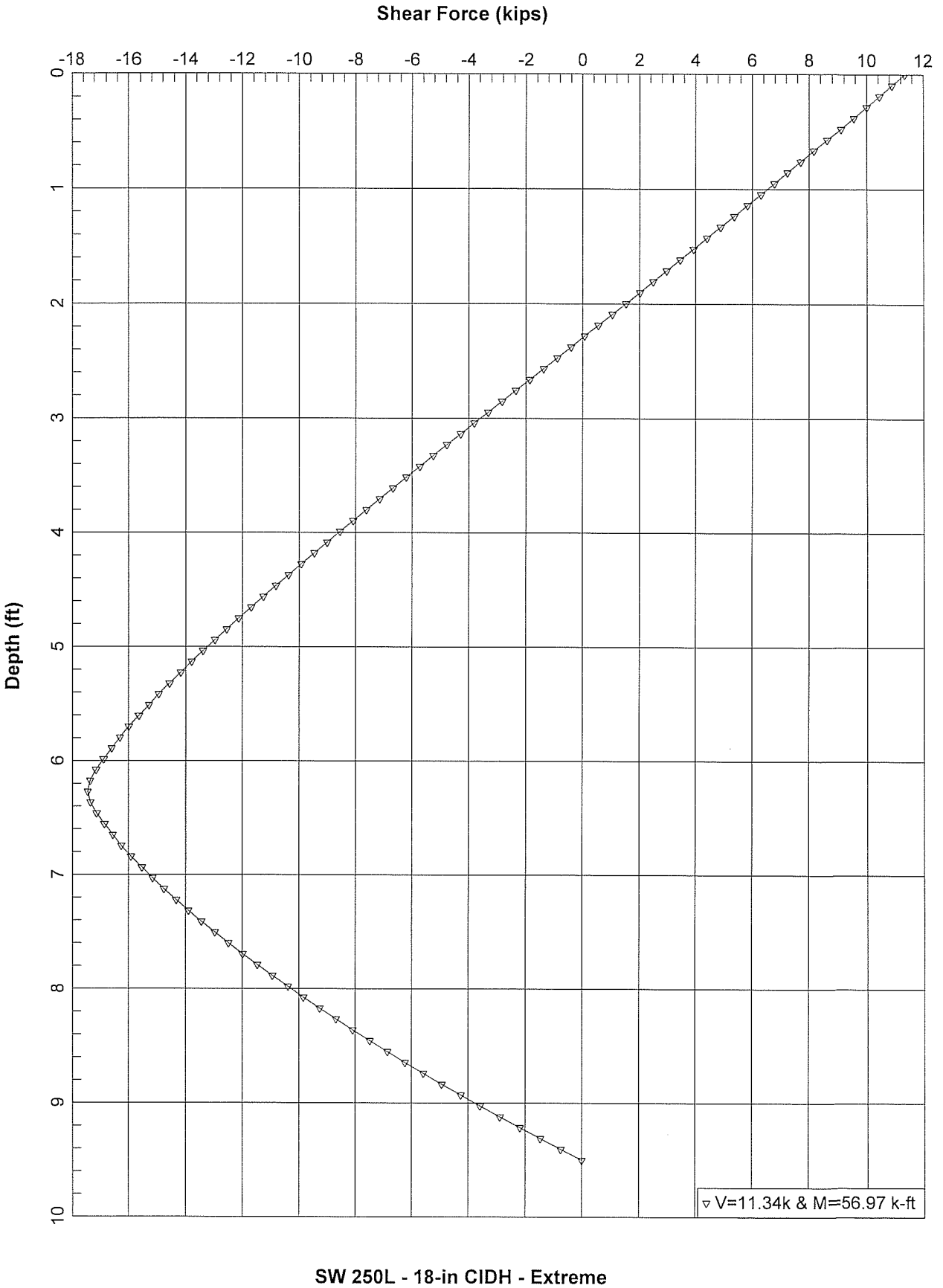
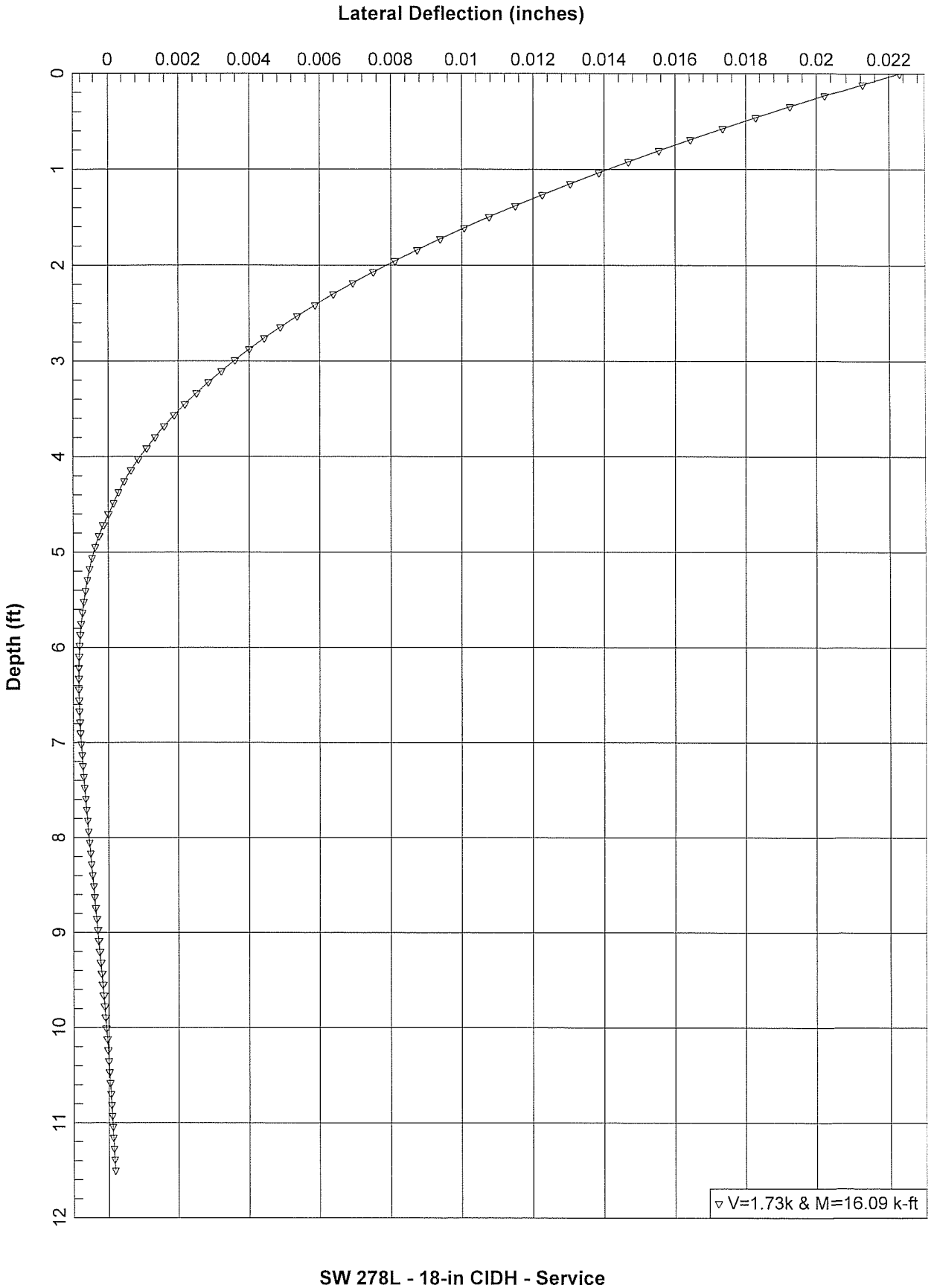


SW 250L - 18-in CIDH - Extreme

SW NO. 278L

CONCRETE BARRIER TYPE 736S (MOD)



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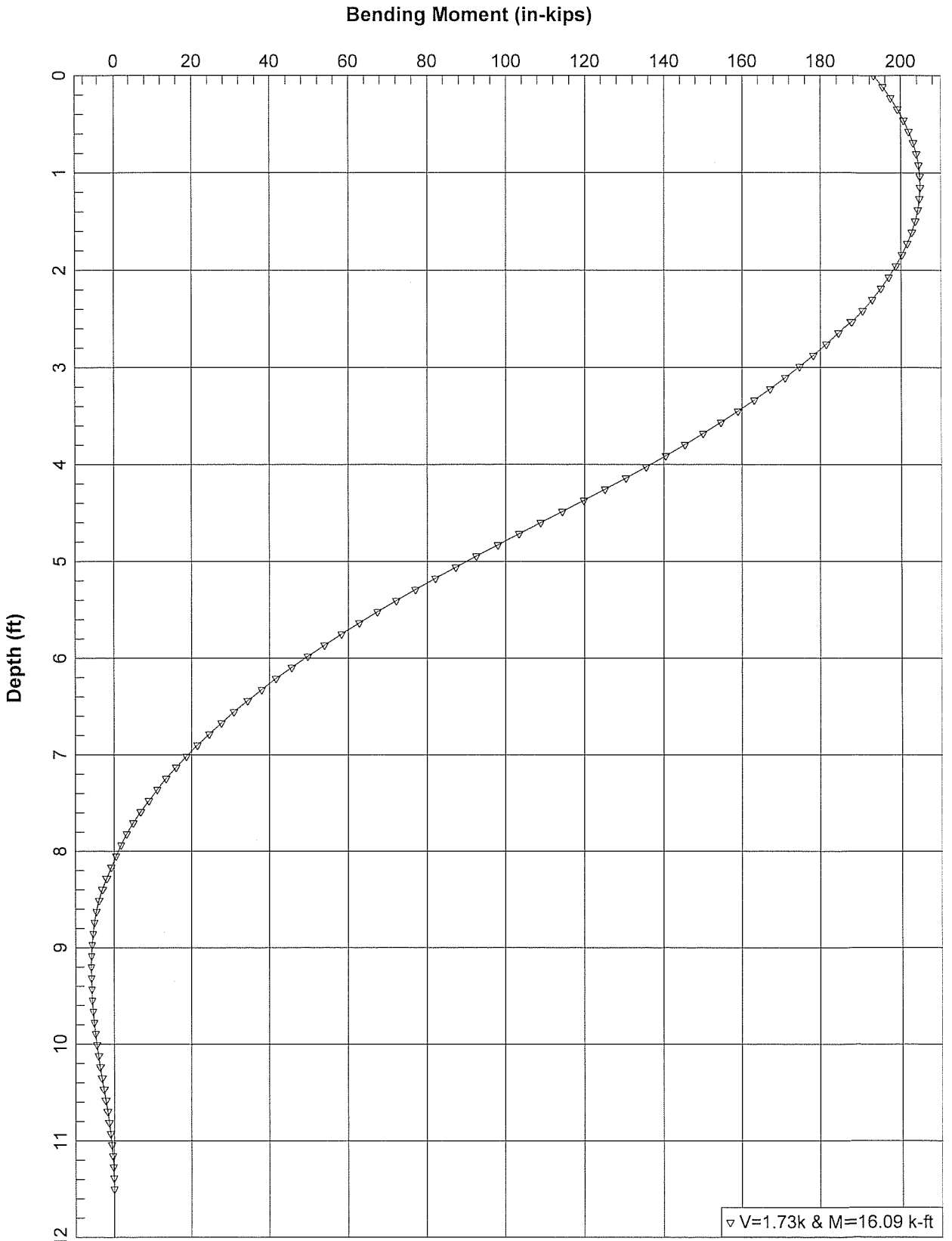

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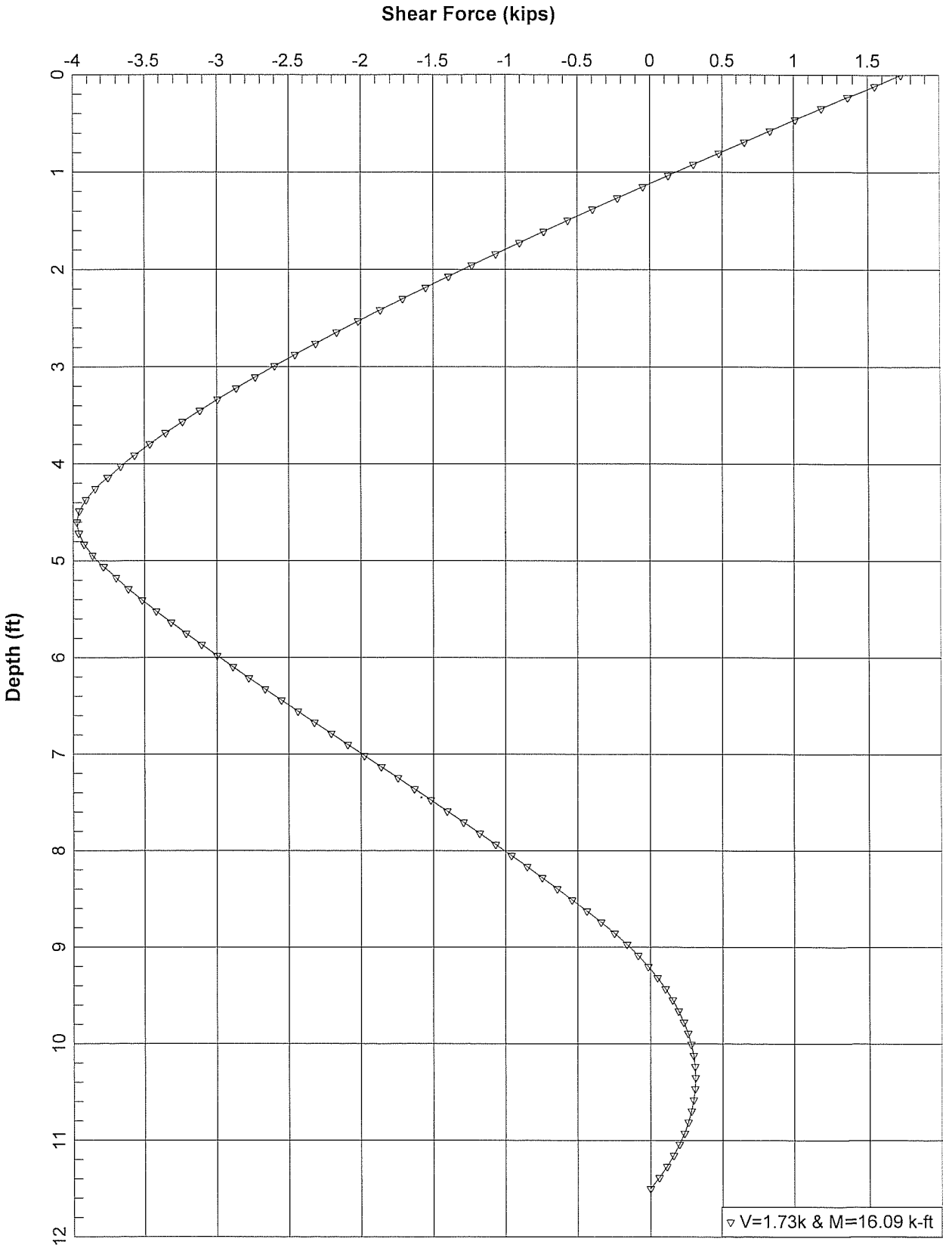
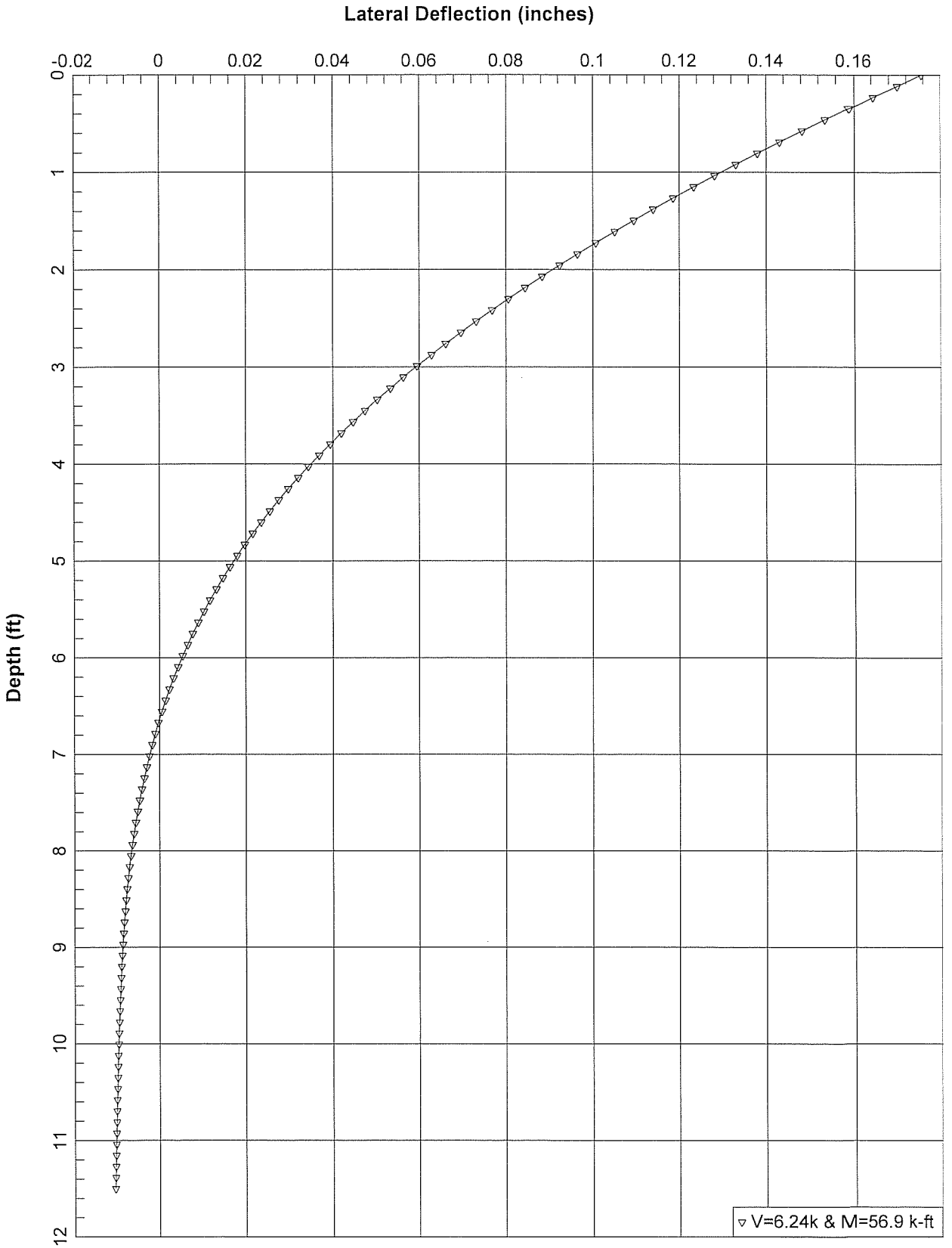
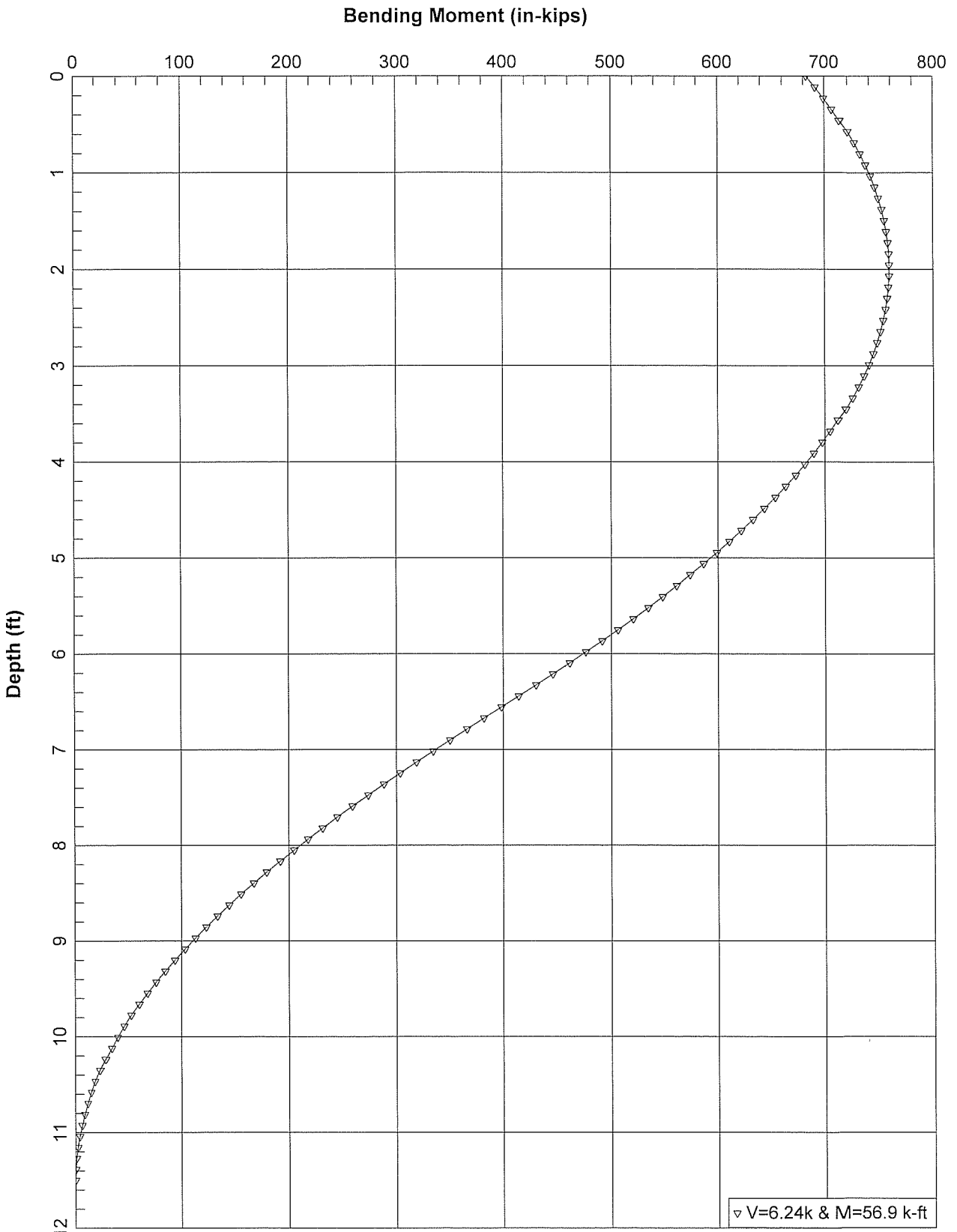


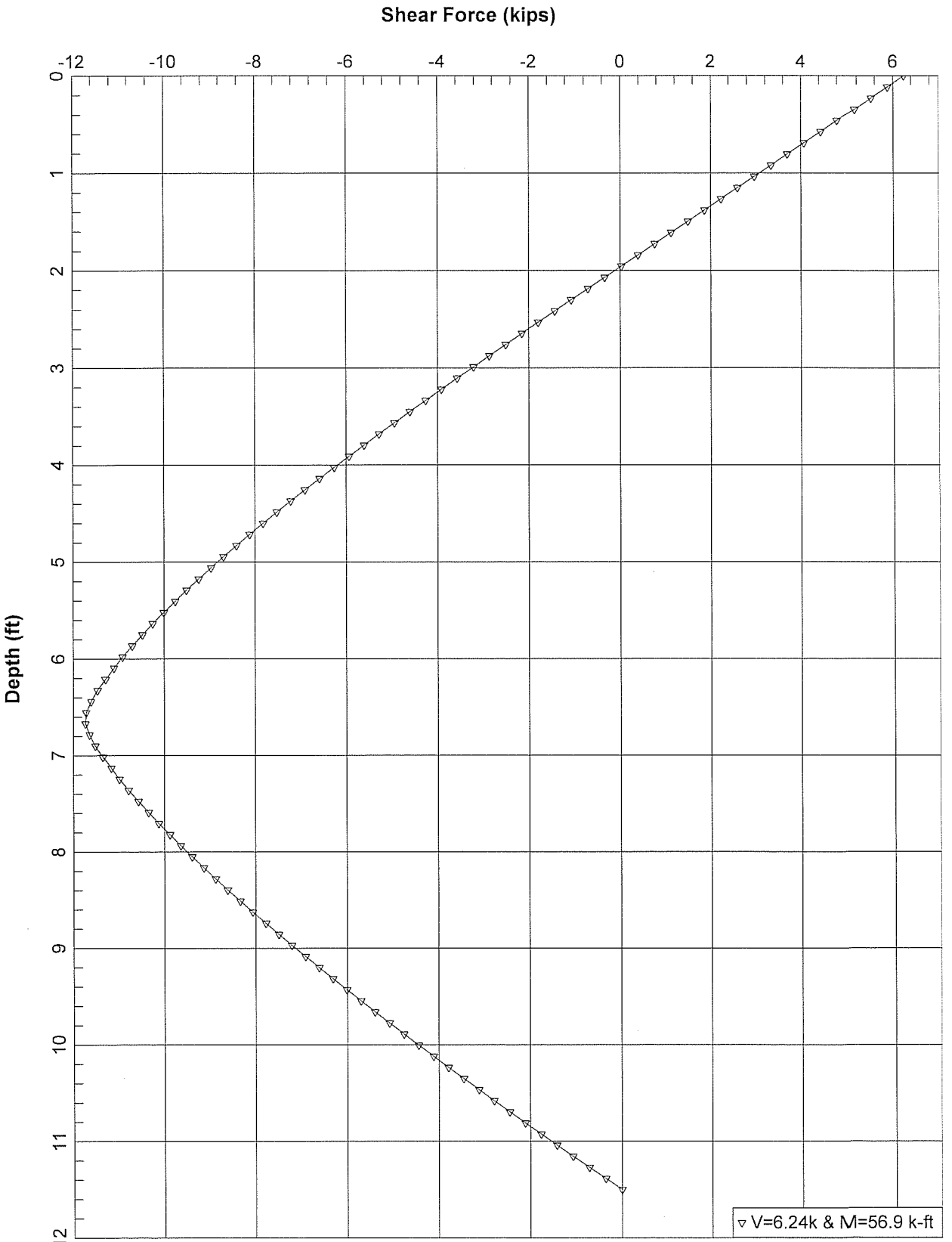
SW 278L - 18-in CIDH - Service



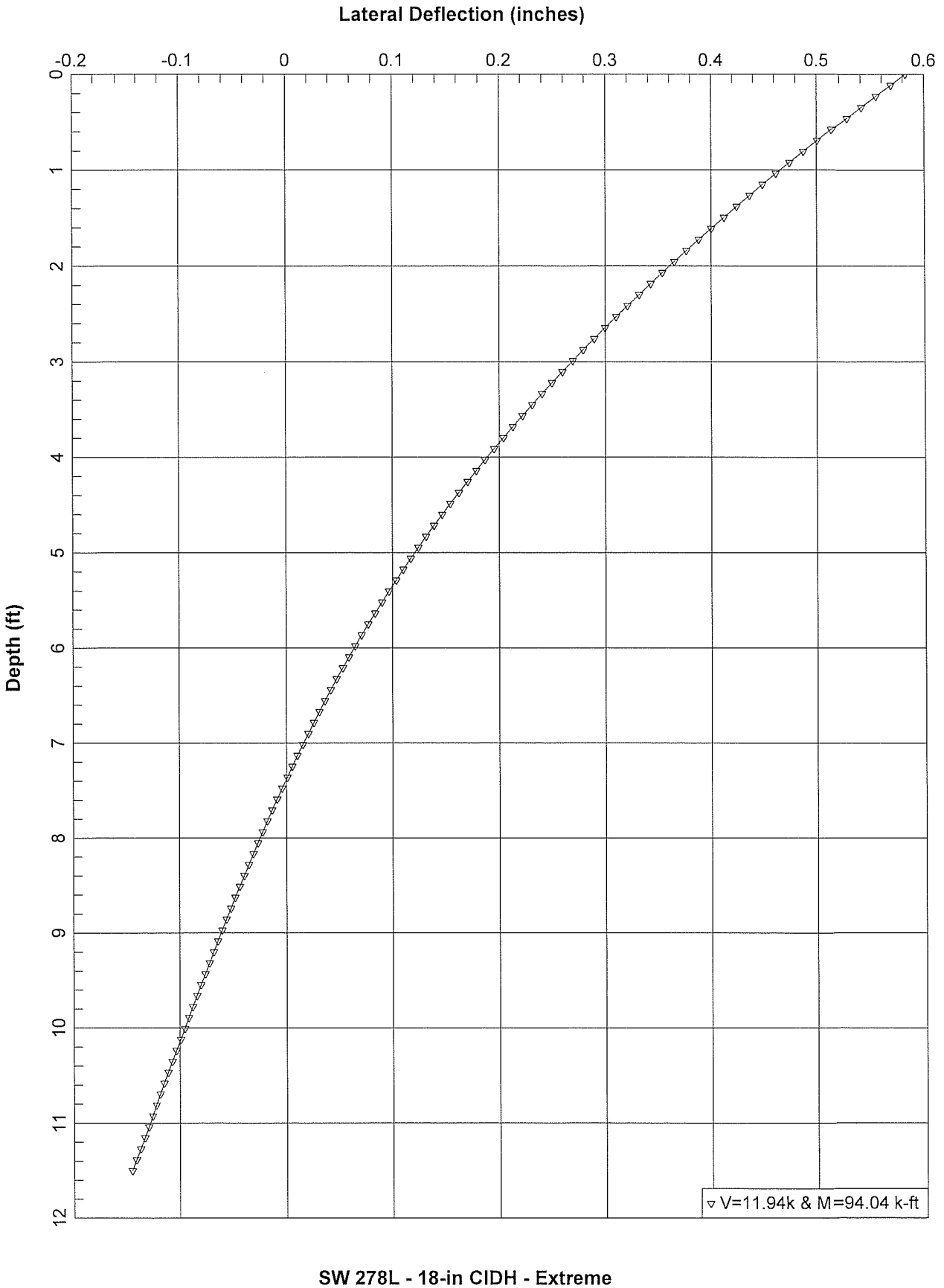
SW 278L - 18-in CIDH - Strength



SW 278L - 18-in CIDH - Strength



SW 278L - 18-in CIDH - Strength



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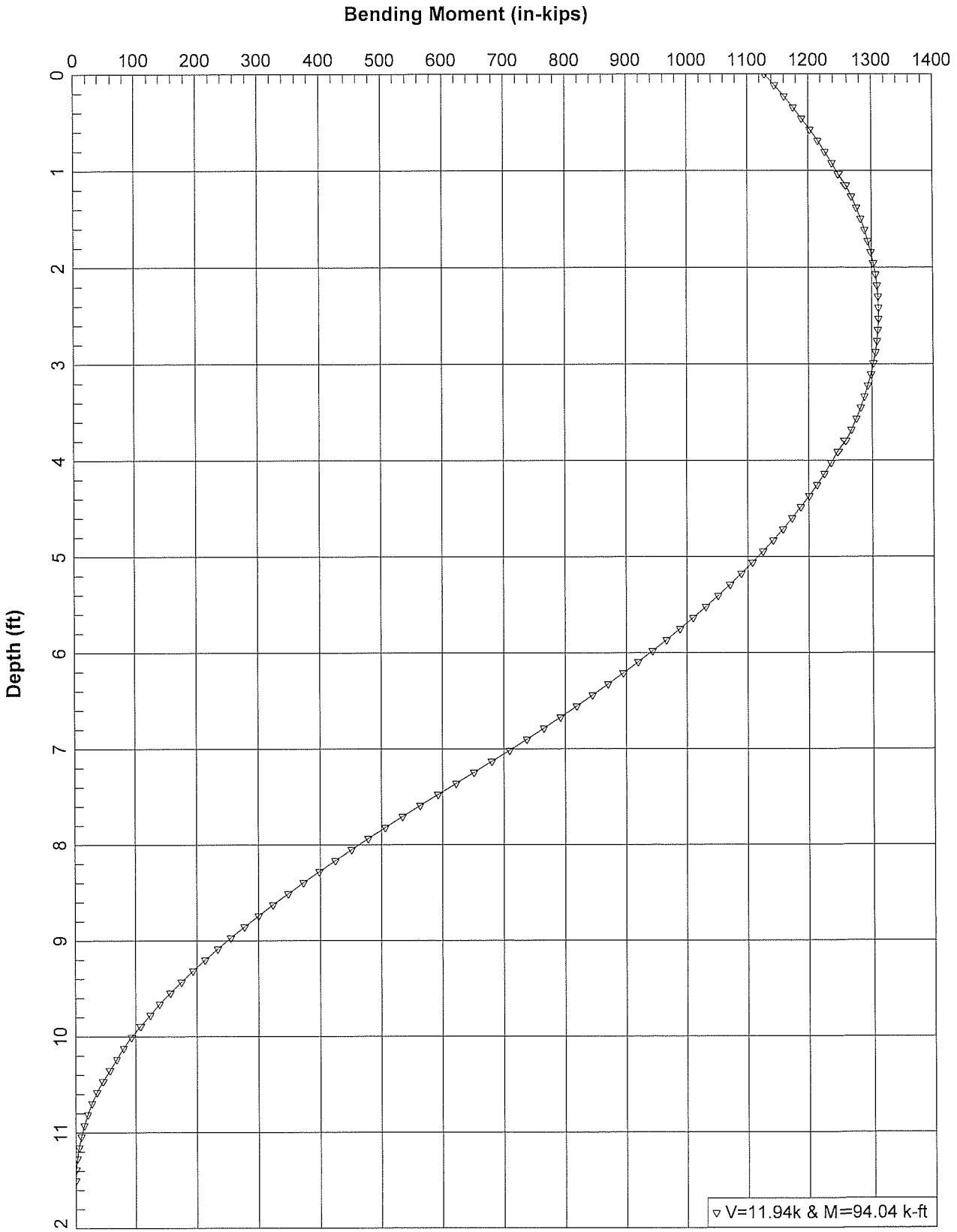
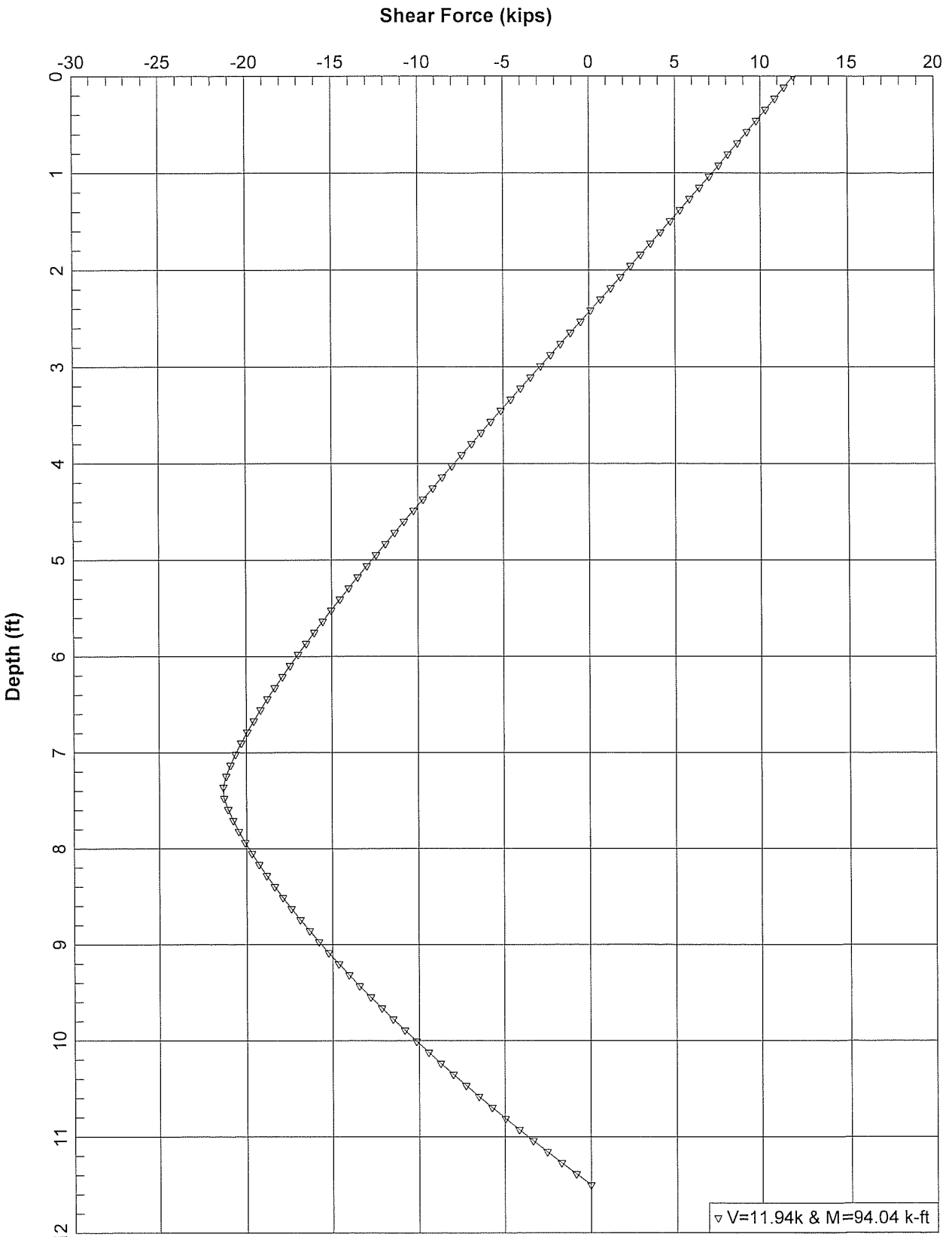
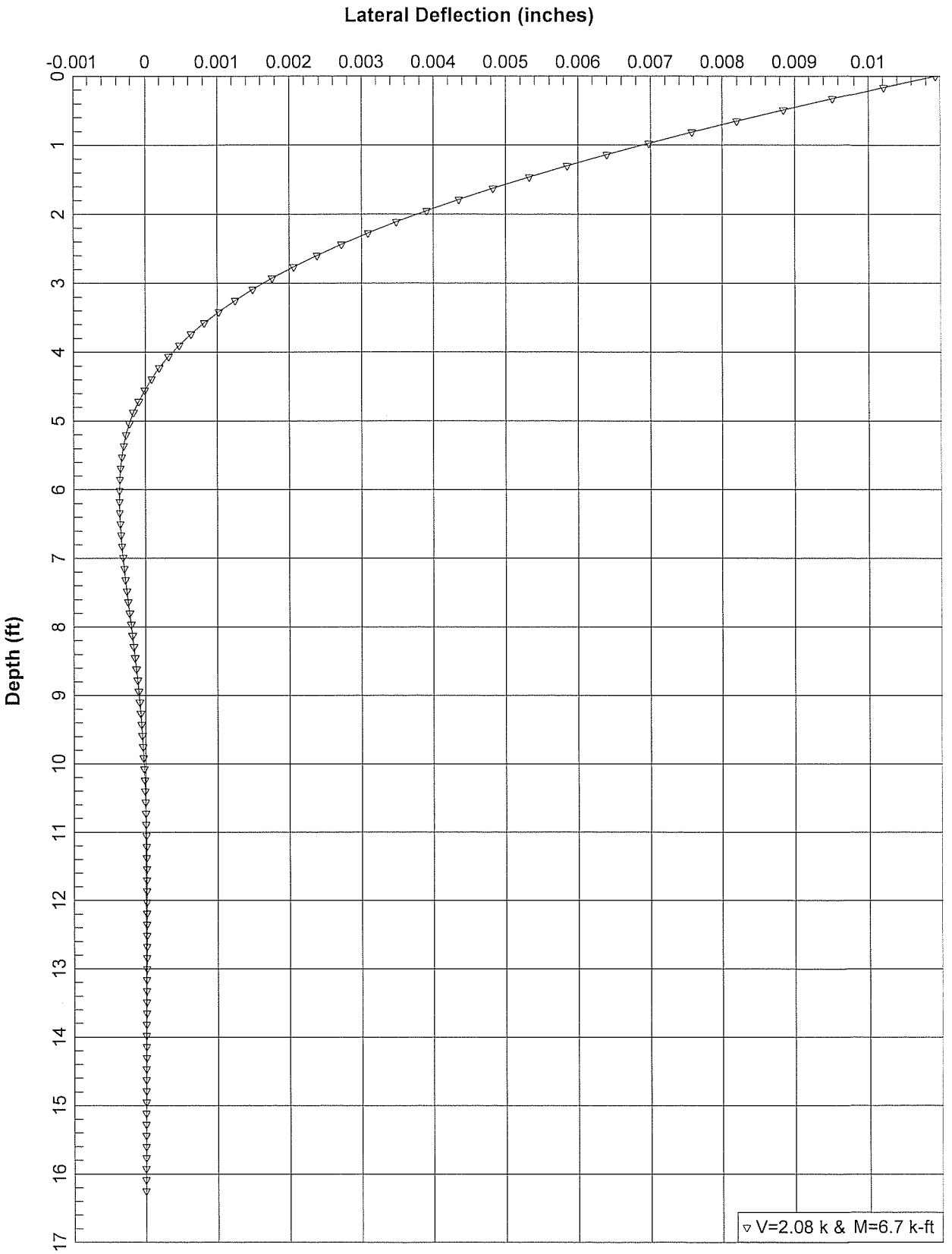


SW 278L - 18-in CIDH - Extreme

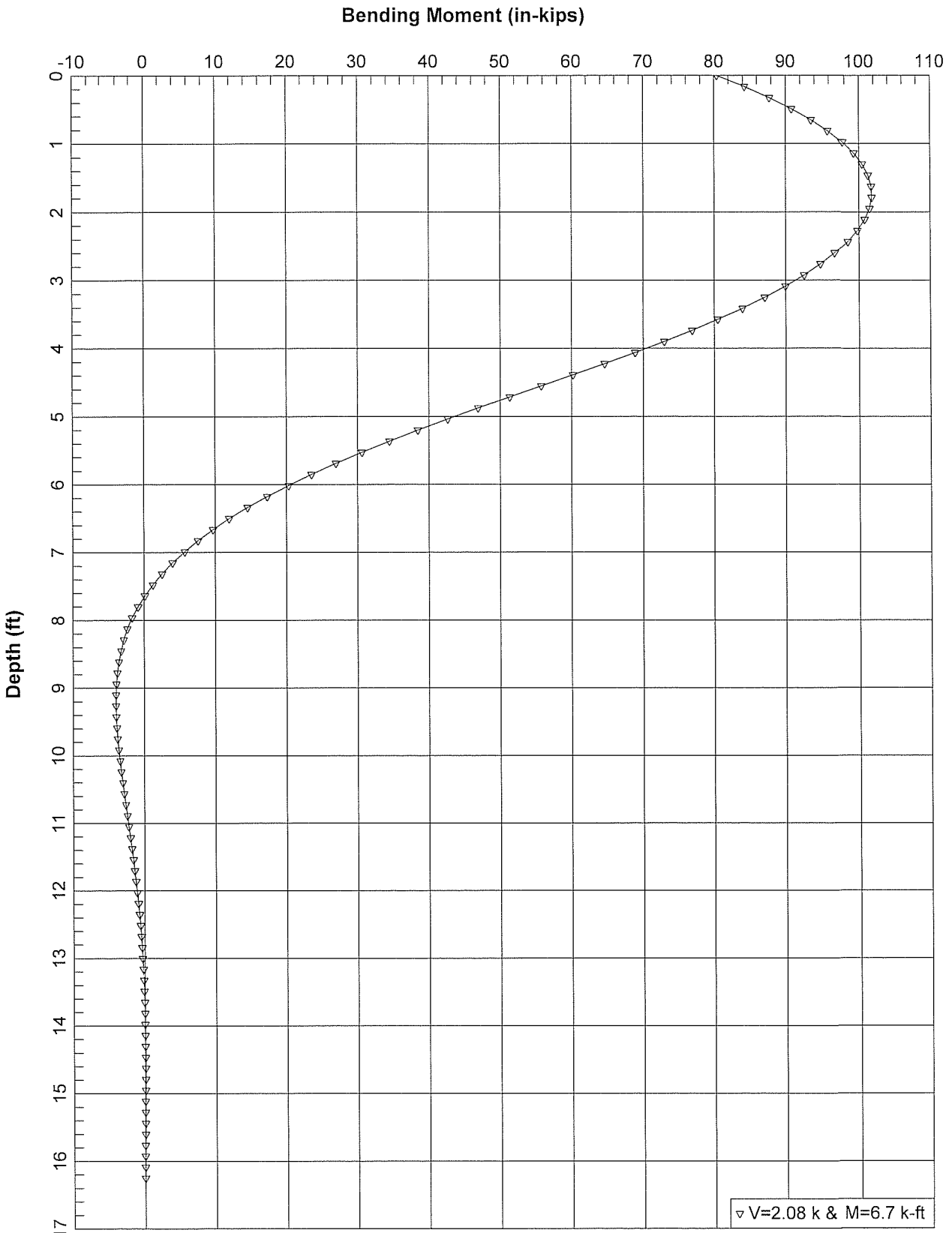


SW 278L - 18-in CIDH - Extreme

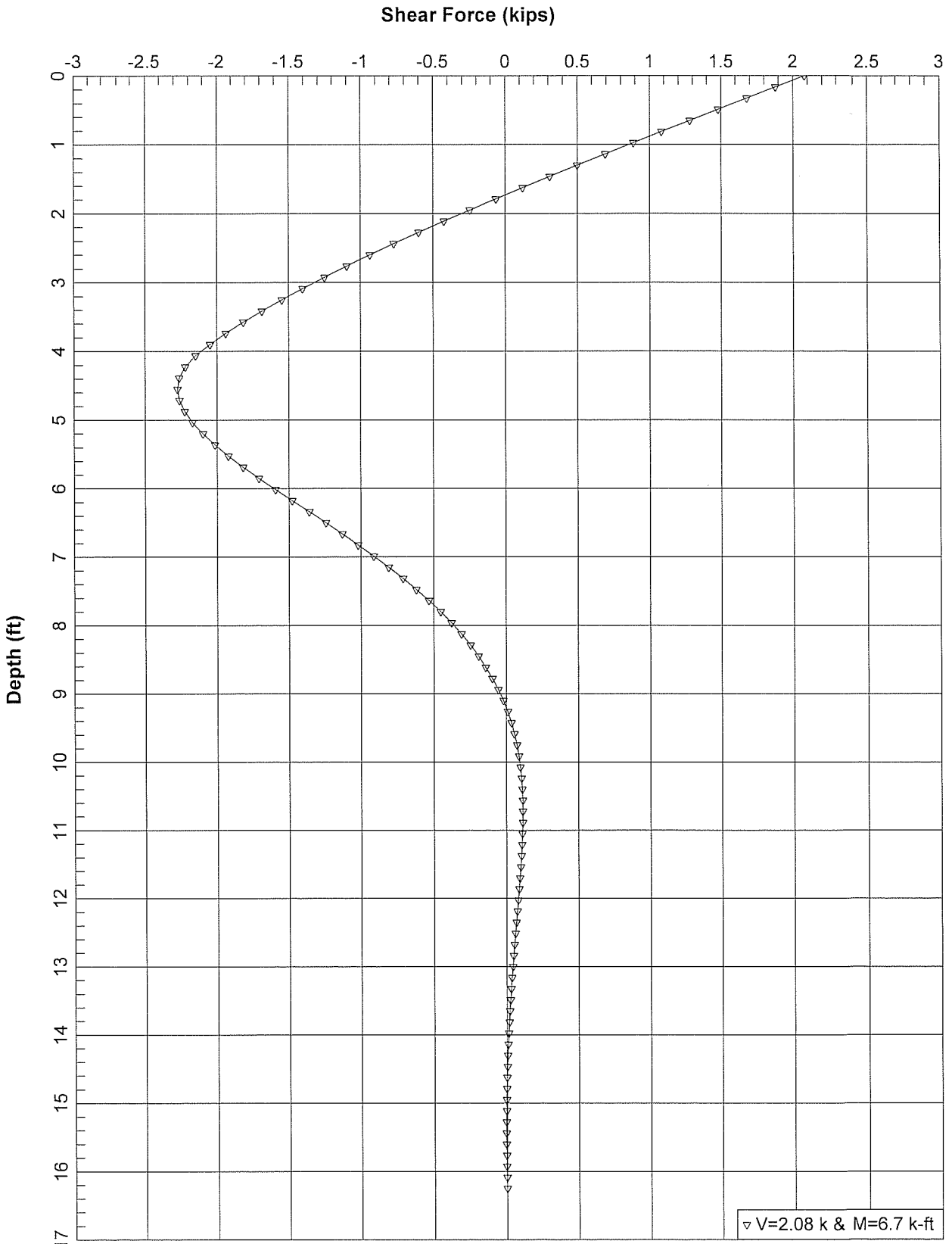
CONCRETE BARRIER TYPE 736SV (MOD)



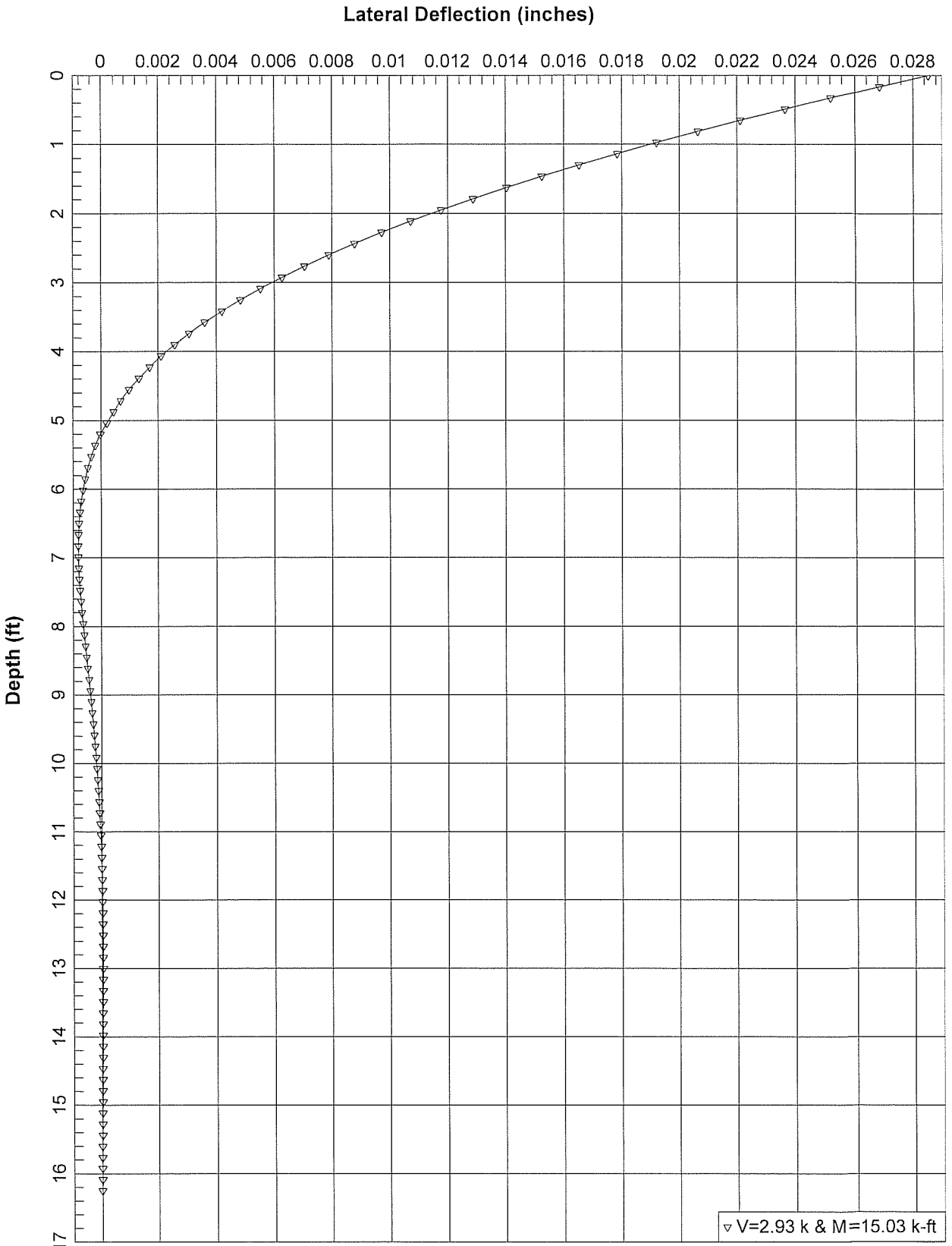
SW 278L - 18-in CIDH - Service



SW 278L - 18-in CIDH - Service



SW 278L - 18-in CIDH - Service



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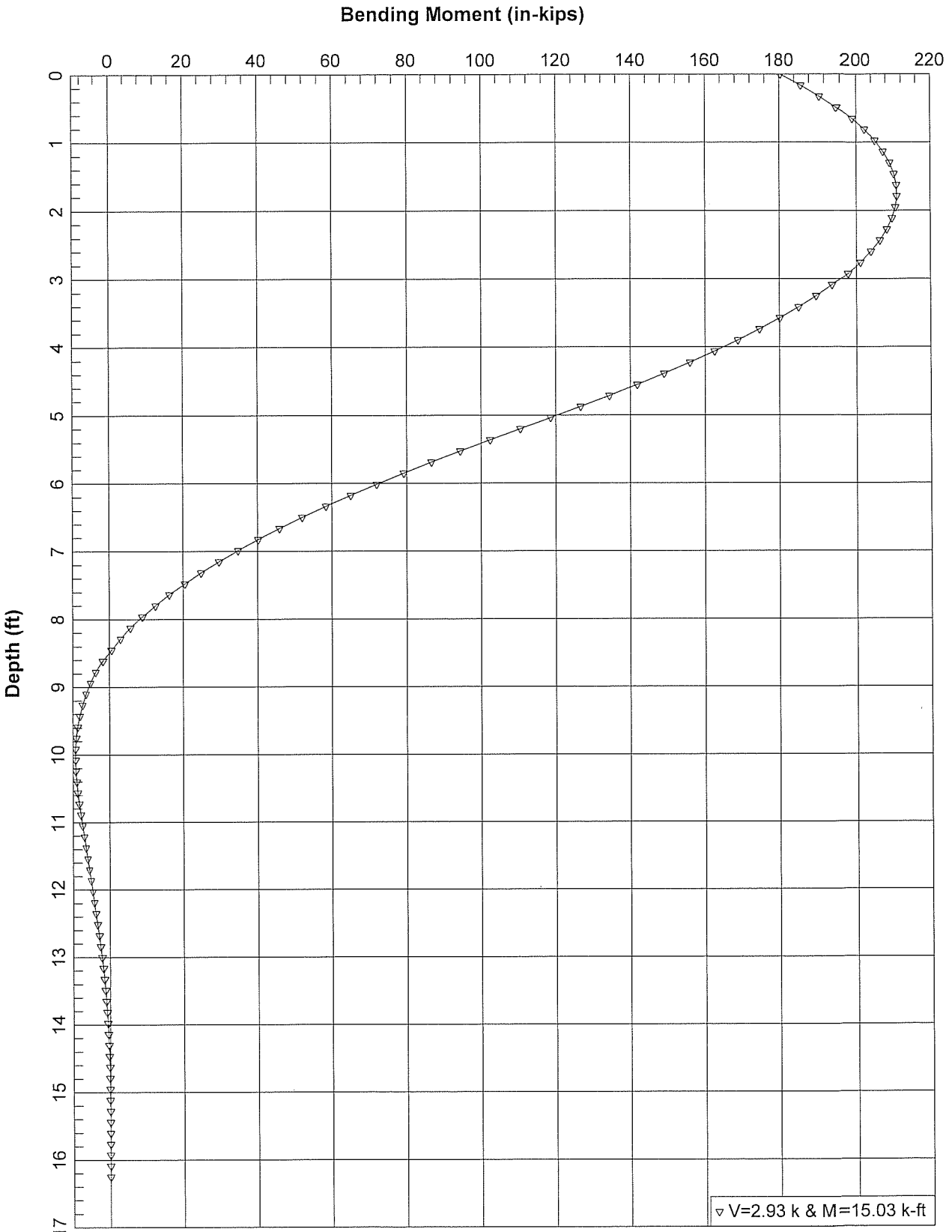

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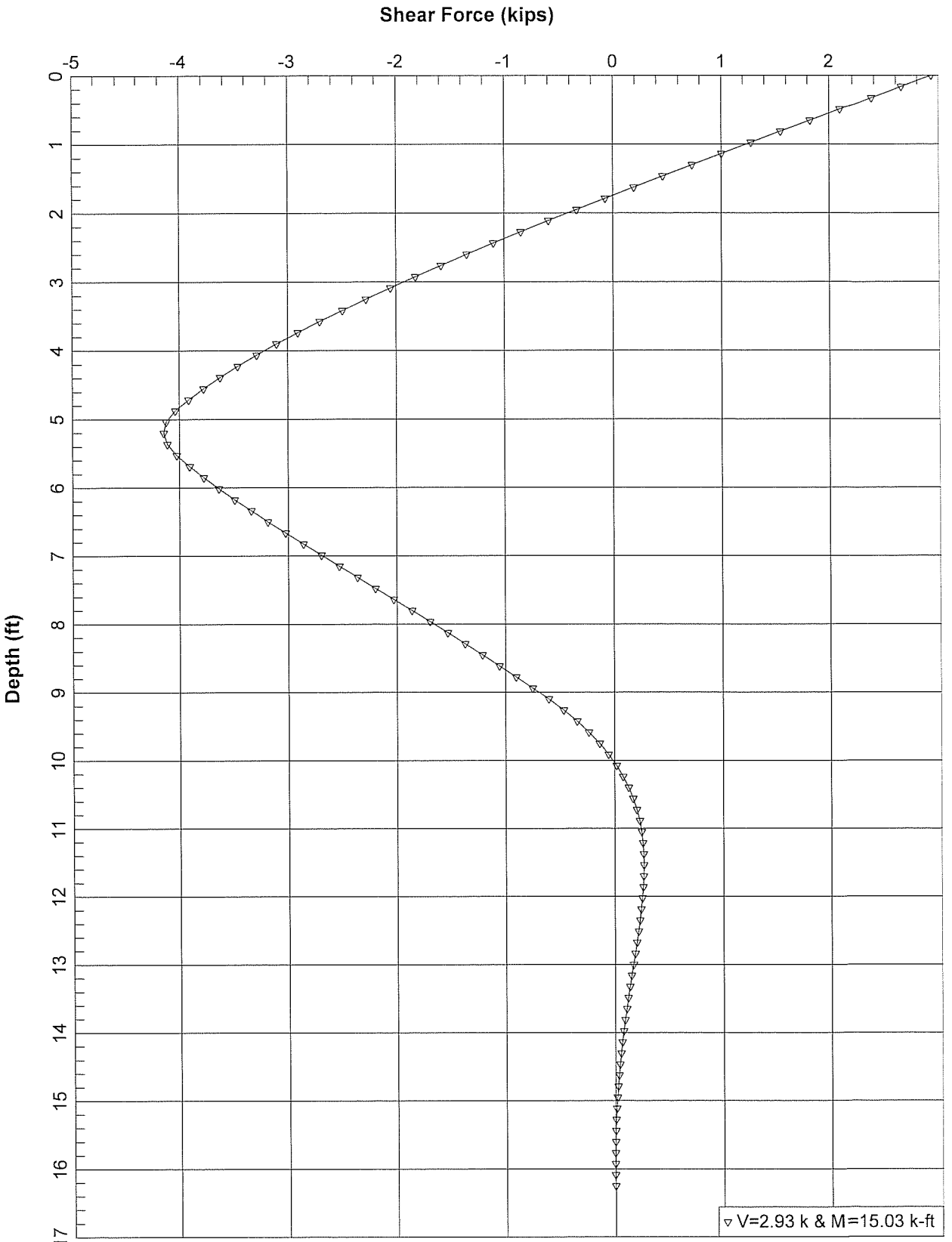

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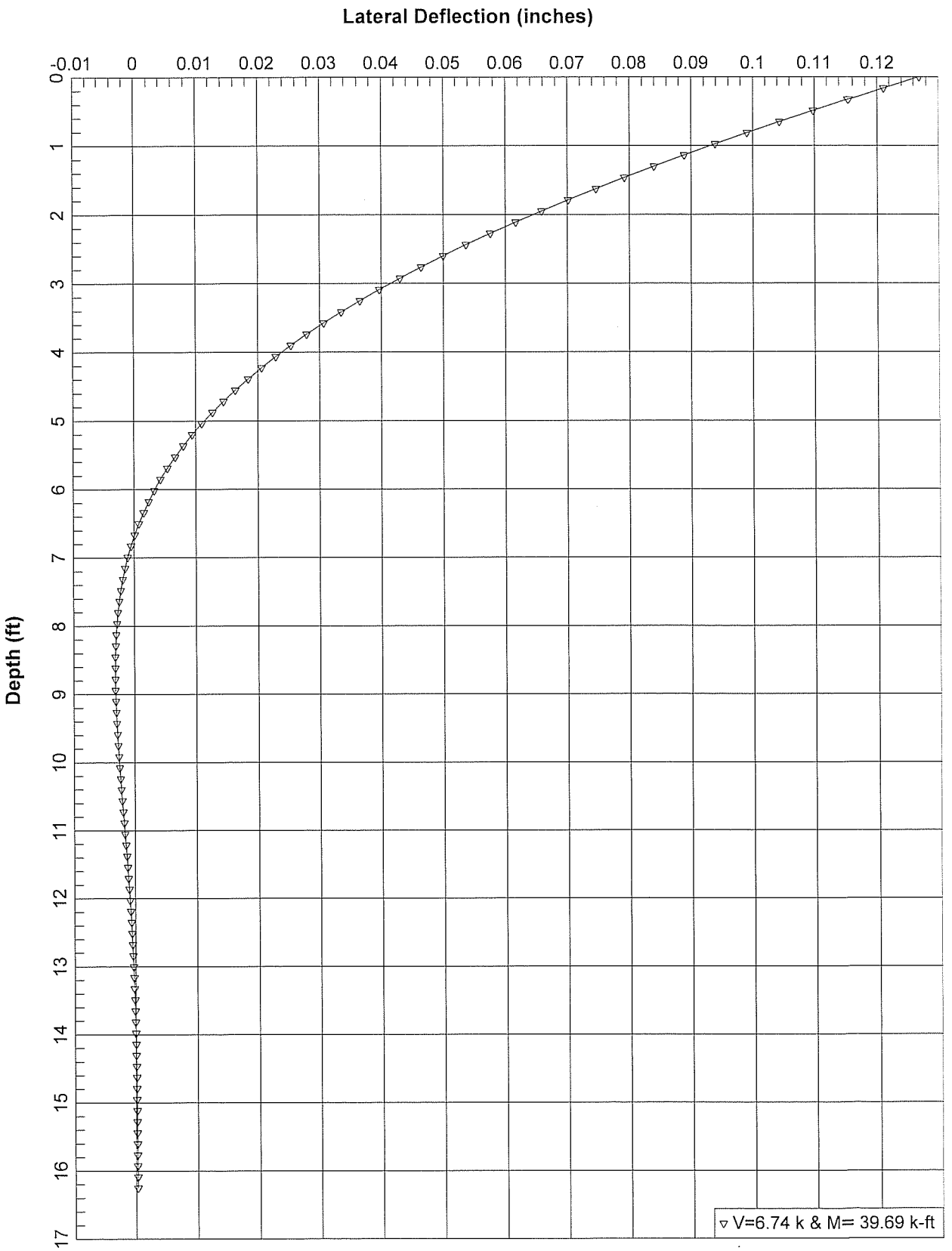
Lateral Deflection (inches)
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0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
0.12
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
▽ V=6.74 k & M= 39.69 k-ft
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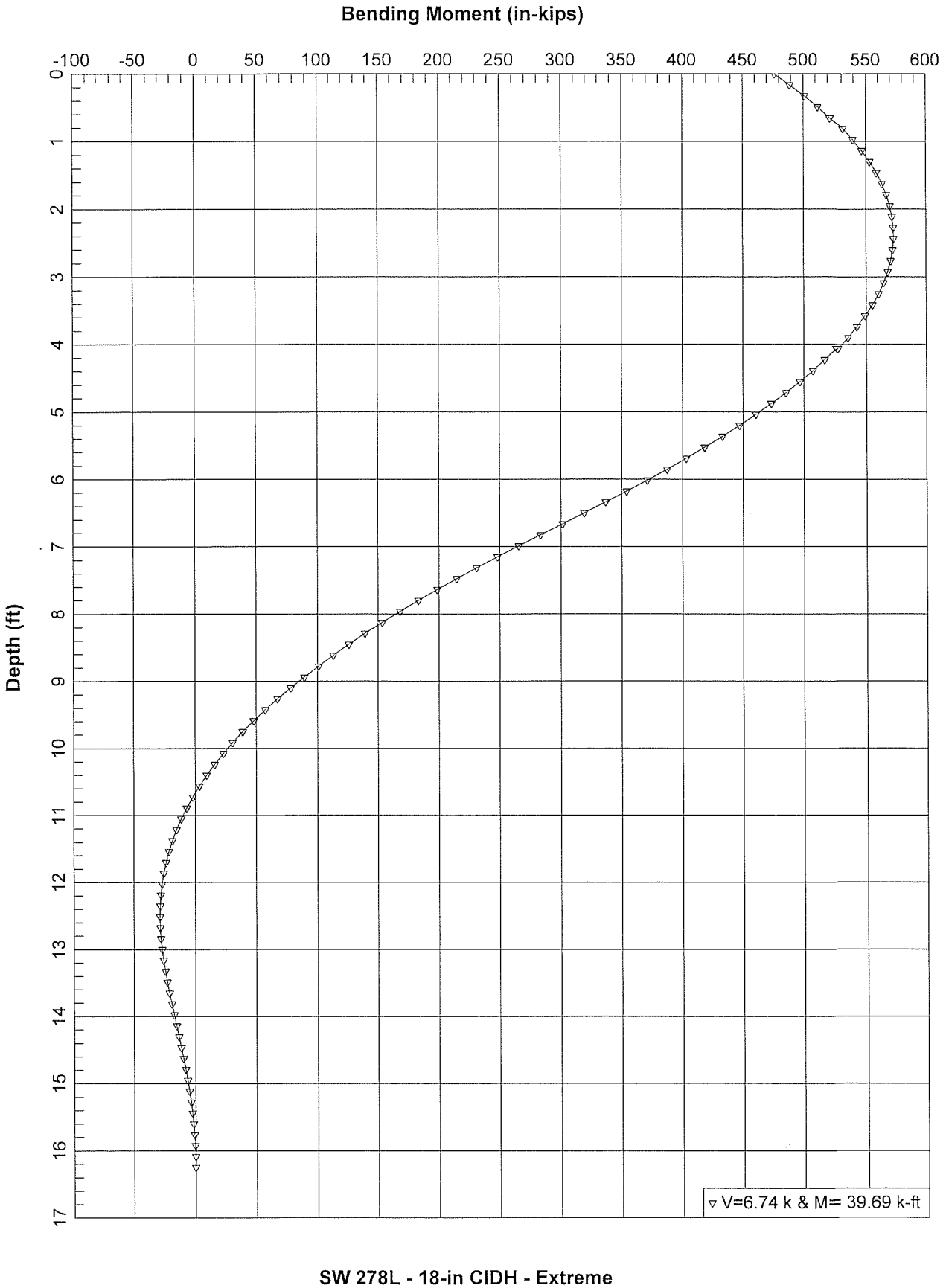

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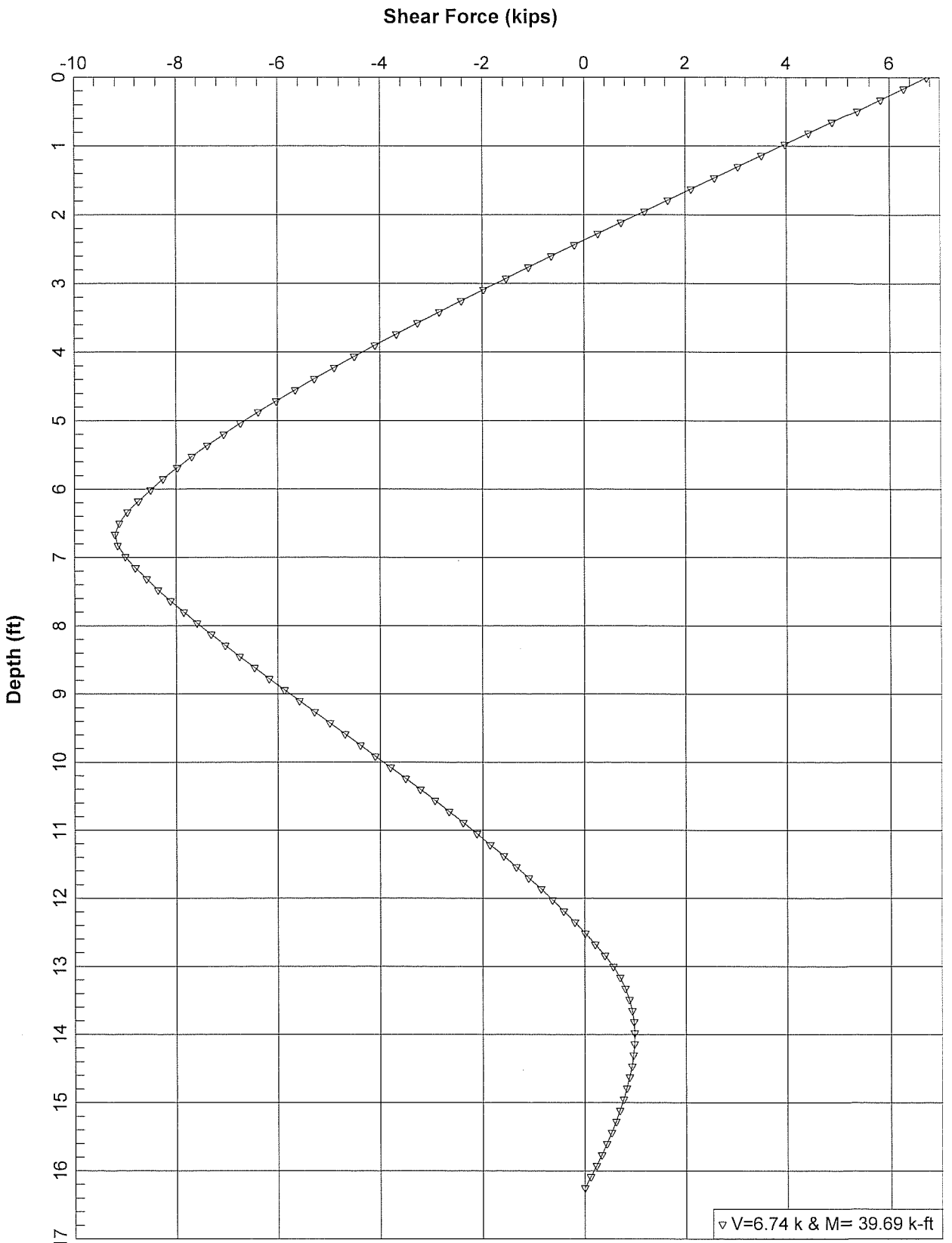

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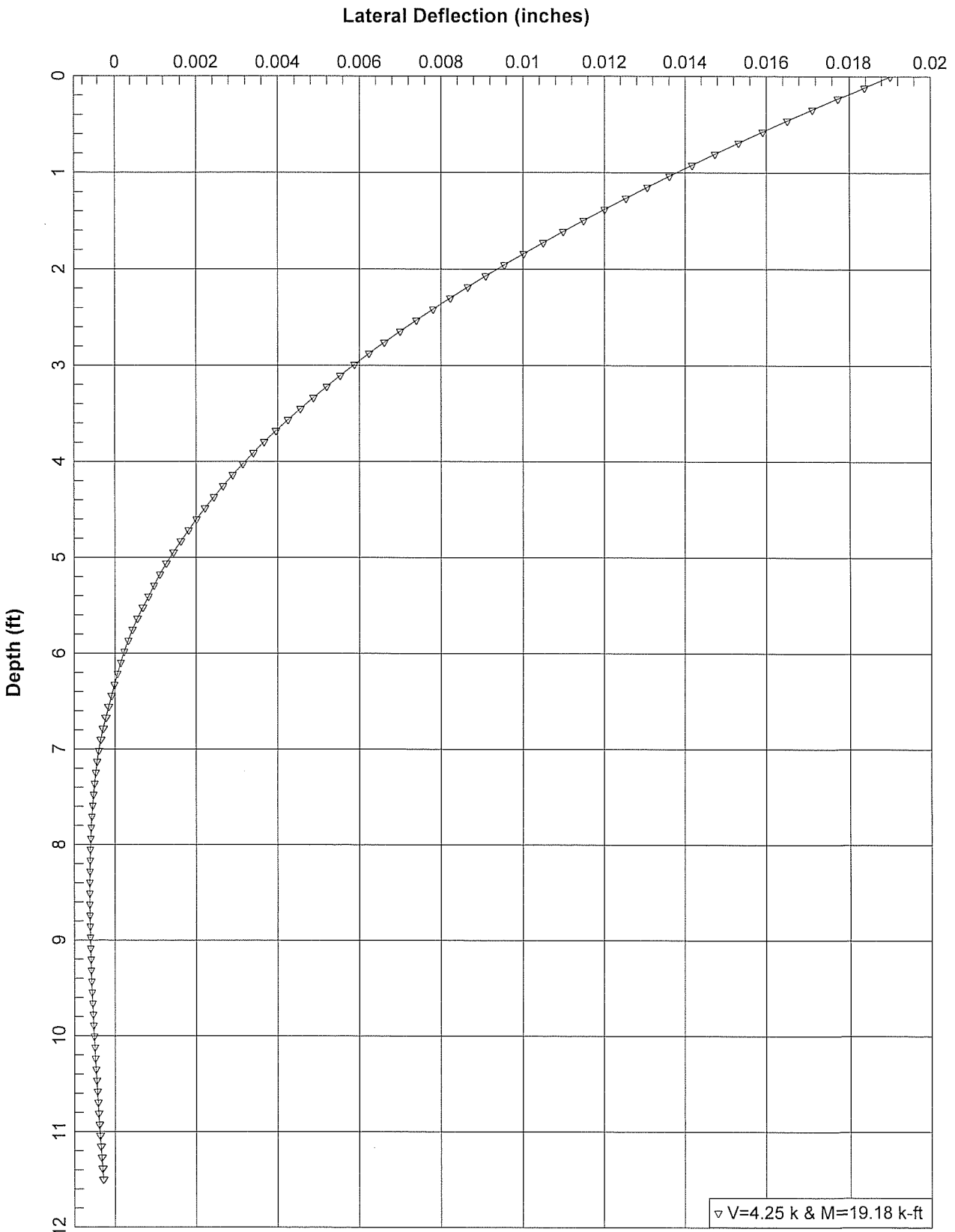

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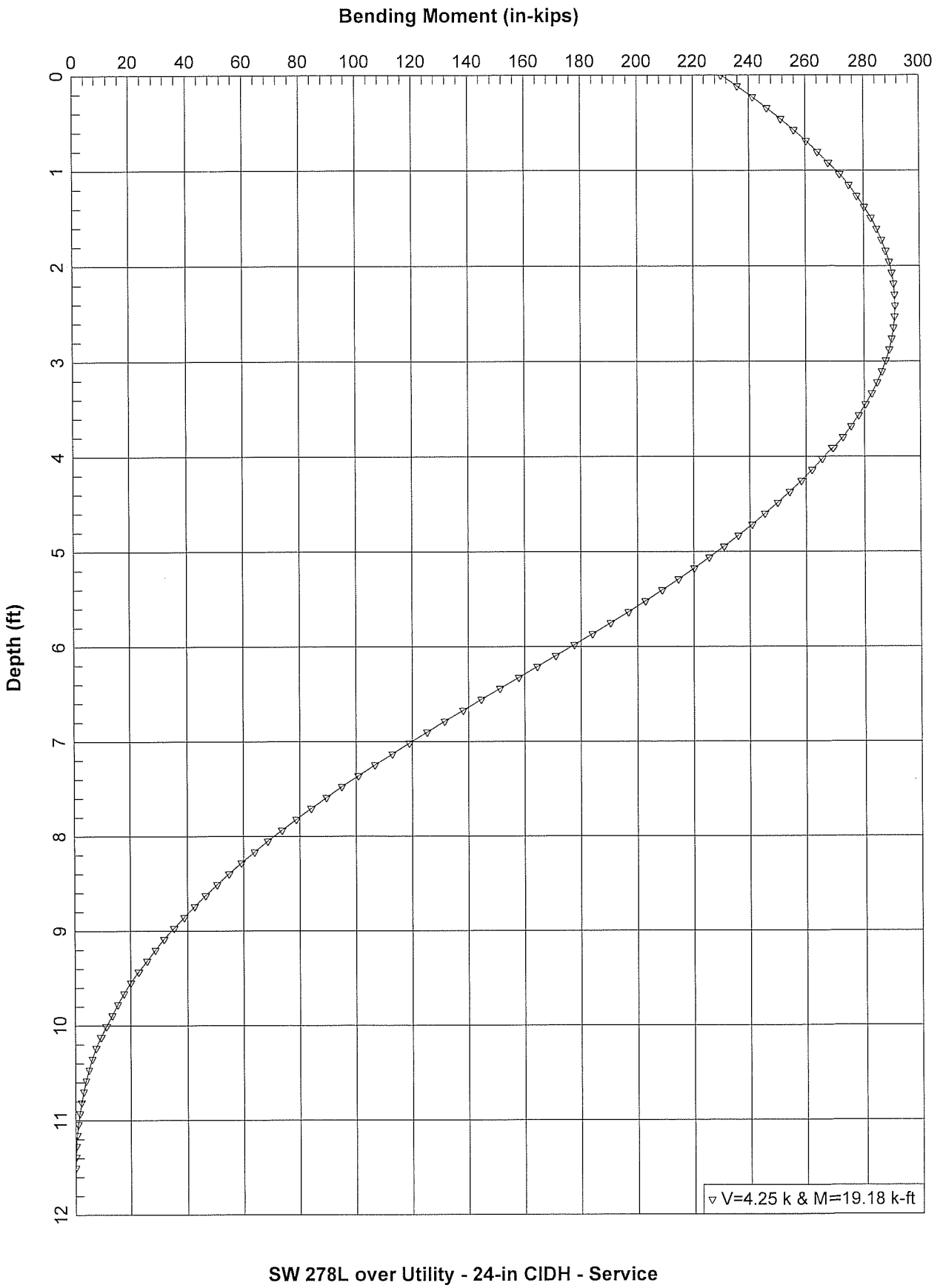

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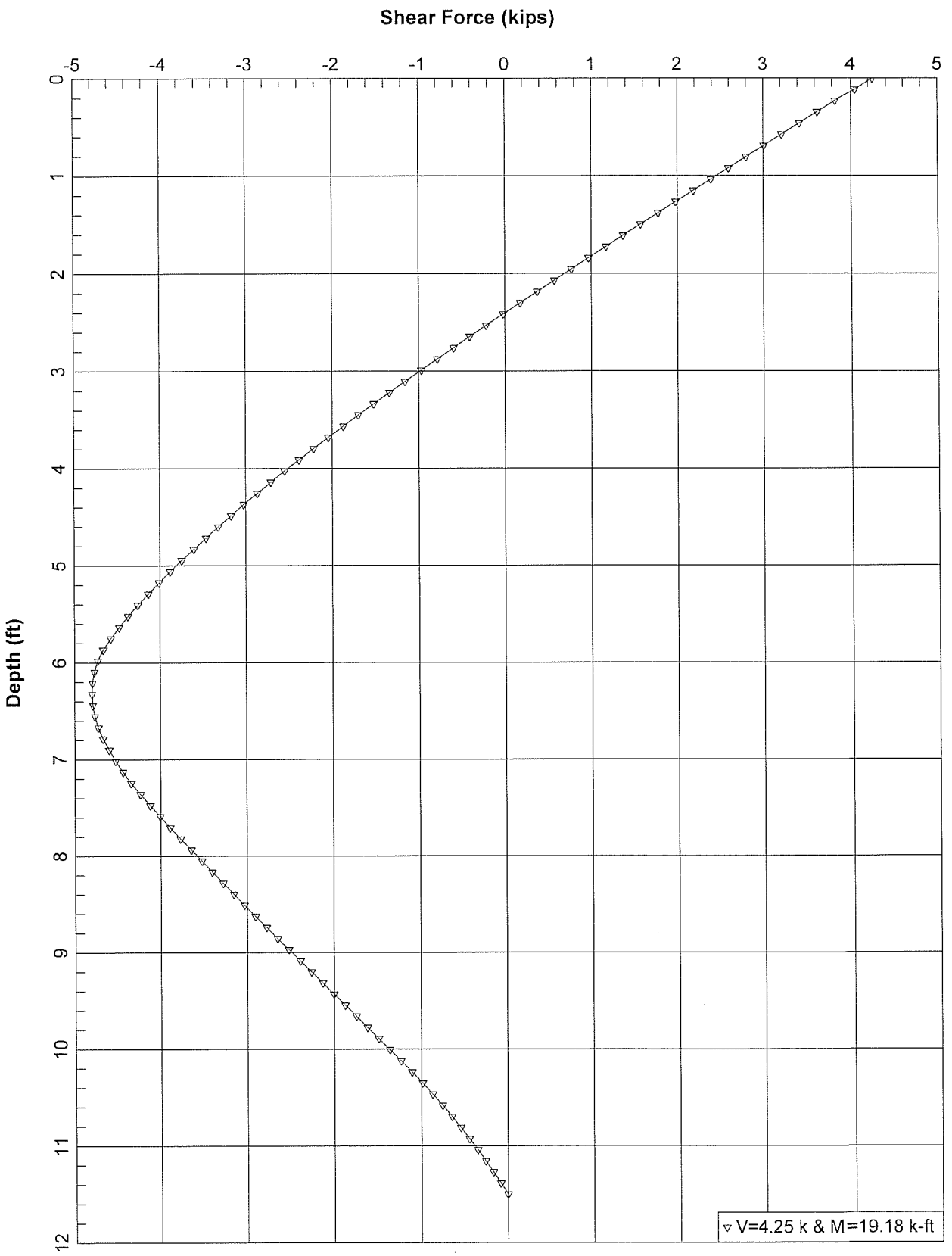

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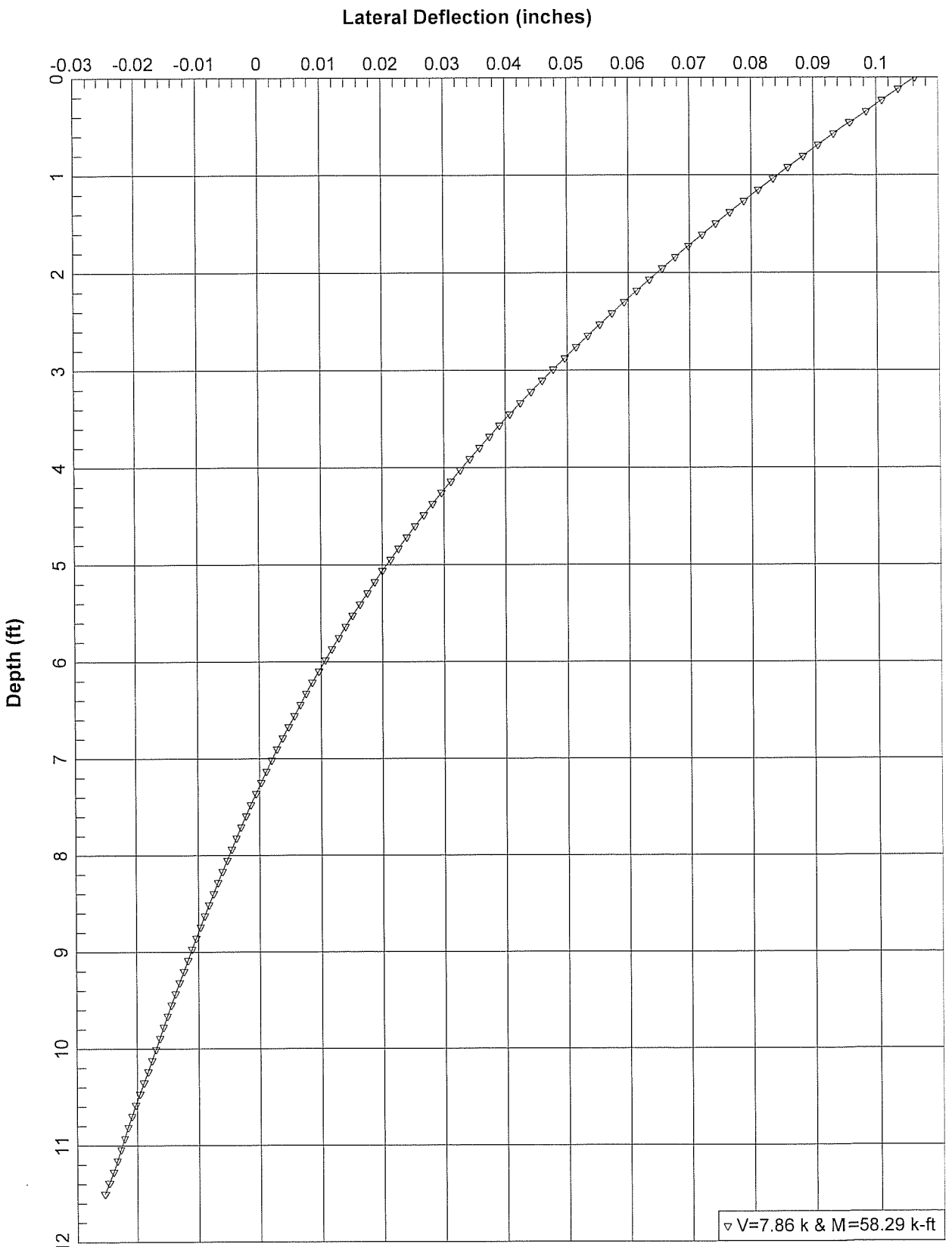

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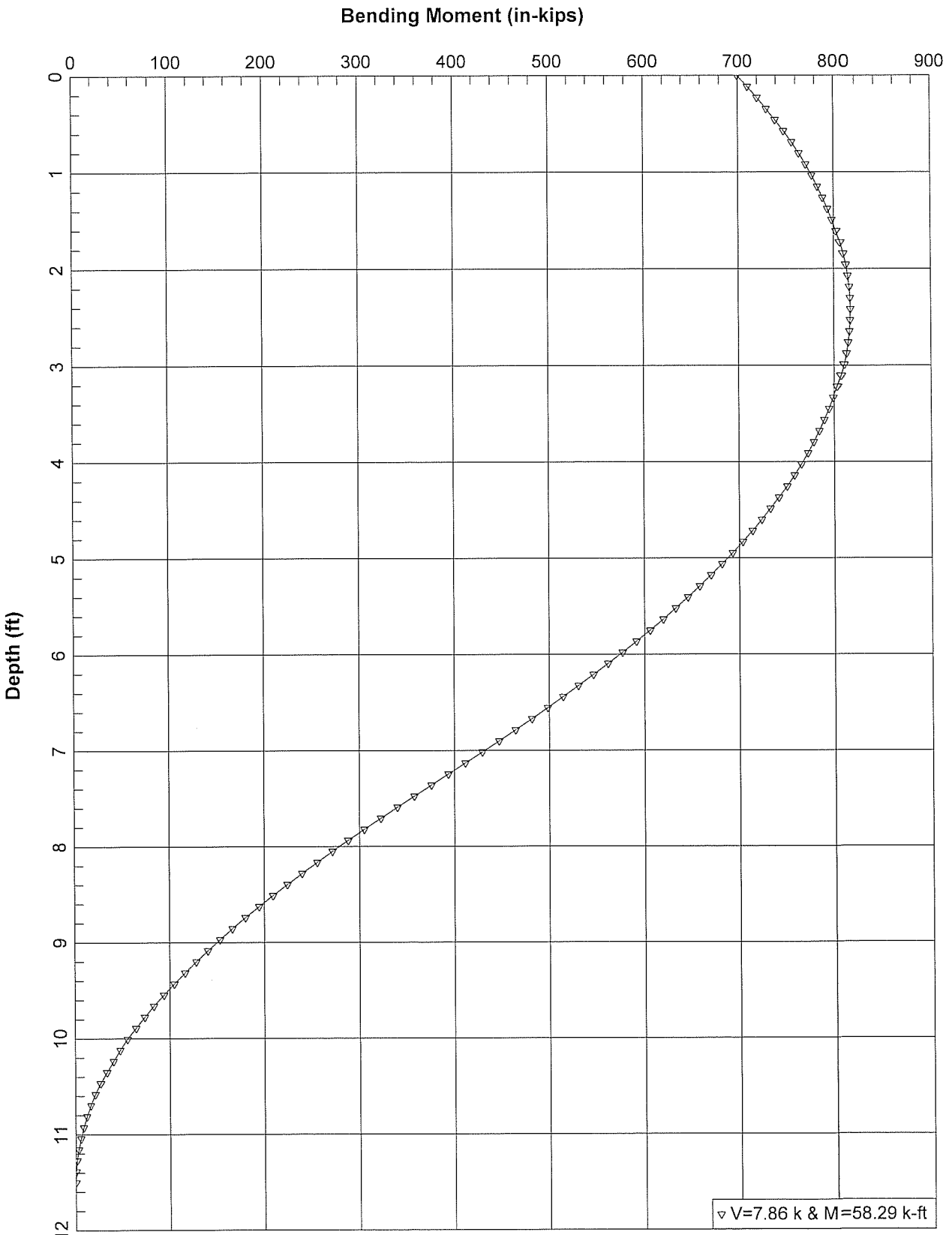

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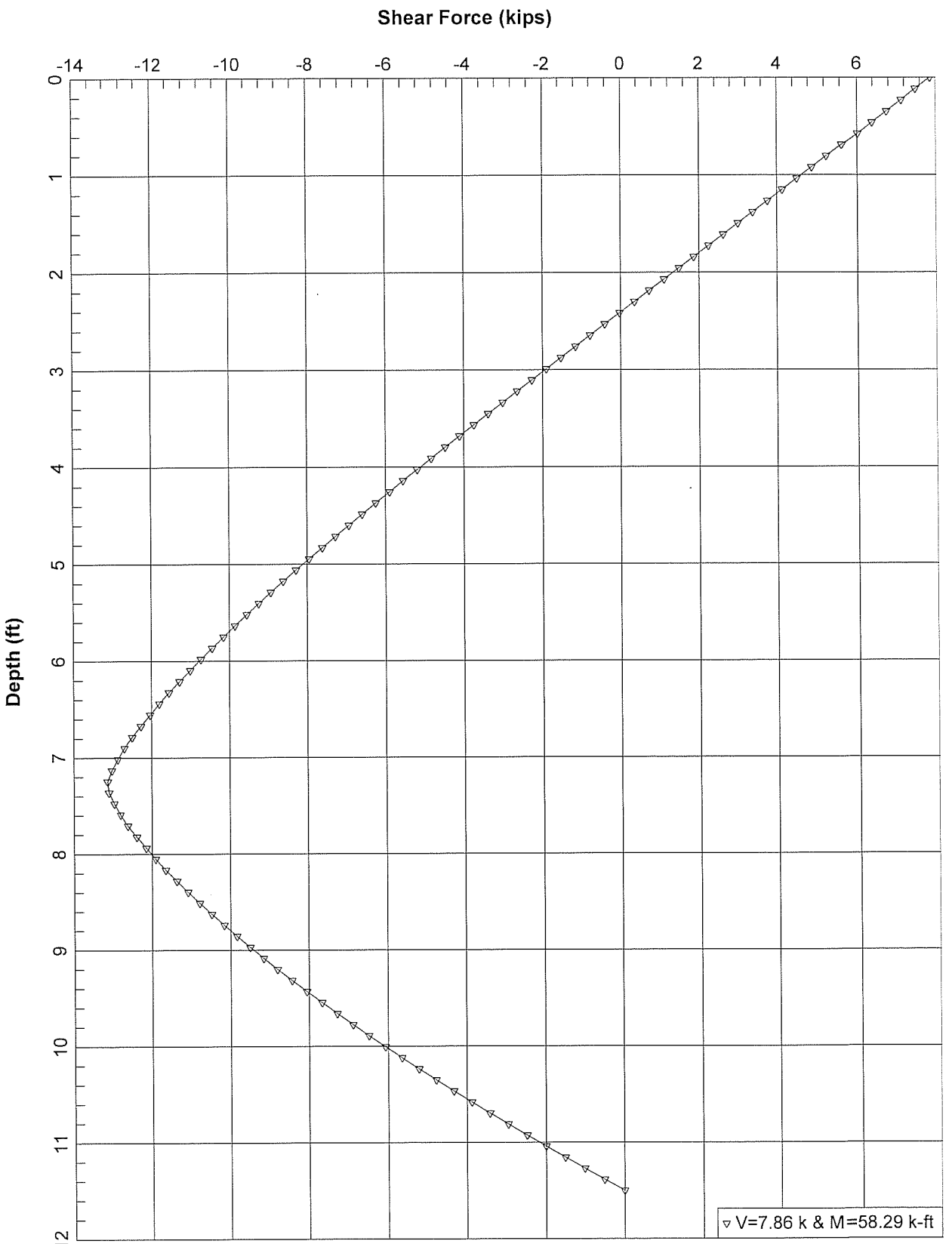

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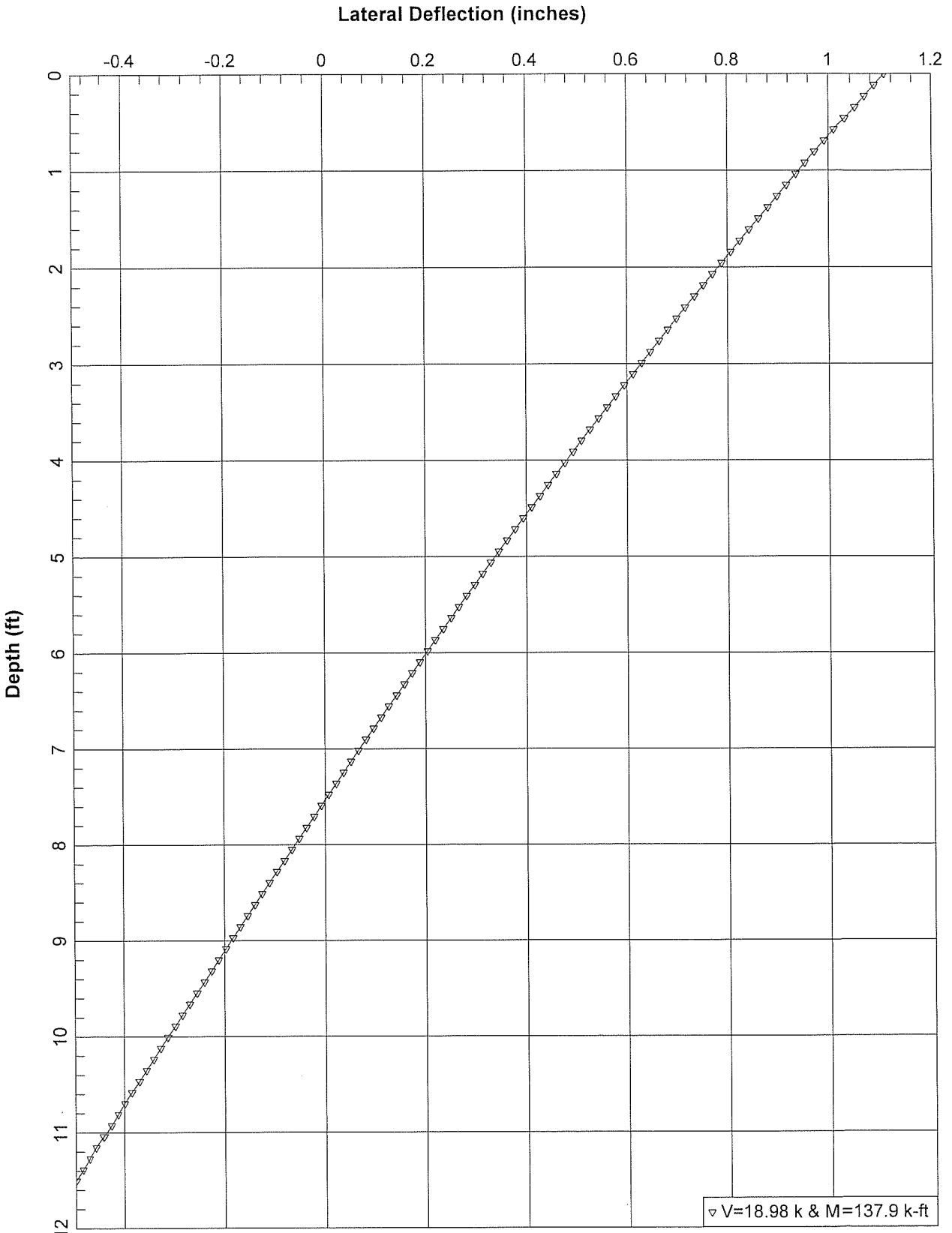

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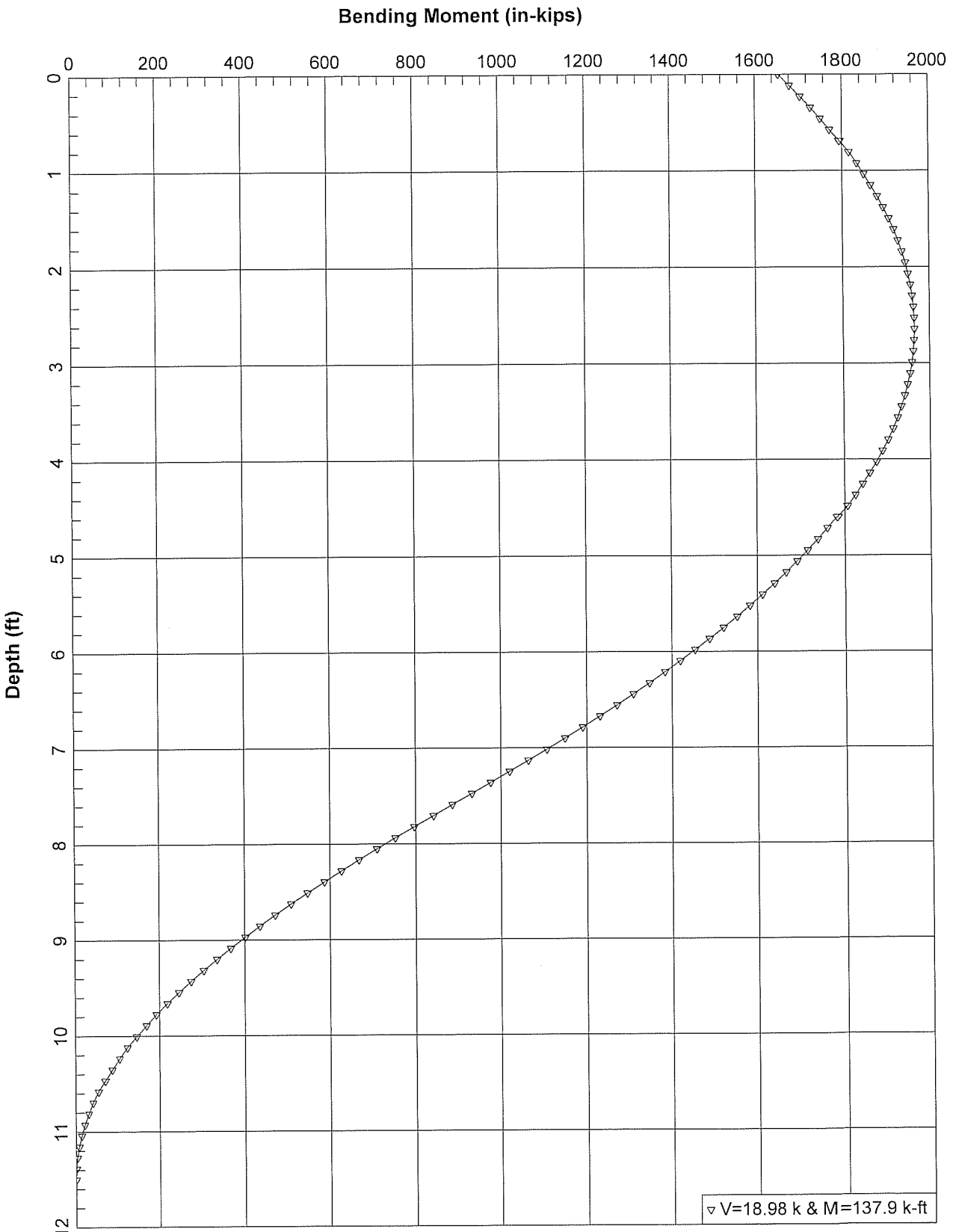

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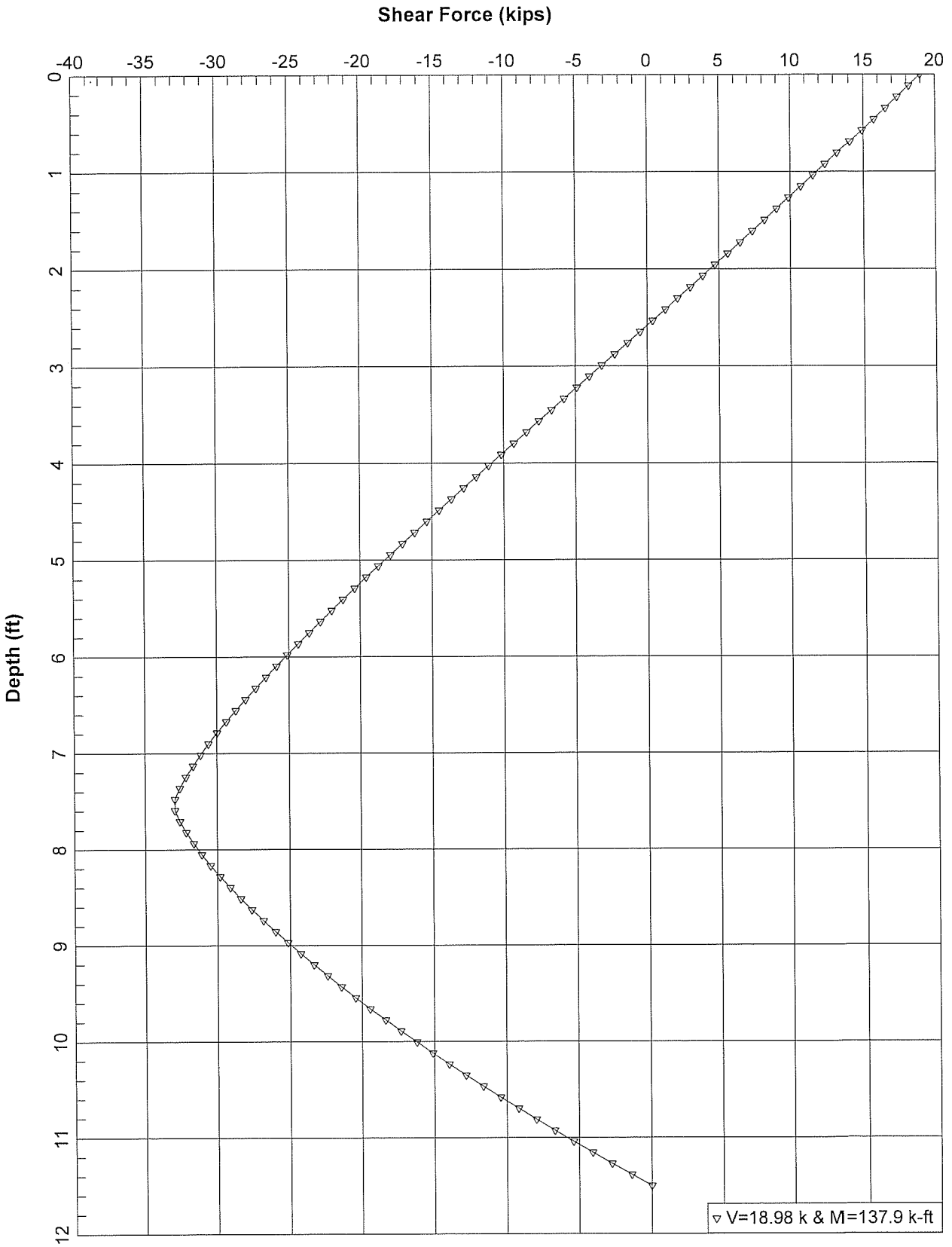

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SW NO. 294L

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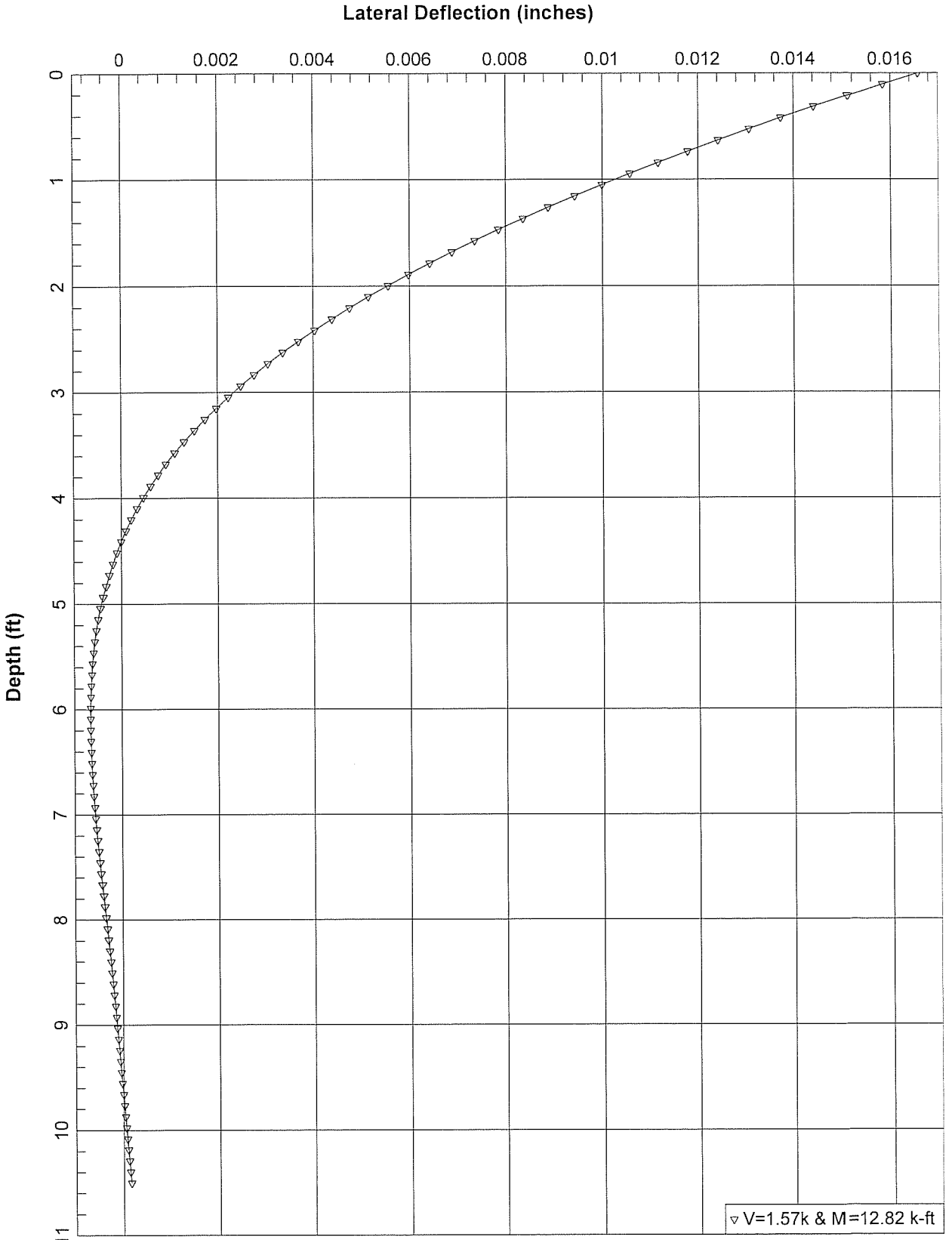

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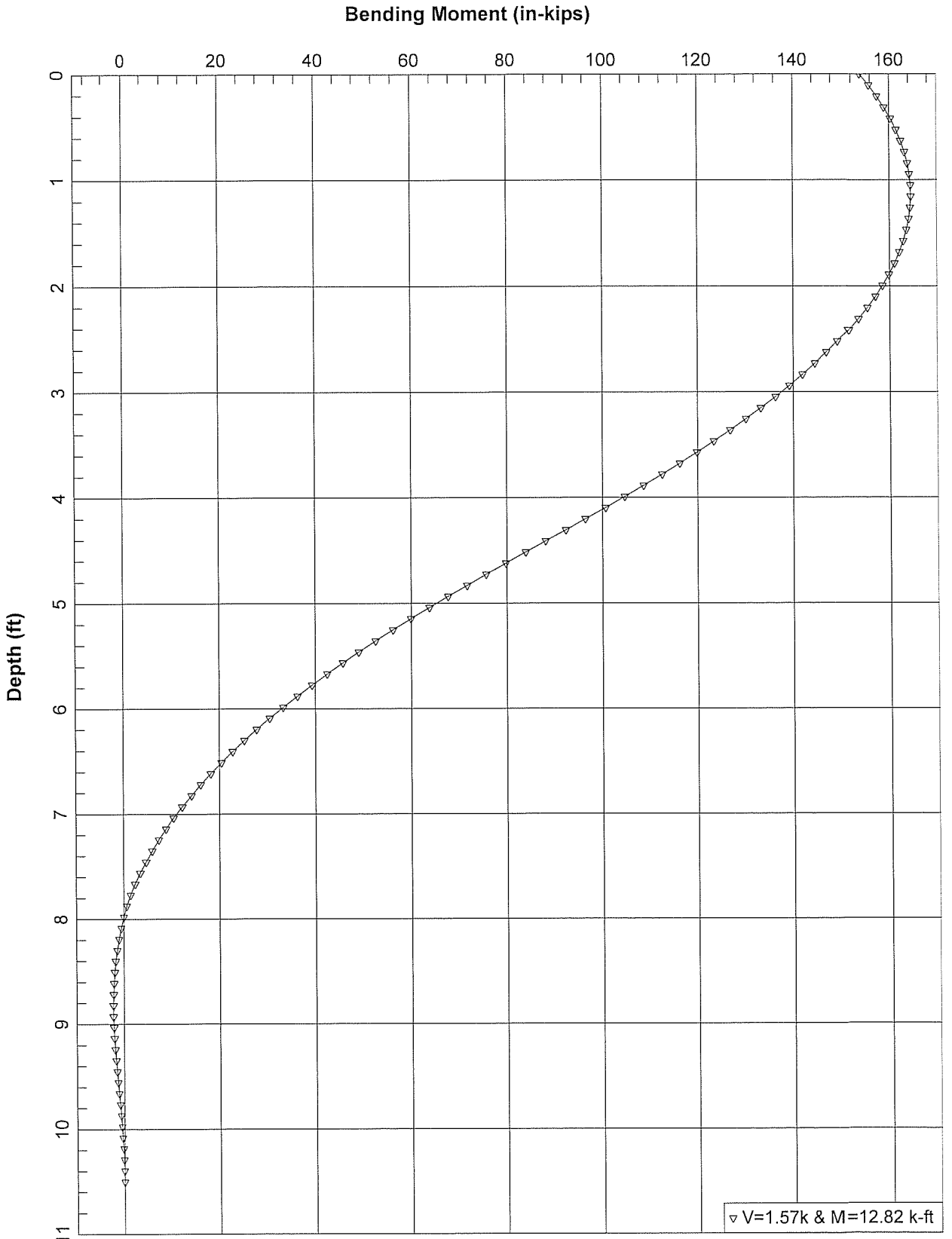

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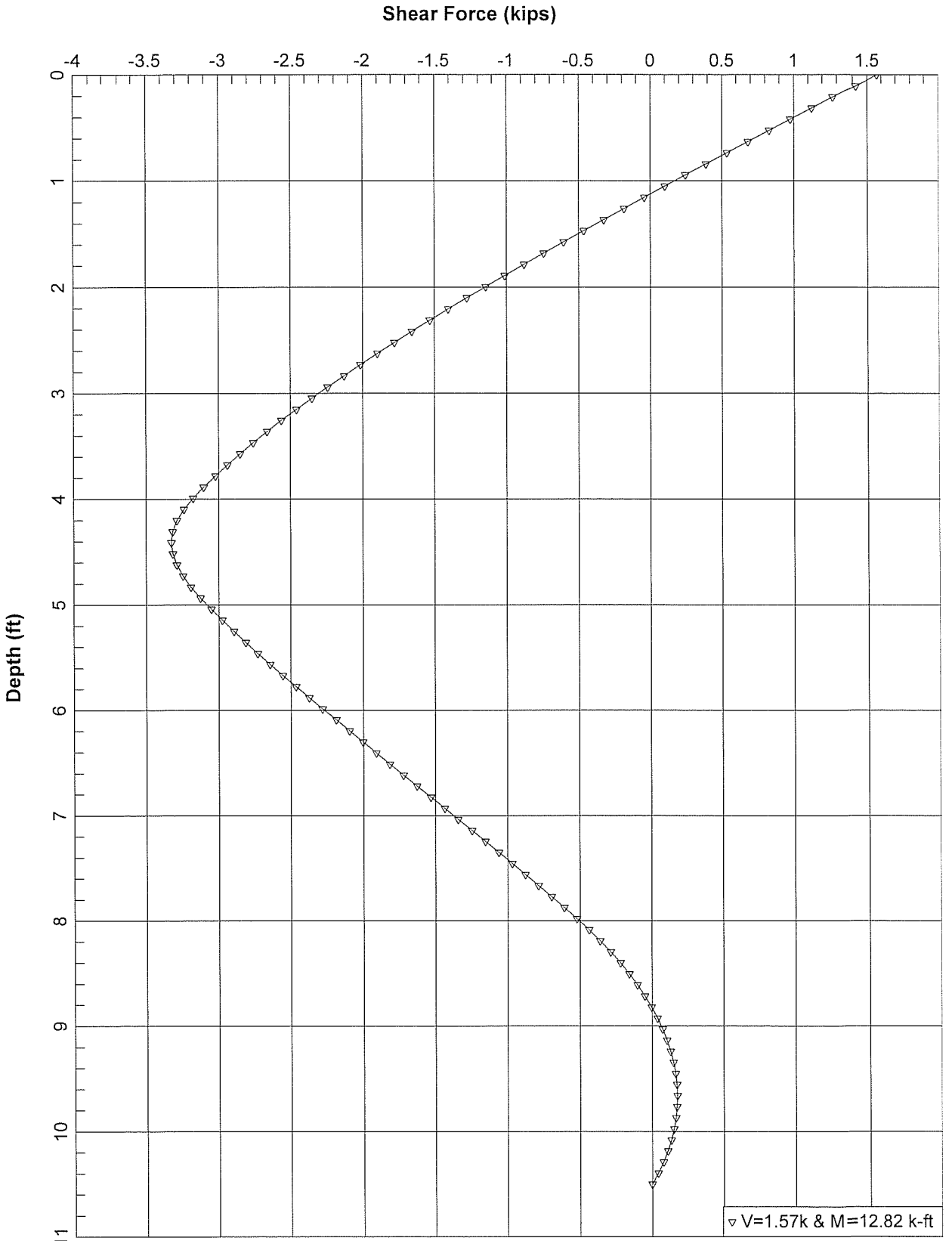

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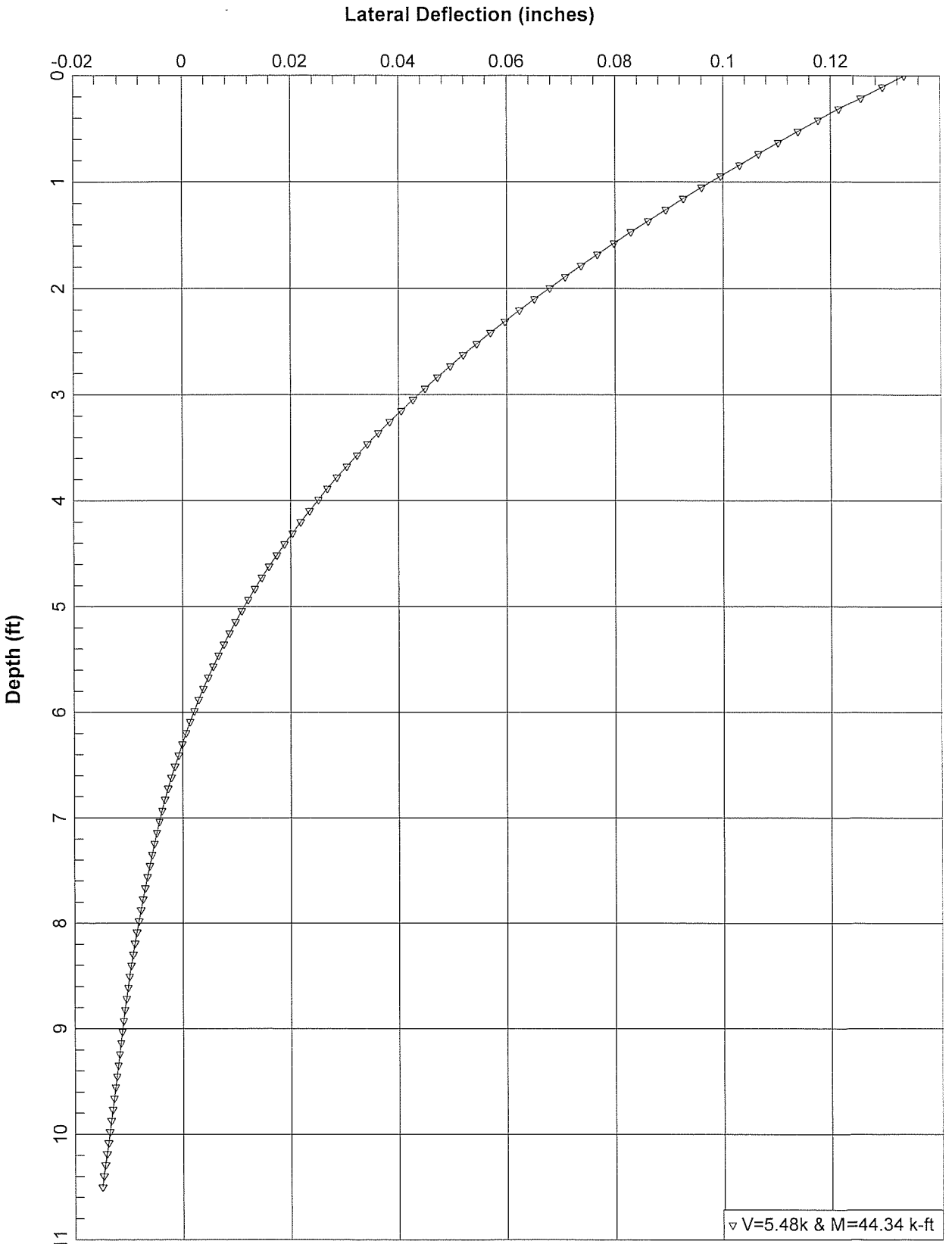

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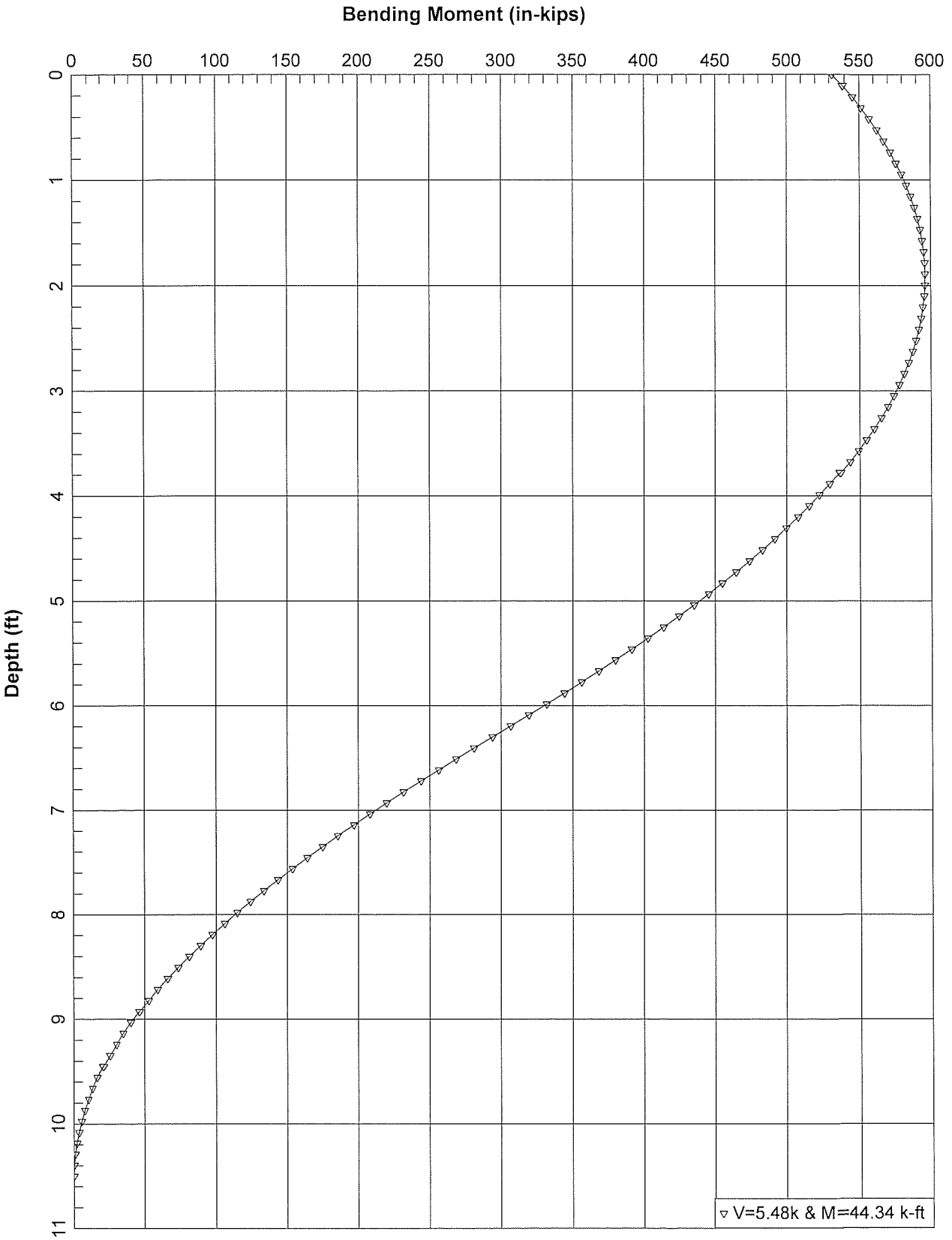

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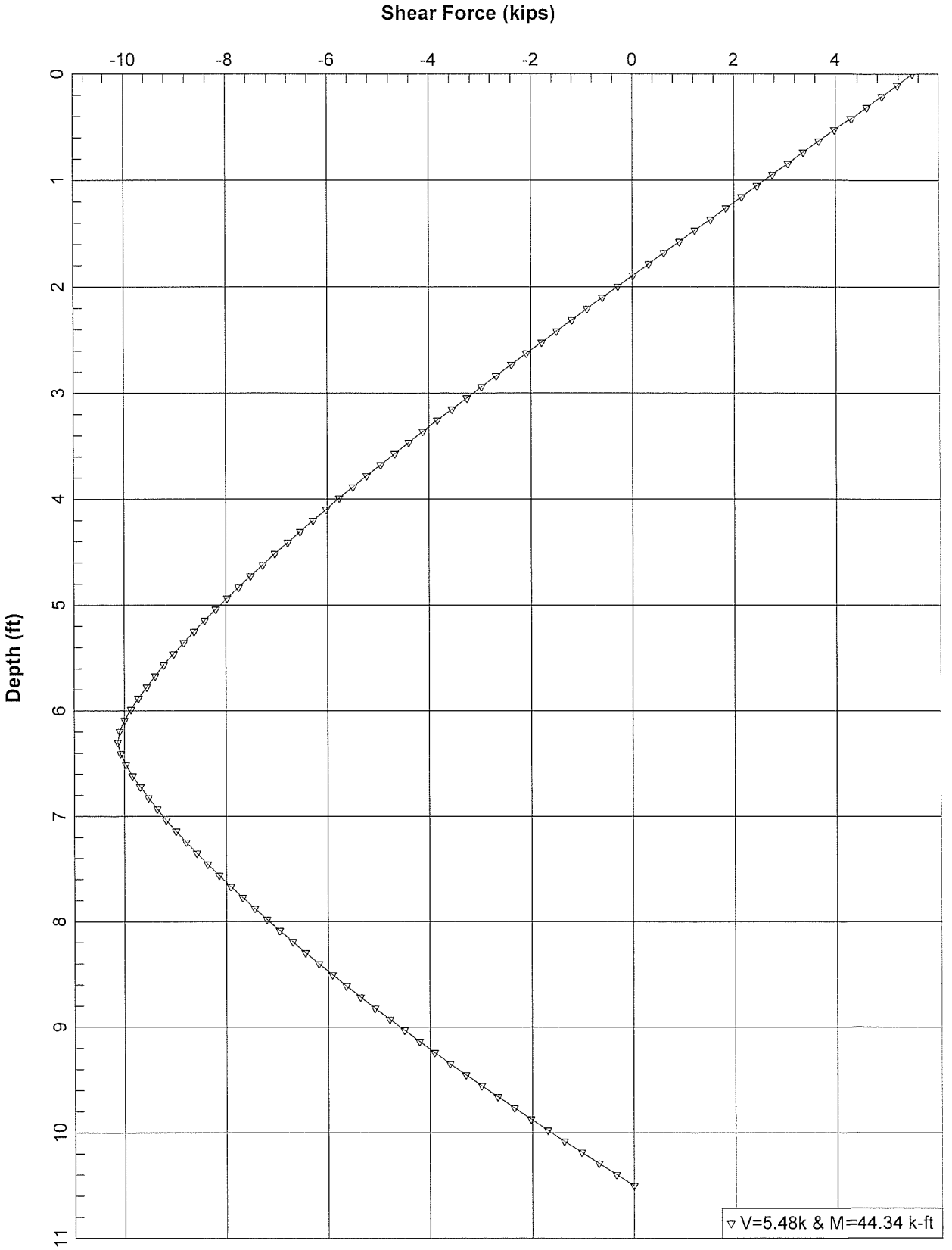

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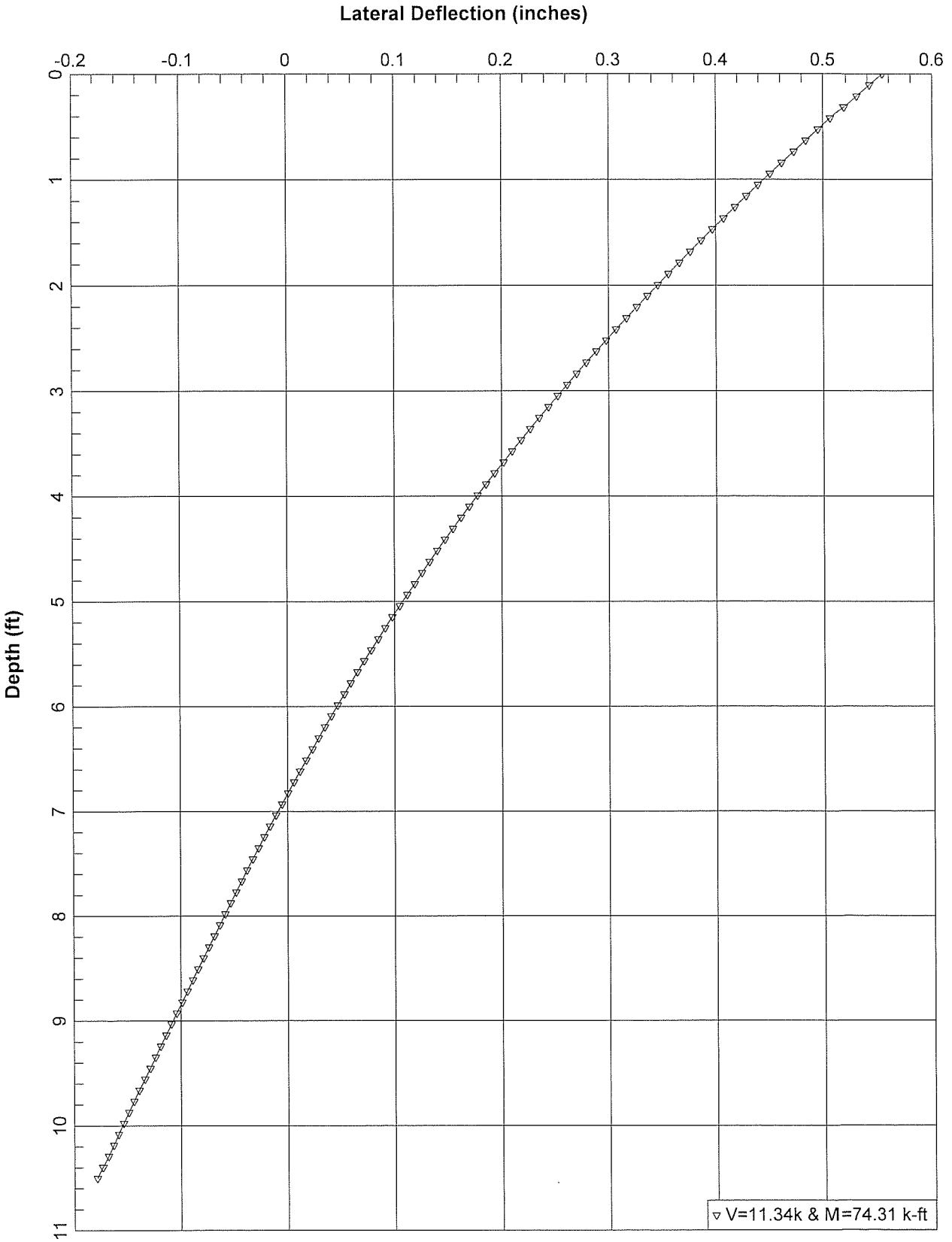

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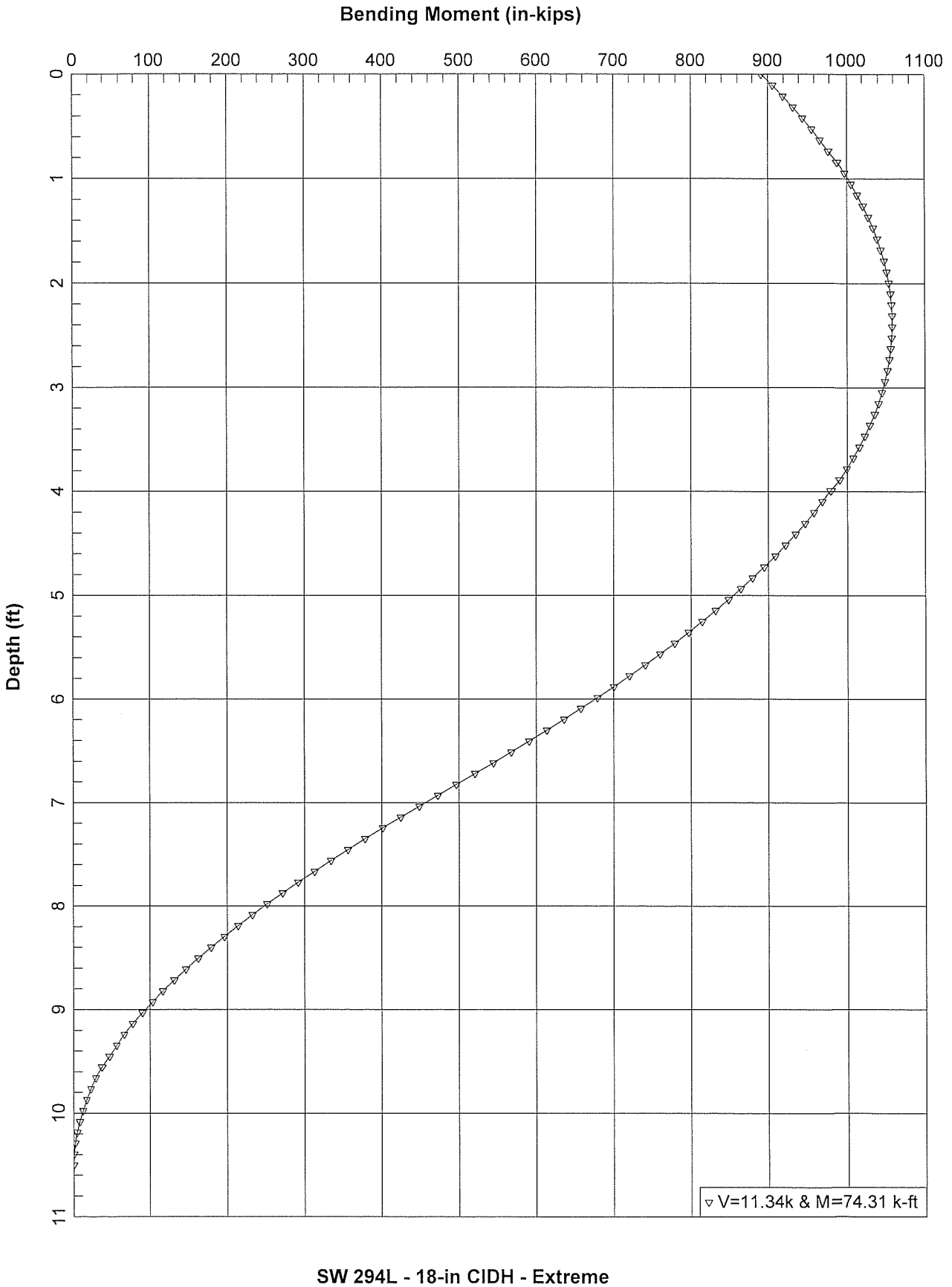

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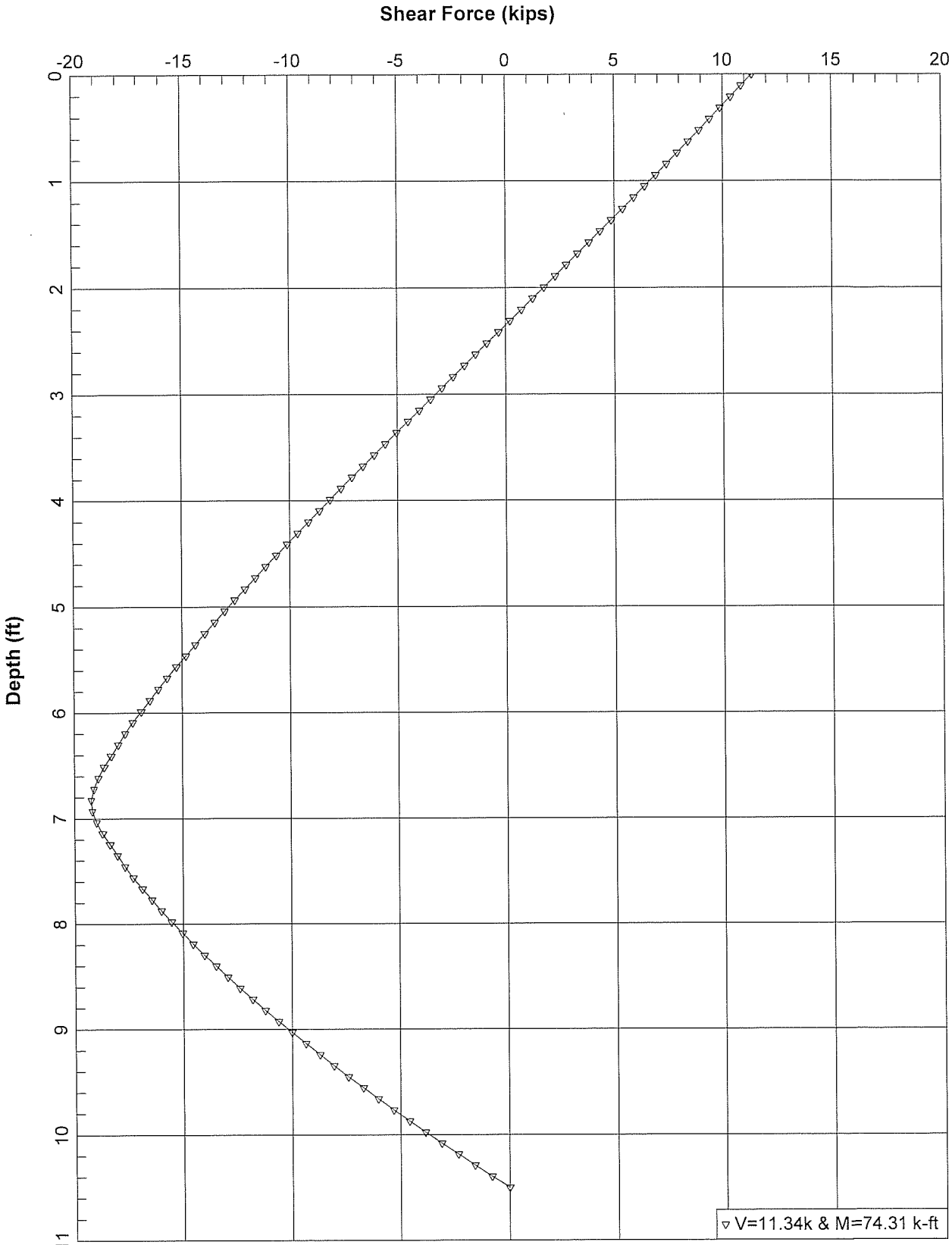

SW 294L - 18-in CIDH - Extreme

FINAL AERIALLY DEPOSITED LEAD REPORT

I-5 HOV Improvement Project (Segments 1, 2, and 3)
Cities of San Clemente and Dana Point, and San Juan Capistrano, Orange County, California
12-Ora-5, PM 3.0/8.7
Caltrans Project Nos. 1200020277 (EA 12-0F96B), 1200020278 (EA No. 12-0F96C1), and 1200020279 (EA 12-0F96E1)

EMI Project Nos. 11-135, 11-136, 11-137
Date: July 2, 2012

EARTH MECHANICS, INC.

Geotechnical and Earthquake Engineering

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

July 2, 2012

EMI Project Nos. 11-135, 11-136, 11-137

California Department of Transportation
District 12, Environmental Engineering
3347 Michelson Drive, Suite 100
Irvine, CA 92612-1691

Attention: Dr. Reza Aurasteh, Branch Chief

Subject: ***Final Aerially Deposited Lead Report***
Interstate 5 HOV Improvement Project (Segments 1, 2, and 3)
Cities of San Clemente and Dana Point, and San Juan Capistrano
Orange County, California
12-Ora-5, PM 3.0/8.7
Caltrans Project Nos. 1200020277 (EA 12-0F96B),
1200020278 (EA No. 12-0F96C1), and 1200020279 (EA 12-0F96E1)

Dear Dr. Aurasteh:

Attached is our Final Aerially Deposited Lead (ADL) Report for the subject projects. This report presents the details of our field and laboratory investigations, and the results of our analyses and recommendations for handling, disposal and re-use of potentially lead-contaminated soils and yellow traffic stripes as part of the structure and roadway improvements for the subject projects.

Earlier version of this ADL Report, dated April 30, 2012, was reviewed by Caltrans. Caltrans reviewer provided comments in emails and telephone conversations. We coordinated with Caltrans reviewers to resolve those comments by submitting report revisions in emails with follow-up telephone conversations. After a few iterations, Caltrans prepared an approval memorandum, dated June 5, 2012; a copy of this memorandum is included in Appendix D. All Caltrans review comments and our proposed revisions have been incorporated into this final report.

We appreciate the opportunity to provide design services and recommendations for this project. If you have any questions please call us.

Sincerely,
EARTH MECHANICS, INC.

7-2-12

(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

7-2-12

Lino Cheang, GE 2345
Project Manager

GJG/gjg,lcc

FINAL AERIALLY DEPOSITED LEAD REPORT
INTERSTATE 5 HOV WIDENING, SEGMENTS 1, 2, AND 3
CITIES OF SAN CLEMENTE, DANA POINT, AND SAN JUAN CAPISTRANO
ORANGE COUNTY, CALIFORNIA
12-ORA-5, PM 3.0/8.7
CALTRANS PROJECT NOS. 1200020277 (EA 12-0F96B), 1200020278 (EA 12-0F96C1), AND 1200020279 (EA 12-0F96E1)

Prepared for:

California Department of Transportation
District 12, Environmental Engineering
3347 Michelson Drive, Suite 100
Irvine, CA 92612-1691

Prepared by:

Earth Mechanics, Inc.
17800 Newhope Street, Suite B
Fountain Valley, California 92708

EMI Project Nos. 11-135, 11-136, 11-137

July 2, 2012

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1.0 INTRODUCTION

1.1 Purpose and Scope of Work

This Aerially Deposited Lead (ADL) Report presents the findings and conclusions of the ADL investigation conducted by Earth Mechanics, Inc. (EMI) for Interstate 5 (I-5) mainline between Avenida Pico and San Juan Creek Road in the Cities of San Clemente and Dana Point, and San Juan Capistrano, Orange County, California. This report presents results of the field investigation and laboratory testing and provides recommendations to aid designers in preparing the project plans, specifications, and cost estimates.

The geotechnical services provided for this project included the following tasks:

- Field exploration consisting of excavating and sampling a total of two-hundred (200) exploratory borings;
- Laboratory testing of soil samples;
- Statistical analysis to characterize the test data and evaluate the level of contamination of site soils;
- Perform lead contamination investigation in yellow traffic striping; and
- Preparation of this report presenting our findings, conclusions, and recommendations.

This report is intended for use by the project roadway design engineers and construction personnel.

1.2 Project Description

The Orange County Transportation Authority (OCTA), in cooperation with the California Department of Transportation (Caltrans), and the Cities of Dana Point, San Clemente, and San Juan Capistrano, is proposing to widen the I-5 mainline between Avenida Pico and San Juan Creek Road. The project will add one HOV lane in each direction of the I-5 freeway, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. The total project length along the I-5 corridor is approximately 5.7 miles. The project limits on I-5 freeway extend from 0.4 mile south of the Avenida Pico Undercrossing (UC) at Post Mile (PM) 3.0 to 0.1 mile south of the San Juan Creek Road UC at PM 8.7.

The project is divided into three segments:

- Segment 1 is from Post Mile 3.0 to 3.7;
- Segment 2 is from Post Mile 3.7 to 6.2; and
- Segment 3 is from Post Mile 6.2 to 8.7.

A site location map showing the project limits of these segments is provided in Figure 1.

The segments of I-5 freeway within the project limits currently provides five through-lanes in each direction north of SR-1 and four through-lanes in each direction south of SR-1, with auxiliary lanes at some of the on- and off-ramps. Based on the plans, we understand that earthwork will not be performed from northbound Station 395+00 ("A" Line) and southbound Station 408+00 ("A" Line) to the northern project limit at Station 465+00 ("A" Line) in Segment 3; only pavement restriping will be performed within this stretch of I-5 freeway.

1.3 Proposed Improvements

To accommodate the HOV lanes, the I-5 mainline will be widened in both the northbound (NB) and southbound (SB) directions of the freeway. The project proposes to remove the existing I-5 paved shoulders and construct new traveled way and new shoulder pavement to the outside of the NB and SB lanes to accommodate HOV lanes. As part of the proposed improvements, the following structures within the project limits will be modified:

- Avenida Pico Undercrossing (Bridge No. 55-0207): Structure replacement.
- Avenida Vaquero Undercrossing (Bridge No. 55-0223): Structure widening.
- Camino de Estrella Overcrossing (Bridge No. 55-0224): Tieback retaining wall under the structure.
- Via California (Bridge No. 55-0225): Tieback retaining wall under the structure.
- NB I-5 to NB PCH Connector (Bridge No. 55-0226): Structure widening.
- I-5/Camino Las Ramblas (SR-1) Undercrossing (Bridge No. 55-0510): Structure widening.
- Camino Capistrano Undercrossing (Bridge No. 55-0227): Structure widening.

In addition, all ramps within the project limits will be modified in order to accommodate the HOV lanes, which include improvements ranging from restriping to complete reconstruction. Specifically, ramp modifications include: On- and Off-ramps at Avenida Pico, Avenida Vista Hermosa, Camino de Estrella, Camino Las Ramplas/SR-1, and Camino Capistrano (Stonehill Drive). Ancillary improvements include several earth retaining walls, sound walls, new pavement, overhead sign structures, utility lines, drainage structures, lighting, landscaping, and roadway striping.

1.4 Pre-Field Activities

EMI conducted pre-field activities including:

- Preparing a boring location map,
- Preparing a Work Plan for Caltrans review and approval,
- Securing an encroachment permit from Caltrans,
- Marking the proposed boring locations,
- Notifying Underground Services Alert for utility clearance on the proposed borings,
- Preparing a schedule for the field work, and
- Coordinating work with drilling/soil sampling subcontractors and Caltrans.

2.0 INVESTIGATIVE METHODS AND RESULTS

2.1 Existing Information

Based on our understanding, there have not been any previous ADL studies conducted specifically for the project improvements described in this report.

2.2 Field Exploration

The field investigation, accomplished in December 2011 and February 2012, was performed to collect near-surface samples of on-site soils for ADL testing. In addition, yellow thermoplastic traffic stripes were also sampled to test for lead and chromium contamination.

2.2.1 ADL Soil Borings

A total of two-hundred (200) shallow borings to collect near-surface samples of on-site soils specifically for ADL testing for Segments 1, 2, and 3. The approximate locations of the borings performed for each segment are shown on the attached Boring Location Plans as follows:

- Segment 1 - Figure 2 through Figure 5
- Segment 2 - Figure 6 through Figure 18
- Segment 3 - Figure 19 through Figure 25

Boring locations were selected at about 300-foot spacing within Caltrans right-of-way, along unpaved shoulders of existing paved roadways where excavations are expected to be performed. In Segment 3, ADL borings were not performed from northbound Station 395+00 ("A" Line) and southbound Station 408+00 ("A" Line) to the northern end Station 465+00 ("A" Line) of the project limit since no earthwork is proposed within these regions. Borings were performed by a 3-inch diameter stainless steel hand auger. Borings were excavated to a depth up to 4 feet below existing grade. A triple-rinse method was used to decontaminate the samplers before collecting the soil samples. Soil samples were collected from depths of about 6, 18, 36, and 48 inches below existing grade. A total of eight-hundred (800) soil samples were collected and tested for ADL content.

Soil samples retrieved from the hand auger bailer were immediately placed in clean glass jars with teflon lids. Jars were labeled with project information including the project name and number, boring number, sample number, depth from which sample was collected, date and time of sampling. All samples were entered on the chain-of-custody forms and transported to a laboratory for testing. Copies of the chain-of-custody forms are provided in Appendix A.

2.2.2 Yellow Traffic Stripe Sampling

TRC Solutions, Inc. (TRC) will sample and test the yellow thermoplastic traffic stripes in Segment 3. Yellow thermoplastic traffic stripes were sampled at 0.5 mile interval along the I-5 Mainline median in each direction and all the ramps within Segments 1 and 2.

2.3 Laboratory Testing

Soil and yellow thermoplastic traffic stripes samples collected from the field investigation were forwarded to Alpha Scientific Corporation (ASC) of Cerritos, California, a California Certified Analytical Laboratory for testing.

2.3.1 Soil Sample Testing

Soil samples were analyzed for total lead (TTLC), soluble lead content by the California Waste Extraction Test using CITRATE (STLC) and de-ionized water (WET-DI) as the leaching compound, soluble lead using the toxicity characteristic leashing procedure (TCLP), and pH.

Laboratory testing on the selected soil samples was assigned as follows:

(1) All samples were tested for total lead,

(2) Samples that contain greater than or equal to 50 mg/kg of total lead were analyzed for soluble lead using Waste Extraction Test (citric acid extraction) for extractable lead,

(3) Samples that contain greater than or equal to 5 mg/l of extractable lead using WET (citric acid), were analyzed using WET (de-ionized extraction) for de-ionized extractable lead,

(4) Samples that contain greater than or equal to 1000 mg/kg of total lead, or greater than or equal to 5 mg/l of extractable lead using WET (Citric acid) were analyzed using the Toxic Characteristic Leaching Procedure (TCLP) for leachable lead, and

(5) Ten percent of all samples were tested for pH.

Results of the laboratory testing are presented in Table B1 through Table B3 in Appendix B. Copies of the original laboratory test results for the soil samples are also included in Appendix B.

2.3.2 Yellow Traffic Stripe Sample Testing

The existing yellow thermoplastic traffic striping samples were tested for concentrations of lead and chromium contents as follows:

(1) All samples were analyzed for total lead,

(2) All samples were analyzed for Chromium,

(3) Samples that contain greater than or equal to 50 mg/kg total lead were analyzed for soluble lead using Waste Extraction Test (Citric acid extraction) for extractable lead,

(4) Samples that contain greater than or equal to 50 mg/kg total chromium were analyzed for soluble chromium lead using Waste Extraction Test (Citric acid extraction) for extractable lead,

(5) Samples that contain greater than or equal to 1,000 mg/kg of total lead, or greater than or equal to 5 mg/l of extractable lead using WET (Citric acid) were analyzed for Toxic characteristic Leaching Procedure (TCLP) for leachable lead, and

(6) Samples that contain greater than or equal to 1,000 mg/kg of total chromium, or greater than or equal to 5 mg/l of extractable lead chromium using WET (Citric acid) were analyzed for Toxic characteristic Leaching Procedure (TCLP) for leachable chromium lead.

2.4 Ground Water

No groundwater was encountered down to a depth of 4 feet below the ground surface during the ADL soil boring investigation conducted in December 2011 and February 2012.

3.0 STATISTICAL DATA EVALUATION - METHODOLOGY

3.1 Purpose

The purpose of the statistical evaluation of the laboratory test results is to determine the applicability of the Department of Toxic Substance's Control (DTSC) variance and the appropriate waste classification(s) for any excess soils generated due to remedial excavations and general earthwork on the project.

3.2 Data Distribution and Goodness-of-Fit Tests

The primary statistical element used to classify ADL-impacted soils is the upper confidence limit (UCL) on the mean. There are several different methods to calculate the 95% UCL on the mean consisting of parametric methods that are dependent on the distribution of data, and non-parametric methods that are independent of the distribution of data.

Caltrans ADL Guidance (Caltrans, 2007) recommends specific methodology for calculation of the UCL for three different parametric distributions (normal distribution, log-normal distribution and gamma distribution) and for non-parametric distributions. The advantage of using parametric tests is their assumptions are more stringent, thereby requiring less qualification of the results in drawing conclusions about the data. Non-parametric methods enable data to be reduced that otherwise would be unsuitable for statistical analysis.

Goodness-of-fit tests are performed to determine the distribution of the sample data. Based on the number of samples and the distribution of data, the appropriate statistical method is selected to calculate the 95% UCL on the mean. If the data do not appear to be distributed normally, log-normally or as a gamma distribution, application of a non-parametric method is required to determine the 95% UCL on the mean.

Goodness-of-fit tests performed on the sample data presented herein and determination of the data distribution was performed using the EPA's statistical program ProUCL V4.00.02 (EPA, 2007).

3.3 Upper Confidence Limit (UCL)

The method of calculation of the UCL was based upon the recommendations provided in the Caltrans ADL Guidelines and determined using the statistical program ProUCL V4.00.02. For normally-distributed data, the 95% UCL on the mean is determined using the Student's-t distribution. For log-normally-distributed data, the H-statistic based UCL is used if the standard deviation is less than 2.0; otherwise, either a UCL computation based upon a gamma distribution, a non-parametric bootstrap or Chebyshev method is used to determine the UCL. For gamma-distributed data, either a gamma method, adjusted gamma method, Bootstrap-t or Hall's Bootstrap method may be used to determine the UCL. For data that are not normally-, log-normally-, or gamma-distributed, a variety of non-parametric distributions may be used including Hall's Bootstrap UCL, the Chebyshev UCL, and the modified-t statistic.

3.4 Regression Analysis

For samples tested with greater than 50 mg/kg of total lead requiring that soluble lead be tested using the WET-Citric method, a correlation between the 95% UCL on the mean for total lead and the 95% UCL on the mean for soluble lead can be obtained using a regression analysis.

The regression analysis consists of creating a least-squares-fit approximation of the soluble lead and total lead data and obtaining a correlation coefficient "r". If the regression analysis yields a correlation coefficient "r", a value of 0.8 or greater, the 95% UCL for total lead can be correlated to the 95% UCL for soluble lead. To determine the correlation coefficient "r", a line is fit to the data using the equation:

$$y = mx + b$$

where:

y = soluble lead, milligrams per liter
x = total lead concentration, milligrams per kilogram
b = y-intercept
$m = \text{slope} = (r \times s_t)/s_s$

where:

r = correlation coefficient
s_t = standard deviation of the total lead concentrations
s_s = standard deviation of the soluble lead concentrations

The applicability of the correlation is directly related to "r", which should be greater than or equal to 0.8. If "r" is less than 0.8, then the determination of the 95% UCL on the mean for soluble lead may not be achievable by this method.

3.5 Incorporation of Non-Detects (ND's)

As part of the Associated Documents of the Caltrans ADL Guidance (Caltrans, 2007), Section 3.0 of the "Statistical Analysis of ADL Data" indicates that if the number of non-detect results within a sample is less than 15% of the data, reliable statistical results can be obtained by replacing each ND sample with a value equal to one-half the detectible limit of the analysis. However, the Caltrans ADL Guidance also recommends the use of the statistical software available from the Environmental Protection Agency (EPA) which recommends in Section 2.8 of the ProUCL V4.00.02 User Guide (EPA, 2007) that ND's be replaced with a value equal to the detectible limit of the analysis.

For the analyses presented herein, where ND samples are included in the sample data, ND samples are incorporated consistent with the ProUCL V4.00.02 user guide recommendations and replaced with a value equal to the detectible limit of the analysis.

4.0 ANALYSES AND RECOMMENDATIONS

4.1 Caltrans Aerially Deposited Lead Soil Management

Caltrans specifications classify soils based on total and soluble lead concentrations to provide guidance on appropriate management of these materials. The soil classifications and associated criteria for each classification per Caltrans Aerially Deposited Lead Soil Management can be downloaded from the Caltrans website http://www.dot.ca.gov/hq/env/haz/pdfs/adl/h306.pdf. This Caltrans ADL Soil Management classification is duplicated below in Table 1.

Table 1. Caltrans Aerially Deposited Lead Soil Management

SOLUBLE LEAD (mg/l)	TOTAL LEAD (mg/kg)	SOIL TYPE	HANDLING
California Testing			
STLC < 5.0	TTLC < 1000	X	Non-hazardous. Notify and require Lead Compliance Plan for worker safety.
	1000 ≤ TTLC <1411 & DI WET < 1.5 mg/l	Y1	Hazardous Variance applies – cover with minimum 1 foot of clean soil*.
	1411 ≤ TTLC < 3397 & DI WET < 150 mg/l	Y2	Hazardous Variance applies – cover with pavement structure*.
	1000 ≤ TTLC < 3397 but Surplus	Z2	Surplus - Hazardous Dispose at Class 1 disposal site.
	3397 ≤ TTLC or 1000 ≤ TTLC < 3397 and DI WET > 150 mg/l	Z2	Hazardous – not reusable under Variance. Dispose at Class 1 disposal site.
STLC > 5.0	TTLC < 1411 & DI WET < 1.5 mg/l	Y1	Hazardous Variance applies – cover with minimum of 1 foot of clean soil*.
	1411 ≤ TTLC < 3397 & DI WET < 150 mg/l	Y2	Hazardous Variance applies – cover with pavement structure*.
	TTLC < 3397 & DI WET < 150 mg/l but Surplus	Z2	Surplus – Hazardous Dispose at Class 1 disposal site.
	3397 ≤ TTLC or DI WET > 150 mg/l	Z2	Hazardous – not reusable under Variance Dispose at Class 1 disposal site.
Federal Testing			
TCLP > 5.0 mg/l	N/A	Z3	RCRA Hazardous Waste Dispose at Class 1 disposal site as a RCRA waste regardless of TTLC and STLC results.
**Note: For hazardous waste levels of lead – if pH is less than 5.5 soil must be placed under a pavement structure. If pH is less than 5.0 variance cannot be used and the soil must be disposed as Z-2 material.*			

4.2 Conclusions

Based on our assessment of all the laboratory test results, the TTLC (except for one out of 800 samples), TCLP, DI-WET and pH values are all less than the threshold published in the Caltrans Aerially Deposited Lead Soil Management table (Table 1):

- TTLC test results are all less than 1000 mg/kg, except for one sample L-3-09-1 shows TTLC of 1,600 mg/kg,
- TCLP test results are all less than 5.0 mg/l,
- DI-WET test results are all less than 1.5 mg/l, and
- pH test results are all greater than 5.5.

Thus, the TTLC, TCLP, DI-Wet and pH test results do not govern handling of the onsite soils. Only the STLC test results will affect the handling procedure of the onsite soils.

Using the statistical analysis discussed earlier, the laboratory test results, and the Caltrans Aerially Deposited Lead Soil Management table, the findings within each roadway segment including the ramps are presented below. The statistical calculations performed for each roadway segment including the ramps are included in Appendix C.

4.2.1 Segment 1, Between Sta. 163+00 and Sta. 210+00 ("A" Line)

As shown in Figure 26, a correlation coefficient of 0.952 was obtained in the regression analysis between TTLC and STLC. This indicates that the 95% UCL (Upper Confidence Limit) for TTLC can be correlated to the 95% UCL for STLC. Results of the statistical analyses and the projected STLC based on 95% UCL TTLC are tabulated below.

Depth Interval (ft)	TTLC			STLC		WET-DI		TCLP		UCL		
	No.	Mean (mg/kg)	SD (mg/kg)	No.	Mean (mg/l)	No.	Value (mg/l)	No.	Value (mg/l)	95% UCL TTLC (mg/kg)	Distribution	Proj. STLC (mg/l)
0.0-4.0	164	19.1	37.9	14	3.5	1	0.18	1	0.18	37.61	Chebyshev	0

Based on the above 95% UCL of TTLC and the projected STLC, soils in Segment 1 are considered as Soil Type "X", which is non-hazardous. There is no special requirement for on-site reuse and off-site disposal.

4.2.2 Segment 2, Between Sta. 210+00 and Sta. 340+00 ("A" Line)

In order to refine the limits of the classification areas, Segment 2 was divided into the following five regions:

Region	Stationing ("A" Line)	Boring No.
2A	Sta. 210+00 to Sta. 271+00	From Borings L-2-1 to L-2-43, and Boring L-2-45
2B	Sta. 271+00 to Sta. 275+00	Borings L-2-44 and L-2-47
2C	Sta. 275+00 to Sta. 282+00	Boring L-2-46, and from Borings L-2-48 to L-2-51
2D	Sta. 282+00 to Sta. 288+50	From Borings L-2-52 to L-2-55
2E	Sta. 288+50 to Sta. 340+00	From Borings L-2-56 to L-2-102

4.2.2.1 Region 2A - Sta. 210+00 to Sta. 271+00 ("A" Line)

As shown in Figure 27, a correlation coefficient of 0.983 was obtained in the regression analysis between TTLC and STLC. This indicates that the 95% UCL for TTLC can be correlated to the 95% UCL for STLC. Results of the statistical analyses and the projected STLC based on 95% UCL TTLC are tabulated below.

Depth Interval (ft)	TTLC			STLC		WET-DI		TCLP		UCL		
	No.	Mean (mg/kg)	SD (mg/kg)	No.	Mean (mg/l)	No.	Value (mg/l)	No.	Value (mg/l)	95% UCL TTLC (mg/kg)	Distribution	Proj. STLC (mg/l)
0.0-4.0	176	14.6	40.8	9	3.3	1	0.2	1	0.1	28.04	Chebyshev	0.65

Based on the above 95% UCL of TTLC and the projected STLC, soils in Region 2A are considered as Soil Type "X", which is non-hazardous. There is no special requirement for on-site reuse and off-site disposal.

4.2.2.2 Region 2B - Sta. 271+00 to Sta. 275+00 ("A" Line)

As shown in Figure 28, a correlation coefficient of 0.850 was obtained in the regression analysis between TTLC and STLC. This indicates that the 95% UCL for TTLC can be correlated to the 95% UCL for STLC. Results of the statistical analyses and the projected STLC based on 95% UCL TTLC are tabulated below.

Depth Interval (ft)	TTLC			STLC		WET-DI		TCLP		UCL		
	No.	Mean (mg/kg)	SD (mg/kg)	No.	Mean (mg/l)	No.	Max & Mean (mg/l)	No.	Max & Mean (mg/l)	95% UCL TTLC (mg/kg)	Distribution	Proj. STLC (mg/l)
0.0-4.0	8	71.5	46.0	6	5.1	4	0.2	4	0.1	102.3	Student's-t	5.7

Based on the above 95% UCL of TTLC and the projected STLC, soils in Region 2B are considered as Soil Type "Y1", which is hazardous. The "block-diagram" approach was not performed to delineate the vertical extent of the "Y1" soils because the number of data-points is not adequate to compute a meaningful and reliable estimates of 95% UCL for TTLC for limited upper depth scenarios (i.e., top 0.5 or 1.5 or 3.0 feet depths). Therefore, we conservatively recommend classifying the upper 4 feet of onsite soils, regardless of depth, within this region as Soil Type "Y1"; the 4-foot depth is the maximum depth explored in this study. If the upper 4.0 feet of excavated soil, regardless of depth, is disposed off-site, it should be classified as Soil Type "Z2" (hazardous waste).

4.2.2.3 Region 2C - Sta. 275+00 to Sta. 282+00 ("A" Line)

As shown in Figure 29, a correlation coefficient of 0.988 was obtained in the regression analysis between TTLC and STLC. This indicates that the 95% UCL for TTLC can be correlated to the 95% UCL for STLC. Results of the statistical analyses and the projected STLC based on 95% UCL TTLC are tabulated below.

Depth Interval (ft)	TTLC			STLC		WET-DI		TCLP		UCL		
	No.	Mean (mg/kg)	SD (mg/kg)	No.	Mean (mg/l)	No.	Mean (mg/l)	No.	Mean (mg/l)	95% UCL TTLC (mg/kg)	Distribution	Proj. STLC (mg/l)
0.0-4.0	20	50.4	113.2	5	2.1	-	-	-	-	107.4	Chebyshev	2.28

Based on the above 95% UCL of TTLC and the projected STLC, soils in Region 2C are considered as Soil Type "X", which is non-hazardous. There is no special requirement for on-site reuse and off-site disposal.

4.2.2.4 Region 2D - Sta. 282+00 to Sta. 288+50 ("A" Line)

As shown in Figure 30, a correlation coefficient of 0.894 was obtained in the regression analysis between TTLC and STLC. This indicates that the 95% UCL for TTLC can be correlated to the 95% UCL for STLC. Results of the statistical analyses and the projected STLC based on 95% UCL TTLC are tabulated below.

Depth Interval (ft)	TTLC			STLC		WET-DI		TCLP		UCL		
	No.	Mean (mg/kg)	SD (mg/kg)	No.	Mean (mg/l)	No.	Max & Mean (mg/l)	No.	Max & Mean (mg/l)	95% UCL TTLC (mg/kg)	Distribution	Proj. STLC (mg/l)
0.0-4.0	16	51.8	90.0	4	11.5	3	0.20	3	0.10	275.7	Chebyshev	25.7

Based on the above 95% UCL of TTLC and the projected STLC, soils in Region 2D are considered as Soil Type "Y1", which is hazardous. The "block-diagram" approach was not performed to delineate the vertical extent of the "Y1" soils because the number of data-points is not adequate to compute a meaningful and reliable estimates of 95% UCL for TTLC for limited upper depth scenarios (i.e., top 0.5 or 1.5 or 3.0 feet depths). Therefore, we conservatively recommend classifying the upper 4 feet of onsite soils, regardless of depth, within this region as Soil Type "Y1"; the 4-foot depth is the maximum depth explored in this study. If the upper 4.0 feet of excavated soil, regardless of depth, is disposed off-site, it should be classified as Soil Type "Z2" (hazardous waste).

4.2.2.5 Region 2E - Sta. 288+50 to Sta. 340+00 ("A" Line)

As shown in Figure 31, a correlation coefficient of 0.922 was obtained in the regression analysis between TTLC and STLC. This indicates that the 95% UCL for TTLC can be correlated to the 95% UCL for STLC. Results of the statistical analyses and the projected STLC based on 95% UCL TTLC are tabulated below.

Depth Interval (ft)	TTLC			STLC		WET-DI		TCLP		UCL		
	No.	Mean (mg/kg)	SD (mg/kg)	No.	Mean (mg/l)	No.	Value (mg/l)	No.	Value (mg/l)	95% UCL TTLC (mg/kg)	Distribution	Proj. STLC (mg/l)
0.0-4.0	188	14.8	28.6	11	3.6	1	0.2	1	0.1	27.87	Chebyshev	1.06

Based on the above 95% UCL of TTLC and the projected STLC, soils in Region 2E are considered as Soil Type "X", which is non-hazardous. There is no special requirement for on-site reuse and off-site disposal.

4.2.3 Segment 3, Between Sta. 340+00 and Sta. 408+00 ("A" Line)

In order to refine the limits of the classification areas, Segment 3 was divided into the following three regions:

Region	Stationing ("A" Line)	Boring No.
3A	NB Sta. 340+00 to Sta. 348+00, and SB Sta. 340+00 to Sta. 353+00	From Borings L-3-1 to L-3-6, and Borings L-3-8 and L-3-10
3B	NB Sta. 348+00 to Sta. 353+00	Borings L-3-7, L-3-9 and L-3-11
3C	Sta. 353+00 to Sta. 408+00	From Borings L-2-12 to L-3-57

4.2.3.1 Region 3A - NB Sta. 340+00 to Sta. 348+00 and SB Sta. 340+00 to Sta. 353+00 ("A" Line)

There were 8 borings drilled in this region and a total of 32 samples were tested. Among the 32 samples, only 5 samples with TTLC greater than 50 mg/kg were tested for soluble lead (STLC). All of the test results for TTLC and STLC indicate the soils are well below the "Y1" Classification threshold. The maximum TTLC is 91.9 mg/kg and the average TTLC is 25.1 mg/kg; the maximum STLC is 3.2 mg/l and the average STLC is 2.2 mg/l. Therefore, soils in Region 3A are considered as Soil Type "X", which is non-hazardous. There is no special requirement for on-site reuse and off-site disposal.

4.2.3.2 Region 3B - NB Sta. 348+00 to Sta. 353+00 ("A" Line)

As shown in Figure 32, a correlation coefficient of 0.951 was obtained in the regression analysis between TTLC and STLC. This indicates that the 95% UCL for TTLC can be correlated to the 95% UCL for STLC. Results of the statistical analyses and the projected STLC based on mean and 95% UCL TTLC are tabulated below.

Depth Interval (ft)	TTLC			STLC		WET-DI		TCLP		UCL		
	No.	Mean (mg/kg)	SD (mg/kg)	No.	Mean (mg/l)	No.	Max & Mean (mg/l)	No.	Max & Mean (mg/l)	95% UCL TTLC (mg/kg)	Distribution	Proj. STLC (mg/l)
0.0-4.0	12	55.1	86.8	5	12.0	3	0.49	3	0.10	1071	Chebyshev	23.20

Based on the above 95% UCL of TTLC and the projected STLC, soils in Region 3B are considered as Soil Type "Y1", which is hazardous. The "block-diagram" approach was not performed to delineate the vertical extent of the "Y1" soils because the number of data-points is not adequate to compute a meaningful and reliable estimates of 95% UCL for TTLC for limited upper depth scenarios (i.e., top 0.5 or 1.5 or 3.0 feet depths). Therefore, we conservatively recommend classifying the upper 4 feet of onsite soils, regardless of depth, within this region as Soil Type "Y1"; the 4-foot depth is the maximum depth explored in this study. If the upper 4.0 feet of excavated soil, regardless of depth, is disposed off-site, it should be classified as Soil Type "Z2" (hazardous waste).

4.2.3.3 Region 3C - Sta. 353+00 to Sta. 408+00 ("A" Line)

As shown in Figure 33, a correlation coefficient of 0.924 was obtained in the regression analysis between TTLC and STLC. This indicates that the 95% UCL for TTLC can be correlated to the 95% UCL for STLC. Results of the statistical analyses and the projected STLC based on 95% UCL TTLC are tabulated below.

Depth Interval (ft)	TTLC			STLC		WET-DI		TCLP		UCL		
	No.	Mean (mg/kg)	SD (mg/kg)	No.	Mean (mg/l)	No.	Mean (mg/l)	No.	Mean (mg/l)	95% UCL TTLC (mg/kg)	Distribution	Proj. STLC (mg/l)
0.0-4.0	184	44.3	100.3	34	7.5	13	0.30	13	0.11	90.53	Chebyshev	2.55

Based on the above 95% UCL of TTLC and the projected STLC, soils in Region 3C are considered as Soil Type "X", which is non-hazardous. There is no special requirement for on-site reuse and off-site disposal.

4.3 Recommendations

Based on the analytical results, soils from the following regions along the mainline should be managed as Soil Type Y1 based on Caltrans Aerially Deposited Lead Soil Management presented earlier in Table 1:

- Soils from the upper 4.0 feet, regardless of depth, between mainline northbound and southbound Sta. 271+00 and Sta. 275+00 ("A" Line) (Region 2B);

- Soils from the upper 4.0 feet, regardless of depth, between mainline northbound and southbound Sta. 282+00 and Sta. 288+50 ("A" Line) (Region 2D); and

- Soils from the upper 4.0 feet, regardless of depth, between mainline northbound Sta. 348+00 and Sta. 353+00 ("A" Line) (Region 3B).

The remaining soils within the project limit, including the ramps, are considered as Soil Type X. For soils classified as Soil Type X, there is no special requirement for on-site reuse and off-site disposal.

Soils classified as Soil Type Y1 are suitable for on-site reuse with respect to the total and WET-DI soluble lead concentrations. They are allowed to be used as fill in the Caltrans right-of-way provided the soil is placed a minimum of 5 feet above the maximum level of water table and is covered either with pavement structure or with a minimum of 1 foot of clean soil. If the above soils are elected to be disposed offsite, they should be classified as Soil Type Z2 since the citric soluble lead concentrations exceed the STLC of 5.0 mg/l. Soil Type Z2 is considered as California hazardous waste. Therefore, they should be disposed at a Class I hazardous waste facility.

Contractors excavating, transporting, or stockpiling soil should prepare a Lead Compliance Plan in accordance with the Caltrans Code of Safety Practices, California Code of Regulations and

Cal-OSHA standards addressing the presence of ADL in the soils within the project area. A Lead content testing results contained herein should be given to contractors handling the soils during construction.

4.4 Conclusion and Recommendations for Yellow Traffic Stripe Paint Analyses

Caltrans SSP states that waste residue from removal of yellow painted traffic stripe and pavement marking is a non-hazardous waste, if it contains lead in average concentrations less than 1000 mg/kg total lead and 5 mg/l soluble lead. For leachable chromium (Cr) lead, samples that contain lead in average concentrations less than 1000 mg/kg total Cr and 5 mg/l extractable lead Cr is considered a non-hazardous waste.

TRC Solutions, Inc. (TRC) will sample and test the yellow thermoplastic traffic stripes in Segment 3. Within Segments 1 and 2, yellow traffic stripes were located along the ramps and the mainline median only. Therefore, yellow traffic stripe paint samples were collected at the on- and off-ramps, and along the I-5 Mainline median in the southbound and northbound directions at 0.5 mile interval.

Copies of the original laboratory test results for the paint samples are included in Appendix B. A summary of the test results are tabulated below for the ramps followed by the mainline median.

Sample ID	Lab ID	Ramp	TTLC (mg/kg)	STLC (mg/l)	Total Cr (mg/kg)	STLC Cr (mg/l)
LP-NPF	EA202012-1	I-5, NB Avenida Pico Off-Ramp	234.0	0.6	81.2	1.9
LP-SPF	EA202012-2	I-5, SB Avenida Pico Off-Ramp	2.8	-	ND	-
LP-SPN	EA202012-3	I-5, SB Avenida Pico On-Ramp	114.0	1.4	46.3	-
LP-NPN	EA202012-4	I-5, NB Avenida Pico On-Ramp	11,600.0	3.2	2,870.0	10.1
LP-SHF	EA202012-5	I-5, SB Avenida Vista Hermosa Off-Ramp	119.0	0.6	38.6	-
LP-SHNL	EA202012-6	I-5, SB Avenida Vista Hermosa On-Ramp Loop	217.0	0.9	54.5	3.6
LP-NHNL	EA202012-7	I-5, NB Avenida Vista Hermosa On-Ramp Loop	342.0	1.4	125.0	4.0
LP-NHN	EA202012-8	I-5, NB Avenida Vista Hermosa On-Ramp	384.0	0.8	89.5	2.7
LP-NHF	EA202012-9	I-5, NB Avenida Vista HermosaOff-Ramp	199.0	0.5	59.2	2.0
LP-SEF	EA202012-10	I-5, SB Camino de Estrella Off-Ramp	222.0	0.7	67.5	1.4
LP-SEN	EA202012-11	I-5, SB Camino de Estrella On-Ramp	4,650.0	4.6	1,320.0	8.9
LP-NEN	EA202012-12	I-5, NB Camino de Estrella On-Ramp	332.0	0.7	107.0	1.5
LP-NENL	EA202012-13	I-5, NB Camino de Estrella On-Ramp Loop	9,620.0	4.3	1,620.0	7.5
LP-NEF	EA202012-14	I-5, NB Camino de Estrella Off-Ramp	2,610.0	3.1	633.0	13.9

Sample ID	Lab ID	Mainline Median	TTLC (mg/kg)	STLC (mg/l)	Total Cr (mg/kg)	STLC Cr (mg/l)
LP-S-1	EA202012-15	I-5, SB Sta. 307+50	10.2	-	6.50	-
LP-S-2	EA202012-16	I-5, SB Sta. 281+00	7.0	-	2.0	-
LP-S-3	EA202012-17	I-5, SB Sta. 255+50	14.8	-	2.50	-
LP-S-4	EA202012-18	I-5, SB Sta. 229+50	7.1	-	2.0	-
LP-S-5	EA202012-19	I-5, SB Sta. 203+50	9.1	-	10.40	-
LP-S-6	EA202012-20	I-5, SB Sta. 177+50	8.2	-	3.10	-
LP-N-1	EA202012-21	I-5, NB Sta. 190+00	1,470.0	5.7	328.00	5.2
LP-N-2	EA202012-22	I-5, NB Sta. 216+00	4.9	-	2.0	-
LP-N-3	EA202012-23	I-5, NB Sta. 242+00	526.0	0.6	105.00	1.5
LP-N-4	EA202012-24	I-5, NB Sta. 272+50	2,540.0	2.9	672.00	5.2
LP-N-5	EA202012-25	I-5, NB Sta. 294+00	15.6	-	5.60	-
LP-N-6	EA202012-26	I-5, NB Sta. 320+00	129.0	0.3	37.70	-

Based on the above results, the yellow stripe paint Samples LP-NPN, LP-SEN, LP-NENL, and LP-NEF collected at ramp locations and Samples LP-N-1 and LP-N-4 collected along the I-5 northbound median contain total lead concentration greater than the TTLC value for total lead of 1,000 mg/kg or soluble lead concentration greater than the STLC value for soluble lead of 5 mg/l. Therefore, the waste residue from removal of painted yellow traffic stripes from the following locations should be considered as a hazardous waste residue:

- I-5, NB Avenida Pico On-Ramp (Sample LP-NPN);
- I-5, SB Camino de Estrella On-Ramp (Sample LP-SEN);
- I-5, NB Camino de Estrella On-Ramp Loop (Sample LP-NENL);
- I-5, NB Camino de Estrella Off-Ramp (Sample LP-NEF);
- I-5 Northbound Mainline median between Sta. 163+00 and Sta. 216+00 ("A" Line) (Sample LP-N-1); and
- I-5 Northbound Mainline median between Sta. 242+00 and Sta. 294+00 ("A" Line) (Sample LP-N-4).

The remaining waste residues from removal of painted yellow traffic stripes within the project limit are considered as a non-hazardous waste residue.

5.0 LIMITATIONS

This report is intended for use by OCTA, Caltrans, Parsons, AECOM and TRC for the I-5 HOV Improvement Project (Segments 1, 2, and 3). This report is based on the project as described herein and the information obtained from the exploratory borings at the approximate locations indicated on the attached plans. The findings and recommendations contained in this report are based on the results of the field investigation, laboratory tests, and analyses. Also, soils and subsurface conditions encountered in the exploratory borings are presumed to be representative of the project site; however, subsurface conditions and characteristics of soils between exploratory borings can vary. Findings reflect an interpretation of the direct evidence obtained. Recommendations presented herein are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. EMI should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Modifications to the project plans or variations in subsurface conditions may require re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained herein are applicable to the specific design elements and locations which are the subject of this report. Data, opinions, and recommendations herein have no applicability to any other design elements or to any other locations, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of EMI.

EMI is not responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the Contractor, or any other person performing any of the construction, or for the failure of any worker to carry out the construction in accordance with the Final construction drawings and specifications.

Services performed by EMI were conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

6.0 REFERENCES

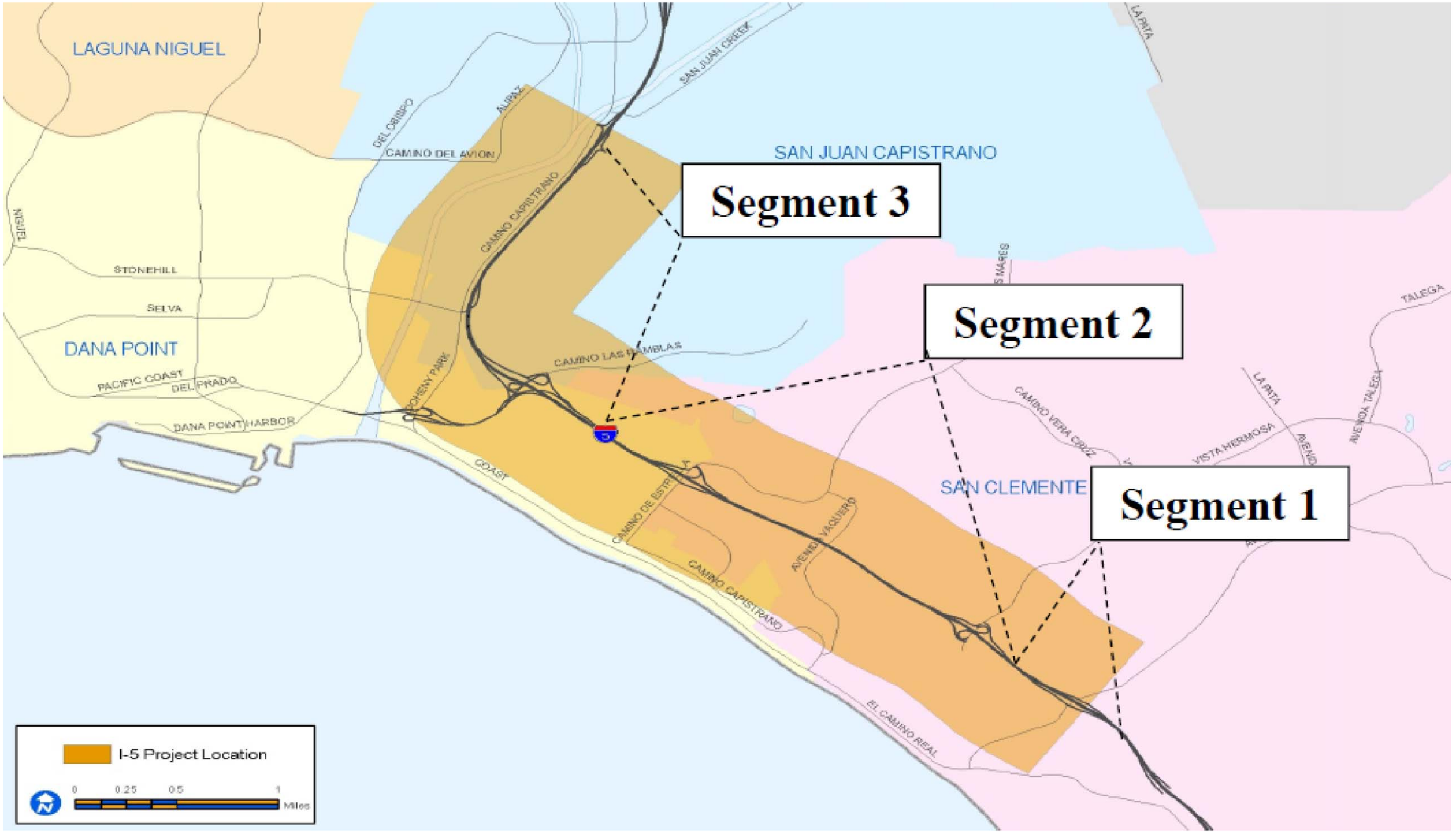
California Environmental Protection Agency, Department of Toxic Substances Control; Variance (to Caltrans District 8 for Reuse of Lead-Contaminated Soils), Variance No. 00-H-VAR-04; September 22, 2000.

California Department of Transportation (Caltrans), 2007, Aerially Deposited Lead Guidance, June.

Caltrans, Aerially Deposited Lead Soil Management, http://www.dot.ca.gov/hq/env/haz/pdfs/adl/h306.pdf.

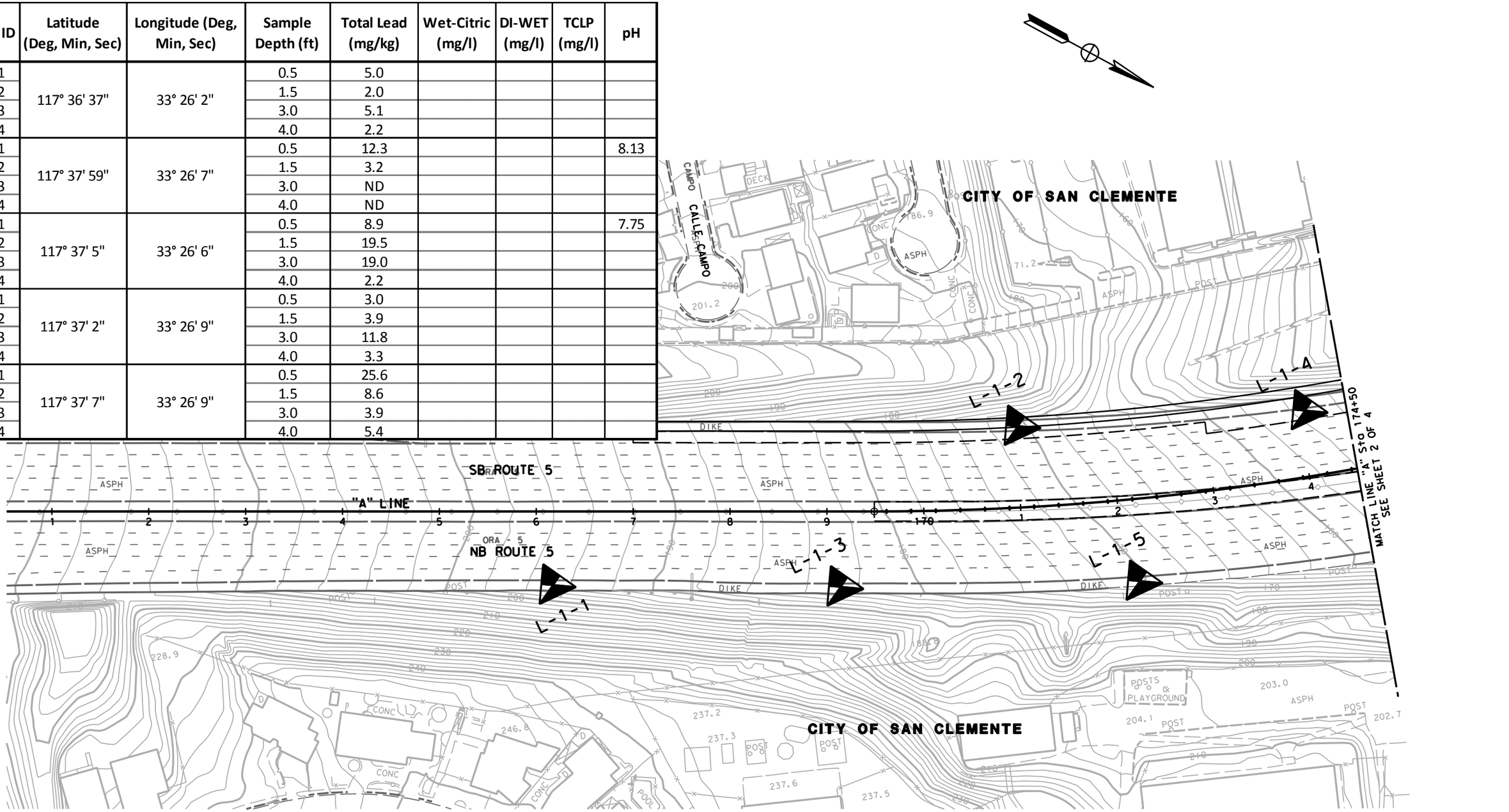
United States Environmental Protection Agency (EPA), 2007, ProUCL Version 4.00.02 User Guide and Technical Guide, April.

FIGURES



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**ADL Investigation, I-5 HOV Widening, Segments 1, 2 and 3** EMI Project No.: 11-135, 11-136, 11-137 Date: 04-25-2012	**Site Location Map** **Figure 1**

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-1-1	117° 36' 37"	33° 26' 2"	0.5	5.0				
L-1-1-2			1.5	2.0				
L-1-1-3			3.0	5.1				
L-1-1-4			4.0	2.2				
L-1-2-1	117° 37' 59"	33° 26' 7"	0.5	12.3				8.13
L-1-2-2			1.5	3.2				
L-1-2-3			3.0	ND				
L-1-2-4			4.0	ND				
L-1-3-1	117° 37' 5"	33° 26' 6"	0.5	8.9				7.75
L-1-3-2			1.5	19.5				
L-1-3-3			3.0	19.0				
L-1-3-4			4.0	2.2				
L-1-4-1	117° 37' 2"	33° 26' 9"	0.5	3.0				
L-1-4-2			1.5	3.9				
L-1-4-3			3.0	11.8				
L-1-4-4			4.0	3.3				
L-1-5-1	117° 37' 7"	33° 26' 9"	0.5	25.6				
L-1-5-2			1.5	8.6				
L-1-5-3			3.0	3.9				
L-1-5-4			4.0	5.4				



Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

INTERSTATE 5 HOV IMPROVEMENT PROJECT (SEGMENT 1)

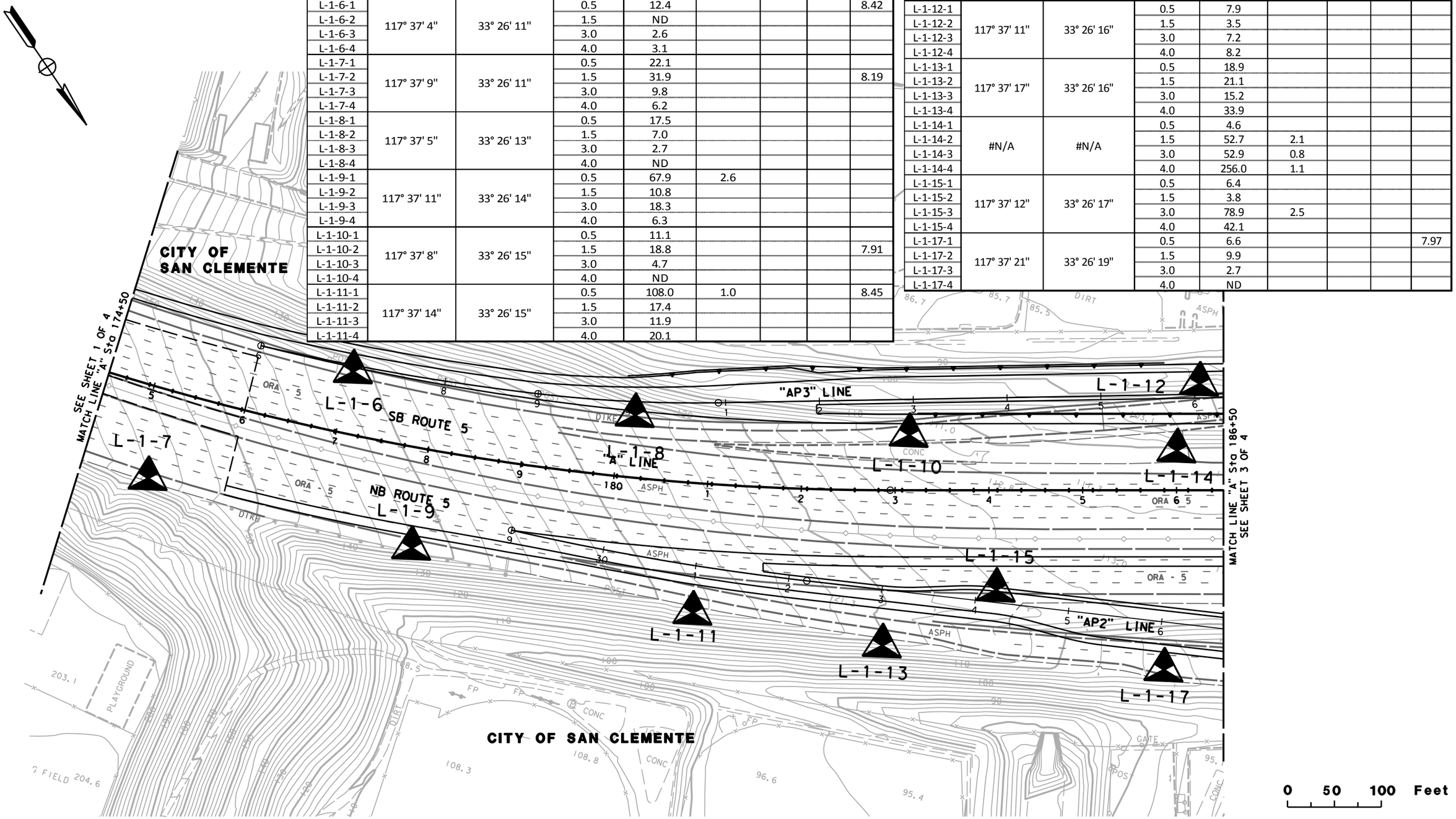
Project No.: 11-135 | **Date: 03-14-2012**

Exploratory Boring Location Map (1 of 4) for ADL Study

Figure 2

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-6-1	117° 37' 4"	33° 26' 11"	0.5	12.4				8.42
L-1-6-2			1.5	ND				
L-1-6-3			3.0	2.6				
L-1-6-4			4.0	3.1				
L-1-7-1	117° 37' 9"	33° 26' 11"	0.5	22.1				
L-1-7-2			1.5	31.9				8.19
L-1-7-3			3.0	9.8				
L-1-7-4			4.0	6.2				
L-1-8-1	117° 37' 5"	33° 26' 13"	0.5	17.5				
L-1-8-2			1.5	7.0				
L-1-8-3			3.0	2.7				
L-1-8-4			4.0	ND				
L-1-9-1	117° 37' 11"	33° 26' 14"	0.5	67.9	2.6			
L-1-9-2			1.5	10.8				
L-1-9-3			3.0	18.3				
L-1-9-4			4.0	6.3				
L-1-10-1	117° 37' 8"	33° 26' 15"	0.5	11.1				
L-1-10-2			1.5	18.8				7.91
L-1-10-3			3.0	4.7				
L-1-10-4			4.0	ND				
L-1-11-1	117° 37' 14"	33° 26' 15"	0.5	108.0	1.0			8.45
L-1-11-2			1.5	17.4				
L-1-11-3			3.0	11.9				
L-1-11-4			4.0	20.1				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-12-1	117° 37' 11"	33° 26' 16"	0.5	7.9				
L-1-12-2			1.5	3.5				
L-1-12-3			3.0	7.2				
L-1-12-4			4.0	8.2				
L-1-13-1	117° 37' 17"	33° 26' 16"	0.5	18.9				
L-1-13-2			1.5	21.1				
L-1-13-3			3.0	15.2				
L-1-13-4			4.0	33.9				
L-1-14-1	#N/A	#N/A	0.5	4.6				
L-1-14-2			1.5	52.7	2.1			
L-1-14-3			3.0	52.9	0.8			
L-1-14-4			4.0	256.0	1.1			
L-1-15-1	117° 37' 12"	33° 26' 17"	0.5	6.4				
L-1-15-2			1.5	3.8				
L-1-15-3			3.0	78.9	2.5			
L-1-15-4			4.0	42.1				
L-1-17-1	117° 37' 21"	33° 26' 19"	0.5	6.6				7.97
L-1-17-2			1.5	9.9				
L-1-17-3			3.0	2.7				
L-1-17-4			4.0	ND				



Earth Mechanics, Inc.
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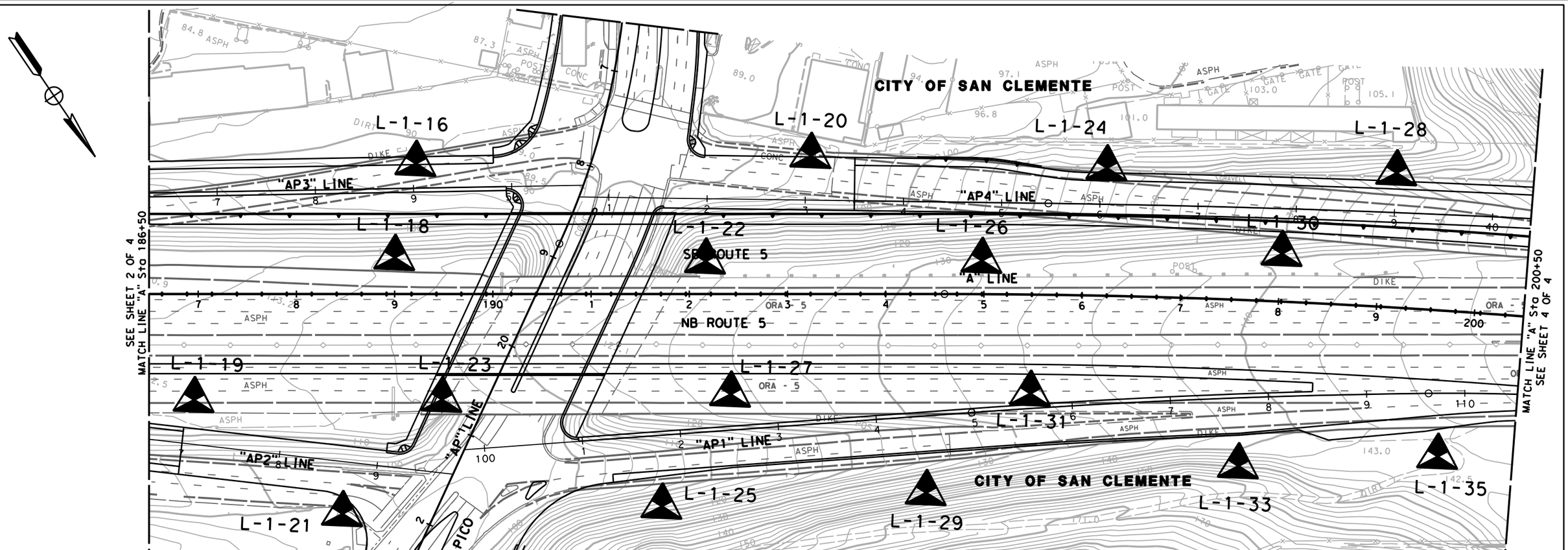
INTERSTATE 5 HOV IMPROVEMENT PROJECT (SEGMENT 1)

Project No.: 11-135 | **Date: 03-14-2012**

Exploratory Boring Location Map (2 of 4) for ADL Study

Figure 3



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-16-1	117° 37' 13"	33° 26' 18"	0.5	18.7				8.21
L-1-16-2			1.5	14.2				
L-1-16-3			3.0	2.2				
L-1-16-4			4.0	ND				
L-1-18-1	117° 37' 15"	33° 26' 19"	0.5	27.7				
L-1-18-2			1.5	15.3				
L-1-18-3			3.0	22.3				
L-1-18-4			4.0	21.6				
L-1-19-1	117° 37' 20"	33° 26' 19"	0.5	91.1	3.9			
L-1-19-2			1.5	41.1				8.48
L-1-19-3			3.0	12.4				
L-1-19-4			4.0	2.7				
L-1-20-1	117° 37' 16"	33° 26' 20"	0.5	5.7				8.04
L-1-20-2			1.5	2.3				
L-1-20-3			3.0	2.4				
L-1-20-4			4.0	2.2				
L-1-21-1	117° 37' 25"	33° 26' 20"	0.5	4.0				
L-1-21-2			1.5	5.6				
L-1-21-3			3.0	ND				
L-1-21-4			4.0	ND				
L-1-22-1	117° 37' 17"	33° 26' 20"	0.5	18.2				
L-1-22-2			1.5	30.2				
L-1-22-3			3.0	21.7				
L-1-22-4			4.0	17.5				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-23-1	117° 37' 23"	33° 26' 20"	0.5	9.3				
L-1-23-2			1.5	9.7				
L-1-23-3			3.0	41.3				
L-1-23-4			4.0	18.4				
L-1-24-1	117° 37' 18"	33° 26' 21"	0.5	9.6				
L-1-24-2			1.5	8.7				
L-1-24-3			3.0	10.4				
L-1-24-4			4.0	8.8				
L-1-25-1	117° 37' 27"	33° 26' 22"	0.5	22.1				7.68
L-1-25-2			1.5	16.4				
L-1-25-3			3.0	3.2				
L-1-25-4			4.0	ND				
L-1-26-1	117° 37' 20"	33° 26' 22"	0.5	4.3				8
L-1-26-2			1.5	3.0				
L-1-26-3			3.0	2.1				
L-1-26-4			4.0	7.3				
L-1-27-1	117° 37' 25"	33° 26' 21"	0.5	51.6	1.7			
L-1-27-2			1.5	17.9				8.51
L-1-27-3			3.0	8.2				
L-1-27-4			4.0	11.5				
L-1-28-1	117° 37' 21"	33° 26' 24"	0.5	ND				
L-1-28-2			1.5	ND				8.87
L-1-28-3			3.0	ND				
L-1-28-4			4.0	2.4				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-29-1	117° 37' 30"	33° 26' 23"	0.5	19.8				
L-1-29-2			1.5	14.5				
L-1-29-3			3.0	3.5				
L-1-29-4			4.0	7.2				
L-1-30-1	117° 37' 23"	33° 26' 24"	0.5	21.6				
L-1-30-2			1.5	2.9				
L-1-30-3			3.0	6.2				
L-1-30-4			4.0	ND				
L-1-31-1	117° 37' 28"	33° 26' 23"	0.5	32.4				
L-1-31-2			1.5	4.9				
L-1-31-3			3.0	7.8				
L-1-31-4			4.0	39.0				
L-1-33-1	117° 37' 33"	33° 26' 25"	0.5	108.0	1.5			7.61
L-1-33-2			1.5	335.0	23.8	ND	0.18	
L-1-33-3			3.0	25.3				
L-1-33-4			4.0	3.7				
L-1-35-1	117° 37' 32"	33° 26' 26"	0.5	12.9				
L-1-35-2			1.5	19.6				
L-1-35-3			3.0	4.7				
L-1-35-4			4.0	7.6				

0 50 100 Feet

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

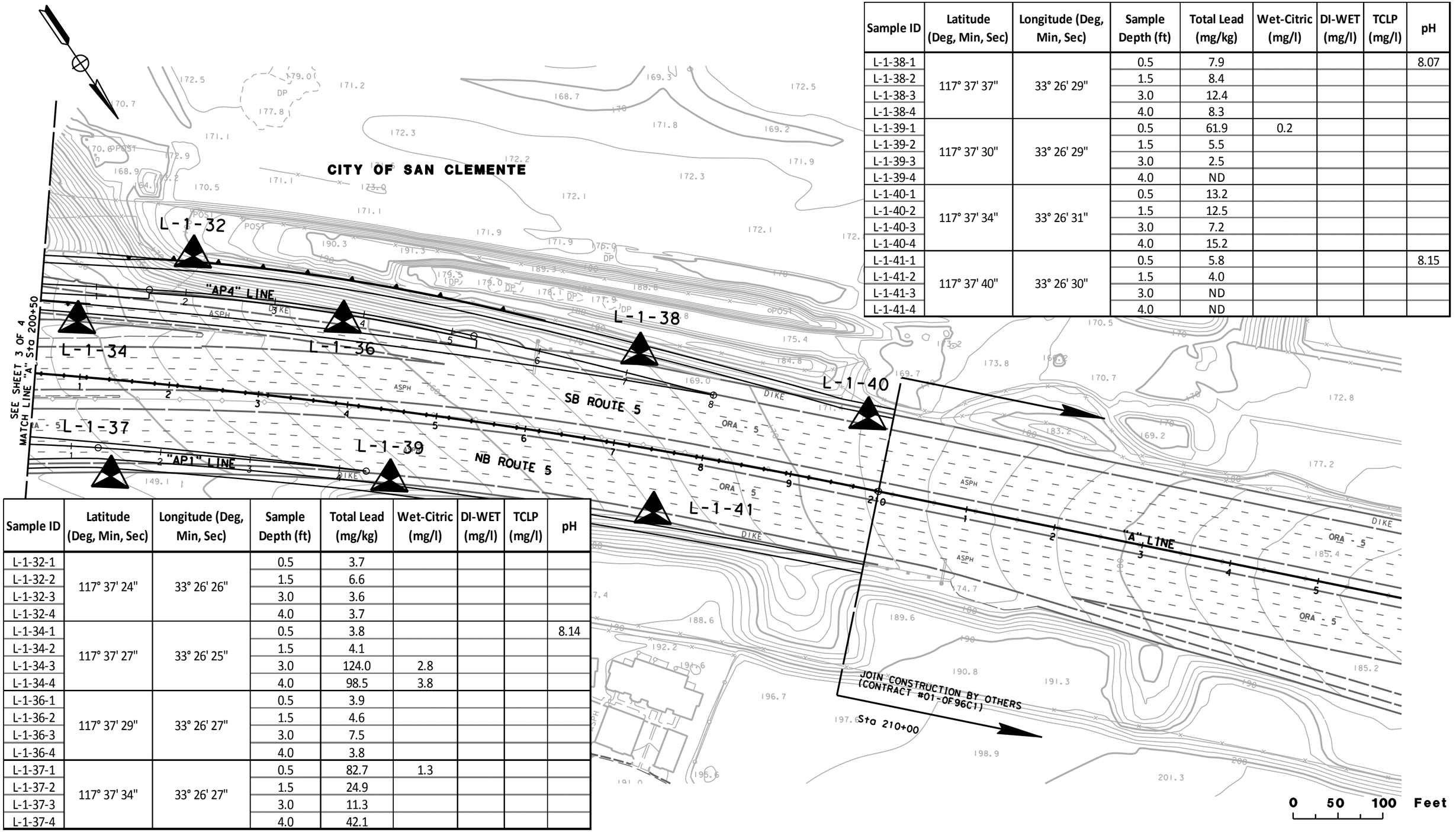
INTERSTATE 5 HOV IMPROVEMENT PROJECT (SEGMENT 1)

Project No.: 11-135

Date: 03-14-2012

Exploratory Boring Location Map (3 of 4) for ADL Study

Figure 4



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-38-1	117° 37' 37"	33° 26' 29"	0.5	7.9				8.07
L-1-38-2			1.5	8.4				
L-1-38-3			3.0	12.4				
L-1-38-4			4.0	8.3				
L-1-39-1	117° 37' 30"	33° 26' 29"	0.5	61.9	0.2			
L-1-39-2			1.5	5.5				
L-1-39-3			3.0	2.5				
L-1-39-4			4.0	ND				
L-1-40-1	117° 37' 34"	33° 26' 31"	0.5	13.2				
L-1-40-2			1.5	12.5				
L-1-40-3			3.0	7.2				
L-1-40-4			4.0	15.2				
L-1-41-1	117° 37' 40"	33° 26' 30"	0.5	5.8				8.15
L-1-41-2			1.5	4.0				
L-1-41-3			3.0	ND				
L-1-41-4			4.0	ND				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-32-1	117° 37' 24"	33° 26' 26"	0.5	3.7				
L-1-32-2			1.5	6.6				
L-1-32-3			3.0	3.6				
L-1-32-4			4.0	3.7				
L-1-34-1	117° 37' 27"	33° 26' 25"	0.5	3.8				8.14
L-1-34-2			1.5	4.1				
L-1-34-3			3.0	124.0	2.8			
L-1-34-4			4.0	98.5	3.8			
L-1-36-1	117° 37' 29"	33° 26' 27"	0.5	3.9				
L-1-36-2			1.5	4.6				
L-1-36-3			3.0	7.5				
L-1-36-4			4.0	3.8				
L-1-37-1	117° 37' 34"	33° 26' 27"	0.5	82.7	1.3			
L-1-37-2			1.5	24.9				
L-1-37-3			3.0	11.3				
L-1-37-4			4.0	42.1				

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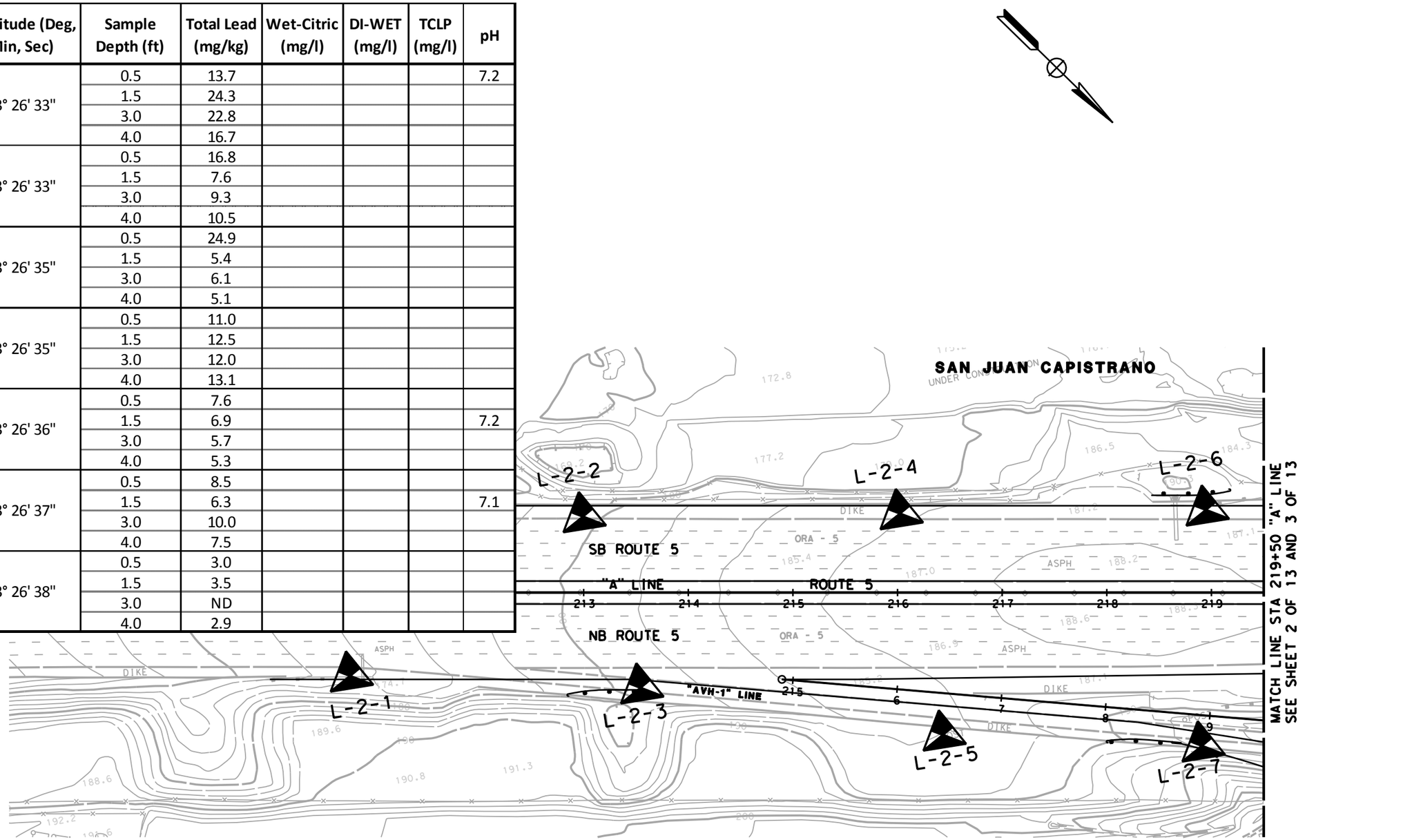
INTERSTATE 5 HOV IMPROVEMENT PROJECT (SEGMENT 1)

Project No.: 11-135 | Date: 03-14-2012

Exploratory Boring Location Map (4 of 4) for ADL Study

Figure 5

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-1-1	117° 37' 36"	33° 26' 33"	0.5	13.7				7.2
L-2-1-2			1.5	24.3				
L-2-1-3			3.0	22.8				
L-2-1-4			4.0	16.7				
L-2-2-1	117° 37' 39"	33° 26' 33"	0.5	16.8				
L-2-2-2			1.5	7.6				
L-2-2-3			3.0	9.3				
L-2-2-4			4.0	10.5				
L-2-3-1	117° 37' 42"	33° 26' 35"	0.5	24.9				
L-2-3-2			1.5	5.4				
L-2-3-3			3.0	6.1				
L-2-3-4			4.0	5.1				
L-2-4-1	117° 37' 41"	33° 26' 35"	0.5	11.0				
L-2-4-2			1.5	12.5				
L-2-4-3			3.0	12.0				
L-2-4-4			4.0	13.1				
L-2-5-1	117° 37' 45"	33° 26' 36"	0.5	7.6				
L-2-5-2			1.5	6.9				7.2
L-2-5-3			3.0	5.7				
L-2-5-4			4.0	5.3				
L-2-6-1	117° 37' 43"	33° 26' 37"	0.5	8.5				
L-2-6-2			1.5	6.3				7.1
L-2-6-3			3.0	10.0				
L-2-6-4			4.0	7.5				
L-2-7-1	117° 37' 47"	33° 26' 38"	0.5	3.0				
L-2-7-2			1.5	3.5				
L-2-7-3			3.0	ND				
L-2-7-4			4.0	2.9				



Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

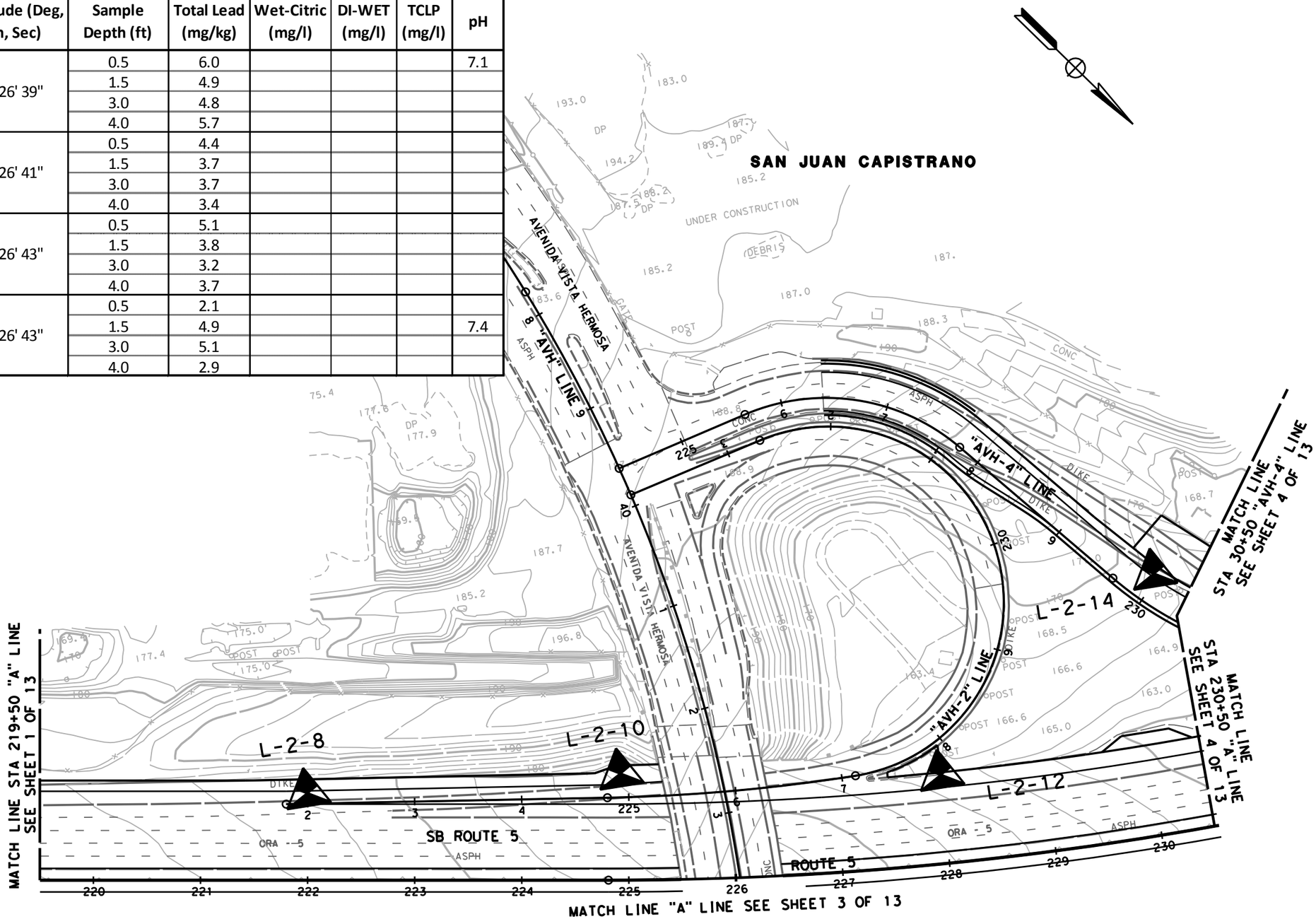
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (1 of 13) for ADL Study

Figure 6

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-8-1	117° 37' 45"	33° 26' 39"	0.5	6.0				7.1
L-2-8-2			1.5	4.9				
L-2-8-3			3.0	4.8				
L-2-8-4			4.0	5.7				
L-2-10-1	117° 37' 46"	33° 26' 41"	0.5	4.4				
L-2-10-2			1.5	3.7				
L-2-10-3			3.0	3.7				
L-2-10-4			4.0	3.4				
L-2-12-1	117° 37' 49"	33° 26' 43"	0.5	5.1				
L-2-12-2			1.5	3.8				
L-2-12-3			3.0	3.2				
L-2-12-4			4.0	3.7				
L-2-14-1	117° 37' 46"	33° 26' 43"	0.5	2.1				
L-2-14-2			1.5	4.9				7.4
L-2-14-3			3.0	5.1				
L-2-14-4			4.0	2.9				



Earth Mechanics, Inc.
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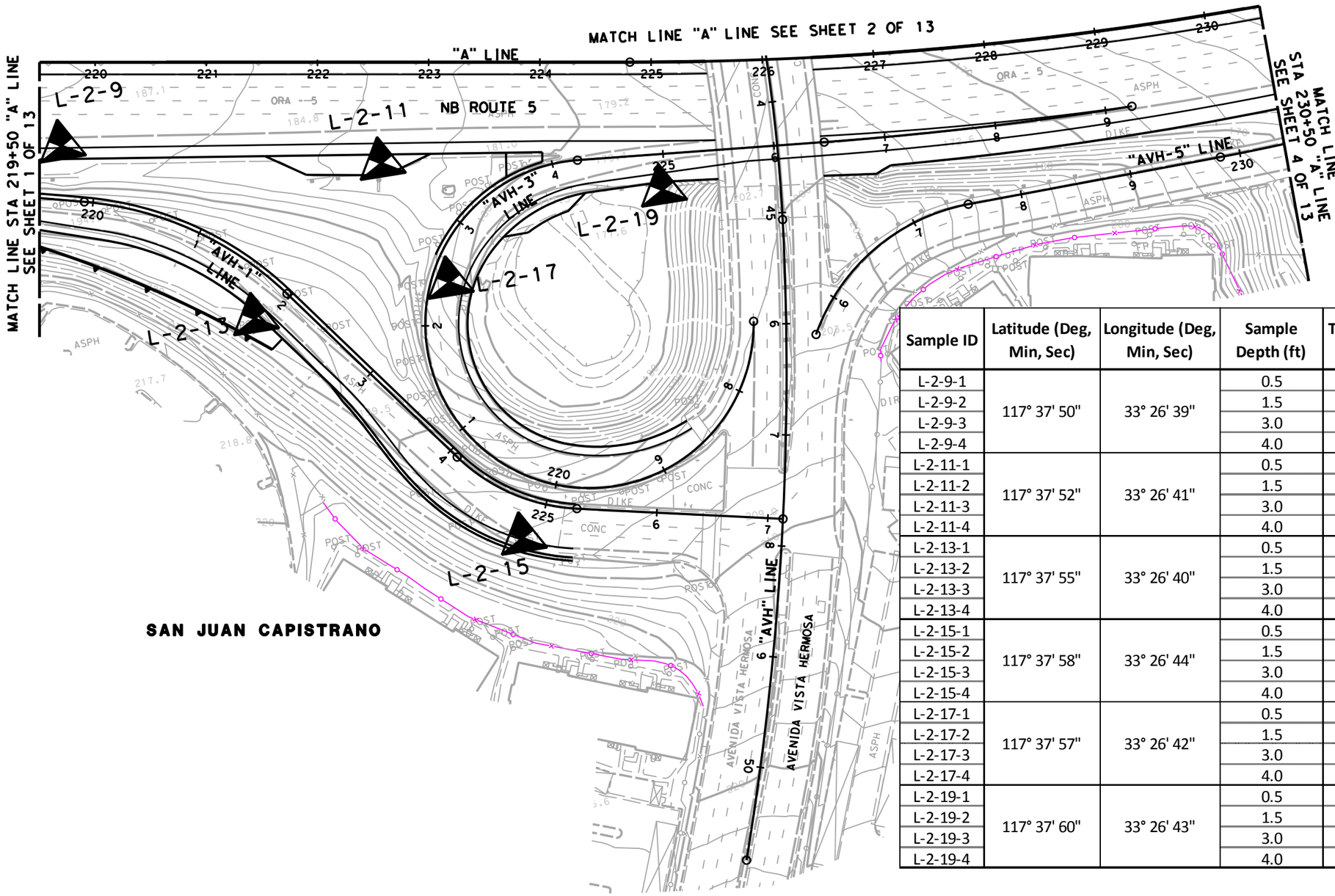
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (2 of 13) for ADL Study

Figure 7



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-9-1	117° 37' 50"	33° 26' 39"	0.5	7.2				
L-2-9-2			1.5	2.7				
L-2-9-3			3.0	3.4				
L-2-9-4			4.0	ND				
L-2-11-1	117° 37' 52"	33° 26' 41"	0.5	4.0				
L-2-11-2			1.5	4.7				
L-2-11-3			3.0	4.4				7.2
L-2-11-4			4.0	4.5				
L-2-13-1	117° 37' 55"	33° 26' 40"	0.5	13.5				7.3
L-2-13-2			1.5	3.2				
L-2-13-3			3.0	ND				
L-2-13-4			4.0	4.6				
L-2-15-1	117° 37' 58"	33° 26' 44"	0.5	7.3				
L-2-15-2			1.5	3.5				
L-2-15-3			3.0	3.1				
L-2-15-4			4.0	4.2				
L-2-17-1	117° 37' 57"	33° 26' 42"	0.5	6.6				
L-2-17-2			1.5	4.4				7.7
L-2-17-3			3.0	4.8				
L-2-17-4			4.0	4.7				
L-2-19-1	117° 37' 60"	33° 26' 43"	0.5	6.5				
L-2-19-2			1.5	5.2				
L-2-19-3			3.0	5.0				
L-2-19-4			4.0	7.1				

0 50 100 Feet

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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (3 of 13) for ADL Study

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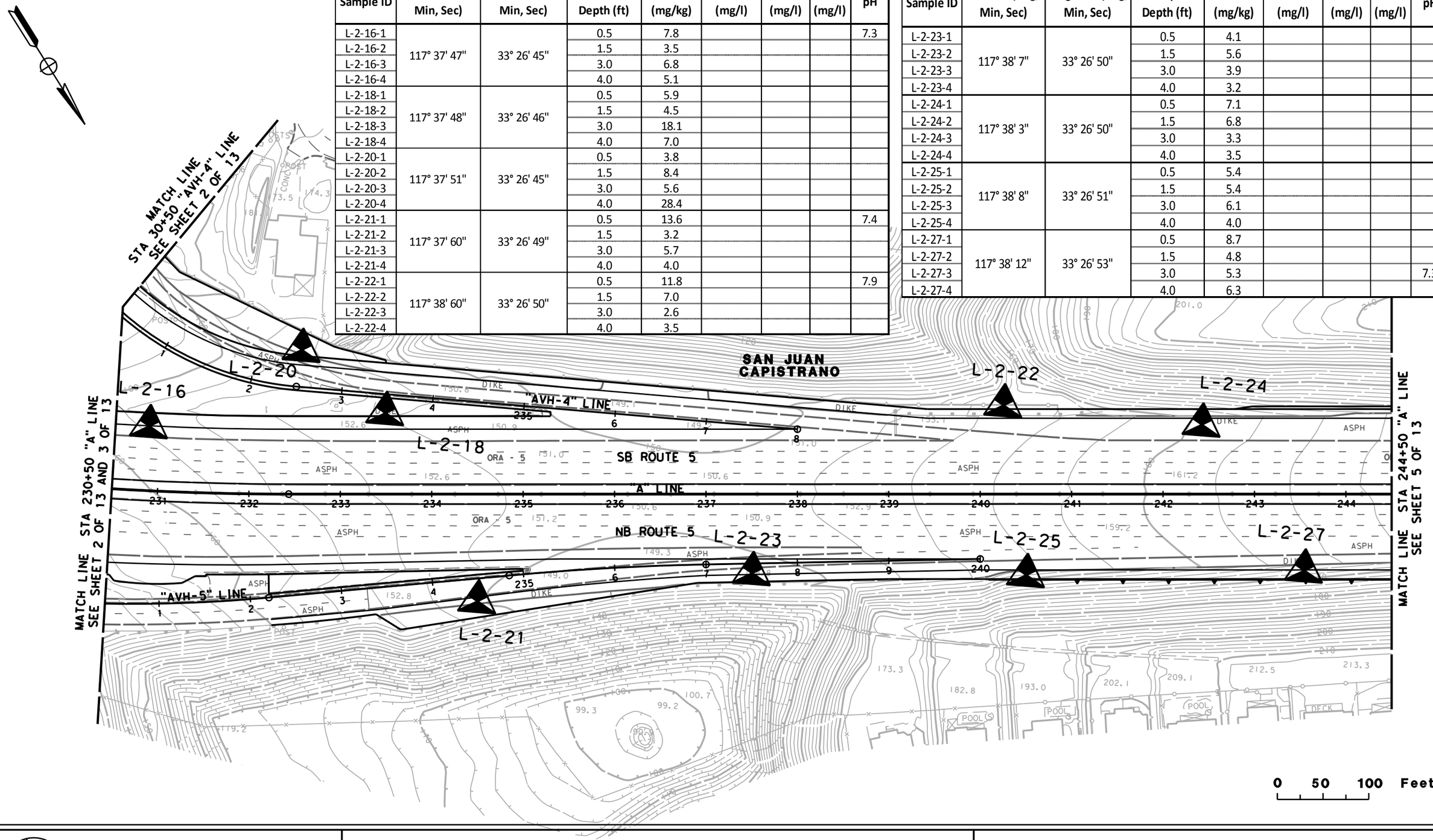
Figure 8

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-16-1	117° 37' 47"	33° 26' 45"	0.5	7.8				7.3
L-2-16-2			1.5	3.5				
L-2-16-3			3.0	6.8				
L-2-16-4			4.0	5.1				
L-2-18-1	117° 37' 48"	33° 26' 46"	0.5	5.9				
L-2-18-2			1.5	4.5				
L-2-18-3			3.0	18.1				
L-2-18-4			4.0	7.0				
L-2-20-1	117° 37' 51"	33° 26' 45"	0.5	3.8				
L-2-20-2			1.5	8.4				
L-2-20-3			3.0	5.6				
L-2-20-4			4.0	28.4				
L-2-21-1	117° 37' 60"	33° 26' 49"	0.5	13.6				7.4
L-2-21-2			1.5	3.2				
L-2-21-3			3.0	5.7				
L-2-21-4			4.0	4.0				
L-2-22-1	117° 38' 60"	33° 26' 50"	0.5	11.8				7.9
L-2-22-2			1.5	7.0				
L-2-22-3			3.0	2.6				
L-2-22-4			4.0	3.5				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-23-1	117° 38' 7"	33° 26' 50"	0.5	4.1				
L-2-23-2			1.5	5.6				
L-2-23-3			3.0	3.9				
L-2-23-4			4.0	3.2				
L-2-24-1	117° 38' 3"	33° 26' 50"	0.5	7.1				
L-2-24-2			1.5	6.8				
L-2-24-3			3.0	3.3				
L-2-24-4			4.0	3.5				
L-2-25-1	117° 38' 8"	33° 26' 51"	0.5	5.4				
L-2-25-2			1.5	5.4				
L-2-25-3			3.0	6.1				
L-2-25-4			4.0	4.0				
L-2-27-1	117° 38' 12"	33° 26' 53"	0.5	8.7				
L-2-27-2			1.5	4.8				
L-2-27-3			3.0	5.3				7.3
L-2-27-4			4.0	6.3				



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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

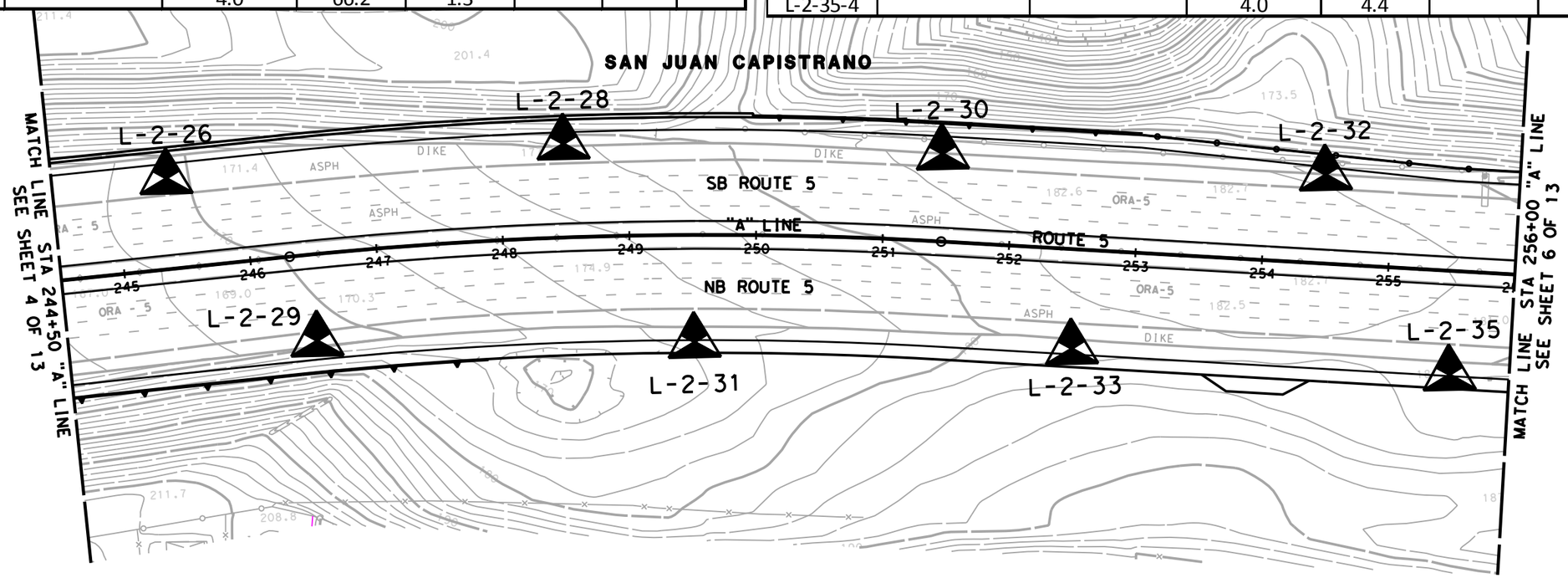
Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (4 of 13) for ADL Study

Figure 9

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-26-1	117° 38' 6"	33° 26' 53"	0.5	7.0				
L-2-26-2			1.5	4.7				
L-2-26-3			3.0	3.9				
L-2-26-4			4.0	3.6				
L-2-28-1	117° 38' 10"	33° 26' 54"	0.5	61.2	1.3			
L-2-28-2			1.5	18.1				7.6
L-2-28-3			3.0	18.9				
L-2-28-4			4.0	16.8				
L-2-29-1	117° 38' 15"	33° 26' 55"	0.5	20.2				
L-2-29-2			1.5	6.6				
L-2-29-3			3.0	5.6				
L-2-29-4			4.0	6.6				
L-2-30-1	117° 38' 13"	33° 26' 55"	0.5	446.0	1.3			
L-2-30-2			1.5	67.4	1.3			
L-2-30-3			3.0	61.7	1.7			
L-2-30-4			4.0	66.2	1.3			

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-31-1	117° 38' 17"	33° 26' 56"	0.5	20.0				6.7
L-2-31-2			1.5	24.9				
L-2-31-3			3.0	5.4				
L-2-31-4			4.0	3.8				
L-2-32-1	117° 38' 15"	33° 26' 58"	0.5	44.8				
L-2-32-2			1.5	6.3				
L-2-32-3			3.0	14.3				
L-2-32-4			4.0	14.6				
L-2-33-1	117° 38' 21"	33° 26' 57"	0.5	11.1				
L-2-33-2			1.5	3.6				
L-2-33-3			3.0	ND				
L-2-33-4			4.0	ND				
L-2-35-1	117° 38' 23"	33° 26' 59"	0.5	21.8				
L-2-35-2			1.5	4.4				
L-2-35-3			3.0	5.5				
L-2-35-4			4.0	4.4				



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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

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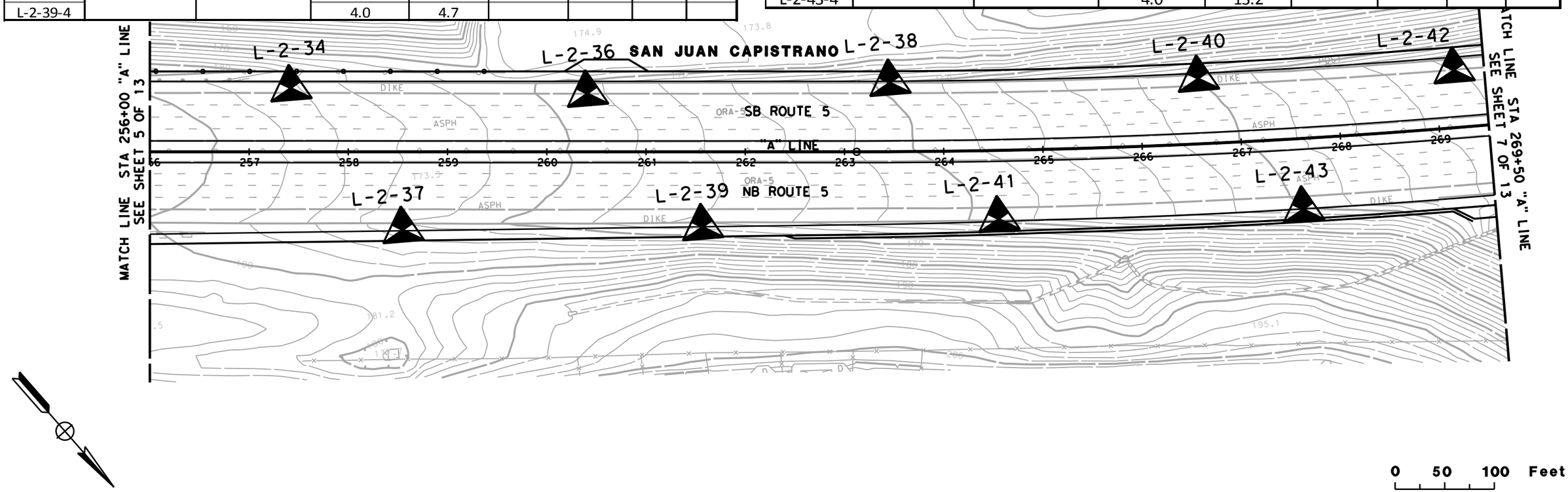
Exploratory Boring Location Map (5 of 13) for ADL Study

Figure 10

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-34-1	117° 38' 17"	33° 26' 60"	0.5	282.0	16.1	ND	ND	7.7
L-2-34-2			1.5	15.8				
L-2-34-3			3.0	6.2				
L-2-34-4			4.0	5.3				
L-2-36-1	117° 38' 20"	33° 27' 2"	0.5	8.1				
L-2-36-2			1.5	2.8				
L-2-36-3			3.0	3.4				
L-2-36-4			4.0	2.3				
L-2-37-1	117° 38' 26"	33° 27' 1"	0.5	11.4				
L-2-37-2			1.5	3.2				7.2
L-2-37-3			3.0	4.2				
L-2-37-4			4.0	3.5				
L-2-38-1	117° 38' 23"	33° 27' 4"	0.5	4.7				
L-2-38-2			1.5	4.6				
L-2-38-3			3.0	51.2	0.1			
L-2-38-4			4.0	49.2				
L-2-39-1	117° 38' 28"	33° 27' 3"	0.5	26.0				
L-2-39-2			1.5	5.9				
L-2-39-3			3.0	6.4				
L-2-39-4			4.0	4.7				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-40-1	117° 38' 26"	33° 27' 5"	0.5	9.9				
L-2-40-2			1.5	13.0				7.1
L-2-40-3			3.0	6.0				
L-2-40-4			4.0	33.3				
L-2-41-1	117° 38' 31"	33° 27' 6"	0.5	6.6				
L-2-41-2			1.5	9.6				
L-2-41-3			3.0	7.0				
L-2-41-4			4.0	5.3				
L-2-42-1	117° 38' 29"	33° 27' 7"	0.5	91.6	3.1			7.5
L-2-42-2			1.5	55.9	3.4			
L-2-42-3			3.0	7.6				
L-2-42-4			4.0	4.9				
L-2-43-1	117° 38' 34"	33° 27' 8"	0.5	9.0				
L-2-43-2			1.5	12.9				
L-2-43-3			3.0	18.0				
L-2-43-4			4.0	13.2				



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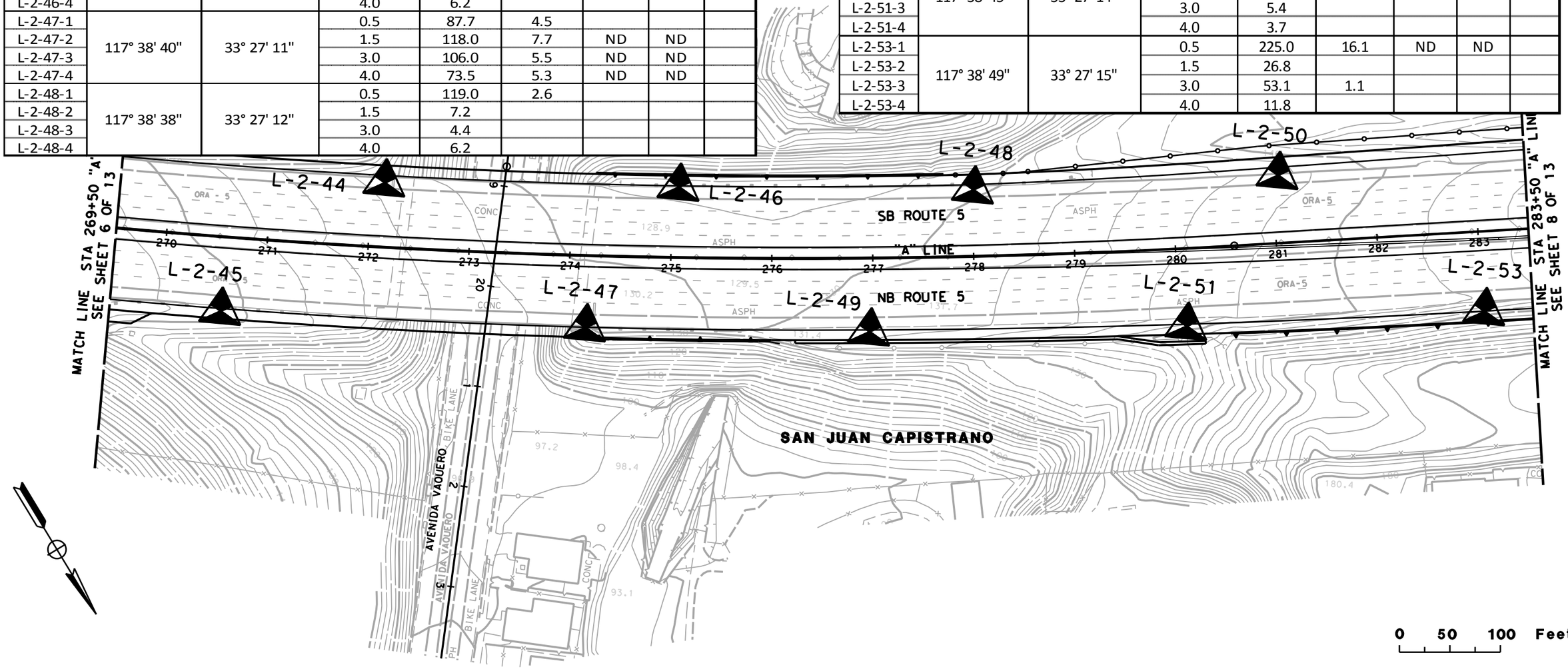
Exploratory Boring Location Map (6 of 13) for ADL Study

Figure 11

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-44-1	117° 38' 32"	33° 27' 9"	0.5	56.4	1.8			
L-2-44-2			1.5	119.0	5.8	ND	ND	7.1
L-2-44-3			3.0	7.9				
L-2-44-4			4.0	3.4				
L-2-45-1	117° 38' 37"	33° 27' 9"	0.5	27.3				8.5
L-2-45-2			1.5	6.4				
L-2-45-3			3.0	14.2				
L-2-45-4			4.0	10.1				
L-2-46-1	117° 38' 34"	33° 27' 10"	0.5	71.5	1.3			
L-2-46-2			1.5	25.7				
L-2-46-3			3.0	3.9				
L-2-46-4			4.0	6.2				
L-2-47-1	117° 38' 40"	33° 27' 11"	0.5	87.7	4.5			
L-2-47-2			1.5	118.0	7.7	ND	ND	
L-2-47-3			3.0	106.0	5.5	ND	ND	
L-2-47-4			4.0	73.5	5.3	ND	ND	
L-2-48-1	117° 38' 38"	33° 27' 12"	0.5	119.0	2.6			
L-2-48-2			1.5	7.2				
L-2-48-3			3.0	4.4				
L-2-48-4			4.0	6.2				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-49-1	117° 38' 43"	33° 27' 13"	0.5	65.5	0.8			
L-2-49-2			1.5	22.3				
L-2-49-3			3.0	510.0	4.1			
L-2-49-4			4.0	18.1				
L-2-50-1	117° 38' 41"	33° 27' 13"	0.5	18.5				6.1
L-2-50-2			1.5	4.7				
L-2-50-3			3.0	3.7				
L-2-50-4			4.0	ND				
L-2-51-1	117° 38' 45"	33° 27' 14"	0.5	18.0				7.6
L-2-51-2			1.5	91.5	1.8			
L-2-51-3			3.0	5.4				
L-2-51-4			4.0	3.7				
L-2-53-1	117° 38' 49"	33° 27' 15"	0.5	225.0	16.1	ND	ND	
L-2-53-2			1.5	26.8				
L-2-53-3			3.0	53.1	1.1			
L-2-53-4			4.0	11.8				



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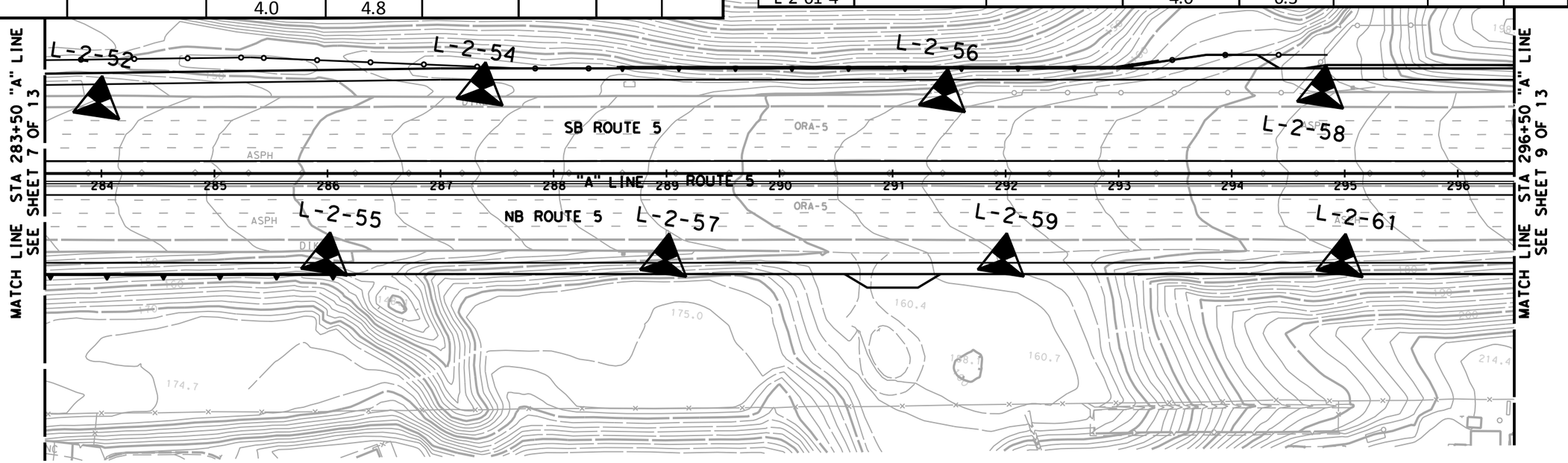
Exploratory Boring Location Map (7 of 13) for ADL Study

Figure 12

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-52-1	117° 38' 44"	33° 27' 15"	0.5	8.7				
L-2-52-2			1.5	6.1				
L-2-52-3			3.0	6.3				
L-2-52-4			4.0	3.5				
L-2-54-1	117° 38' 46"	33° 27' 16"	0.5	5.1				6.2
L-2-54-2			1.5	271.0	6.9	ND	ND	
L-2-54-3			3.0	2.8				
L-2-54-4			4.0	4.0				
L-2-55-1	117° 38' 53"	33° 27' 17"	0.5	191.0	22.0	ND	ND	
L-2-55-2			1.5	8.9				
L-2-55-3			3.0	2.6				
L-2-55-4			4.0	2.7				
L-2-56-1	117° 38' 51"	33° 27' 18"	0.5	5.1				
L-2-56-2			1.5	3.8				
L-2-56-3			3.0	4.3				
L-2-56-4			4.0	4.8				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-57-1	117° 38' 56"	33° 27' 18"	0.5	2.7				7.7
L-2-57-2			1.5	79.6	4.6			
L-2-57-3			3.0	12.8				
L-2-57-4			4.0	7.6				
L-2-58-1	117° 38' 53"	33° 27' 19"	0.5	14.7				
L-2-58-2			1.5	3.1				
L-2-58-3			3.0	5.5				
L-2-58-4			4.0	6.4				
L-2-59-1	117° 38' 60"	33° 27' 19"	0.5	7.2				
L-2-59-2			1.5	19.7				
L-2-59-3			3.0	13.8				
L-2-59-4			4.0	4.1				
L-2-61-1	117° 38' 2"	33° 27' 21"	0.5	10.1				
L-2-61-2			1.5	25.2				7.5
L-2-61-3			3.0	5.8				
L-2-61-4			4.0	6.3				



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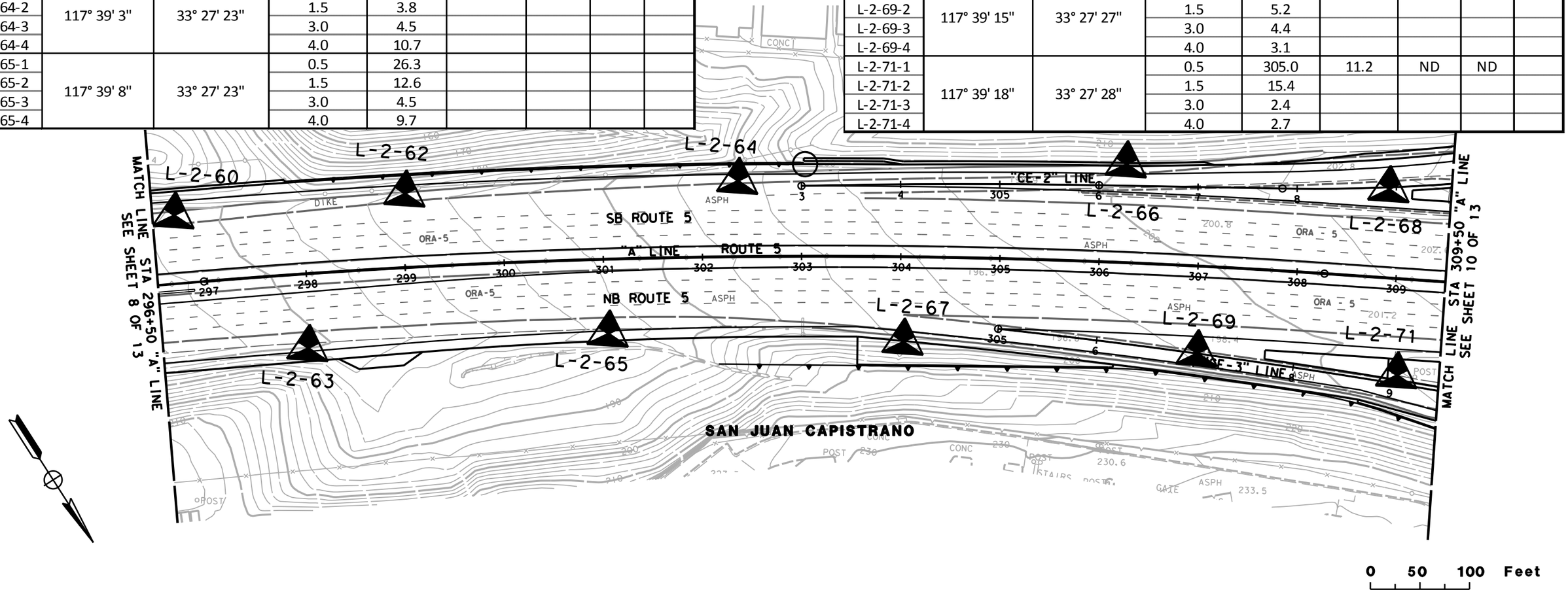
Exploratory Boring Location Map (8 of 13) for ADL Study

Figure 13

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-60-1	117° 39' 56"	33° 27' 20"	0.5	11.1				
L-2-60-2			1.5	4.1				
L-2-60-3			3.0	4.8				
L-2-60-4			4.0	5.2				
L-2-62-1	117° 39' 60"	33° 27' 21"	0.5	56.7	0.9			7.1
L-2-62-2			1.5	18.0				
L-2-62-3			3.0	38.4				
L-2-62-4			4.0	13.4				
L-2-63-1	117° 39' 3"	33° 27' 22"	0.5	8.7				7.7
L-2-63-2			1.5	13.3				
L-2-63-3			3.0	3.2				
L-2-63-4			4.0	3.1				
L-2-64-1	117° 39' 3"	33° 27' 23"	0.5	7.8				
L-2-64-2			1.5	3.8				
L-2-64-3			3.0	4.5				
L-2-64-4			4.0	10.7				
L-2-65-1	117° 39' 8"	33° 27' 23"	0.5	26.3				
L-2-65-2			1.5	12.6				
L-2-65-3			3.0	4.5				
L-2-65-4			4.0	9.7				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-66-1	117° 39' 5"	33° 27' 25"	0.5	7.3				
L-2-66-2			1.5	2.4				
L-2-66-3			3.0	4.6				
L-2-66-4			4.0	2.2				
L-2-67-1	117° 39' 12"	33° 27' 25"	0.5	3.2				
L-2-67-2			1.5	2.4				
L-2-67-3			3.0	ND				
L-2-67-4			4.0	3.4				
L-2-68-1	117° 39' 9"	33° 27' 27"	0.5	17.7				
L-2-68-2			1.5	4.7				
L-2-68-3			3.0	8.6				
L-2-68-4			4.0	4.7				
L-2-69-1	117° 39' 15"	33° 27' 27"	0.5	3.9				6.6
L-2-69-2			1.5	5.2				
L-2-69-3			3.0	4.4				
L-2-69-4			4.0	3.1				
L-2-71-1	117° 39' 18"	33° 27' 28"	0.5	305.0	11.2	ND	ND	
L-2-71-2			1.5	15.4				
L-2-71-3			3.0	2.4				
L-2-71-4			4.0	2.7				



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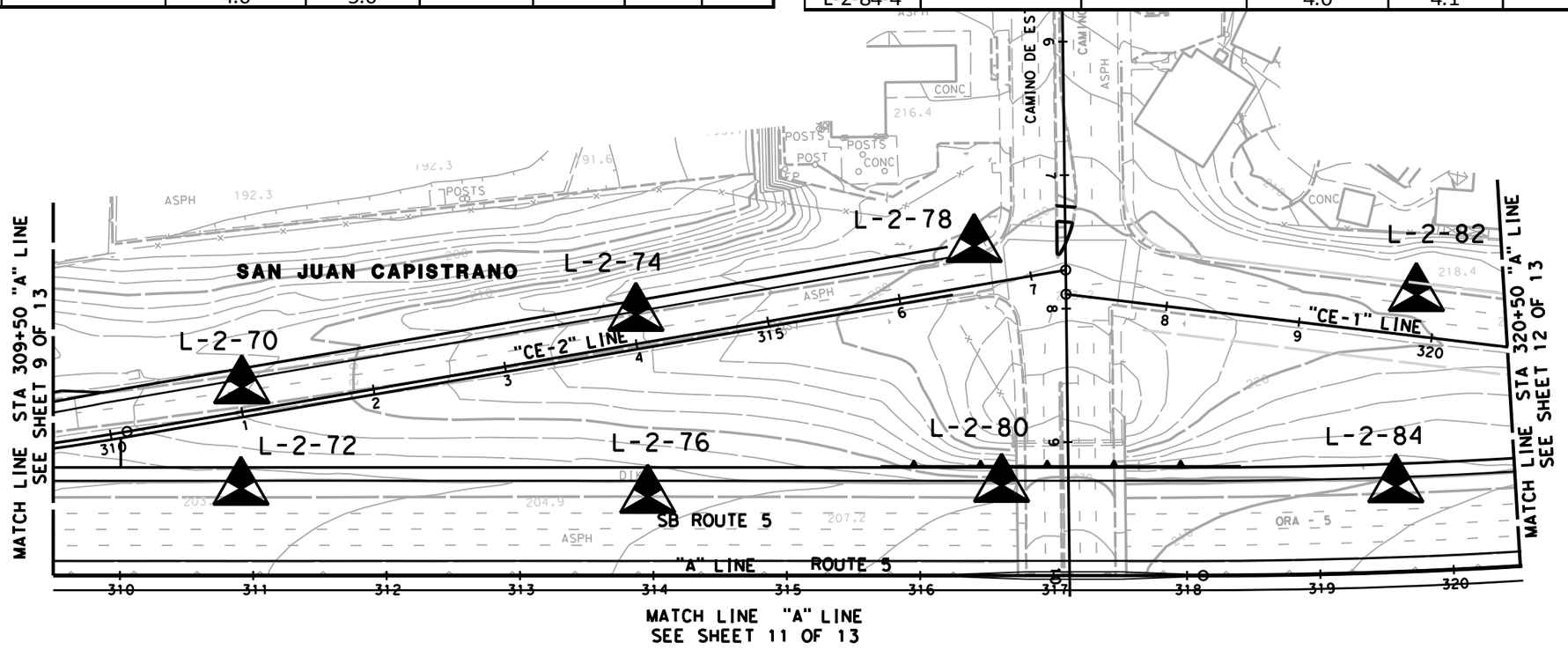
Exploratory Boring Location Map (9 of 13) for ADL Study

Figure 14

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-70-1	117° 39' 11"	33° 27' 27"	0.5	11.8				
L-2-70-2			1.5	2.4				
L-2-70-3			3.0	2.3				
L-2-70-4			4.0	ND				
L-2-72-1	117° 39' 14"	33° 27' 28"	0.5	16.9				
L-2-72-2			1.5	2.1				
L-2-72-3			3.0	3.5				
L-2-72-4			4.0	3.2				
L-2-74-1	117° 39' 15"	33° 27' 31"	0.5	7.3				
L-2-74-2			1.5	9.6				
L-2-74-3			3.0	6.8				
L-2-74-4			4.0	3.6				
L-2-76-1	117° 39' 20"	33° 27' 30"	0.5	14.1				7.6
L-2-76-2			1.5	2.3				
L-2-76-3			3.0	4.5				
L-2-76-4			4.0	5.0				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-78-1	117° 39' 18"	33° 27' 30"	0.5	70.6	2.6			6.7
L-2-78-2			1.5	10.2				
L-2-78-3			3.0	7.3				
L-2-78-4			4.0	9.6				
L-2-80-1	117° 39' 16"	33° 27' 31"	0.5	9.5				
L-2-80-2			1.5	4.0				
L-2-80-3			3.0	3.4				
L-2-80-4			4.0	21.0				
L-2-82-1	117° 39' 18"	33° 27' 32"	0.5	26.1				
L-2-82-2			1.5	20.6				
L-2-82-3			3.0	18.4				
L-2-82-4			4.0	16.0				
L-2-84-1	117° 39' 20"	33° 27' 33"	0.5	8.2				
L-2-84-2			1.5	3.7				
L-2-84-3			3.0	2..4				
L-2-84-4			4.0	4.1				



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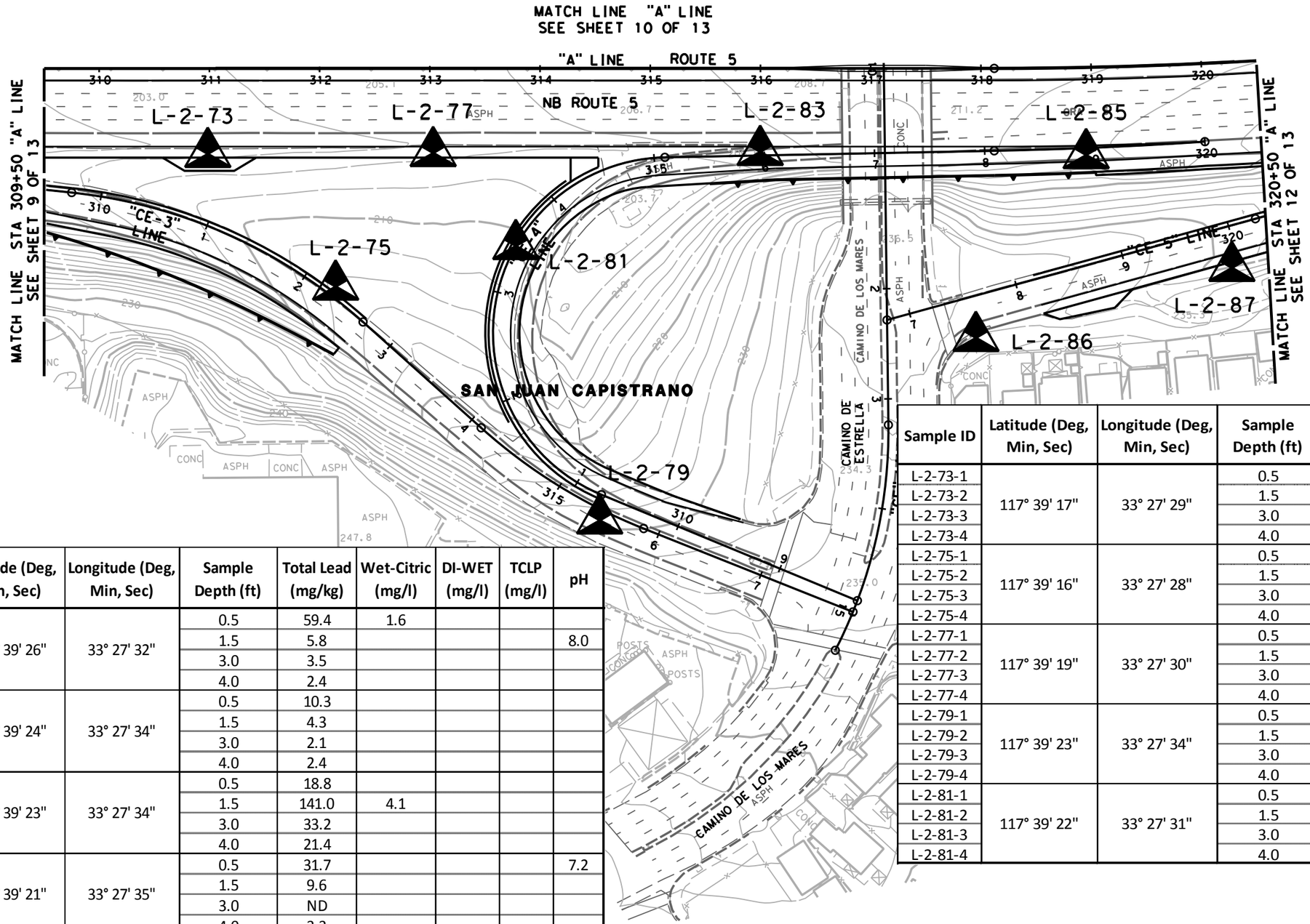
Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (10 of 13) for ADL Study

Figure 15



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-73-1	117° 39' 17"	33° 27' 29"	0.5	5.3				
L-2-73-2			1.5	ND				
L-2-73-3			3.0	ND				
L-2-73-4			4.0	2.3				
L-2-75-1	117° 39' 16"	33° 27' 28"	0.5	10.9				6.6
L-2-75-2			1.5	2.7				
L-2-75-3			3.0	4.4				
L-2-75-4			4.0	3.2				
L-2-77-1	117° 39' 19"	33° 27' 30"	0.5	35.2				
L-2-77-2			1.5	4.6				
L-2-77-3			3.0	5.0				
L-2-77-4			4.0	2.1				
L-2-79-1	117° 39' 23"	33° 27' 34"	0.5	4.0				
L-2-79-2			1.5	2.4				
L-2-79-3			3.0	3.4				
L-2-79-4			4.0	6.0				
L-2-81-1	117° 39' 22"	33° 27' 31"	0.5	4.9				7.9
L-2-81-2			1.5	4.0				
L-2-81-3			3.0	2.9				
L-2-81-4			4.0	3.9				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-83-1	117° 39' 26"	33° 27' 32"	0.5	59.4	1.6			
L-2-83-2			1.5	5.8				8.0
L-2-83-3			3.0	3.5				
L-2-83-4			4.0	2.4				
L-2-85-1	117° 39' 24"	33° 27' 34"	0.5	10.3				
L-2-85-2			1.5	4.3				
L-2-85-3			3.0	2.1				
L-2-85-4			4.0	2.4				
L-2-86-1	117° 39' 23"	33° 27' 34"	0.5	18.8				
L-2-86-2			1.5	141.0	4.1			
L-2-86-3			3.0	33.2				
L-2-86-4			4.0	21.4				
L-2-87-1	117° 39' 21"	33° 27' 35"	0.5	31.7				7.2
L-2-87-2			1.5	9.6				
L-2-87-3			3.0	ND				
L-2-87-4			4.0	3.3				

0 50 100 Feet

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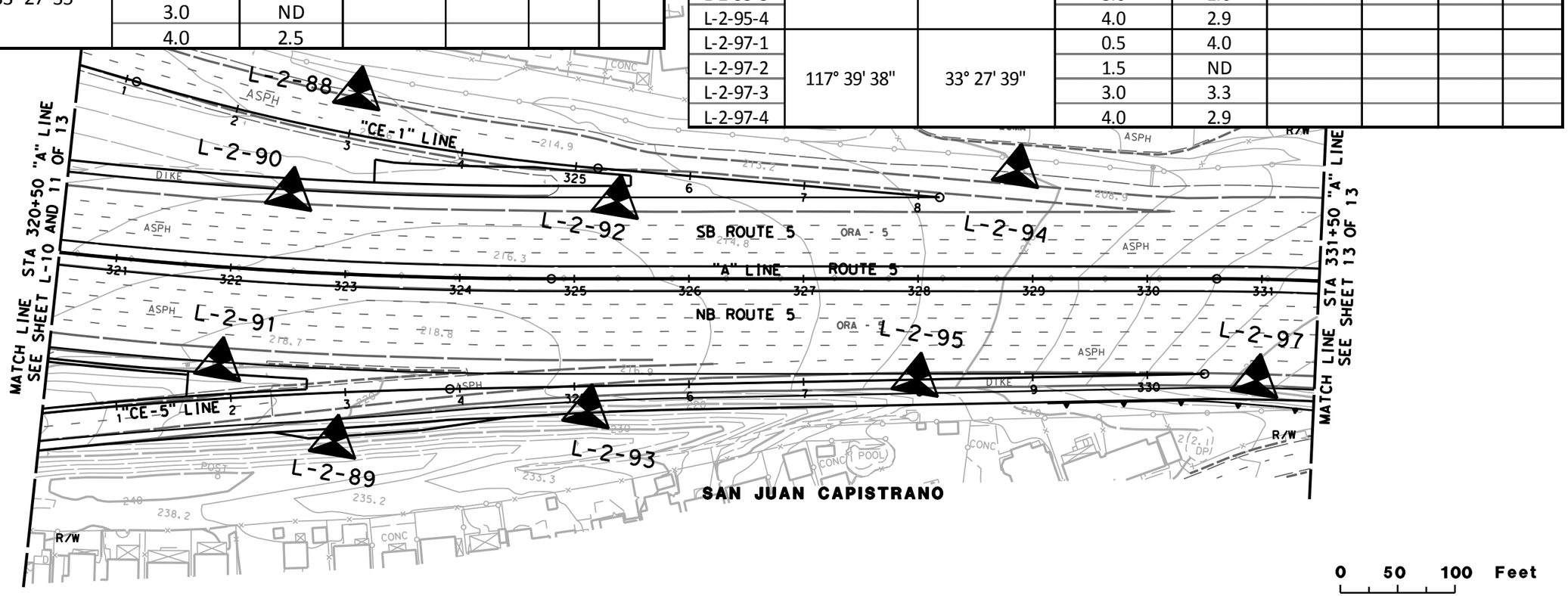
Exploratory Boring Location Map (11 of 13) for ADL Study

Figure 16

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-88-1	117° 39' 24"	33° 27' 34"	0.5	3.5				6.9
L-2-88-2			1.5	ND				
L-2-88-3			3.0	ND				
L-2-88-4			4.0	ND				
L-2-89-1	117° 39' 29"	33° 27' 36"	0.5	3.8				
L-2-89-2			1.5	2.1				
L-2-89-3			3.0	2.7				
L-2-89-4			4.0	ND				
L-2-90-1	117° 39' 27"	33° 27' 34"	0.5	4.2				
L-2-90-2			1.5	12.3				
L-2-90-3			3.0	8.1				
L-2-90-4			4.0	24.2				
L-2-91-1	117° 39' 27"	33° 27' 35"	0.5	8.4				
L-2-91-2			1.5	3.6				
L-2-91-3			3.0	ND				
L-2-91-4			4.0	2.5				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-92-1	117° 39' 26"	33° 27' 35"	0.5	85.3	2.2			6.8
L-2-92-2			1.5	38.2				
L-2-92-3			3.0	32.5				
L-2-92-4			4.0	47.2				
L-2-93-1	117° 39' 30"	33° 27' 37"	0.5	9.6				7.7
L-2-93-2			1.5	2.7				
L-2-93-3			3.0	2.2				
L-2-93-4			4.0	2.7				
L-2-94-1	117° 39' 29"	33° 27' 37"	0.5	12.5				
L-2-94-2			1.5	15.9				
L-2-94-3			3.0	21.6				
L-2-94-4			4.0	11.6				
L-2-95-1	117° 39' 34"	33° 27' 38"	0.5	19.2				
L-2-95-2			1.5	6.8				
L-2-95-3			3.0	2.6				
L-2-95-4			4.0	2.9				
L-2-97-1	117° 39' 38"	33° 27' 39"	0.5	4.0				
L-2-97-2			1.5	ND				
L-2-97-3			3.0	3.3				
L-2-97-4			4.0	2.9				



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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

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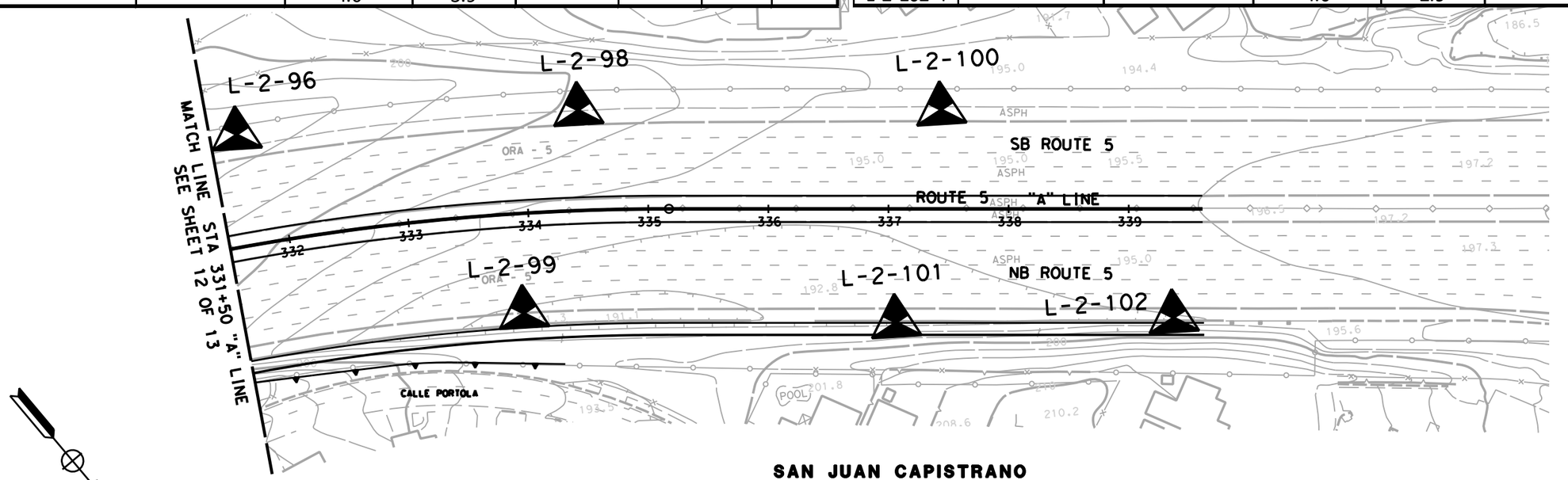
Exploratory Boring Location Map (12 of 13) for ADL Study

Figure 17

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-96-1	117° 39' 31"	33° 27' 38"	0.5	68.0	4.6			
L-2-96-2			1.5	77.9	3.3			
L-2-96-3			3.0	80.1	2.4			
L-2-96-4			4.0	74.9	2.4			
L-2-98-1	117° 39' 36"	33° 27' 40"	0.5	41.8				6.3
L-2-98-2			1.5	48.1				
L-2-98-3			3.0	35.9				
L-2-98-4			4.0	22.7				
L-2-99-1	117° 39' 40"	33° 27' 41"	0.5	28.8				7.9
L-2-99-2			1.5	20.8				
L-2-99-3			3.0	9.7				
L-2-99-4			4.0	3.9				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-100-1	117° 39' 38"	33° 27' 41"	0.5	40.1				
L-2-100-2			1.5	27.6				
L-2-100-3			3.0	9.8				
L-2-100-4			4.0	12.2				
L-2-101-1	117° 39' 43"	33° 27' 43"	0.5	16.3				
L-2-101-2			1.5	4.2				
L-2-101-3			3.0	2.2				
L-2-101-4			4.0	2.3				
L-2-102-1	117° 39' 41"	33° 27' 44"	0.5	33.0				
L-2-102-2			1.5	9.9				8.3
L-2-102-3			3.0	2.4				
L-2-102-4			4.0	2.9				



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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

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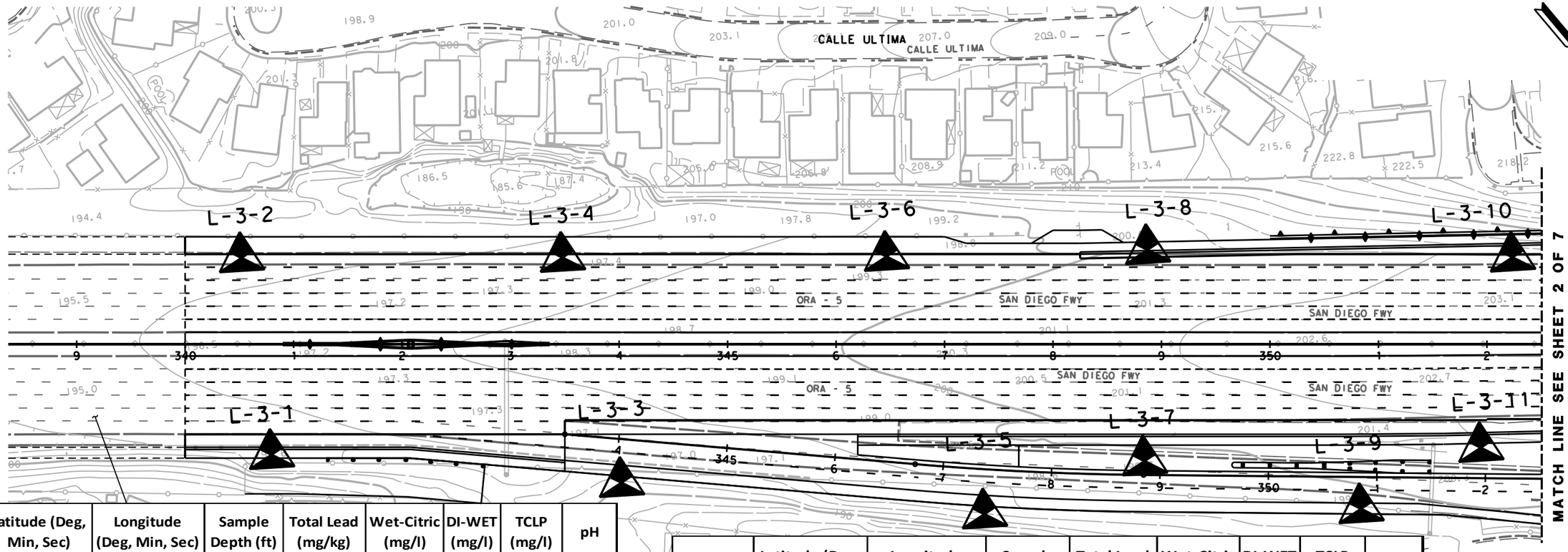
Exploratory Boring Location Map (13 of 13) for ADL Study

Figure 18



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-1-1	117° 39' 42"	33° 27' 45"	0.5	48.7				6.95
L-3-1-2			1.5	20.5				
L-3-1-3			3.0	5.8				
L-3-1-4			4.0	4.6				
L-3-2-1	117° 39' 44"	33° 27' 44"	0.5	14.8				
L-3-2-2			1.5	21.2				
L-3-2-3			3.0	15.1				
L-3-2-4			4.0	21.9				
L-3-3-1	117° 39' 46"	33° 27' 48"	0.5	68.4	1.1			6.12
L-3-3-2			1.5	13.2				
L-3-3-3			3.0	8.4				
L-3-3-4			4.0	18.6				
L-3-4-1	117° 39' 47"	33° 27' 48"	0.5	77.9	3.2			
L-3-4-2			1.5	15.5				
L-3-4-3			3.0	14.9				
L-3-4-4			4.0	8.4				
L-3-5-1	117° 39' 48"	33° 27' 50"	0.5	39.4				
L-3-5-2			1.5	14.3				
L-3-5-3			3.0	29.6				
L-3-5-4			4.0	33.9				
L-3-6-1	117° 39' 51"	33° 27' 47"	0.5	7.5				6.89
L-3-6-2			1.5	6.5				
L-3-6-3			3.0	2.9				
L-3-6-4			4.0	4.8				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-7-1	117° 39' 51"	33° 27' 50"	0.5	281.0	6.0	ND	ND	6.03
L-3-7-2			1.5	12.6				
L-3-7-3			3.0	8.2				
L-3-7-4			4.0	9.8				
L-3-8-1	117° 39' 52"	33° 27' 49"	0.5	91.9	2.1			
L-3-8-2			1.5	13.1				
L-3-8-3			3.0	3.8				
L-3-8-4			4.0	16.0				
L-3-9-1	117° 39' 53"	33° 27' 51"	0.5	1600.0	31.9	0.8	0.10J	
L-3-9-2			1.5	67.9	1.4			
L-3-9-3			3.0	27.0				
L-3-9-4			4.0	21.0				
L-3-10-1	117° 39' 54"	33° 27' 51"	0.5	65.9	2.2			
L-3-10-2			1.5	70.3	2.2			
L-3-10-3			3.0	15.4				
L-3-10-4			4.0	11.1				
L-3-11-1	117° 39' 57"	33° 27' 52"	0.5	487.0	19.0	0.46	ND	
L-3-11-2			1.5	8.3				
L-3-11-3			3.0	62.9	1.5			
L-3-11-4			4.0	10.2				

0 50 100 Feet

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

INTERSTATE 5 HOV IMPROVEMENT PROJECT, SEGMENT 3

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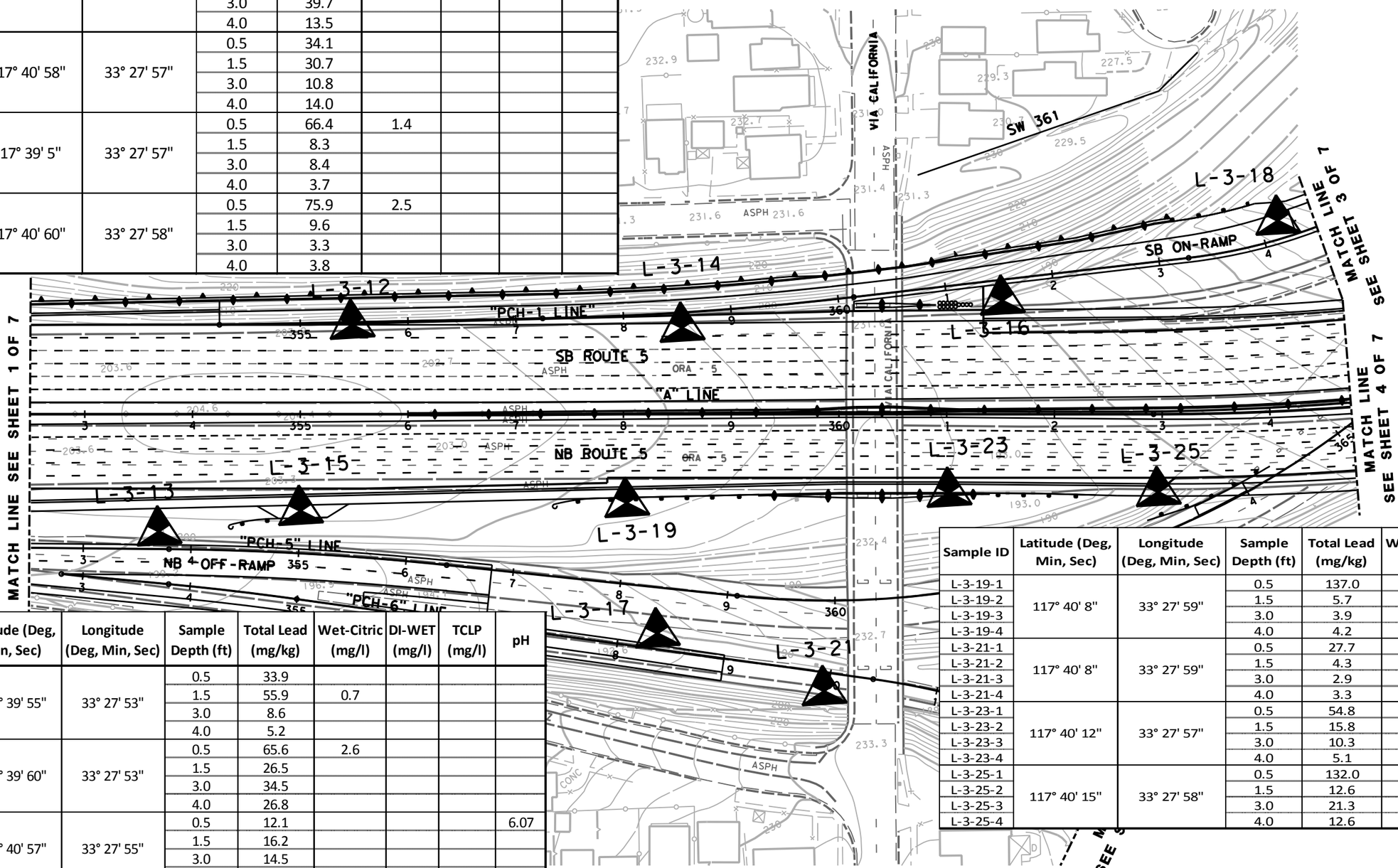
Exploratory Boring Location Map (1 of 7) for ADL Study

Figure 19

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-15-1	117° 39' 2"	33° 27' 54"	0.5	63.4	1.1			
L-3-15-2			1.5	6.1				
L-3-15-3			3.0	39.7				
L-3-15-4			4.0	13.5				
L-3-16-1	117° 40' 58"	33° 27' 57"	0.5	34.1				
L-3-16-2			1.5	30.7				
L-3-16-3			3.0	10.8				
L-3-16-4			4.0	14.0				
L-3-17-1	117° 39' 5"	33° 27' 57"	0.5	66.4	1.4			
L-3-17-2			1.5	8.3				
L-3-17-3			3.0	8.4				
L-3-17-4			4.0	3.7				
L-3-18-1	117° 40' 60"	33° 27' 58"	0.5	75.9	2.5			
L-3-18-2			1.5	9.6				
L-3-18-3			3.0	3.3				
L-3-18-4			4.0	3.8				



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-12-1	117° 39' 55"	33° 27' 53"	0.5	33.9				
L-3-12-2			1.5	55.9	0.7			
L-3-12-3			3.0	8.6				
L-3-12-4			4.0	5.2				
L-3-13-1	117° 39' 60"	33° 27' 53"	0.5	65.6	2.6			
L-3-13-2			1.5	26.5				
L-3-13-3			3.0	34.5				
L-3-13-4			4.0	26.8				
L-3-14-1	117° 40' 57"	33° 27' 55"	0.5	12.1				6.07
L-3-14-2			1.5	16.2				
L-3-14-3			3.0	14.5				
L-3-14-4			4.0	16.1				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-19-1	117° 40' 8"	33° 27' 59"	0.5	137.0	4.5			6.4
L-3-19-2			1.5	5.7				
L-3-19-3			3.0	3.9				
L-3-19-4			4.0	4.2				
L-3-21-1	117° 40' 8"	33° 27' 59"	0.5	27.7				5.81
L-3-21-2			1.5	4.3				
L-3-21-3			3.0	2.9				
L-3-21-4			4.0	3.3				
L-3-23-1	117° 40' 12"	33° 27' 57"	0.5	54.8	1.0			
L-3-23-2			1.5	15.8				
L-3-23-3			3.0	10.3				
L-3-23-4			4.0	5.1				
L-3-25-1	117° 40' 15"	33° 27' 58"	0.5	132.0	4.6			
L-3-25-2			1.5	12.6				
L-3-25-3			3.0	21.3				
L-3-25-4			4.0	12.6				

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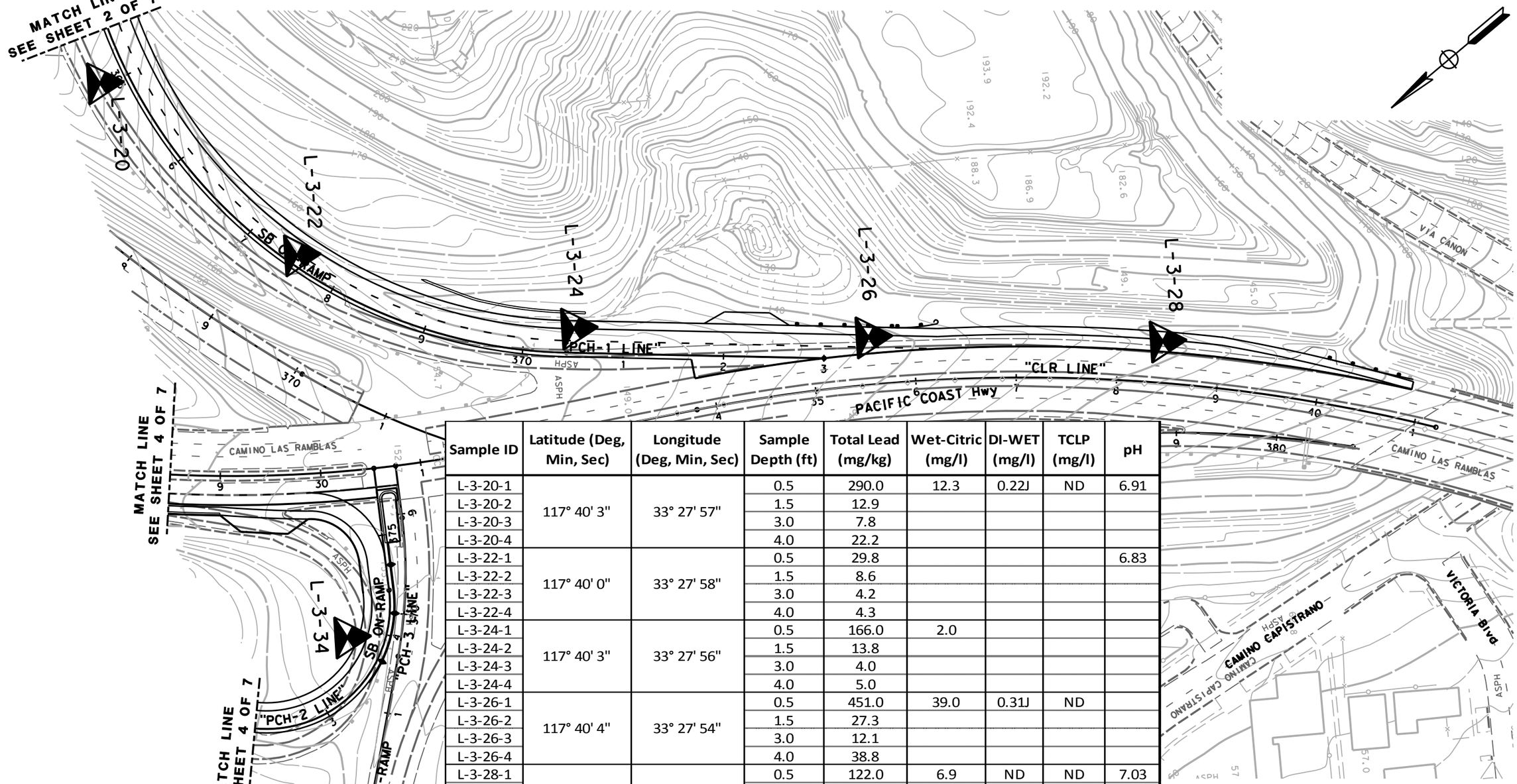
Exploratory Boring Location Map (2 of 7) for ADL Study

Figure 20



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-20-1	117° 40' 3"	33° 27' 57"	0.5	290.0	12.3	0.22J	ND	6.91
L-3-20-2			1.5	12.9				
L-3-20-3			3.0	7.8				
L-3-20-4			4.0	22.2				
L-3-22-1	117° 40' 0"	33° 27' 58"	0.5	29.8				6.83
L-3-22-2			1.5	8.6				
L-3-22-3			3.0	4.2				
L-3-22-4			4.0	4.3				
L-3-24-1	117° 40' 3"	33° 27' 56"	0.5	166.0	2.0			
L-3-24-2			1.5	13.8				
L-3-24-3			3.0	4.0				
L-3-24-4			4.0	5.0				
L-3-26-1	117° 40' 4"	33° 27' 54"	0.5	451.0	39.0	0.31J	ND	
L-3-26-2			1.5	27.3				
L-3-26-3			3.0	12.1				
L-3-26-4			4.0	38.8				
L-3-28-1	117° 40' 8"	33° 27' 51"	0.5	122.0	6.9	ND	ND	7.03
L-3-28-2			1.5	12.7				
L-3-28-3			3.0	9.4				
L-3-28-4			4.0	1.6				
L-3-34-1	117° 40' 16"	33° 28' 0"	0.5	20.4				7.16
L-3-34-2			1.5	4.3				
L-3-34-3			3.0	2.5				
L-3-34-4			4.0	2.6				

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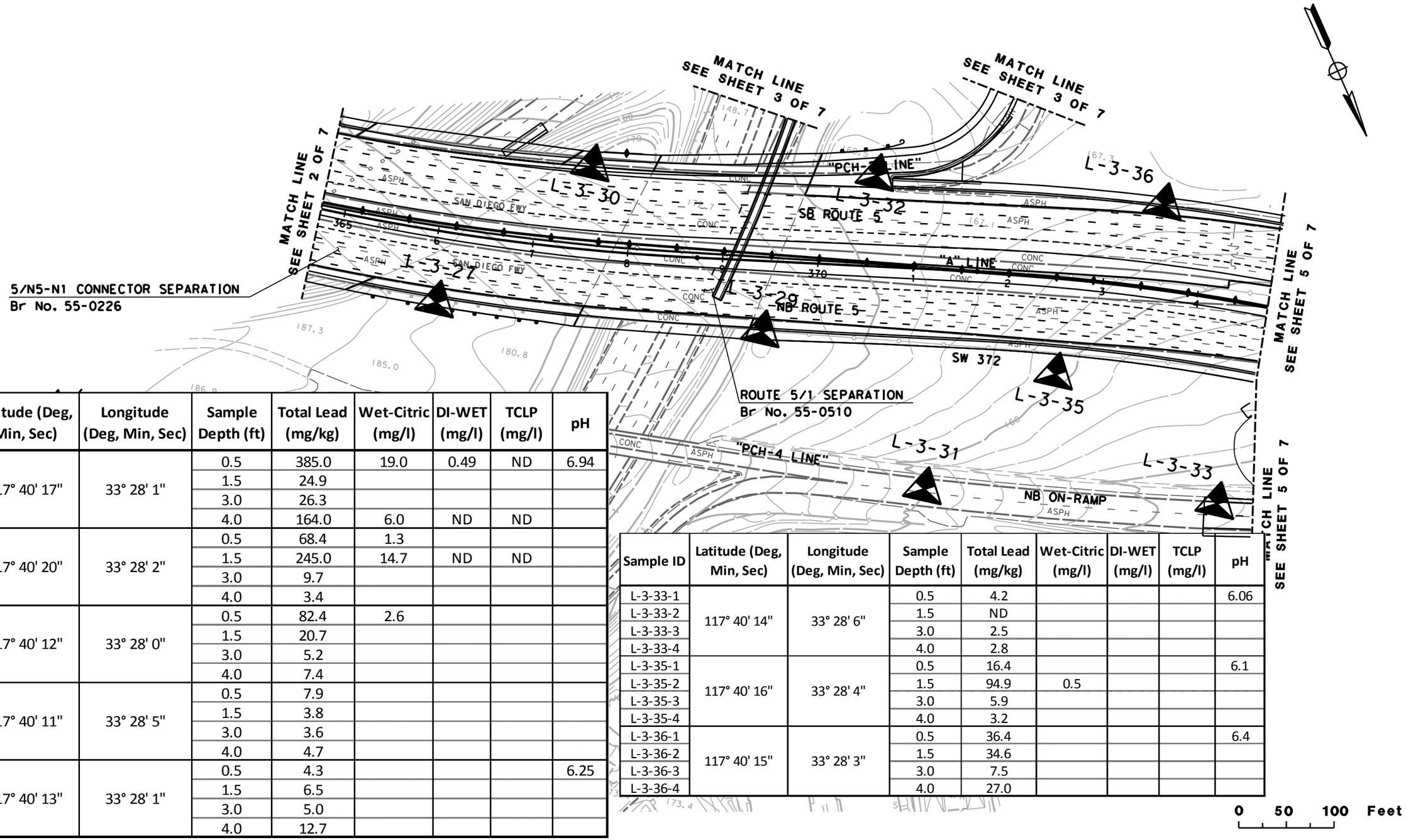
Exploratory Boring Location Map (3 of 7) for ADL Study

Figure 21



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-27-1	117° 40' 17"	33° 28' 1"	0.5	385.0	19.0	0.49	ND	6.94
L-3-27-2			1.5	24.9				
L-3-27-3			3.0	26.3				
L-3-27-4			4.0	164.0	6.0	ND	ND	
L-3-29-1	117° 40' 20"	33° 28' 2"	0.5	68.4	1.3			
L-3-29-2			1.5	245.0	14.7	ND	ND	
L-3-29-3			3.0	9.7				
L-3-29-4			4.0	3.4				
L-3-30-1	117° 40' 12"	33° 28' 0"	0.5	82.4	2.6			
L-3-30-2			1.5	20.7				
L-3-30-3			3.0	5.2				
L-3-30-4			4.0	7.4				
L-3-31-1	117° 40' 11"	33° 28' 5"	0.5	7.9				
L-3-31-2			1.5	3.8				
L-3-31-3			3.0	3.6				
L-3-31-4			4.0	4.7				
L-3-32-1	117° 40' 13"	33° 28' 1"	0.5	4.3				6.25
L-3-32-2			1.5	6.5				
L-3-32-3			3.0	5.0				
L-3-32-4			4.0	12.7				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-33-1	117° 40' 14"	33° 28' 6"	0.5	4.2				6.06
L-3-33-2			1.5	ND				
L-3-33-3			3.0	2.5				
L-3-33-4			4.0	2.8				
L-3-35-1	117° 40' 16"	33° 28' 4"	0.5	16.4				6.1
L-3-35-2			1.5	94.9	0.5			
L-3-35-3			3.0	5.9				
L-3-35-4			4.0	3.2				
L-3-36-1	117° 40' 15"	33° 28' 3"	0.5	36.4				6.4
L-3-36-2			1.5	34.6				
L-3-36-3			3.0	7.5				
L-3-36-4			4.0	27.0				

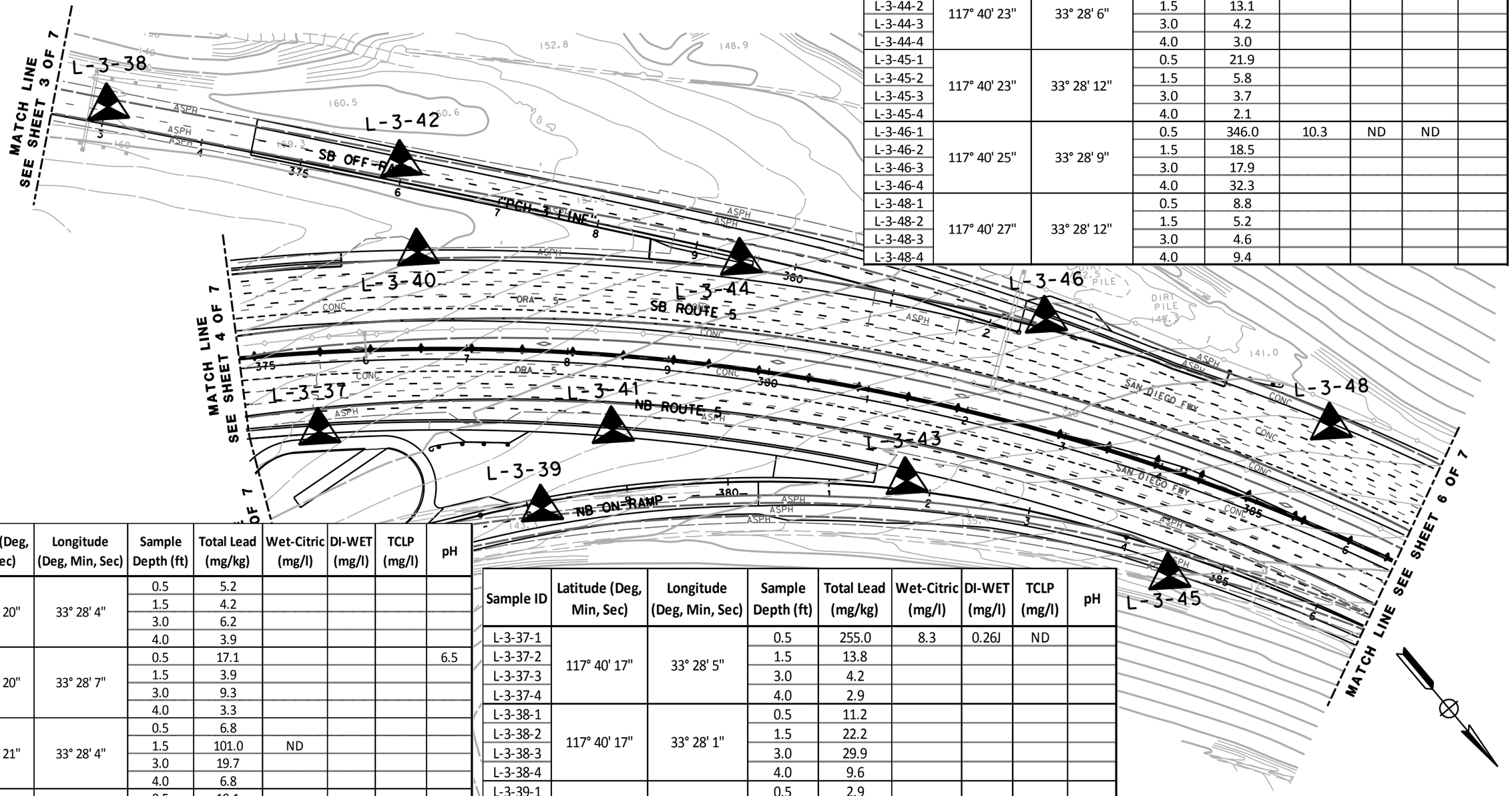
Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

INTERSTATE 5 HOV IMPROVEMENT PROJECT, SEGMENT 3

Project No.: 11-137 | **Date: 03-08-2012**

Exploratory Boring Location Map (4 of 7) for ADL Study

Figure 22



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-44-1	117° 40' 23"	33° 28' 6"	0.5	83.3	2.2			6.36
L-3-44-2			1.5	13.1				
L-3-44-3			3.0	4.2				
L-3-44-4			4.0	3.0				
L-3-45-1	117° 40' 23"	33° 28' 12"	0.5	21.9				
L-3-45-2			1.5	5.8				
L-3-45-3			3.0	3.7				
L-3-45-4			4.0	2.1				
L-3-46-1	117° 40' 25"	33° 28' 9"	0.5	346.0	10.3	ND	ND	
L-3-46-2			1.5	18.5				
L-3-46-3			3.0	17.9				
L-3-46-4			4.0	32.3				
L-3-48-1	117° 40' 27"	33° 28' 12"	0.5	8.8				
L-3-48-2			1.5	5.2				
L-3-48-3			3.0	4.6				
L-3-48-4			4.0	9.4				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-40-1	117° 40' 20"	33° 28' 4"	0.5	5.2				
L-3-40-2			1.5	4.2				
L-3-40-3			3.0	6.2				
L-3-40-4			4.0	3.9				
L-3-41-1	117° 40' 20"	33° 28' 7"	0.5	17.1				6.5
L-3-41-2			1.5	3.9				
L-3-41-3			3.0	9.3				
L-3-41-4			4.0	3.3				
L-3-42-1	117° 40' 21"	33° 28' 4"	0.5	6.8				
L-3-42-2			1.5	101.0	ND			
L-3-42-3			3.0	19.7				
L-3-42-4			4.0	6.8				
L-3-43-1	117° 40' 21"	33° 28' 9"	0.5	10.1				
L-3-43-2			1.5	2.4				
L-3-43-3			3.0	3.0				
L-3-43-4			4.0	2.6				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-37-1	117° 40' 17"	33° 28' 5"	0.5	255.0	8.3	0.26J	ND	
L-3-37-2			1.5	13.8				
L-3-37-3			3.0	4.2				
L-3-37-4			4.0	2.9				
L-3-38-1	117° 40' 17"	33° 28' 1"	0.5	11.2				
L-3-38-2			1.5	22.2				
L-3-38-3			3.0	29.9				
L-3-38-4			4.0	9.6				
L-3-39-1	117° 40' 19"	33° 28' 7"	0.5	2.9				
L-3-39-2			1.5	ND				
L-3-39-3			3.0	ND				
L-3-39-4			4.0	2.2				

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

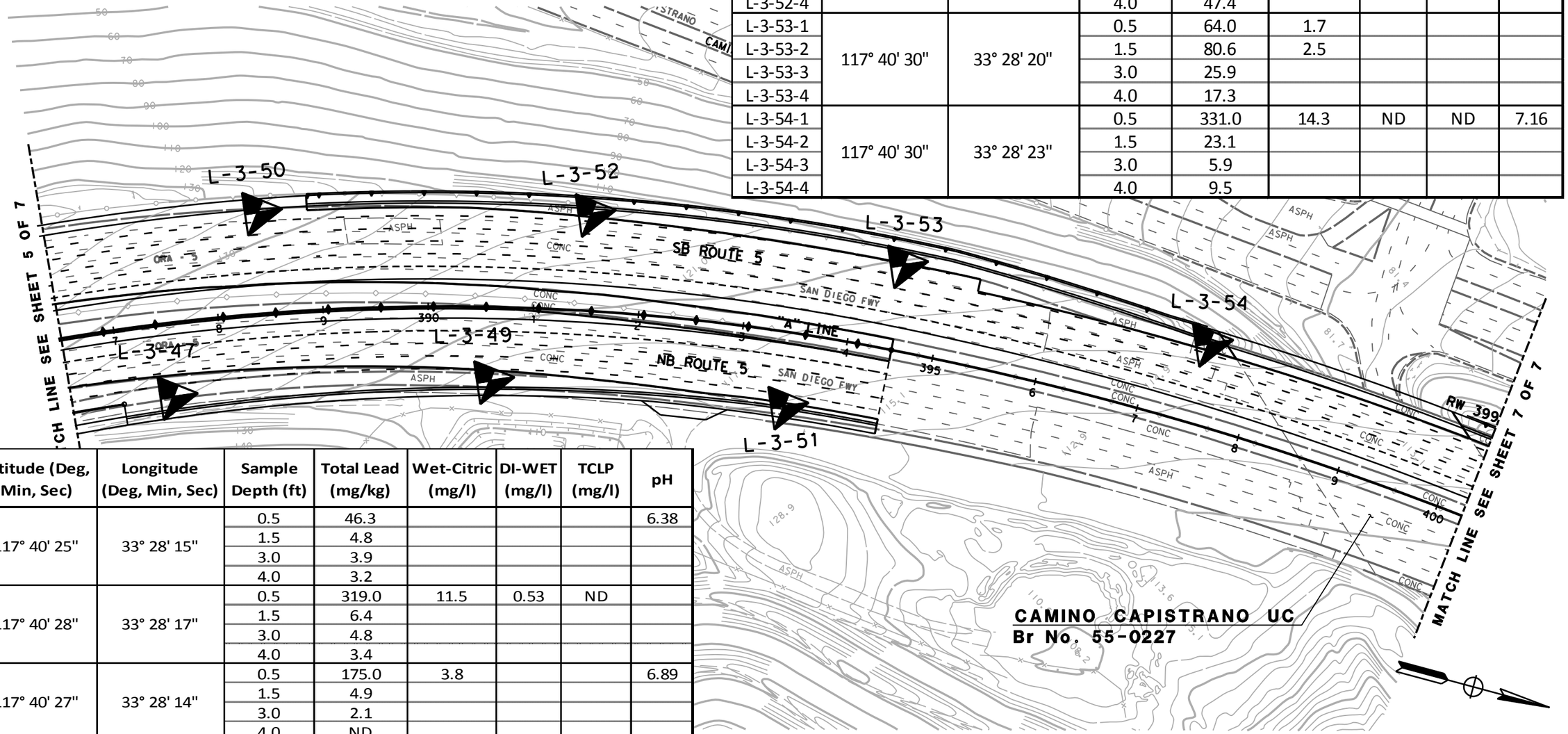
INTERSTATE 5 HOV IMPROVEMENT PROJECT, SEGMENT 3

Project No.: 11-137 | **Date: 03-08-2012**

Exploratory Boring Location Map (5 of 7) for ADL Study

Figure 23

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-52-1	117° 40' 28"	33° 28' 17"	0.5	243.0	7.9	ND	ND	
L-3-52-2			1.5	46.6				
L-3-52-3			3.0	19.8				
L-3-52-4			4.0	47.4				
L-3-53-1	117° 40' 30"	33° 28' 20"	0.5	64.0	1.7			
L-3-53-2			1.5	80.6	2.5			
L-3-53-3			3.0	25.9				
L-3-53-4			4.0	17.3				
L-3-54-1	117° 40' 30"	33° 28' 23"	0.5	331.0	14.3	ND	ND	7.16
L-3-54-2			1.5	23.1				
L-3-54-3			3.0	5.9				
L-3-54-4			4.0	9.5				



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-47-1	117° 40' 25"	33° 28' 15"	0.5	46.3				6.38
L-3-47-2			1.5	4.8				
L-3-47-3			3.0	3.9				
L-3-47-4			4.0	3.2				
L-3-49-1	117° 40' 28"	33° 28' 17"	0.5	319.0	11.5	0.53	ND	
L-3-49-2			1.5	6.4				
L-3-49-3			3.0	4.8				
L-3-49-4			4.0	3.4				
L-3-50-1	117° 40' 27"	33° 28' 14"	0.5	175.0	3.8			6.89
L-3-50-2			1.5	4.9				
L-3-50-3			3.0	2.1				
L-3-50-4			4.0	ND				
L-3-51-1	117° 40' 29"	33° 28' 20"	0.5	68.1	2.6			6.06
L-3-51-2			1.5	11.0				
L-3-51-3			3.0	6.7				
L-3-51-4			4.0	4.7				

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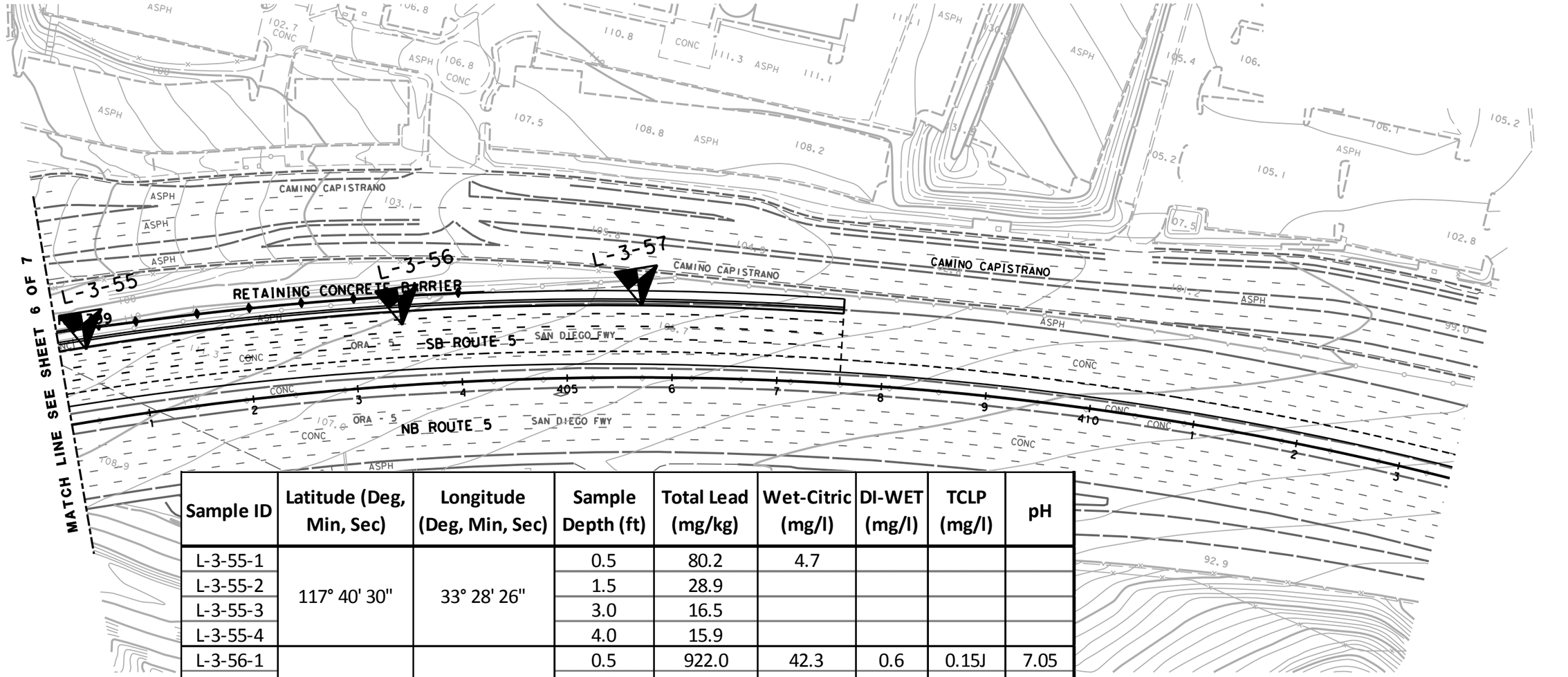
INTERSTATE 5 HOV IMPROVEMENT PROJECT, SEGMENT 3

Project No.: 11-137 | **Date: 03-08-2012**

Exploratory Boring Location Map (6 of 7) for ADL Study

Figure 24



Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-55-1	117° 40' 30"	33° 28' 26"	0.5	80.2	4.7			
L-3-55-2			1.5	28.9				
L-3-55-3			3.0	16.5				
L-3-55-4			4.0	15.9				
L-3-56-1	117° 40' 30"	33° 28' 29"	0.5	922.0	42.3	0.6	0.15J	7.05
L-3-56-2			1.5	30.3				
L-3-56-3			3.0	20.0				
L-3-56-4			4.0	91.4	2.6			
L-3-57-1	117° 40' 29"	33° 28' 32"	0.5	355.0	15.4	0.30J	ND	
L-3-57-2			1.5	87.3	3.5			
L-3-57-3			3.0	5.6				
L-3-57-4			4.0	21.1				

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

INTERSTATE 5 HOV IMPROVEMENT PROJECT, SEGMENT 3

Project No.: 11-137 Date: 03-08-2012

Exploratory Boring Location Map (7 of 7) for ADL Study

Figure 25

Figure 26. Regression Analysis for Segment 1

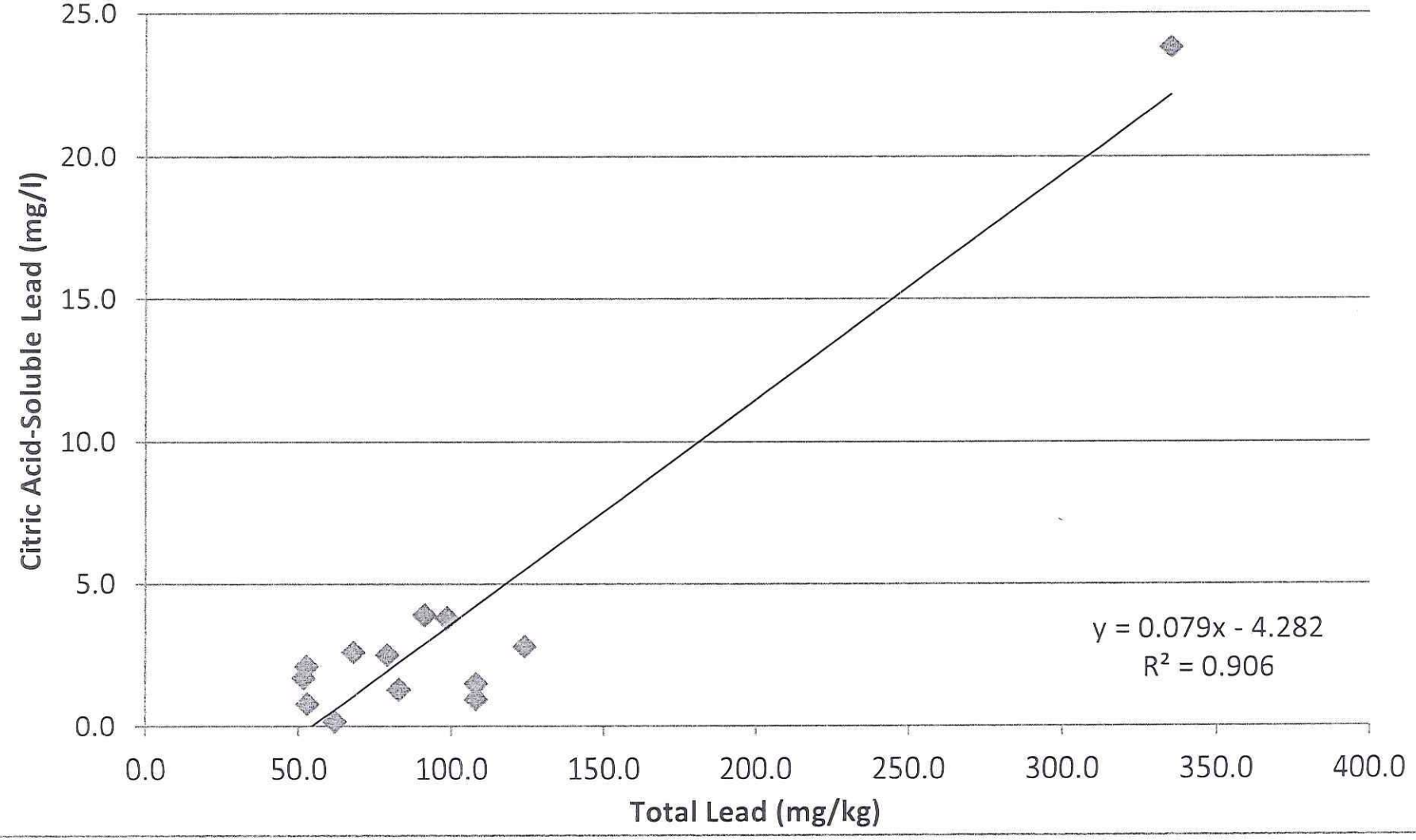
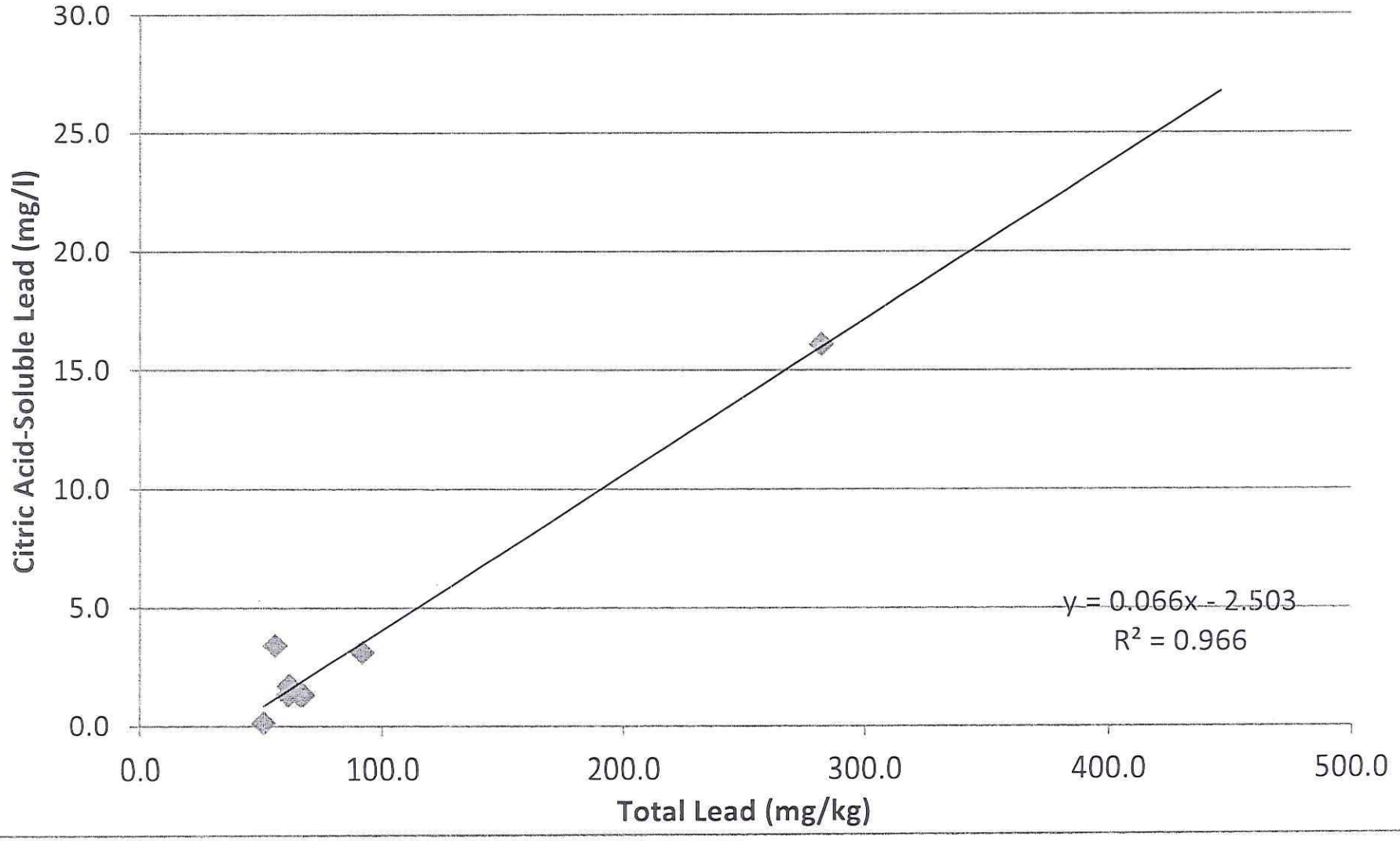


Figure 27. Regression Analysis for Region 2A



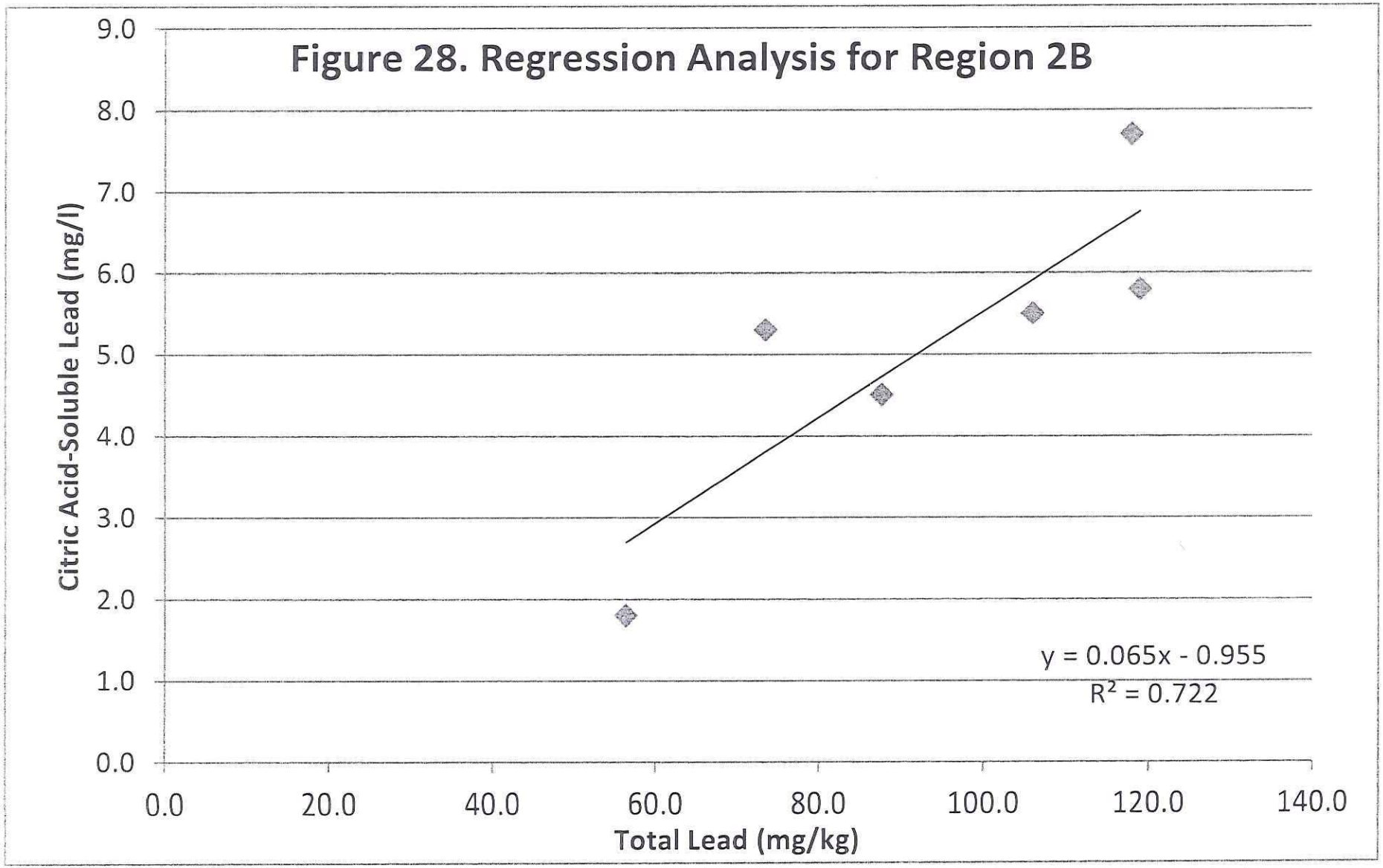


Figure 28. Regression Analysis for Region 2B
Citric Acid-Soluble Lead (mg/l)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
Total Lead (mg/kg)
y = 0.065x - 0.955
R² = 0.722

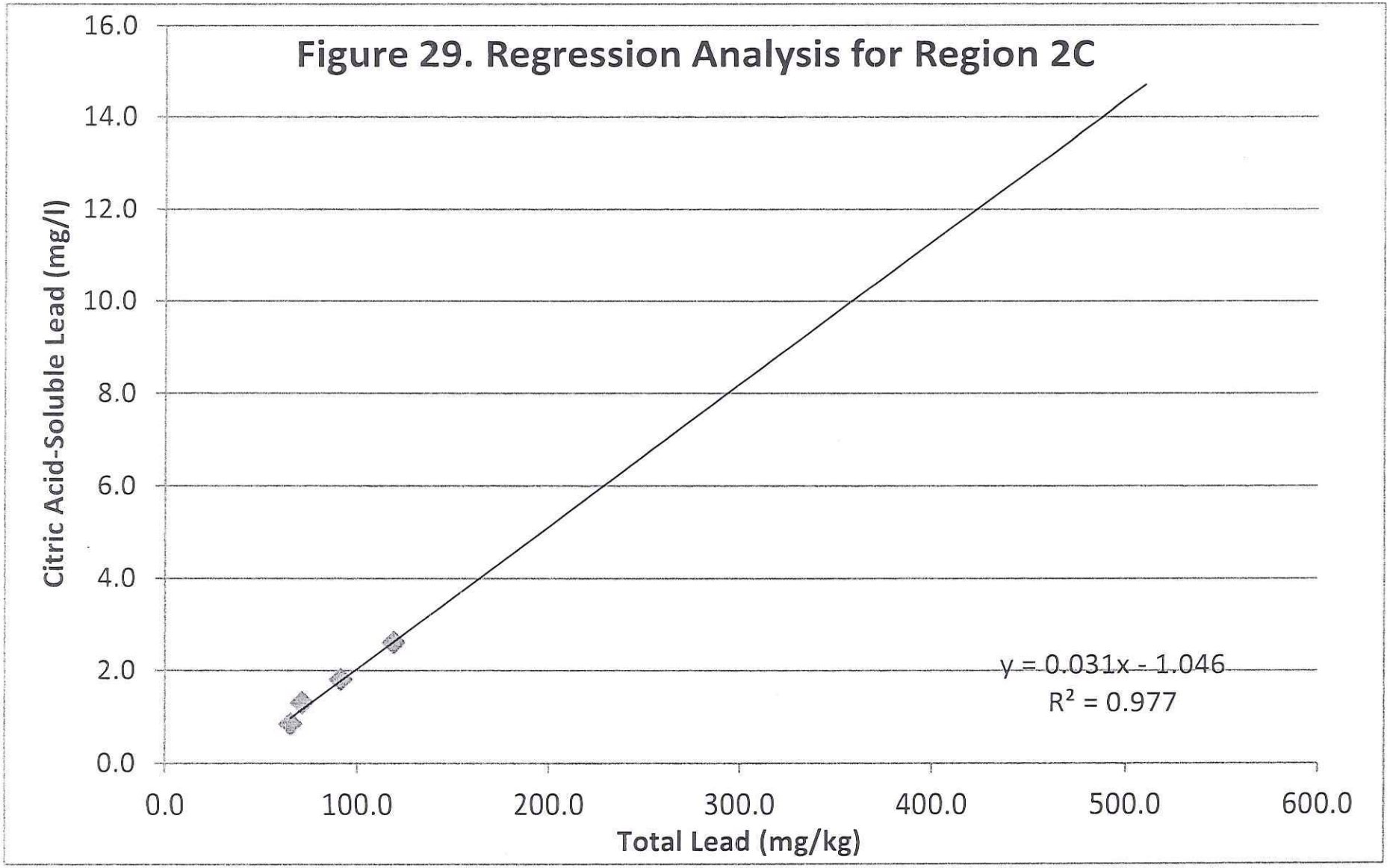


Figure 29. Regression Analysis for Region 2C
Citric Acid-Soluble Lead (mg/l)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
100.0
200.0
300.0
400.0
500.0
600.0
Total Lead (mg/kg)
y = 0.031x - 1.046
R² = 0.977

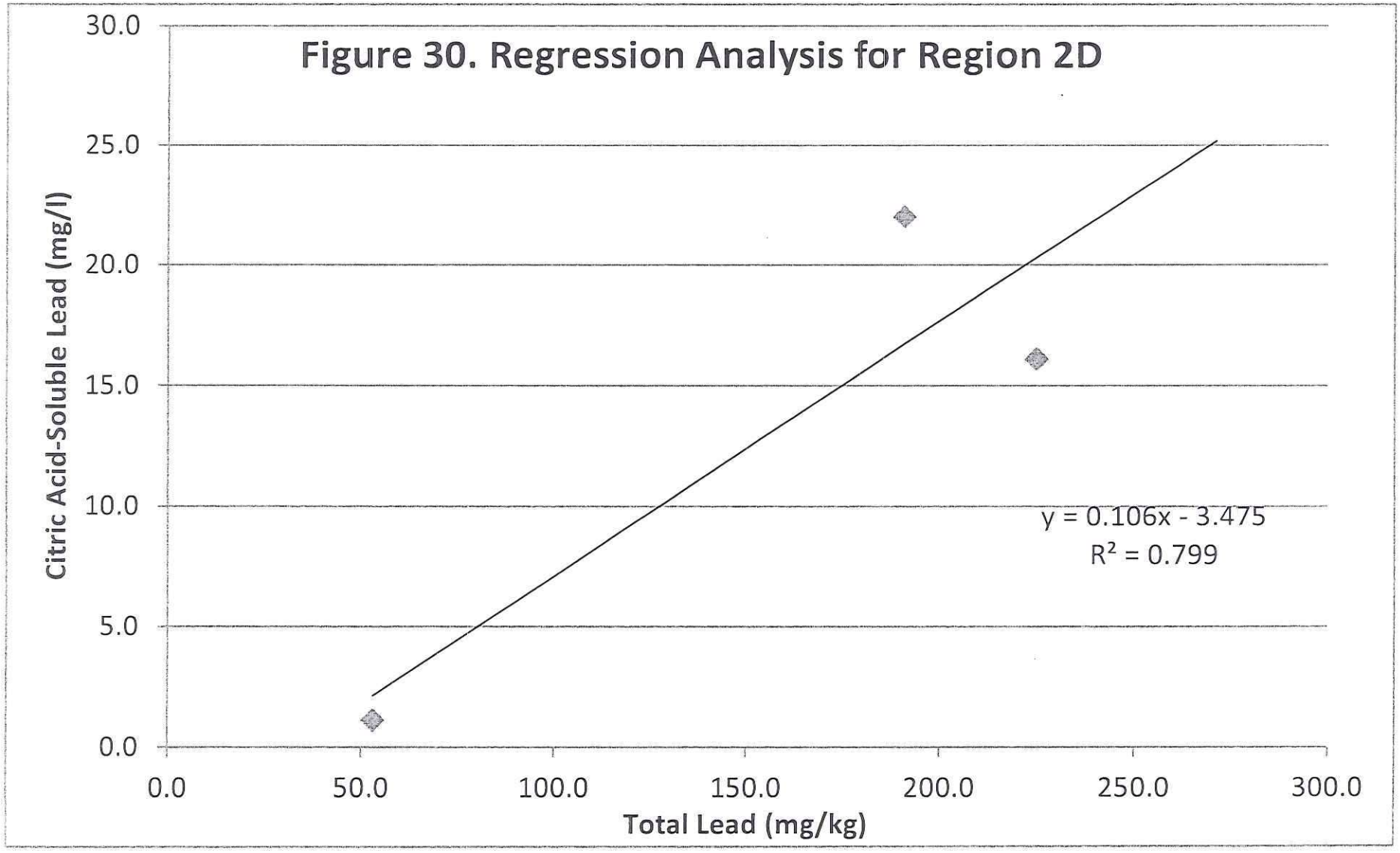


Figure 30. Regression Analysis for Region 2D
Citric Acid-Soluble Lead (mg/l)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
Total Lead (mg/kg)
y = 0.106x - 3.475
R² = 0.799

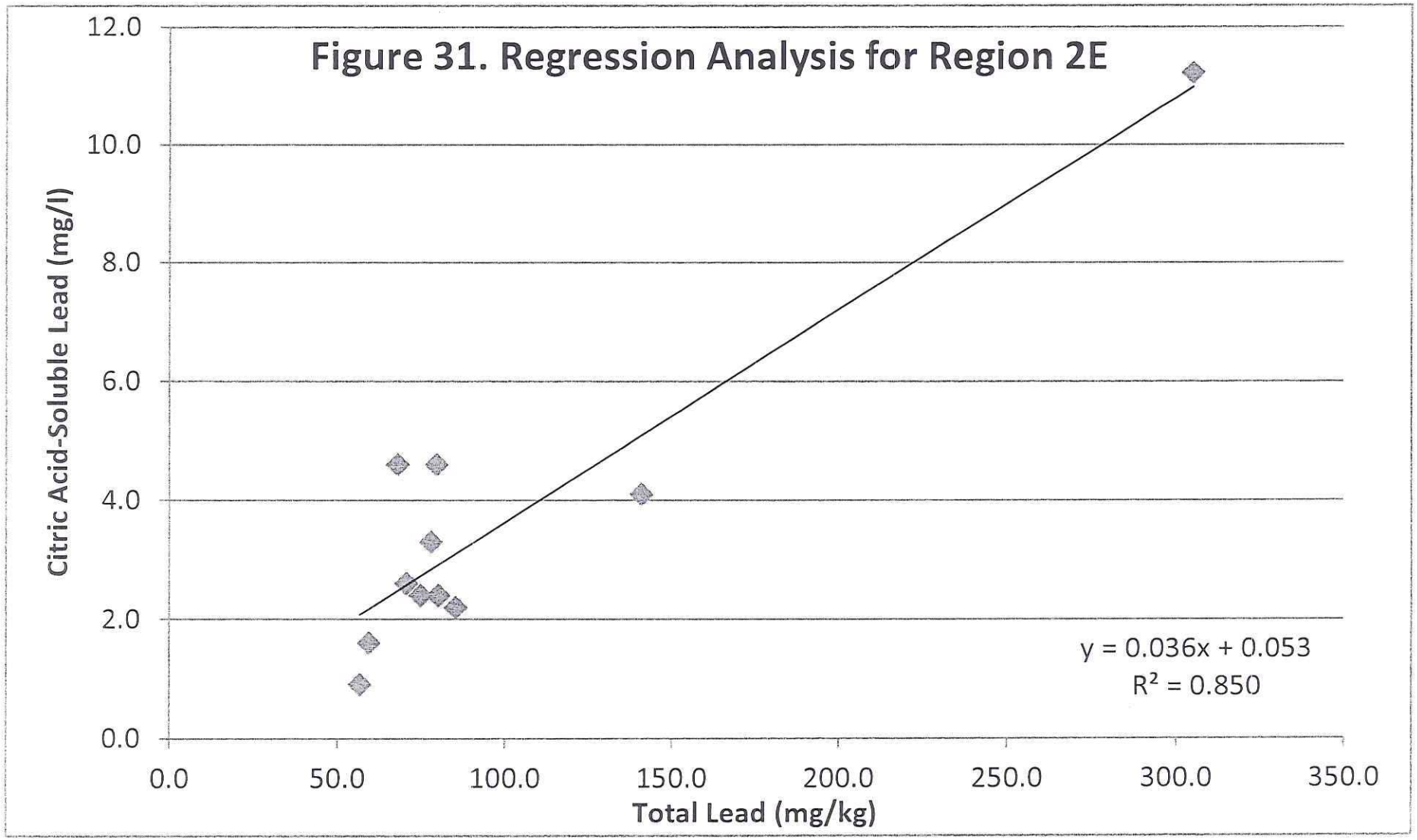


Figure 31. Regression Analysis for Region 2E
Citric Acid-Soluble Lead (mg/l)
Total Lead (mg/kg)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
y = 0.036x + 0.053
R² = 0.850

Figure 32. Regression Analysis for Region 3B

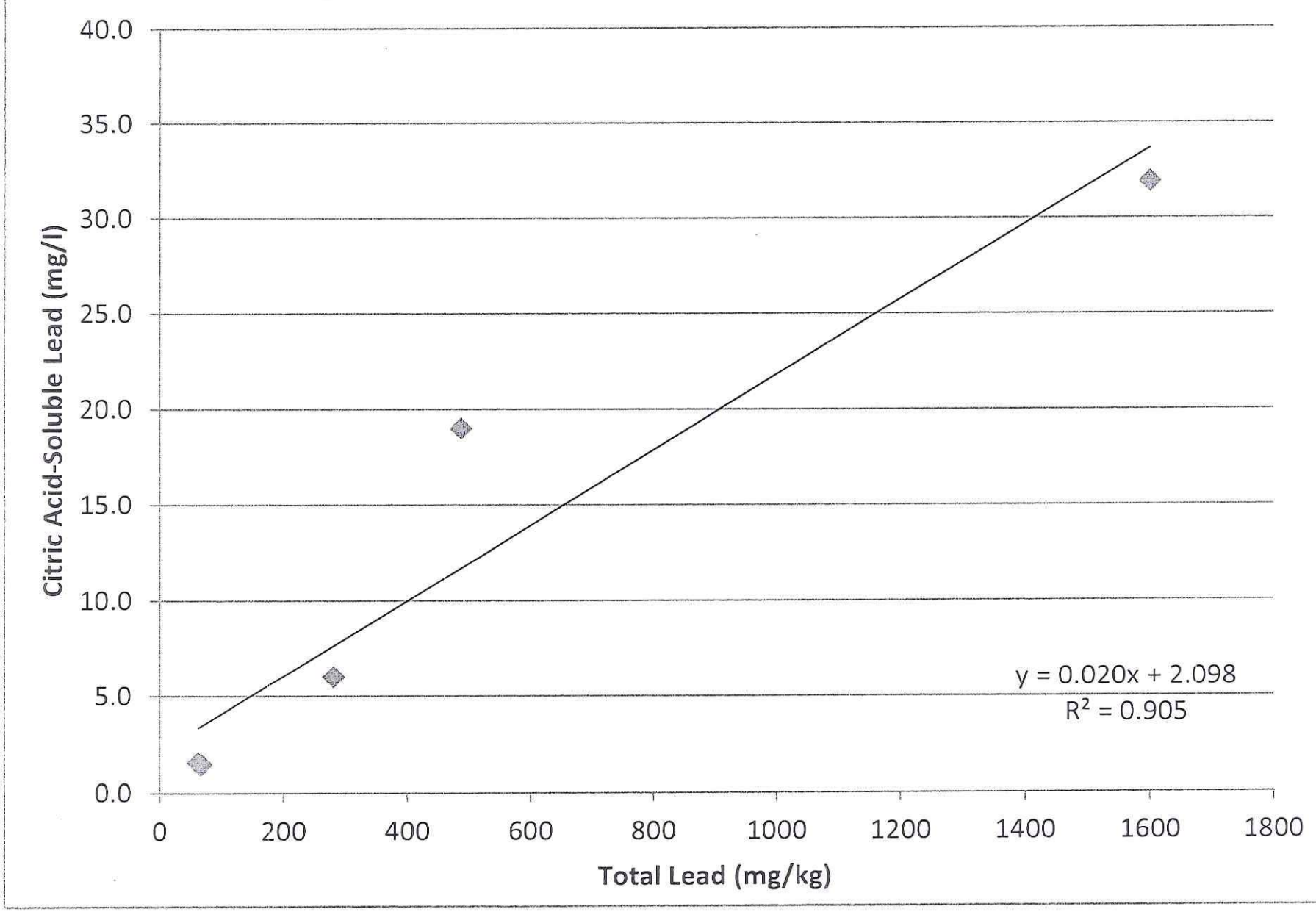
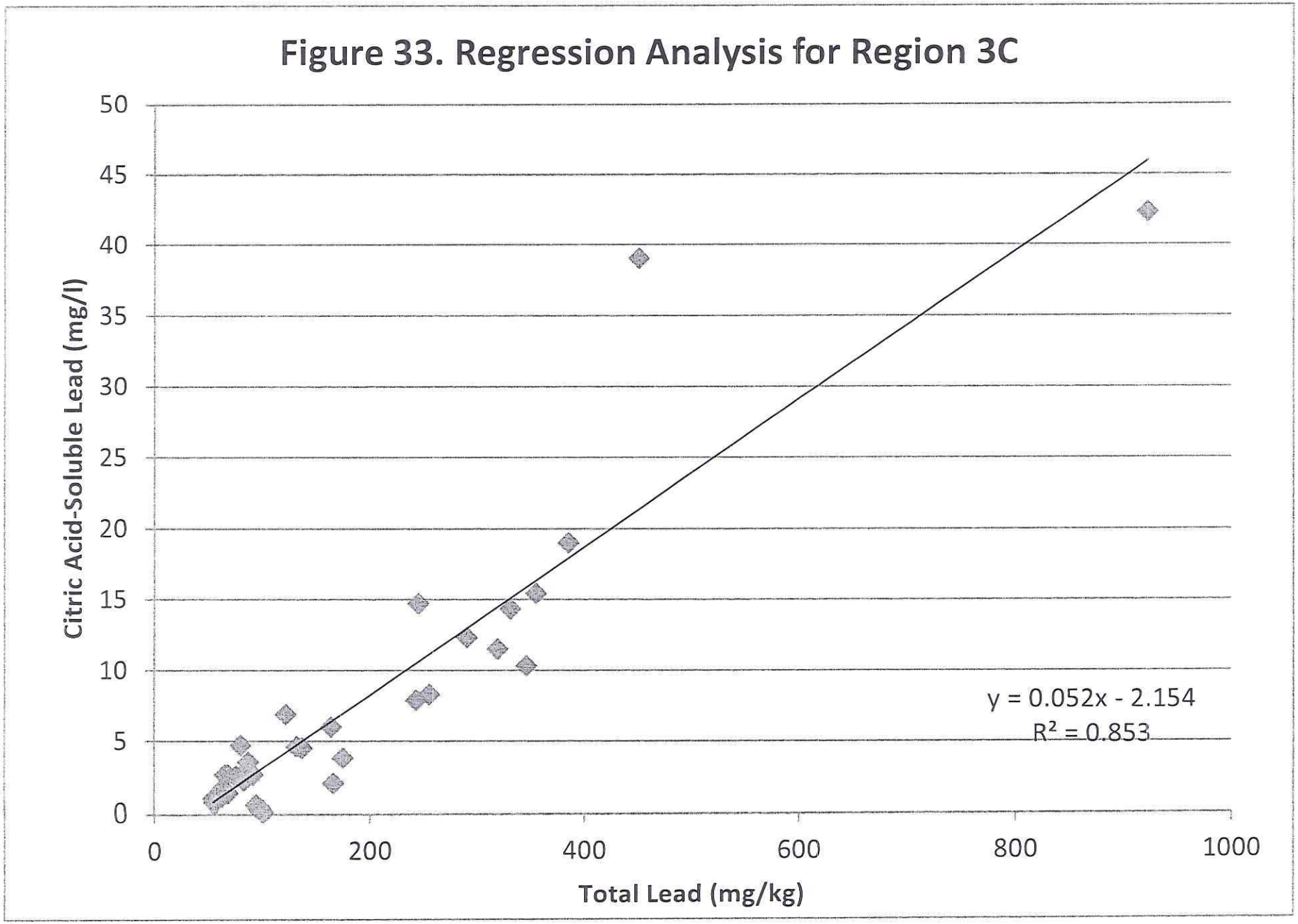


Figure 33. Regression Analysis for Region 3C



APPENDIX A

CHAIN-OF-CUSTODY FORM

SEGMENT 1

BETWEEN STA. 163+00 AND STA. 210+00 ("A" LINE)

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201140

Client: EARTH MECHANICS, INC.

Address

Report Attention: Raja | Phone | Fax | Sampled by: R. Y.

Project Name/No.: 11-135 | Project Site: I-5 HOV Lane

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container
L-1-40-1	EA201140-1	1-27-12	0920	Soil	None	4oz. Jar
L-1-40-2	2		0930			
L-1-40-3	3		0945			
L-1-40-4	4		1005			
L-1-38-1	5		1020			
L-1-38-2	6		1030			
L-1-38-3	7		1050			
L-1-38-4	8		1110			
L-1-36-1	9		1120			
L-1-36-2	10		1125			
L-1-36-3	11		1145			
L-1-36-4	12		1210			
L-1-32-1	13		1300			
L-1-32-2	14		1310			
L-1-32-3	15		1330			
L-1-32-4	16		1350			

Analyses Requested

TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH			
							↓	X			

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☑ Normal

Sample Condition
☐ Chilled ☑ Intact
☐ Sample seals

Remark: Test total lead on all sample, please save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-28-12	1000	[signature]	ACE	1-28-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201140

Client: EARTH MECHANICS, INC.			Analyses Requested
Address			
Report Attention: Raja	Phone	Fax	Sampled by: R. G.
Project Name/No.: L1-135	Project Site: I-5 HOV Lane		

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH			
L-1-28-1	EA201140-17	1-27-12	1400	Soil	none	4oz. jar												
L-1-28-2	18		1410												X			
L-1-28-3	19		1430															
L-1-28-4	20		1450															
L-1-24-1	21		1500															
L-1-24-2	22		1510															
L-1-24-3	23		1525															
L-1-24-4	24		1545															

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☑ Normal

Sample Condition
☐ Chilled ☑ Intact
☐ Sample seals

Remark
Test total lead on all samples, please save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	GMI	1-28-12	1000	[signature]	ASC	1-28-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. Y.

Project Name/No.: 11-135 | Project Site: I-5 HOV Lane

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Lead (6010)	pH			Remark
L-1-20-1	EA202009-1	1-27-12	1610	Soil	none	4oz. jar									X			Test total lead on all samples, please Save samples for future tests
L-1-20-2	2	↓	1620	↓	↓	↓												
L-1-20-3	3		1635															
L-1-20-4	4	↓	1650															
L-1-16-1	5	1-30-12													X			
L-1-16-2	6																	
L-1-16-3	7																	
L-1-16-4	8																	
L-1-12-1	9																	
L-1-12-2	10																	
L-1-12-3	11																	
L-1-12-4	12																	
L-1-10-1	13																	
L-1-10-2	14														X			
L-1-10-3	15																	
L-1-10-4	16	↓		↓	↓	↓								↓				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Raymond Yee	EMI	2-4-12	10:10		ASC	2/4/12	10:10
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH MECHANICS, INC.

Address

Report Attention: Reza | Phone | Fax | Sampled by: R. Of.

Project Name/No.: 11-135 | Project Site: I-5 HOV Lane

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container
L-1-8-1	EA202009-17	1-30-12	1020	Soil	none	4oz. jar
L-1-8-2	18		1025			
L-1-8-3	19		1040			
L-1-8-4	20		1100			
L-1-6-1	21		1120			
L-1-6-2	22		1130			
L-1-6-3	23		1145			
L-1-6-4	24		1210			
L-1-4-1	25		1300			
L-1-4-2	26		1310			
L-1-4-3	27		1330			
L-1-4-4	28		1350			
L-1-2-1	29		1400			
L-1-2-2	30		1410			
L-1-2-3	31		1435			
L-1-2-4	32		1450			

Analyses Requested

TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH
							↓	X
								X

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Remark: Test total lead on all sample, please save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Reza Jafari	EMI	2-4-12	1010	[signature]	ABC	2/4/12	10:10
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: A=Air Bag, G=Glass bottle, M=Metal Tube, P=Plastic bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH Mechanics, Inc.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R.J.

Project Name/No.: 11-135 | Project Site: I-5 HOV Lane

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH			Remark
L-1-1-1	EA202009-33	1-30-12	1500	Soil	none	4oz. jar								↓				Test total lead on all sample, please pre-sample for future tests
L-1-1-2	34	↓	1510	↓	↓	↓												
L-1-1-3	35		1540															
L-1-1-4	36		1600												X			
L-1-3-1	37	1-31-12	0715												X			
L-1-3-2	38		0725															
L-1-3-3	39		0740															
L-1-3-4	40		0800															
L-1-5-1	41		0815															
L-1-5-2	42		0825															
L-1-5-3	43		0845															
L-1-5-4	44		0905															
L-1-7-1	45		0915															
L-1-7-2	46		0920												X			
L-1-7-3	47		0940															
L-1-7-4	48	↓	1000	↓	↓	↓								↓				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Raja Rajmed R.J.	ZMI	2-4-12	1010		ABC	2/4/12	10:10
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
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Fax: (562) 809-8801

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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH MECHANICS, INC

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R.Y.

Project Name/No.: 11-135 | Project Site: I-5 HOV Lane

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH			Remark
L-1-9-1	EA202009-49	3-12	0915	Soil	None	4oz. jar												Test total lead on all sample, please save samples for future tests
L-1-9-2	50		1025															
L-1-9-3	51		1040															
L-1-9-4	52		1100															
L-1-11-1	53		1120												X			
L-1-11-2	54		1130															
L-1-11-3	55		1150															
L-1-11-4	56		1210															
L-1-13-1	57		1300															
L-1-13-2	58		1310															
L-1-13-3	59		1330															
L-1-13-4	60		1350															
L-1-17-1	61		1400												X			
L-1-17-2	62		1410															
L-1-17-3	63		1425															
L-1-17-4	64		1440															

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	2-4-12	1010	[signature]	ABC	2/4/12	10:10
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: RY

Project Name/No.: 11-135 | Project Site: I-5 Hov Lane

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); Total Lead (6010); pH

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No. type* & size of container	Total Lead (6010)	pH
L-1-21-1	EA202009-65	1-31-12	1500	Soil	none	4 oz. jar		
L-1-21-2	66		1510					
L-1-21-3	67		1530					
L-1-21-4	68		1550					
L-1-25-1	69	2-1-12	0730					X
L-1-25-2	70		0740					
L-1-25-3	71		0755					
L-1-25-4	72		0815					
L-1-29-1	73		0830					
L-1-29-2	74		0840					
L-1-29-3	75		0900					
L-1-29-4	76		0920					
L-1-33-1	77		0930					X
L-1-33-2	78		0940					
L-1-33-3	79		0950					
L-1-33-4	80		1010					

Remark: Test total lead on all sample, please save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	2-4-12	1010	[signature]	ABC	2/4/12	10:10
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH MECHANICS INC.
Address:
Report Attention: Raja | Phone: | Fax: | Sampled by: R. Z
Project Name/No.: 11-135 | Project Site: I-5 HOV Lane

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); Total Lead (6010); pH

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	Total Lead (6010)	pH	Remark
L-1-35-1	EA202009-81	2-1-12	1030	Soil	None	4oz jar			Test total lead on all sample, please save samples for future tests
L-1-35-2	82		1040						
L-1-35-3	83		1055						
L-1-35-4	84		1115						
L-1-37-1	85		1130						
L-1-37-2	86		1140						
L-1-37-3	87		1200						
L-1-37-4	88		1220						
L-1-39-1	89		1300						
L-1-39-2	90		1310						
L-1-39-3	91		1335						
L-1-39-4	92		1350						
L-1-41-1	93		1400					X	
L-1-41-2	94		1410						
L-1-41-3	95		1425						
L-1-41-4	96	↓	1440	↓	↓	↓	↓		

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Raja Jonnalagadda	EMI	2-4-12	1010	[illegible]	ABC	2/4/12	10:10
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

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ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH MECHANICS, Inc

Address

Report Attention: Raja | Phone | Fax | Sampled by: R.Y.

Project Name/No.: 11-135 | Project Site: I-5 HOV Lane

Analyses Requested

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH				Remark
L-1-34-1	EA202009-97	2-1-12	1500	Soil	None	4 oz. jar									X				Test total lead on all sample, please save samples for future tests
L-1-34-2	98	↓	1510	↓	↓	↓								↓					
L-1-34-3	99		1525																
L-1-34-4	100		1545																
L-1-30-1	101	2-2-12	0730																
L-1-30-2	102		0740																
L-1-30-3	103		0755																
L-1-30-4	104		0815																
L-1-26-1	105		0830												X				
L-1-26-2	106		0840																
L-1-26-3	107		0900																
L-1-26-4	108		0920																
L-1-22-1	109		0925																
L-1-22-2	110		0935																
L-1-22-3	111		0950																
L-1-22-4	112	↓	1010	↓	↓	↓								↓					

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	2-4-12	1010	[signature]	ABC	2/4/12	10:10
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

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ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH MECHANICS, Inc.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. Y.

Project Name/No.: 11-135 | Project Site: I-5 HOV Lane

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); Total Lead (6010); pH

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	Total Lead (6010)	pH	Remark
L-1-18-1	EA202009-113	2-2-12	1030	Soil	None	4 oz. jar			Test total lead on all sample, please save samples for future tests
L-1-18-2	114		1040						
L-1-18-3	115		1055						
L-1-18-4	116		1110						
L-1-14-1	117		1130						
L-1-14-2	118		1140						
L-1-14-3	119		1200						
L-1-14-4	120		1215						
L-1-15-1	121		1300						
L-1-15-2	122		1310						
L-1-15-3	123		1325						
L-1-15-4	124		1345						
L-1-19-1	125		1400						
L-1-19-2	126		1410					X	
L-1-19-3	127		1425						
L-1-19-4	128	↓	1445	↓	↓	↓	↓		

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Raja	EMI	2-4-12	1010		ABC	2/4/12	10:10
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202009

Client: EARTH MECHANICS, INC.				Analyses Requested												T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal
Address																Sample Condition: ☑ Chilled ☑ Intact ☐ Sample seals
Report Attention: Roza	Phone	Fax	Sampled by: R. Y.													
Project Name/No.: 11-135	Project Site: I-5 Hov Lane															

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH				Remark
L-1-23-1	EA202009-129	2-2-12	1500	Soil	None	4oz. jar													Test total lead on all sample, please save samples for historic tests
L-1-23-2	130		1510																
L-1-23-3	131		1535																
L-1-23-4	132		1600																
L-1-27-1	133	2-3-12	0820																
L-1-27-2	134		0830												X				
L-1-27-3	135		0845																
L-1-27-4	136		0900																
L-1-31-1	137		0720																
L-1-31-2	138		0730																
L-1-31-3	139		0750																
L-1-31-4	140		0810																
~~D-1-1~~	141		1700	Water			✓	✓		✓		✓							
~~D-1-2~~	142		1700				✓	✓		✓		✓							
~~D-2-1~~	143		1700				✓	✓		✓		✓							
D-2-2	144		1700				✓	✓		✓		✓							

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Reinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
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Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202009A

Client: EARTH MECHANICS, INC.				Analyses Requested													T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal
Address: 17800 Newhope st. Suite B, Fountain Valley, 92708																	Sample Condition: ☑ Chilled ☒ Intact ☐ Sample seals
Report Attention: Raja	Phone	Fax	Sampled by: R. Gs														
Project Name/No.: 11-135	Project Site: I-5 HOV Lane																

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)						Remark
D-1-1	EA202009-141	2-3-12	1700	Water	None	4oz. jar	V	V		V		V							
D-1-2	-142	"	"	"	"	"	V	V		V		V							
D-2-1	-143	"	"	"	"	"	V	V		V		V							
D-2-2	-144	"	"	"	"	"	V	V		V		V							

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	2-4-12	1010	[signature]	ABC	2-4-12	1010
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

SEGMENT 2

BETWEEN STA. 210+00 AND STA. 340+00 ("A" LINE)

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA20127

Client: EARTH MECHANICS, INC.

Address: 17802 Newhope st. Suite B. Fountain Valley. 92708

Report Attention: Raja | Phone: 714-751-3826 | Fax: | Sampled by: R-S.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX. Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	Pb-T Pb-D			
L-2-68-1	EA20127-1	6-6-12	1100	Soil	None	4oz jar												
L-2-68-2	-2		1105															
L-2-68-3	-3		1120															
L-2-68-4	-4		1135															
L-2-66-1	-5		1145															
L-2-66-2	-6		1155															
L-2-66-3	-7		1215															
L-2-66-4	-8		1230															
L-2-64-1	-9		1300															
L-2-64-2	-10		1310															
L-2-64-3	-11		1325															
L-2-64-4	-12		1340															
L-2-58-1	-13		1400															
L-2-58-2	-14		1405															
L-2-58-3	-15		1420															
L-2-58-4	-16		1440															

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Remark: Please test all sample for total lead. Save sample for future test

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-7-12	12:20	[signature]	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201027

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (Pb)	TPH			Remark
L-2-48-1	EA201027-17	1-6-12	1455	Soil	None	4oz jar												please test all sample for total lead, save samp. for future tests
L-2-48-2	-18		1505															
L-2-48-3	-19		1515															
L-2-48-4	-20		1530															
L-2-46-1	-21		1540															
L-2-46-2	-22		1550															
L-2-46-3	-23		1610															
L-2-46-4	-24	↓	1625	↓	↓	↓								↓				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-7-12	12:20	[signature]	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
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Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
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Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201027

Client: EARTH MECHANICS, INC.				Analyses Requested												T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal
Address																Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals
Report Attention: Raja	Phone	Fax	Sampled by: R. J.													
Project Name/No.: 11-137	Project Site: I-5 Hov Lane Widen															

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (Pb)	pH			Remark
L-3-7-1	EA201027-25	12-30-11	1435	Soil	None	4oz. jar									X			Please test all
L-3-7-2	-26		1440															sample for total
L-3-7-3	-27		1450															lead. save sample
L-3-7-4	-28		1505															for future tests
L-3-9-1	-29		1520															
L-3-9-2	-30		1530															
L-3-9-3	-31		1540															
L-3-9-4	-32		1555															
L-3-5-1	-33	1-3-12	0730															
L-3-5-2	-34		0740															
L-3-5-3	-35		0800															
L-3-5-4	-36		0820															
L-3-3-1	-37		0900												X			
L-3-3-2	-38		0905															
L-3-3-3	-39		0930															
L-3-3-4	-40		0950															

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-7-12	12:20	[signature]	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA20127

Client: EARTH MECHANICS, INC

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. J.

Project Name/No.: 11-137 | Project Site: I-5 HOV Lane, Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH
L-3-11-1	EA20127-41	11-3-12	1050	Soil	none	4 oz. jar									
L-3-11-2	-42		1055												
L-3-11-3	-43		1105												
L-3-11-4	-44		1115												
L-3-13-1	-45		1120												
L-3-13-2	-46		1130												
L-3-13-3	-47		1145												
L-3-13-4	-48		1205												
L-3-15-1	-49		1250												
L-3-15-2	-50		1300												
L-3-15-3	-51		1315												
L-3-15-4	-52		1330												
L-3-19-1	-53		1430												X
L-3-19-2	-54		1435												
L-3-19-3	-55		1445												
L-3-19-4	-56		1500												

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Remark: Please Test all samples for total lead. Save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Leonard Ojo	EMI	1-7-12	12:20	Wanger	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: A=Air Bag, G=Glass bottle, M=Metal Tube, P=Plastic bottle, V=VOA vial

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Cerritos, CA 90703

Email: ascorp@verizon.net
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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA 201027

Client: EARTH MECHANICS, INC

Address:

Report Attention: Rafa | Phone: | Fax: | Sampled by: R. J.

Project Name/No.: 11-137 | Project Site: I-5 HOV Lane, Woden

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH			
L-3-25-1	EA201027-57	1-3-12	1510	Soil	none	4oz. jar												
L-3-25-2	58		1515															
L-3-25-3	59		1525															
L-3-25-4	60		1535															
L-3-25-1	61		1540															
L-3-25-2	62		1550															
L-3-25-3	63		1605															
L-3-25-4	64		1620															
L-3-21-1	65	1-4-12	0730												X			
L-3-21-2	66		0740															
L-3-21-3	67		0755															
L-3-21-4	68		0805															
L-3-17-1	69		0840															
L-3-17-2	70		0850															
L-3-17-3	71		0920															
L-3-17-4	72		0930															

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Remark: please test all sample for Total lead. Save sample for future tests.

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Reynold Jr	EMI	1-7-12	12:20	Wangei	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: A=Air Bag, G=Glass bottle, M=Metal Tube, P=Plastic bottle, V=VOA vial

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Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201027

Client: EARTH MECHANICS, INC

Address:

Report Attention: Carla | Phone: | Fax: | Sampled by: R. J.

Project Name/No.: 11-137 | Project Site: I-5 HOV Lane, widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH
L-3-27-1	EA201027-73	1-4-12	1000	Soil	none	4oz. Jar								X	
L-3-27-2	-74		1010												
L-3-27-3	-75		1025												
L-3-27-4	-76		1040												
L-3-29-1	-77		1100												
L-3-29-2	-78		1110												
L-3-29-3	-79		1125												
L-3-29-4	-80		1140												
L-3-35-1	-81		1210											X	
L-3-35-2	-82		1220												
L-3-35-3	-83		1235												
L-3-35-4	-84		1250												
L-3-31-1	-85	1-5-12	0730												
L-3-31-2	-86		0735												
L-3-31-3	-87		0750												
L-3-31-4	-88		0810												

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Remark: please test all samples for total lead. save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Reynold Yi	EMI	1-7-12	12:20	Wang	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

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Cerritos, CA 90703

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Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201027

Client: EARTH MECHANICS, INC				Analyses Requested												T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal
Address																Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals
Report Attention: Rania	Phone	Fax	Sampled by: R-J.													
Project Name/No.: 11-137	Project Site: I-5 HOV Lane, Widen															

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH			Remark
L-3-33-1	EA201027-89	1-5-12	0825	Soil	none	4oz. jar									X			please test all
L-3-33-2	90		0835															sample for total lead
L-3-33-3	91		0845															pair sample for
L-3-33-4	92		0900															future tests
L-3-39-1	93		0910															
L-3-39-2	94		0920															
L-3-39-3	95		0940															
L-3-39-4	96		1005															
L-3-45-1	97		1035															
L-3-45-2	98		1040															
L-3-45-3	99		1055															
L-3-45-4	100		1115															
L-3-47-1	101		1125												X			
L-3-47-2	102		1130															
L-3-47-3	103		1145															
L-3-47-4	104	↓	1200	↓	↓	↓								↓				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-7-12	12:20	[signature]	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA20107

Client: EARTH MECHANICS, INC.				Analyses Requested												T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal
Address																Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals
Report Attention: Raja	Phone	Fax	Sampled by: R. J.													
Project Name/No.: 11-137	Project Site: I-5 HOV Lane, Widen															

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH				Remark
L-3-49-1	EA20107-05	1-5-12	1215	Soil	none	4oz jar								↓					Please Test all Sample for total lead Save Samples for future tests
L-3-49-2	106	↓	1225	↓	↓	↓													
L-3-49-3	107		1240																
L-3-49-4	108		1300																
L-3-51-1	109		1335												X				
L-3-51-2	110		1340																
L-3-51-3	111		1350																
L-3-51-4	112	↓	1405																
L-3-37-1	113	1-6-12	0730																
L-3-37-2	114		0735																
L-3-37-3	115		0745																
L-3-37-4	116		0800																
L-3-41-1	117		0815												X				
L-3-41-2	118		0820																
L-3-41-3	119		0835																
L-3-41-4	120	↓	0850	↓	↓	↓								↓					

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-7-12	12:20	[signature]	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Cerritos, CA 90703

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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201027

Client: EARTH MECHANICS, INC.

Address

Report Attention: Raja | Phone | Fax | Sampled by: R. J.

Project Name/No.: 11-137 | Project Site: I-5 HOV Lane, Wilton

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); Total Lead (6010); pH

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	Remark
L-3-43-1	EA201027-121	1-6-12	0900	Soil	none	4oz. jar	Please test all Sampl. for Total Lead. Save samples for future tests
L-3-43-2	122	↓	0910	↓	↓	↓	
L-3-43-3	123	↓	0925	↓	↓	↓	
L-3-43-4	124	↓	0940	↓	↓	↓	

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-7-12	12:20	[signature]	ASC	1-7-12	12:20
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC.

Address: 17800 Newhope street, Suite B, Fountain Valley, 92708

Report Attention: Raja | Phone: 714-751-3826 | Fax: 714-751-3928 | Sampled by: R. J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH	STLC - Lead
L-2-28-1	EA201089-1	1-16-12	0730	Soil	none	4 oz. jar										X
L-2-28-2	-2		0740												X	
L-2-28-3	-3		0755													
L-2-28-4	-4		0815													
L-2-30-1	-5		0830													X
L-2-30-2	-6		0835													X
L-2-30-3	-7		0850													X
L-2-30-4	-8		0910													X
L-2-32-1	-9		0925													
L-2-32-2	-10		0930													
L-2-32-3	-11		0950													
L-2-32-4	-12		1010													
L-2-34-1	-13		1025												X	X
L-2-34-2	-14		1030													
L-2-34-3	-15		1045													
L-2-34-4	-16	↓	1100	↓	↓	↓								↓		

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Remark: please run Total Lead on all samples. Save samples for future tests.

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Raymond R. Qiu	EMI	1-21-12	1145	[signature]	ASC	1/21/12	11:45
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
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Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC.

Address

Report Attention: Raja | Phone | Fax | Sampled by: R. J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH	STLC - Lead			Remark
																			Test total lead
L-2-36-1	EA201089-17	1-16-12	1120	Soil	None	4oz. jar								↓					on all samples.
L-2-36-2	-18	↓	1125	↓	↓	↓													please save samp
L-2-36-3	-19		1140																for future tests
L-2-36-4	-20		1155																
L-2-38-1	-21		1210																
L-2-38-2	-22		1220																
L-2-38-3	-23		1235													X			
L-2-38-4	-24		1255																
L-2-40-1	-25		1315																
L-2-40-2	-26		1325												X				
L-2-40-3	-27		1340																
L-2-40-4	-28		1355																
L-2-42-1	-29		1425													X			
L-2-42-2	-30		1435													X			
L-2-42-3	-31		1450																
L-2-42-4	-32	↓	1510	↓	↓	↓								↓					

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-21-12	1145	[signature]	ABC	1/21/12	11:45
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Email: ascorp@verizon.net
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Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. G.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane. Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH	STLC - Lead
L-2-44-1	EA201089-33	1-16-12	1515	Soil	None	4 oz. jar								√		X
L-2-44-2	-34		1530												X	X
L-2-44-3	-35		1545													
L-2-44-4	-36		1600													
L-2-26-1	-37		1615													
L-2-26-2	-38		1625													
L-2-26-3	-39		1635													
L-2-26-4	-40	↓	1645													
L-2-24-1	-41	1-17-12	0720													
L-2-24-2	-42		0730													
L-2-24-3	-43		0750													
L-2-24-4	-44		0810													
L-2-22-1	-45		0825												X	
L-2-22-2	-46		0835													
L-2-22-3	-47		0855													
L-2-22-4	-48	↓	0915	↓	↓	↓								√		

Analyses Requested

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☑ Normal

Sample Condition
☐ Chilled ☑ Intact
☐ Sample seals

Remark
Test Total Lead on all Sample, Please Reserve samples for future Test

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-21-12	1145	[signature]	ABC	1/12/12	11:45
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

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Cerritos, CA 90703

Email: ascorp@verizon.net
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Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Kayla

Phone:

Fax:

Sampled by: R. G.

Project Name/No.: 11-136

Project Site: I-5 HOV Lane Widen

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); Total Lead (6010); pH

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	Remark
L-2-20-1	E201089-49	1-17-12	0930	Soil	none	4oz. jar	Test total Lead on all samples, please Save samples for future tests
L-2-20-2	-50		0940				
L-2-20-3	-51		1000				
L-2-20-4	-52		1020				
L-2-18-1	-53		1040				
L-2-18-2	-54		1050				
L-2-18-3	-55		1105				
L-2-18-4	-56		1120				
L-2-16-1	-57		1130				X (pH)
L-2-16-2	-58		1140				
L-2-16-3	-59		1155				
L-2-16-4	-60		1215				
L-2-14-1	-61		1250				
L-2-14-2	-62		1300				X (pH)
L-2-14-3	-63		1315				
L-2-14-4	-64	↓	1335	↓	↓	↓	

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-24-12	1145	[signature]	ABC	1/24/12	11:45
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. L.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH			
L-2-12-1	EA201089-65	1-7-12	1345	Soil	None	4oz. jar												
L-2-12-2	-66		1350															
L-2-12-3	-67		1410															
L-2-12-4	-68		1430															
L-2-10-1	-69		1450															
L-2-10-2	-70		1455															
L-2-10-3	-71		1515															
L-2-10-4	-72		1535															
L-2-8-1	-73		1600												X			
L-2-8-2	-74		1610															
L-2-8-3	-75		1630															
L-2-8-4	-76		1645															
L-2-6-1	-77	1-8-12	0730															
L-2-6-2	-78		0740												X			
L-2-6-3	-79		0755															
L-2-6-4	-80		0815															

Analyses Requested

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☒ Normal

Sample Condition
☐ Chilled ☒ Intact
☐ Sample seals

Remark: Test total lead on soil samples please. Bank samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-2-12	1145	[signature]	ASC	1/2/12	11:45
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH			
L-2-4-1	EA201089-81	11-8-12	0830	Soil	None	4oz. jar												
L-2-4-2	82		0840															
L-2-4-3	83		0855															
L-2-4-4	84		0915															
L-2-2-1	85		0930															
L-2-2-2	86		0940															
L-2-2-3	87		0950															
L-2-2-4	88		1010															
L-2-1-1	89		1030												X			
L-2-1-2	90		1040															
L-2-1-3	91		1055															
L-2-1-4	92		1120															
L-2-3-1	93		1130															
L-2-3-2	94		1140															
L-2-3-3	95		1150															
L-2-3-4	96		1215															

Analyses Requested

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☑ Normal

Sample Condition
☐ Chilled ☑ Intact
☐ Sample seals

Remark: Test total lead on all samples, please Save samples for future Tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	11-21-12	1145	[signature]	ASC	11/21/12	11:45
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. Y.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH			
L-2-5-1	EA201089-97	1-18-12	1300	Soil	None	4oz jar								↓				
L-2-5-2	98		1310												X			
L-2-5-3	99		1330															
L-2-5-4	100		1350															
L-2-7-1	101		1400															
L-2-7-2	102		1410															
L-2-7-3	103		1425															
L-2-7-4	104		1445															
L-2-13-1	105		1500												X			
L-2-13-2	106		1510															
L-2-13-3	107		1535															
L-2-13-4	108		1550															
L-2-15-1	109		1600															
L-2-15-2	110		1610															
L-2-15-3	111		1625															
L-2-15-4	112	↓	1640	↓	↓	↓								↓				

Analyses Requested

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☑ Normal

Sample Condition
☐ Chilled ☑ Intact
☐ Sample seals

Remark: Test Total Lead on all sample, please pair 2 samples for future tests.

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-21-12	1145	[signature]	ASC	1/21/12	11:45
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC.

Address

Report Attention: Raja | Phone | Fax | Sampled by: R. G.

Project Name/No.: 11-136 | Project Site: I-5 Hoover Lane Widen

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); Total Lead (6010); pH

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	Remark
L-2-9-1	EA201089-113	1-9-12	0715	Soil	none	4oz jar	Test Total Lead on all samples, please save samples for future tests
L-2-9-2	114		0725				
L-2-9-3	115		0740				
L-2-9-4	116		0800				
L-2-11-1	117		0815				
L-2-11-2	118		0825				
L-2-11-3	119		0835				pH: X
L-2-11-4	120		0855				
L-2-17-1	121		0915				
L-2-17-2	122		0925				pH: X
L-2-17-3	123		0940				
L-2-17-4	124		0955				
L-2-19-1	125		1020				
L-2-19-2	126		1030				
L-2-19-3	127		1045				
L-2-19-4	128		1100				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Raja Qazi	EMI	1-21-12	1145	[illegible]	ABC	1/21/12	1145
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC.

Address

Report Attention	Phone	Fax	Sampled by
Raja			R. J.

Project Name/No.	Project Site
11-136	I-5 HOV Lane Widen

Analyses Requested

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH			Remark
L-2-84-1	EA201089-129	1-9-12	1120	Soil	None	4oz. jar								↓				Test Total Lead on all sample, please save samples for future Tests
L-2-84-2	130		1125	↓	↓	↓												
L-2-84-3	131		1140															
L-2-84-4	132		1200															
L-2-80-1	133		1215															
L-2-80-2	134		1225															
L-2-80-3	135		1240															
L-2-80-4	136		1300															
L-2-76-1	137		1330												X			
L-2-76-2	138		1340															
L-2-76-3	139		1355															
L-2-76-4	140		1410															
L-2-72-1	141		1430															
L-2-72-2	142		1440															
L-2-72-3	143		1500															
L-2-72-4	144	↓	1515	↓	↓	↓								↓				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-21-12	1145	[signature]	ASC	1/21/12	1145
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client:	EARTH MECHANICS, INC.
Address	
Report Attention	Kaja
Phone	
Fax	
Sampled by	R. J.
Project Name/No.	11-136
Project Site	I-5 HOV Lane Widen

Analyses Requested

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH			
L-2-21-1	EA201089-145	1-19-12	1535	Soil	None	4oz. jar									X			
L-2-21-2	146		1545															
L-2-21-3	147		1600															
L-2-21-4	148		1620															
L-2-23-1	149	1-20-12	0720															
L-2-23-2	150		0730															
L-2-23-3	151		0745															
L-2-23-4	152		0800															
L-2-25-1	153		0815															
L-2-25-2	154		0820															
L-2-25-3	155		0835															
L-2-25-4	156		0855															
L-2-27-1	157		0915															
L-2-27-2	158		0925															
L-2-27-3	159		0940												X			
L-2-27-4	160		0955															

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☒ Normal

Sample Condition
☐ Chilled ☒ Intact
☐ Sample seals

Remark
Test Total Lead on all samples, please save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-21-12	1145	[signature]	ASC	1/21/12	1145
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
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Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201089

Client: EARTH MECHANICS, INC

Address

Report Attention: Roja | Phone | Fax | Sampled by: R. J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH
L-2-29-1	EA201089-161	1-20-12	1015	Soil	None	4oz. jar								Total Lead (6010)	pH
L-2-29-2	162		1025												
L-2-29-3	163		1040												
L-2-29-3	164		1100												
L-2-35-1	165		1120												
L-2-35-2	166		1130												
L-2-35-3	167		1145												
L-2-35-4	168		1205												

Analyses Requested

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☑ Normal

Sample Condition
☐ Chilled ☑ Intact
☐ Sample seals

Remark: Test Total Lead on all samples please save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-21-12	1145	[signature]	ASC	1/21/12	11:45
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201139

Client: EARTH MECHANICS, INC

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R-J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH	STLC - Lead			Remark
L-2-37-1	EA201139-1	1-20-12	1300	Soil	none	4oz jar													Test Total Lead on soil sample, please save samples for future tests
L-2-37-2	-2		1320												X				
L-2-37-3	-3		1325																
L-2-37-4	-4		1345																
L-2-39-1	-5		1400																
L-2-39-2	-6		1410																
L-2-39-3	-7		1435																
L-2-39-4	-8		1450																
L-2-41-1	-9		1500												X				
L-2-41-2	-10		1510																
L-2-41-3	-11		1530																
L-2-41-4	-12	↓	1600																
L-2-47-1	-13	1-24-12	0715													X			
L-2-47-2	-14		0725													X			
L-2-47-3	-15		0740													X			
L-2-47-4	-16	↓	0800	↓	↓	↓								✓		X			

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Leonard Jr	EMI	1-26-12	1000	[illegible]	ABC	1-26-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201139

Client: EARTH MECHANICS, INC

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R.Q.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (200.8)	PH	STLC-Lead			Remark
L-2-49-1	EA201139-17	1-24-12	0820	Soil	None	4oz. jar										X			Test total lead on all sample, please save samples for future test
L-2-49-2	18		0830																
L-2-49-3	19		0845													X			
L-2-49-4	20		0900																
L-2-51-1	21		0920												X				
L-2-51-2	22		0930													X			
L-2-51-3	23		0940																
L-2-51-4	24		1000																
L-2-53-1	25		1020													X			
L-2-53-2	26		1030																
L-2-53-3	27		1050													X			
L-2-53-4	28		1110																
L-2-55-1	29		1120													X			
L-2-55-2	30		1125																
L-2-55-3	31		1140																
L-2-55-4	32		1200																

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-28-12	1000	[signature]	AZ	1-28-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201139

Client: EARTH MECHANICS, INC

Address

Report Attention: Raja | Phone | Fax | Sampled by: R.Y

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	TPH	STLC-Lead
L-2-57-1	EA201139-33	1-24-12	1215	Soil	none	4oz. jar								↓	X	
L-2-57-2	34		1225	↓	↓	↓										X
L-2-57-3	35		1245													
L-2-57-4	36		1310													
L-2-59-1	37		1330													
L-2-59-2	38		1340													
L-2-59-3	39		1355													
L-2-59-4	40		1415													
L-2-61-1	41		1430													
L-2-61-2	42		1440												X	
L-2-61-3	43		1455													
L-2-61-4	44		1515													
L-2-63-1	45		1530												X	
L-2-63-2	46		1540													
L-2-63-3	47		1600													
L-2-63-4	48	↓	1645	↓	↓	↓								↓		

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Remark: Test total lead on all sample, please save samples for future tests

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-28-12	1000	[signature]	ABC	1-28-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201139

Client: EARTH MECHANICS, INC

Address

Report Attention: Raja | Phone | Fax | Sampled by: R. J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (Low)	PH				Remark
L-2-65-1	EA201139-49	1-25-12	0720	soil	none	4oz jar								√					Test total lead on all sample, please save samples for future tests
L-2-65-2	50		0730																
L-2-65-3	51		0745																
L-2-65-4	52		0805																
L-2-67-1	53		0830																
L-2-67-2	54		0840																
L-2-67-3	55		0855																
L-2-67-4	56		0915																
L-2-75-1	57		0930												X				
L-2-75-2	58		0940																
L-2-75-3	59		0955																
L-2-75-4	60		1015																
L-2-79-1	61		1040																
L-2-79-2	62		1050																
L-2-79-3	63		1110																
L-2-79-4	64	√	1130	√	√	√								√					

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-28-12	1000	[signature]	ATC	1-28-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
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Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201139

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R.J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	RH	STLC - Lead			Remark
L-2-77-1	EA201139-65	1-25-12	1140	Soil	None	4 oz. jar													Test total lead on all sample please save samples for future tests
L-2-77-2	66		1150																
L-2-77-3	67		1210																
L-2-77-4	68		1230																
L-2-81-1	69		1300												X				
L-2-81-2	70		1310																
L-2-81-3	71		1330																
L-2-81-4	72		1350																
L-2-83-1	73		1400													X			
L-2-83-2	74		1410												X				
L-2-83-3	75		1435																
L-2-83-4	76		1450																
L-2-85-1	77		1500																
L-2-85-2	78		1510																
L-2-85-3	79		1530																
L-2-85-4	80		1550																

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
Signed	EMI	1-28-12	1000				
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
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Email: ascorp@verizon.net
Tel: (562) 809-8880
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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201139

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. J.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); Total Lead (lead); pH

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	Test Remark
L-2-91-1	EA201139-81	1-25-12	1600	Soil	None	4oz. jar	Total Lead on all Sample, please save Samples for future tests
L-2-91-2	82		1610				
L-2-91-3	83		1630				
L-2-91-4	84		1650				
L-2-89-1	85	1-26-12	0720				
L-2-89-2	86		0730				
L-2-89-3	87		0745				
L-2-89-4	88		0800				
L-2-93-1	89		0820				pH: X
L-2-93-2	90		0830				
L-2-93-3	91		0850				
L-2-93-4	92		0910				
L-2-95-1	93		0920				
L-2-95-2	94		0925				
L-2-95-3	95		0940				
L-2-95-4	96		1000				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-26-12	1000	[signature]	ASC	1-26-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201139

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raza | Phone: | Fax: | Sampled by: R. Y.

Project Name/No.: 11-136 | Project Site: I-5 HOV Lane

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH				Remark
L-2-97-1	EA201139-97	1-26-12	1020	Soil	None	4oz. jar													Test total lead on all samples, please save samples for future tests
L-2-97-2	98		1030																
L-2-97-3	99		1045																
L-2-97-4	100		1100																
L-2-99-1	101		1120												X				
L-2-99-2	102		1130																
L-2-99-3	103		1150																
L-2-99-4	104		1215																
L-2-101-1	105		1300																
L-2-101-2	106		1310																
L-2-101-3	107		1330																
L-2-101-4	108		1345																
L-2-102-1	109		1400																
L-2-102-2	110		1410												X				
L-2-102-3	111		1425																
L-2-102-4	112	↓	1445	↓	↓	↓								↓					

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-26-12	1000	[signature]	ATL	1-26-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
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Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201139

Client: EARTH MECHANICS, INC.				Analyses Requested													T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal
Address																	Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals
Report Attention: Raja	Phone	Fax	Sampled by: R. J.														
Project Name/No.: 11-136	Project Site: I-5 HOV Lane																

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (Pb)	pH			Remark
L-2-43-1	EA201139-113	1-27-12	0720	Soil	none	4oz. jar												Test total lead on all samples, please save samples for future tests
L-2-43-2	114		0730															
L-2-43-3	115		0745															
L-2-43-4	116		0805															
L-2-45-1	117		0820												X			
L-2-45-2	118		0830															
L-2-45-3	119		0845															
L-2-45-4	120		0910															

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-28-12	1000	[signature]	ASC	1-28-12	1000
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

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Cerritos, CA 90703

Email: ascorp@verizon.net
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Distribution: WHITE with report, PINK to courier.

SEGMENT 3

BETWEEN STA. 340+00 AND STA. 408+00 ("A" LINE)

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC

Address: 17800 Newhope Street, Suite B, Fountain Valley, CA 92708

Report Attention: RAJA | Phone: 714-751-3826 | Fax: | Sampled by: R. Jie

Project Name/No.: I-5 HOV Widen | Project Site: San Clemente to Capistrano

11-137

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	STLC	TCLP	pH	Remark
L-3-48-1	EA201001-1	12-7-11	1125	Soil	None	4 oz jar								✓				please test all
L-3-48-2	-2	"	1130	"	"	"								"				sample for
L-3-48-3	3	"	1140	"	"	"								"				Total Lead.
L-3-48-4	4	"	1155	"	"	"								"				Save samples
L-3-50-1	5	"	1245	"	"	"								"			X	for future TPH
L-3-50-2	6	"	1250	"	"	"								"				
L-3-50-3	7	"	1300	"	"	"								"				
L-3-50-4	8	"	1315	"	"	"								"				
L-3-52-1	9	"	1530	"	"	"								"				
L-3-52-2	10	"	1540	"	"	"								"				
L-3-52-3	11	"	1550	"	"	"								"				
L-3-52-4	12	"	1615	"	"	"								"				
L-3-53-1	13	"	1425	"	"	"								"				
L-3-53-2	14	"	1430	"	"	"								"				
L-3-53-3	15	"	1445	"	"	"								"				
L-3-53-4	16	"	1455	"	"	"								✓				

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	12-12-11	1130	[signature]	ASC	12/14/11	11:30
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.				Analyses Requested												T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal
Address: 17800 Newhope street, Suite B, Fountain Valley, CA 92708																Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals
Report Attention: Raja	Phone: 714 751-3826	Fax:	Sampled by: K. Jie													
Project Name/No.: 11-137	Project Site: I-5 Hov Widen.															

Client Sample ID	Lab Sample ID	Sample Collection: Date	Sample Collection: Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	√Total Lead (6010)	PH				Remark
L-3-54-1	EA201001-17	12/27/11	1355	Soil	None	4oz. Jar								√	X				Please test all Sample for total Lead. Save Samples for future Tests
L-3-54-2	18		1400																
L-3-54-3	19		1410																
L-3-54-4	20		1420																
L-3-55-1	21		0910																
L-3-55-2	22		0920																
L-3-55-3	23		0935																
L-3-55-4	24		0950																
L-3-56-1	25		0820												X				
L-3-56-2	26		0825																
L-3-56-3	27		0835																
L-3-56-4	28		0850																
L-3-57-1	29		0745																
L-3-57-2	30		0750																
L-3-57-3	31		0800																
L-3-57-4	32	↓	0810	↓	↓	↓								↓					

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	12-2-12	1130	[signature]	ASC	12/2/12	11:45am
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC				Analyses Requested											T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal
Address: 17800 Newhope St. Suite B. Fountain Valley, CA 92708															Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals
Report Attention: Raja	Phone: 714 751-3826	Fax:	Sampled by: R. Jie												
Project Name/No.: 11-137	Project Site: I-5 HOV Widen														

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	√Total Lead (6010)	pH			Remark
L-3-46-1	EA201001-33	12/8/11	0705	Soil	none	4oz jar												pls test all sample for total Lead. Save samples for future tests
L-3-46-2	34		0710															
L-3-46-3	35		0725															
L-3-46-4	36		0735															
L-3-44-1	37		0800												X			
L-3-44-2	38		0805															
L-3-44-3	39		0815															
L-3-44-4	40		0830															
L-3-40-1	41		0900															
L-3-40-2	42		0910															
L-3-40-3	43		0935															
L-3-40-4	44		0950															
L-3-36-1	45		1022												X			
L-3-36-2	46		1030															
L-3-36-3	47		1045															
L-3-36-4	48	↓	1100	↓	↓	↓								↓				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
R. Jie	EMI	12-12	1130			12/12	11:50
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, Inc.

Address

Report Attention	Phone	Fax	Sampled by
			R. Joe

Project Name/No.	Project Site
11-137	I-5 HOV Widen

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (Pb)	pH			Remark
L-3-34-1	EA201001-49	12/28/11	1130	Soil	None	4 oz jar								✓	X			Please Test all Sample for Total Lead prior to Sample for Future Tests
L-3-34-2	50		1135															
L-3-34-3	51		1145															
L-3-34-4	52		1200															
L-3-32-1	53		1305												X			
L-3-32-2	54		1310															
L-3-32-3	55		1325															
L-3-32-4	56		1340															
L-3-30-1	57		1355															
L-3-30-2	58		1400															
L-3-30-3	59		1415															
L-3-30-4	60		1430															
L-3-20-1	61		1440												X			
L-3-20-2	62		1445															
L-3-20-3	63		1455															
L-3-20-4	64	↓	1510	↓	↓	↓								↓				

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☒ Normal

Sample Condition
☐ Chilled ☒ Intact
☐ Sample seals

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
	EMI	1-2-12	1130		ABC	1/2/12	1130
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Cerritos, CA 90703

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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Roya | Phone: | Fax: | Sampled by: R. Jai

Project Name/No.: 11-137 | Project Site: I-5 Hov Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	√Total Lead (6010)	pH			Remark
L-3-18-1	EA201001-65	12/28/11	1530	Soil	none	4 oz. jar								√				Please list all Sample for Total Lead, Soil Samples for Future Tests
L-3-18-2	66		1535															
L-3-18-3	67		1545															
L-3-18-4	68		1555															
L-3-16-1	69		1605															
L-3-16-2	70		1610															
L-3-16-3	71		1615															
L-3-16-4	72	↓	1640															
L-3-42-1	73	12/29/11	0720															
L-3-42-2	74		0730															
L-3-42-3	75		0745															
L-3-42-4	76		0810															
L-3-38-1	77		0850															
L-3-38-2	78		0900															
L-3-38-3	79		0915															
L-3-38-4	80	↓	0940	↓	↓	↓								↓				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	12-29-11	1130	[signature]	ASC	12/29/11	11:30 AM
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. Joe

Project Name/No.: 11-137 | Project Site: I-5 HOV Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	√ Total Lead (lab)	pH			Remark
L3-28-1	EA201001-81	12/29/11	1020	Soil	None	4 oz. jar								√	X			please test all samples for Total lead, save samples for future tests
L3-28-2	82		1025															
L3-28-3	83		1040															
L3-28-4	84		1055															
L3-26-1	85		1110															
L3-26-2	86		1120															
L3-26-3	87		1135															
L3-26-4	88		1150															
L3-24-1	89		1240															
L3-24-2	90		1245															
L3-24-3	91		1300															
L3-24-4	92		1310															
L3-22-1	93		1315												X			
L3-22-2	94		1320															
L3-22-3	95		1335															
L3-22-4	96	↓	1350	↓	↓	↓								↓				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-2-12	1130	[signature]	ASC	1/2/12	11:19 AM
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: A=Air Bag, G=Glass bottle, M=Metal Tube, P=Plastic bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Kaja | Phone: | Fax: | Sampled by: R. Joe

Project Name/No.: 11-137 | Project Site: I-5 HOV Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); ✓ Total Lead (6010); PH

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	Remark
L-3-14-1	EA201001-97	12/29/11	1420	Soil	None	4oz. jar	Please test all sample for total lead. Save sample for future tests
L-3-14-2	98		1430				
L-3-14-3	99		1445				
L-3-14-4	100		1500				
L-3-12-1	101		1615				
L-3-12-2	102		1620				
L-3-12-3	103		1635				
L-3-12-4	104		1650				
L-3-10-1	105		1530				
L-3-10-2	106		1535				
L-3-10-3	107		1550				
L-3-10-4	108	↓	1605				
L-3-8-1	109	12/30/11	0720				
L-3-8-2	110		0725				
L-3-8-3	111		0745				
L-3-8-4	112	↓	0800	↓	↓	↓	

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-2-12	1130	[signature]	ABC	1/2/12	11:30 AM
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC			
Address			
Report Attention: Raja	Phone	Fax	Sampled by: R. Joe
Project Name/No.: 11-137	Project Site: I-5 HOV NB new		

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	TPH				Remark
L3-6-1	EA201001-113	12/30/11	0810	Soil	None	4 oz. Jar								✓	X				please test all sample for total lead, save samples for future tests
L3-6-2	114		0820																
L3-6-3	115		0845																
L3-6-4	116		0905																
L3-4-1	117		0930																
L3-4-2	118		0935																
L3-4-3	119		0950																
L3-4-4	120		1020																
L3-2-1	121		1130																
L3-2-2	122		1140																
L3-2-3	123		1200																
L3-2-4	124		1215																
L3-1-1	125		1345												X				
L3-1-2	126		1350																
L3-1-3	127	↓	1405	↓	↓	↓								↓					
L3-1-4	128		1425																

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-2-12	1130	[signature]	ABC	1/2/12	11:30
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

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ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: K.K.

Project Name/No.: 11-136 | Project Site: I-5 HOV Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	√ Total Lead (6010)	PH				Remark
L-2-100-1	EA201001-129	12/22/11	0730	Soil	none	4oz jar								√					Please test all sample for total lead. Save samples for future tests
L-2-100-2	130	"	0735	"	"	"								"					
L-2-100-3	131	"	0750	"	"	"								"					
L-2-100-4	132	"	0810	"	"	"								"					
L-2-98-1	133	"	0830	"	"	"								"	X				
L-2-98-2	134	"	0840	"	"	"								"					
L-2-98-3	135	"	0855	"	"	"								"					
L-2-98-4	136	"	0915	"	"	"								"					
L-2-96-1	137	"	0945	"	"	"								"					
L-2-96-2	138	"	0955	"	"	"								"					
L-2-96-3	139	"	1015	"	"	"								"					
L-2-96-4	140	"	1035	"	"	"								"					
L-2-94-1	141	"	1100	"	"	"								"					
L-2-94-2	142	"	1105	"	"	"								"					
L-2-94-3	143	"	1120	"	"	"								"					
L-2-94-4	144	"	1140	"	"	"								"					

Analyses Requested

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	12-22-11	1130	[signature]	ASC	12/22/11	1136 AM
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: K.K.

Project Name/No.: 11-136 | Project Site: I-5 HOV Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	Analyses Requested: TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	✓ (Total Lead (6010)	PH				Remark
L-2-92-1	EA201001-145	12/27/11	1200	Soil	none	4oz jar								✓	X				Please test soil samples for total lead. Save samples for future tests
L-2-92-2	146		1210																
L-2-92-3	147		1230																
L-2-92-4	148		1245																
L-2-90-1	149		1255																
L-2-90-2	150		1300																
L-2-90-3	151		1315																
L-2-90-4	152		1330																
L-2-86-1	153		1340																
L-2-86-2	154		1345																
L-2-86-3	155		1400																
L-2-86-4	156		1415																
L-2-87-1	157		1430												X				
L-2-87-2	158		1435																
L-2-87-3	159		1450																
L-2-87-4	160	✓	1510	✓	✓	✓								✓					

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	12-12	1130	[signature]	ABC	12/12/11	11:30 am
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, G=Glass bottle, V=VOA vial

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Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.

Address

Report Attention	Phone	Fax	Sampled by
Rada			K.K.

Project Name/No.	Project Site
11-136	I-5 HOV Widen

Analyses Requested

T.A.T. Requested
☐ 8 hrs ☐ 24 hrs ☐ 48 hrs
☐ 3 days ☒ Normal

Sample Condition
☐ Chilled ☒ Intact
☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	pH				Remark
L-2-88-1	EA201001-161	12/28/11	0800	Soil	none	4 oz jar								✓	X				Please test all sample for total lead, save sample for future tests
L-2-88-2	162		0805																
L-2-88-3	163		0815																
L-2-88-4	164		0830																
L-2-82-1	165		0845																
L-2-82-2	166		0850																
L-2-82-3	167		0905																
L-2-82-4	168		0920																
L-2-78-1	169		0950												X				
L-2-78-2	170		0955																
L-2-78-3	171		1015																
L-2-78-4	172		1040																
L-2-75-1	173		1100												X				
L-2-75-2	174		1110																
L-2-75-3	175	↓	1125																
L-2-75-4	176	↓	1140	↓	↓	↓								↓					

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
K. K.	EMI	12-29-11	1130		ASC		
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, P=Plastic bottle, A=Air Bag, V=VOA vial, G=Glass bottle

Alpha Scientific Corporation
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Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Reza | Phone: | Fax: | Sampled by: K.K.

Project Name/No.: 11-136 | Project Site: I-5 HOV Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	PH			Remark
L-2-73-1	EA201001-177	12/28/11	1210	Soil	none	4oz. jar								√				Please test all sample for total lead, save sample for future tests
L-2-73-2	178	"	1215	"	"	"								"				
L-2-73-3	179	"	1230	"	"	"								"				
L-2-73-4	180	"	1245	"	"	"								"				
L-2-71-1	181	"	1300	"	"	"								"				
L-2-71-2	182	"	1310	"	"	"								"				
L-2-71-3	183	"	1325	"	"	"								"				
L-2-71-4	184	"	1340	"	"	"								"				
L-2-69-1	185	"	1400	"	"	"								"	X			
L-2-69-2	186	"	1410	"	"	"								"				
L-2-69-3	187	"	1440	"	"	"								"				
L-2-69-4	188	"	1500	"	"	"								"				
L-2-70-1	189	12/30/11	0900	"	"	"								"				
L-2-70-2	190	"	0905	"	"	"								"				
L-2-70-3	191	"	0920	"	"	"								"				
L-2-70-4	192	"	0940	"	"	"								"				

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-2-12	1130	[signature]	ASC	1/2/12	1130
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

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Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: K. K.

Project Name/No.: 11-136 | Project Site: I-5 HOV Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	✓ Total Lead (6010)	PLM			Remark
L-2-62-1	EA201001-193	12/30/11	1005	Soil	none	4oz jar								✓	X			Please test all sample for total lead, save samples for future tests
L-2-62-2	194		1015											✓				
L-2-62-3	195		1030															
L-2-62-4	196		1045															
L-2-60-1	197		1105															
L-2-60-2	198		1110															
L-2-60-3	199		1120															
L-2-60-4	200		1135															
L-2-56-1	201		1145															
L-2-56-2	202		1150															
L-2-56-3	203		1200															
L-2-56-4	204		1215															
L-2-54-1	205		1230												X			
L-2-54-2	206		1235															
L-2-54-3	207	↓	1245	↓	↓	↓								↓				
L-2-54-4	208		1300															

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	1-2-12	1130	[signature]	BSL	1/2/12	1130
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Email: ascorp@verizon.net
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Distribution: WHITE with report, PINK to courier.

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA201001

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: K.K.

Project Name/No.: 11-136 | Project Site: I-5 HOV Widen

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	✓Total Lead (6010)	PH				Remark
L-2-52-1	EA201001-209	12/20/10	1310	Soil	none	4 oz jar								✓					please test all sample for total lead. Save sample for future tests
L-2-52-2	210		1305																
L-2-52-3	211		1315																
L-2-52-4	212		1330																
L-2-50-1	213		1350												X				
L-2-50-2	214		1355																
L-2-50-3	215		1410																
L-2-50-4	216		1425																
L-2-31-1	217		1440												X				
L-2-31-2	218		1445																
L-2-31-3	219		1455																
L-2-31-4	220		1510																
L-2-33-1	221		1520																
L-2-33-2	222		1525																
L-2-33-3	223		1540																
L-2-33-4	224	↓	1600	↓	↓	↓								✓					

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	12-21-10	1130	[signature]	ABC	12/21/10	11:30
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Cerritos, CA 90703

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Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

YELLOW TRAFFIC STRIPE PAINT

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202012

Client: EARTH MECHANICS, Inc.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. Y.

Project Name/No.: I1-176 | Project Site: I-5 HOV Lane

Analyses Requested

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Total Lead (6010)	Chromium			Remark
LP-NPF	EA202012-1	12-3-12	0930	Paint	None	4oz. jar								↓	↓			Test total lead on all samples, please save samples for future tests
LP-SPF	-2		1000															
LP-SPN	-3		1030															
LP-NPN	-4		1100															
LP-SHF	-5		1130															
LP-SHNL	-6		1200															
LP-NHNL	-7		1230															
LP-NHN	-8		1250															
LP-NHF	-9		1320															
LP-SEF	-10		1400															
LP-SEN	-11		1430															
LP-NEN	-12		1500															
LP-NENL	-13		1520															
LP-NEF	-14	↓	1550	↓	↓	↓								↓	↓			

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	2-7-12	1140	[signature]	ASC	2/7/12	11:40 Am
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

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Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

ALPHA SCIENTIFIC CORPORATION
CHAIN OF CUSTODY RECORD

Lab Job Number EA202012

Client: EARTH MECHANICS, INC.

Address:

Report Attention: Raja | Phone: | Fax: | Sampled by: R. G.

Project Name/No.: 11-B6 | Project Site: I-5 HOV Lane

Analyses Requested: TPH-Gasoline; TPH-Diesel; 8260B (BTEX, Oxygenates); 8260B (VOCs); 8270C (SVOCs); CAM Metals; 8082 (PCBs); Total Lead (6010); Cadmium

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☑ Normal

Sample Condition: ☐ Chilled ☑ Intact ☐ Sample seals

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No..type* & size of container	Remark
LP-S-1	EA202012-15	2-5-12	2240	paint	None	4 oz. jar	Test total lead on all samples, please save samples for future tests
LP-S-2	-16	↓	2310	↓	↓	↓	
LP-S-3	-17		2340				
LP-S-4	-18	2-6-12	0010				
LP-S-5	-19		0100				
LP-S-6	-20		0145				
LP-N-1	-21		2245				
LP-N-2	-22		2320				
LP-N-3	-23		2355				
LP-N-4	-24	2-7-12	0030				
LP-N-5	-25		0105				
LP-N-6	-26	↓	0145	↓	↓	↓	

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	EMI	2-7-12	1140	[signature]	ABC	2-7-12	11:40 AM
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier

APPENDIX B

LABORATORY SOIL TEST RESULTS

Table B1. Summary of Laboratory Soil Test Results for Segment 1 (1 of 5)								
Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-1-1-1	117° 36' 37"	33° 26' 2"	0.5	5.0				
L-1-1-2			1.5	2.0				
L-1-1-3			3.0	5.1				
L-1-1-4			4.0	2.2				
L-1-2-1	117° 37' 59"	33° 26' 7"	0.5	12.3				8.13
L-1-2-2			1.5	3.2				
L-1-2-3			3.0	ND				
L-1-2-4			4.0	ND				
L-1-3-1	117° 37' 5"	33° 26' 6"	0.5	8.9				7.75
L-1-3-2			1.5	19.5				
L-1-3-3			3.0	19.0				
L-1-3-4			4.0	2.2				
L-1-4-1	117° 37' 2"	33° 26' 9"	0.5	3.0				
L-1-4-2			1.5	3.9				
L-1-4-3			3.0	11.8				
L-1-4-4			4.0	3.3				
L-1-5-1	117° 37' 7"	33° 26' 9"	0.5	25.6				
L-1-5-2			1.5	8.6				
L-1-5-3			3.0	3.9				
L-1-5-4			4.0	5.4				
L-1-6-1	117° 37' 4"	33° 26' 11"	0.5	12.4				8.42
L-1-6-2			1.5	ND				
L-1-6-3			3.0	2.6				
L-1-6-4			4.0	3.1				
L-1-7-1	117° 37' 9"	33° 26' 11"	0.5	22.1				
L-1-7-2			1.5	31.9				8.19
L-1-7-3			3.0	9.8				
L-1-7-4			4.0	6.2				
L-1-8-1	117° 37' 5"	33° 26' 13"	0.5	17.5				
L-1-8-2			1.5	7.0				
L-1-8-3			3.0	2.7				
L-1-8-4			4.0	ND				
L-1-9-1	117° 37' 11"	33° 26' 14"	0.5	67.9	2.6			
L-1-9-2			1.5	10.8				
L-1-9-3			3.0	18.3				
L-1-9-4			4.0	6.3				
L-1-10-1	117° 37' 8"	33° 26' 15"	0.5	11.1				
L-1-10-2			1.5	18.8				7.91
L-1-10-3			3.0	4.7				
L-1-10-4			4.0	ND				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B1. Summary of Laboratory Soil Test Results for Segment 1 (2 of 5)								
L-1-11-1	117° 37' 14"	33° 26' 15"	0.5	108.0	1.0			8.45
L-1-11-2			1.5	17.4				
L-1-11-3			3.0	11.9				
L-1-11-4			4.0	20.1				
L-1-12-1	117° 37' 11"	33° 26' 16"	0.5	7.9				
L-1-12-2			1.5	3.5				
L-1-12-3			3.0	7.2				
L-1-12-4			4.0	8.2				
L-1-13-1	117° 37' 17"	33° 26' 16"	0.5	18.9				
L-1-13-2			1.5	21.1				
L-1-13-3			3.0	15.2				
L-1-13-4			4.0	33.9				
L-1-14-1	#N/A	#N/A	0.5	4.6				
L-1-14-2			1.5	52.7	2.1			
L-1-14-3			3.0	52.9	0.8			
L-1-14-4			4.0	256.0	1.1			
L-1-15-1	117° 37' 12"	33° 26' 17"	0.5	6.4				
L-1-15-2			1.5	3.8				
L-1-15-3			3.0	78.9	2.5			
L-1-15-4			4.0	42.1				
L-1-16-1	117° 37' 13"	33° 26' 18"	0.5	18.7				8.21
L-1-16-2			1.5	14.2				
L-1-16-3			3.0	2.2				
L-1-16-4			4.0	ND				
L-1-17-1	117° 37' 21"	33° 26' 19"	0.5	6.6				7.97
L-1-17-2			1.5	9.9				
L-1-17-3			3.0	2.7				
L-1-17-4			4.0	ND				
L-1-18-1	117° 37' 15"	33° 26' 19"	0.5	27.7				
L-1-18-2			1.5	15.3				
L-1-18-3			3.0	22.3				
L-1-18-4			4.0	21.6				
L-1-19-1	117° 37' 20"	33° 26' 19"	0.5	91.1	3.9			
L-1-19-2			1.5	41.1				8.48
L-1-19-3			3.0	12.4				
L-1-19-4			4.0	2.7				
L-1-20-1	117° 37' 16"	33° 26' 20"	0.5	5.7				8.04
L-1-20-2			1.5	2.3				
L-1-20-3			3.0	2.4				
L-1-20-4			4.0	2.2				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B1. Summary of Laboratory Soil Test Results for Segment 1 (3 of 5)								
L-1-21-1	117° 37' 25"	33° 26' 20"	0.5	4.0				
L-1-21-2			1.5	5.6				
L-1-21-3			3.0	ND				
L-1-21-4			4.0	ND				
L-1-22-1	117° 37' 17"	33° 26' 20"	0.5	18.2				
L-1-22-2			1.5	30.2				
L-1-22-3			3.0	21.7				
L-1-22-4			4.0	17.5				
L-1-23-1	117° 37' 23"	33° 26' 20"	0.5	9.3				
L-1-23-2			1.5	9.7				
L-1-23-3			3.0	41.3				
L-1-23-4			4.0	18.4				
L-1-24-1	117° 37' 18"	33° 26' 21"	0.5	9.6				
L-1-24-2			1.5	8.7				
L-1-24-3			3.0	10.4				
L-1-24-4			4.0	8.8				
L-1-25-1	117° 37' 27"	33° 26' 22"	0.5	22.1				7.68
L-1-25-2			1.5	16.4				
L-1-25-3			3.0	3.2				
L-1-25-4			4.0	ND				
L-1-26-1	117° 37' 20"	33° 26' 22"	0.5	4.3				8
L-1-26-2			1.5	3.0				
L-1-26-3			3.0	2.1				
L-1-26-4			4.0	7.3				
L-1-27-1	117° 37' 25"	33° 26' 21"	0.5	51.6	1.7			
L-1-27-2			1.5	17.9				8.51
L-1-27-3			3.0	8.2				
L-1-27-4			4.0	11.5				
L-1-28-1	117° 37' 21"	33° 26' 24"	0.5	ND				
L-1-28-2			1.5	ND				8.87
L-1-28-3			3.0	ND				
L-1-28-4			4.0	2.4				
L-1-29-1	117° 37' 30"	33° 26' 23"	0.5	19.8				
L-1-29-2			1.5	14.5				
L-1-29-3			3.0	3.5				
L-1-29-4			4.0	7.2				
L-1-30-1	117° 37' 23"	33° 26' 24"	0.5	21.6				
L-1-30-2			1.5	2.9				
L-1-30-3			3.0	6.2				
L-1-30-4			4.0	ND				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B1. Summary of Laboratory Soil Test Results for Segment 1 (4 of 5)								
L-1-31-1	117° 37' 28"	33° 26' 23"	0.5	32.4				
L-1-31-2			1.5	4.9				
L-1-31-3			3.0	7.8				
L-1-31-4			4.0	39.0				
L-1-32-1	117° 37' 24"	33° 26' 26"	0.5	3.7				
L-1-32-2			1.5	6.6				
L-1-32-3			3.0	3.6				
L-1-32-4			4.0	3.7				
L-1-33-1	117° 37' 33"	33° 26' 25"	0.5	108.0	1.5			7.61
L-1-33-2			1.5	335.0	23.8	ND	0.18	
L-1-33-3			3.0	25.3				
L-1-33-4			4.0	3.7				
L-1-34-1	117° 37' 27"	33° 26' 25"	0.5	3.8				8.14
L-1-34-2			1.5	4.1				
L-1-34-3			3.0	124.0	2.8			
L-1-34-4			4.0	98.5	3.8			
L-1-35-1	117° 37' 32"	33° 26' 26"	0.5	12.9				
L-1-35-2			1.5	19.6				
L-1-35-3			3.0	4.7				
L-1-35-4			4.0	7.6				
L-1-36-1	117° 37' 29"	33° 26' 27"	0.5	3.9				
L-1-36-2			1.5	4.6				
L-1-36-3			3.0	7.5				
L-1-36-4			4.0	3.8				
L-1-37-1	117° 37' 34"	33° 26' 27"	0.5	82.7	1.3			
L-1-37-2			1.5	24.9				
L-1-37-3			3.0	11.3				
L-1-37-4			4.0	42.1				
L-1-38-1	117° 37' 37"	33° 26' 29"	0.5	7.9				8.07
L-1-38-2			1.5	8.4				
L-1-38-3			3.0	12.4				
L-1-38-4			4.0	8.3				
L-1-39-1	117° 37' 30"	33° 26' 29"	0.5	61.9	0.2			
L-1-39-2			1.5	5.5				
L-1-39-3			3.0	2.5				
L-1-39-4			4.0	ND				
L-1-40-1	117° 37' 34"	33° 26' 31"	0.5	13.2				
L-1-40-2			1.5	12.5				
L-1-40-3			3.0	7.2				
L-1-40-4			4.0	15.2				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B1. Summary of Laboratory Soil Test Results for Segment 1 (5 of 5)								
L-1-41-1	117° 37' 40"	33° 26' 30"	0.5	5.8				8.15
L-1-41-2			1.5	4.0				
L-1-41-3			3.0	ND				
L-1-41-4			4.0	ND				

Table B2. Summary of Laboratory Soil Test Results for Segment 2 (1 of 11)								
Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-2-1-1	117° 37' 36"	33° 26' 33"	0.5	13.7				7.2
L-2-1-2			1.5	24.3				
L-2-1-3			3.0	22.8				
L-2-1-4			4.0	16.7				
L-2-2-1	117° 37' 39"	33° 26' 33"	0.5	16.8				
L-2-2-2			1.5	7.6				
L-2-2-3			3.0	9.3				
L-2-2-4			4.0	10.5				
L-2-3-1	117° 37' 42"	33° 26' 35"	0.5	24.9				
L-2-3-2			1.5	5.4				
L-2-3-3			3.0	6.1				
L-2-3-4			4.0	5.1				
L-2-4-1	117° 37' 41"	33° 26' 35"	0.5	11.0				
L-2-4-2			1.5	12.5				
L-2-4-3			3.0	12.0				
L-2-4-4			4.0	13.1				
L-2-5-1	117° 37' 45"	33° 26' 36"	0.5	7.6				
L-2-5-2			1.5	6.9				7.2
L-2-5-3			3.0	5.7				
L-2-5-4			4.0	5.3				
L-2-6-1	117° 37' 43"	33° 26' 37"	0.5	8.5				
L-2-6-2			1.5	6.3				7.1
L-2-6-3			3.0	10.0				
L-2-6-4			4.0	7.5				
L-2-7-1	117° 37' 47"	33° 26' 38"	0.5	3.0				
L-2-7-2			1.5	3.5				
L-2-7-3			3.0	ND				
L-2-7-4			4.0	2.9				
L-2-8-1	117° 37' 45"	33° 26' 39"	0.5	6.0				7.1
L-2-8-2			1.5	4.9				
L-2-8-3			3.0	4.8				
L-2-8-4			4.0	5.7				
L-2-9-1	117° 37' 50"	33° 26' 39"	0.5	7.2				
L-2-9-2			1.5	2.7				
L-2-9-3			3.0	3.4				
L-2-9-4			4.0	ND				
L-2-10-1	117° 37' 46"	33° 26' 41"	0.5	4.4				
L-2-10-2			1.5	3.7				
L-2-10-3			3.0	3.7				
L-2-10-4			4.0	3.4				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (2 of 11)								
L-2-11-1	117° 37' 52"	33° 26' 41"	0.5	4.0				
L-2-11-2			1.5	4.7				
L-2-11-3			3.0	4.4				7.2
L-2-11-4			4.0	4.5				
L-2-12-1	117° 37' 49"	33° 26' 43"	0.5	5.1				
L-2-12-2			1.5	3.8				
L-2-12-3			3.0	3.2				
L-2-12-4			4.0	3.7				
L-2-13-1	117° 37' 55"	33° 26' 40"	0.5	13.5				7.3
L-2-13-2			1.5	3.2				
L-2-13-3			3.0	ND				
L-2-13-4			4.0	4.6				
L-2-14-1	117° 37' 46"	33° 26' 43"	0.5	2.1				
L-2-14-2			1.5	4.9				7.4
L-2-14-3			3.0	5.1				
L-2-14-4			4.0	2.9				
L-2-15-1	117° 37' 58"	33° 26' 44"	0.5	7.3				
L-2-15-2			1.5	3.5				
L-2-15-3			3.0	3.1				
L-2-15-4			4.0	4.2				
L-2-16-1	117° 37' 47"	33° 26' 45"	0.5	7.8				7.3
L-2-16-2			1.5	3.5				
L-2-16-3			3.0	6.8				
L-2-16-4			4.0	5.1				
L-2-17-1	117° 37' 57"	33° 26' 42"	0.5	6.6				
L-2-17-2			1.5	4.4				7.7
L-2-17-3			3.0	4.8				
L-2-17-4			4.0	4.7				
L-2-18-1	117° 37' 48"	33° 26' 46"	0.5	5.9				
L-2-18-2			1.5	4.5				
L-2-18-3			3.0	18.1				
L-2-18-4			4.0	7.0				
L-2-19-1	117° 37' 60"	33° 26' 43"	0.5	6.5				
L-2-19-2			1.5	5.2				
L-2-19-3			3.0	5.0				
L-2-19-4			4.0	7.1				
L-2-20-1	117° 37' 51"	33° 26' 45"	0.5	3.8				
L-2-20-2			1.5	8.4				
L-2-20-3			3.0	5.6				
L-2-20-4			4.0	28.4				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (3 of 11)								
L-2-21-1	117° 37' 60"	33° 26' 49"	0.5	13.6				7.4
L-2-21-2			1.5	3.2				
L-2-21-3			3.0	5.7				
L-2-21-4			4.0	4.0				
L-2-22-1	117° 38' 60"	33° 26' 50"	0.5	11.8				7.9
L-2-22-2			1.5	7.0				
L-2-22-3			3.0	2.6				
L-2-22-4			4.0	3.5				
L-2-23-1	117° 38' 7"	33° 26' 50"	0.5	4.1				
L-2-23-2			1.5	5.6				
L-2-23-3			3.0	3.9				
L-2-23-4			4.0	3.2				
L-2-24-1	117° 38' 3"	33° 26' 50"	0.5	7.1				
L-2-24-2			1.5	6.8				
L-2-24-3			3.0	3.3				
L-2-24-4			4.0	3.5				
L-2-25-1	117° 38' 8"	33° 26' 51"	0.5	5.4				
L-2-25-2			1.5	5.4				
L-2-25-3			3.0	6.1				
L-2-25-4			4.0	4.0				
L-2-26-1	117° 38' 6"	33° 26' 53"	0.5	7.0				
L-2-26-2			1.5	4.7				
L-2-26-3			3.0	3.9				
L-2-26-4			4.0	3.6				
L-2-27-1	117° 38' 12"	33° 26' 53"	0.5	8.7				
L-2-27-2			1.5	4.8				
L-2-27-3			3.0	5.3				7.3
L-2-27-4			4.0	6.3				
L-2-28-1	117° 38' 10"	33° 26' 54"	0.5	61.2	1.3			
L-2-28-2			1.5	18.1				7.6
L-2-28-3			3.0	18.9				
L-2-28-4			4.0	16.8				
L-2-29-1	117° 38' 15"	33° 26' 55"	0.5	20.2				
L-2-29-2			1.5	6.6				
L-2-29-3			3.0	5.6				
L-2-29-4			4.0	6.6				
L-2-30-1	117° 38' 13"	33° 26' 55"	0.5	446.0	1.3			
L-2-30-2			1.5	67.4	1.3			
L-2-30-3			3.0	61.7	1.7			
L-2-30-4			4.0	66.2	1.3			

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (4 of 11)								
L-2-31-1	117° 38' 17"	33° 26' 56"	0.5	20.0				6.7
L-2-31-2			1.5	24.9				
L-2-31-3			3.0	5.4				
L-2-31-4			4.0	3.8				
L-2-32-1	117° 38' 15"	33° 26' 58"	0.5	44.8				
L-2-32-2			1.5	6.3				
L-2-32-3			3.0	14.3				
L-2-32-4			4.0	14.6				
L-2-33-1	117° 38' 21"	33° 26' 57"	0.5	11.1				
L-2-33-2			1.5	3.6				
L-2-33-3			3.0	ND				
L-2-33-4			4.0	ND				
L-2-34-1	117° 38' 17"	33° 26' 60"	0.5	282.0	16.1	ND	ND	7.7
L-2-34-2			1.5	15.8				
L-2-34-3			3.0	6.2				
L-2-34-4			4.0	5.3				
L-2-35-1	117° 38' 23"	33° 26' 59"	0.5	21.8				
L-2-35-2			1.5	4.4				
L-2-35-3			3.0	5.5				
L-2-35-4			4.0	4.4				
L-2-36-1	117° 38' 20"	33° 27' 2"	0.5	8.1				
L-2-36-2			1.5	2.8				
L-2-36-3			3.0	3.4				
L-2-36-4			4.0	2.3				
L-2-37-1	117° 38' 26"	33° 27' 1"	0.5	11.4				
L-2-37-2			1.5	3.2				7.2
L-2-37-3			3.0	4.2				
L-2-37-4			4.0	3.5				
L-2-38-1	117° 38' 23"	33° 27' 4"	0.5	4.7				
L-2-38-2			1.5	4.6				
L-2-38-3			3.0	51.2	0.1			
L-2-38-4			4.0	49.2				
L-2-39-1	117° 38' 28"	33° 27' 3"	0.5	26.0				
L-2-39-2			1.5	5.9				
L-2-39-3			3.0	6.4				
L-2-39-4			4.0	4.7				
L-2-40-1	117° 38' 26"	33° 27' 5"	0.5	9.9				
L-2-40-2			1.5	13.0				7.1
L-2-40-3			3.0	6.0				
L-2-40-4			4.0	33.3				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (5 of 11)								
L-2-41-1	117° 38' 31"	33° 27' 6"	0.5	6.6				
L-2-41-2			1.5	9.6				
L-2-41-3			3.0	7.0				
L-2-41-4			4.0	5.3				
L-2-42-1	117° 38' 29"	33° 27' 7"	0.5	91.6	3.1			7.5
L-2-42-2			1.5	55.9	3.4			
L-2-42-3			3.0	7.6				
L-2-42-4			4.0	4.9				
L-2-43-1	117° 38' 34"	33° 27' 8"	0.5	9.0				
L-2-43-2			1.5	12.9				
L-2-43-3			3.0	18.0				
L-2-43-4			4.0	13.2				
L-2-44-1	117° 38' 32"	33° 27' 9"	0.5	56.4	1.8			
L-2-44-2			1.5	119.0	5.8	ND	ND	7.1
L-2-44-3			3.0	7.9				
L-2-44-4			4.0	3.4				
L-2-45-1	117° 38' 37"	33° 27' 9"	0.5	27.3				8.5
L-2-45-2			1.5	6.4				
L-2-45-3			3.0	14.2				
L-2-45-4			4.0	10.1				
L-2-46-1	117° 38' 34"	33° 27' 10"	0.5	71.5	1.3			
L-2-46-2			1.5	25.7				
L-2-46-3			3.0	3.9				
L-2-46-4			4.0	6.2				
L-2-47-1	117° 38' 40"	33° 27' 11"	0.5	87.7	4.5			
L-2-47-2			1.5	118.0	7.7	ND	ND	
L-2-47-3			3.0	106.0	5.5	ND	ND	
L-2-47-4			4.0	73.5	5.3	ND	ND	
L-2-48-1	117° 38' 38"	33° 27' 12"	0.5	119.0	2.6			
L-2-48-2			1.5	7.2				
L-2-48-3			3.0	4.4				
L-2-48-4			4.0	6.2				
L-2-49-1	117° 38' 43"	33° 27' 13"	0.5	65.5	0.8			
L-2-49-2			1.5	22.3				
L-2-49-3			3.0	510.0	4.1			
L-2-49-4			4.0	18.1				
L-2-50-1	117° 38' 41"	33° 27' 13"	0.5	18.5				6.1
L-2-50-2			1.5	4.7				
L-2-50-3			3.0	3.7				
L-2-50-4			4.0	ND				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (6 of 11)								
L-2-51-1	117° 38' 45"	33° 27' 14"	0.5	18.0				7.6
L-2-51-2			1.5	91.5	1.8			
L-2-51-3			3.0	5.4				
L-2-51-4			4.0	3.7				
L-2-52-1	117° 38' 44"	33° 27' 15"	0.5	8.7				
L-2-52-2			1.5	6.1				
L-2-52-3			3.0	6.3				
L-2-52-4			4.0	3.5				
L-2-53-1	117° 38' 49"	33° 27' 15"	0.5	225.0	16.1	ND	ND	
L-2-53-2			1.5	26.8				
L-2-53-3			3.0	53.1	1.1			
L-2-53-4			4.0	11.8				
L-2-54-1	117° 38' 46"	33° 27' 16"	0.5	5.1				6.2
L-2-54-2			1.5	271.0	6.9	ND	ND	
L-2-54-3			3.0	2.8				
L-2-54-4			4.0	4.0				
L-2-55-1	117° 38' 53"	33° 27' 17"	0.5	191.0	22.0	ND	ND	
L-2-55-2			1.5	8.9				
L-2-55-3			3.0	2.6				
L-2-55-4			4.0	2.7				
L-2-56-1	117° 38' 51"	33° 27' 18"	0.5	5.1				
L-2-56-2			1.5	3.8				
L-2-56-3			3.0	4.3				
L-2-56-4			4.0	4.8				
L-2-57-1	117° 38' 56"	33° 27' 18"	0.5	2.7				7.7
L-2-57-2			1.5	79.6	4.6			
L-2-57-3			3.0	12.8				
L-2-57-4			4.0	7.6				
L-2-58-1	117° 38' 53"	33° 27' 19"	0.5	14.7				
L-2-58-2			1.5	3.1				
L-2-58-3			3.0	5.5				
L-2-58-4			4.0	6.4				
L-2-59-1	117° 38' 60"	33° 27' 19"	0.5	7.2				
L-2-59-2			1.5	19.7				
L-2-59-3			3.0	13.8				
L-2-59-4			4.0	4.1				
L-2-60-1	117° 39' 56"	33° 27' 20"	0.5	11.1				
L-2-60-2			1.5	4.1				
L-2-60-3			3.0	4.8				
L-2-60-4			4.0	5.2				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (7 of 11)								
L-2-61-1	117° 38' 2"	33° 27' 21"	0.5	10.1				
L-2-61-2			1.5	25.2				7.5
L-2-61-3			3.0	5.8				
L-2-61-4			4.0	6.3				
L-2-62-1	117° 39' 60"	33° 27' 21"	0.5	56.7	0.9			7.1
L-2-62-2			1.5	18.0				
L-2-62-3			3.0	38.4				
L-2-62-4			4.0	13.4				
L-2-63-1	117° 39' 3"	33° 27' 22"	0.5	8.7				7.7
L-2-63-2			1.5	13.3				
L-2-63-3			3.0	3.2				
L-2-63-4			4.0	3.1				
L-2-64-1	117° 39' 3"	33° 27' 23"	0.5	7.8				
L-2-64-2			1.5	3.8				
L-2-64-3			3.0	4.5				
L-2-64-4			4.0	10.7				
L-2-65-1	117° 39' 8"	33° 27' 23"	0.5	26.3				
L-2-65-2			1.5	12.6				
L-2-65-3			3.0	4.5				
L-2-65-4			4.0	9.7				
L-2-66-1	117° 39' 5"	33° 27' 25"	0.5	7.3				
L-2-66-2			1.5	2.4				
L-2-66-3			3.0	4.6				
L-2-66-4			4.0	2.2				
L-2-67-1	117° 39' 12"	33° 27' 25"	0.5	3.2				
L-2-67-2			1.5	2.4				
L-2-67-3			3.0	ND				
L-2-67-4			4.0	3.4				
L-2-68-1	117° 39' 9"	33° 27' 27"	0.5	17.7				
L-2-68-2			1.5	4.7				
L-2-68-3			3.0	8.6				
L-2-68-4			4.0	4.7				
L-2-69-1	117° 39' 15"	33° 27' 27"	0.5	3.9				6.6
L-2-69-2			1.5	5.2				
L-2-69-3			3.0	4.4				
L-2-69-4			4.0	3.1				
L-2-70-1	117° 39' 11"	33° 27' 27"	0.5	11.8				
L-2-70-2			1.5	2.4				
L-2-70-3			3.0	2.3				
L-2-70-4			4.0	ND				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (8 of 11)								
L-2-71-1	117° 39' 18"	33° 27' 28"	0.5	305.0	11.2	ND	ND	
L-2-71-2			1.5	15.4				
L-2-71-3			3.0	2.4				
L-2-71-4			4.0	2.7				
L-2-72-1	117° 39' 14"	33° 27' 28"	0.5	16.9				
L-2-72-2			1.5	2.1				
L-2-72-3			3.0	3.5				
L-2-72-4			4.0	3.2				
L-2-73-1	117° 39' 17"	33° 27' 29"	0.5	5.3				
L-2-73-2			1.5	ND				
L-2-73-3			3.0	ND				
L-2-73-4			4.0	2.3				
L-2-74-1	117° 39' 15"	33° 27' 31"	0.5	7.3				
L-2-74-2			1.5	9.6				
L-2-74-3			3.0	6.8				
L-2-74-4			4.0	3.6				
L-2-75-1	117° 39' 16"	33° 27' 28"	0.5	10.9				6.6
L-2-75-2			1.5	2.7				
L-2-75-3			3.0	4.4				
L-2-75-4			4.0	3.2				
L-2-76-1	117° 39' 20"	33° 27' 30"	0.5	14.1				7.6
L-2-76-2			1.5	2.3				
L-2-76-3			3.0	4.5				
L-2-76-4			4.0	5.0				
L-2-77-1	117° 39' 19"	33° 27' 30"	0.5	35.2				
L-2-77-2			1.5	4.6				
L-2-77-3			3.0	5.0				
L-2-77-4			4.0	2.1				
L-2-78-1	117° 39' 18"	33° 27' 30"	0.5	70.6	2.6			6.7
L-2-78-2			1.5	10.2				
L-2-78-3			3.0	7.3				
L-2-78-4			4.0	9.6				
L-2-79-1	117° 39' 23"	33° 27' 34"	0.5	4.0				
L-2-79-2			1.5	2.4				
L-2-79-3			3.0	3.4				
L-2-79-4			4.0	6.0				
L-2-80-1	117° 39' 16"	33° 27' 31"	0.5	9.5				
L-2-80-2			1.5	4.0				
L-2-80-3			3.0	3.4				
L-2-80-4			4.0	21.0				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (9 of 11)								
L-2-81-1	117° 39' 22"	33° 27' 31"	0.5	4.9				7.9
L-2-81-2			1.5	4.0				
L-2-81-3			3.0	2.9				
L-2-81-4			4.0	3.9				
L-2-82-1	117° 39' 18"	33° 27' 32"	0.5	26.1				
L-2-82-2			1.5	20.6				
L-2-82-3			3.0	18.4				
L-2-82-4			4.0	16.0				
L-2-83-1	117° 39' 26"	33° 27' 32"	0.5	59.4	1.6			
L-2-83-2			1.5	5.8				8.0
L-2-83-3			3.0	3.5				
L-2-83-4			4.0	2.4				
L-2-84-1	117° 39' 20"	33° 27' 33"	0.5	8.2				
L-2-84-2			1.5	3.7				
L-2-84-3			3.0	2..4				
L-2-84-4			4.0	4.1				
L-2-85-1	117° 39' 24"	33° 27' 34"	0.5	10.3				
L-2-85-2			1.5	4.3				
L-2-85-3			3.0	2.1				
L-2-85-4			4.0	2.4				
L-2-86-1	117° 39' 23"	33° 27' 34"	0.5	18.8				
L-2-86-2			1.5	141.0	4.1			
L-2-86-3			3.0	33.2				
L-2-86-4			4.0	21.4				
L-2-87-1	117° 39' 21"	33° 27' 35"	0.5	31.7				7.2
L-2-87-2			1.5	9.6				
L-2-87-3			3.0	ND				
L-2-87-4			4.0	3.3				
L-2-88-1	117° 39' 24"	33° 27' 34"	0.5	3.5				6.9
L-2-88-2			1.5	ND				
L-2-88-3			3.0	ND				
L-2-88-4			4.0	ND				
L-2-89-1	117° 39' 29"	33° 27' 36"	0.5	3.8				
L-2-89-2			1.5	2.1				
L-2-89-3			3.0	2.7				
L-2-89-4			4.0	ND				
L-2-90-1	117° 39' 27"	33° 27' 34"	0.5	4.2				
L-2-90-2			1.5	12.3				
L-2-90-3			3.0	8.1				
L-2-90-4			4.0	24.2				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (10 of 11)								
L-2-91-1	117° 39' 27"	33° 27' 35"	0.5	8.4				
L-2-91-2			1.5	3.6				
L-2-91-3			3.0	ND				
L-2-91-4			4.0	2.5				
L-2-92-1	117° 39' 26"	33° 27' 35"	0.5	85.3	2.2			6.8
L-2-92-2			1.5	38.2				
L-2-92-3			3.0	32.5				
L-2-92-4			4.0	47.2				
L-2-93-1	117° 39' 30"	33° 27' 37"	0.5	9.6				7.7
L-2-93-2			1.5	2.7				
L-2-93-3			3.0	2.2				
L-2-93-4			4.0	2.7				
L-2-94-1	117° 39' 29"	33° 27' 37"	0.5	12.5				
L-2-94-2			1.5	15.9				
L-2-94-3			3.0	21.6				
L-2-94-4			4.0	11.6				
L-2-95-1	117° 39' 34"	33° 27' 38"	0.5	19.2				
L-2-95-2			1.5	6.8				
L-2-95-3			3.0	2.6				
L-2-95-4			4.0	2.9				
L-2-96-1	117° 39' 31"	33° 27' 38"	0.5	68.0	4.6			
L-2-96-2			1.5	77.9	3.3			
L-2-96-3			3.0	80.1	2.4			
L-2-96-4			4.0	74.9	2.4			
L-2-97-1	117° 39' 38"	33° 27' 39"	0.5	4.0				
L-2-97-2			1.5	ND				
L-2-97-3			3.0	3.3				
L-2-97-4			4.0	2.9				
L-2-98-1	117° 39' 36"	33° 27' 40"	0.5	41.8				6.3
L-2-98-2			1.5	48.1				
L-2-98-3			3.0	35.9				
L-2-98-4			4.0	22.7				
L-2-99-1	117° 39' 40"	33° 27' 41"	0.5	28.8				7.9
L-2-99-2			1.5	20.8				
L-2-99-3			3.0	9.7				
L-2-99-4			4.0	3.9				
L-2-100-1	117° 39' 38"	33° 27' 41"	0.5	40.1				
L-2-100-2			1.5	27.6				
L-2-100-3			3.0	9.8				
L-2-100-4			4.0	12.2				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B2. Summary of Laboratory Soil Test Results for Segment 2 (11 of 11)								
L-2-101-1	117° 39' 43"	33° 27' 43"	0.5	16.3				
L-2-101-2			1.5	4.2				
L-2-101-3			3.0	2.2				
L-2-101-4			4.0	2.3				
L-2-102-1	117° 39' 41"	33° 27' 44"	0.5	33.0				
L-2-102-2			1.5	9.9				8.3
L-2-102-3			3.0	2.4				
L-2-102-4			4.0	2.9				

Table B3. Summary of Laboratory Soil Test Results for Segment 3 (1 of 6)								
Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
L-3-1-1	117° 39' 42"	33° 27' 45"	0.5	48.7				6.95
L-3-1-2			1.5	20.5				
L-3-1-3			3.0	5.8				
L-3-1-4			4.0	4.6				
L-3-2-1	117° 39' 44"	33° 27' 44"	0.5	14.8				
L-3-2-2			1.5	21.2				
L-3-2-3			3.0	15.1				
L-3-2-4			4.0	21.9				
L-3-3-1	117° 39' 46"	33° 27' 48"	0.5	68.4	1.1			6.12
L-3-3-2			1.5	13.2				
L-3-3-3			3.0	8.4				
L-3-3-4			4.0	18.6				
L-3-4-1	117° 39' 47"	33° 27' 48"	0.5	77.9	3.2			
L-3-4-2			1.5	15.5				
L-3-4-3			3.0	14.9				
L-3-4-4			4.0	8.4				
L-3-5-1	117° 39' 48"	33° 27' 50"	0.5	39.4				
L-3-5-2			1.5	14.3				
L-3-5-3			3.0	29.6				
L-3-5-4			4.0	33.9				
L-3-6-1	117° 39' 51"	33° 27' 47"	0.5	7.5				6.89
L-3-6-2			1.5	6.5				
L-3-6-3			3.0	2.9				
L-3-6-4			4.0	4.8				
L-3-7-1	117° 39' 51"	33° 27' 50"	0.5	281.0	6.0	ND	ND	6.03
L-3-7-2			1.5	12.6				
L-3-7-3			3.0	8.2				
L-3-7-4			4.0	9.8				
L-3-8-1	117° 39' 52"	33° 27' 49"	0.5	91.9	2.1			
L-3-8-2			1.5	13.1				
L-3-8-3			3.0	3.8				
L-3-8-4			4.0	16.0				
L-3-9-1	117° 39' 53"	33° 27' 51"	0.5	1600.0	31.9	0.8	0.10J	
L-3-9-2			1.5	67.9	1.4			
L-3-9-3			3.0	27.0				
L-3-9-4			4.0	21.0				
L-3-10-1	117° 39' 54"	33° 27' 51"	0.5	65.9	2.2			
L-3-10-2			1.5	70.3	2.2			
L-3-10-3			3.0	15.4				
L-3-10-4			4.0	11.1				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B3. Summary of Laboratory Soil Test Results for Segment 3 (2 of 6)								
L-3-11-1	117° 39' 57"	33° 27' 52"	0.5	487.0	19.0	0.46	ND	
L-3-11-2			1.5	8.3				
L-3-11-3			3.0	62.9	1.5			
L-3-11-4			4.0	10.2				
L-3-12-1	117° 39' 55"	33° 27' 53"	0.5	33.9				
L-3-12-2			1.5	55.9	0.7			
L-3-12-3			3.0	8.6				
L-3-12-4			4.0	5.2				
L-3-13-1	117° 39' 60"	33° 27' 53"	0.5	65.6	2.6			
L-3-13-2			1.5	26.5				
L-3-13-3			3.0	34.5				
L-3-13-4			4.0	26.8				
L-3-14-1	117° 40' 57"	33° 27' 55"	0.5	12.1				6.07
L-3-14-2			1.5	16.2				
L-3-14-3			3.0	14.5				
L-3-14-4			4.0	16.1				
L-3-15-1	117° 39' 2"	33° 27' 54"	0.5	63.4	1.1			
L-3-15-2			1.5	6.1				
L-3-15-3			3.0	39.7				
L-3-15-4			4.0	13.5				
L-3-16-1	117° 40' 58"	33° 27' 57"	0.5	34.1				
L-3-16-2			1.5	30.7				
L-3-16-3			3.0	10.8				
L-3-16-4			4.0	14.0				
L-3-17-1	117° 39' 5"	33° 27' 57"	0.5	66.4	1.4			
L-3-17-2			1.5	8.3				
L-3-17-3			3.0	8.4				
L-3-17-4			4.0	3.7				
L-3-18-1	117° 40' 60"	33° 27' 58"	0.5	75.9	2.5			
L-3-18-2			1.5	9.6				
L-3-18-3			3.0	3.3				
L-3-18-4			4.0	3.8				
L-3-19-1	117° 40' 8"	33° 27' 59"	0.5	137.0	4.5			6.4
L-3-19-2			1.5	5.7				
L-3-19-3			3.0	3.9				
L-3-19-4			4.0	4.2				
L-3-20-1	117° 40' 3"	33° 27' 57"	0.5	290.0	12.3	0.22J	ND	6.91
L-3-20-2			1.5	12.9				
L-3-20-3			3.0	7.8				
L-3-20-4			4.0	22.2				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B3. Summary of Laboratory Soil Test Results for Segment 3 (3 of 6)								
L-3-21-1	117° 40' 8"	33° 27' 59"	0.5	27.7				5.81
L-3-21-2			1.5	4.3				
L-3-21-3			3.0	2.9				
L-3-21-4			4.0	3.3				
L-3-22-1	117° 40' 0"	33° 27' 58"	0.5	29.8				6.83
L-3-22-2			1.5	8.6				
L-3-22-3			3.0	4.2				
L-3-22-4			4.0	4.3				
L-3-23-1	117° 40' 12"	33° 27' 57"	0.5	54.8	1.0			
L-3-23-2			1.5	15.8				
L-3-23-3			3.0	10.3				
L-3-23-4			4.0	5.1				
L-3-24-1	117° 40' 3"	33° 27' 56"	0.5	166.0	2.0			
L-3-24-2			1.5	13.8				
L-3-24-3			3.0	4.0				
L-3-24-4			4.0	5.0				
L-3-25-1	117° 40' 15"	33° 27' 58"	0.5	132.0	4.6			
L-3-25-2			1.5	12.6				
L-3-25-3			3.0	21.3				
L-3-25-4			4.0	12.6				
L-3-26-1	117° 40' 4"	33° 27' 54"	0.5	451.0	39.0	0.31J	ND	
L-3-26-2			1.5	27.3				
L-3-26-3			3.0	12.1				
L-3-26-4			4.0	38.8				
L-3-27-1	117° 40' 17"	33° 28' 1"	0.5	385.0	19.0	0.49	ND	6.94
L-3-27-2			1.5	24.9				
L-3-27-3			3.0	26.3				
L-3-27-4			4.0	164.0	6.0	ND	ND	
L-3-28-1	117° 40' 8"	33° 27' 51"	0.5	122.0	6.9	ND	ND	7.03
L-3-28-2			1.5	12.7				
L-3-28-3			3.0	9.4				
L-3-28-4			4.0	1.6				
L-3-29-1	117° 40' 20"	33° 28' 2"	0.5	68.4	1.3			
L-3-29-2			1.5	245.0	14.7	ND	ND	
L-3-29-3			3.0	9.7				
L-3-29-4			4.0	3.4				
L-3-30-1	117° 40' 12"	33° 28' 0"	0.5	82.4	2.6			
L-3-30-2			1.5	20.7				
L-3-30-3			3.0	5.2				
L-3-30-4			4.0	7.4				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B3. Summary of Laboratory Soil Test Results for Segment 3 (4 of 6)								
L-3-31-1	117° 40' 11"	33° 28' 5"	0.5	7.9				
L-3-31-2			1.5	3.8				
L-3-31-3			3.0	3.6				
L-3-31-4			4.0	4.7				
L-3-32-1	117° 40' 13"	33° 28' 1"	0.5	4.3				6.25
L-3-32-2			1.5	6.5				
L-3-32-3			3.0	5.0				
L-3-32-4			4.0	12.7				
L-3-33-1	117° 40' 14"	33° 28' 6"	0.5	4.2				6.06
L-3-33-2			1.5	ND				
L-3-33-3			3.0	2.5				
L-3-33-4			4.0	2.8				
L-3-34-1	117° 40' 16"	33° 28' 0"	0.5	20.4				7.16
L-3-34-2			1.5	4.3				
L-3-34-3			3.0	2.5				
L-3-34-4			4.0	2.6				
L-3-35-1	117° 40' 16"	33° 28' 4"	0.5	16.4				6.1
L-3-35-2			1.5	94.9	0.5			
L-3-35-3			3.0	5.9				
L-3-35-4			4.0	3.2				
L-3-36-1	117° 40' 15"	33° 28' 3"	0.5	36.4				6.4
L-3-36-2			1.5	34.6				
L-3-36-3			3.0	7.5				
L-3-36-4			4.0	27.0				
L-3-37-1	117° 40' 17"	33° 28' 5"	0.5	255.0	8.3	0.26J	ND	
L-3-37-2			1.5	13.8				
L-3-37-3			3.0	4.2				
L-3-37-4			4.0	2.9				
L-3-38-1	117° 40' 17"	33° 28' 1"	0.5	11.2				
L-3-38-2			1.5	22.2				
L-3-38-3			3.0	29.9				
L-3-38-4			4.0	9.6				
L-3-39-1	117° 40' 19"	33° 28' 7"	0.5	2.9				
L-3-39-2			1.5	ND				
L-3-39-3			3.0	ND				
L-3-39-4			4.0	2.2				
L-3-40-1	117° 40' 20"	33° 28' 4"	0.5	5.2				
L-3-40-2			1.5	4.2				
L-3-40-3			3.0	6.2				
L-3-40-4			4.0	3.9				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B3. Summary of Laboratory Soil Test Results for Segment 3 (5 of 6)								
L-3-41-1	117° 40' 20"	33° 28' 7"	0.5	17.1				6.5
L-3-41-2			1.5	3.9				
L-3-41-3			3.0	9.3				
L-3-41-4			4.0	3.3				
L-3-42-1	117° 40' 21"	33° 28' 4"	0.5	6.8				
L-3-42-2			1.5	101.0	ND			
L-3-42-3			3.0	19.7				
L-3-42-4			4.0	6.8				
L-3-43-1	117° 40' 21"	33° 28' 9"	0.5	10.1				
L-3-43-2			1.5	2.4				
L-3-43-3			3.0	3.0				
L-3-43-4			4.0	2.6				
L-3-44-1	117° 40' 23"	33° 28' 6"	0.5	83.3	2.2			6.36
L-3-44-2			1.5	13.1				
L-3-44-3			3.0	4.2				
L-3-44-4			4.0	3.0				
L-3-45-1	117° 40' 23"	33° 28' 12"	0.5	21.9				
L-3-45-2			1.5	5.8				
L-3-45-3			3.0	3.7				
L-3-45-4			4.0	2.1				
L-3-46-1	117° 40' 25"	33° 28' 9"	0.5	346.0	10.3	ND	ND	
L-3-46-2			1.5	18.5				
L-3-46-3			3.0	17.9				
L-3-46-4			4.0	32.3				
L-3-47-1	117° 40' 25"	33° 28' 15"	0.5	46.3				6.38
L-3-47-2			1.5	4.8				
L-3-47-3			3.0	3.9				
L-3-47-4			4.0	3.2				
L-3-48-1	117° 40' 27"	33° 28' 12"	0.5	8.8				
L-3-48-2			1.5	5.2				
L-3-48-3			3.0	4.6				
L-3-48-4			4.0	9.4				
L-3-49-1	117° 40' 28"	33° 28' 17"	0.5	319.0	11.5	0.53	ND	
L-3-49-2			1.5	6.4				
L-3-49-3			3.0	4.8				
L-3-49-4			4.0	3.4				
L-3-50-1	117° 40' 27"	33° 28' 14"	0.5	175.0	3.8			6.89
L-3-50-2			1.5	4.9				
L-3-50-3			3.0	2.1				
L-3-50-4			4.0	ND				

Sample ID	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	Sample Depth (ft)	Total Lead (mg/kg)	Wet-Citric (mg/l)	DI-WET (mg/l)	TCLP (mg/l)	pH
Table B3. Summary of Laboratory Soil Test Results for Segment 3 (6 of 6)								
L-3-51-1	117° 40' 29"	33° 28' 20"	0.5	68.1	2.6			6.06
L-3-51-2			1.5	11.0				
L-3-51-3			3.0	6.7				
L-3-51-4			4.0	4.7				
L-3-52-1	117° 40' 28"	33° 28' 17"	0.5	243.0	7.9	ND	ND	
L-3-52-2			1.5	46.6				
L-3-52-3			3.0	19.8				
L-3-52-4			4.0	47.4				
L-3-53-1	117° 40' 30"	33° 28' 20"	0.5	64.0	1.7			
L-3-53-2			1.5	80.6	2.5			
L-3-53-3			3.0	25.9				
L-3-53-4			4.0	17.3				
L-3-54-1	117° 40' 30"	33° 28' 23"	0.5	331.0	14.3	ND	ND	7.16
L-3-54-2			1.5	23.1				
L-3-54-3			3.0	5.9				
L-3-54-4			4.0	9.5				
L-3-55-1	117° 40' 30"	33° 28' 26"	0.5	80.2	4.7			
L-3-55-2			1.5	28.9				
L-3-55-3			3.0	16.5				
L-3-55-4			4.0	15.9				
L-3-56-1	117° 40' 30"	33° 28' 29"	0.5	922.0	42.3	0.6	0.15J	7.05
L-3-56-2			1.5	30.3				
L-3-56-3			3.0	20.0				
L-3-56-4			4.0	91.4	2.6			
L-3-57-1	117° 40' 29"	33° 28' 32"	0.5	355.0	15.4	0.30J	ND	
L-3-57-2			1.5	87.3	3.5			
L-3-57-3			3.0	5.6				
L-3-57-4			4.0	21.1				

MDL : Method Detection Limit;
PQL : Practical Quantitation Limit;
J : Trace Concentration. The Result is Between MDL and PQL

SEGMENT 1

BETWEEN STA. 163+00 AND STA. 210+00 ("A" LINE)

Alpha Scientific Corporation
Environmental Laboratories

Mr. Raja S. Pirathiviraj
Earth Mechanics Inc.
17800 Newhope Street, Suite B
Fountain Valley, CA 92708

Project: 11-135/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Sample Date: 01-27-2012 to 02-03-2012
Lab Job No.: EA201140 to EA202009

Dear Mr. Pirathiviraj:

Enclosed please find the analytical report for the sample(s) received by Alpha Scientific Corporation from 01-28-2012 to 02-04-2012 and analyzed by the following EPA methods:

EPA 6010B (Total Lead)
EPA 6010B (STLC Pb)
EPA 6010B (TCLP Pb)
EPA 6010B (DI Water STLC Pb)
EPA 9045 (Soil pH)

All analyses have met the QA/QC criteria of this laboratory.

The sample(s) arrived in good conditions (i.e., chilled, intact) and with Chain of Custody record forms attached.

Alpha Scientific Corporation is a CA DHS certified laboratory (Certificate Number 2633). Thank you for giving us the opportunity to serve you. Please feel free to call me at (562) 809-8880 if our laboratory can be of further service to you.

Sincerely,

Roger Wang, Ph.D.
Laboratory Director

Enclosures

This cover letter is an integral part of this analytical report.

Client: Earth Mechanics Inc.
Project: 11-135/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201140 to EA202009

Date Sampled: 01-27-2012 to 02-03-2012
Date Received: 01-28-2012 to 02-04-2012
Date Digested: 01-31-2012 to 02-07-2012
Date Analyzed: 02-01-2012 to 02-09-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-1-01-1	EA202009-33	5	2
L-1-01-2	EA202009-34	2	2
L-1-01-3	EA202009-35	5.1	2
L-1-01-4	EA202009-36	2.2	2
L-1-02-1	EA202009-29	12.3	2
L-1-02-2	EA202009-30	3.2	2
L-1-02-3	EA202009-31	ND	2
L-1-02-4	EA202009-32	ND	2
L-1-03-1	EA202009-37	8.9	2
L-1-03-2	EA202009-38	19.5	2
L-1-03-3	EA202009-39	19	2
L-1-03-4	EA202009-40	2.2	2
L-1-04-1	EA202009-25	3	2
L-1-04-2	EA202009-26	3.9	2
L-1-04-3	EA202009-27	11.8	2
L-1-04-4	EA202009-28	3.3	2
L-1-05-1	EA202009-41	25.6	2
L-1-05-2	EA202009-42	8.6	2
L-1-05-3	EA202009-43	3.9	2
L-1-05-4	EA202009-44	5.4	2
L-1-06-1	EA202009-21	12.4	2
L-1-06-2	EA202009-22	ND	2
L-1-06-3	EA202009-23	2.6	2
L-1-06-4	EA202009-24	3.1	2
L-1-07-1	EA202009-45	22.1	2
L-1-07-2	EA202009-46	31.9	2
L-1-07-3	EA202009-47	9.8	2
L-1-07-4	EA202009-48	6.2	2
L-1-08-1	EA202009-17	17.5	2
L-1-08-2	EA202009-18	7	2
L-1-08-3	EA202009-19	2.7	2
L-1-08-4	EA202009-20	ND	2
L-1-09-1	EA202009-49	67.9	2
L-1-09-2	EA202009-50	10.8	2
L-1-09-3	EA202009-51	18.3	2
L-1-09-4	EA202009-52	6.3	2
L-1-10-1	EA202009-13	11.1	2
L-1-10-2	EA202009-14	18.8	2
L-1-10-3	EA202009-15	4.7	2
L-1-10-4	EA202009-16	ND	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-135/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201140 to EA202009

Date Sampled: 01-27-2012 to 02-03-2012
Date Received: 01-28-2012 to 02-04-2012
Date Digested: 01-31-2012 to 02-07-2012
Date Analyzed: 02-01-2012 to 02-09-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-1-11-1	EA202009-53	108	2
L-1-11-2	EA202009-54	17.4	2
L-1-11-3	EA202009-55	11.9	2
L-1-11-4	EA202009-56	20.1	2
L-1-12-1	EA202009-9	7.9	2
L-1-12-2	EA202009-10	3.5	2
L-1-12-3	EA202009-11	7.2	2
L-1-12-4	EA202009-12	8.2	2
L-1-13-1	EA202009-57	18.9	2
L-1-13-2	EA202009-58	21.1	2
L-1-13-3	EA202009-59	15.2	2
L-1-13-4	EA202009-60	33.9	2
L-1-14-1	EA202009-117	4.6	2
L-1-14-2	EA202009-118	52.7	2
L-1-14-3	EA202009-119	52.9	2
L-1-14-4	EA202009-120	256	2
L-1-15-1	EA202009-121	6.4	2
L-1-15-2	EA202009-122	3.8	2
L-1-15-3	EA202009-123	78.9	2
L-1-15-4	EA202009-124	42.1	2
L-1-16-1	EA202009-5	18.7	2
L-1-16-2	EA202009-6	14.2	2
L-1-16-3	EA202009-7	2.2	2
L-1-16-4	EA202009-8	ND	2
L-1-17-1	EA202009-61	6.6	2
L-1-17-2	EA202009-62	9.9	2
L-1-17-3	EA202009-63	2.7	2
L-1-17-4	EA202009-64	ND	2
L-1-18-1	EA202009-113	27.7	2
L-1-18-2	EA202009-114	15.3	2
L-1-18-3	EA202009-115	22.3	2
L-1-18-4	EA202009-116	21.6	2
L-1-19-1	EA202009-125	91.1	2
L-1-19-2	EA202009-126	41.1	2
L-1-19-3	EA202009-127	12.4	2
L-1-19-4	EA202009-128	2.7	2
L-1-20-1	EA202009-1	5.7	2
L-1-20-2	EA202009-2	2.3	2
L-1-20-3	EA202009-3	2.4	2
L-1-20-4	EA202009-4	2.2	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-135/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201140 to EA202009

Date Sampled: 01-27-2012 to 02-03-2012
Date Received: 01-28-2012 to 02-04-2012
Date Digested: 01-31-2012 to 02-07-2012
Date Analyzed: 02-01-2012 to 02-09-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-1-21-1	EA202009-65	4	2
L-1-21-2	EA202009-66	5.6	2
L-1-21-3	EA202009-67	ND	2
L-1-21-4	EA202009-68	ND	2
L-1-22-1	EA202009-109	18.2	2
L-1-22-2	EA202009-110	30.2	2
L-1-22-3	EA202009-111	21.7	2
L-1-22-4	EA202009-112	17.5	2
L-1-23-1	EA202009-129	9.3	2
L-1-23-2	EA202009-130	9.7	2
L-1-23-3	EA202009-131	41.3	2
L-1-23-4	EA202009-132	18.4	2
L-1-24-1	EA201140-21	9.6	2
L-1-24-2	EA201140-22	8.7	2
L-1-24-3	EA201140-23	10.4	2
L-1-24-4	EA201140-24	8.8	2
L-1-25-1	EA202009-69	22.1	2
L-1-25-2	EA202009-70	16.4	2
L-1-25-3	EA202009-71	3.2	2
L-1-25-4	EA202009-72	ND	2
L-1-26-1	EA202009-105	4.3	2
L-1-26-2	EA202009-106	3	2
L-1-26-3	EA202009-107	2.1	2
L-1-26-4	EA202009-108	7.3	2
L-1-27-1	EA202009-133	51.6	2
L-1-27-2	EA202009-134	17.9	2
L-1-27-3	EA202009-135	8.2	2
L-1-27-4	EA202009-136	11.5	2
L-1-28-1	EA201140-17	ND	2
L-1-28-2	EA201140-18	ND	2
L-1-28-3	EA201140-19	ND	2
L-1-28-4	EA201140-20	2.4	2
L-1-29-1	EA202009-73	19.8	2
L-1-29-2	EA202009-74	14.5	2
L-1-29-3	EA202009-75	3.5	2
L-1-29-4	EA202009-76	7.2	2
L-1-30-1	EA202009-101	21.6	2
L-1-30-2	EA202009-102	2.9	2
L-1-30-3	EA202009-103	6.2	2
L-1-30-4	EA202009-104	ND	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-135/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201140 to EA202009

Date Sampled: 01-27-2012 to 02-03-2012
Date Received: 01-28-2012 to 02-04-2012
Date Digested: 01-31-2012 to 02-07-2012
Date Analyzed: 02-01-2012 to 02-09-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-1-31-1	EA202009-137	32.4	2
L-1-31-2	EA202009-138	4.9	2
L-1-31-3	EA202009-139	7.8	2
L-1-31-4	EA202009-140	39	2
L-1-32-1	EA201140-13	3.7	2
L-1-32-2	EA201140-14	6.6	2
L-1-32-3	EA201140-15	3.6	2
L-1-32-4	EA201140-16	3.7	2
L-1-33-1	EA202009-77	108	2
L-1-33-2	EA202009-78	335	2
L-1-33-3	EA202009-79	25.3	2
L-1-33-4	EA202009-80	3.7	2
L-1-34-1	EA202009-97	3.8	2
L-1-34-2	EA202009-98	4.1	2
L-1-34-3	EA202009-99	124	2
L-1-34-4	EA202009-100	98.5	2
L-1-35-1	EA202009-81	12.9	2
L-1-35-2	EA202009-82	19.6	2
L-1-35-3	EA202009-83	4.7	2
L-1-35-4	EA202009-84	7.6	2
L-1-36-1	EA201140-9	3.9	2
L-1-36-2	EA201140-10	4.6	2
L-1-36-3	EA201140-11	7.5	2
L-1-36-4	EA201140-12	3.8	2
L-1-37-1	EA202009-85	82.7	2
L-1-37-2	EA202009-86	24.9	2
L-1-37-3	EA202009-87	11.3	2
L-1-37-4	EA202009-88	42.1	2
L-1-38-1	EA201140-5	7.9	2
L-1-38-2	EA201140-6	8.4	2
L-1-38-3	EA201140-7	12.4	2
L-1-38-4	EA201140-8	8.3	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-135/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201140 to EA202009

Date Sampled: 01-27-2012 to 02-03-2012
Date Received: 01-28-2012 to 02-04-2012
Date Digested: 01-31-2012 to 02-07-2012
Date Analyzed: 02-01-2012 to 02-09-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-1-39-1	EA202009-89	61.9	2
L-1-39-2	EA202009-90	5.5	2
L-1-39-3	EA202009-91	2.5	2
L-1-39-4	EA202009-92	ND	2
L-1-40-1	EA201140-1	13.2	2
L-1-40-2	EA201140-2	12.5	2
L-1-40-3	EA201140-3	7.2	2
L-1-40-4	EA201140-4	15.2	2
L-1-41-1	EA202009-93	5.8	2
L-1-41-2	EA202009-94	4	2
L-1-41-3	EA202009-95	ND	2
L-1-41-4	EA202009-96	ND	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-135/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil

Lab Job No.: EA202009

Date Sampled: 01-27 to 02-03-2012
Date Received: 2/4/2012
Date Analyzed: 2/17/2012

EPA 6010B (Pb, STLC)
Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, STLC	MDL	PQL
Extraction Blank		ND	0.1	0.2
L-1-09-1	EA202009-49	2.6	0.1	0.2
L-1-11-1	EA202009-53	0.96	0.1	0.2
L-1-14-2	EA202009-118	2.1	0.1	0.2
L-1-14-3	EA202009-119	0.8	0.1	0.2
L-1-14-4	EA202009-120	1.1	0.1	0.2
L-1-15-3	EA202009-123	2.5	0.1	0.2
L-1-19-1	EA202009-125	3.9	0.1	0.2
L-1-27-1	EA202009-133	1.7	0.1	0.2
L-1-33-1	EA202009-77	1.5	0.1	0.2
L-1-33-2	EA202009-78	23.8	0.1	0.2
L-1-34-3	EA202009-99	2.8	0.1	0.2
L-1-34-4	EA202009-100	3.8	0.1	0.2
L-1-37-1	EA202009-85	1.3	0.1	0.2
L-1-39-1	EA202009-89	0.15	0.1	0.2

Prep Method: Extraction Procedures, STLC Metals, Title 22, Cal Wet 66700, 48 hours (02-14 to 02-16-2012).

MDL: Method Detection Limit;
PQL: Practical Quantitation Limit
ND: Not Detected (below MDL).

Client:	Earth Mechanics Inc.	Lab Job No.:	EA202009
Project:	11-135/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	01-27 to 02-03-2012
Matrix:	Soil	Date Received:	2/4/2012
		Date Analyzed:	2/28/2012

EPA 6010B (Pb, TCLP)

Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, TCLP	MDL	PQL
Extraction Blank		ND	0.1	0.2
L-1-33-2	EA202009-78	0.18	0.1	0.2

Prep Method: EPA Method 1131, 18 hours (02-24 to 02-25-2012)

EPA 6010B (Pb, STLC-DI Water Extraction)

Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, DI-WET	MDL	PQL
Extraction Blank		ND	0.1	0.2
L-1-33-2	EA202009-78	0.18	0.1	0.2

Prep Method: STLC Metals, Title 22, Cal Wet 66700, 48 hours (02-24 to 02-26-2012).
DI water is used in the extraction instead of the normal STLC solution.

MDL: Method Detection Limit;
PQL: Practical Quantitation Limit;
J: Trace concentration. The result is between MDL and PQL

Client:	Earth Mechanics Inc.	Lab Job No.:	EA201140 to EA202009
Project:	11-135/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	01-27-2012 to 02-03-2012
Matrix:	Soil	Date Received:	01-28-2012 to 02-04-2012
		Date Analyzed:	02-02-2012 to 02-09-2012

EPA Method 9045 (Soil pH)

Reporting Units: pH Unit

Sample ID	Lab ID	pH	Reporting Limit
L-1-02-1	EA202009-29	8.13	---
L-1-03-1	EA202009-37	7.75	---
L-1-06-1	EA202009-21	8.42	---
L-1-07-2	EA202009-46	8.19	---
L-1-10-2	EA202009-14	7.91	---
L-1-11-1	EA202009-53	8.45	---
L-1-16-1	EA202009-5	8.21	---
L-1-17-1	EA202009-61	7.97	---
L-1-19-2	EA202009-126	8.48	---
L-1-20-1	EA202009-1	8.04	---
L-1-25-1	EA202009-69	7.68	---
L-1-26-1	EA202009-105	8.00	---
L-1-27-2	EA202009-134	8.51	---
L-1-28-2	EA201140-18	8.87	---
L-1-33-1	EA202009-77	7.61	---
L-1-34-1	EA202009-97	8.14	---
L-1-38-1	EA201140-5	8.07	---
L-1-41-1	EA202009-93	8.15	---

SEGMENT 2

BETWEEN STA. 210+00 AND STA. 340+00 ("A" LINE)

Alpha Scientific Corporation
Environmental Laboratories

Mr. Raja S. Pirathiviraj
Earth Mechanics Inc.
17800 Newhope Street, Suite B
Fountain Valley, CA 92708

Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Sample Date: 12-27-2011 to 01-27-2012
Lab Job No.: EA201001 to EA201139

Dear Mr. Pirathiviraj:

Enclosed please find the analytical report for the sample(s) received by Alpha Scientific Corporation from 01-02-2012 to 01-28-2012 and analyzed by the following EPA methods:

EPA 6010B (Total Lead)
EPA 6010B (STLC Pb)
EPA 6010B (TCLP Pb)
EPA 6010B (DI Water STLC Pb)
EPA 9045 (Soil pH)

All analyses have met the QA/QC criteria of this laboratory.

The sample(s) arrived in good conditions (i.e., chilled, intact) and with Chain of Custody record forms attached.

Alpha Scientific Corporation is a CA DHS certified laboratory (Certificate Number 2633). Thank you for giving us the opportunity to serve you. Please feel free to call me at (562) 809-8880 if our laboratory can be of further service to you.

Sincerely,

Roger Wang, Ph.D.
Laboratory Director

Enclosures

This cover letter is an integral part of this analytical report.

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-01-1	EA201089-89	13.7	2
L-2-01-2	EA201089-90	24.3	2
L-2-01-3	EA201089-91	22.8	2
L-2-01-4	EA201089-92	16.7	2
L-2-02-1	EA201089-85	16.8	2
L-2-02-2	EA201089-86	7.6	2
L-2-02-3	EA201089-87	9.3	2
L-2-02-4	EA201089-88	10.5	2
L-2-03-1	EA201089-93	24.9	2
L-2-03-2	EA201089-94	5.4	2
L-2-03-3	EA201089-95	6.1	2
L-2-03-4	EA201089-96	5.1	2
L-2-04-1	EA201089-81	11	2
L-2-04-2	EA201089-82	12.5	2
L-2-04-3	EA201089-83	12	2
L-2-04-4	EA201089-84	13.1	2
L-2-05-1	EA201089-97	7.6	2
L-2-05-2	EA201089-98	6.9	2
L-2-05-3	EA201089-99	5.7	2
L-2-05-4	EA201089-100	5.3	2
L-2-06-1	EA201089-77	8.5	2
L-2-06-2	EA201089-78	6.3	2
L-2-06-3	EA201089-79	10	2
L-2-06-4	EA201089-80	7.5	2
L-2-07-1	EA201089-101	3	2
L-2-07-2	EA201089-102	3.5	2
L-2-07-3	EA201089-103	ND	2
L-2-07-4	EA201089-104	2.9	2
L-2-08-1	EA201089-73	6	2
L-2-08-2	EA201089-74	4.9	2
L-2-08-3	EA201089-75	4.8	2
L-2-08-4	EA201089-76	5.7	2
L-2-09-1	EA201089-113	7.2	2
L-2-09-2	EA201089-114	2.7	2
L-2-09-3	EA201089-115	3.4	2
L-2-09-4	EA201089-116	ND	2
L-2-10-1	EA201089-69	4.4	2
L-2-10-2	EA201089-70	3.7	2
L-2-10-3	EA201089-71	3.7	2
L-2-10-4	EA201089-72	3.4	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-11-1	EA201089-117	4	2
L-2-11-2	EA201089-118	4.7	2
L-2-11-3	EA201089-119	4.4	2
L-2-11-4	EA201089-120	4.5	2
L-2-12-1	EA201089-65	5.1	2
L-2-12-2	EA201089-66	3.8	2
L-2-12-3	EA201089-67	3.2	2
L-2-12-4	EA201089-68	3.7	2
L-2-13-1	EA201089-105	13.5	2
L-2-13-2	EA201089-106	3.2	2
L-2-13-3	EA201089-107	ND	2
L-2-13-4	EA201089-108	4.6	2
L-2-14-1	EA201089-61	2.1	2
L-2-14-2	EA201089-62	4.9	2
L-2-14-3	EA201089-63	5.1	2
L-2-14-4	EA201089-64	2.9	2
L-2-15-1	EA201089-109	7.3	2
L-2-15-2	EA201089-110	3.5	2
L-2-15-3	EA201089-111	3.1	2
L-2-15-4	EA201089-112	4.2	2
L-2-16-1	EA201089-57	7.8	2
L-2-16-2	EA201089-58	3.5	2
L-2-16-3	EA201089-59	6.8	2
L-2-16-4	EA201089-60	5.1	2
L-2-17-1	EA201089-121	6.6	2
L-2-17-2	EA201089-122	4.4	2
L-2-17-3	EA201089-123	4.8	2
L-2-17-4	EA201089-124	4.7	2
L-2-18-1	EA201089-53	5.9	2
L-2-18-2	EA201089-54	4.5	2
L-2-18-3	EA201089-55	18.1	2
L-2-18-4	EA201089-56	7	2
L-2-19-1	EA201089-125	6.5	2
L-2-19-2	EA201089-126	5.2	2
L-2-19-3	EA201089-127	5	2
L-2-19-4	EA201089-128	7.1	2
L-2-20-1	EA201089-49	3.8	2
L-2-20-2	EA201089-50	8.4	2
L-2-20-3	EA201089-51	5.6	2
L-2-20-4	EA201089-52	28.4	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-21-1	EA201089-145	13.6	2
L-2-21-2	EA201089-146	3.2	2
L-2-21-3	EA201089-147	5.7	2
L-2-21-4	EA201089-148	4	2
L-2-22-1	EA201089-45	11.8	2
L-2-22-2	EA201089-46	7	2
L-2-22-3	EA201089-47	2.6	2
L-2-22-4	EA201089-48	3.5	2
L-2-23-1	EA201089-149	4.1	2
L-2-23-2	EA201089-150	5.6	2
L-2-23-3	EA201089-151	3.9	2
L-2-23-4	EA201089-152	3.2	2
L-2-24-1	EA201089-41	7.1	2
L-2-24-2	EA201089-42	6.8	2
L-2-24-3	EA201089-43	3.3	2
L-2-24-4	EA201089-44	3.5	2
L-2-25-1	EA201089-153	5.4	2
L-2-25-2	EA201089-154	5.4	2
L-2-25-3	EA201089-155	6.1	2
L-2-25-4	EA201089-156	4	2
L-2-26-1	EA201089-37	7	2
L-2-26-2	EA201089-38	4.7	2
L-2-26-3	EA201089-39	3.9	2
L-2-26-4	EA201089-40	3.6	2
L-2-27-1	EA201089-157	8.7	2
L-2-27-2	EA201089-158	4.8	2
L-2-27-3	EA201089-159	5.3	2
L-2-27-4	EA201089-160	6.3	2
L-2-28-1	EA201089-1	61.2	2
L-2-28-2	EA201089-2	18.1	2
L-2-28-3	EA201089-3	18.9	2
L-2-28-4	EA201089-4	16.8	2
L-2-29-1	EA201089-161	20.2	2
L-2-29-3	EA201089-163	5.6	2
L-2-29-4	EA201089-164	6.6	2
L-2-29-6	EA201089-162	6.6	2
L-2-30-1	EA201089-5	446	2
L-2-30-2	EA201089-6	67.4	2
L-2-30-3	EA201089-7	61.7	2
L-2-30-4	EA201089-8	66.2	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-31-1	EA201001-217	20	2
L-2-31-2	EA201001-218	24.9	2
L-2-31-3	EA201001-219	5.4	2
L-2-31-4	EA201001-220	3.8	2
L-2-32-1	EA201089-9	44.8	2
L-2-32-2	EA201089-10	6.3	2
L-2-32-3	EA201089-11	14.3	2
L-2-32-4	EA201089-12	14.6	2
L-2-33-1	EA201001-221	11.1	2
L-2-33-2	EA201001-222	3.6	2
L-2-33-3	EA201001-223	ND	2
L-2-33-4	EA201001-224	ND	2
L-2-34-1	EA201089-13	282	2
L-2-34-2	EA201089-14	15.8	2
L-2-34-3	EA201089-15	6.2	2
L-2-34-4	EA201089-16	5.3	2
L-2-35-1	EA201089-165	21.8	2
L-2-35-2	EA201089-166	4.4	2
L-2-35-3	EA201089-167	5.5	2
L-2-35-4	EA201089-168	4.4	2
L-2-36-1	EA201089-17	8.1	2
L-2-36-2	EA201089-18	2.8	2
L-2-36-3	EA201089-19	3.4	2
L-2-36-4	EA201089-20	2.3	2
L-2-37-1	EA201139-1	11.4	2
L-2-37-2	EA201139-2	3.2	2
L-2-37-3	EA201139-3	4.2	2
L-2-37-4	EA201139-4	3.5	2
L-2-38-1	EA201089-21	4.7	2
L-2-38-2	EA201089-22	4.6	2
L-2-38-3	EA201089-23	51.2	2
L-2-38-4	EA201089-24	49.2	2
L-2-39-1	EA201139-5	26	2
L-2-39-2	EA201139-6	5.9	2
L-2-39-3	EA201139-7	6.4	2
L-2-39-4	EA201139-8	4.7	2
L-2-40-1	EA201089-25	9.9	2
L-2-40-2	EA201089-26	13	2
L-2-40-3	EA201089-27	6	2
L-2-40-4	EA201089-28	33.3	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-41-1	EA201139-9	6.6	2
L-2-41-2	EA201139-10	9.6	2
L-2-41-3	EA201139-11	7	2
L-2-41-4	EA201139-12	5.3	2
L-2-42-1	EA201089-29	91.6	2
L-2-42-2	EA201089-30	55.9	2
L-2-42-3	EA201089-31	7.6	2
L-2-42-4	EA201089-32	4.9	2
L-2-43-1	EA201139-113	9	2
L-2-43-2	EA201139-114	12.9	2
L-2-43-3	EA201139-115	18	2
L-2-43-4	EA201139-116	13.2	2
L-2-44-1	EA201089-33	56.4	2
L-2-44-2	EA201089-34	119	2
L-2-44-3	EA201089-35	7.9	2
L-2-44-4	EA201089-36	3.4	2
L-2-45-1	EA201139-117	27.3	2
L-2-45-2	EA201139-118	6.4	2
L-2-45-3	EA201139-119	14.2	2
L-2-45-4	EA201139-120	10.1	2
L-2-46-1	EA201027-21	71.5	2
L-2-46-2	EA201027-22	25.7	2
L-2-46-3	EA201027-23	3.9	2
L-2-46-4	EA201027-24	6.2	2
L-2-47-1	EA201139-13	87.7	2
L-2-47-2	EA201139-14	118	2
L-2-47-3	EA201139-15	106	2
L-2-47-4	EA201139-16	73.5	2
L-2-48-1	EA201027-17	119	2
L-2-48-2	EA201027-18	7.2	2
L-2-48-3	EA201027-19	4.4	2
L-2-48-4	EA201027-20	6.2	2
L-2-49-1	EA201139-17	65.5	2
L-2-49-2	EA201139-18	22.3	2
L-2-49-3	EA201139-19	510	2
L-2-49-4	EA201139-20	18.1	2
L-2-50-1	EA201001-213	18.5	2
L-2-50-2	EA201001-214	4.7	2
L-2-50-3	EA201001-215	3.7	2
L-2-50-4	EA201001-216	ND	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139
Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-51-1	EA201139-21	18	2
L-2-51-2	EA201139-22	91.5	2
L-2-51-3	EA201139-23	5.4	2
L-2-51-4	EA201139-24	3.7	2
L-2-52-1	EA201001-209	8.7	2
L-2-52-2	EA201001-210	6.1	2
L-2-52-3	EA201001-211	6.3	2
L-2-52-4	EA201001-212	3.5	2
L-2-53-1	EA201139-25	225	2
L-2-53-2	EA201139-26	26.8	2
L-2-53-3	EA201139-27	53.1	2
L-2-53-4	EA201139-28	11.8	2
L-2-54-1	EA201001-205	5.1	2
L-2-54-2	EA201001-206	271	2
L-2-54-3	EA201001-207	2.8	2
L-2-54-4	EA201001-208	4	2
L-2-55-1	EA201139-29	191	2
L-2-55-2	EA201139-30	8.9	2
L-2-55-3	EA201139-31	2.6	2
L-2-55-4	EA201139-32	2.7	2
L-2-56-1	EA201001-201	5.1	2
L-2-56-2	EA201001-202	3.8	2
L-2-56-3	EA201001-203	4.3	2
L-2-56-4	EA201001-204	4.8	2
L-2-57-1	EA201139-33	2.7	2
L-2-57-2	EA201139-34	79.6	2
L-2-57-3	EA201139-35	12.8	2
L-2-57-4	EA201139-36	7.6	2
L-2-58-1	EA201027-13	14.7	2
L-2-58-2	EA201027-14	3.1	2
L-2-58-3	EA201027-15	5.5	2
L-2-58-4	EA201027-16	6.4	2
L-2-59-1	EA201139-37	7.2	2
L-2-59-2	EA201139-38	19.7	2
L-2-59-3	EA201139-39	13.8	2
L-2-59-4	EA201139-40	4.1	2
L-2-60-1	EA201001-197	11.1	2
L-2-60-2	EA201001-198	4.1	2
L-2-60-3	EA201001-199	4.8	2
L-2-60-4	EA201001-200	5.2	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-61-1	EA201139-41	10.1	2
L-2-61-2	EA201139-42	25.2	2
L-2-61-3	EA201139-43	5.8	2
L-2-61-4	EA201139-44	6.3	2
L-2-62-1	EA201001-193	56.7	2
L-2-62-2	EA201001-194	18	2
L-2-62-3	EA201001-195	38.4	2
L-2-62-4	EA201001-196	13.4	2
L-2-63-1	EA201139-45	8.7	2
L-2-63-2	EA201139-46	13.3	2
L-2-63-3	EA201139-47	3.2	2
L-2-63-4	EA201139-48	3.1	2
L-2-64-1	EA201027-9	7.8	2
L-2-64-2	EA201027-10	3.8	2
L-2-64-3	EA201027-11	4.5	2
L-2-64-4	EA201027-12	10.7	2
L-2-65-1	EA201139-49	26.3	2
L-2-65-2	EA201139-50	12.6	2
L-2-65-3	EA201139-51	4.5	2
L-2-65-4	EA201139-52	9.7	2
L-2-66-1	EA201027-5	7.3	2
L-2-66-2	EA201027-6	2.4	2
L-2-66-3	EA201027-7	4.6	2
L-2-66-4	EA201027-8	2.2	2
L-2-67-1	EA201139-53	3.2	2
L-2-67-2	EA201139-54	2.4	2
L-2-67-3	EA201139-55	ND	2
L-2-67-4	EA201139-56	3.4	2
L-2-68-1	EA201027-1	17.7	2
L-2-68-2	EA201027-2	4.7	2
L-2-68-3	EA201027-3	8.6	2
L-2-68-4	EA201027-4	4.7	2
L-2-69-1	EA201001-185	3.9	2
L-2-69-2	EA201001-186	5.2	2
L-2-69-3	EA201001-187	4.4	2
L-2-69-4	EA201001-188	3.1	2
L-2-70-1	EA201001-189	11.8	2
L-2-70-2	EA201001-190	2.4	2
L-2-70-3	EA201001-191	2.3	2
L-2-70-4	EA201001-192	ND	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-71-1	EA201001-181	305	2
L-2-71-2	EA201001-182	15.4	2
L-2-71-3	EA201001-183	2.4	2
L-2-71-4	EA201001-184	2.7	2
L-2-72-1	EA201089-141	16.9	2
L-2-72-2	EA201089-142	2.1	2
L-2-72-3	EA201089-143	3.5	2
L-2-72-4	EA201089-144	3.2	2
L-2-73-1	EA201001-177	5.3	2
L-2-73-2	EA201001-178	ND	2
L-2-73-3	EA201001-179	ND	2
L-2-73-4	EA201001-180	2.3	2
L-2-75-1	EA201001-173	7.3	2
L-2-75-1	EA201139-57	10.9	2
L-2-75-2	EA201001-174	9.6	2
L-2-75-2	EA201139-58	2.7	2
L-2-75-3	EA201001-175	6.8	2
L-2-75-3	EA201139-59	4.4	2
L-2-75-4	EA201001-176	3.6	2
L-2-75-4	EA201139-60	3.2	2
L-2-76-1	EA201089-137	14.1	2
L-2-76-2	EA201089-138	2.3	2
L-2-76-3	EA201089-139	4.5	2
L-2-76-4	EA201089-140	5	2
L-2-77-1	EA201139-65	35.2	2
L-2-77-2	EA201139-66	4.6	2
L-2-77-3	EA201139-67	5	2
L-2-77-4	EA201139-68	2.1	2
L-2-78-1	EA201001-169	70.6	2
L-2-78-2	EA201001-170	10.2	2
L-2-78-3	EA201001-171	7.3	2
L-2-78-4	EA201001-172	9.6	2
L-2-79-1	EA201139-61	4	2
L-2-79-2	EA201139-62	2.4	2
L-2-79-3	EA201139-63	3.4	2
L-2-79-4	EA201139-64	6	2
L-2-80-1	EA201089-133	9.5	2
L-2-80-2	EA201089-134	4	2
L-2-80-3	EA201089-135	3.4	2
L-2-80-4	EA201089-136	21	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-81-1	EA201139-69	4.9	2
L-2-81-2	EA201139-70	4	2
L-2-81-3	EA201139-71	2.9	2
L-2-81-4	EA201139-72	3.9	2
L-2-82-1	EA201001-165	26.1	2
L-2-82-2	EA201001-166	20.6	2
L-2-82-3	EA201001-167	18.4	2
L-2-82-4	EA201001-168	16	2
L-2-83-1	EA201139-73	59.4	2
L-2-83-2	EA201139-74	5.8	2
L-2-83-3	EA201139-75	3.5	2
L-2-83-4	EA201139-76	2.4	2
L-2-84-1	EA201089-129	8.2	2
L-2-84-2	EA201089-130	3.7	2
L-2-84-3	EA201089-131	2..4	2
L-2-84-4	EA201089-132	4.1	2
L-2-85-1	EA201139-77	10.3	2
L-2-85-2	EA201139-78	4.3	2
L-2-85-3	EA201139-79	2.1	2
L-2-85-4	EA201139-80	2.4	2
L-2-86-1	EA201001-153	18.8	2
L-2-86-2	EA201001-154	141	2
L-2-86-3	EA201001-155	33.2	2
L-2-86-4	EA201001-156	21.4	2
L-2-87-1	EA201001-157	31.7	2
L-2-87-2	EA201001-158	9.6	2
L-2-87-3	EA201001-159	ND	2
L-2-87-4	EA201001-160	3.3	2
L-2-88-1	EA201001-161	3.5	2
L-2-88-2	EA201001-162	ND	2
L-2-88-3	EA201001-163	ND	2
L-2-88-4	EA201001-164	ND	2
L-2-89-1	EA201139-85	3.8	2
L-2-89-2	EA201139-86	2.1	2
L-2-89-3	EA201139-87	2.7	2
L-2-89-4	EA201139-88	ND	2
L-2-90-1	EA201001-149	4.2	2
L-2-90-2	EA201001-150	12.3	2
L-2-90-3	EA201001-151	8.1	2
L-2-90-4	EA201001-152	24.2	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-91-1	EA201139-81	8.4	2
L-2-91-2	EA201139-82	3.6	2
L-2-91-3	EA201139-83	ND	2
L-2-91-4	EA201139-84	2.5	2
L-2-92-1	EA201001-145	85.3	2
L-2-92-2	EA201001-146	38.2	2
L-2-92-3	EA201001-147	32.5	2
L-2-92-4	EA201001-148	47.2	2
L-2-93-1	EA201139-89	9.6	2
L-2-93-2	EA201139-90	2.7	2
L-2-93-3	EA201139-91	2.2	2
L-2-93-4	EA201139-92	2.7	2
L-2-94-1	EA201001-141	12.5	2
L-2-94-2	EA201001-142	15.9	2
L-2-94-3	EA201001-143	21.6	2
L-2-94-4	EA201001-144	11.6	2
L-2-95-1	EA201139-93	19.2	2
L-2-95-2	EA201139-94	6.8	2
L-2-95-3	EA201139-95	2.6	2
L-2-95-4	EA201139-96	2.9	2
L-2-96-1	EA201001-137	68	2
L-2-96-2	EA201001-138	77.9	2
L-2-96-3	EA201001-139	80.1	2
L-2-96-4	EA201001-140	74.9	2
L-2-97-1	EA201139-97	4	2
L-2-97-2	EA201139-98	ND	2
L-2-97-3	EA201139-99	3.3	2
L-2-97-4	EA201139-100	2.9	2
L-2-98-1	EA201001-133	41.8	2
L-2-98-2	EA201001-134	48.1	2
L-2-98-3	EA201001-135	35.9	2
L-2-98-4	EA201001-136	22.7	2
L-2-99-1	EA201139-101	28.8	2
L-2-99-2	EA201139-102	20.8	2
L-2-99-3	EA201139-103	9.7	2
L-2-99-4	EA201139-104	3.9	2
L-2-100-1	EA201001-129	40.1	2
L-2-100-2	EA201001-130	27.6	2
L-2-100-3	EA201001-131	9.8	2
L-2-100-4	EA201001-132	12.2	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201139

Date Sampled: 12-27-2011 to 01-27-2012
Date Received: 01-02-2012 to 01-28-2012
Date Digested: 01-02-2012 to 01-31-2012
Date Analyzed: 01-06-2012 to 02-02-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-2-101-1	EA201139-105	16.3	2
L-2-101-2	EA201139-106	4.2	2
L-2-101-3	EA201139-107	2.2	2
L-2-101-4	EA201139-108	2.3	2
L-2-102-1	EA201139-109	33	2
L-2-102-2	EA201139-110	9.9	2
L-2-102-3	EA201139-111	2.4	2
L-2-102-4	EA201139-112	2.9	2

ND: Not Detected (at the specified limit).

Client:	Earth Mechanics Inc.	Lab Job No.:	EA201001 to EA201139
Project:	11-136/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	12-27-2011 to 01-27-2012
Matrix:	Soil	Date Received:	01-02-2012 to 01-28-2012
		Date Analyzed:	01-24-2012 to 02-06-2012

EPA 6010B (Pb, STLC)

Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, STLC	MDL	PQL
Extraction Blank		ND	0.1	0.2
L-2-28-1	EA201089-1	1.3	0.1	0.2
L-2-30-1	EA201089-5	1.3	0.1	0.2
L-2-30-2	EA201089-6	1.7	0.1	0.2
L-2-30-3	EA201089-7	1.3	0.1	0.2
L-2-30-4	EA201089-8	1.4	0.1	0.2
L-2-34-1	EA201089-13	16.1	0.1	0.2
L-2-38-3	EA201089-23	0.13	0.1	0.2
L-2-42-1	EA201089-29	3.1	0.1	0.2
L-2-42-2	EA201089-30	3.4	0.1	0.2
L-2-44-1	EA201089-33	1.8	0.1	0.2
L-2-44-2	EA201089-34	5.8	0.1	0.2
L-2-46-1	EA201027-21	1.3	0.1	0.2
L-2-47-1	EA201139-13	4.5	0.1	0.2
L-2-47-2	EA201139-14	7.7	0.1	0.2
L-2-47-3	EA201139-15	5.5	0.1	0.2
L-2-47-4	EA201139-16	5.3	0.1	0.2
L-2-48-1	EA201027-17	2.6	0.1	0.2
L-2-49-1	EA201139-17	0.84	0.1	0.2
L-2-49-3	EA201139-19	4.1	0.1	0.2
L-2-51-2	EA201139-22	1.8	0.1	0.2
L-2-53-1	EA201139-25	16.1	0.1	0.2
L-2-53-3	EA201139-27	1.1	0.1	0.2
L-2-54-2	EA201001-206	6.9	0.1	0.2
L-2-55-1	EA201139-29	22	0.1	0.2
L-2-57-2	EA201139-34	4.6	0.1	0.2
L-2-62-1	EA201001-193	0.9	0.1	0.2
L-2-71-1	EA201001-181	11.2	0.1	0.2
L-2-78-1	EA201001-169	2.6	0.1	0.2
L-2-83-1	EA201139-73	1.6	0.1	0.2
L-2-86-2	EA201001-154	4.1	0.1	0.2
L-2-92-1	EA201001-145	2.2	0.1	0.2
L-2-96-1	EA201001-137	4.6	0.1	0.2
L-2-96-2	EA201001-138	3.3	0.1	0.2
L-2-96-3	EA201001-139	2.4	0.1	0.2
L-2-96-4	EA201001-140	2.4	0.1	0.2

Prep Method: Extraction Procedures, STLC Metals, Title 22, Cal Wet 66700, 48 hours.

MDL: Method Detection Limit;
PQL: Practical Quantitation Limit
ND: Not Detected (below MDL).

Client:	Earth Mechanics Inc.	Lab Job No.:	EA201001 to EA201139
Project:	11-136/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	12-27-2011 to 01-27-2012
Matrix:	Soil	Date Received:	01-02-2012 to 01-28-2012
		Date Analyzed:	02-27&28-2012

EPA 6010B (Pb, TCLP)

Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, TCLP	MDL	PQL
Extraction Blank		ND	0.1	0.2
L-2-34-1	EA201089-13	ND	0.1	0.2
L-2-44-2	EA201089-34	ND	0.1	0.2
L-2-47-2	EA201139-14	ND	0.1	0.2
L-2-47-3	EA201139-15	ND	0.1	0.2
L-2-47-4	EA201139-16	ND	0.1	0.2
L-2-53-1	EA201139-25	ND	0.1	0.2
L-2-54-2	EA201001-206	ND	0.1	0.2
L-2-55-1	EA201139-29	ND	0.1	0.2
L-2-71-1	EA201001-181	ND	0.1	0.2

Prep Method: EPA Method 1131, 18 hours (02-24 to 02-25-2012)

EPA 6010B (Pb, STLC-DI Water Extraction)

Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, DI-WET	MDL	PQL
Extraction Blank		ND	0.2	0.4
L-2-34-1	EA201089-13	ND	0.2	0.4
L-2-44-2	EA201089-34	ND	0.2	0.4
L-2-47-2	EA201139-14	ND	0.2	0.4
L-2-47-3	EA201139-15	ND	0.2	0.4
L-2-47-4	EA201139-16	ND	0.2	0.4
L-2-53-1	EA201139-25	ND	0.2	0.4
L-2-54-2	EA201001-206	ND	0.2	0.4
L-2-55-1	EA201139-29	ND	0.2	0.4
L-2-71-1	EA201001-181	ND	0.2	0.4

Prep Method: STLC Metals, Title 22, Cal Wet 66700, 48 hours (02-24 to 02-26-2012).
DI water is used in the extraction instead of the normal STLC solution.

MDL: Method Detection Limit;
PQL: Practical Quantitation Limit;
J: Trace concentration. The result is between MDL and PQL

Client:	Earth Mechanics Inc.	Lab Job No.:	EA201001 to EA201139
Project:	11-136/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	12-27-2011 to 01-27-2012
Matrix:	Soil	Date Received:	01-02-2012 to 01-28-2012
		Date Analyzed:	01-04-2012 to 02-02-2012

EPA Method 9045 (Soil pH)

Reporting Units: pH Unit

Sample ID	Lab ID	pH	Reporting Limit
L-2-01-1	EA201089-89	7.17	---
L-2-05-2	EA201089-98	7.22	---
L-2-06-2	EA201089-78	7.06	---
L-2-08-1	EA201089-73	7.14	---
L-2-11-3	EA201089-119	7.20	---
L-2-13-1	EA201089-105	7.29	---
L-2-14-2	EA201089-62	7.37	---
L-2-16-1	EA201089-57	7.27	---
L-2-17-2	EA201089-122	7.65	---
L-2-21-1	EA201089-145	7.41	---
L-2-22-1	EA201089-45	7.89	---
L-2-27-3	EA201089-159	7.28	---
L-2-28-2	EA201089-2	7.61	---
L-2-31-1	EA201001-217	6.67	---
L-2-34-1	EA201089-13	7.72	---
L-2-37-2	EA201139-2	7.15	---
L-2-40-2	EA201089-26	7.05	---
L-2-42-1	EA201139-9	7.46	---
L-2-44-2	EA201089-34	7.08	---
L-2-45-1	EA201139-117	8.53	---
L-2-50-1	EA201001-213	6.13	---
L-2-51-1	EA201139-21	7.55	---
L-2-54-1	EA201001-205	6.24	---
L-2-57-1	EA201139-33	7.68	---
L-2-61-2	EA201139-42	7.50	---
L-2-62-1	EA201001-193	7.08	---
L-2-63-1	EA201139-45	7.70	---
L-2-69-1	EA201001-185	6.61	---
L-2-75-1	EA201001-173	6.56	---
L-2-75-1	EA201139-57	7.92	---
L-2-76-1	EA201089-137	7.58	---
L-2-78-1	EA201001-169	6.71	---
L-2-81-1	EA201139-69	7.90	---
L-2-83-2	EA201139-74	7.99	---
L-2-87-1	EA201001-157	7.16	---
L-2-88-1	EA201001-161	6.87	---
L-2-92-1	EA201001-145	6.81	---
L-2-93-1	EA201139-89	7.66	---
L-2-98-1	EA201001-133	6.34	---
L-2-99-1	EA201139-101	7.86	---
L-2-102-2	EA201139-110	8.27	---

SEGMENT 3

BETWEEN STA. 340+00 AND STA. 408+00 ("A" LINE)

Alpha Scientific Corporation
Environmental Laboratories

Mr. Raja S. Pirathiviraj
Earth Mechanics Inc.
17800 Newhope Street, Suite B
Fountain Valley, CA 92708

Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Sample Date: 12-27-2011 to 01-06-2012
Lab Job No.: EA201001 to EA201027

Dear Mr. Pirathiviraj:

Enclosed please find the analytical report for the sample(s) received by Alpha Scientific Corporation from 01-02-2012 to 01-07-2012 and analyzed by the following EPA methods:

EPA 6010B (Total Lead)
EPA 6010B (STLC Pb)
EPA 6010B (TCLP Pb)
EPA 6010B (DI Water STLC Pb)
EPA 9045 (Soil pH)

All analyses have met the QA/QC criteria of this laboratory.

The sample(s) arrived in good conditions (i.e., chilled, intact) and with Chain of Custody record forms attached.

Alpha Scientific Corporation is a CA DHS certified laboratory (Certificate Number 2633). Thank you for giving us the opportunity to serve you. Please feel free to call me at (562) 809-8880 if our laboratory can be of further service to you.

Sincerely,

Roger Wang, Ph.D.
Laboratory Director

Enclosures

This cover letter is an integral part of this analytical report.

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Digested: 01-02-2012 to 01-12-2012
Date Analyzed: 01-06-2012 to 01-19-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-3-01-1	EA201001-125	48.7	2
L-3-01-2	EA201001-126	20.5	2
L-3-01-3	EA201001-127	5.8	2
L-3-01-4	EA201001-128	4.6	2
L-3-02-1	EA201001-121	14.8	2
L-3-02-2	EA201001-122	21.2	2
L-3-02-3	EA201001-123	15.1	2
L-3-02-4	EA201001-124	21.9	2
L-3-03-1	EA201027-37	68.4	2
L-3-03-2	EA201027-38	13.2	2
L-3-03-3	EA201027-39	8.4	2
L-3-03-4	EA201027-40	18.6	2
L-3-04-1	EA201001-117	77.9	2
L-3-04-2	EA201001-118	15.5	2
L-3-04-3	EA201001-119	14.9	2
L-3-04-4	EA201001-120	8.4	2
L-3-05-1	EA201027-33	39.4	2
L-3-05-2	EA201027-34	14.3	2
L-3-05-3	EA201027-35	29.6	2
L-3-05-4	EA201027-36	33.9	2
L-3-06-1	EA201001-113	7.5	2
L-3-06-2	EA201001-114	6.5	2
L-3-06-3	EA201001-115	2.9	2
L-3-06-4	EA201001-116	4.8	2
L-3-07-1	EA201027-25	281	2
L-3-07-2	EA201027-26	12.6	2
L-3-07-3	EA201027-27	8.2	2
L-3-07-4	EA201027-28	9.8	2
L-3-08-1	EA201001-109	91.9	2
L-3-08-2	EA201001-110	13.1	2
L-3-08-3	EA201001-111	3.8	2
L-3-08-4	EA201001-112	16.0	2
L-3-09-1	EA201027-29	1,600	2
L-3-09-2	EA201027-30	67.9	2
L-3-09-3	EA201027-31	27.0	2
L-3-09-4	EA201027-32	21.0	2
L-3-10-1	EA201001-105	65.9	2
L-3-10-2	EA201001-106	70.3	2
L-3-10-3	EA201001-107	15.4	2
L-3-10-4	EA201001-108	11.1	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Digested: 01-02-2012 to 01-12-2012
Date Analyzed: 01-06-2012 to 01-19-2012

EPA 6010B for Total Lead

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-3-11-1	EA201027-41	487	2
L-3-11-2	EA201027-42	8.3	2
L-3-11-3	EA201027-43	62.9	2
L-3-11-4	EA201027-44	10.2	2
L-3-12-1	EA201001-101	33.9	2
L-3-12-2	EA201001-102	55.9	2
L-3-12-3	EA201001-103	8.6	2
L-3-12-4	EA201001-104	5.2	2
L-3-13-1	EA201027-45	65.6	2
L-3-13-2	EA201027-46	26.5	2
L-3-13-3	EA201027-47	34.5	2
L-3-13-4	EA201027-48	26.8	2
L-3-14-1	EA201001-97	12.1	2
L-3-14-2	EA201001-98	16.2	2
L-3-14-3	EA201001-99	14.5	2
L-3-14-4	EA201001-100	16.1	2
L-3-15-1	EA201027-49	63.4	2
L-3-15-2	EA201027-50	6.1	2
L-3-15-3	EA201027-51	39.7	2
L-3-15-4	EA201027-52	13.5	2
L-3-16-1	EA201001-69	34.1	2
L-3-16-2	EA201001-70	30.7	2
L-3-16-3	EA201001-71	10.8	2
L-3-16-4	EA201001-72	14	2
L-3-17-1	EA201027-69	66.4	2
L-3-17-2	EA201027-70	8.3	2
L-3-17-3	EA201027-71	8.4	2
L-3-17-4	EA201027-72	3.7	2
L-3-18-1	EA201001-65	75.9	2
L-3-18-2	EA201001-66	9.6	2
L-3-18-3	EA201001-67	3.3	2
L-3-18-4	EA201001-68	3.8	2
L-3-19-1	EA201027-53	137	2
L-3-19-2	EA201027-54	5.7	2
L-3-19-3	EA201027-55	3.9	2
L-3-19-4	EA201027-56	4.2	2
L-3-20-1	EA201001-61	290	2
L-3-20-2	EA201001-62	12.9	2
L-3-20-3	EA201001-63	7.8	2
L-3-20-4	EA201001-64	22.2	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Digested: 01-02-2012 to 01-12-2012
Date Analyzed: 01-06-2012 to 01-19-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-3-21-1	EA201027-65	27.7	2
L-3-21-2	EA201027-66	4.3	2
L-3-21-3	EA201027-67	2.9	2
L-3-21-4	EA201027-68	3.3	2
L-3-22-1	EA201001-93	29.8	2
L-3-22-2	EA201001-94	8.6	2
L-3-22-3	EA201001-95	4.2	2
L-3-22-4	EA201001-96	4.3	2
L-3-23-1	EA201027-57	54.8	2
L-3-23-2	EA201027-58	15.8	2
L-3-23-3	EA201027-59	10.3	2
L-3-23-4	EA201027-60	5.1	2
L-3-24-1	EA201001-89	166	2
L-3-24-2	EA201001-90	13.8	2
L-3-24-3	EA201001-91	4.0	2
L-3-24-4	EA201001-92	5.0	2
L-3-25-1	EA201027-61	132	2
L-3-25-2	EA201027-62	12.6	2
L-3-25-3	EA201027-63	21.3	2
L-3-25-4	EA201027-64	12.6	2
L-3-26-1	EA201001-85	451	2
L-3-26-2	EA201001-86	27.3	2
L-3-26-3	EA201001-87	12.1	2
L-3-26-4	EA201001-88	38.8	2
L-3-27-1	EA201027-73	385	2
L-3-27-2	EA201027-74	24.9	2
L-3-27-3	EA201027-75	26.3	2
L-3-27-4	EA201027-76	164	2
L-3-28-1	EA201001-81	122	2
L-3-28-2	EA201001-82	12.7	2
L-3-28-3	EA201001-83	9.4	2
L-3-28-4	EA201001-84	1.6	2
L-3-29-1	EA201027-77	68.4	2
L-3-29-2	EA201027-78	245	2
L-3-29-3	EA201027-79	9.7	2
L-3-29-4	EA201027-80	3.4	2
L-3-30-1	EA201001-57	82.4	2
L-3-30-2	EA201001-58	20.7	2
L-3-30-3	EA201001-59	5.2	2
L-3-30-4	EA201001-60	7.4	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Digested: 01-02-2012 to 01-12-2012
Date Analyzed: 01-06-2012 to 01-19-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-3-31-1	EA201027-85	7.9	2
L-3-31-2	EA201027-86	3.8	2
L-3-31-3	EA201027-87	3.6	2
L-3-31-4	EA201027-88	4.7	2
L-3-32-1	EA201001-53	4.3	2
L-3-32-2	EA201001-54	6.5	2
L-3-32-3	EA201001-55	5	2
L-3-32-4	EA201001-56	12.7	2
L-3-33-1	EA201027-89	4.2	2
L-3-33-2	EA201027-90	ND	2
L-3-33-3	EA201027-91	2.5	2
L-3-33-4	EA201027-92	2.8	2
L-3-34-1	EA201001-49	20.4	2
L-3-34-2	EA201001-50	4.3	2
L-3-34-3	EA201001-51	2.5	2
L-3-34-4	EA201001-52	2.6	2
L-3-35-1	EA201027-81	16.4	2
L-3-35-2	EA201027-82	94.9	2
L-3-35-3	EA201027-83	5.9	2
L-3-35-4	EA201027-84	3.2	2
L-3-36-1	EA201001-45	36.4	2
L-3-36-2	EA201001-46	34.6	2
L-3-36-3	EA201001-47	7.5	2
L-3-36-4	EA201001-48	27	2
L-3-37-1	EA201027-113	255	2
L-3-37-2	EA201027-114	13.8	2
L-3-37-3	EA201027-115	4.2	2
L-3-37-4	EA201027-116	2.9	2
L-3-38-1	EA201001-77	11.2	2
L-3-38-2	EA201001-78	22.2	2
L-3-38-3	EA201001-79	29.9	2
L-3-38-4	EA201001-80	9.6	2
L-3-39-1	EA201027-93	2.9	2
L-3-39-2	EA201027-94	ND	2
L-3-39-3	EA201027-95	ND	2
L-3-39-4	EA201027-96	2.2	2
L-3-40-1	EA201001-41	5.2	2
L-3-40-2	EA201001-42	4.2	2
L-3-40-3	EA201001-43	6.2	2
L-3-40-4	EA201001-44	3.9	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Digested: 01-02-2012 to 01-12-2012
Date Analyzed: 01-06-2012 to 01-19-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-3-41-1	EA201027-117	17.1	2
L-3-41-2	EA201027-118	3.9	2
L-3-41-3	EA201027-119	9.3	2
L-3-41-4	EA201027-120	3.3	2
L-3-42-1	EA201001-73	6.8	2
L-3-42-2	EA201001-74	101	2
L-3-42-3	EA201001-75	19.7	2
L-3-42-4	EA201001-76	6.8	2
L-3-43-1	EA201027-121	10.1	2
L-3-43-2	EA201027-122	2.4	2
L-3-43-3	EA201027-123	3.0	2
L-3-43-4	EA201027-124	2.6	2
L-3-44-1	EA201001-37	83.3	2
L-3-44-2	EA201001-38	13.1	2
L-3-44-3	EA201001-39	4.2	2
L-3-44-4	EA201001-40	3.0	2
L-3-45-1	EA201027-97	21.9	2
L-3-45-2	EA201027-98	5.8	2
L-3-45-3	EA201027-99	3.7	2
L-3-45-4	EA201027-100	2.1	2
L-3-46-1	EA201001-33	346	2
L-3-46-2	EA201001-34	18.5	2
L-3-46-3	EA201001-35	17.9	2
L-3-46-4	EA201001-36	32.3	2
L-3-47-1	EA201027-101	46.3	2
L-3-47-2	EA201027-102	4.8	2
L-3-47-3	EA201027-103	3.9	2
L-3-47-4	EA201027-104	3.2	2
L-3-48-1	EA201001-1	8.8	2
L-3-48-2	EA201001-2	5.2	2
L-3-48-3	EA201001-3	4.6	2
L-3-48-4	EA201001-4	9.4	2
L-3-49-1	EA201027-105	319	2
L-3-49-2	EA201027-106	6.4	2
L-3-49-3	EA201027-107	4.8	2
L-3-49-4	EA201027-108	3.4	2
L-3-50-1	EA201001-5	175	2
L-3-50-2	EA201001-6	4.9	2
L-3-50-3	EA201001-7	2.1	2
L-3-50-4	EA201001-8	ND	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil
Digestion Method: EPA 3050B

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Digested: 01-02-2012 to 01-12-2012
Date Analyzed: 01-06-2012 to 01-19-2012

EPA 6010B for Total Lead
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead	Reporting Limit
Method Blank		ND	2
L-3-51-1	EA201027-109	68.1	2
L-3-51-2	EA201027-110	11.0	2
L-3-51-3	EA201027-111	6.7	2
L-3-51-4	EA201027-112	4.7	2
L-3-52-1	EA201001-9	243	2
L-3-52-2	EA201001-10	46.6	2
L-3-52-3	EA201001-11	19.8	2
L-3-52-4	EA201001-12	47.4	2
L-3-53-1	EA201001-13	64.0	2
L-3-53-2	EA201001-14	80.6	2
L-3-53-3	EA201001-15	25.9	2
L-3-53-4	EA201001-16	17.3	2
L-3-54-1	EA201001-17	331	2
L-3-54-2	EA201001-18	23.1	2
L-3-54-3	EA201001-19	5.9	2
L-3-54-4	EA201001-20	9.5	2
L-3-55-1	EA201001-21	80.2	2
L-3-55-2	EA201001-22	28.9	2
L-3-55-3	EA201001-23	16.5	2
L-3-55-4	EA201001-24	15.9	2
L-3-56-1	EA201001-25	922	2
L-3-56-2	EA201001-26	30.3	2
L-3-56-3	EA201001-27	20.0	2
L-3-56-4	EA201001-28	91.4	2
L-3-57-1	EA201001-29	355	2
L-3-57-2	EA201001-30	87.3	2
L-3-57-3	EA201001-31	5.6	2
L-3-57-4	EA201001-32	21.1	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Analyzed: 01-24-2012 to 02-06-2012

EPA 6010B (Pb, STLC)
Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, STLC	MDL	PQL
Extraction Blank		ND	0.1	0.2
L-3-03-1	EA201027-37	1.1	0.1	0.2
L-3-04-1	EA201001-117	3.2	0.1	0.2
L-3-07-1	EA201027-25	6.0	0.1	0.2
L-3-08-1	EA201001-109	2.1	0.1	0.2
L-3-09-1	EA201027-29	31.9	0.1	0.2
L-3-09-2	EA201027-30	1.4	0.1	0.2
L-3-10-1	EA201001-105	2.2	0.1	0.2
L-3-10-2	EA201001-106	2.2	0.1	0.2
L-3-11-1	EA201027-41	19.0	0.1	0.2
L-3-11-3	EA201027-43	1.5	0.1	0.2
L-3-12-2	EA201001-102	0.7	0.1	0.2
L-3-13-1	EA201027-45	2.6	0.1	0.2
L-3-15-1	EA201027-49	1.1	0.1	0.2
L-3-17-1	EA201027-69	1.4	0.1	0.2
L-3-18-1	EA201001-65	2.5	0.1	0.2
L-3-19-1	EA201027-53	4.5	0.1	0.2
L-3-20-1	EA201001-61	12.3	0.1	0.2
L-3-23-1	EA201027-57	0.95	0.1	0.2
L-3-24-1	EA201001-89	2.0	0.1	0.2
L-3-25-1	EA201027-61	4.6	0.1	0.2
L-3-26-1	EA201001-85	39.0	0.1	0.2
L-3-27-1	EA201027-73	19.0	0.1	0.2
L-3-27-4	EA201027-76	6.0	0.1	0.2
L-3-28-1	EA201001-81	6.9	0.1	0.2
L-3-29-1	EA201027-77	1.3	0.1	0.2
L-3-29-2	EA201027-78	14.7	0.1	0.2
L-3-30-1	EA201001-57	2.6	0.1	0.2
L-3-35-2	EA201027-82	0.5	0.1	0.2
L-3-37-1	EA201027-113	8.3	0.1	0.2
L-3-42-2	EA201001-74	ND	0.1	0.2
L-3-44-1	EA201001-37	2.2	0.1	0.2
L-3-46-1	EA201001-33	10.3	0.1	0.2
L-3-49-1	EA201027-105	11.5	0.1	0.2

Prep Method: Extraction Procedures, STLC Metals, Title 22, Cal Wet 66700, 48 hours.

MDL: Method Detection Limit;
PQL: Practical Quantitation Limit
ND: Not Detected (below MDL).

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Analyzed: 01-24-2012 to 02-06-2012

EPA 6010B (Pb, STLC)
Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, STLC	MDL	PQL
Extraction Blank		ND	0.1	0.2
L-3-50-1	EA201001-5	3.8	0.1	0.2
L-3-51-1	EA201027-109	2.6	0.1	0.2
L-3-52-1	EA201001-9	7.9	0.1	0.2
L-3-53-1	EA201001-13	1.7	0.1	0.2
L-3-53-2	EA201001-14	2.5	0.1	0.2
L-3-54-1	EA201001-17	14.3	0.1	0.2
L-3-55-1	EA201001-21	4.7	0.1	0.2
L-3-56-1	EA201001-25	42.3	0.1	0.2
L-3-56-4	EA201001-28	2.6	0.1	0.2
L-3-57-1	EA201001-29	15.4	0.1	0.2
L-3-57-2	EA201001-30	3.5	0.1	0.2

Prep Method: Extraction Procedures, STLC Metals, Title 22, Cal Wet 66700, 48 hours.

MDL: Method Detection Limit;
PQL: Practical Quantitation Limit
ND: Not Detected (below MDL).

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Analyzed: 01-24-2012 to 02-06-2012

EPA 6010B (Pb, TCLP)
Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, TCLP	MDL	PQL
Extraction Blank		ND	0.1	0.2
L-3-07-1	EA201027-25	ND	0.1	0.2
L-3-09-1	EA201027-29	0.10J	0.1	0.2
L-3-11-1	EA201027-41	ND	0.1	0.2
L-3-20-1	EA201001-61	ND	0.1	0.2
L-3-26-1	EA201001-85	ND	0.1	0.2
L-3-27-1	EA201027-73	ND	0.1	0.2
L-3-27-4	EA201027-76	ND	0.1	0.2
L-3-28-1	EA201001-81	ND	0.1	0.2
L-3-29-2	EA201027-78	ND	0.1	0.2
L-3-37-1	EA201027-113	ND	0.1	0.2
L-3-46-1	EA201001-33	ND	0.1	0.2
L-3-49-1	EA201027-105	ND	0.1	0.2
L-3-52-1	EA201001-9	ND	0.1	0.2
L-3-54-1	EA201001-17	ND	0.1	0.2
L-3-56-1	EA201001-25	0.15J	0.1	0.2
L-3-57-1	EA201001-29	ND	0.1	0.2

Prep Method: EPA Method 1131, 18 hours (02-24 to 02-25-2012)

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Analyzed: 01-24-2012 to 02-06-2012

EPA 6010B (Pb, STLC-DI Water Extraction)

Reporting Units: mg/L (ppm)

Sample ID	Lab ID	Lead, DI-WET	MDL	PQL
Extraction Blank		ND	0.2	0.4
L-3-07-1	EA201027-25	ND	0.2	0.4
L-3-09-1	EA201027-29	0.8	0.2	0.4
L-3-11-1	EA201027-41	0.46	0.2	0.4
L-3-20-1	EA201001-61	0.22J	0.2	0.4
L-3-26-1	EA201001-85	0.31J	0.2	0.4
L-3-27-1	EA201027-73	0.49	0.2	0.4
L-3-27-4	EA201027-76	ND	0.2	0.4
L-3-28-1	EA201001-81	ND	0.2	0.4
L-3-29-2	EA201027-78	ND	0.2	0.4
L-3-37-1	EA201027-113	0.26J	0.2	0.4
L-3-46-1	EA201001-33	ND	0.2	0.4
L-3-49-1	EA201027-105	0.53	0.2	0.4
L-3-52-1	EA201001-9	ND	0.2	0.4
L-3-54-1	EA201001-17	ND	0.2	0.4
L-3-56-1	EA201001-25	0.6	0.2	0.4
L-3-57-1	EA201001-29	0.30J	0.2	0.4

Prep Method: STLC Metals, Title 22, Cal Wet 66700, 48 hours (02-24 to 02-26-2012).
DI water is used in the extraction instead of the normal STLC solution.

MDL: Method Detection Limit;
PQL: Practical Quantitation Limit;
J: Trace concentration. The result is between MDL and PQL

Client: Earth Mechanics Inc.
Project: 11-137/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Soil

Lab Job No.: EA201001 to EA201027

Date Sampled: 12-27-2011 to 01-06-2012
Date Received: 01-02-2012 to 01-07-2012
Date Analyzed: 01-24-2012 to 02-06-2012

EPA Method 9045 (Soil pH)
Reporting Units: pH Unit

Sample ID	Lab ID	pH	Reporting Limit
L-3-01-1	EA201001-125	6.95	---
L-3-03-1	EA201027-37	6.12	---
L-3-06-1	EA201001-113	6.89	---
L-3-07-1	EA201027-25	6.03	---
L-3-14-1	EA201001-97	6.07	---
L-3-19-1	EA201027-53	6.4	---
L-3-20-1	EA201001-61	6.91	---
L-3-21-1	EA201027-65	5.81	---
L-3-22-1	EA201001-93	6.83	---
L-3-27-1	EA201027-73	6.94	---
L-3-28-1	EA201001-81	7.03	---
L-3-33-1	EA201027-89	6.06	---
L-3-34-1	EA201001-49	7.16	---
L-3-35-1	EA201027-81	6.1	---
L-3-36-1	EA201001-45	6.4	---
L-3-41-1	EA201027-117	6.5	---
L-3-44-1	EA201001-37	6.36	---
L-3-47-1	EA201027-101	6.38	---
L-3-50-1	EA201001-5	6.89	---
L-3-51-1	EA201027-109	6.06	---
L-3-54-1	EA201001-17	7.16	---
L-3-56-1	EA201001-25	7.05	---

YELLOW TRAFFIC STRIPE PAINT

Alpha Scientific Corporation
Environmental Laboratories

02-28-2012

Mr. Raja S. Pirathiviraj
Earth Mechanics Inc.
17800 Newhope Street, Suite B
Fountain Valley, CA 92708

Project: 11-135 & 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Sample Date: 02-03/05/06/07-2012
Lab Job No.: EA202012

Dear Mr. Pirathiviraj:

Enclosed please find the analytical report for the sample(s) received by Alpha Scientific Corporation on 02-07-2012 and analyzed by the following EPA methods:

EPA 6010B (Total Lead)
EPA 6010B (Total Chromium)
EPA 6010B (STLC Pb & Cr)
EPA 6010B (TCLP Pb & Cr)
EPA 6010B (DI Water STLC Pb & Cr)
EPA 9045C (pH)

All analyses have met the QA/QC criteria of this laboratory.

The sample(s) arrived in good conditions (i.e., chilled, intact) and with a chain of custody record attached.

Alpha Scientific Corporation is a CA DHS certified laboratory (Certificate Number 2633). Thank you for giving us the opportunity to serve you. Please feel free to call me at (562) 809-8880 if our laboratory can be of further service to you.

Sincerely,

Roger Wang, Ph.D.
Laboratory Director

Enclosures

This cover letter is an integral part of this analytical report.

Client: Earth Mechanics Inc.
Project: 11-135 & 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Paint
Digestion Method:EPA 3050B
Batch No.: 0209-MS2

Lab Job No.: EA202012

Date Sampled: 02-03-2012
Date Received: 02-07-2012
Date Digested: 02-07-2012
Date Analyzed: 02-09-2012
Date Reported: 02-13-2012

EPA 6010B for Total Lead & Chromium
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead (Pb)	Chromium (Cr)	Reporting Limit
Method Blank		ND	ND	2
LP-NPF	EA202012-1	234	81.2	2
LP-SPF	EA202012-2	2.8	ND	2
LP-SPN	EA202012-3	114	46.3	2
LP-NPN	EA202012-4	11,600	2,870	2
LP-SHF	EA202012-5	119	38.6	2
LP-SHNL	EA202012-6	217	54.5	2
LP-NHNL	EA202012-7	342	125	2
LP-NHN	EA202012-8	384	89.5	2
LP-NHF	EA202012-9	199	59.2	2
LP-SEF	EA202012-10	222	67.5	2
LP-SEN	EA202012-11	4,650	1,320	2
LP-NEN	EA202012-12	332	107	2
LP-NENL	EA202012-13	9,620	1,620	2
LP-NEF	EA202012-14	2,610	633	2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-135 & 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Paint
Digestion Method:EPA 3050B
Batch No.: 0209-MS2/0210-MS1

Lab Job No.: EA202012

Date Sampled: 02-05/06/07-2012
Date Received: 02-07-2012
Date Digested: 02-07-2012
Date Analyzed: 02-09/10-2012
Date Reported: 02-13-2012

EPA 6010B for Total Lead & Chromium
Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Total Lead (Pb)	Chromium (Cr)	Reporting Limit
Method Blank		ND	ND	2
LP-S-1	EA202012-15	10.2	6.5	2
LP-S-2	EA202012-16	7.0	ND	2
LP-S-3	EA202012-17	14.8	2.5	2
LP-S-4	EA202012-18	7.1	ND	2
LP-S-5	EA202012-19	9.1	10.4	2
LP-S-6	EA202012-20	8.2	3.1	2
LP-N-1	EA202012-21	1,470	328	2
LP-N-2	EA202012-22	4.9	ND	2
LP-N-3	EA202012-23	526	105	2
LP-N-4	EA202012-24	2,540	672	2
LP-N-5	EA202012-25	15.6	5.6	2
LP-N-6	EA202012-26	129	37.7	2
				2

ND: Not Detected (at the specified limit).

Client: Earth Mechanics Inc.
Project: 11-135 & 11-136/I-5 HOV Improvement
Project Site: San Clemente to Capistrono
Matrix: Paint
Batch No. for 6010B: 0217-MS2

Lab Job No.: EA202012A

Date Sampled: 02-03/05/06/07-2012
Date Received: 02-07-2012
Date Analyzed: 02-17-2012
Date Reported: 02-20-2012

EPA 6010B (Pb & Cr, STLC)
Reporting Unit: mg/L (ppm)

Sample ID	Lab ID	Lead, STLC	Chromium, STLC
MDL		0.1	0.1
PQL		0.2	0.2
Extraction Blank		ND	ND
LP-NPF	EA202012-1	0.62	1.9
LP-SPN	EA202012-3	1.40	NA
LP-NPN	EA202012-4	3.2	10.1
LP-SHF	EA202012-5	0.56	NA
LP-SHNL	EA202012-6	0.86	3.6
LP-NHNL	EA202012-7	1.4	4.0
LP-NHN	EA202012-8	0.81	2.7
LP-NHF	EA202012-9	0.51	2.0
LP-SEF	EA202012-10	0.67	1.4
LP-SEN	EA202012-11	4.6	8.9
LP-NEN	EA202012-12	0.69	1.5
5.7LP-NENL	EA202012-13	4.3	7.5
LP-N-1	EA202012-21	5.7	5.2
LP-N-3	EA202012-23	0.64	1.5
LP-N-4	EA202012-24	2.9	5.2
LP-N-6	EA202012-26	0.30	NA

Note: Sample Preparation: Extraction Procedures, STLC Metals, Title 22, Cal Wet 66700, 48 hours (02-14 to 02-16-2012).
MDL: Method Detection Limit;
PQL: Practical Quantitation Limit
ND: Not Detected (at the specified limit).
NA: Not Applicable.

Client:	Earth Mechanics Inc.	Lab Job No.:	EA202012A
Project:	11-135 & 11-136/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	02-03-2012
Matrix:	Paint	Date Received:	02-07-2012
Batch No. for 6010B:	0223-MS1	Date Analyzed:	02-23-2012
		Date Reported:	02-23-2012

EPA 6010B (Pb & Cr, STLC)
Reporting Unit: mg/L (ppm)

Sample ID	Lab ID	Lead, STLC	Chromium, STLC
MDL		0.1	0.1
PQL		0.2	0.2
Extraction Blank		ND	ND
LP-NEF	EA202012-14	3.1	13.9

Note: Sample Preparation: Extraction Procedures, STLC Metals, Title 22, Cal Wet 66700, 48 hours (02-21 to 02-23-2012).
MDL: Method Detection Limit;
PQL: Practical Quantitation Limit
ND: Not Detected (at the specified limit).

Client:	Earth Mechanics Inc.	Lab Job No.:	EA202012B
Project:	11-135 & 11-136/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	02-03-2012
Matrix:	Paint	Date Received:	02-07-2012
Batch No.:	0228-MS1	Date Analyzed:	02-28-2012
		Date Reported:	02-28-2012

EPA 6010B for Lead & Chromium, TCLP

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Lead, TCLP	Chromium, TCLP	Reporting Limit
Extraction Blank		ND	ND	0.1
LP-NPN	EA202012-4	ND	ND	0.1
LP-SEN	EA202012-11	ND	ND	0.1
LP-NENL	EA202012-13	ND	ND	0.1
LP-NEF	EA202012-14	ND	ND	0.1
LP-N-1	EA202012-21	ND	ND	0.1
LP-N-4	EA202012-24	ND	ND	0.1

Prep Method: EPA Method 1131, 18 hours (02-24 to 02-25-2012).

ND: Not Detected (at the specified limit).
MDL: Method Detection Limit;
PQL: Practical Quantitation Limit;
J: Trace concentration. The result is between MDL and PQL

Client:	Earth Mechanics Inc.	Lab Job No.:	EA202012B
Project:	11-135 & 11-136/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	02-03-2012
Matrix:	Paint	Date Received:	02-07-2012
Batch No.:	0312-MS1	Date Analyzed:	03-12-2012
		Date Reported:	03-12-2012

EPA 6010B for Lead & Chromium, STLC-DI Water Extraction

Reporting Units: mg/kg (ppm)

Sample ID	Lab ID	Lead, DI-WET	Chromium, DI-WET	Reporting Limit
Extraction Blank		ND	ND	0.2
LP-NPN	EA202012-4	NA	ND	0.2
LP-SEN	EA202012-11	ND	ND	0.2
LP-NENL	EA202012-13	0.40	0.48	0.2
LP-NEF	EA202012-14	NA	0.41	0.2
LP-N-1	EA202012-21	ND	ND	0.2
LP-N-4	EA202012-24	NA	ND	0.2

Note: Sample Preparation: Extraction Procedures, STLC Metals, Title 22, Cal Wet 66700, 48 hours (02-19 to 02-21-2012). DI water is used in the extraction instead of the normal STLC solution.

MDL: Method Detection Limit;
PQL: Practical Quantitation Limit;
J: Trace concentration. The result is between MDL and PQL;
ND: Not Detected (at the specified limit).
NA: Not Analyzed.

Client:	Earth Mechanics Inc.	Lab Job No.:	EA202012B
Project:	11-135 & 11-136/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	02-03-2012
Matrix:	Paint	Date Received:	02-07-2012
Batch No.:	0224-pH1	Date Analyzed:	02-24-2012
		Date Reported:	02-28-2012

EPA 9045C (pH)
Reporting Units: pH Unit

Sample ID	Lab ID	pH	Reporting Limit
LP-NPF	EA202012-1	7.34	------
LP-SPF	EA202012-2	7.30	------
LP-SPN	EA202012-3	7.30	------
LP-NPN	EA202012-4	7.26	------
LP-SHF	EA202012-5	7.26	------
LP-SHNL	EA202012-6	7.42	------
LP-NHNL	EA202012-7	7.27	------
LP-NHN	EA202012-8	7.52	------
LP-NHF	EA202012-9	7.35	------
LP-SEF	EA202012-10	7.40	------
LP-SEN	EA202012-11	7.35	------
LP-NEN	EA202012-12	7.37	------
LP-NENL	EA202012-13	7.14	------
LP-NEF	EA202012-14	7.55	------

ND: Not Detected (at the specified limit).

Client:	Earth Mechanics Inc.	Lab Job No.:	EA202012B
Project:	11-135 & 11-136/I-5 HOV Improvement		
Project Site:	San Clemente to Capistrono	Date Sampled:	02-03-2012
Matrix:	Paint	Date Received:	02-07-2012
Batch No.:	0224-pH2	Date Analyzed:	02-24-2012
		Date Reported:	02-28-2012

EPA 9045C (pH)
Reporting Units: pH Unit

Sample ID	Lab ID	pH	Reporting Limit
LP-S-1	EA202012-15	7.38	------
LP-S-2	EA202012-16	7.42	------
LP-S-3	EA202012-17	7.50	------
LP-S-4	EA202012-18	7.37	------
LP-S-5	EA202012-19	7.36	------
LP-S-6	EA202012-20	7.49	------
LP-N-1	EA202012-21	7.34	------
LP-N-2	EA202012-22	7.38	------
LP-N-3	EA202012-23	7.44	------
LP-N-4	EA202012-24	7.36	------
LP-N-5	EA202012-25	7.35	------
LP-N-6	EA202012-26	7.37	------

APPENDIX C

STATISTICAL CALCULATIONS

SEGMENT 1

BETWEEN STA. 163+00 AND STA. 210+00 ("A" LINE)

General UCL Statistics for Full Data Sets

User Selected Options

From File	X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\ADL\I-HOV Worksheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Region I

General Statistics

Number of Valid Observations	164	Number of Distinct Observations	115

Raw Statistics

Minimum	2
Maximum	335
Mean	19.13
Median	8.05
SD	37.89
Coefficient of Variation	1.98
Skewness	5.567

Log-transformed Statistics

Minimum of Log Data	0.693
Maximum of Log Data	5.814
Mean of log Data	2.182
SD of log Data	1.131

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.326
Lilliefors Critical Value	0.0692

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	24.03

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	25.37
95% Modified-t UCL	24.24

Gamma Distribution Test

k star (bias corrected)	0.765
Theta Star	25.01
nu star	250.9
Approximate Chi Square Value (.05)	215.3
Adjusted Level of Significance	0.0485
Adjusted Chi Square Value	215
Anderson-Darling Test Statistic	6.998
Anderson-Darling 5% Critical Value	0.795
Kolmogorov-Smirnov Test Statistic	0.149
Kolmogorov-Smirnov 5% Critical Value	0.0758

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	22.3
95% Adjusted Gamma UCL	22.33

Lognormal Distribution Test

Lilliefors Test Statistic	0.0939
Lilliefors Critical Value	0.0692

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	20.56
95% Chebyshev (MVUE) UCL	24.8
97.5% Chebyshev (MVUE) UCL	28.3
99% Chebyshev (MVUE) UCL	35.18

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	24
95% Jackknife UCL	24.03
95% Standard Bootstrap UCL	23.83
95% Bootstrap-t UCL	26.85
95% Hall's Bootstrap UCL	31.39
95% Percentile Bootstrap UCL	24.36
95% BCA Bootstrap UCL	25.82
95% Chebyshev(Mean, Sd) UCL	32.03
97.5% Chebyshev(Mean, Sd) UCL	37.61
99% Chebyshev(Mean, Sd) UCL	48.57

Potential UCL to Use	Use 97.5% Chebyshev (Mean, Sd) UCL	37.61

SEGMENT 2

BETWEEN STA. 210+00 AND STA. 340+00 ("A" LINE)

General UCL Statistics for Full Data Sets

User Selected Options

From File	X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\ADL\I-HOV Worksheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Region IIA

General Statistics

Number of Valid Observations	176	Number of Distinct Observations	105

Raw Statistics

Minimum	2
Maximum	446
Mean	14.62
Median	5.95
SD	40.84
Coefficient of Variation	2.794
Skewness	8.519

Log-transformed Statistics

Minimum of Log Data	0.693
Maximum of Log Data	6.1
Mean of log Data	2.005
SD of log Data	0.889

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.379
Lilliefors Critical Value	0.0668

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.16
Lilliefors Critical Value	0.0668

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	19.71

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	21.8
95% Modified-t UCL	20.04

Assuming Lognormal Distribution

95% H-UCL	12.67
95% Chebyshev (MVUE) UCL	14.76
97.5% Chebyshev (MVUE) UCL	16.38
99% Chebyshev (MVUE) UCL	19.58

Gamma Distribution Test

k star (bias corrected)	0.857
Theta Star	17.07
nu star	301.5
Approximate Chi Square Value (.05)	262.3
Adjusted Level of Significance	0.0486
Adjusted Chi Square Value	262
Anderson-Darling Test Statistic	16.97
Anderson-Darling 5% Critical Value	0.79
Kolmogorov-Smirnov Test Statistic	0.239
Kolmogorov-Smirnov 5% Critical Value	0.0723

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	16.8
95% Adjusted Gamma UCL	16.82

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	19.68
95% Jackknife UCL	19.71
95% Standard Bootstrap UCL	19.71
95% Bootstrap-t UCL	28.85
95% Hall's Bootstrap UCL	43.14
95% Percentile Bootstrap UCL	20.26
95% BCA Bootstrap UCL	22.58
95% Chebyshev(Mean, Sd) UCL	28.04
97.5% Chebyshev(Mean, Sd) UCL	33.85
99% Chebyshev(Mean, Sd) UCL	45.25

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL	28.04

General UCL Statistics for Full Data Sets

User Selected Options

From File	X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\ADL\I-HOV Worksheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Region IIB

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics

Minimum	3.4
Maximum	119
Mean	71.49
Median	80.6
SD	45.96
Coefficient of Variation	0.643
Skewness	-0.634

Log-transformed Statistics

Minimum of Log Data	1.224
Maximum of Log Data	4.779
Mean of log Data	3.788
SD of log Data	1.365

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.883
Shapiro Wilk Critical Value	0.818

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.75
Shapiro Wilk Critical Value	0.818

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	102.3

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	94.33
95% Modified-t UCL	101.7

Assuming Lognormal Distribution

95% H-UCL	1071
95% Chebyshev (MVUE) UCL	293.9
97.5% Chebyshev (MVUE) UCL	380.5
99% Chebyshev (MVUE) UCL	550.5

Gamma Distribution Test

k star (bias corrected)	0.82
Theta Star	87.22
nu star	13.11
Approximate Chi Square Value (.05)	5.969
Adjusted Level of Significance	0.0195
Adjusted Chi Square Value	4.806
Anderson-Darling Test Statistic	0.845
Anderson-Darling 5% Critical Value	0.733
Kolmogorov-Smirnov Test Statistic	0.277

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	98.21
95% Jackknife UCL	102.3
95% Standard Bootstrap UCL	95.93
95% Bootstrap-t UCL	98.38
95% Hall's Bootstrap UCL	91.72
95% Percentile Bootstrap UCL	95.4

Kolmogorov-Smirnov 5% Critical Value	0.301	95% BCA Bootstrap UCL	93.78
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	142.3
		97.5% Chebyshev(Mean, Sd) UCL	173
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	233.2
95% Approximate Gamma UCL	157		
95% Adjusted Gamma UCL	195.1		
Potential UCL to Use		Use 95% Student's-t UCL	102.3

General UCL Statistics for Full Data Sets

User Selected Options

From File	X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\ADL\I-HOV Worksheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Region IIC

General Statistics

Number of Valid Observations	20	Number of Distinct Observations	18

Raw Statistics		Log-transformed Statistics	
Minimum	2	Minimum of Log Data	0.693
Maximum	510	Maximum of Log Data	6.234
Mean	50.38	Mean of log Data	2.702
Median	12.6	SD of log Data	1.468
SD	113.2		
Coefficient of Variation	2.248		
Skewness	3.882		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.448	Shapiro Wilk Test Statistic	0.917
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	94.16	95% H-UCL	133
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	107.4
95% Adjusted-CLT UCL	115.5	97.5% Chebyshev (MVUE) UCL	136.7
95% Modified-t UCL	97.83	99% Chebyshev (MVUE) UCL	194.2

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.474	Data appear Lognormal at 5% Significance Level	
Theta Star	106.2		
nu star	18.97		
Approximate Chi Square Value (.05)	10.1	Nonparametric Statistics	
Adjusted Level of Significance	0.038	95% CLT UCL	92.03
Adjusted Chi Square Value	9.589	95% Jackknife UCL	94.16
		95% Standard Bootstrap UCL	91.23
Anderson-Darling Test Statistic	1.5	95% Bootstrap-t UCL	187.3
Anderson-Darling 5% Critical Value	0.801	95% Hall's Bootstrap UCL	231.1
Kolmogorov-Smirnov Test Statistic	0.232	95% Percentile Bootstrap UCL	96.55
Kolmogorov-Smirnov 5% Critical Value	0.205	95% BCA Bootstrap UCL	125.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	160.8
		97.5% Chebyshev(Mean, Sd) UCL	208.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	302.3
95% Approximate Gamma UCL	94.65		
95% Adjusted Gamma UCL	99.68		

Potential UCL to Use		Use 95% Chebyshev (MVUE) UCL	107.4

General UCL Statistics for Full Data Sets

User Selected Options

From File	X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\ADL\I-HOV Worksheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Region IID

General Statistics

Number of Valid Observations	16	Number of Distinct Observations	16

Raw Statistics

Minimum	2.6
Maximum	271
Mean	51.84
Median	7.5
SD	90.01
Coefficient of Variation	1.736
Skewness	1.808

Log-transformed Statistics

Minimum of Log Data	0.956
Maximum of Log Data	5.602
Mean of log Data	2.578
SD of log Data	1.631

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.6
Shapiro Wilk Critical Value	0.887

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	91.29

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	99.72
95% Modified-t UCL	92.98

Gamma Distribution Test

k star (bias corrected)	0.422
Theta Star	122.8
nu star	13.51
Approximate Chi Square Value (.05)	6.236
Adjusted Level of Significance	0.0335
Adjusted Chi Square Value	5.682
Anderson-Darling Test Statistic	1.735
Anderson-Darling 5% Critical Value	0.803
Kolmogorov-Smirnov Test Statistic	0.305
Kolmogorov-Smirnov 5% Critical Value	0.228

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	112.3
95% Adjusted Gamma UCL	123.2

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.839
Shapiro Wilk Critical Value	0.887

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	244.5
95% Chebyshev (MVUE) UCL	129.8
97.5% Chebyshev (MVUE) UCL	167.7
99% Chebyshev (MVUE) UCL	242

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	88.85
95% Jackknife UCL	91.29
95% Standard Bootstrap UCL	86.75
95% Bootstrap-t UCL	113.6
95% Hall's Bootstrap UCL	81.94
95% Percentile Bootstrap UCL	90.09
95% BCA Bootstrap UCL	97.21
95% Chebyshev(Mean, Sd) UCL	149.9
97.5% Chebyshev(Mean, Sd) UCL	192.4
99% Chebyshev(Mean, Sd) UCL	275.7

Potential UCL to Use	Use 99% Chebyshev (Mean, Sd) UCL	275.7

Recommended UCL exceeds the maximum observation

General UCL Statistics for Full Data Sets

User Selected Options

From File	X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\ADL\I-HOV Worksheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Region IIE

General Statistics

Number of Valid Observations	188	Number of Distinct Observations	116

Raw Statistics

Minimum	2
Maximum	305
Mean	14.84
Median	5.2
SD	28.62
Coefficient of Variation	1.929
Skewness	6.53

Log-transformed Statistics

Minimum of Log Data	0.693
Maximum of Log Data	5.72
Mean of log Data	1.991
SD of log Data	1.062

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.327
Lilliefors Critical Value	0.0646

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	18.29

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	19.33
95% Modified-t UCL	18.45

Gamma Distribution Test

k star (bias corrected)	0.826
Theta Star	17.96
nu star	310.6
Approximate Chi Square Value (.05)	270.8
Adjusted Level of Significance	0.0487
Adjusted Chi Square Value	270.5
Anderson-Darling Test Statistic	10.26
Anderson-Darling 5% Critical Value	0.792
Kolmogorov-Smirnov Test Statistic	0.172
Kolmogorov-Smirnov 5% Critical Value	0.0692

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	17.02
95% Adjusted Gamma UCL	17.04

Lognormal Distribution Test

Lilliefors Test Statistic	0.132
Lilliefors Critical Value	0.0646

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	15.27
95% Chebyshev (MVUE) UCL	18.15
97.5% Chebyshev (MVUE) UCL	20.45
99% Chebyshev (MVUE) UCL	24.99

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	18.27
95% Jackknife UCL	18.29
95% Standard Bootstrap UCL	18.25
95% Bootstrap-t UCL	20.14
95% Hall's Bootstrap UCL	31.61
95% Percentile Bootstrap UCL	18.5
95% BCA Bootstrap UCL	20.05
95% Chebyshev(Mean, Sd) UCL	23.93
97.5% Chebyshev(Mean, Sd) UCL	27.87
99% Chebyshev(Mean, Sd) UCL	35.6

Potential UCL to Use	Use 97.5% Chebyshev (Mean, Sd) UCL	27.87

SEGMENT 3

BETWEEN STA. 340+00 AND STA. 408+00 ("A" LINE)

General UCL Statistics for Full Data Sets

User Selected Options

From File	X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\ADL\I-HOV Worksheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Region IIIB

General Statistics

Number of Valid Observations	12	Number of Distinct Observations	12

Raw Statistics

Minimum	8.2
Maximum	1600
Mean	216.3
Median	24
SD	459.7
Coefficient of Variation	2.125
Skewness	2.924

Log-transformed Statistics

Minimum of Log Data	2.104
Maximum of Log Data	7.378
Mean of log Data	3.772
SD of log Data	1.778

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.528
Shapiro Wilk Critical Value	0.859

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.865
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	454.7

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	554.3
95% Modified-t UCL	473.3

Assuming Lognormal Distribution

95% H-UCL	2338
95% Chebyshev (MVUE) UCL	560.5
97.5% Chebyshev (MVUE) UCL	732.7
99% Chebyshev (MVUE) UCL	1071

Gamma Distribution Test

k star (bias corrected)	0.362
Theta Star	597.5
nu star	8.689
Approximate Chi Square Value (.05)	3.14
Adjusted Level of Significance	0.029
Adjusted Chi Square Value	2.653
Anderson-Darling Test Statistic	1.163
Anderson-Darling 5% Critical Value	0.803
Kolmogorov-Smirnov Test Statistic	0.28
Kolmogorov-Smirnov 5% Critical Value	0.262

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	598.6
95% Adjusted Gamma UCL	708.6

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	434.6
95% Jackknife UCL	454.7
95% Standard Bootstrap UCL	421.1
95% Bootstrap-t UCL	1240
95% Hall's Bootstrap UCL	1281
95% Percentile Bootstrap UCL	455.2
95% BCA Bootstrap UCL	596.4
95% Chebyshev(Mean, Sd) UCL	794.8
97.5% Chebyshev(Mean, Sd) UCL	1045
99% Chebyshev(Mean, Sd) UCL	1537

Potential UCL to Use	Use 99% Chebyshev (MVUE) UCL 1071

General UCL Statistics for Full Data Sets

User Selected Options

From File	X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\ADL\I-HOV Worksheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Region IIIC

General Statistics

Number of Valid Observations	184	Number of Distinct Observations	142

Raw Statistics

Minimum	1.6
Maximum	922
Mean	44.35
Median	11.65
SD	100.3
Coefficient of Variation	2.262
Skewness	5.074

Log-transformed Statistics

Minimum of Log Data	0.47
Maximum of Log Data	6.827
Mean of log Data	2.652
SD of log Data	1.379

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.335
Lilliefors Critical Value	0.0653

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.0888
Lilliefors Critical Value	0.0653

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	56.57

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	59.47
95% Modified-t UCL	57.04

Assuming Lognormal Distribution

95% H-UCL	47.37
95% Chebyshev (MVUE) UCL	58.34
97.5% Chebyshev (MVUE) UCL	67.86
99% Chebyshev (MVUE) UCL	86.55

Gamma Distribution Test

k star (bias corrected)	0.544
Theta Star	81.56
nu star	200.1
Approximate Chi Square Value (.05)	168.4
Adjusted Level of Significance	0.0487
Adjusted Chi Square Value	168.2
Anderson-Darling Test Statistic	11.52
Anderson-Darling 5% Critical Value	0.816
Kolmogorov-Smirnov Test Statistic	0.175
Kolmogorov-Smirnov 5% Critical Value	0.0715

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	52.71
95% Adjusted Gamma UCL	52.78

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	56.51
95% Jackknife UCL	56.57
95% Standard Bootstrap UCL	56.43
95% Bootstrap-t UCL	61.14
95% Hall's Bootstrap UCL	63.05
95% Percentile Bootstrap UCL	57.43
95% BCA Bootstrap UCL	60.24
95% Chebyshev(Mean, Sd) UCL	76.58
97.5% Chebyshev(Mean, Sd) UCL	90.53
99% Chebyshev(Mean, Sd) UCL	117.9

Potential UCL to Use	Use 97.5% Chebyshev (Mean, Sd) UCL	90.53

APPENDIX D

CALTRANS APPROVAL MEMORANDUM

DEPARTMENT OF TRANSPORTATION
3347 MICHELSON DRIVE, SUITE 100
IRVINE, CA 92612-8894
PHONE (949) 724-2738
FAX (949) 756-7633
TTY 711

Flex your power!
Be energy efficient!

June 5, 2012

File: Ora-5
EA: 0F96A1, 0F96C1, 0F96E1
PM: 3.0/8.7

Earth Mechanics, Inc.
17800 Newhope Street, Suite B
Fountain Valley, CA 92708

Attention: Mr. Lino Cheang, GE
Project Manager

Subject: Aerially Deposited Lead Report Review, Interstate 5, HOV Widening, Segments 1, 2, and 3, Dana Point, San Clemente, and San Juan Capistrano, Orange County CA.

Reference;

Aerially Deposited Lead Investigation, Interstate 5, HOV Improvement Project, Segments 1, 2, and 3, Cities of San Clemente, Dana Point, and Juan Capistrano, Orange County CA, Prepared by Earth Mechanics, Inc. dated, April 30, 2012.

Dear Mr. Cheang:

We have reviewed the above referenced document and it meets our approval. Please prepare related SSPs and submit for approval.

If you have any questions, please do not hesitate to call Mr. David Yaghoubi of my staff at (949) 756-7828.

Sincerely,

R Aurasteh

Reza Aurasteh, P.E. PhD. Chief
Department of Transportation, District 12
Environmental Engineering

Kamran Mazhar, Branch Chief, Design F
Mohamad Sadiq, Project Engineer
David Yaghoubi, Environmental Engineering

FINAL MATERIALS REPORT

INTERSTATE 5 HOV WIDENING, SEGMENT 2
ORANGE COUNTY, CALIFORNIA
12-ORA-5, PM 3.8/6.2
CALTRANS EA NO. 12-0F96C01

EMI Project No. 11-136
Date: August 30, 2012

EARTH MECHANICS, INC.

Geotechnical and Earthquake Engineering

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

May 1, 2013

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Addendum No. 1 for Final Materials Report***
Interstate 5 HOV Widening, Segment 2 Project
Cities of San Clemente and Dana Point, Orange County, California
12-Ora-05, PM 3.8/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

Dear Mr. Montes:

This addendum (Addendum No. 1) is intended to respond to a Caltrans review comment and supplement the published Final Materials Report (reference report) for the Interstate 5 HOV Widening Segment 2 Project. The Caltrans review comment (shown in italics) and our response is presented below.

Comment: *The new pavement section 8, shall be included in the Material Report. Deflection study was recommended but, due to time constrain, it has not been performed yet. It is assumed that the existing pavement is constructed on imported borrow (R>40 and PI<12).*

Response: Typical Structural Section No. 8, shown on the project plan, which consists of

0.10' HMA-O / 0.20' RHMA-G / 0.95' JPCP / 0.35' LCB

may be used within the project limits for outside lanes along the mainline having a TI of 16.0 when the existing soil subgrade possesses an R-value greater than 40 and Plasticity Index (PI) less than 12.

REFERENCE: Earth Mechanics, Inc., 2012. Final Materials Report; Interstate 5 HOV Widening, Segment 2 Project; Cities of San Clemente and Dana Point, Orange County, California; 12-Ora-05, PM 3.8/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C1); August 30.

If you have any questions regarding the above information, please call our office.

Sincerely,
EARTH MECHANICS, INC.

REGISTERED PROFESSIONAL ENGINEER
GNANAPRAGASAM J. GUNARANJAN
No. GE2970
Exp: 12-31-13
GEOTECHNICAL
STATE OF CALIFORNIA

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(Ranjan) G. J. Gunaranjan, GE 2970
Senior Staff Engineer

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Principal Engineer

17800 Newhope Street, Suite B, Fountain Valley, California 92708 Tel: (714) 751-3826 Fax: (714) 751-3928

Earth Mechanics, Inc.

Geotechnical & Earthquake Engineering

August 30, 2012

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Final Materials Report***
Interstate 5 HOV Widening, Segment 2
Cities of San Clemente and Dana Point, Orange County, California
12-Ora-5, PM 3.8/6.2
Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

Dear Mr. Montes:

Attached is the Final Materials Report for the Interstate 5 (I-5) HOV Widening, Segment 2 Project. The report contains our findings, conclusions, and recommendations for the design and construction of the proposed improvements. This report addresses geotechnical and materials issues as described in Topic 114 of the Caltrans Highway Design Manual and Caltrans Test Method 130.

The previous Materials Report for the project, dated March 28, 2012, was reviewed by Caltrans and their comments were incorporated into this Final Report. Caltrans comments and recommendations are provided in Appendix C.

We appreciate the opportunity to provide geotechnical services for the subject project. If you have questions regarding this report or require additional information, please call us.

Sincerely,
EARTH MECHANICS, INC.

REGISTERED PROFESSIONAL ENGINEER
GNANAPRAGASAM J. GUNARANJAN
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(Ranjan) G.J. Gunaranjan, GE 2970
Senior Staff Engineer

Andrew Korkos, GE 2357
Principal Engineer

CERTIFIED ENGINEERING GEOLOGIST
WENDY A. DRUMMOND
CEG No. 2049
EXP. 8/31/2013
STATE OF CALIFORNIA

Wendy A. Drummond, CEG 2049
Senior Geologist

17800 Newhope Street, Suite B, Fountain Valley, California 92708 Tel: (714) 751-3826 Fax: (714) 751-3928

FINAL MATERIALS REPORT
INTERSTATE 5 HOV WIDENING, SEGMENT 2
CITIES OF SAN CLEMENTE AND DANA POINT, ORANGE COUNTY, CALIFORNIA
12-ORA-5, PM 3.8/6.2
CALTRANS PROJECT NO. 1200020278 (EA NO. 12-0F96C01)

Prepared for:

AECOM
999 Town & Country Road
Orange, California 92868

Prepared by:

Earth Mechanics, Inc.
17800 Newhope Street, Suite B
Fountain Valley, California 92708

EMI Project Number: 11-136

August 30, 2012

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1.0 GENERAL

1.1 PURPOSE AND SCOPE OF WORK

This Materials Report presents findings and conclusions of a geotechnical study conducted by Earth Mechanics, Inc. (EMI) for the Interstate 5 (I-5) High Occupancy Vehicle (HOV), Segment 2 Project. The project location is shown on Figure 1. The purpose of the geotechnical study was to obtain subsurface information to develop design and construction recommendations to aid AECOM in preparing the project plans, specifications, and cost estimates.

This report follows the requirements for a Materials Report in accordance with Topic 114 of the California Department of Transportation (Caltrans) Highway Design Manual (HDM, 2008) and is organized in general accordance with California Test (CT) 130 (Caltrans, 2000). The report provides geotechnical information and recommendations for pavement structural sections, earthwork, culverts, and addresses corrosion potential of the on-site soils as required by the HDM.

The following geotechnical services were completed by EMI for this project:

- Geotechnical field exploration consisting of drilling and logging fifty-seven exploratory borings and conducting nine Cone Penetration Test (CPT) soundings.
- Laboratory testing of selected earth samples to determine various engineering parameters.
- Soil/bedrock corrosivity evaluation.
- Pavement structural section design.
- Preparation of this report presenting our findings, conclusions, and recommendations.

1.2 PROJECT DESCRIPTION

Orange County Transportation Authority (OCTA), in cooperation with the California Department of Transportation (Caltrans), and the Cities of Dana Point, San Clemente, and San Juan Capistrano, is proposing to widen the I-5 mainline between Avenida Pico and San Juan Creek Road. The project will add one HOV lane in each direction of the I-5 freeway, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. ***This report applies only to Segment 2 of the overall project; the limits of Segment 2 extend along the mainline from about 1,600 feet southeast of Avenida Vista Hermosa to about 2,400 feet northwest of Camino de Estrella***.

To accommodate the two additional HOV lanes, the I-5 mainline will be widened in the northbound (NB) and southbound (SB) directions of the freeway. Major improvements proposed in Segment 2 include widening the Avenida Vaquero Undercrossing (UC), ramp improvements at the Avenida Vista Hermosa and Camino de Estrella interchanges, several earth retaining walls, sound walls, and new pavement. Ancillary improvements include sign structures, drainage structures, utility lines, lighting, landscaping, and roadway striping.

1.2.1 CLIMATIC CONDITIONS

Weather in the coastal Orange County area is a Mediterranean-type, semi-arid, climate characterized by warm dry summers and mild winters. A dominating factor in the weather is the semi-permanent north Pacific high pressure system that migrates northward in summer, holding storm tracks well to

the north, and as a result southern California receives little or no precipitation during the summers. In winter, the north Pacific high moves southward permitting storm centers to swing across southern California. These storms generate moderate, but occasionally severe, precipitation events. When changes in the circulation pattern permit storms to approach from a southwesterly direction, the colder northern air masses merge with subtropical air masses and bring copious amounts of moisture with the northeastward streaming air. This results in heavy rains and often produces widespread flooding, especially in the spring when it coincides with runoff from melting snow in the mountains.

Summer is a dry period over most of the area. With the northward migration of the Pacific high most storm tracks are deflected far to the north during summer, and southern California seldom receives precipitation from Pacific storms during this time of year. Occasionally, during the summer months, moist air drifts northward from the Gulf of Mexico or the Gulf of California creating monsoonal conditions. At such times, scattered, locally heavy thunder showers occur, mostly in the desert and inland mountain areas.

The average annual high temperature is 73°F and the average low about 52°F. The hottest months are July, August, and September when high temperatures average in the high 70s, and low temperatures average in the high 50s. The coolest temperatures are in the winter months of December, January, and February when average highs are in the high 60s and average lows are in the low to mid 40s.

The extreme high temperatures occur during July, August, and September with the record high of 108°F. These high temperatures are commonly associated with adiabatic heating associated with the Santa Ana winds. The extreme low temperatures average about 44°F in December through February with a record low of 21°F. Freezing occurs occasionally on winter nights, but is generally of short duration (a few hours) and does not commonly result in a "hard" freeze.

Annual precipitation averages about 14 inches. The wettest months are November through March with an average of 3.4 inches in February. Snow is not uncommon in the surrounding high mountains but is extremely rare in the project area.

The prevailing wind direction is from the southwest. Generally these light winds bring cool ocean air that moderates the local climate. A typical weather characteristic in the area results from the juxtaposition of cool marine waters and dry hot desert air. As the moist marine air masses drift over colder water, a bank of fog or low clouds, locally referred to as the "marine layer", sweeps inland a short distance before evaporating. The marine layer extends inland a mile or two and then recedes offshore during the heat of the afternoon. Occasionally the layer may extend to the bordering hills and mountains during the night. During May and June, the marine layer can remain the entire day.

1.2.2 TERRAIN, LAND USE, AND SURFACE DRAINAGE

The project area extends in a curving southwest to southeast direction for a distance of about 2½ miles from the southern end of the San Joaquin Hills of south Orange County. The project corridor is located in the northwestern portion of the Peninsular Ranges geomorphic province (Figure 2). The I-5 alignment is along the rolling hills bordering the Santa Ana Mountains which rise to elevations up to +1675 ft above sea level. The I-5 freeway, in the project area, is a series of crest and sag vertical curves. Elevations along the project alignment range from about +130 ft at Avenida Vaquero to about +218 ft near Camino de Estrella. Graded ascending and descending slopes, with heights up to 80 feet tall and inclinations of 2H:1V or flatter, exist adjacent to the mainline and ramps.

Major rivers within south Orange County are San Juan Creek and San Mateo Creek. San Juan Creek originates in the Santa Ana Mountains to the northeast and flows to the Pacific Ocean in Dana Point, just northerly of the project corridor. San Mateo Creek is located southwesterly of the project site. It also originates in the Santa Ana Mountains to the northeast and flows to the Pacific Ocean in San Clemente.

Drainages in proximity to the project area flow from the Santa Ana Mountains on the northeast. These include, from north to south, San Juan Creek, Prima Deshecha Canada, Segunda Deshecha Canada and San Mateo creeks. Prima Deshecha Canada passes through the project corridor in the vicinity of Avenida Vaquero; this is the only natural, named drainage that crosses this segment of the project corridor. Other drainage features within the project area include grated inlets, catch basins, and reinforced concrete pipes.

1.2.3 Regional Geology

The project area is located in the northwestern part of the Peninsular Ranges physiographic province. The Peninsular Ranges comprise a northwest-southeast trending group of fault-bounded ranges between the Salton Trough and the Pacific Ocean. The Santa Ana Mountains, Puente Hills, and San Joaquin Hills are ranges within the Peninsular Ranges (Figures 2 and 3).

The project site is located on the low lying rolling hills westerly of the Santa Ana Mountains at the southerly end of the San Joaquin Hills in an area referred to as the Capistrano Embayment.

Comprehensive discussions regarding geology and geologic structure are provided in the project Geotechnical Design Report (EMI, 2012a).

1.3 Pertinent Reports and Investigations

Based on our understanding, no previous geotechnical studies were performed specifically for the proposed improvements described in this report. The Log-of-Test-Boring sheets, included with the as-built plans, for the existing bridges (Avenida Vista Hermosa UC, Avenida Vaquero UC, and Camino de Estrella OC) were reviewed by EMI. In addition, as-built roadway plans, which included pavement sections for the I-5 mainline and ramps, were reviewed for this geotechnical study.

1.4 Related Reports Prepared for the Proposed Improvements

A separate Geotechnical Design Report (EMI, 2012a) prepared for the current geotechnical study addresses geotechnical issues not contained in this report. The GDR may be referred to for additional geotechnical information and recommendations. Also, separate Foundation Reports (2012b, 2012c, 2012d, 2012e) were prepared by EMI for the proposed widening of the Avenida Vaquero UC, the proposed tieback walls, the proposed non-standard retaining walls, the proposed sign structures. These reports can be referred to for geotechnical information and recommendations pertaining to the specific bridge, wall, and sign improvements. Finally, EMI prepared an Aerially-Deposited Lead report (2012f) for the overall I-5 HOV Widening Project (Segments 1, 2, and 3).

2.0 EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 EXISTING FACILITIES

I-5 as a major north-south freeway in the State of California that serves local traffic, regional traffic, interstate traffic, and international traffic to and from Canada and Mexico. I-5 is designated in the National Highway System (NHS), Department of Defense Rural Interstates and Single Routing in Urban Areas and the Strategic Highway Corridor Network (STRAHNET). I-5 is a major commuter route between Los Angeles and Orange Counties. The I-5, in the cities of San Clemente and Dana Point, is composed of eight or nine general purpose lanes with occasional auxiliary lanes, and inside and outside shoulders.

The Avenida Vista Hermosa interchange area has five and four general purpose lanes in the NB and SB directions, respectively. In the NB direction, one of the lanes is dropped after the NB off-ramp resulting in four lanes through the interchange area. The mainline has inside and outside shoulders, and an auxiliary lane from the Avenida Vista Hermosa SB on-ramp to the Avenida Pico SB off-ramp. The existing interchange is a partial cloverleaf configuration with a direct off-ramp and loop on-ramp in the NB direction, and a direct on-ramp, direct off-ramp, and loop on-ramp in the SB direction.

At Avenida Vaquero, there is no existing interchange that includes ramps. The I-5 mainline spans Avenida Vaquero by way of the existing single-span UC structure.

The Camino de Estrella interchange area has four general purpose lanes in the NB direction and a fifth lane is added from the NB loop on-ramp. There is also an auxiliary lane from the NB on-ramp to the NB I-5 to NB Pacific Coast Highway (PCH) Connector; the fifth general purpose lane is dropped after the Connector. In the SB direction, there are four general purpose lanes and an auxiliary lane between the Camino Las Ramblas SB loop on-ramp and the Camino de Estrella SB off-ramp. The mainline has inside and outside shoulders. In the NB direction, the existing interchange is a partial cloverleaf with a direct on-ramp, direct off-ramp, and loop on-ramp; in the SB direction the interchange is a tight diamond with direct on-ramp and direct off-ramp.

2.2 EXISTING DRAINAGE DEVICES

Surface water (run-off) sheet flows over existing paved and unpaved surfaces into existing earthen swales, concrete v-ditches, and into grated drop inlets. The existing drainage system along the I-5 mainline and in the existing interchanges, within the project limits, includes 18-inch and 24-inch Reinforced Concrete Pipes (RCP) connected to the drop inlets. It is presumed that the Caltrans drainage system ultimately sends water to the local municipal drainage system which ultimately conveys the water into the Prima Deshecha Canada channel. The Prima Deshecha Canada channel appears to be the largest drainage feature in the project area; the channel/Reinforced Concrete Box (RCB) structure is located approximately 275 feet west of the Avenida Vaquero UC and crosses the mainline at a slight skew.

The existing drainage culverts, that are anticipated to be exposed due to the proposed construction, should be inspected and any corroded or damaged culverts should be repaired or replaced.

2.3 PROPOSED IMPROVEMENTS

Orange County Transportation Authority (OCTA), in cooperation with the California Department of Transportation (Caltrans), and the Cities of Dana Point, San Clemente, and San Juan Capistrano, is proposing to widen the I-5 mainline between Avenida Pico and San Juan Creek Road. The project will add one HOV lane in each direction of the I-5 freeway, reestablish existing auxiliary lanes and construct new auxiliary lanes, and improve several existing on- and off-ramps. ***This report applies only to Segment 2 of the overall project; the limits of Segment 2 extend along the mainline from about 1,600 feet southeast of Avenida Vista Hermosa to about 2,400 feet northwest of Camino de Estrella***.

To accommodate the two additional HOV lanes, the I-5 mainline will be widened in the northbound (NB) and southbound (SB) directions of the freeway. Major improvements proposed in Segment 2 include widening the Avenida Vaquero Undercrossing (UC), ramp improvements at the Avenida Vista Hermosa and Camino de Estrella interchanges, several earth retaining walls, sound walls, and new pavement. Ancillary improvements include sign structures, drainage structures, utility lines, lighting, landscaping, and roadway striping.

Recommendations for drainage structures are given in subsequent sections herein. Recommended pavement sections are presented in Section 7.0.

3.0 GEOTECHNICAL INVESTIGATION AND LABORATORY TESTING

3.1 GEOTECHNICAL INVESTIGATION

A geotechnical field investigation was conducted between September 26 and November 7, 2011. Fifty-seven (57) exploratory boreholes were drilled and nine (9) Cone Penetration Test (CPT) soundings were completed under the supervision of EMI for Segment 2. Boreholes were conducted for the purpose of collecting samples of subsurface earth materials and logging subsurface conditions where improvements are proposed. CPT soundings were conducted to obtain continuous subsurface information and estimate the shear wave velocity of the subsurface materials. Boreholes and CPT's were conducted at various locations along the NB and SB outside shoulders of the I-5 mainline and along inside and outside shoulders of ramps.

Boreholes were excavated using either a truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers, a limited-access tripod rig equipped with 6-inch diameter solid flight augers, or a 3-inch diameter hand auger. Subsurface earth materials and conditions were logged and samples of subsurface materials were collected for laboratory testing. Large bulk samples of near-surface soils were logged and collected. Smaller soil/bedrock samples were collected from borings generally at 5-foot vertical intervals by means of split-spoon drive samplers; the Standard Penetration Test (SPT) sampler and the Modified California Drive (MCD) sampler were used to collect small disturbed and relatively undisturbed samples, respectively. The SPT sampler (1.4-inch ID) and MCD sampler (2.5-inch ID) were driven a total depth of 18 inches or until refusal, using a 140-pound hammer falling 30 inches. The blowcounts for the last 12 inches of penetration were recorded on the boring logs. The MCD is a split-barrel sampler with a tapered cutting tip and lined with a series of 1-inch tall brass rings. Log-of-Test-Boring (LOTB) sheets and boring logs are presented in Appendix A.

The CPT soundings were performed using an electronic cone penetrometer in general accordance with current ASTM Standards (ASTM D5778 and ASTM D3441). CPT equipment consisted of a cone penetrometer assembly mounted at the end of a series of hollow sounding rods. The cone penetrometer assembly consisted of a conical tip with a 60° apex angle and a projected cross sectional area of 1.55 in² and a cylindrical friction sleeve with a surface area of 23.25 in². The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurements of cone tip and sleeve friction during penetration. The cone penetrometer assembly is continuously pushed into the soil by a set of hydraulic rams at a standard rate of 0.79 inch per second while the cone tip resistance and sleeve friction are recorded every 1.967 inches and digitally stored. A specially designed all-wheel drive 25-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the testing equipment. The computer generated graphical logs include tip resistance, friction resistance, and friction ratio. Soil behavior type interpretations are based on guidelines by Robertson and Campanella (1989). Logs of CPT soundings are given in Appendix A.

EMI borehole and CPT information is summarized in Table 1 below. The approximate locations of the boreholes and CPT's for this project are shown on Figures 4 through 16.

Table 1. Exploratory Borehole and CPT Sounding Information

Borehole/ CPT Number	Easting	Northing	Station (A-Line)	Offset (feet)	GSE (feet)	GWE (feet)	Depth (feet)	Method	Figure No.
A-11-201	6,141,475	2,107,376	211+00	86.5 RT	+174.2	NE	31.5	HSA	5
A-11-202	6,141,102	2,107,839	216+91	143.2 RT	+186.6	NE	31.5	HSA	5
A-11-203	6,140,877	2,108,123	220+52	180.9 RT	+194.0	NE	31.5	HSA	7
HA-11-204	6,140,853	2,108,454	223+06	395.0 RT	+204.6	NE	5.0	HA	7
A-11-205	6,141,307	2,107,306	211+67	83.1 LT	+176.1	NE	6.5	HSA	5
A-11-206	6,140,825	2,107,781	218+44	95.7 LT	+188.0	NE	31.5	HSA	5
HA-11-207	6,140,359	2,108,250	225+06	101.2 LT	+172.8	NE	5.0	HA	6
HA-11-208	6,139,842	2,108,603	231+56	157.5 LT	+160.4	NE	5.0	HA	8
A-11-209	6,139,326	2,108,993	238+05	100.9 LT	+149.5	NE	10.0	HSA	8
CPT-11-209	6,139,320	2,108,999	238+13	99.2 LT	+149.6	NM	79.7	CPT	8
A-11-210	6,139,075	2,109,173	241+13	81.5 LT	+156.9	NE	50.75	HSA	8
A-11-211	6,139,067	2,109,357	242+18	69.9 RT	+159.8	NE	31.5	HSA	8
A-11-212	6,138,769	2,109,535	245+65	63.1 RT	+167.6	NE	30.8	HSA	9
HA-11-213	6,138,270	2,109,914	252+03	70.3 RT	+180.8	NE	2.0	HA	9

Notes: 1. Easting/Northing coordinates and Stations/offsets were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevations (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Encountered During Drilling (approximate);
NE = Groundwater Table Not Encountered; NM = Groundwater Not Measured.
4. HSA = Hollow-stem Auger Boring; HA = Hand Auger; CPT = Cone Penetration Test Sounding.

Table 1. Exploratory Borehole and CPT Sounding Information (Continued)

Borehole/ CPT Number	Easting	Northing	Station (A-Line)	Offset (feet)	GSE (feet)	GWE (feet)	Depth (feet)	Method	Figure No.
A-11-214	6,138,347	2,109,669	249+87	67.5 LT	+180.2	NE	51.5	HSA	9
CPT-11-215	6,137,929	2,110,034	255+38	65.0 LT	+180.5	NM	60.6	CPT	9
A-11-216	6,137,682	2,110,250	258+66	65.1 LT	+172.3	NE	51.5	HSA	10
HA-11-217	6,137,366	2,110,708	264+05	71.7 RT	+159.9	NE	2.0	HA	10
HA-11-218	6,136,919	2,110,885	268+65	70.6 LT	+143.3	NE	2.0	HA	10
A-11-219	6,136,646	2,111,089	272+09	64.2 LT	+133.5	NE	91.5	HSA	11
A-11-220	6,136,719	2,111,192	272+06	61.5 RT	+135.7	NE	90.5	HSA	11
A-11-221	6,136,532	2,111,317	274+30	62.3 RT	+130.5	NE	91.5	HSA	11
A-11-222	6,136,446	2,111,223	274+52	63.5 LT	+127.9	+73.9	90.3	HSA	11
CPT-11-222	6,136,441	2,111,226	274+57	63.7 LT	+127.8	NM	99.6	CPT	11
CPT-11-223	6,136,131	2,111,411	278+22	64.7 LT	+129.9	NM	70.0	CPT	11
A-11-224	6,136,364	2,111,437	276+34	76.1 RT	+130.4	NE	51.5	HSA	11
A-11-225	6,135,700	2,111,632	283+08	74.8 LT	+142.4	NE	31.5	HSA	11
A-11-226	6,135,930	2,111,668	281+21	64.7 RT	+139.1	+113.4	50.8	HSA	11
CPT-11-227	6,135,270	2,112,017	288+68	64.2 RT	+156.5	NM	36.6	CPT	12
A-11-228	6,135,303	2,111,845	287+59	72.8 LT	+153.5	NE	37.0	HSA	12
CPT-11-229	6,134,993	2,112,018	291+13	65.2 LT	+161.9	NM	77.9	CPT	12
A-11-230	6,134,671	2,112,187	294+77	65.8 LT	+172.3	+126.8	50.0	HSA	12
HA-11-231	6,134,541	2,112,404	290+73	77.6 RT	+160.7	NE	5.0	HA	13
A-11-232	6,134,393	2,112,320	297+83	79.7 LT	+182.5	NE	50.4	HSA	13
A-11-233	6,133,981	2,112,548	302+49	91.1 LT	+193.7	NE	51.5	HSA	13
CPT-11-234	6,133,976	2,112,743	303+58	71.1 RT	+193.1	NM	37.7	CPT	13
A-11-235	6,133,663	2,112,993	307+62	99.5 RT	+198.5	+179.7	51.5	HSA	13
CPT-11-236	6,133,416	2,113,273	311+29	177.6 RT	+208.5	NM	20.0	CPT	15
HA-11-237	6,133,363	2,113,205	311+31	91.6 RT	+204.6	NE	5.0	HA	15
HA-11-238	6,133,617	2,112,774	306+72	105.0 LT	+200.4	NE	2.0	HA	13
A-11-239	6,133,185	2,113,003	311+53	176.8 LT	+209.7	NE	6.5	HSA	14
A-11-240	6,132,803	2,113,218	315+88	232.3 LT	+219.5	NE	6.5	HSA	14
HA-11-241	6,133,207	2,113,113	312+01	76.1 LT	+203.9	NE	5.0	HA	14
HA-11-242	6,133,192	2,113,697	315+61	384.6 RT	+230.2	NE	5.0	HA	15
HA-11-243	6,133,251	2,113,438	313+60	211.5 RT	+212.4	NE	5.0	HA	15

Notes: 1. Easting/Northing coordinates and Stations/offsets were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevation (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Encountered During Drilling (approximate);
NE = Groundwater Not Encountered; NM = Groundwater Not Measured.
4. HSA = Hollow-stem Auger Boring; HA = Hand Auger; CPT = Cone Penetration Test Sounding.

Table 1. Exploratory Borehole and CPT Sounding Information (Continued)

Borehole / CPT Number	Easting	Northing	Station (A-Line)	Offset (feet)	GSE (feet)	GWE (feet)	Depth (feet)	Method	Figure No.
A-11-244	6,132,930	2,113,518	316+65	85.2 RT	+207.9	NE	31.5	HSA	15
CPT-11-245	6,132,743	2,113,667	319+02	93.8 RT	+215.6	NM	57.9	CPT	15
A-11-246	6,132,919	2,113,331	315+62	72.5 LT	+206.7	NE	31.5	HSA	14
A-11-247	6,132,675	2,113,509	318+66	73.8 LT	+209.8	NE	51.5	HSA	14
A-11-248	6,132,607	2,113,347	318+23	245.4 LT	+220.0	NE	6.5	HSA	14
A-11-249	6,132,256	2,113,680	323+23	155.3 LT	+216.2	NE	6.5	HSA	16
HA-11-250	6,132,812	2,113,774	319+07	221.2 RT	+233.2	NE	5.0	HA	15
HA-11-251	6,132,458	2,113,897	322+56	133.8 RT	+221.4	NE	5.0	HA	16
HA-11-252	6,132,111	2,114,041	326+23	98.0 RT	+215.1	NE	5.0	HA	16
A-11-253	6,131,811	2,114,191	329+58	96.0 RT	+206.0	+183.0	51.5	HSA	16
A-11-254	6,131,567	2,114,354	332+62	120.3 RT	+201.4	+183.8	50.5	HSA	17
A-11-255	6,131,622	2,114,082	330+77	87.2 LT	+206.8	+176.8	30.8	HSA	16
A-11-256	6,131,235	2,114,347	335+28	84.0 LT	+197.7	NE	6.5	HSA	17
HA-11-257	6,131,159	2,114,644	337+77	94.7 RT	+193.1	NE	5.0	HA	17
A-11-258	6,132,809	2,113,348	316+61	123.6 LT	+227.0	NE	31.5	HSA	14
A-11-259	6,132,899	2,113,643	317+64	166.2 RT	+236.6	NE	31.5	HSA	15
A-11-260	6,140,910	2,108,148	220+47	221.3 RT	+208.2	NE	30.4	SS	7
A-11-261	6,138,920	2,109,492	244+14	106.5 RT	+178.8	NE	31.1	SS	8
A-11-262	6,134,034	2,112,767	303+22	122.2 RT	+208.8	NE	36.5	HSA	13
A-11-263	6,133,504	2,113,253	310+46	214.1 RT	+230.0	NE	36.5	HSA	15
A-11-264	6,135,616	2,111,832	284+76	61.8 RT	+146.4	NE	50.5	HSA	12

Notes: 1. Easting/Northing coordinates and Stations/offsets were surveyed and provided by AECOM.
2. GSE = Ground Surface Elevation (surveyed elevations were provided by AECOM).
3. GWE = Groundwater Encountered During Drilling (approximate); NE = Groundwater Not Encountered; NM = Groundwater Not Measured.
4. HSA = Hollow-stem Auger Boring; SS = Solid-stem Auger; HA = Hand Auger; CPT = Cone Penetration Test Sounding.

3.2 Laboratory Soil Testing

Laboratory tests were performed on representative samples of soil and bedrock to determine or derive their relevant physical and engineering properties. Selected samples were tested to determine soil/bedrock classifications, Expansion Index, plasticity, R-value, in-situ moisture and density, maximum density, and corrosion potential. A list of tests performed, the corresponding test methods, and the purpose of testing is presented in Table 2. The laboratory tests were conducted in general accordance with California Test (CT) methods or American Society for Testing and Materials (ASTM) standards. The test results are shown in Appendix B. Results of direct shear tests, UU triaxial tests, and consolidation and swell tests are provided in the GDR (EMI, 2012a).

Table 2. Explanation of Laboratory Tests Performed

Type of Test	*Applicable Test Method*	*Purpose*
Dry Density	ASTM[1] D 2937	Estimate in-situ soil density
Moisture Content	ASTM D 2216	Estimate in-situ soil moisture content
No. 200 Wash	ASTM D 1140	Estimate percentage of gravel, sand, and fines content
Grain Size Distribution	ASTM D 422	Estimate percentage of gravel, sand, and fines content
Atterberg Limits	ASTM D 4318	Determine the plasticity of the soil
R-value	ASTM D 2844	Estimate the Resistance Value for pavement design
Expansion Index	ASTM D 4829	Determine expansion classification
Maximum Density	CT[2] 216	Estimate maximum density and optimum moisture content
Soil pH	CT 643	Determine pH to assess corrosion potential of soil
Minimum Resistivity	CT 643	Determine corrosion potential of soil
Sulfate Content	CT 417	Determine sulfate content to assess corrosion potential of soil
Chloride Content	CT 422	Determine chloride content to assess corrosion potential of soil

Notes: 1. ASTM = American Society for Testing and Materials.
2. CT = California Test Method.

3.3 GROUNDWATER

The Segment 2 project area is within the San Juan Valley hydrologic area. No indication of a static groundwater table was observed within the depths explored during the investigation for the overall project. However, perched groundwater was encountered in seven of the thirty-four deep boreholes (>30 feet deep), drilled for the Segment 2 project, at elevations ranging from +74 to +184 feet. The perched groundwater condition is validated by the fact that groundwater was found within a very wide range of elevation.

The as-built LOTB sheets for the existing Avenida Vista Hermosa UC and Camino de Estrella OC, indicate in a note that groundwater was not encountered or do not indicate the presence of groundwater. The borings for the original structures were drilled in 1966 and 1968. The as-built LOTB for the Avenida Vaquero UC shows groundwater at elevation +92 feet in one boring.

Soil moisture content and groundwater elevation can fluctuate due to variations in seasonal rainfall, nearby irrigation, changes in or addition of flood control improvements, groundwater injection or extraction activities, construction activities, or numerous other man-made or natural conditions.

3.4 FOUNDATION TREATMENT

Vegetation on existing ground should be removed prior to fill placement. Loose, soft, dry, wet, or otherwise unsuitable materials should be removed from areas to receive fill. An overexcavation of at least 2 feet should be performed within all areas to receive compacted fill. In at-grade and cut areas where new pavement is proposed, the overexcavation should extend to the depth required to construct the proposed pavement sections. The overexcavations should extend laterally a minimum

distance of 2 feet from the edges of proposed fills and new pavements. Bottoms of overexcavations should be scarified to a minimum depth of 8 inches, moisture conditioned to near optimum moisture content, and compacted in place to at least 90 percent relative compaction. Overexcavation bottoms should be firm and unyielding prior placing fill. No special foundation treatment is recommended for proposed drainage structures. Foundation treatment for pavement subgrade is discussed in Section 7.0.

4.0 CUTS AND EXCAVATIONS

Based on the current grading plans and cross-sections, relatively minor to fairly significant cuts are required to achieve proposed finish grades (to accommodate the mainline widening). Generally, the permanent cuts involve sliver cuts into existing ascending slopes and vertical cuts supported by proposed retaining walls. The existing slopes range in height from less than 4 feet to about 55 feet. The proposed cuts into the slopes can be up to 24 feet wide (measured horizontally into the slope) and up to 12 feet deep (measured vertically). The proposed cuts will result in new permanent cut slope faces having inclinations of 2H:1V or flatter. In addition to the permanent cuts, relatively minor temporary excavations (2 to 4 feet deep) are recommended to accomplish remedial removals in areas where compacted fill and new pavement are proposed. A list of the larger permanent cuts is given below (the station limits are relative to the "A-Line" and are approximate).

- Station 218+75 to 221+00, retaining wall (north side of mainline)
- Station 241+00 to 244+00, cut slope (south side of mainline)
- Station 240+00 to 246+00, retaining wall (north side of mainline)
- Station 246+00 to 249+25, cut slope (south side of mainline)
- Station 246+00 to 247+50, cut slope (north side of mainline)
- Station 260+00 to 269+00, cut slope (north and south sides of mainline)
- Station 269+00 to 272+00, cut slope (south side of mainline)
- Station 281+00 to 290+00, cut slope (north side of mainline)
- Station 293+00 to 295+00, cut slope (north side of mainline)
- Station 295+00 to 297+50, cut slope (north and south sides of mainline)
- Station 302+00 to 306+00, retaining wall (north side of mainline)
- Station 324+25 to 327+50, cut slope (north side of mainline)
- Station 337+00 to 339+00, cut slope (north side of mainline)

Topic 304 of the Caltrans HDM (2008) advises that for new construction, widening, or where slopes are otherwise being modified, embankment (fill) slopes should be constructed at an inclination of 4H:1V or flatter. Due to right-of-way limitations, possible physical obstructions, and associated earthwork costs, cut slopes having an inclination of 2H:1V can be constructed for the project (existing cut slopes are graded to 2H:1V). Slopes steeper than 4H:1V require obtaining a design exception from Caltrans and obtaining approval from the Caltrans Landscape Architect. Stability of proposed cut slopes is addressed in the GDR by EMI (2012a).

5.0 EMBANKMENTS

Existing embankments within the project area include the mainline embankment, and the on- and off-ramp embankments at Avenida Vista Hermosa and Camino de Estrella. The embankments and associated slopes can be compacted fill derived from native earth materials or native cut materials.

Existing embankments range in height from about 60 feet to less than a few feet and have side slopes with an inclination of about 2H:1V or flatter. The existing slopes exhibit no evidence of gross or surficial instability and appear to have performed adequately over time.

Based on the current grading plans and cross-sections, relatively minor to moderate fills are required to achieve proposed finish grades. Generally, the grading involves placing compacted fills along portions of the mainline and ramps to widen the existing embankments. The fills will be placed along the existing outside edges of the embankments, where there are presently graded descending slopes. At the locations where fill is proposed, the existing slopes range in height from less than 4 feet to about 60 feet. In most cases, the thicker fills will be placed behind proposed retaining walls. The proposed compacted fills, to create new slopes (2H:1V or flatter), can be sliver fills less than 4 feet wide and up to 10 feet wide (measured horizontally from the existing slope face); the fills range in thickness from less than 2 feet and up to about 12 feet. The fills behind proposed retaining walls can be up to 20 feet wide and 12 feet thick. A list of where the thicker fills are proposed is given below (the station limits are relative to the "A-Line" and are approximate).

- Station 213+00 to 217+00, sliver fill for proposed 2H:1V slope (south side of mainline)
- Station 274+00 to 275+00, retaining wall backfill (north and south sides of mainline)
- Station 289+00 to 293+00, retaining wall backfill (south side of mainline)
- Station 293+25 to 294+00, fill slope (south side of mainline)
- Station 298+50 to 299+25, retaining wall backfill (south side of mainline)

Topic 304 of the Caltrans HDM (2008) advises that for new construction, widening, or where slopes are otherwise being modified, embankment (fill) slopes should be constructed with an inclination of 4H:1V or flatter. The requirement for constructing slopes with inclinations of 4H:1V or flatter is based on the assumptions that adequate space is available, that there are no physical obstructions interfering with the slope, and that earthwork costs are not prohibitive. Where space is limited by right-of-way or other physical constraints, or when fill quantities and associated earthwork costs become unreasonable, stable fill slopes can be constructed with inclinations steeper than 4H:1V and flatter than 2H:1V. However, slopes steeper than 4H:1V require obtaining a design exception from Caltrans and obtaining approval from the Caltrans Landscape Architect. Stability and settlement of widened existing embankments is addressed in the GDR by EMI (2012a).

6.0 SOIL CORROSIVITY

Representative soil and bedrock samples were tested to determine their corrosivity using procedures described in California Test Methods 417, 422, and 643. The minimum resistivities ranged from 122 to 2,260 ohm-cm with the average value equal to 459 ohm-cm. The pH ranged from 3.5 to 8.1 with the average equal to 6.8. The soluble sulfate ranged from 220 to 8,636 parts per million (ppm) with the average value equal to 1,308 ppm. And, the soluble chloride ranged from 120 to 4,642 ppm with the average equal to 1,474 ppm. Test results are summarized in Appendix B.

According to the Caltrans Corrosion Guidelines (2003), soils are corrosive if the pH is 5.5 or less, or chloride concentration is 500 parts per million (ppm) or greater, or sulfate concentration is 2,000 ppm or greater. Based on the test results, the on-site earth materials are corrosive to concrete and metals. The project area is deemed to be an aggressive corrosion environment. Appropriate corrosion measures should be taken for any concrete or steel elements that will be in contact with on-site soil and bedrock.

7.0 PAVEMENT STRUCTURAL SECTION DESIGN

7.1 EXISTING PAVEMENT SECTIONS

The typical cross-sections provided on the current project plans show existing pavement sections within the project limits. It appears that rigid pavement exists along the majority of the mainline with the exception a segment of the outside lane at the Avenida Vista Hermosa interchange which is flexible pavement. The mainline outside shoulders and the interchange ramps are flexible pavement sections composed of Hot Mix Asphalt over various base sections. The existing pavement sections shown in the typical cross-sections on the project plans are described in the Table 3 below.

Table 3. Pavement Sections Identified on Project Plans

Roadway	*Pavement Structural Section (feet)*
I-5 Mainline Lanes	0.10' RAC-O / 0.20' RAC-G / 0.10' AC-B / 0.65' PCC / 0.33' CTB / 0.33' AB / 0.65' AS
I-5 Mainline Outside Shoulders	0.10' RAC-O / 0.20' RAC-G / 0.10' AC-B / 0.90' PCC / 0.66' CTB / 0.65' AS
Ramps	0.65' AC-A / 1.80' CLASS 2 AB
Avenida Vista Hermosa Ramps	0.70' AC / 0.25' ATP / 0.45' CLASS 2 AB / 0.35' AS
Camino de Estrella Ramps	0.75' AC-A / 1.25' CLASS 2 AB
AVH Outside Lane & Shoulder	0.10' RAC-O / 0.20' RAC-G / 0.40' AC-B / 0.25' ATPB / 0.95' AB / 0.30' AS **or** 1.40' AC-B

During the geotechnical field investigation, EMI personnel measured the pavement sections that were exposed in the sides of the exploratory boreholes. The measurements of the existing pavements are shown on the boring logs and LOTB sheets provided in Appendix A.

7.2 EXPANSION POTENTIAL OF SUBGRADE MATERIALS

Based on visual classifications and laboratory tests, the vast majority of earth materials throughout the project site are plastic fine-grained materials including fills and alluvium composed of clay and silt, terrace deposits, and clayey siltstone and claystone of the Capistrano formation. The clays found throughout the project are predominantly fat clays and the silts are elastic silts. Based on Plasticity Index (PI) and Expansion Index (EI) values, the vast majority of earth materials throughout the project site are classified as having "high" or "very high" expansion potential. These materials have a tendency to swell as moisture content increases. The in-situ native soils, terrace deposits, and Capistrano formation bedrock should not be left in-place directly beneath proposed pavement sections and should not be used as fill directly beneath pavement sections. Also, these expansive materials should not be used as backfill behind or beneath retaining walls. But, these materials may be used in general fill areas, away from proposed pavement and structures. Laboratory tests may be required during earthwork activities to verify the expansion potential of soils used in specific areas.

7.3 Pavement Life-Cycle Cost Analysis

A pavement Life-Cycle Cost Analysis (LCCA) report was prepared by Kleinfelder West, Inc. (2010) during the PA/ED phase of the project; the LCCA was reviewed by Caltrans. The LCCA report indicates that new pavement sections designed based on a 40-year design life are the most cost effective pavement sections for the project (compared to 20-year design life). The LCCA report recommends using JPCP for the I-5 mainline, and HMA for the mainline shoulders and ramps for a 40-year design life.

7.4 R-values and Traffic Indices

Twenty-four (24) samples of near-surface soils and bedrock were tested to determine their R-value. Results of the tests are shown in Appendix B. Based on the laboratory tests, R-values range between 6 and 81; however, only three samples exceeded an R-value of 60. The majority of the R-values range between 6 and 20, with the average value equal to about 13. It appears that most materials composing the subgrade are derived from on-site fine-grained terrace deposits and sedimentary bedrock of the Capistrano formation. Sand subgrade was encountered in a few localized areas.

Traffic Indices (TI's) for the project are summarized in the table below. The TI for the mainline and the shoulders was taken from the Kleinfelder (2010) LCCA report and is being used for the I-5 HOV Segment 3 project. In addition, our understanding is that a TI of 12 is required for all ramps related to the I-5 HOV Widening project, which is also currently being used for Segment 3.

Table 4. Traffic Indices

Roadway Segment	*Traffic Index, TI (40-yr design life)*
I-5 Mainline	16.0
I-5 Outside Shoulder	10.0
On- and Off-ramps	12.0

7.5 Pavement Structural Section Alternatives

Rigid and flexible pavement sections were determined using the TI's given in Table 4. Flexible pavement sections were developed using the procedures given in Chapter 630 of the Caltrans Highway Design Manual (2008). Rigid pavement sections were developed in accordance with Chapter 620 of the Caltrans HDM (2008). Alternatives for new pavement sections are provided in Table 5.

The majority of R-values range between 6 and 20, and the PI of the earth materials range between 16 and 41. Based on results of expansion tests and the PI's determined for the various materials, the on-site earth materials have high and very high expansion potential. After numerous discussions with Caltrans Materials personnel, it was agreed to use a design R-value of 10, overexcavate a nominal depth to place select non-expansive soil and add a layer of lime treated subgrade, and install underdrains along the mainline and ramps to mitigate the expansion potential of the earth materials.

Rigid pavement is required at ramp termini in accordance with Caltrans standards. Rigid pavement may be selected from Table 5 using the ramp TI. The length of the rigid pavement, along the ramp, depends on the ramp alignment, ramp grades, and length of queues. For signalized intersections, the rigid pavement should extend to the first set of signal loops. For un-signalized intersections, the rigid pavement should extend at least 150 feet along the ramp measured from the ramp terminus. Gore and merging areas (ramp transitions) should also be rigid pavement when the ramps adjoin mainlines that are composed of rigid pavement.

Rapid Strength Concrete (RSC) may be used in lieu of standard Jointed Plain Concrete Pavement (JPCP). "Rapid Setting" LCB may be used in lieu of standard mix LCB. If RSC and Rapid Setting LCB are used, a polyethylene film bond breaker should be used between the two layers. Also, referring to

Table 5, for the composite JPCP/LCB sections, the JPCP and LCB can be combined to create a "full-depth" RSC section. The full-depth RSC thickness should be equal to the sum of the JPCP and LCB thicknesses.

Soils used for the subgrade should be inspected, sampled, and tested during grading to verify that soils possess the minimum R-value and the minimum required relative compaction.

7.6 UNDERDRAIN RECOMMENDATIONS

According to as-built plans, there are existing 8-inch diameter underdrains at two locations along the north side of the mainline. One of the underdrains is shown between mainline Station 263+00 and 269+00 ("A-Line"), and the other between Station 292+75 and 297+00 ("A-Line"). The as-built plans appear to show the drains located just outside the edge of the outside shoulder, between the shoulder and the toe of the existing ascending slopes. The reason for installing the underdrains is unknown; however, we speculate that the drains were placed to either collect localized perched groundwater or to intercept surface water that infiltrates into the ground from the adjacent slopes. The two underdrains that are noted on the as-built plans, and any other undocumented underdrains discovered during construction, should be replaced.

Since the earth materials throughout the project area are highly expansive, minimizing the amount of surface water and groundwater entering the subgrade beneath pavement sections is important to minimize the expansion of native materials and potential distress to pavement sections. Therefore, additional underdrains should be placed along the edge of the mainline and ramps as mitigation against subgrade expansion. The underdrains will aid in collecting groundwater and surface water that infiltrates into the ground, and minimize the amount of water that enters the subgrade below the pavement. Underdrains should be placed in all cut areas and at-grade areas where widening and new pavement is proposed. The underdrains should be placed along the outside edge of the proposed shoulders. Underdrains in fill areas should be evaluated on a case-by-case basis. Final plans should be reviewed by EMI to verify locations of proposed drains and to determine if underdrains are needed in fill areas. Underdrains should outlet to approved drainage devices.

Underdrains should be placed outside the subgrade area (refer to Caltrans Standard Plan D102); the permeable material should extend from 6 inches below the finish grade to 6 inches below the bottom of the pipe. Underdrain pipe should be placed at such depth that the top of pipe lines up or is lower than the bottom of the lowest adjacent AS layer (mainline and shoulder pavement). There should be

no hydraulic conductivity between the permeable material placed around the underdrain pipes and the AB, AS, and LTS that compose the adjacent pavement. Also, there should be no connection between the underdrains/permeable material and proposed edge drains connected to ATPB layers.

Table 5. Pavement Structural Section Alternatives

Design R-value	*Traffic Index*	*Undrained Pavement Structural Sections*[1, 2, 5]	
		Flexible Sections [4]	*Rigid Sections* [3]
10	10.0	0.10' RHMA-O / 0.20' RHMA-G / 1.05' HMA-A / 0.50' AB / 1.00' AS / 0.67' LTS *(Mainline Outside Shoulders)*	
	12.0	1.55' HMA-A / 0.50' AB / 1.00' AS / 0.67' LTS *(Ramp Lanes)*	
	16.0		0.10' RHMA-O / 0.20' RHMA-G / 0.95' JPCP / 0.35' LCB / 2.00' AS / 0.67' LTS *(Mainline Outside Lanes)*
		Drained Pavement Structural Sections[1, 2, 5]	
		Flexible Sections [4]	*Rigid Sections* [3]
	10.0	0.10' RHMA-O / 0.20' RHMA-G / 0.95' HMA-A / 0.25' ATPB / 0.50' AB / 1.00' AS / 0.67' LTS *(Mainline Outside Shoulders – AVH)*	
	12.0	1.40' HMA-A / 0.25' ATPB / 0.50' AB / 1.00' AS / 0.67' LTS *(Ramp Lanes – AVH)*	
	16.0		0.10' RHMA-O / 0.20' RHMA-G / 0.95' JPCP / 0.25' ATPB / 0.35' LCB / 2.00' AS / 0.67' LTS *(Mainline Outside Lanes – AVH)*

Notes:

1. *HMA-A = Hot-Mix Asphalt (Type A); AB = Aggregate Base (Class 2); JPCP = Jointed Plain Concrete Pavement; LCB = Lean Concrete Base; RHMA-O = Rubberized Hot Mix Asphalt-Open Graded (0.10' maximum thickness); RHMA-G = Rubberized Hot Mix Asphalt-Gap Graded (0.20' maximum thickness); ATPB = Asphalt Treated Permeable Base; AS = Aggregate Subbase (Class 2), and LTS = Lime Treated Subgrade.*
2. *Refer to Topic 626 of the Caltrans HDM (2008) for additional recommendations for ramps.*
3. *Based on "South Coast" climate region and lateral support for JPCP (refer to HDM for conditions that satisfy lateral support). Rapid Strength Concrete (RSC) and "Rapid Setting" LCB may be used in lieu of standard JPCP and standard mix LCB, respectively. A polyethylene film bond breaker should be used between the RSC and Rapid Setting LCB layers.*
4. *For flexible pavement sections: the 0.10' RHMA-O may be eliminated if existing pavement does not include RHMA-O, and, the 0.20' RHMA-G may be added to the HMA-A to obtain a full-depth HMA-A thickness.*
5. *Underdrains are recommended to be installed along the outside shoulder of the mainline & ramps. Underdrains should consist of 8-inch diameter perforated pipe surrounded by permeable material wrapped in filter fabric in accordance with Caltrans Standard Plan D102 and Section 68-2 of the Caltrans Standard Specifications (2010a). Underdrains should be placed at such depth that the top of pipe lines up or is lower than the bottom of the lowest adjacent AS layer (mainline and shoulder pavement). Underdrains should outlet to approved drainage devices.*

7.7 COMPACTION AND REMEDIAL GRADING

Compaction of the subgrade should conform to the requirements described in Section 19-5.03 of the Caltrans Standard Specifications (2010a). The top 6 inches of the subgrade should be compacted to at least 95 percent relative compaction for the roadway width between the outer edges of the outside shoulders. In addition, at least 95 percent relative compaction is required for a minimum depth of 2.5 feet below the finish pavement surface for the width of the traveled way plus 3 feet on each side. Relative compaction should be based on the maximum densities determined using CT 216.

In fill areas, select material should be placed in the upper 4 feet of the subgrade. The select material should be granular soil with a minimum R-value of 41 and a Plasticity Index of less than 12 percent.

During earthwork activities, if 95 percent relative compaction cannot be achieved in native fine-grained earth materials, an exception for the minimum relative compaction may be requested from Caltrans. The contractor should use caution in adjusting moisture content – moisture should not increase to the point of causing pumping conditions.

If subgrades are observed to be soft and yielding (pumping) during earthwork operations, the subgrades will require stabilization in order to achieve a firm and unyielding subgrade on which fills can be placed and compacted. Gravel, fabric, geogrid or a combination of the aforementioned materials may be used to stabilize soft subgrades.

8.0 MATERIALS AVAILABLE

Fill is expected to be required for the proposed improvements. Fill materials can be obtained from public or private sources. Private sources of construction materials (sand, gravel, aggregate base, concrete, and asphalt concrete) were not investigated by EMI. However, materials are available from various commercial suppliers located in Orange County and the surrounding area. Table 6 lists a limited number of nearby commercial sources that can supply materials for the project.

Pulverizing existing pavement, during construction, might be performed. New asphalt pavement can be produced using Reclaimed Asphalt Pavement (RAP). RAP and new pavement produced from RAP should conform to requirements of the Caltrans Standard Specifications and Standard Special Provisions (SSP) #S1-020 and 39-010. RAP, pulverized AC and pulverized Portland cement concrete can be used as Aggregate Base (AB) or Aggregate Subbase (AS) assuming the pulverized materials are processed and meet the quality requirements of AB and AS specified in Sections 26 and 25, respectively, of the Caltrans Standard Specifications (2010a). Caltrans must approve the use of RAP and pulverized materials.

Prior to submitting bids and scheduling construction, contractors should verify the availability of materials from the suppliers listed in Table 6. A current listing of mining operations eligible to sell materials to the State can be found on the Internet at: *http://www.consrv.ca.gov/omr/index.htm*.

Table 6. Material Sources

Operator	*Location / Telephone Number*
Sand and Gravel	
Air Pumped Sand & Gravel of California	Mission Viejo / 949-707-1247
GSI Sand & Gravel	Temecula / 951-303-0878
Hanson Aggregates	Santa Ana / 714-245-1550
Ortega Rock	Laguna Niguel / 949-728-1244
Mountain Materials Inc.	Lakeside / 619-390-9932
Pacific Aggregates	Lake Elsinore / 951-245-2460
LaCadena Building Materials Company	Colton / 909-825-1624
P.T.I. Sand & Gravel, Inc.	Corona / 951-272-0140
Riverside Mining Ltd.	Riverside / 951-801-4166
West Coast Sand & Gravel Inc.	Buena Park / 800-522-0282
Ready-Mix Portland Cement Concrete	
A & A Ready Mixed Concrete, Inc.	Newport Beach / 949-253-2800
Associated Ready Mixed Concrete, Inc.	Fountain Valley / 714-966-0231
Bison Ready Mix	Anaheim / 714-936-2757
Calmat Company	San Diego / 619-298-0551
Cemex USA	Temecula / 951-676-4184
Pacific Ready Mix, Inc.	Anaheim / 714-369-8325
Pomeroy Corporation	Perris / 951-657-6093
Robertson's	Corona / 800-834-7557
Standard Concrete Products, Inc.	Santa Ana / 877-713-1555
Superior Ready Mix Concrete	Escondido / 760-745-0556

9.0 RECOMMENDED MATERIALS SPECIFICATIONS

9.1 REVIEW OF GRADING AND CONSTRUCTION PLANS

Recommendations contained herein are based on preliminary plans. Final grading and construction plans should be reviewed by EMI to confirm that geotechnical recommendations were applied to the design and that no additional recommendations are required. Recommendations contained herein may require modification or additional recommendations may be necessary based on the final design.

9.2 GENERAL EARTHWORK REQUIREMENTS

Earthwork should conform to requirements of Section 19 of the Caltrans Standard Specifications (2010a). Compaction of soil should be conducted in accordance with requirements in Section 19-5 of the Standard Specifications. Fills placed on sloping ground should be properly keyed and benched

into the existing side slopes as described in Section 19-6.03 of the Caltrans Standard Specifications. As stated in Section 3.4, a minimum overexcavation of 2 feet should be performed within all areas to receive compacted fill; the overexcavation should extend laterally a minimum distance of 2 feet from the edges of new fills.

9.3 Pavement Subgrade and Materials

Because the majority of R-values range between 6 and 20, and the PI of the earth materials range between 16 and 41, and the materials possess high and very high expansion potential, the subgrade materials in at-grade and cut areas should be overexcavated and the materials replaced by AS, which is included in the recommended pavement sections. In fill areas, Class 3 AS should be placed in the upper 4 feet of the subgrade. The Class 3 AS should be granular soil possessing a minimum R-value of 41 and PI less than 12.

9.4 Lime Treated Subgrade

Prior to placing the AS of proposed pavement structural sections, a 0.67-ft thick layer of Lime Treated Subgrade (LTS) should be constructed. The PI of the surficial earth materials throughout the project area generally vary from 20 to 40 percent. Using a relationship between PI and percent soil binder (by McDowell, 1966), the estimated lime content can range between 3 and 6 percent of dry weight of soil for the lower and higher PI earth materials, respectively. Prior to spreading lime and processing the subgrade to create the LTS layer, the contractor should collect a sufficient number of representative soil and sedimentary bedrock samples to determine the required lime content to achieve a PI less than 10 and a pH of at least 12.5. Materials, preparation, and placement of LTS should conform to requirements in Section 24-2 of the Caltrans Standard Specifications (2010a).

9.5 Underdrains

Underdrains should be placed outside the subgrade area; refer to Caltrans Standard Plan D102 (2010b). The permeable material should extend from 6 inches below the finish grade to 6 inches below the bottom of the perforated pipe. For continuous underdrains that are 500 feet or longer, 8-inch diameter perforated pipe should be used. For continuous underdrains less than 500 feet long, 6-inch diameter perforated pipe may be used. Underdrains should be placed at such depth that the top of pipe lines up or is lower than the bottom of the lowest adjacent AS layer (mainline and shoulder pavement). There should be no hydraulic conductivity between the permeable material placed around the underdrains and the AB, AS and LTS that compose the adjacent pavement. Also, there should be no connection between the underdrains/permeable material and the proposed edge drains connected to the ATPB layer. Refer to Section 7.6 of this report for additional information.

9.6 Pavement Materials and Construction

Hot-Mix Asphalt (HMA) should conform to requirements of Section 39 of the Caltrans Standard Specifications and Special Provisions. For HMA pavement sections, PG 64-10 asphalt binder and 3/4-inch coarse aggregate gradation can be used. For HMA dikes and miscellaneous areas, use 3/8-inch or 1/2-inch aggregate gradation and PG 64-10 asphalt binder. Recommended aggregate gradations for HMA miscellaneous areas and HMA dikes are currently found in Section 39 of the Caltrans Standard Specifications (2010a).

Concrete pavement should be constructed in accordance with Section 40 of the Caltrans Standard Specifications. If Rapid Strength Concrete and Rapid Setting Base are used, the appropriate Caltrans Specifications and Special Provisions should be applied.

Pavement construction should be conducted in accordance with Caltrans Standard Specifications. The proposed pavement sections that will be placed adjacent to existing rigid pavement sections should be constructed such that there are smooth transitions between existing pavement and new pavement surfaces. Where minor variations may occur between the existing rigid pavement and new pavement surfaces, along the join line, grinding of the existing rigid pavement may be performed to ensure a smooth transition between existing and new pavement.

9.7 CULVERT MATERIALS

The Caltrans web-based "AltPipe" software (Version 7.0) was used to obtain material requirements for proposed pipe culverts. The design parameters shown below were used in the AltPipe software to determine culvert material recommendations.

(a) RCP diameter = 18, 24, and 36 inches
(b) Soil pH = 5.9
(c) Soil minimum resistivity = 122 ohm-cm
(d) Sulfate concentration = 8,636 ppm
(e) Chloride concentration = 4,642 ppm
(f) Abrasion level = 1
(g) 2-5 year flow velocity = 1.5 ft/sec
(h) Design service life = 50 years
(i) Height of cover = 0.5 ft to 4 ft

Table 7 below summarizes the recommendations for 18-inch, 24-inch, and 36-inch diameter pipes (based on the parameters shown above). The project structural engineer should check the structural adequacy of all proposed pipes that are buried at depths greater than 4 feet below the finish grade. There were localized areas where the pH was found to be lower than 5.5. However, since only four of the thirty-six samples possessed pH values less than 5.5, the absolute lowest pH value was not used in the assessment. That said, there may be localized areas where concrete or steel culverts and concrete headwalls could have a service life of less than 50 years.

The designer should reassess the recommendations in Table 7 if the actual abrasion levels, flow velocities, and buried depths are greater than what was evaluated in this study.

9.8 ADJACENT STRUCTURES

No excavation should be performed below an imaginary plane inclined at 45 degrees from the edge of any existing foundation without providing proper support for the existing foundation. The contractor is responsible for worker safety in the field during construction. The contractor shall conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California. In addition, the contractor should satisfy all County and Municipal safety regulations. If a shoring plan is required, the geotechnical consultant should review the plan to confirm that appropriate soil parameters have been used in the design.

Table 7. Culvert Material Recommendations

Culvert Material	*Material Recommendations*
Reinforced Concrete Pipe (RCP)	For 18-inch, 24-inch, and 36-inch pipe: (a) Steel cover = 1¼-inch; cement content = 470 pounds/cy; water/cement = 0.35 (b) Steel cover = 1½-inch; cement content = 470 pounds/cy; water/cement = 0.40 (c) Steel cover = 1¼-inch; cement content = 564 pounds/cy; water/cement = 0.40 (d) Steel cover = 1½-inch; cement content = 470 pounds/cy; water/cement = 0.40
Corrugated Steel Pipe (CSP)	Not recommended due to low minimum resistivity values.
Aluminum or Aluminized Steel Pipe	Not recommended due to low minimum resistivity values.
Plastic Pipe	For 18-inch, 24-inch, and 36-inch pipe: (a) Corrugated PVC is acceptable. (b) Corrugated HDPE (Type S) is acceptable. If plastic pipes are used, the ends of the plastic pipes should be protected from fire damage or other physical damage by using concrete headwalls or using concrete or steel end treatments.

9.9 INSPECTION AND TESTING

Qualified geotechnical personnel should perform inspection and testing during the following stages of construction:

- Grading operations including excavations and placement of compacted fill.
- Removal of existing pavement structural sections, curb and gutter, and concrete sidewalk.
- Preparation of pavement subgrade.
- Placement of aggregate base and subbase.
- Excavations for utility trenches and drainage structures.
- Removal or support of buried utilities or structures.
- Shoring installation, if necessary.
- When any unusual conditions are encountered.

10.0 SOIL TESTING AND MATERIAL PROPERTIES SUMMARY

Relevant soil exploration logs and materials testing results prepared as part of this investigation are presented in Appendix A and Appendix B, respectively.

11.0 LIMITATIONS

This report is intended for use by AECOM, the Orange County Transportation Authority (OCTA), the California Department of Transportation, and the Cities of Dana Point and San Clemente for the I-5 HOV Widening, Segment 2 Project. This report is based on the project as described herein and the information obtained from the exploratory boreholes and CPT soundings at the approximate

locations shown on the attached plans. The findings and recommendations contained herein are based on the results of the field investigation, laboratory tests, and geotechnical engineering analyses. Earth materials and subsurface conditions encountered in the exploratory boreholes and CPT's are presumed to be representative of the project area. However, subsurface conditions and characteristics of subsurface materials between exploratory boreholes and CPT's can vary. Findings reflect an interpretation of the direct evidence obtained. Recommendations presented herein are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. EMI should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Changes to the plans or subsurface variations may require reevaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained herein are applicable to the specific design elements and locations which are the subject of this report. The data, opinions, and recommendations have no applicability to any other design elements or to any other locations and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of EMI.

EMI has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the CONTRACTOR, or any other person performing any of the construction, or for the failure of any worker to carry out construction in accordance with Final Construction Drawings and Specifications.

Services performed by EMI were conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

12.0 REFERENCES

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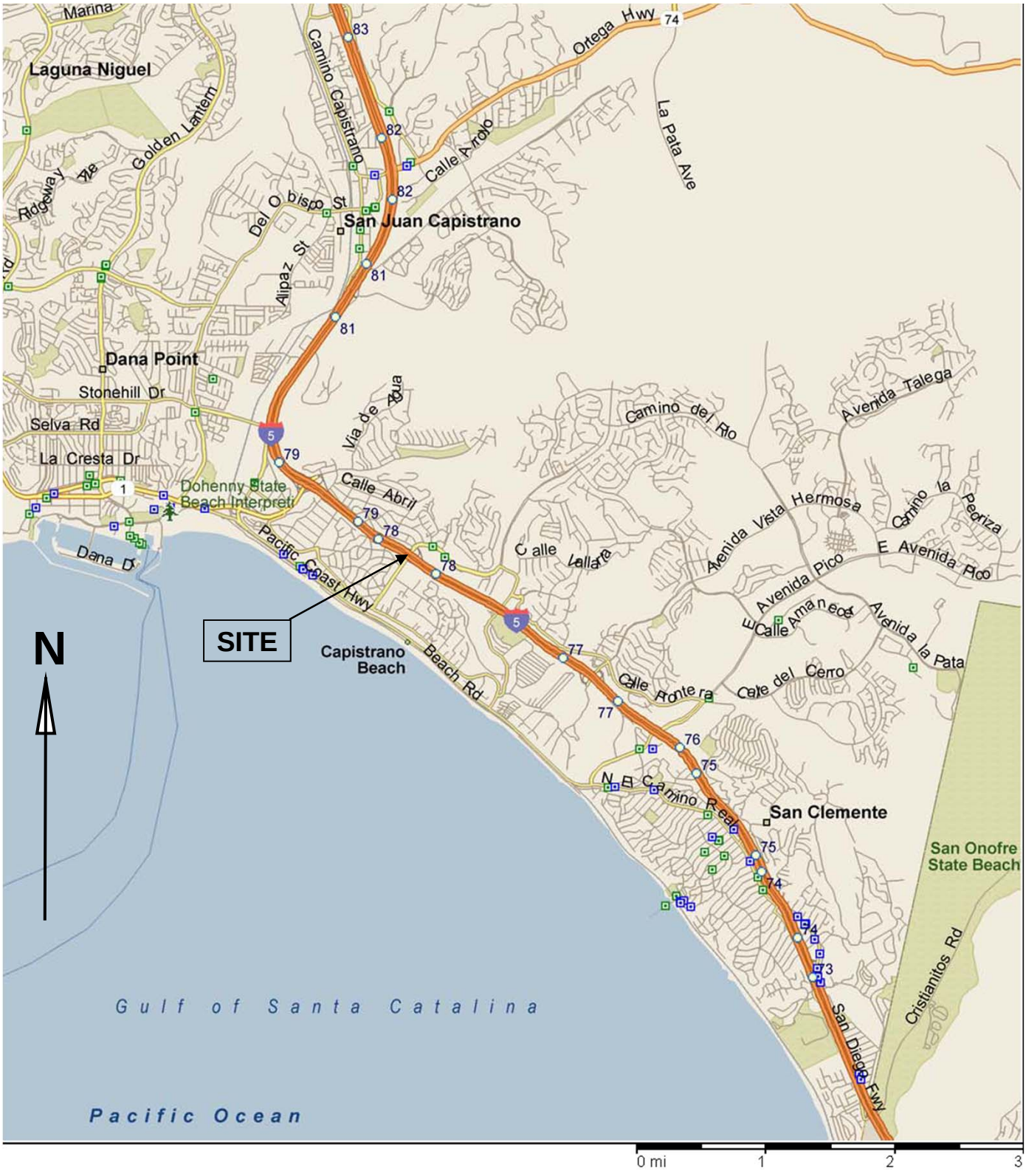

INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

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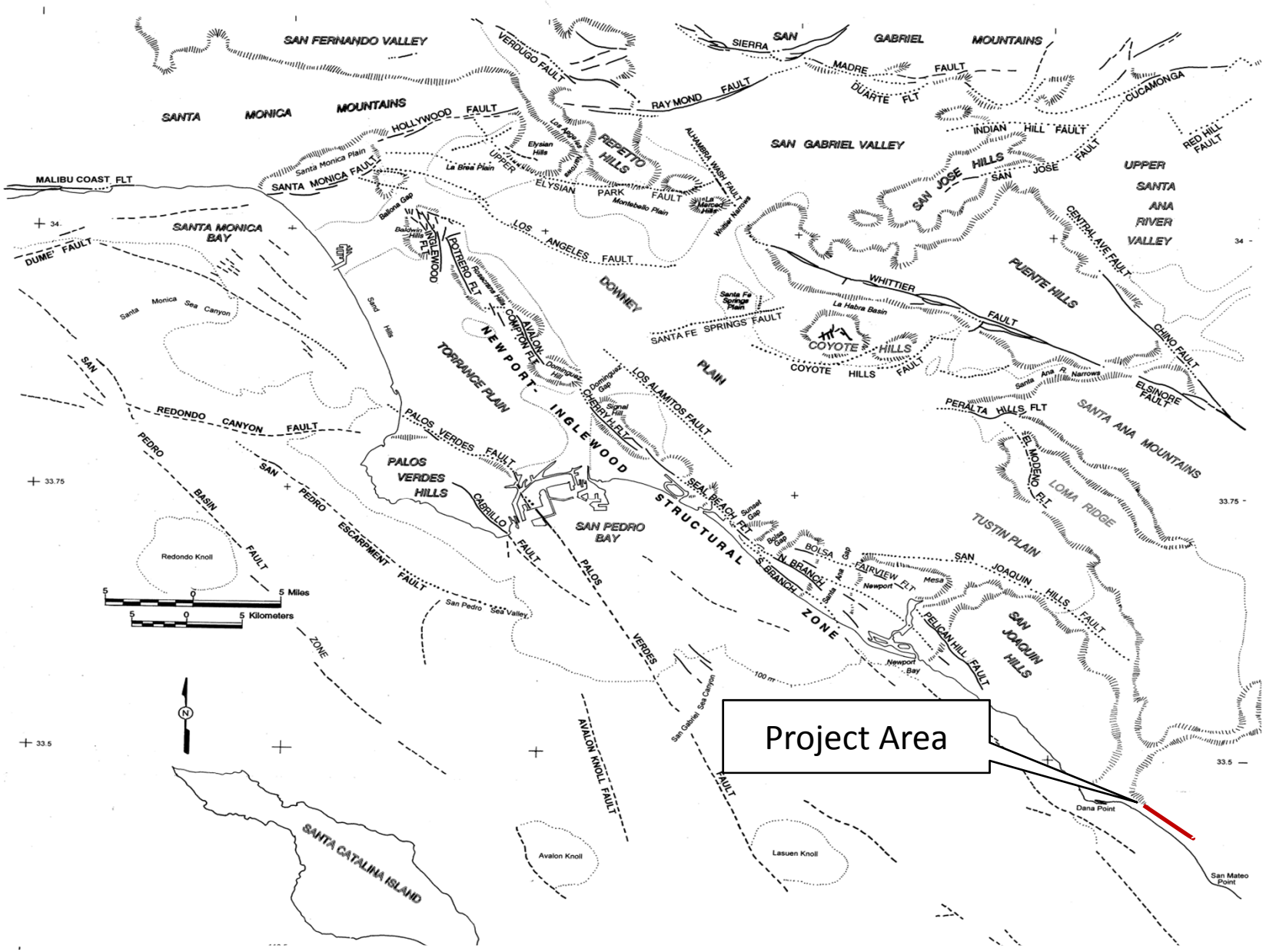
SITE LOCATION MAP

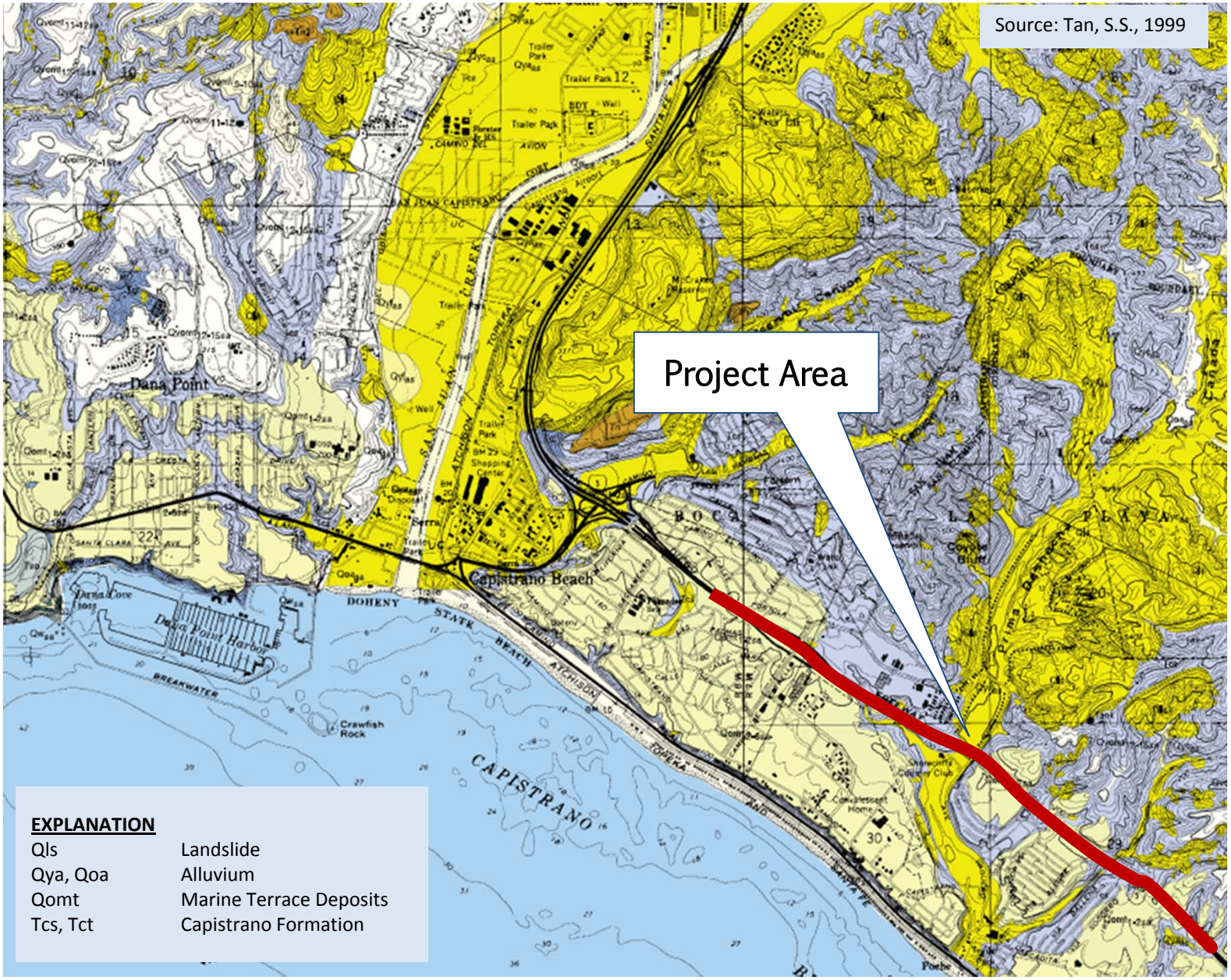
Figure 1

Project No. 11-136

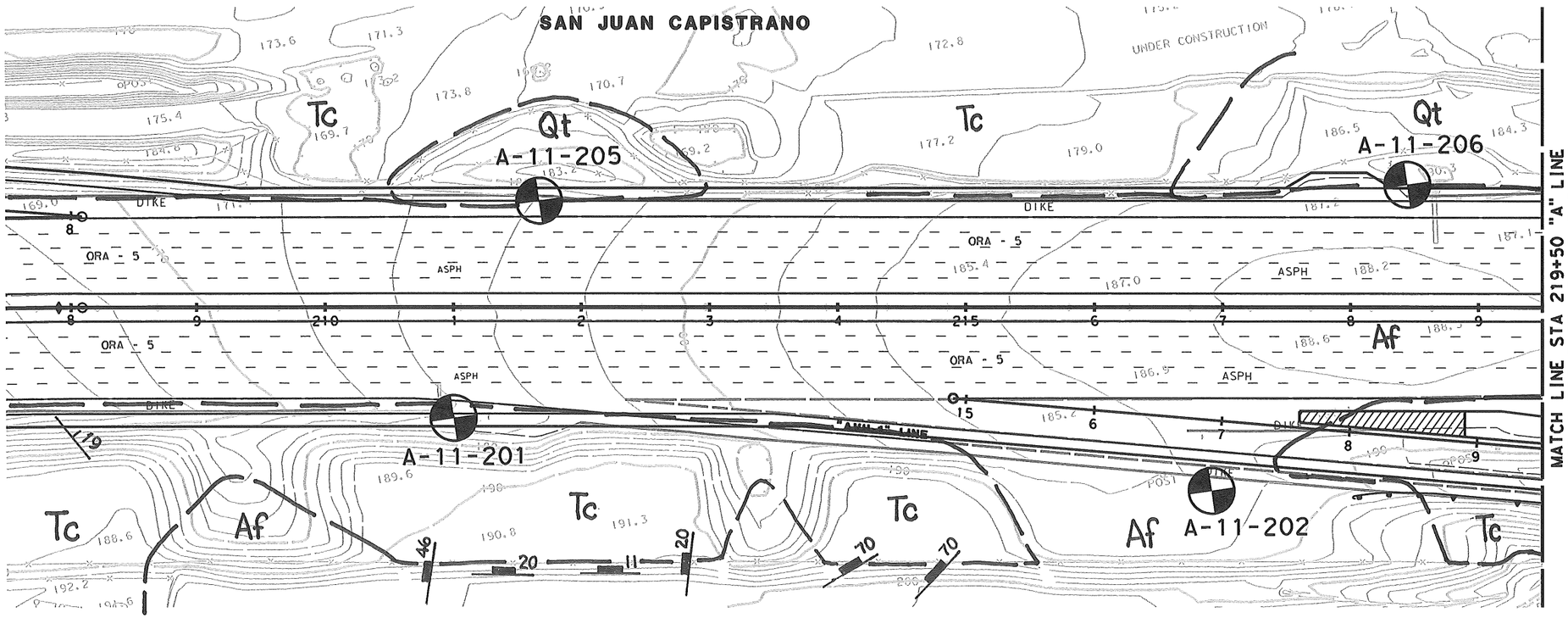
Date: 03-19-12



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Map of Physiography and Active Faults Figure 2
	Project No. 11-136 / Date: 03-19-12	



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2	Geological Map
	Project No. 11-136 / Date: 03-08-12	Figure 3



0 50 100 Feet

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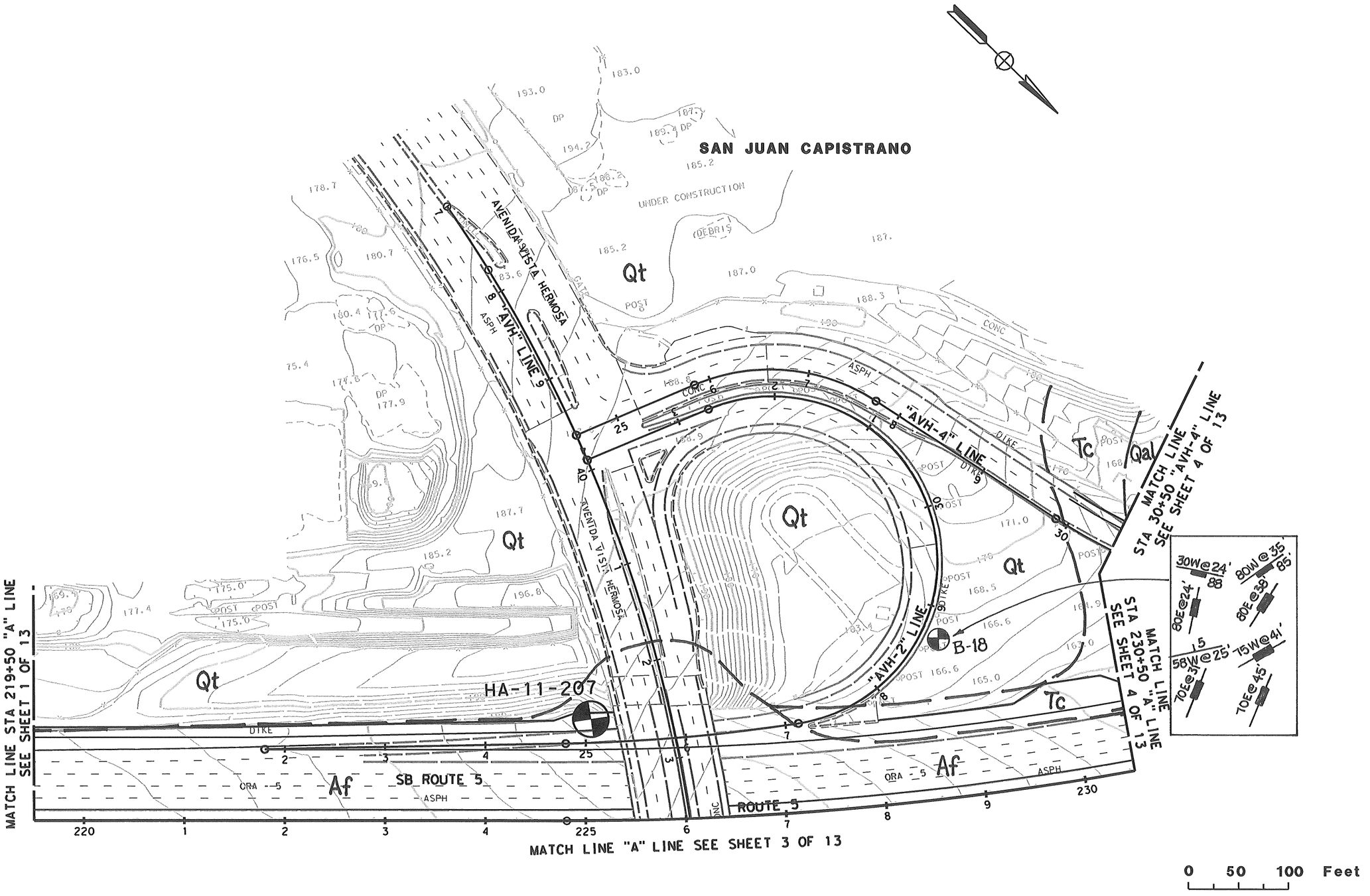
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (1 of 13)

Figure 4

Project No.: 11-136 | **Date: 03-01-2012**



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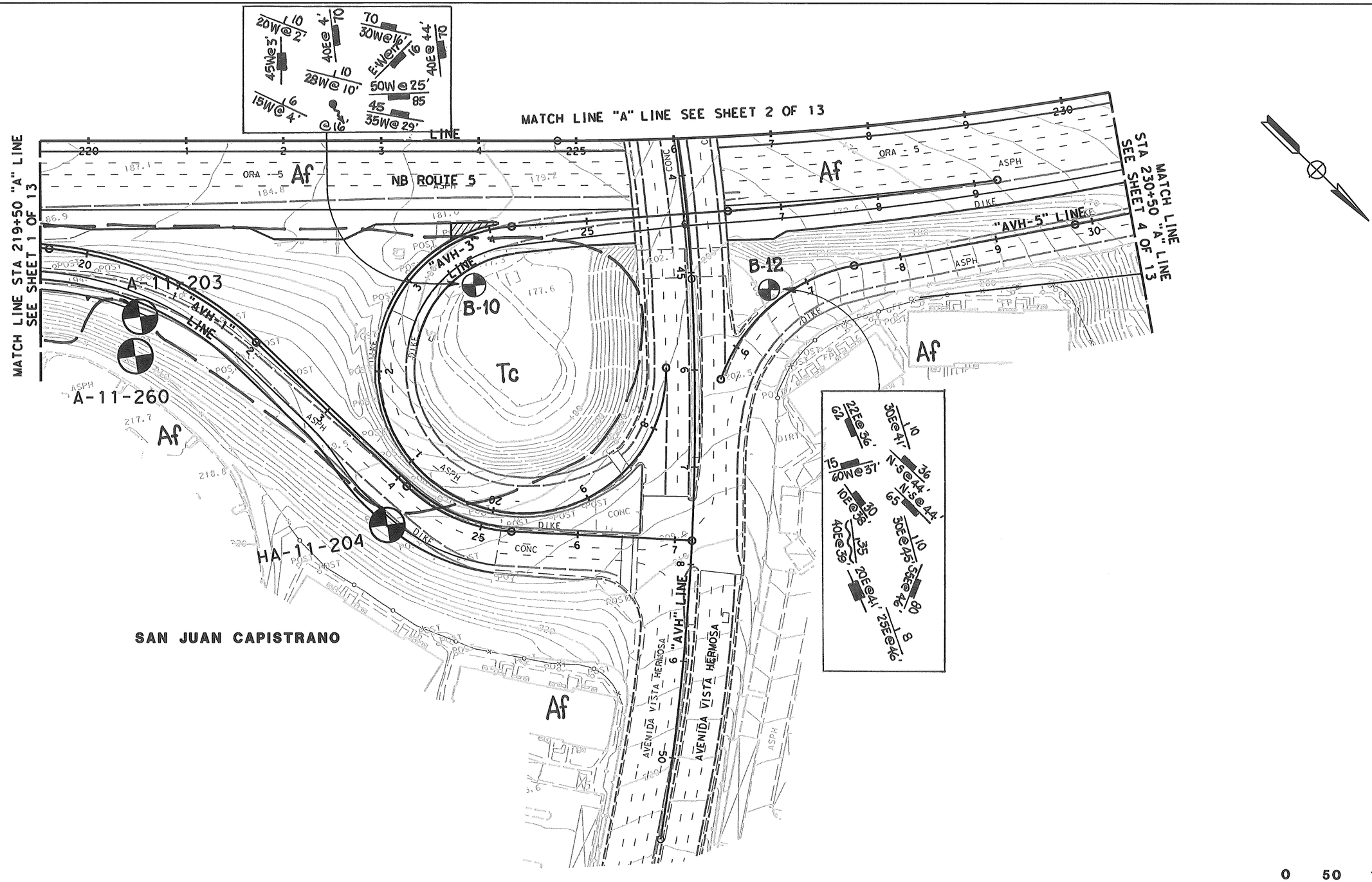
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (2 of 13)

Figure 5



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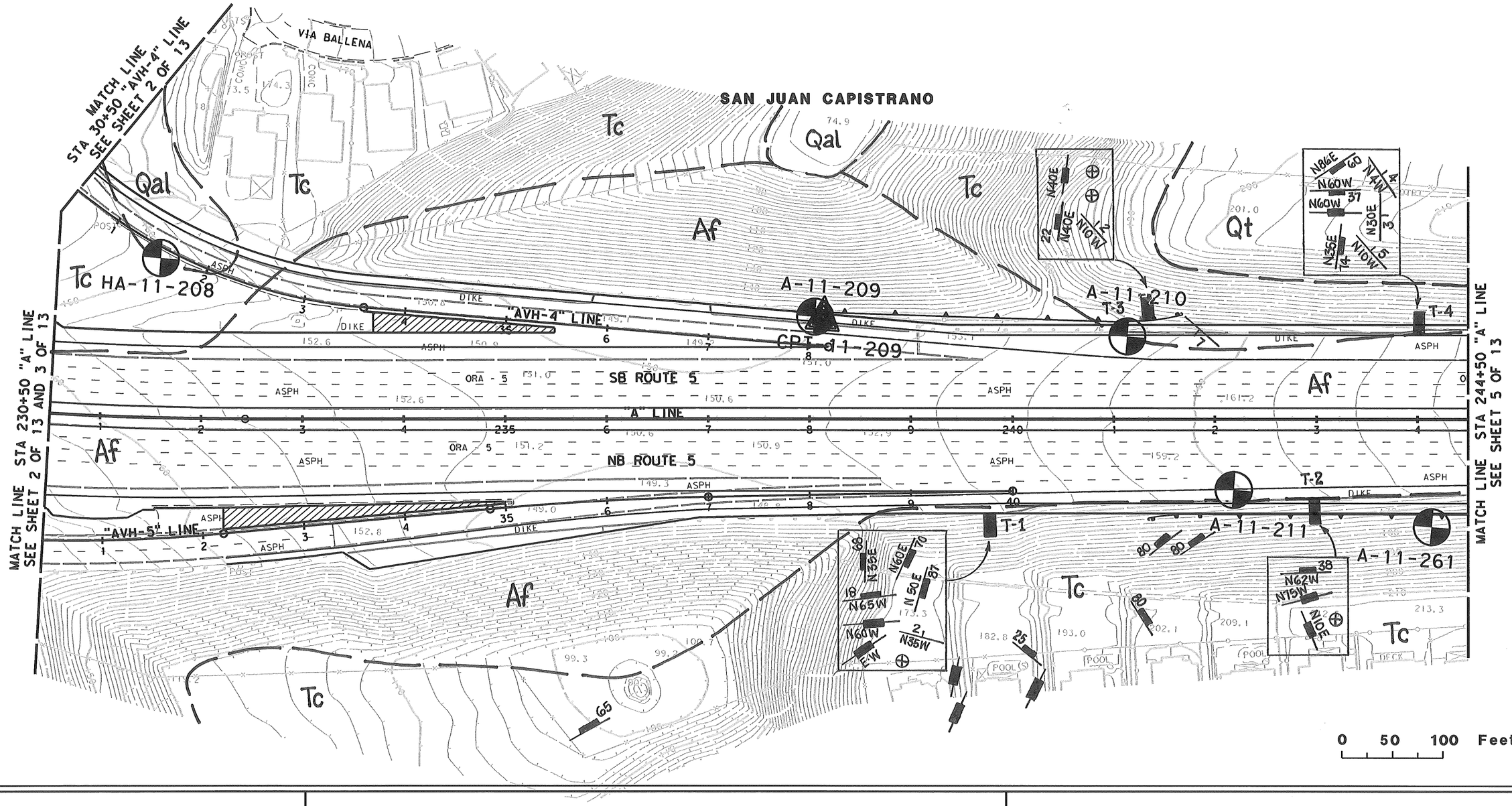
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (3 of 13)

Figure 6

Project No.: 11-136

Date: 03-01-2012



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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

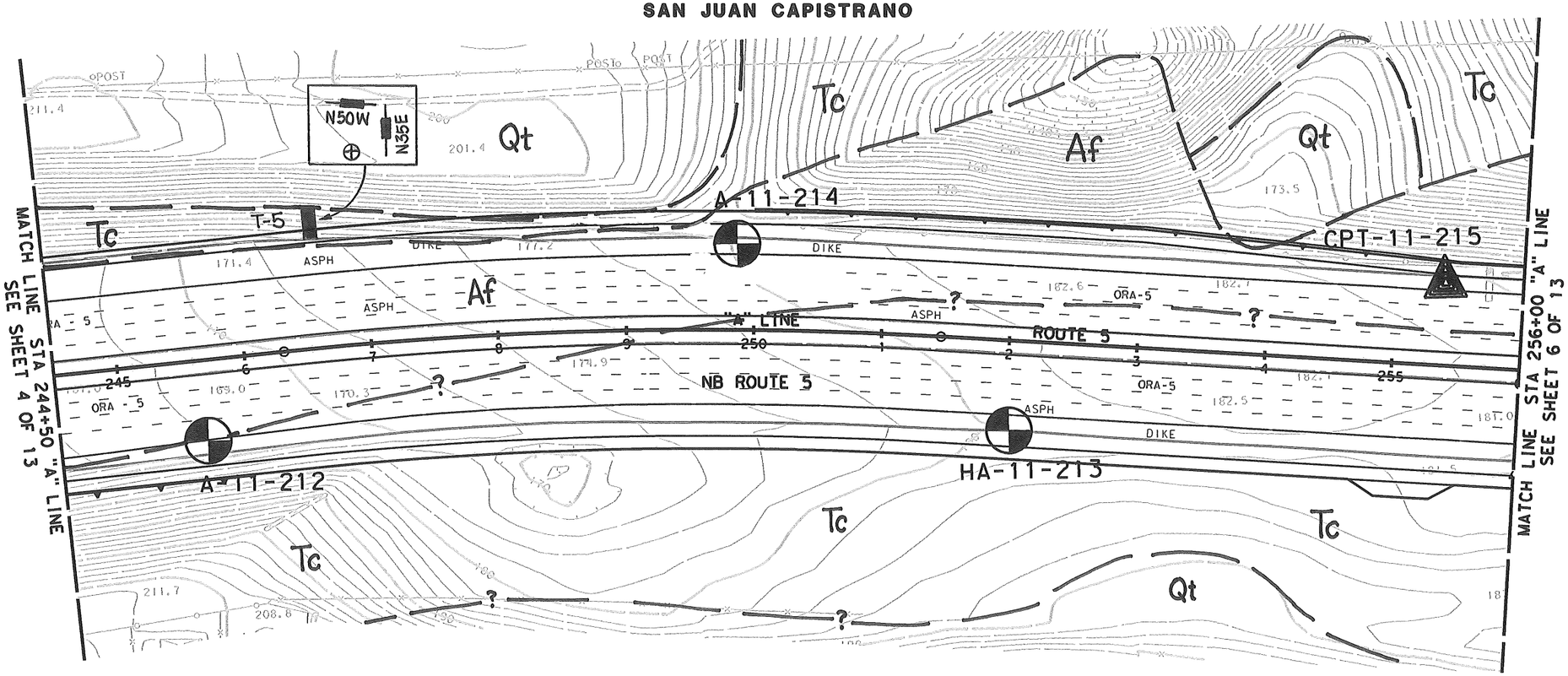
Project No.: 11-136

Date: 03-01-2012

Exploratory Boring Location Map (4 of 13)

Figure 7

SAN JUAN CAPISTRANO



0 50 100 Feet

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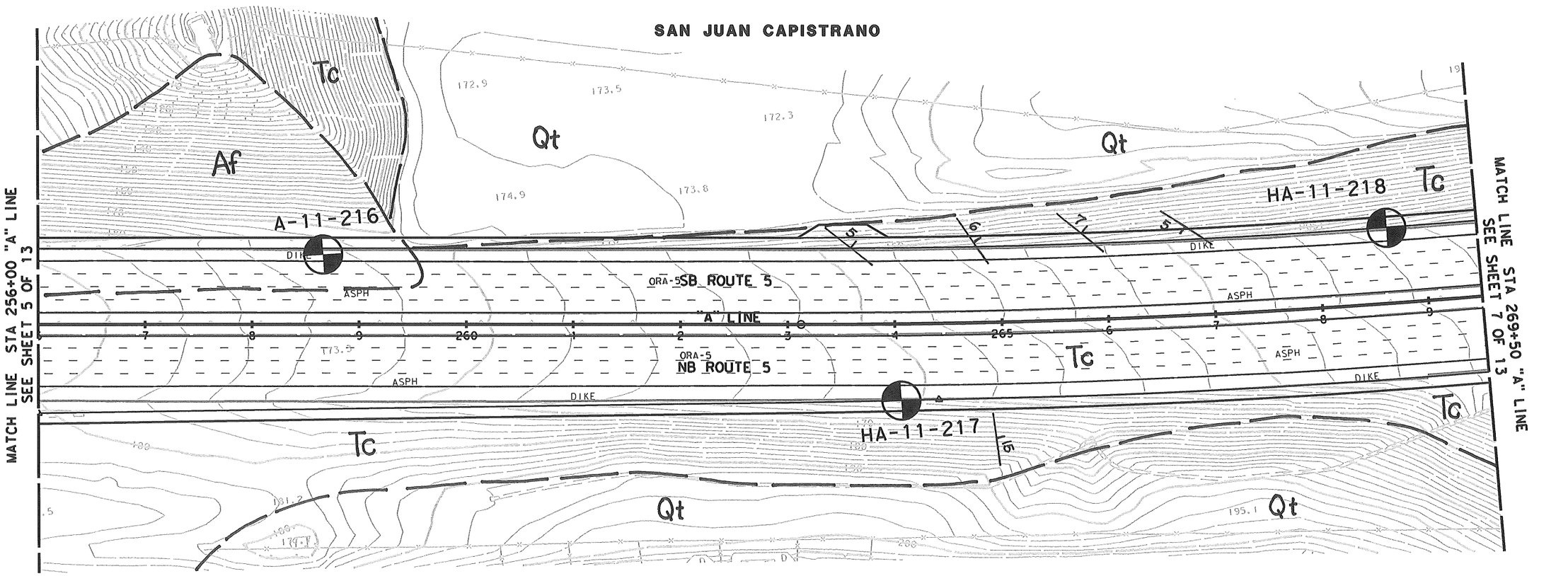
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (5 of 13)

Project No.: 11-136 | **Date: 03-01-2012**

Figure 8



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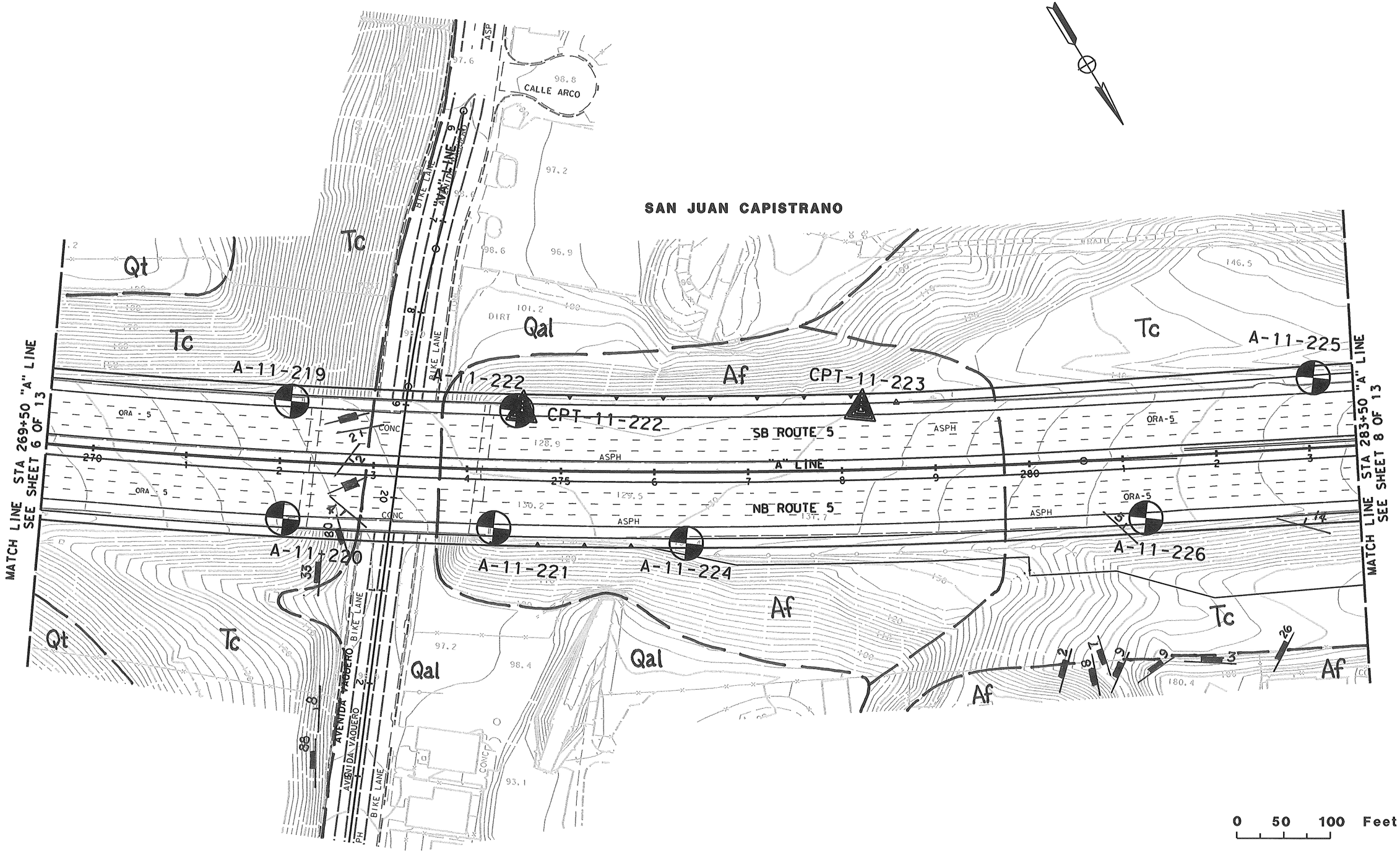
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (6 of 13)

Project No.: 11-136 | **Date: 03-01-2012**

Figure 9

SAN JUAN CAPISTRANO



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (7 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 10

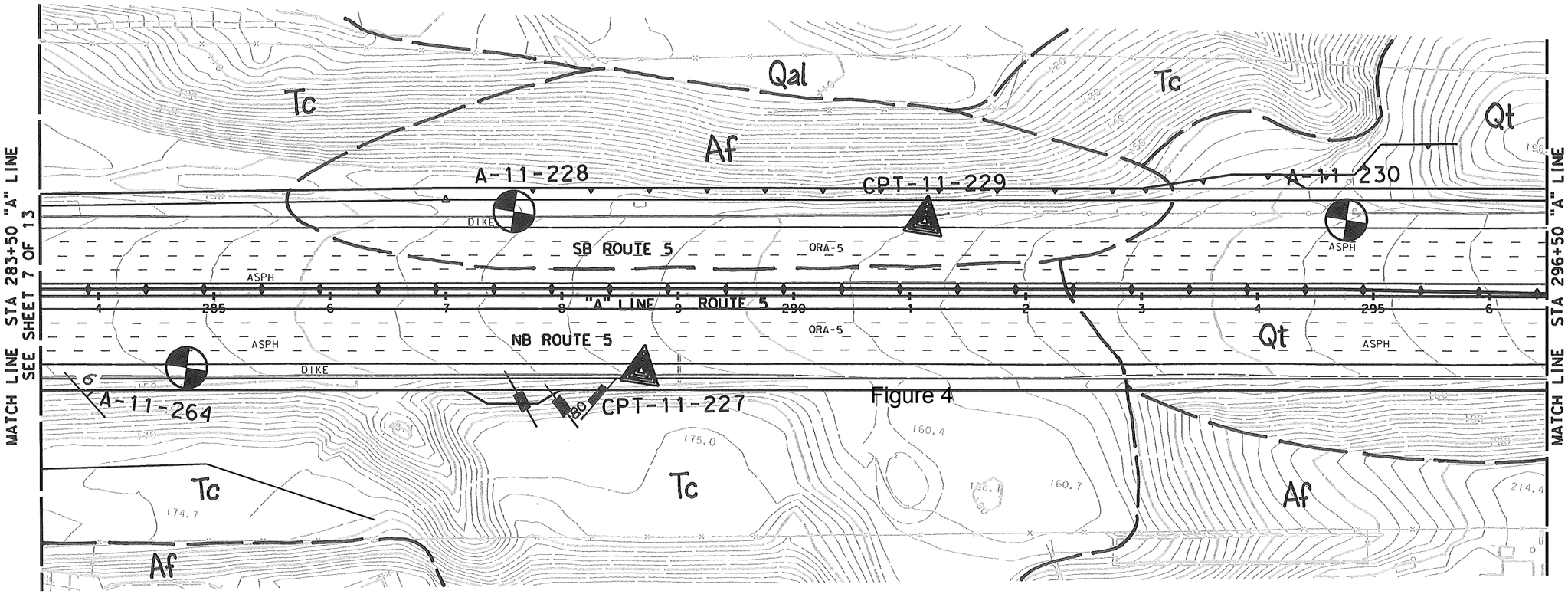
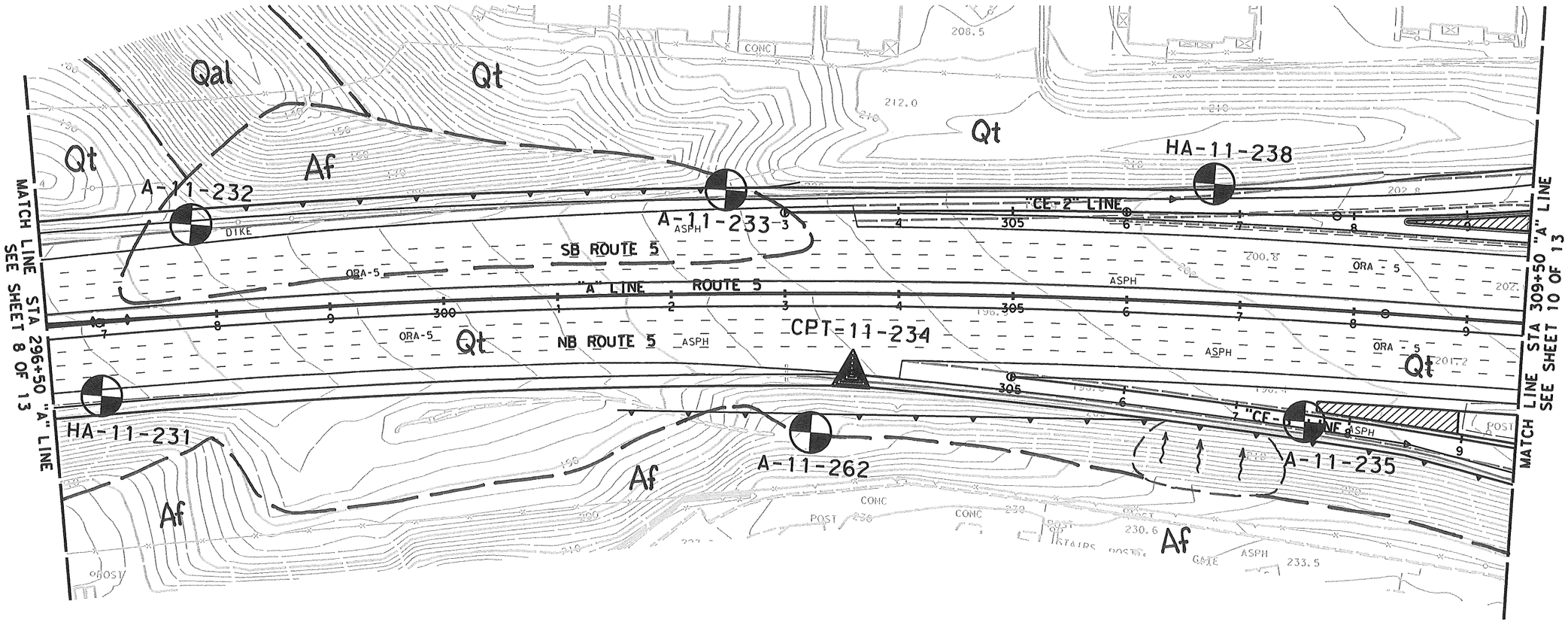


Figure 4

Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (8 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 11

SAN JUAN CAPISTRANO



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Earth Mechanics, Inc.
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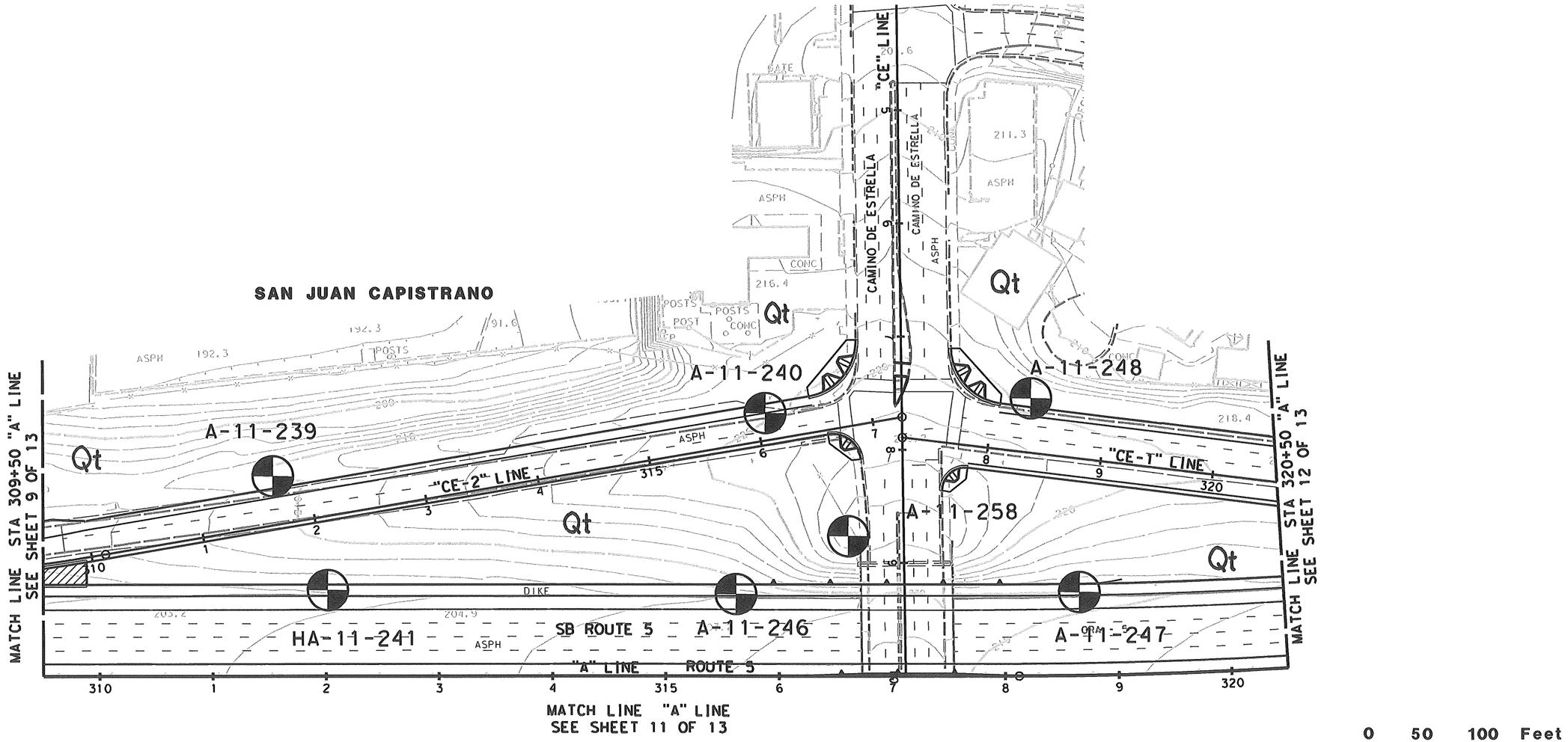
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

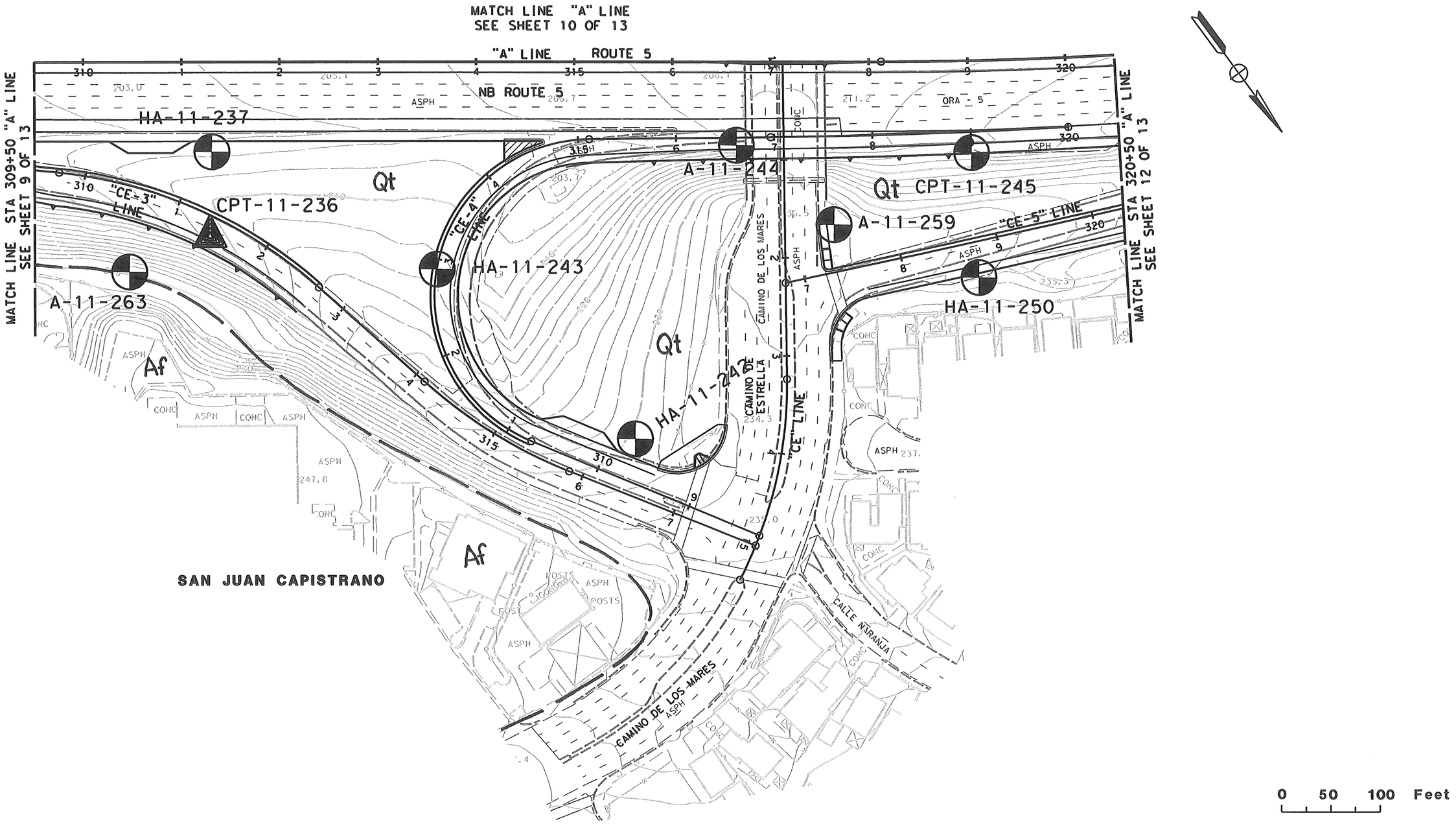
Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (9 of 13)

Figure 12



Earth Mechanics, Inc. Geotechnical & Earthquake Engineering	**INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2**	**Exploratory Boring Location Map (10 of 13)**
	Project No.: 11-136 / **Date: 03-01-2012**	Figure 13



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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (11 of 13)

Figure 14

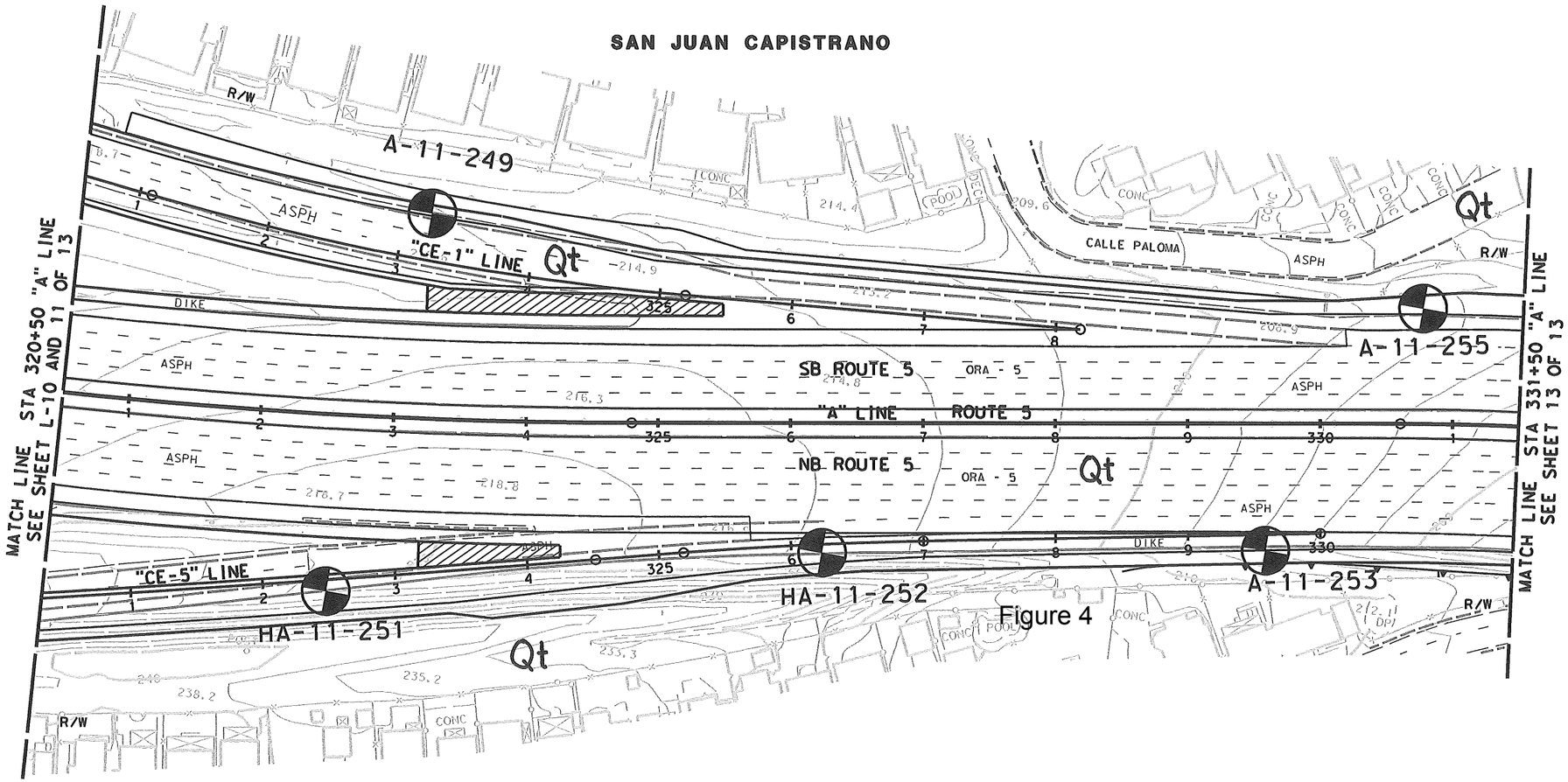

Figure 4

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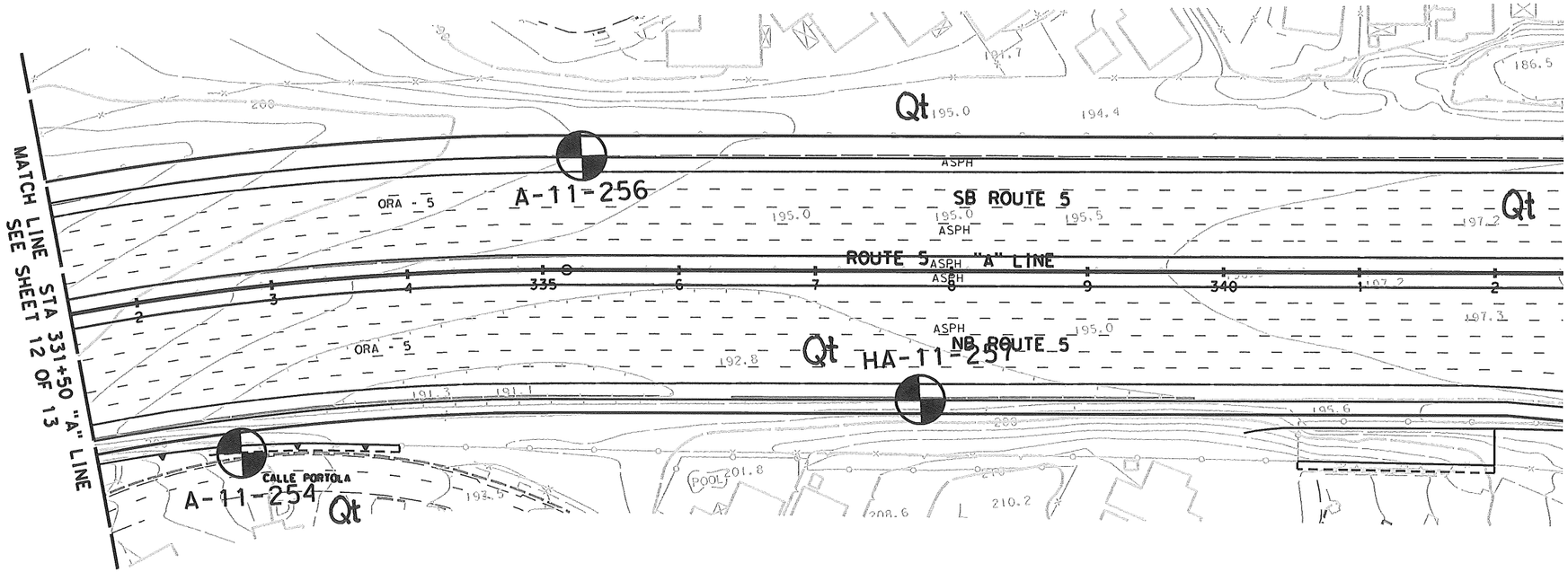
INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Project No.: 11-136 | **Date: 03-01-2012**

Exploratory Boring Location Map (12 of 13)

Figure 15

SAN JUAN CAPISTRANO



0 50 100 Feet

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INTERSTATE 5 HOV WIDENING PROJECT, SEGMENT 2

Exploratory Boring Location Map (13 of 13)

Project No.: 11-136

Date: 03-01-2012

Figure 16

Appendix A. Exploratory Boring Logs and CPT Sounding Logs

Grade Elevation	+27.3 ft				
Boring Depth	25.0 ft	Driller	SoCal Drilling		SHEET 1 OF 1
Borehole Diameter	8 inches	Type of Rig	Mud Rotary	Comments	
Date Drilled	04-21-10	Drive Wt.	140-lb		
Logged By	P. F. Chan	Drop	30 inches		

Depth (ft)	Sample Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	1			SILTY SAND (SM): dark olive-brown, moist, mostly medium to fine, little fines			R,CP
5	D	2	20		Poorly graded SAND (SP): loose, light olive-gray, moist, mostly coarse to fine SAND, slightly compact when handled	14	106	DS
10	S	3	20		Poorly graded SAND with SILT and GRAVEL (SP-SM): light olive-gray, moist, little GRAVEL, mostly coarse to fine SAND, few fines, compact	35	-	PA
15	D	4	40			24	108	

1. 'Sample Type' – Graphical representation of sample type as shown below.
   - S: Split Spoon – Standard Penetration Test Sample (SPT)
   - D: Drive Sample – California Drive Sampler
   - B: Bulk Sample – Obtained by collecting cuttings in a plastic bag
   - T: Tube Sample – Thin-walled Tube Sample
   - P: Thin-walled Pitcher Core Sample

2. 'Sample' – Sample Number

3. 'Blows/foot' – Number of blows required to advance sampler one foot (unless a distance is specified). Samplers in general were driven into the soil at the bottom of the hole with a 140-lb automatic trip hammer falling a standard 30 inches (as specified in header).

   'REC/RQD' – Sample Core Recovery (REC) in percent (%) and Rock Quality Designation (RQD) in percent (%). RQD is defined as the percentage of core in each run in which the spacing between natural fractures is greater than 4 inches. Mechanical breaks of the core are not considered.

4. 'Graphic Log' – Standard symbols for soil and rock types, as shown in Note B opposite

5. ▼ Groundwater elevation while drilling.

6. 'Geotechnical Description' (See also Note A, opposite).
   Soil – Soil classifications are in general accordance with the American Society for Testing and Materials (ASTM) D2488.84. Designations include consistency, moisture, and color. Field description have been modified to reflect results of laboratory analyses where deemed appropriate.

   Rock – Rock classifications generally include a rock type, color, moisture, mineral constituents, degree of weathering, alteration and the mechanical properties of the rock.

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

EMI Project No.: 11-136 | Date: 03/05/12

LEGEND FOR LETTER-SIZE GEOTECHNICAL BORING LOGS (SHEET 1 OF 2)

7. 'Moisture Content' and 'Total Unit Weight' determined by laboratory testing.

8. 'Tests/Results' – Identify types of laboratory tests performed on samples collected from the field investigation. Abbreviations of tests are provided below:

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

Criteria for Describing Moisture Condition

Description	Criteria (After ASTM D 2488)
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

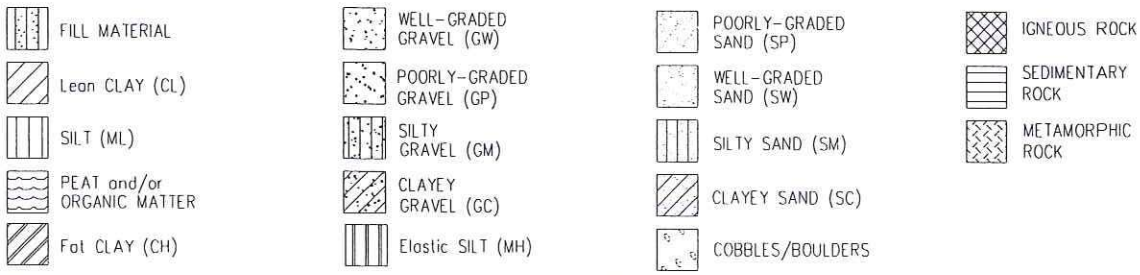
Relative Density of Coarse–Grained Soil

Blows/foot	Relative Density	Field Test (After Sowers, 1979)
0 – 4	Very Loose	Easily penetrated 12" with 0.5–inch steel rod pushed by hand
5 – 10	Loose	Easily penetrated with 0.5–inch steel rod pushed by hand
11 – 30	Medium Dense	Easily penetrated with 0.5–inch steel rod driven by 5–lb hammer
31 – 50	Dense	Penetrated a foot with 0.5–inch steel rod driven by 5–lb hammer
> 50	Very Dense	Penetrated a few inches with 0.5–inch steel rod driven by 5–lb hammer

Consistency of Cohesive Soils

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

Legend of Earth Materials



Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I–5 HOV Widening Segment 2

EMI Project No.: 11–136 | Date: 03/05/12

LEGEND FOR LETTER–SIZE GEOTECHNICAL BORING LOGS (SHEET 2 OF 2)

LOG OF BORING NO. HA-11-204

Grade Elevation:	+204.6 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 223+06; 395' RT; "A" Line
Date Drilled:	10/17/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY fat CLAY (CH): olive-brown, moist, fine SAND, trace medium SAND, trace fine GRAVEL, high plasticity	-	-	PI,CP,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
10								
15								
20								
25								
30								
35								

LOG OF BORING NO. A-11-205

Grade Elevation:	+176.1 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/30/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 211+67; 83' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0					7" Asphalt Concrete, 3" Base			
	B	0			SILTY SAND with GRAVEL (SM): olive-brown, moist, coarse to fine SAND, little coarse to fine GRAVEL, nonplastic	-	-	
					some asphalt fragments			
5	S	1	13		Elastic SILT (MH): very stiff, olive-brown, moist, fine SAND, high plasticity	28	-	PI
					Terminated Boring at 6.5 ft depth.			
					No Groundwater Encountered.			
10								
15								
20								
25								
30								
35								

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-207

Grade Elevation:	+172.8 ft				
Boring Depth:	5.0 feet	Driller:	EMI		SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 225+06; 101' LT; "A" Line	
Date Drilled:	10/17/11	Drive Wt. (lbs):			
Logged By:	CP	Drop (inches):			

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0					7" Asphalt Concrete, 12" Base			
	B	0			SILTY SAND with GRAVEL (SM): olive-yellow, moist, coarse to fine SAND, little coarse to fine GRAVEL, nonplastic	-	-	CP,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-208

Grade Elevation:	+160.4 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 231+56; 157' LT; "A" Line
Date Drilled:	10/11/11	Drive Wt. (lbs):		
Logged By:	RJ	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			Lean CLAY with SAND (CL): olive-brown, moist, medium to fine SAND, low to medium plasticity	-	-	CP,R
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-209

Grade Elevation:	+149.5 ft				
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1	
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer 2. 3.25" O.D. ring sampler 3. Sta. 238+05; 101' LT; "A" Line	
Date Drilled:	09/28/11	Drive Wt. (lbs):	140		
Logged By:	KIAT	Drop (inches):	30		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0					Asphalt Concrete			
	B	0			Lean CLAY (CL): olive, moist, coarse to fine SAND, medium plasticity	-	-	PI,R
5	S	1	3		CLAYEY SAND (SC): very loose, olive-brown, moist, 5% fine GRAVEL, 59% coarse to fine SAND, 33% fines, medium plasticity	12	-	PA
10					Terminated boring at 10 ft depth due to hard drilling No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-213

Grade Elevation:	+180.8 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 252+03; 70' RT; "A" Line
Date Drilled:	10/18/11	Drive Wt. (lbs):		
Logged By:	KIAT	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY lean CLAY to CLAYEY SAND (CL to SC): olive-brown, moist, medium to fine SAND, low to medium plasticity	-	-	
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-217

Grade Elevation:	+159.9 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 264+05; 72' RT; "A" Line
Date Drilled:	10/13/11	Drive Wt. (lbs):		
Logged By:	RJ	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY elastic SILT (MH): olive-brown, moist, coarse to fine SAND, trace fine GRAVEL, high plasticity	-	-	PI,CR,R
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-218

Grade Elevation:	+143.3 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 268+65; 70' LT; "A" Line
Date Drilled:	10/12/11	Drive Wt. (lbs):		
Logged By:	RJ	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			Fat CLAY with SAND (CH): olive-brown, moist, fine SAND, high plasticity, claystone [Bedrock]	-	-	PI,R
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-237

Grade Elevation:	+204.6 ft				
Boring Depth:	5.0 feet	Driller:	EMI		SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 311+31; 92' RT; "A" Line	
Date Drilled:	10/17/11	Drive Wt. (lbs):			
Logged By:	CP	Drop (inches):			

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILTY SAND (SM): light yellowish brown, moist, fine SAND, nonplastic	-	-	
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-238

Grade Elevation:	+200.4 ft			
Boring Depth:	2.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 306+72; 105' LT; "A" Line
Date Drilled:	09/28/11	Drive Wt. (lbs):		
Logged By:	KIAT	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILT (ML): olive-brown, moist, medium to fine SAND, low to medium plasticity	-	-	
					Terminated Boring at 2.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-239

Grade Elevation:	+209.7 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 311+53; 177' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			Lean CLAY (CL): olive-brown, moist, fine SAND, medium to high plasticity	-	-	CP
	S	1	5		medium stiff, 13% fine SAND, 87% fines	16	-	PA
5	D	2	27		very stiff, PP=3.5 tsf, some veins of caliche	24	121	PI
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-240

Grade Elevation:	+219.5 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 315+88; 232' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY lean CLAY (CL): olive-brown, moist, fine SAND, medium to high plasticity	-	-	PI,R
	D	1	23		Lean CLAY (CL): very stiff, olive-brown, moist, fine SAND, medium to high plasticity, PP=3.25 tsf	20	122	
5	S	2	9		stiff, 14% fine SAND, 86% fines	21	-	PI,PA
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-241

Grade Elevation:	+203.9 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 312+01; 76' LT; "A" Line
Date Drilled:	10/10/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY SILT (ML): light yellowish brown, moist, fine SAND, low plasticity	-	-	CR,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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LOG OF BORING NO. HA-11-242

Grade Elevation:	+230.2 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 315+62; 385' RT; "A" Line
Date Drilled:	10/06/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			CLAYEY SAND (SC): dark yellowish brown, moist, medium to fine SAND, nonplastic to low plasticity	-	-	
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-243

Grade Elevation:	+212.4 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 313+60; 212' RT; "A" Line
Date Drilled:	10/10/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			Lean CLAY with SAND (CL): dark yellowish brown, moist, medium to fine SAND, trace fine GRAVEL, low plasticity	-	-	R,PI
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-248

Grade Elevation:	+220.0 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer 2. 3.25" O.D. ring sampler 3. Sta. 318+24; 245' LT; "A" Line
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	
Logged By:	KIAT	Drop (inches):	30	

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY lean CLAY (CL): olive-brown, moist, fine SAND, low to medium plasticity	-	-	
	D	1	24		Lean CLAY with SAND (CL): stiff, olive-brown, moist, 6% fine GRAVEL, 19% fine SAND, 75% fines, low to medium plasticity, PP=3.25 tsf	13	126	PA
5	S	2	15		very stiff, asphalt concrete encountered at bottom of sample	13	-	PI
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-249

Grade Elevation:	+216.2 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	2. 3.25" O.D. ring sampler
Logged By:	KIAT	Drop (inches):	30	3. Sta. 323+24; 155' LT; "A" Line

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SANDY lean CLAY (CL): olive-brown, moist, fine SAND, medium to high plasticity	-	-	CP,PI,R
	S	1	8		Lean CLAY (CL): stiff, olive-brown, moist, fine SAND, medium plasticity, with 4" SILT layer at top	19	-	PI
5	D	2	61		hard, 7% fine SAND, 93% fines, PP>4.5 tsf	15	132	PA
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-250

Grade Elevation:	+233.2 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 319+07; 221' RT; "A" Line
Date Drilled:	10/07/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILTY SAND with GRAVEL (SM): light yellowish brown, moist, medium to fine SAND, little fine GRAVEL, nonplastic	-	-	CP,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-251

Grade Elevation:	+221.4 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 322+56; 134' RT; "A" Line
Date Drilled:	10/07/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			CLAYEY SAND (SC): light yellowish brown, moist, medium to fine SAND, trace fine GRAVEL, low plasticity	-	-	
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-252

Grade Elevation:	+215.1 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 326+24; 98' RT; "A" Line
Date Drilled:	10/07/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			CLAYEY SAND (SC): light yellowish brown, moist, medium to fine SAND, trace fine GRAVEL, low plasticity	-	-	
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. A-11-256

Grade Elevation:	+197.7 ft			
Boring Depth:	6.5 feet	Driller:	2R Drilling	SHEET 1 OF 1
Borehole Diameter:	8 inches	Type of Rig:	Hollow Stem	Comments: 1. CME 75 with automatic hammer 2. 3.25" O.D. ring sampler 3. Sta. 335+28; 84' LT; "A" Line
Date Drilled:	09/28/11	Drive Wt. (lbs):	140	
Logged By:	KIAT	Drop (inches):	30	

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILTY SAND to SILT with SAND (SM to ML): olive-brown, moist, fine SAND, nonplastic to low plasticity	-	-	
	S	1	18		SANDY lean CLAY (CL): very stiff, olive-brown, moist, 5% fine GRAVEL, 31% medium to fine SAND, 64% fines, medium plasticity	10	-	PA
5	D	2	26		Lean CLAY with SAND (CL): hard, olive-brown, moist, 1% fine GRAVEL, 15% medium to fine SAND, 84% fines, medium plasticity, PP>4.5 tsf	14	124	PA,PI
					Terminated boring at 6.5 ft depth. No Groundwater Encountered.			
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

LOG OF BORING NO. HA-11-257

Grade Elevation:	+193.1 ft			
Boring Depth:	5.0 feet	Driller:	EMI	SHEET 1 OF 1
Borehole Diameter:		Type of Rig:	Hand Auger	Comments: 1. Sta. 337+77; 95' RT; "A" Line
Date Drilled:	10/07/11	Drive Wt. (lbs):		
Logged By:	CP	Drop (inches):		

Depth (feet)	Sampler Type	Sample	Blows/foot	Graphic Log	GEOTECHNICAL DESCRIPTION	Moisture (%)	Total Unit Weight (pcf)	Tests/ Results
0	B	0			SILTY SAND with GRAVEL (SM): light yellowish brown, moist, medium to fine SAND, trace fine GRAVEL, nonplastic	-	-	CP,R
5					Terminated Boring at 5.0 ft depth. No Groundwater Encountered.			
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25								
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Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

I-5 HOV Widening Segment 2

Project No. 11-136 Date: 03/05/12

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¾" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

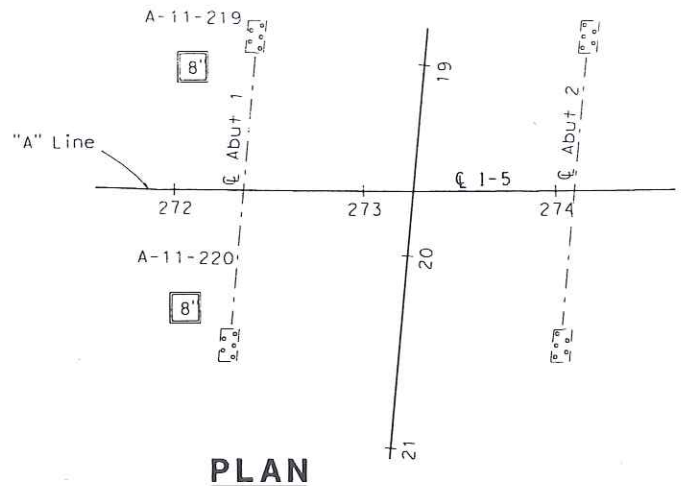
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN
1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

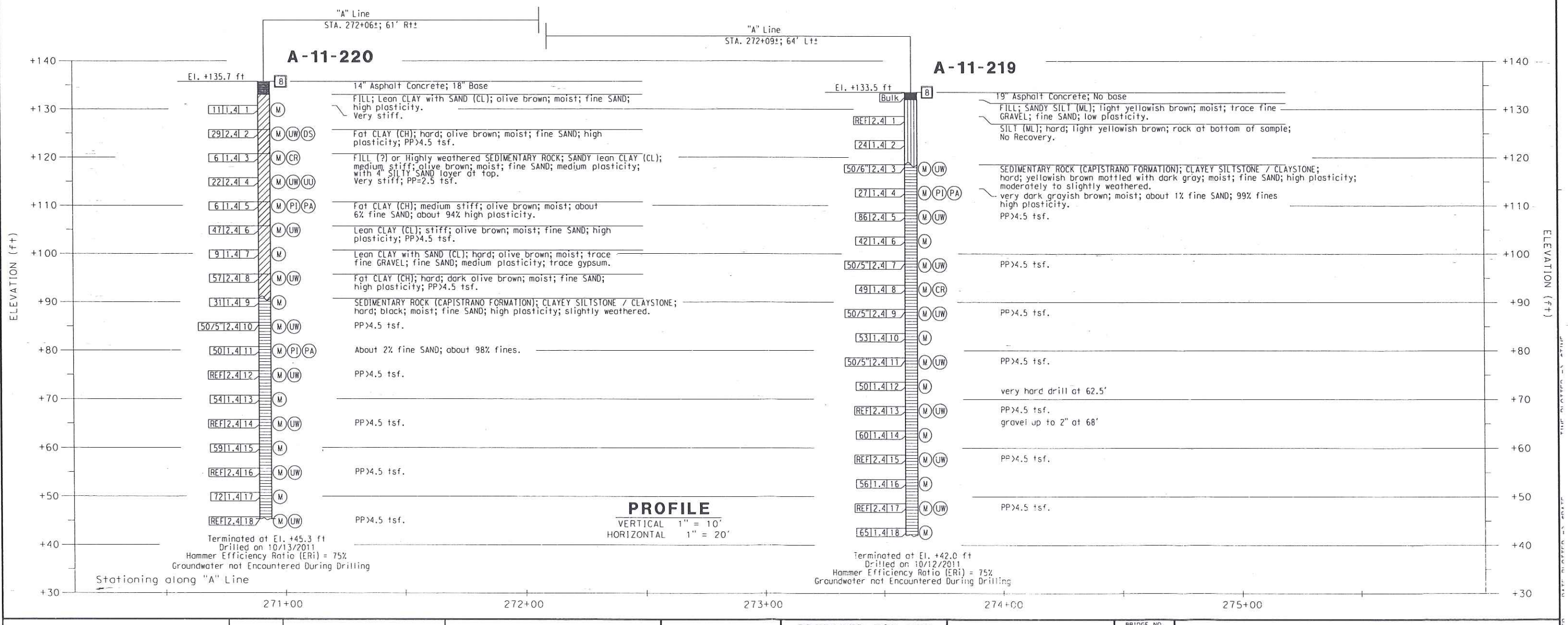
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. 55-0223	AVENIDA VAQUERO UC (WIDEN)
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES 4.97	LOG OF TEST BORINGS 1 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

CONTRACT NO 12-0E0554 PROJECT ID 1200020776

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

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

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS, NO. GE 2357, EXP. 3-31-14, GEOTECHNICAL — STATE OF CALIFORNIA

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

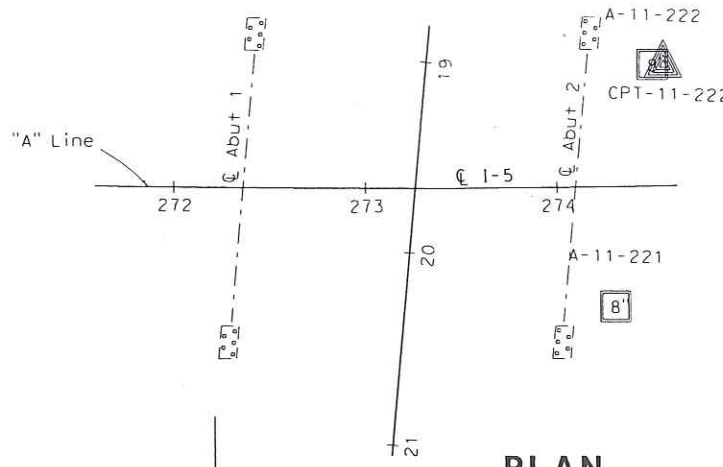
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

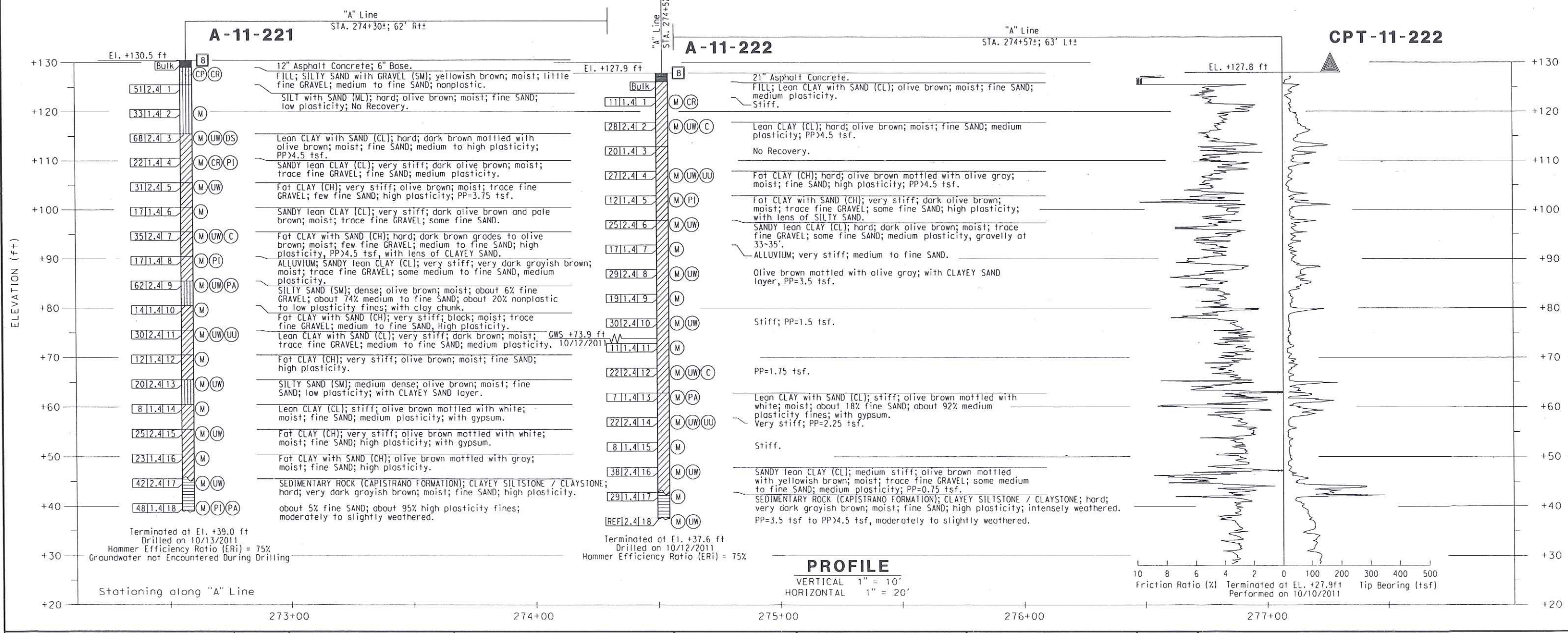
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'

To Los Angeles



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. 55-0223	AVENIDA VAQUERO UC (WIDEN)
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES 4.97	LOG OF TEST BORINGS 2 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

CONTRACT NO.: 12-0E960 | PROJECT ID: 1200020278

FILE => @REQUEST

FED. ROAD DIST. NO.	STATE	F. A. PROJECT No.	SHEET No.	TOTAL SHEETS
7	CALIF.			

DIST.	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
07	Ora	5	0.0/6.1	526	538
30		5	27.1/27.4		

March 12, 1972

BENCH MARK

#271-26-60 El. 131.79
3" std. brass cap monument 4' Rt. ℄ Fwy.
Sta. 271+01.30 M.P.C.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
12	ORA	5	3.8/6.2		

GEOTECHNICAL PROFESSIONAL — DATE

AVENIDA VAQUERO UC (WIDEN)

LOG OF TEST BORINGS 3 OF 3

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

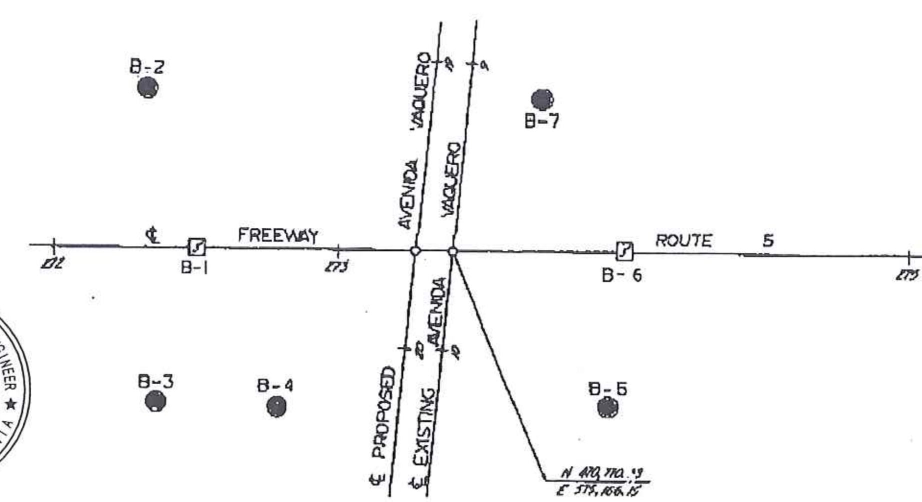
UNIT:
PROJECT NUMBER & PHASE: 12000202781

BRIDGE No.	Sheet	of
55-0223	1	1

Revisions made to this Log of Test Borings from the original ____ Log of Test Borings are the addition of the following table and notes:

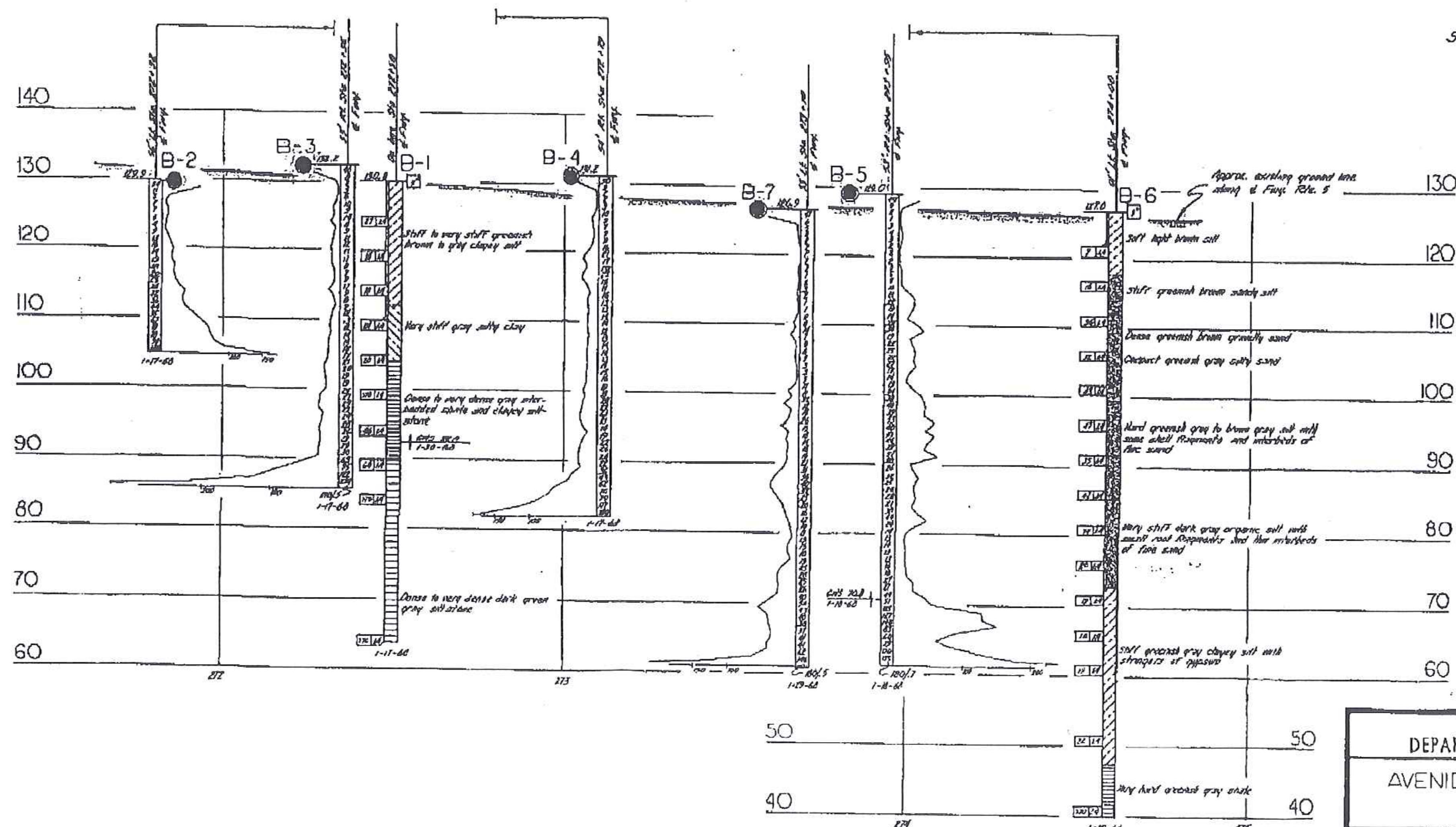
Boring	Station	Offset from C/L Rte. 101

REGISTERED PROFESSIONAL ENGINEER A. KORKOS NO. GE 2357 EXP. 3-31-14 GEOTECHNICAL STATE OF CALIFORNIA



PLAN
Scale: 1"=30

PROFILE
Scale: Vert. 1"=10' Horiz. 1"=20'



NO AS BUILT CORRECTION
AS BUILT
CORRECTIONS BY W. Lohse
CONTRACT NO. 07-105274
DATE 4-1-85 and 10-18-85

Sheet 11 of 11

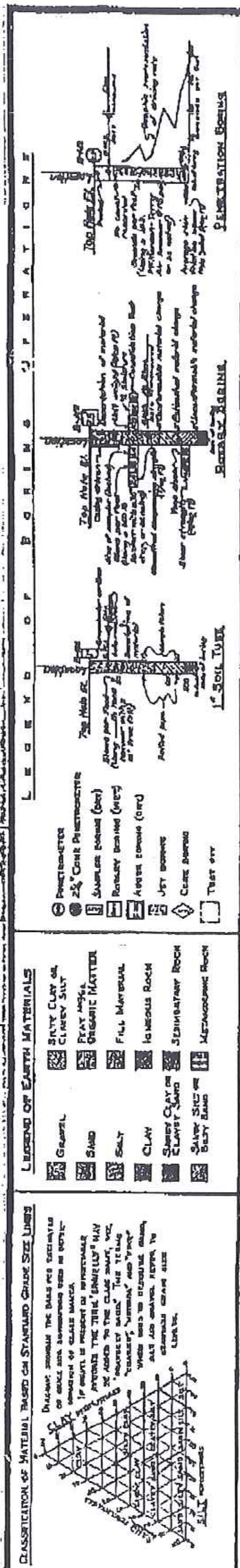
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

AVENIDA VAQUERO UNDERCROSSING

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 55-223 | FILE | DRAWING 55273-7

PREL. DRAWING No. PR-



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.

FIELD STUDY	K. Conley 1-12-68
DRAWN	R. Alba 2-9-68
CHECKED	K. Conley 3-11-68

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

526

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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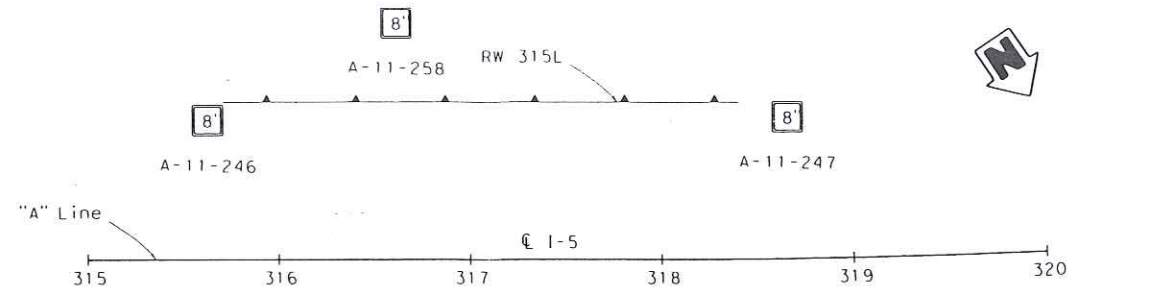
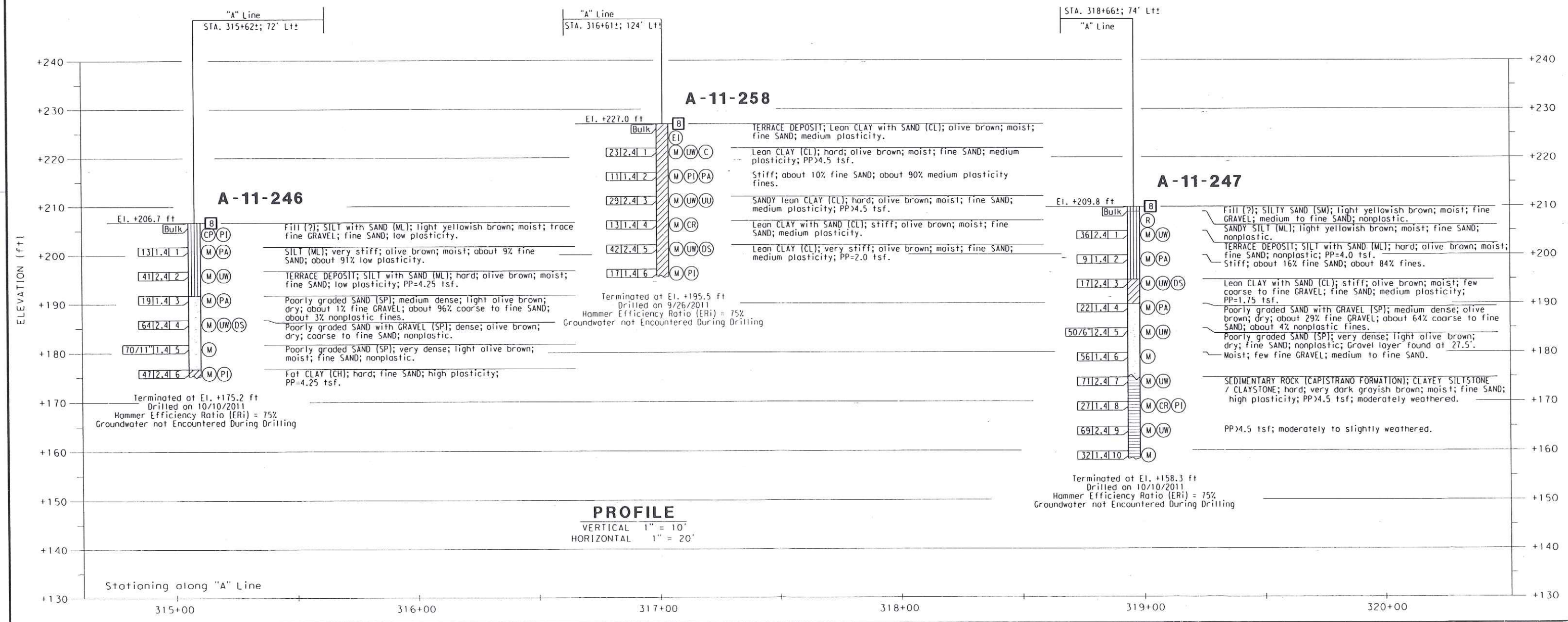
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		

BRIDGE NO. 55-0224
POST MILES 5.8

TIEBACK WALLS 315L & 316R
LOG OF TEST BORINGS 1 OF 3

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: -
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES

SHEET OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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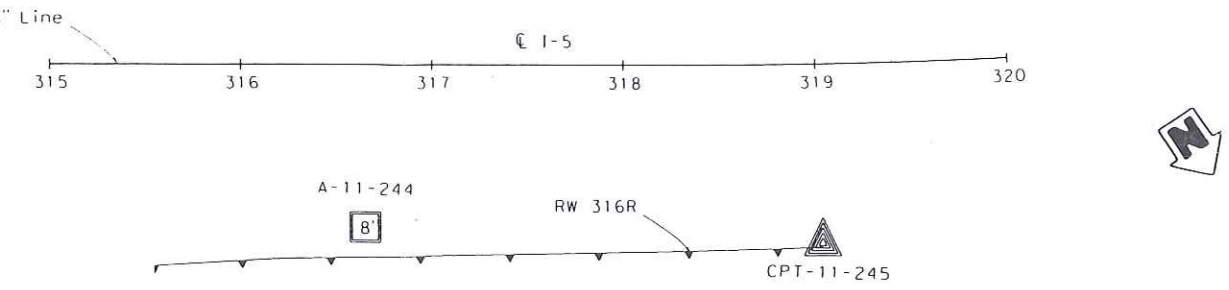

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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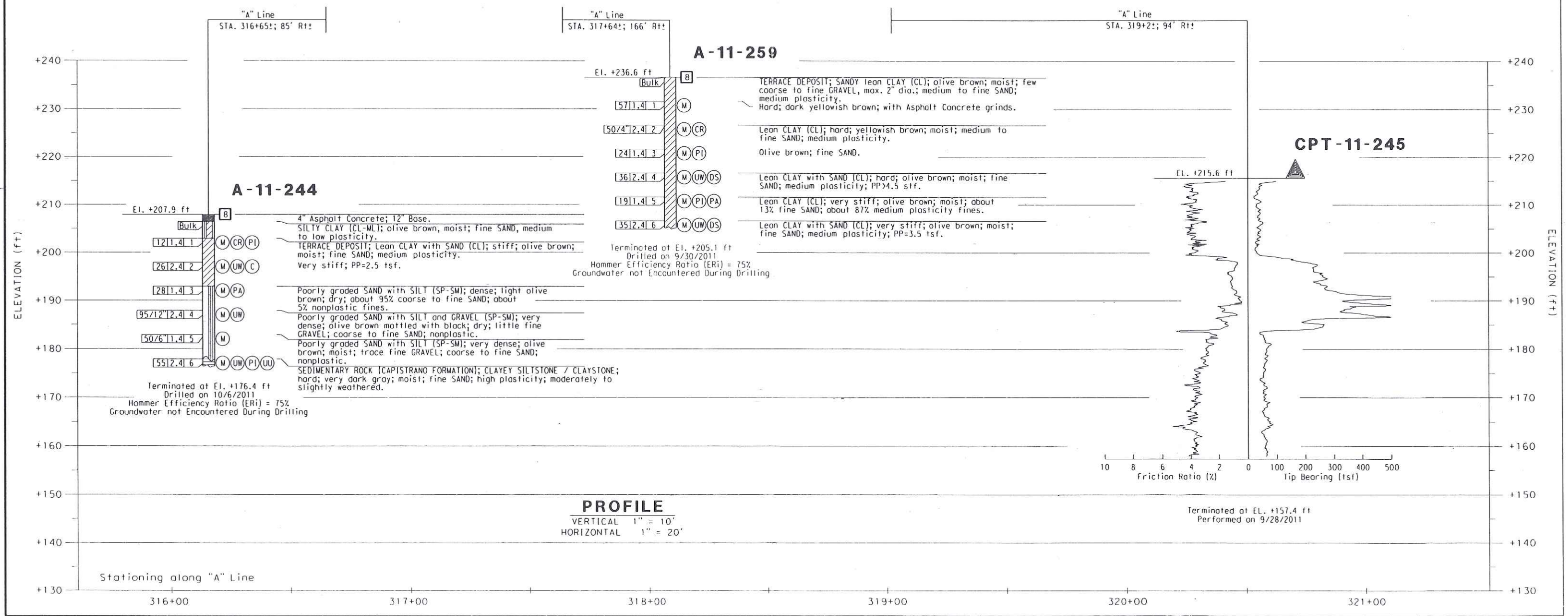
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. 55-0224	TIEBACK WALLS 315L & 316R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES 5.8	LOG OF TEST BORINGS 2 OF 3

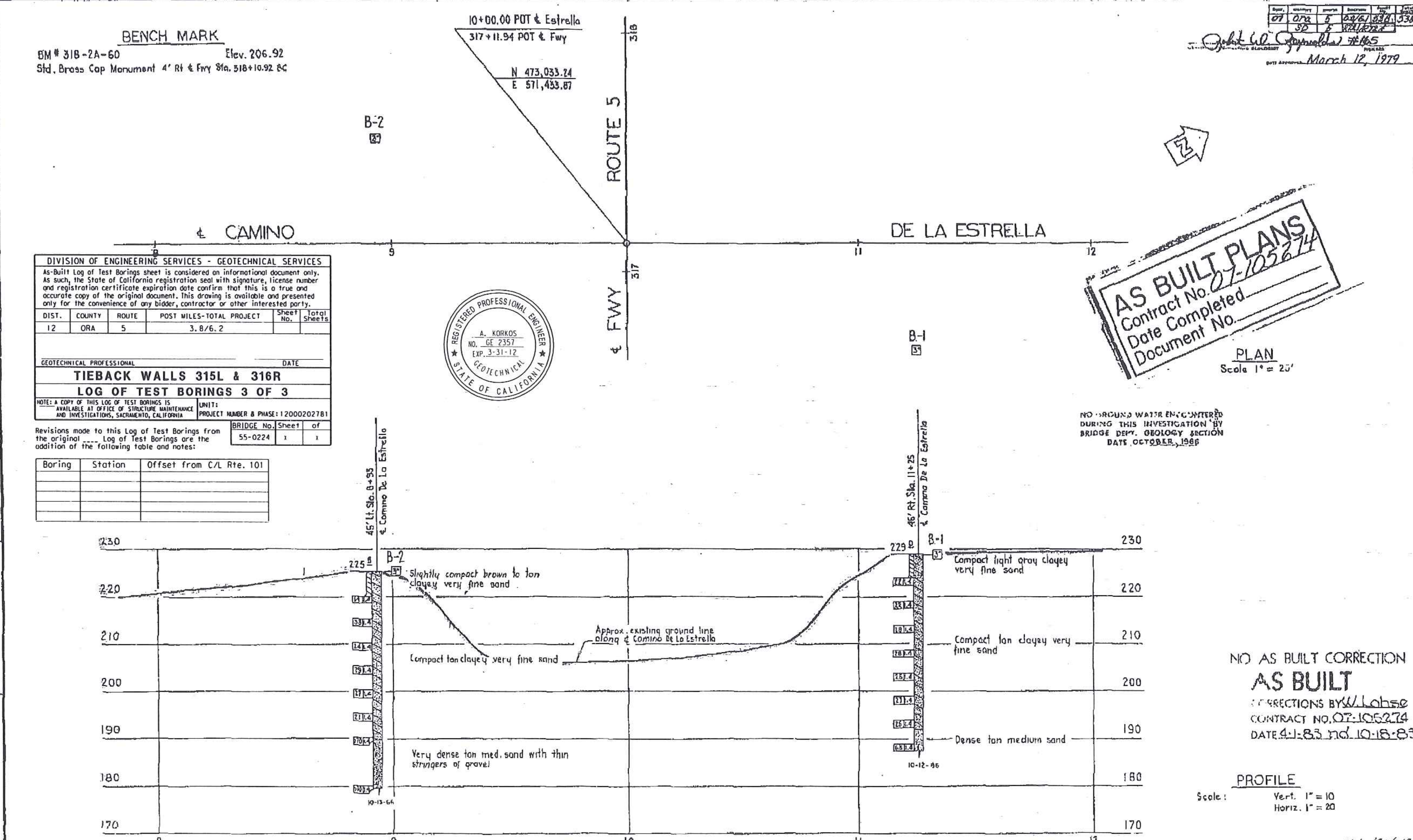
GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF



A. KORKOS
NO. GE 2357
EXP. 3-31-12
REGISTERED PROFESSIONAL ENGINEER
GEOTECHNICAL
STATE OF CALIFORNIA

AS BUILT PLANS
Contract No. 07-105674
Date Completed
Document No.

NO AS BUILT CORRECTION
AS BUILT
CORRECTIONS BY W. Lohse
CONTRACT NO. 07-105274
DATE 4-1-83 and 10-18-83

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES					
As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.					
DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
12	ORA	5	3.8/6.2		

GEOTECHNICAL PROFESSIONAL DATE

TIEBACK WALLS 315L & 316R

LOG OF TEST BORINGS 3 OF 3

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT:
PROJECT NUMBER & PHASE: 12000202781

BRIDGE No.	Sheet	of
55-0224	1	1

Revisions made to this Log of Test Borings from the original ____ Log of Test Borings are the addition of the following table and notes:

Boring	Station	Offset from C/L Rte. 101

DIST.	STATE	F. A. PROJECT No.	SHEET No.	TOTAL SHEETS
7	CALIF.			

March 12, 1979

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

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.

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

538

Sht 12 of 12

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CAMINO DE ESTRELLA OVERCROSSING REPLACE

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 55-224 | FILE | DRAWING 55-224-11

Charge 07209
W.A. 105271

PREL. DRAWING No. PR-

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

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REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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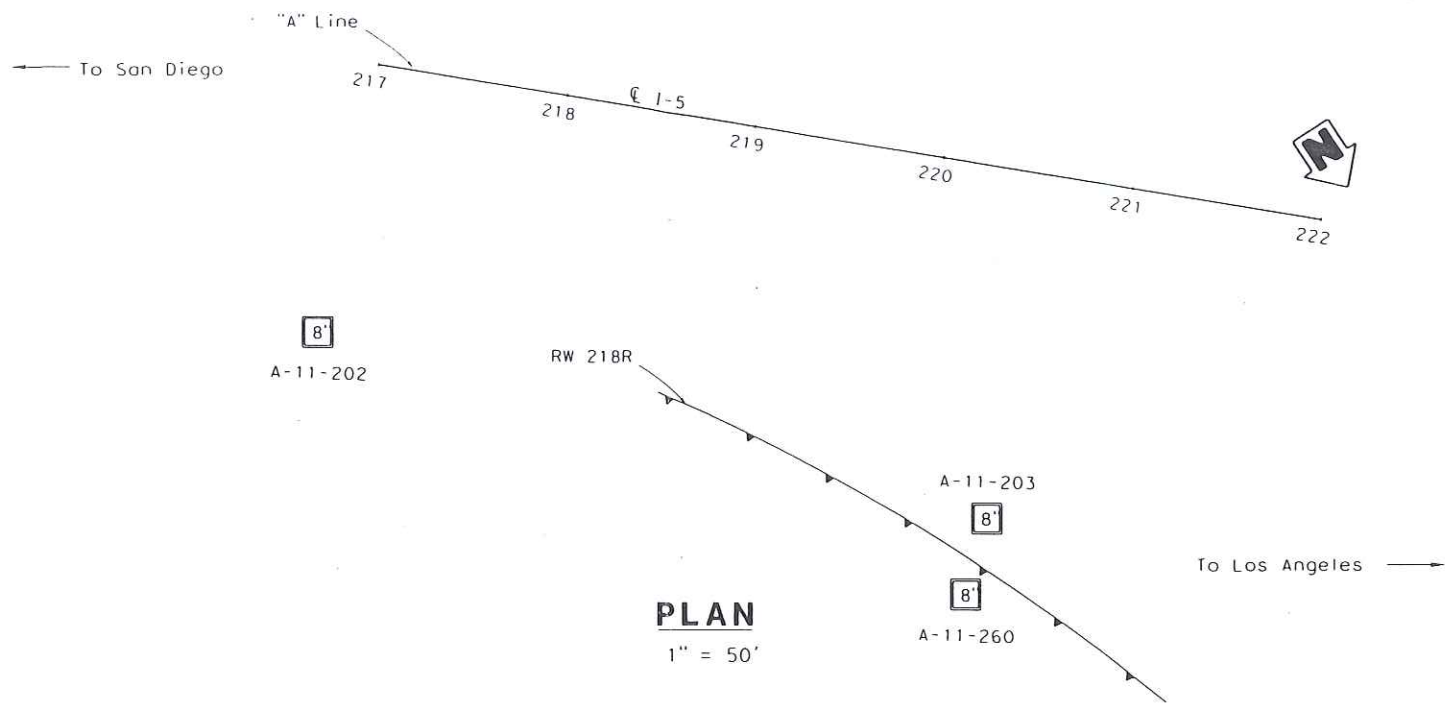
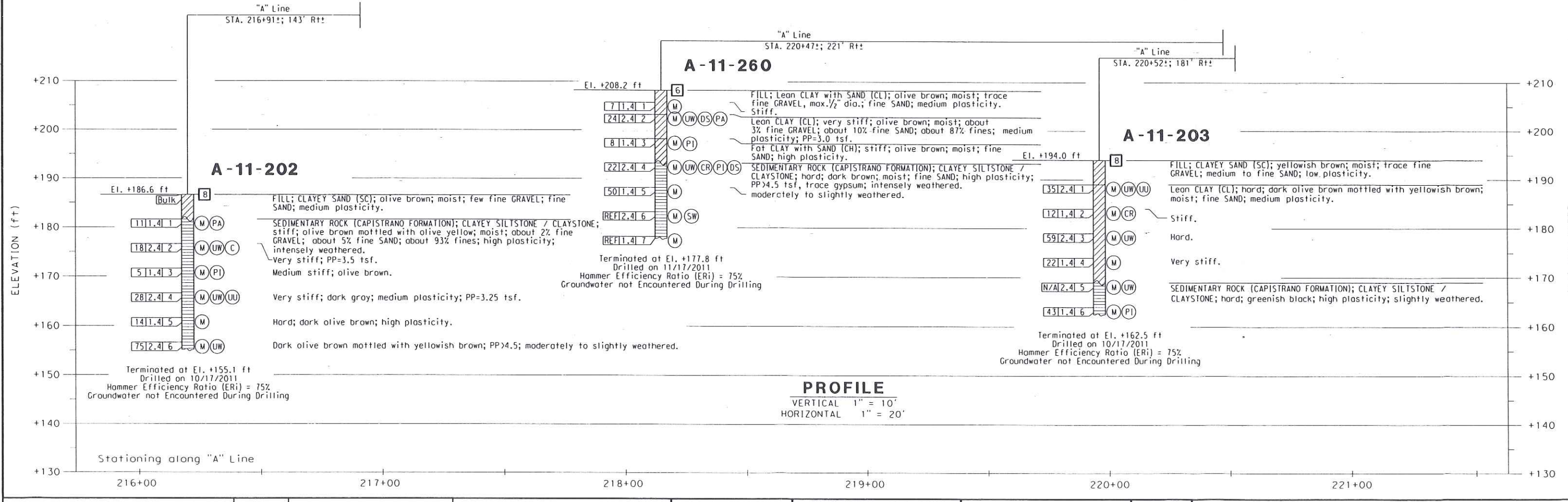


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL NO. 218R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES 3.94	LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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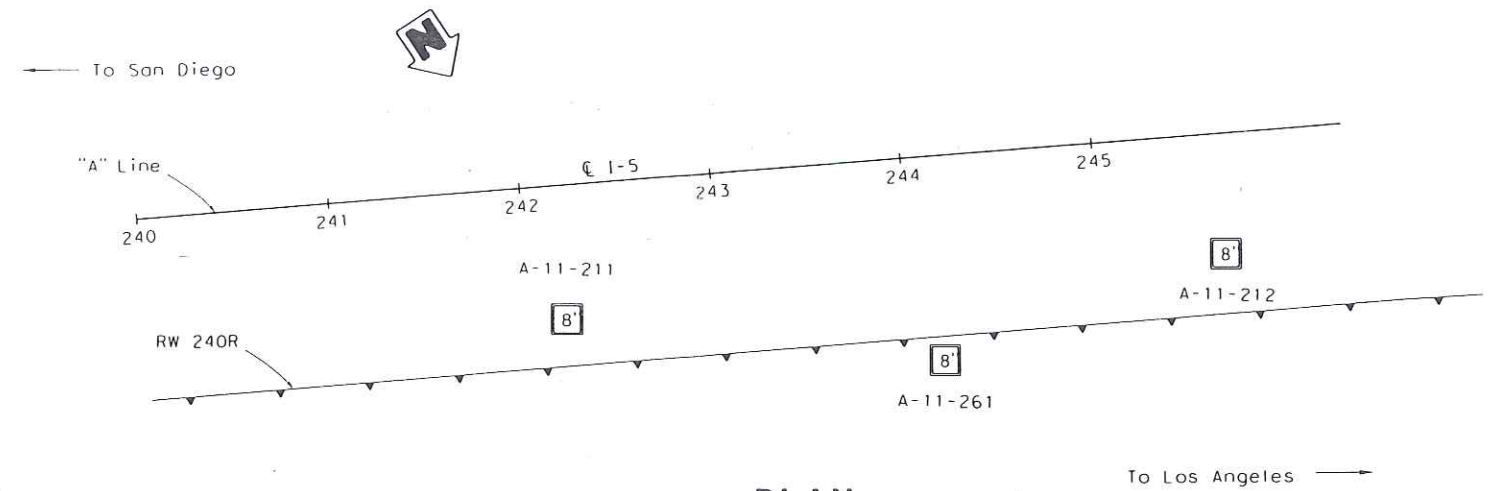
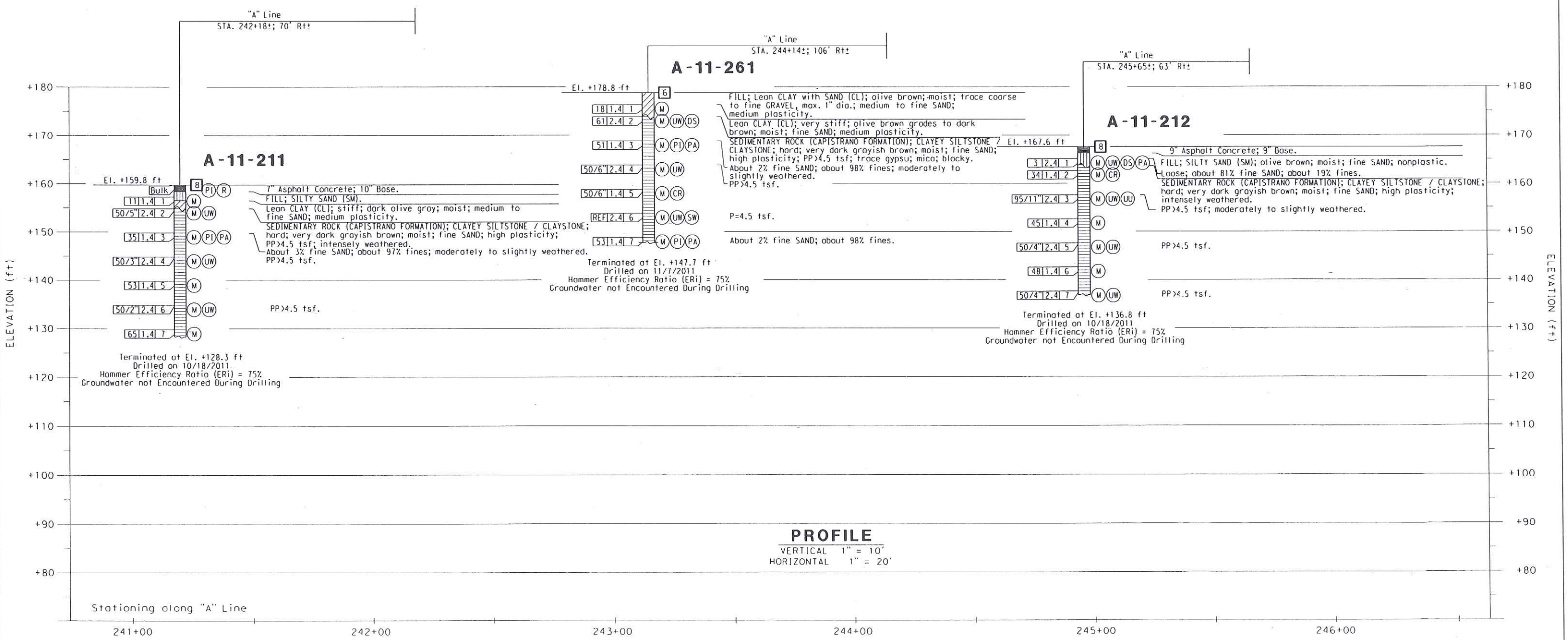


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		

BRIDGE NO. -
POST MILES 4.38

RETAINING WALL NO. 240R

LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: -
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

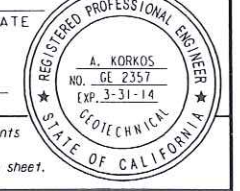
REVISION DATES

SHEET OF

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____



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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¾" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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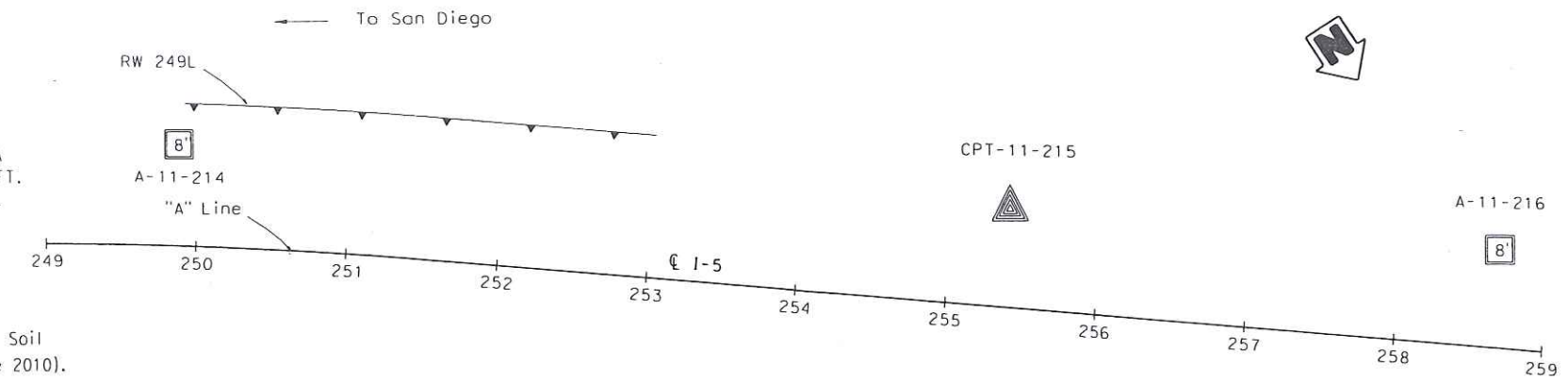
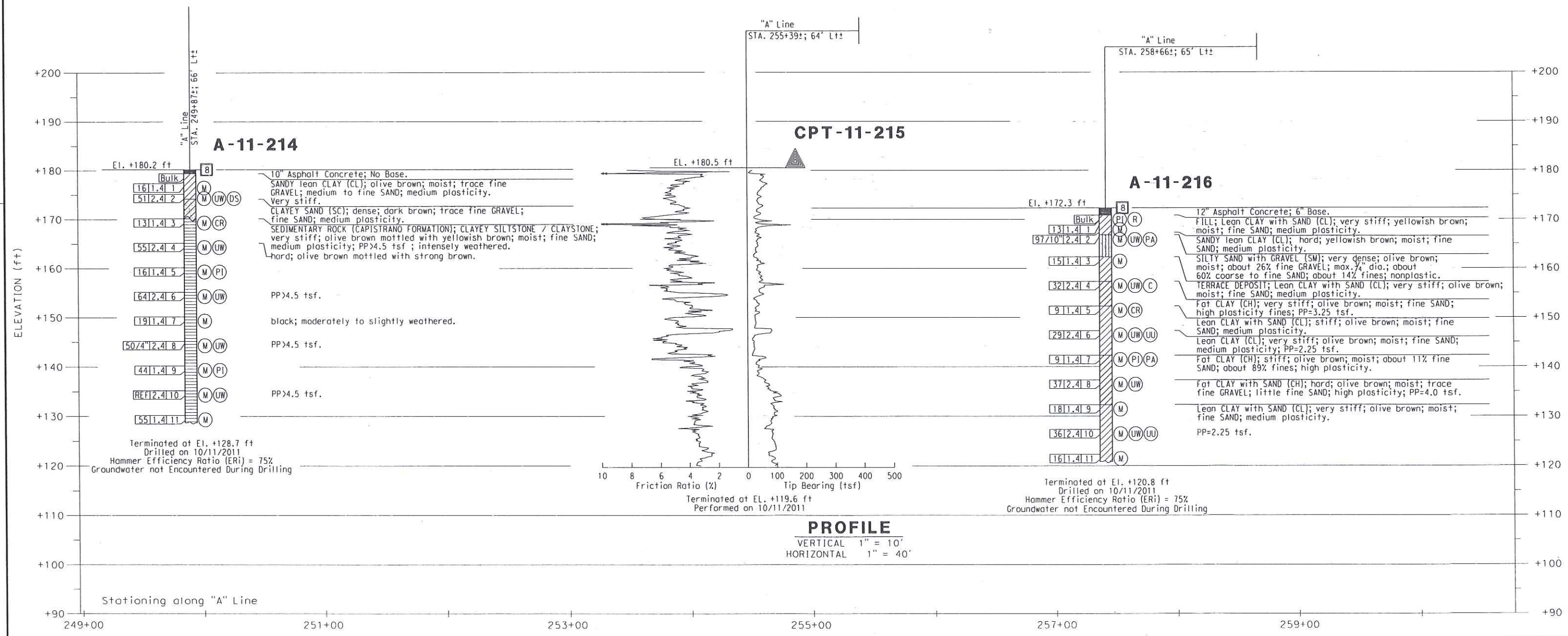


PLAN

1" = 60'

To Los Angeles →



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL 249L
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER — DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

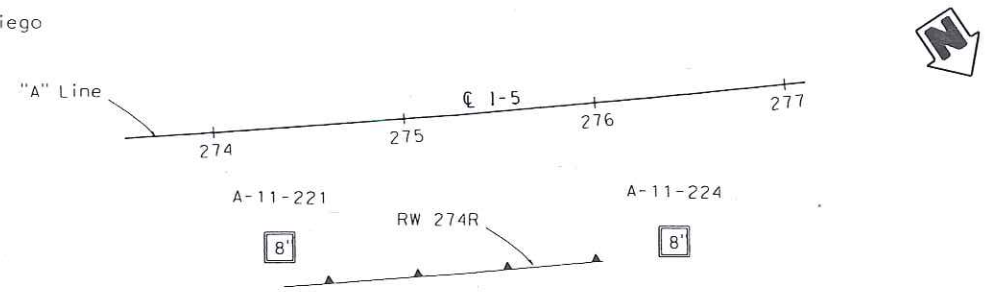
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010)

(2) 2.4" samples were taken using a California Modified Sampler.

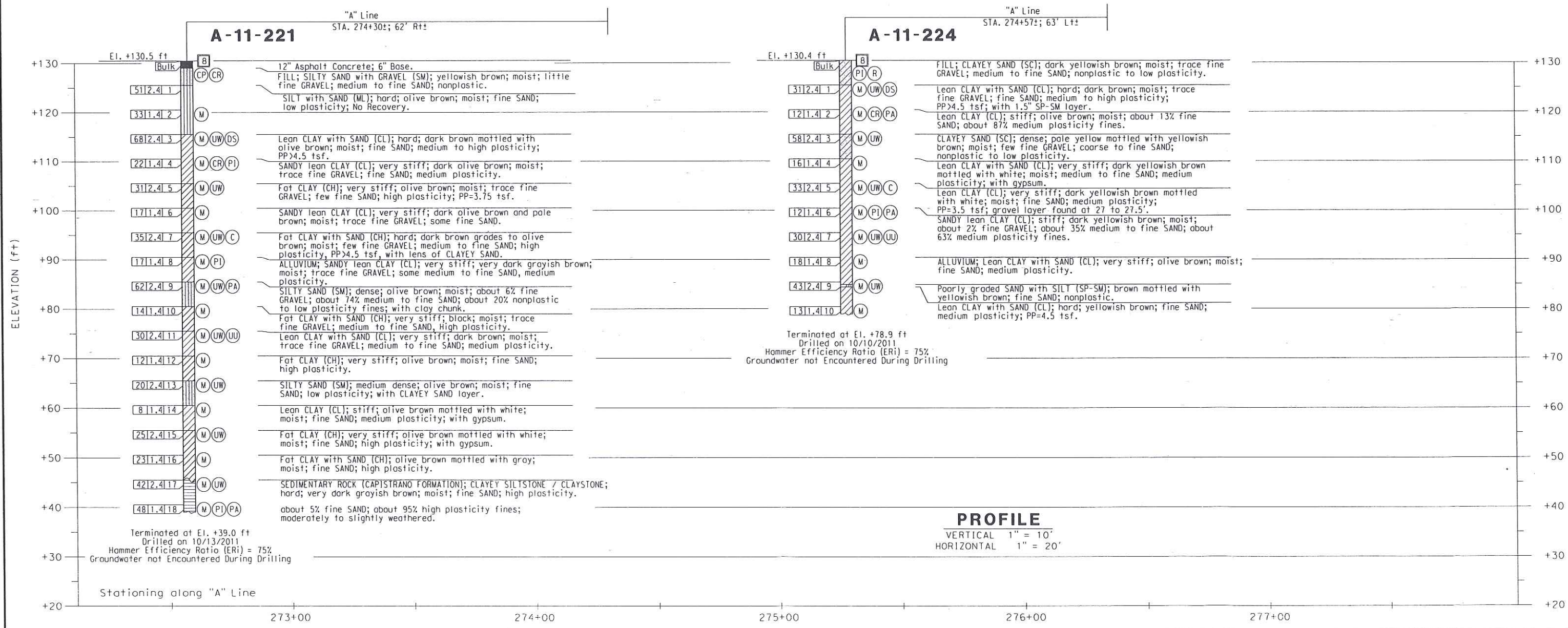
(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL 274R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

CONTRACT NO 12-0E066 | PROJECT ID: 12000202781

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER — DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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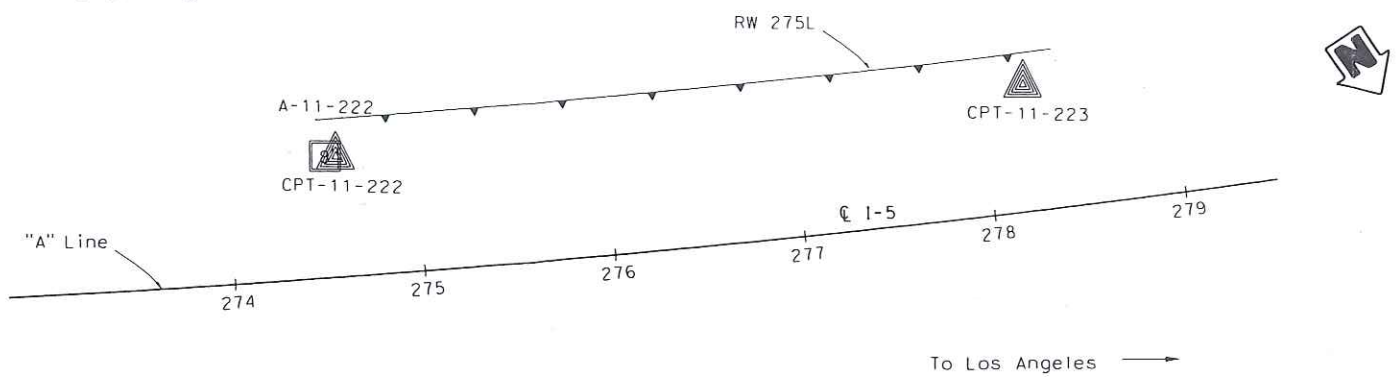
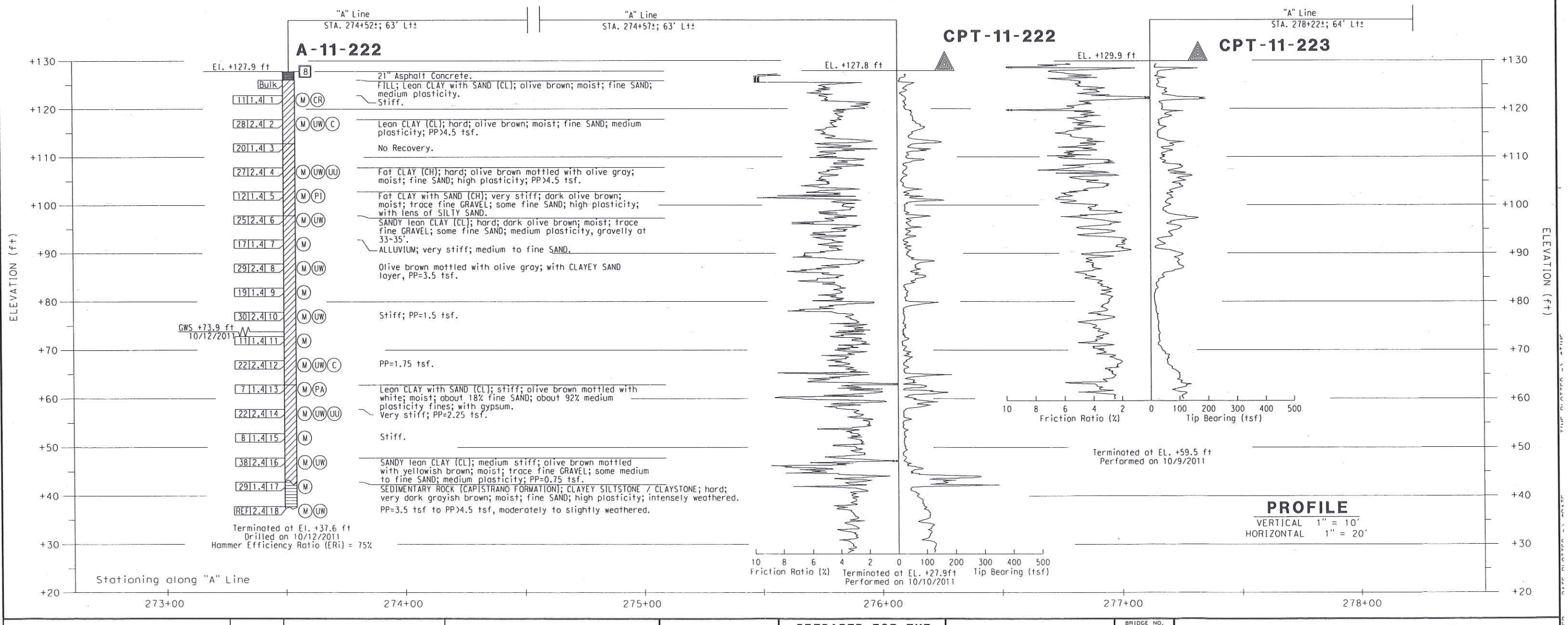


PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -

RETAINING WALL 275L

LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES | SHEET | OF

CONTRACT NO. 12-0E066L PROJECT ID: 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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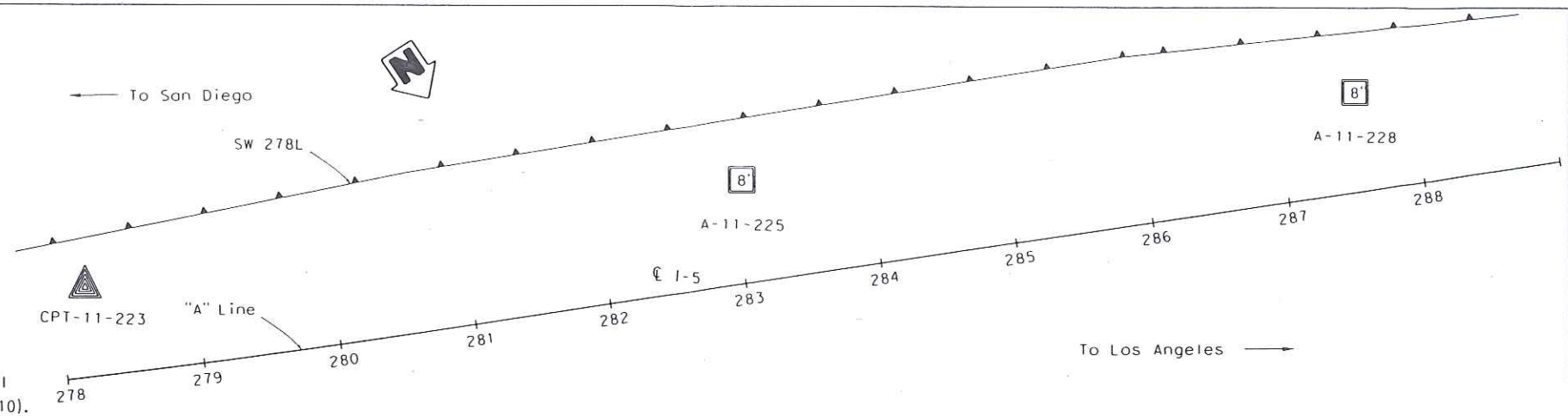

PLAN

1" = 60'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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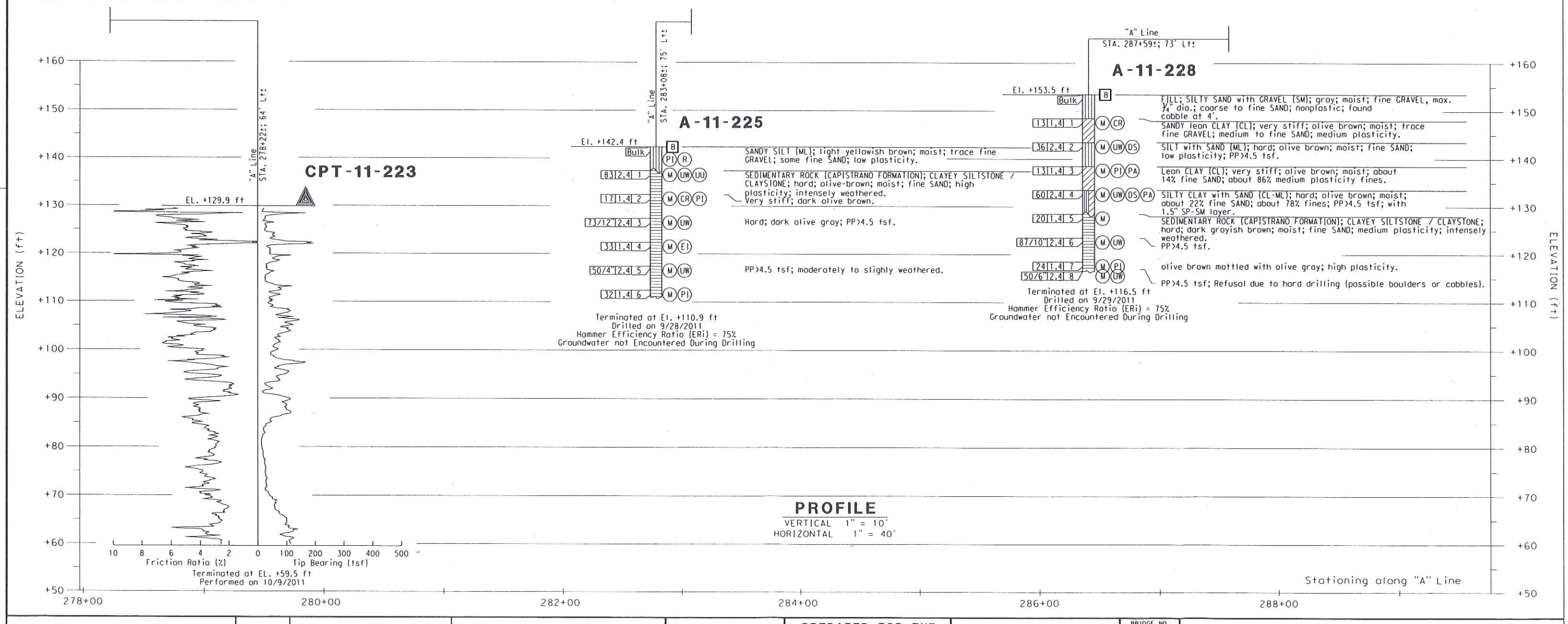
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	SOUND WALL NO. 278L
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS NO. 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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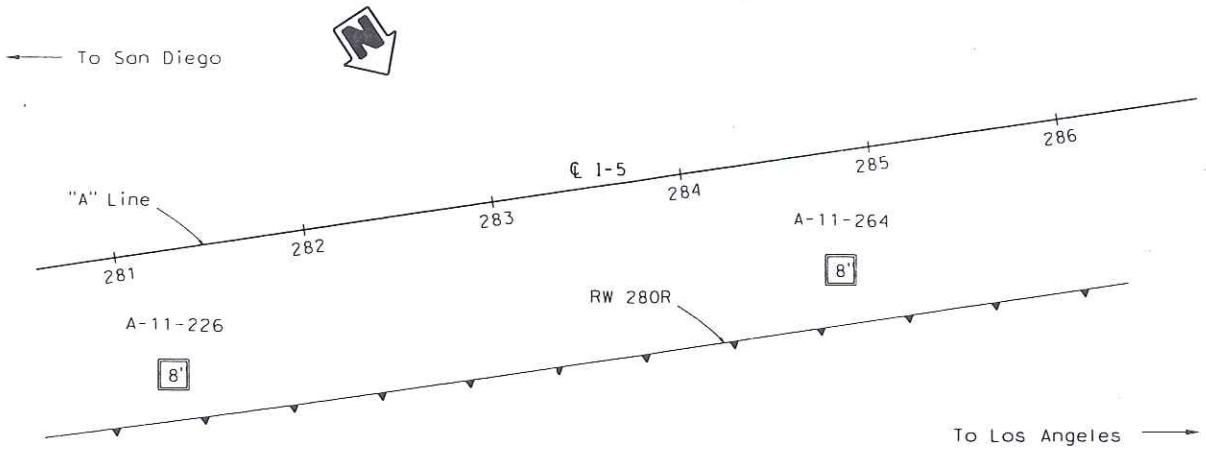

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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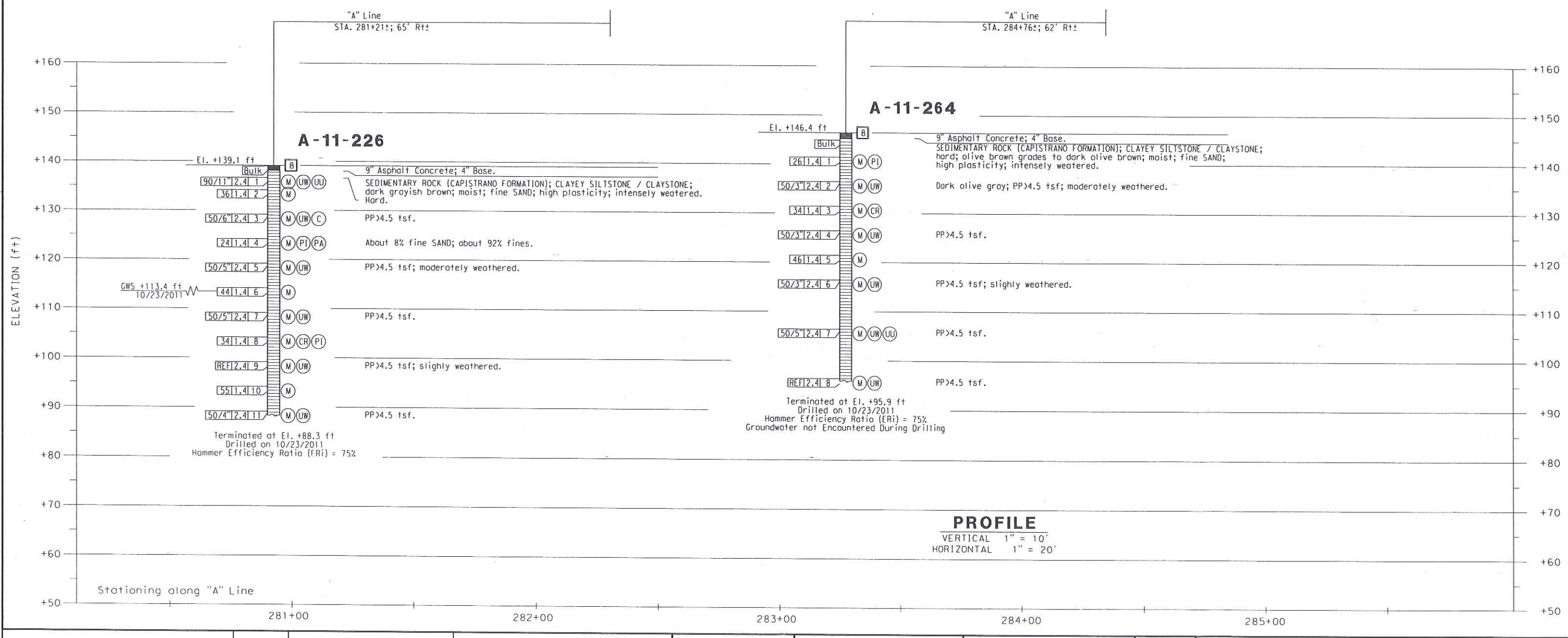
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS PROJECT ENGINEER	BRIDGE NO. - POST MILES -	RETAINING WALL 280R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN					LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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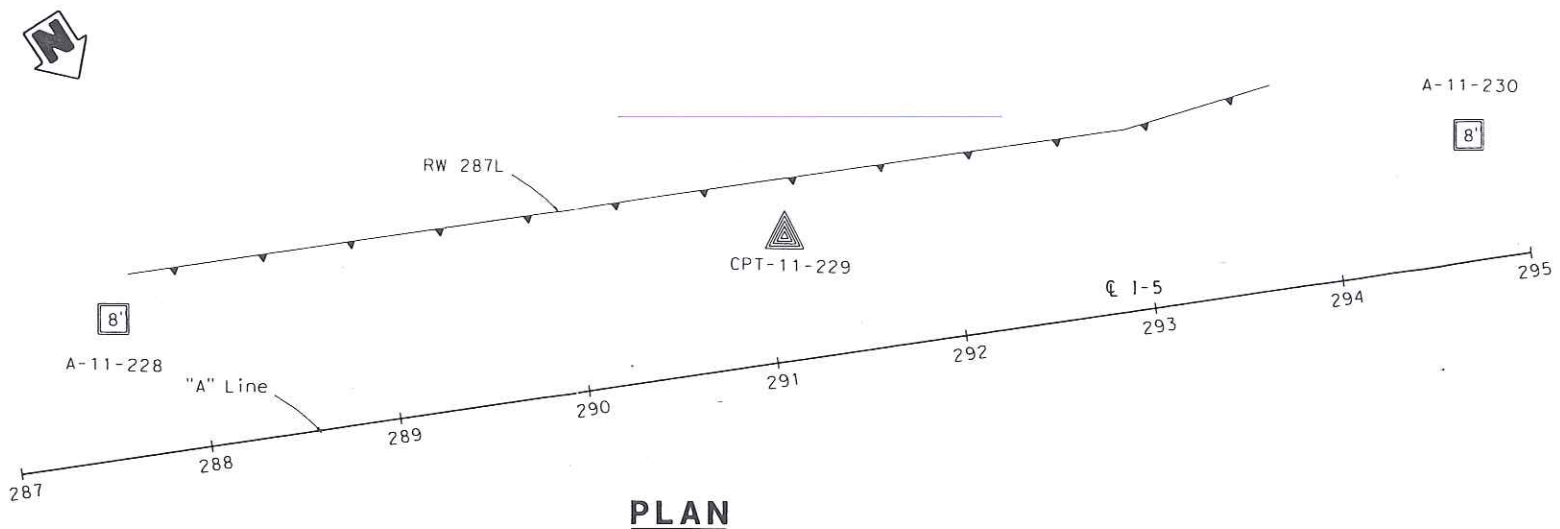

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	55	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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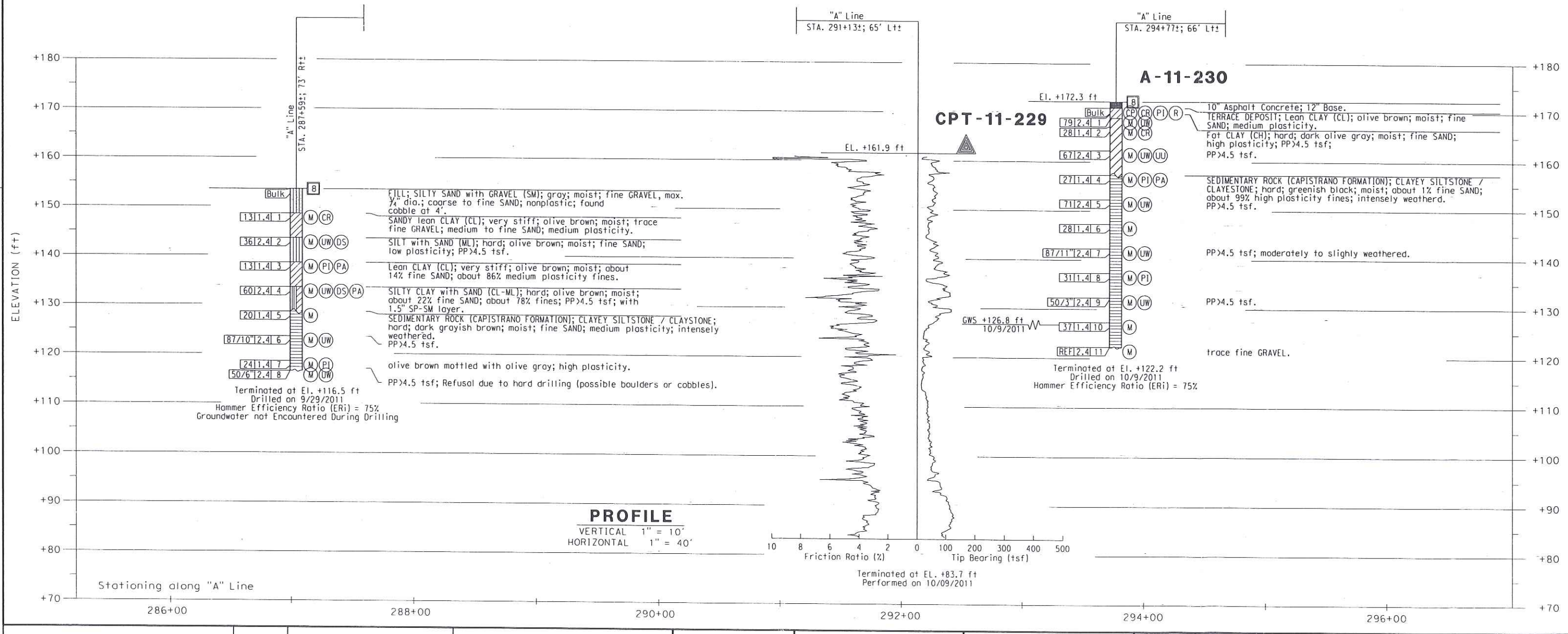
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -

RETAINING WALL 287L

LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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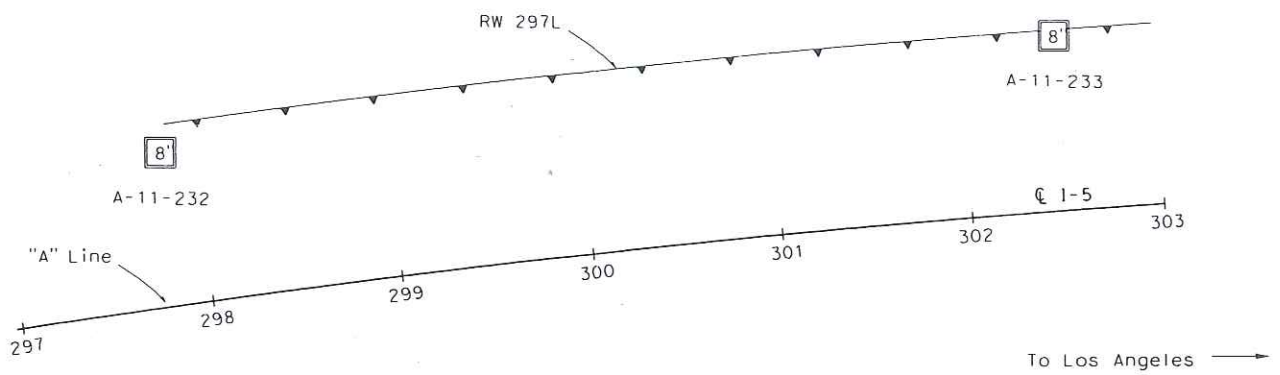
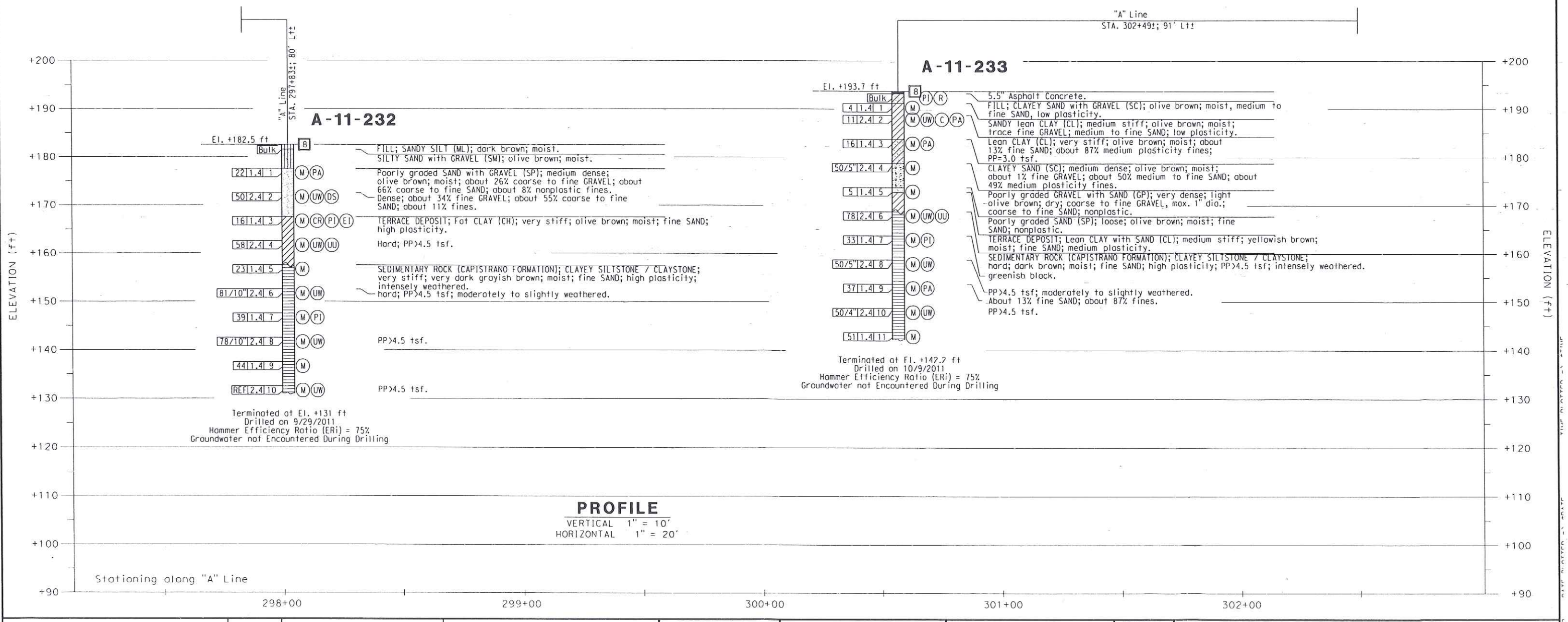


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE; K. KAEKUL; C. PONGSAKORNPATARA	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -

RETAINING WALL 297L

LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

CONTRACT NO.: 12-0E966J PROJECT ID: 1200030278

PLOT DATE: 3/7/2012

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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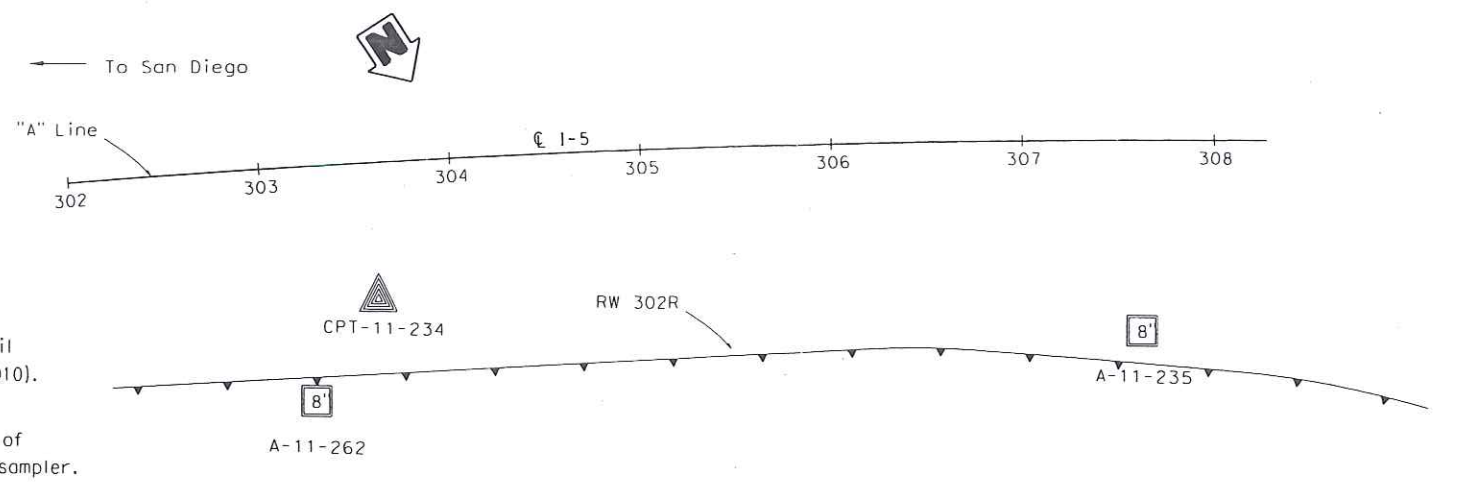

PLAN

1" = 50'

To Los Angeles

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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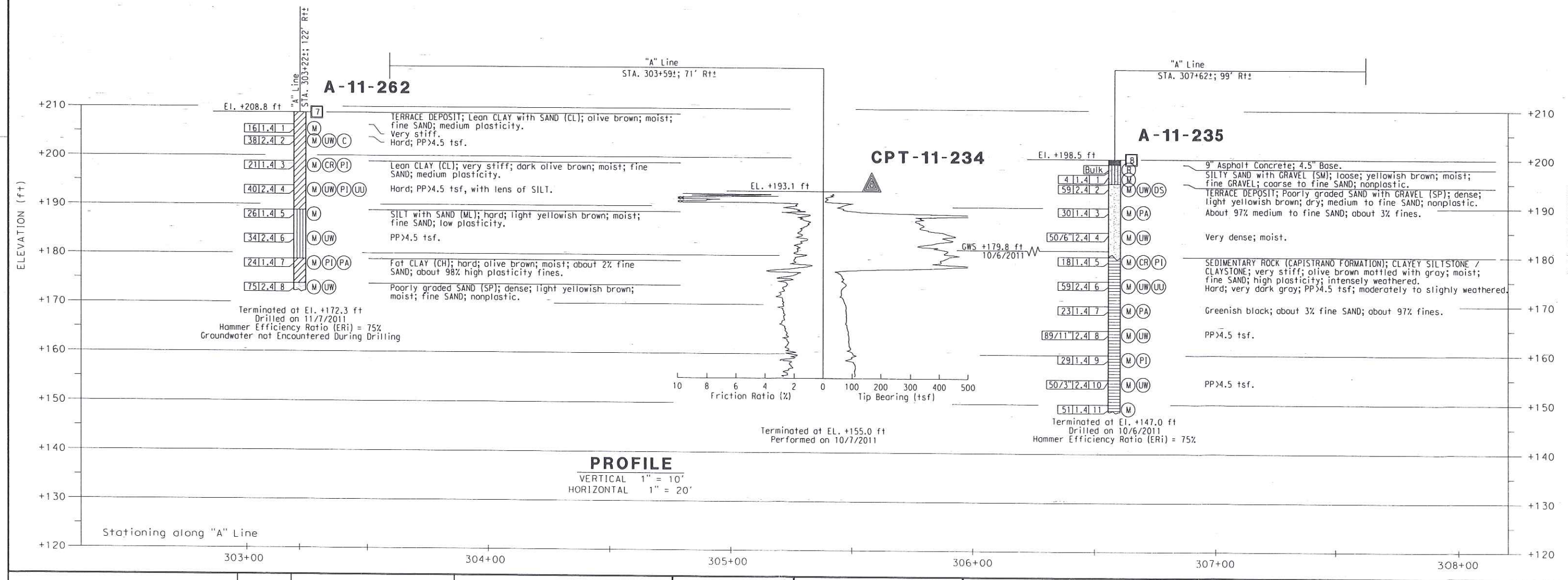
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

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HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL 302R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 1 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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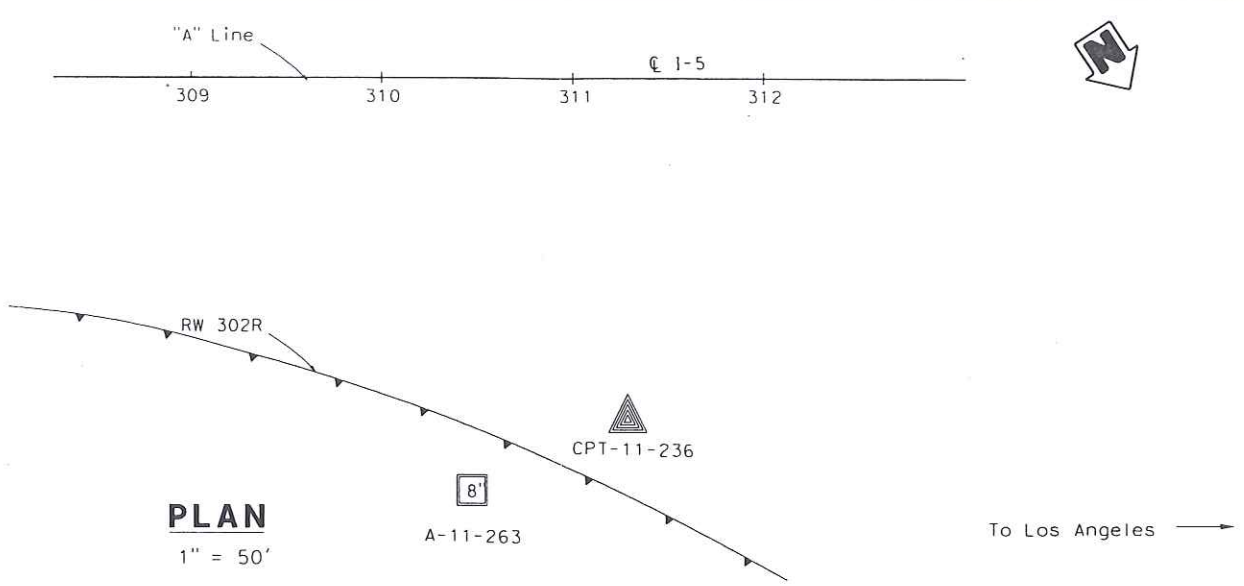

PLAN
1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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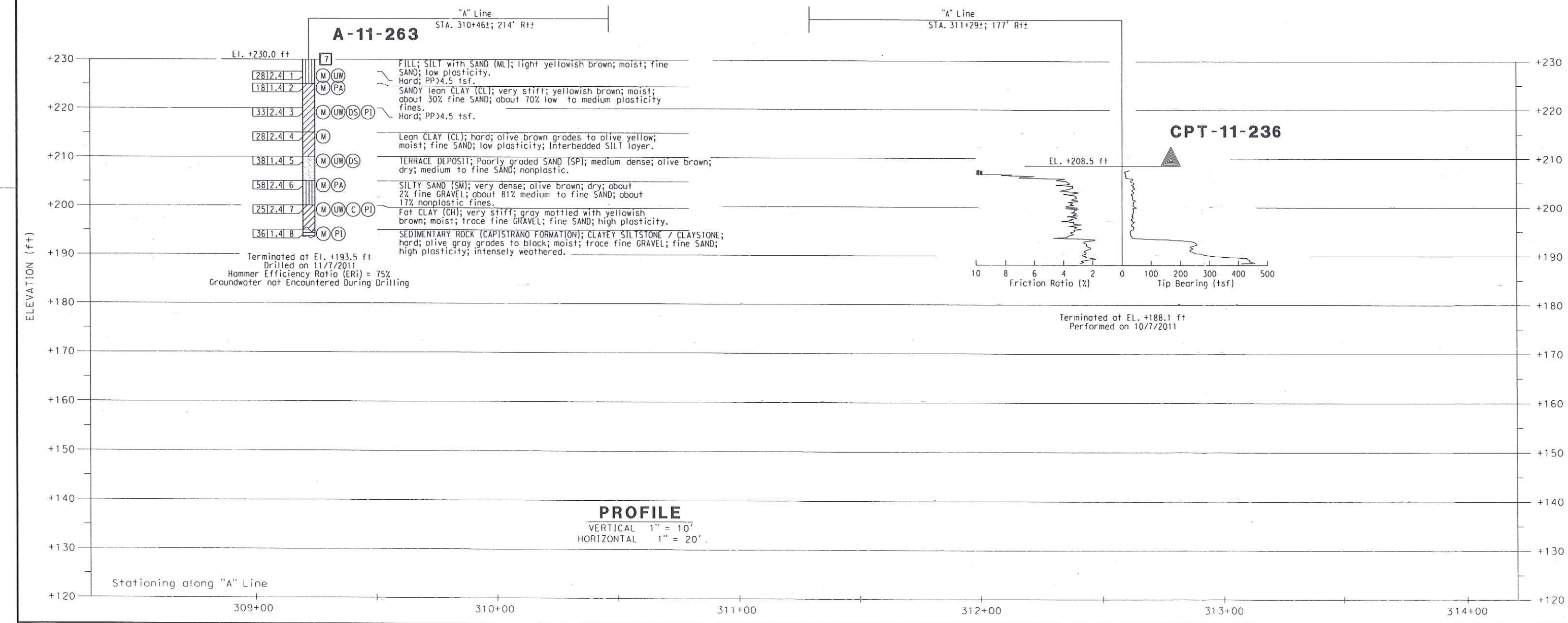
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			PROJECT ENGINEER	POST MILES 5.51

RETAINING WALL 302R

LOG OF TEST BORINGS 2 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

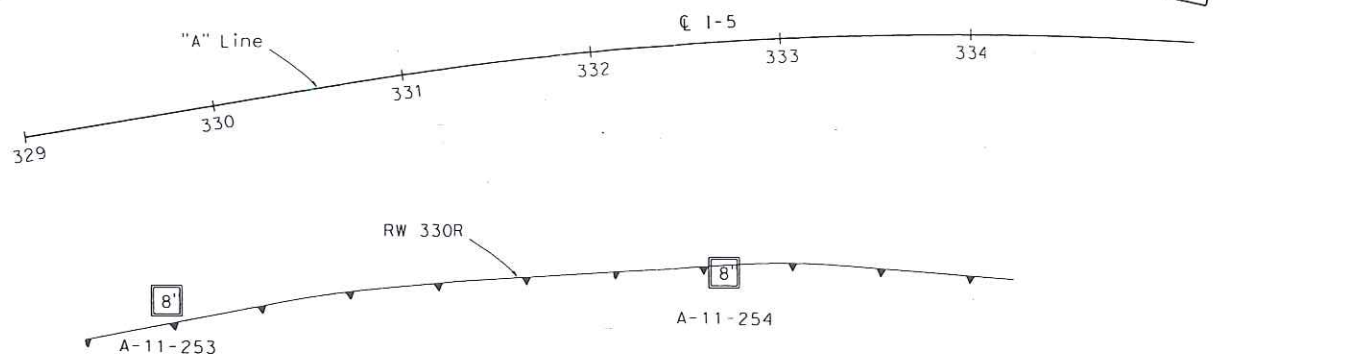
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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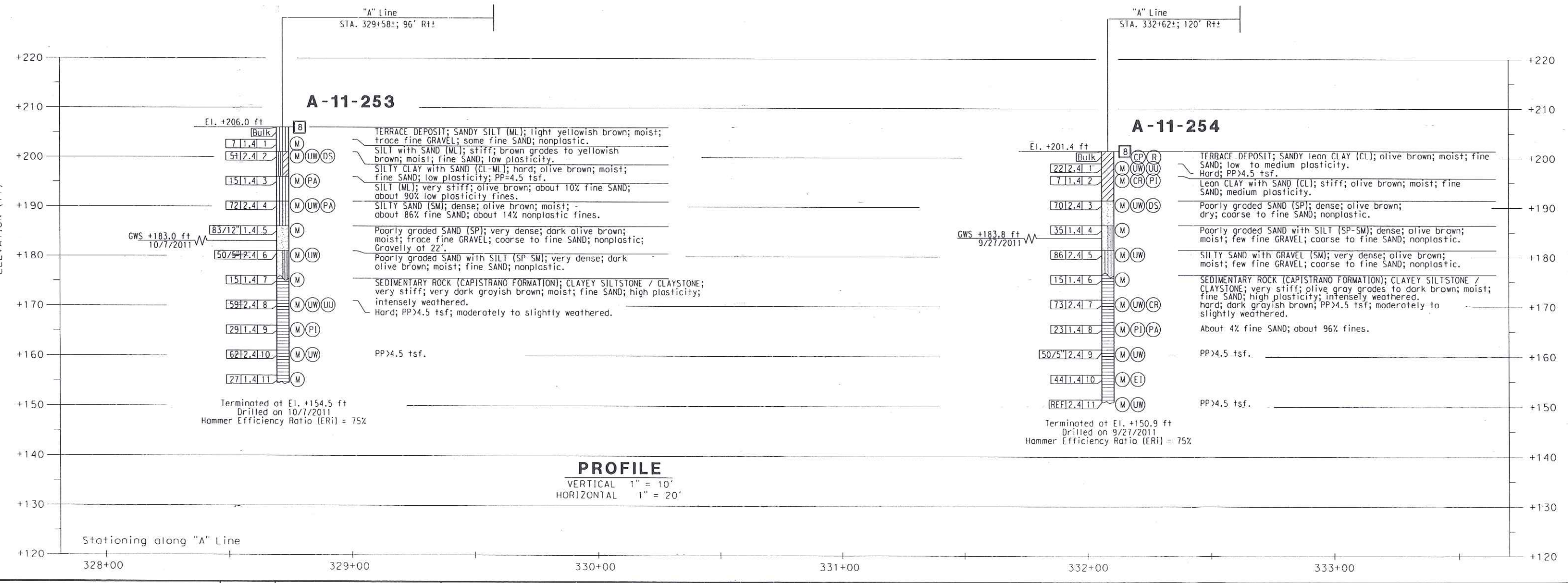
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	RETAINING WALL 330R
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 1200020278

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

CONTRACT NO.: 12-0E0601 PROJECT ID: 1200020278

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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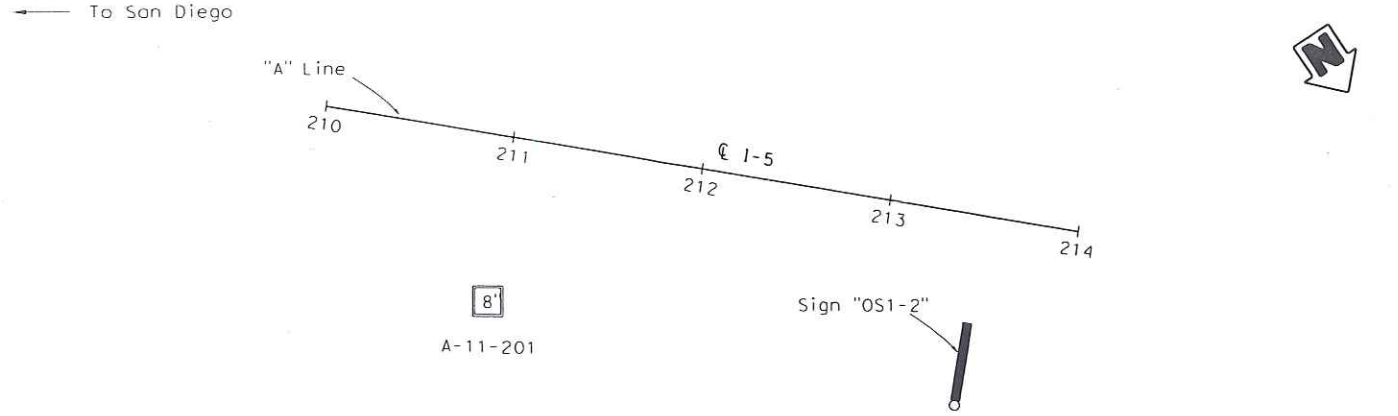
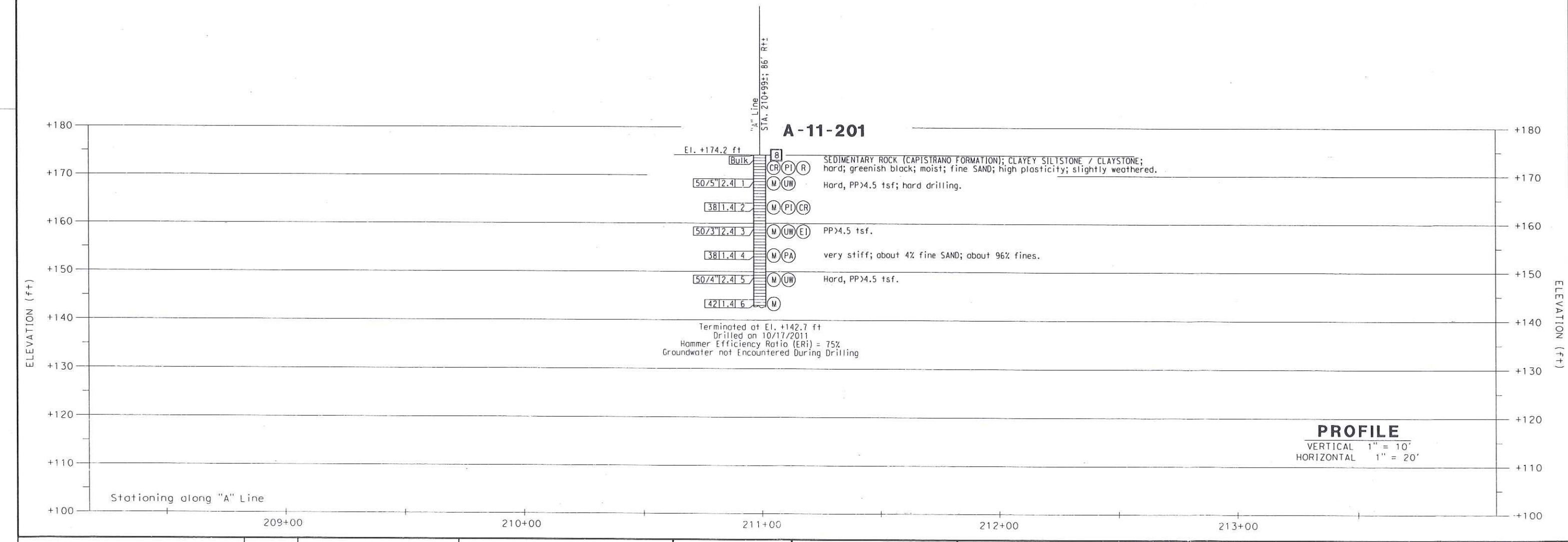
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN
1" = 50'



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		A. KORKOS PROJECT ENGINEER	POST MILES -	LOG OF TEST BORING 1 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

CONTRACT NO. 12-0F0661 PROJECT ID: 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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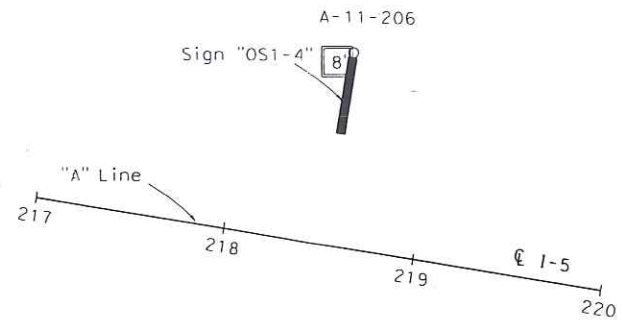
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

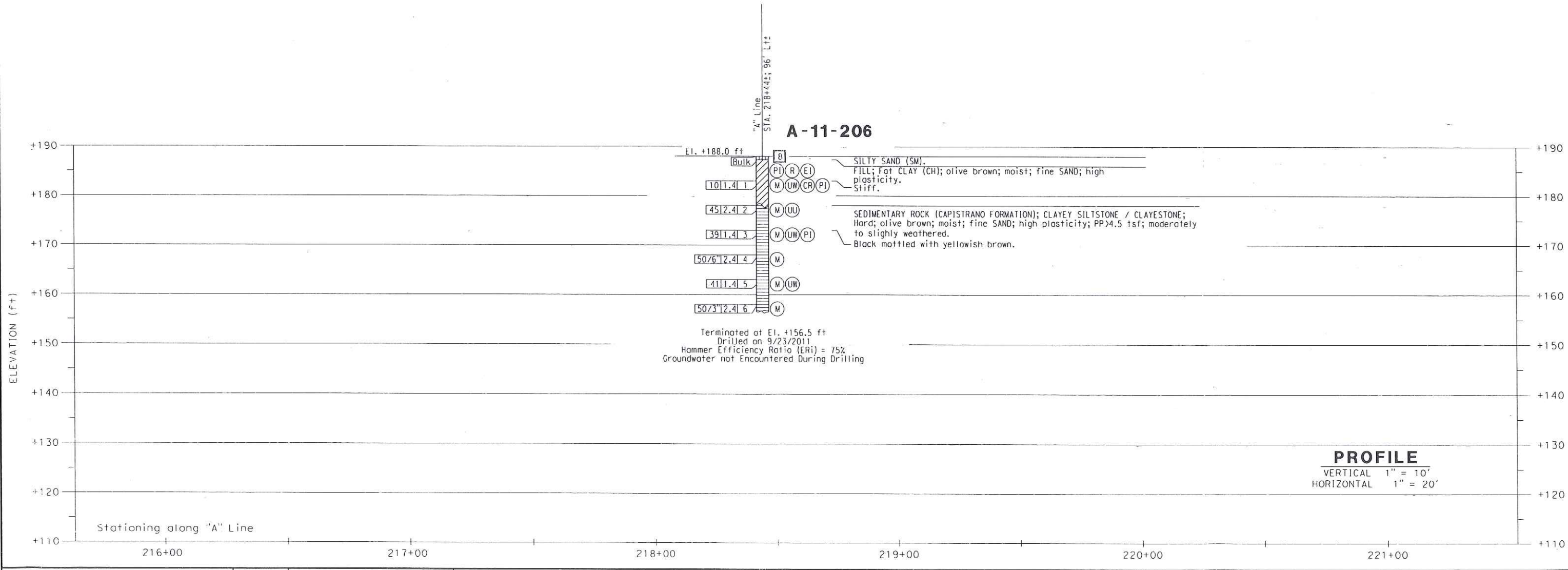
EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PLAN

1" = 50'

To Los Angeles



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -

OVERHEAD SIGN STRUCTURES

LOG OF TEST BORING 2 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

FILE => REQUEST

CONTRACT NO.: 12-0E960 PROJECT ID: 1200020278

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS NO. GE 2357 EXP. 3-31-14 GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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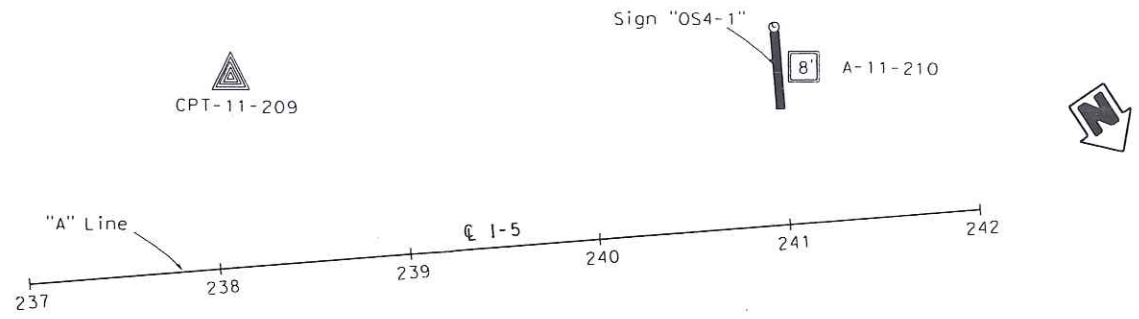
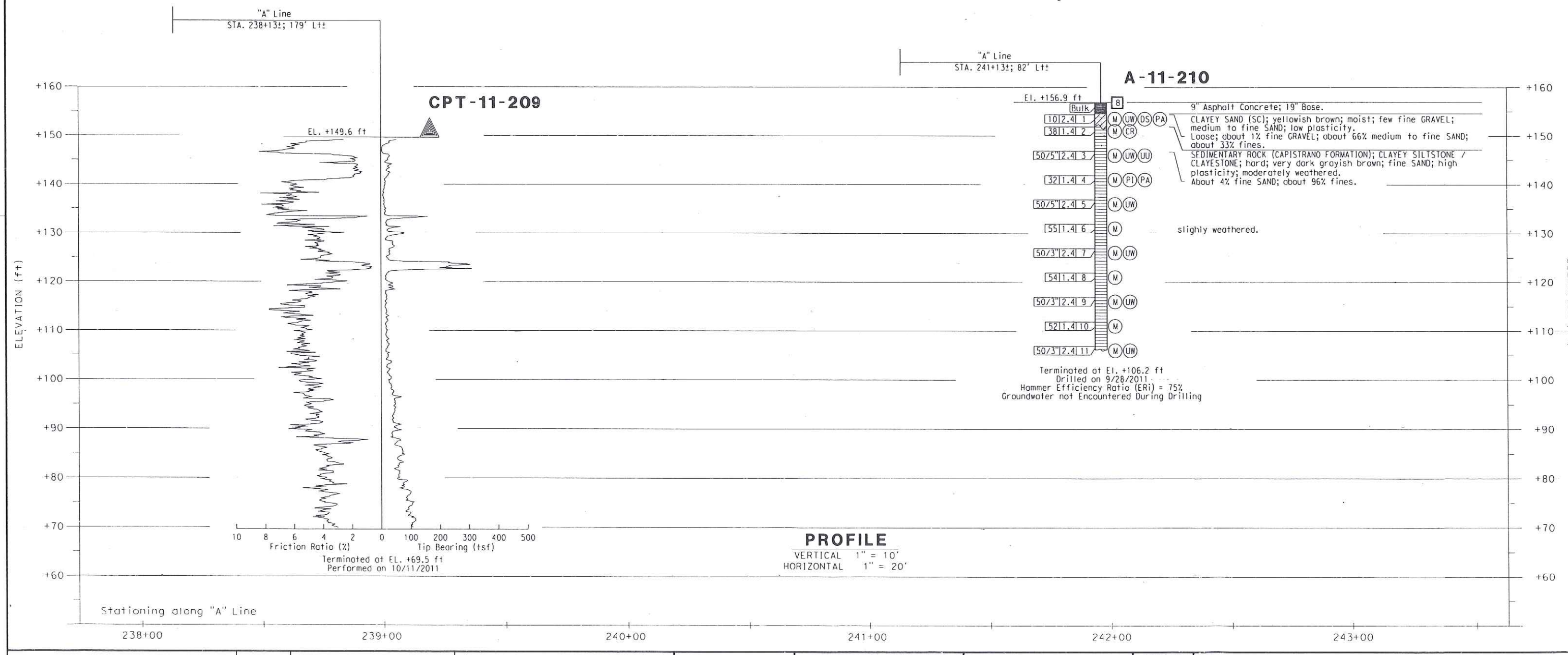


PLAN
1" = 50'

To Los Angeles



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	R. JIE FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011	A. KORKOS PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 3 OF 9
GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)			ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3	UNIT: PROJECT NUMBER & PHASE: 1200020278	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	REVISION DATES / SHEET / OF

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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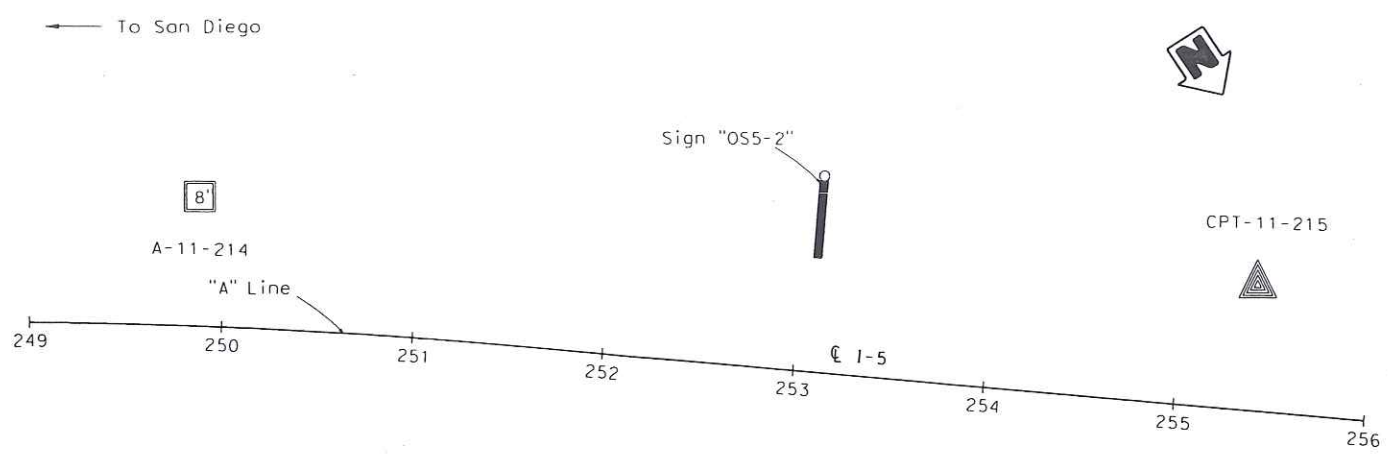
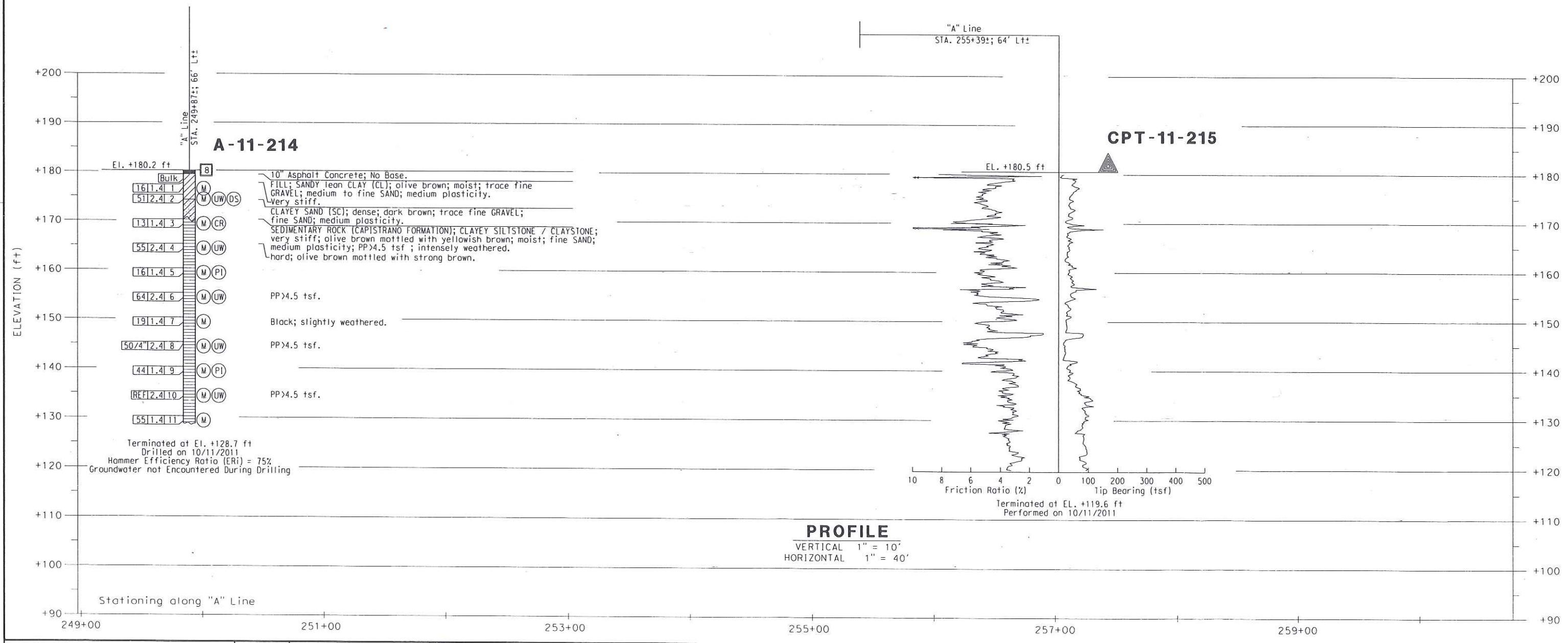


PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS NO. GE 2357 EXP. 3-31-14 GEOTECHNICAL — STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

DESIGN OVERSIGHT

SIGN OFF DATE

DRAWN BY J. FANG

CHECKED BY G. J. GUNARANJAN

R. JIE
FIELD INVESTIGATION BY:
DATE: 9/2011, 10/2011

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

A. KORKOS
PROJECT ENGINEER

BRIDGE NO. -

POST MILES -

OVERHEAD SIGN STRUCTURES

LOG OF TEST BORINGS 4 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: -
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

CONTRACT NO. 12-0E0601 PROJECT ID 1200020278

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS, NO. GE 2357, EXP. 3-31-14, GEOTECHNICAL, STATE OF CALIFORNIA

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ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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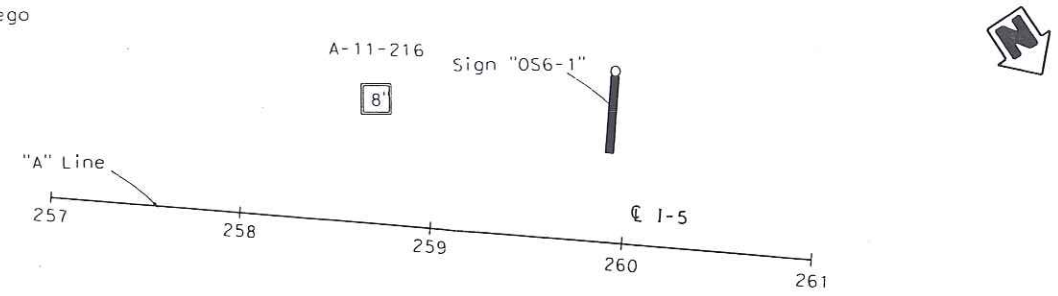
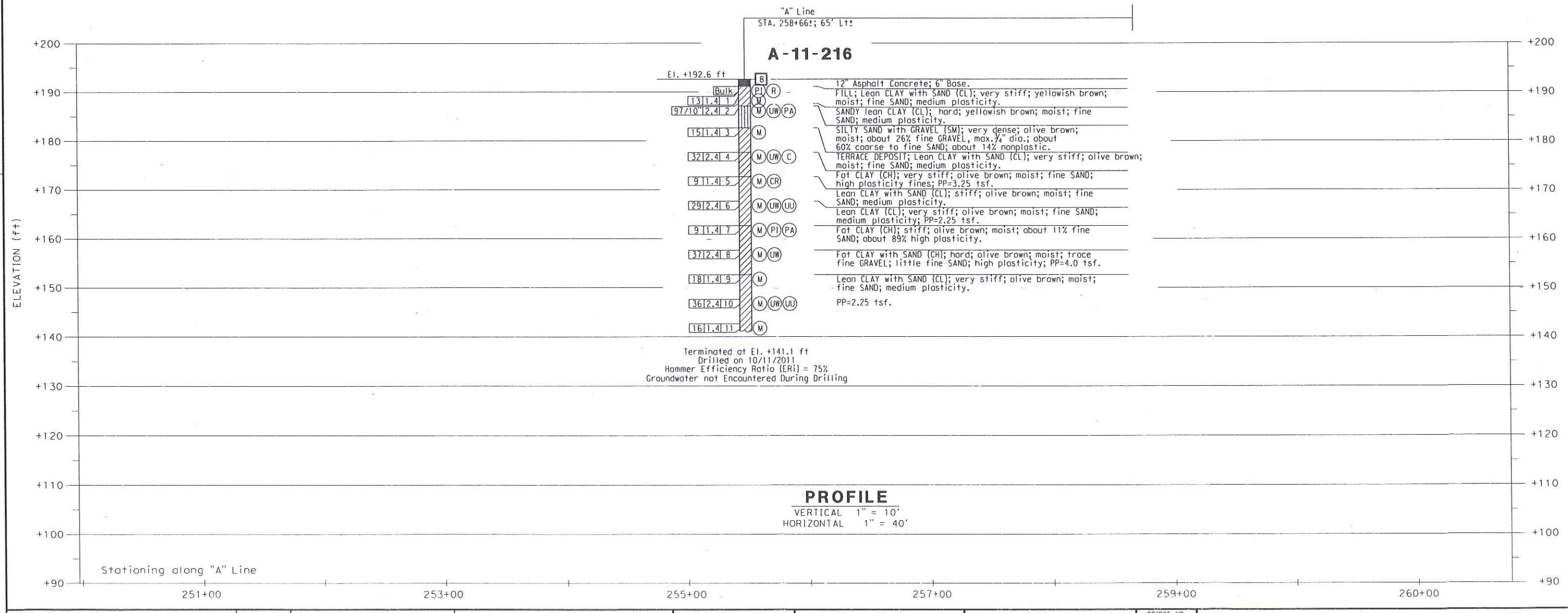


PLAN

1" = 50'

To Los Angeles



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORING 5 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: - PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES | SHEET | OF

FILE => 6REQUEST

CONTRACT NO: 12-0E960 PROJECT ID: 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

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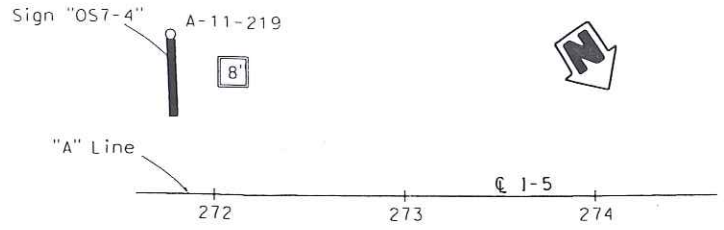

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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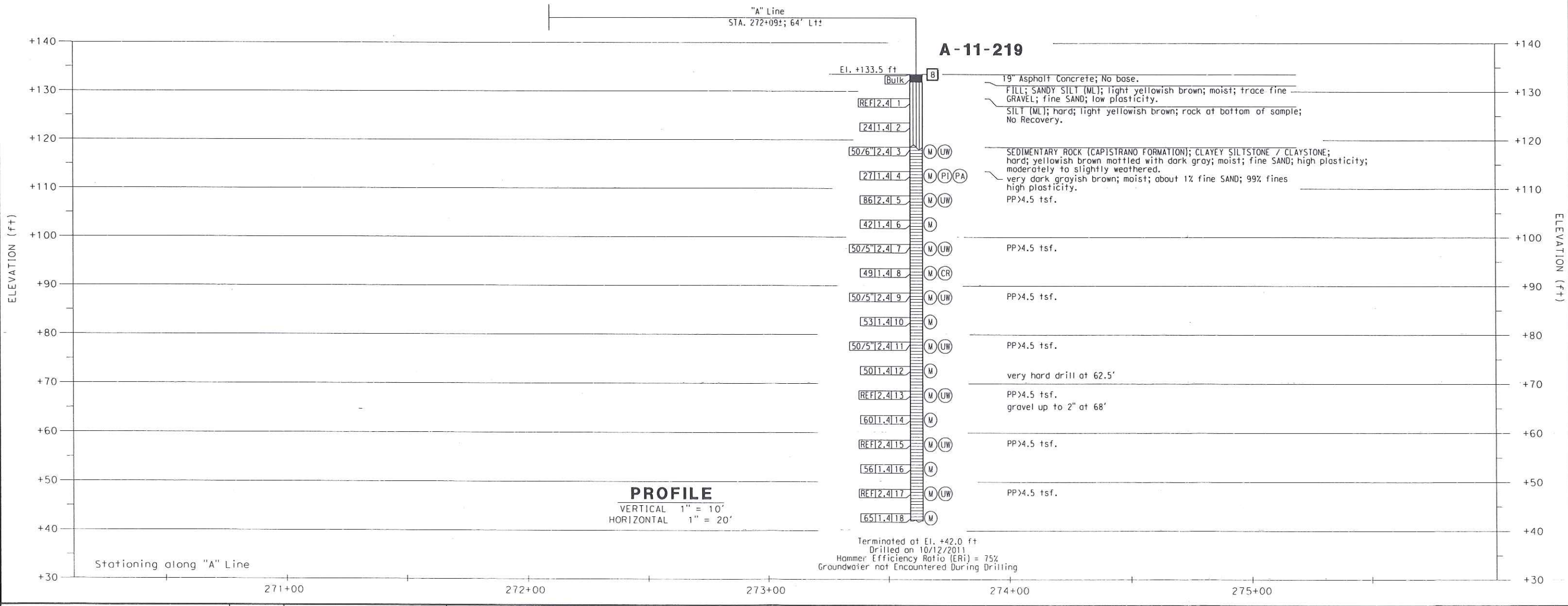
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

PLAN

1" = 50'



DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO.	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES	LOG OF TEST BORING 6 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

CONTRACT NO. 12-0E066 PROJECT ID: 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¾" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

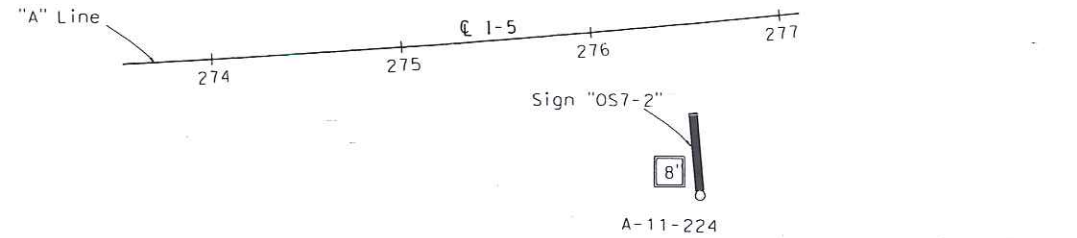
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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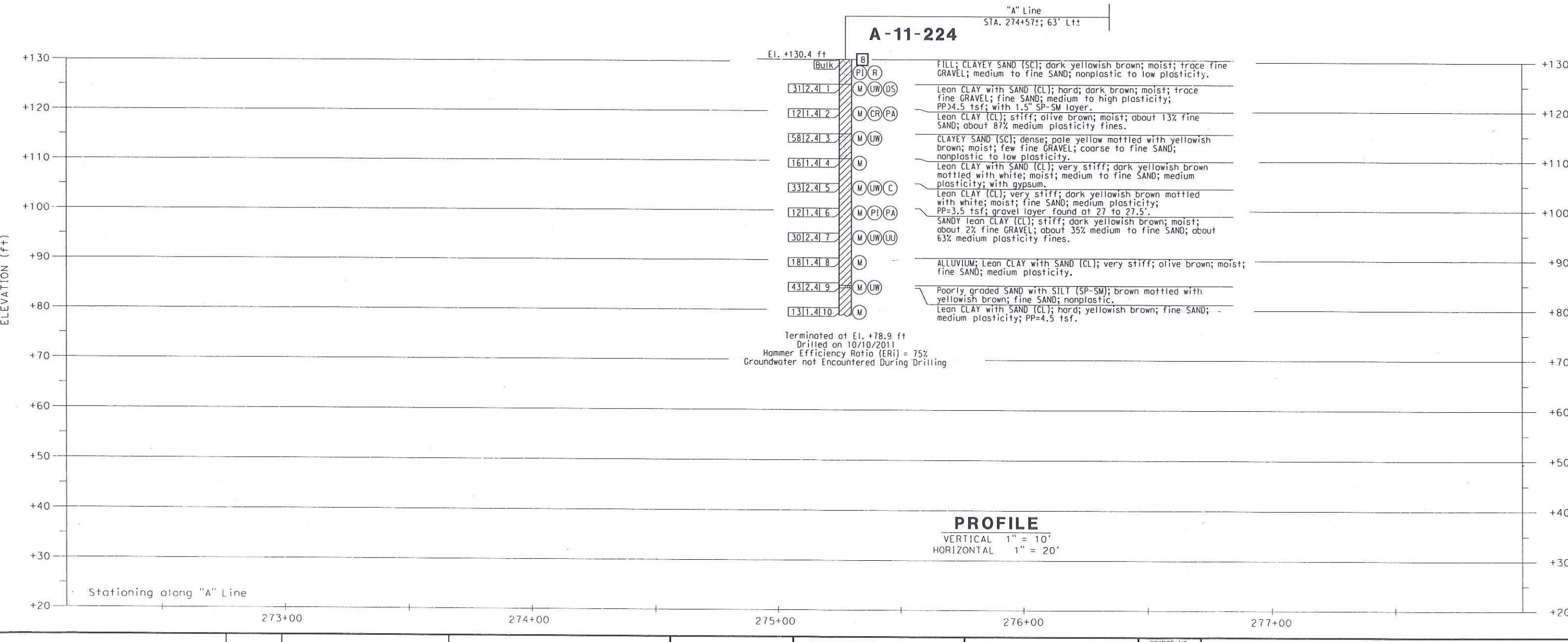
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

PLAN

1" = 50'



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS, PROJECT ENGINEER	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	R. JIE, FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		POST MILES -

OVERHEAD SIGN STRUCTURES

LOG OF TEST BORING 7 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: -
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

CONTRACT NO.: 12-0E960 | PROJECT ID: 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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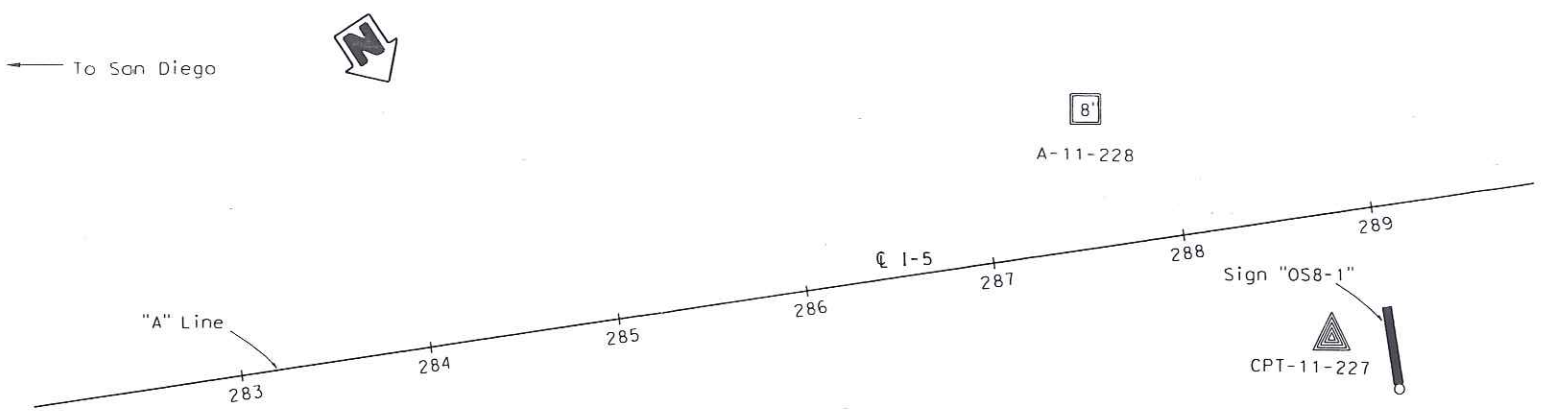
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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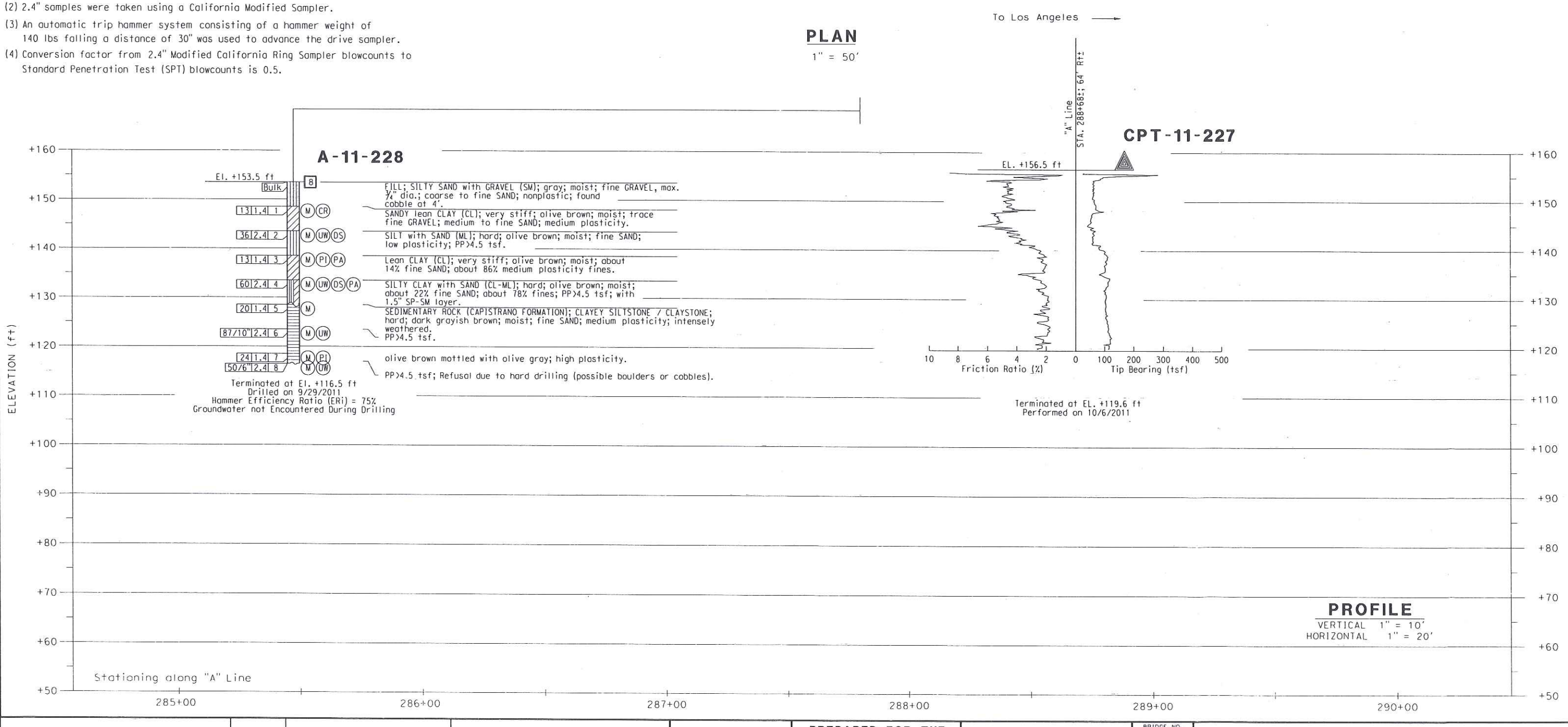
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 8 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

CONTRACT NO. 12-0E0601 PROJECT ID 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

DESCRIBED BY OCS 2003 - FOUND 3¼" OCS ALUMINUM BENCH MARK DISK STAMPED "3SS-2-82", SET IN THE SOUTHEASTERLY CORNER OF A 4 FT. BY 4.5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE NORTHWESTERLY SIDE OF AVENIDA VAQUERO, 100 FT. NORTHERLY OF THE NORTHERLY EDGE OF THE SAN DIEGO FREEWAY OVERCROSSING OF AVENIDA VAQUERO, 23 FT. WESTERLY OF THE CENTERLINE OF VAQUERO AND 29.2 FT. SOUTHERLY OF A STREET STANDARD NO NUMBER. MONUMENT IS SET LEVEL WITH THE TOP OF THE CURB.

NOTES:

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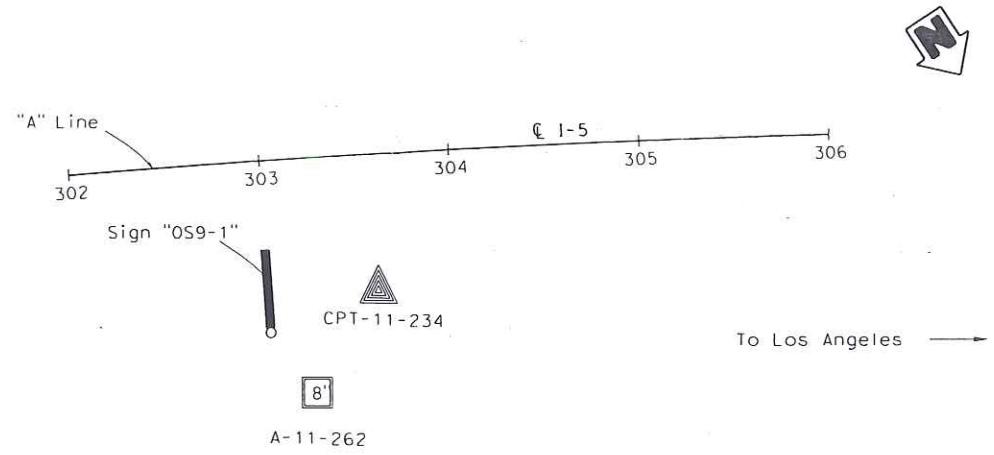

PLAN

1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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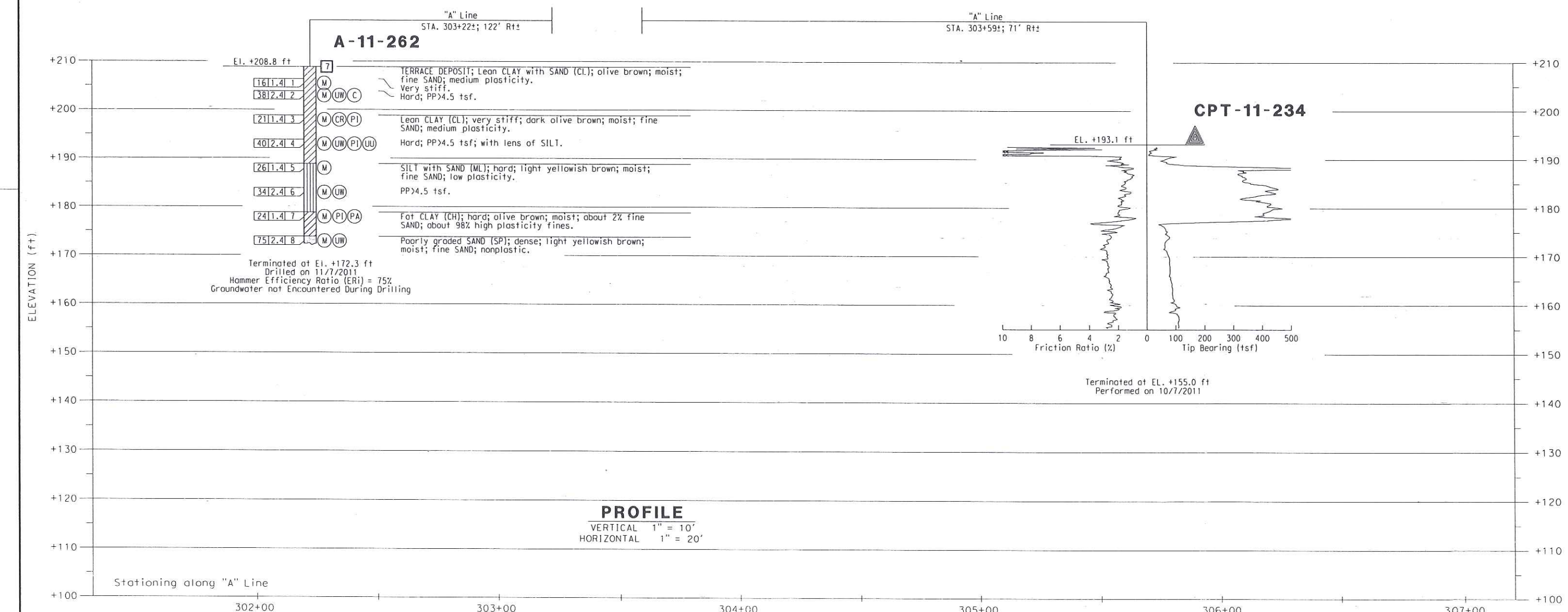
ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -	OVERHEAD SIGN STRUCTURES
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -	LOG OF TEST BORINGS 9 OF 9

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7-16-10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

CONTRACT NO. 12-0E066 PROJECT ID 1200020278

BENCH MARK

DESIGNATION: 3SS-2-82 ELEV 95.558'

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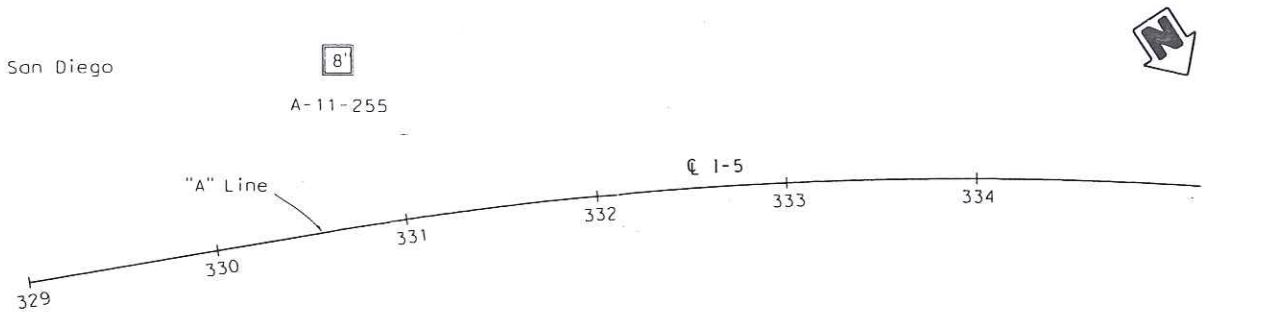

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	ORA	5	3.8/6.2		

REGISTERED ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — A. KORKOS — NO. GE 2357 — EXP. 3-31-14 — GEOTECHNICAL — STATE OF CALIFORNIA

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550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708

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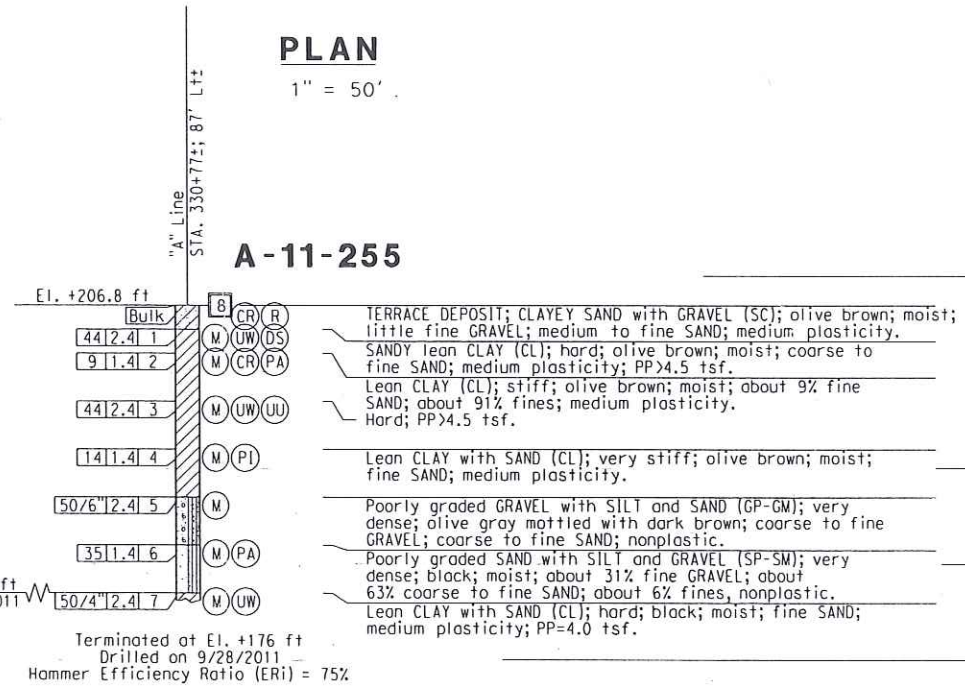
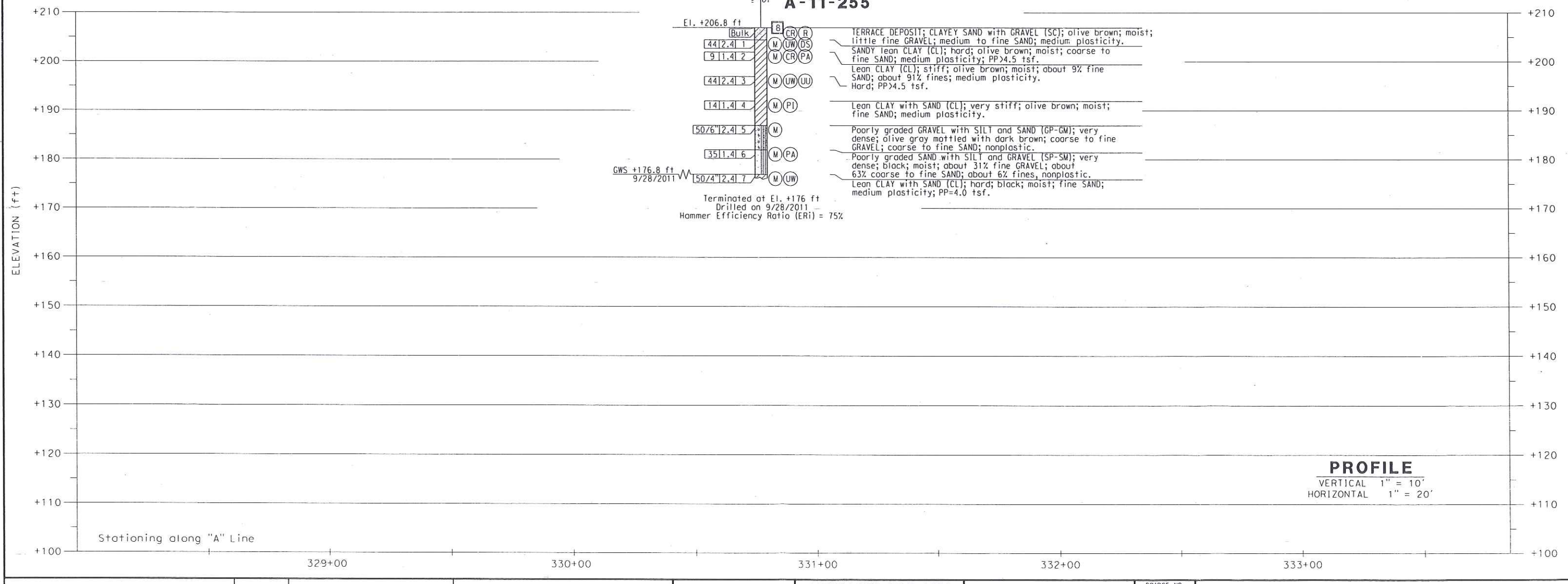
(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.

PLAN

1" = 50'





PROFILE

VERTICAL 1" = 10'
HORIZONTAL 1" = 20'

DESIGN OVERSIGHT	DRAWN BY	J. FANG	R. JIE	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	A. KORKOS	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	G. J. GUNARANJAN	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011		PROJECT ENGINEER	POST MILES -

I-5 HOV WIDENING SEGMENT 2

LOG OF TEST BORINGS 1 OF 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT:
PROJECT NUMBER & PHASE: 12000202781

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

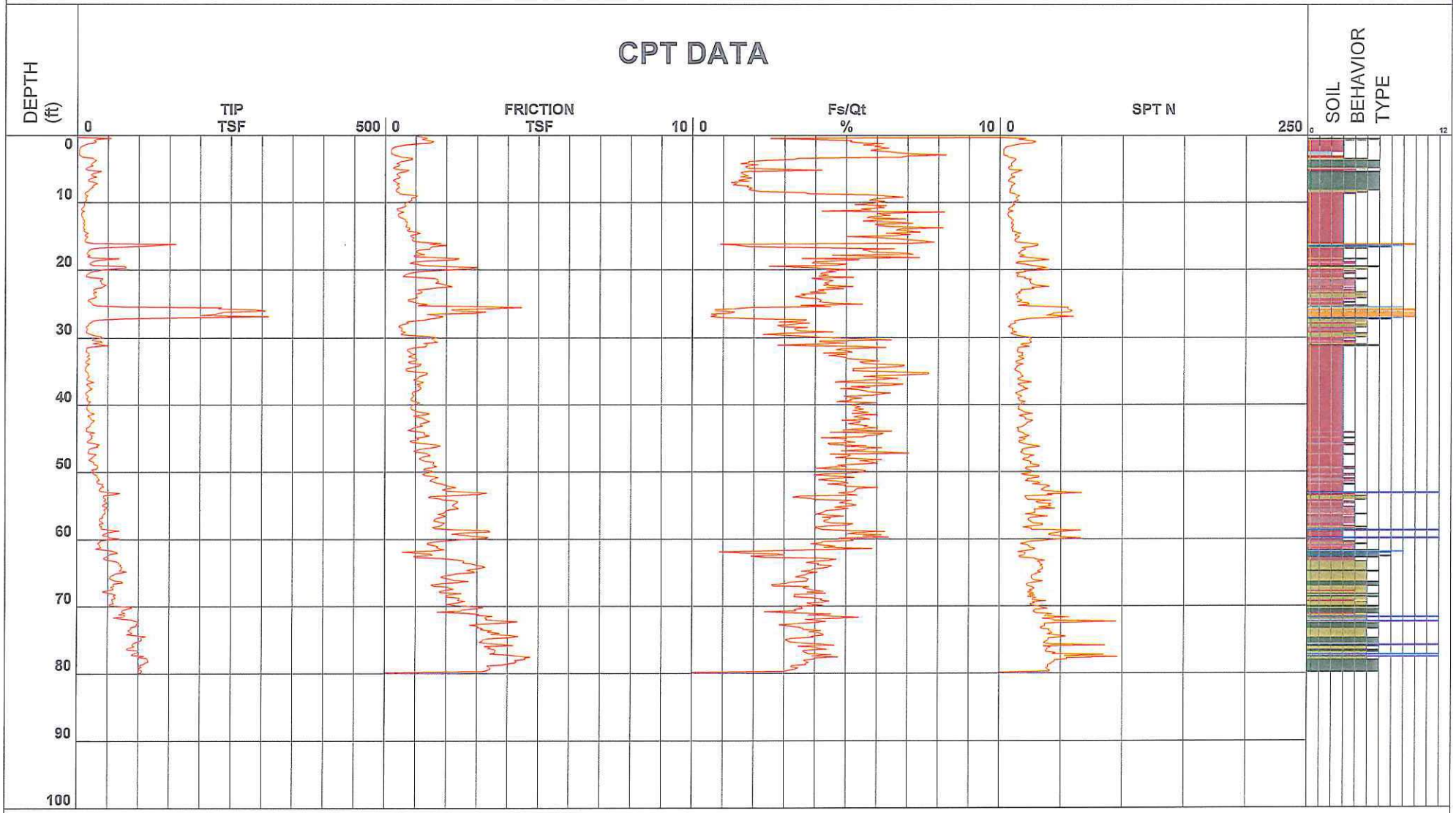
REVISION DATES | SHEET | OF

CONTRACT NO. 12-0E960 PROJECT ID: 1200020278

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(577).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-209	Date and Time	10/11/2011 11:42:23 PM	Maximum Depth	80.05 ft
Water Table Depth		80.05 ft			

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

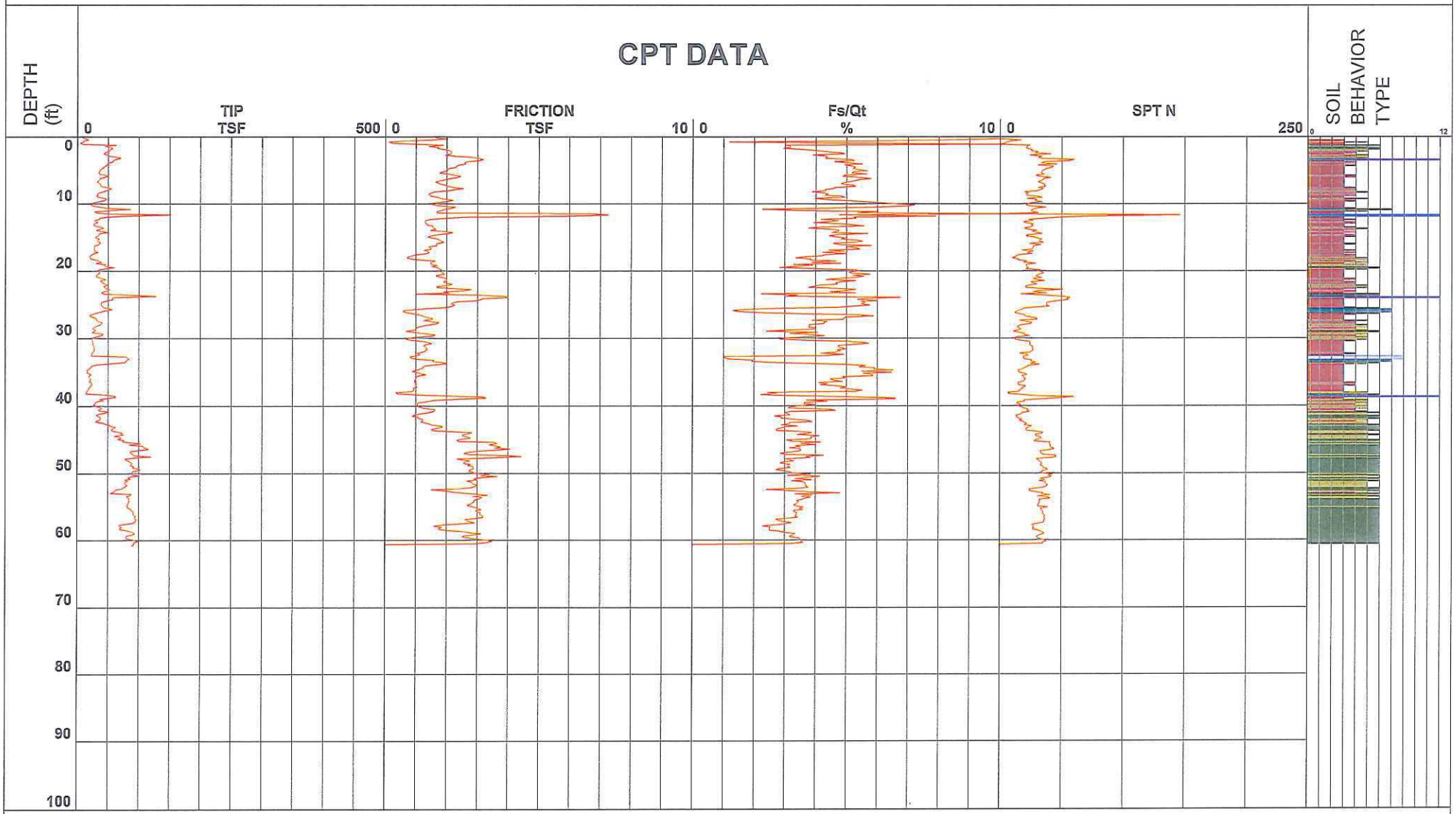
Depth Increment

(*)Soil behavior type and SPT based on data from UBC-1983

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(576).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-215	Date and Time	10/11/2011 10:34:01 PM	Maximum Depth	60.86 ft
Water Table Depth		>60.86 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

(*)Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
0.33	1.1	0.5	-	1.3	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.49	54.3	87.1	152.0	1.4	0.4	2.5	5	silty SAND to sandy SILT	120	4.0	14	22	62	48	-	-	20	16	N/A	0.00	N/A	N/A
0.66	31.3	50.2	146.5	1.2	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	32	15	N/A	0.00	N/A	N/A
0.82	26.6	42.7	-	1.4	0.3	5.2	3	silty CLAY to CLAY	115	1.5	18	28	-	-	1.9	9.9	39	15	N/A	0.00	N/A	N/A
0.98	30.7	49.2	-	1.6	0.3	5.1	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	37	15	N/A	0.00	N/A	N/A
1.15	27.5	44.2	-	1.5	0.3	5.5	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	39	15	N/A	0.00	N/A	N/A
1.31	17.9	28.7	-	1.1	0.3	6.2	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	49	15	N/A	0.00	N/A	N/A
1.48	12.5	20.1	-	0.7	0.3	5.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	54	15	N/A	0.00	N/A	N/A
1.64	8.0	12.8	-	0.5	0.3	6.2	3	silty CLAY to CLAY	115	1.5	5	9	-	-	0.6	9.9	66	15	N/A	0.00	N/A	N/A
1.80	5.6	9.0	-	0.3	0.2	6.0	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	75	15	N/A	0.00	N/A	N/A
1.97	3.9	6.3	-	0.3	-3.1	6.6	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.9	87	15	N/A	0.00	N/A	N/A
2.13	3.7	5.9	-	0.2	-3.3	6.2	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.3	9.7	88	15	N/A	0.00	N/A	N/A
2.30	3.7	5.9	-	0.2	-3.3	6.0	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.2	9.0	87	15	N/A	0.00	N/A	N/A
2.46	3.1	5.0	-	0.2	-3.4	6.7	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	7.1	95	15	N/A	0.00	N/A	N/A
2.62	3.1	4.9	-	0.2	-3.5	7.0	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	6.5	95	15	N/A	0.00	N/A	N/A
2.79	3.0	4.8	-	0.2	-3.6	7.5	2	Organic SOILS - Peats	100	1.0	3	5	-	-	0.3	6.0	95	10	N/A	0.00	N/A	N/A
2.95	3.7	5.9	-	0.3	-3.6	8.6	2	Organic SOILS - Peats	100	1.0	4	6	-	-	0.4	7.0	95	10	N/A	0.00	N/A	N/A
3.12	6.0	9.5	-	0.4	-3.6	7.2	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	77	15	N/A	0.00	N/A	N/A
3.28	7.8	12.5	-	0.5	-3.8	6.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	69	15	-	-	0.17	-
3.45	25.5	40.9	126.9	0.9	-3.8	3.5	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	34	15	0.74	-	0.17	51.2
3.61	26.9	43.2	126.0	0.9	-3.6	3.3	4	clayy SILT to silty CLAY	115	2.0	13	22	-	-	1.9	9.9	32	15	0.90	-	0.17	51.2
3.77	31.0	49.8	113.2	0.7	-3.6	2.4	5	silty SAND to sandy SILT	120	4.0	8	12	44	43	-	-	26	16	1.87	-	0.16	41.1
3.94	28.5	45.7	95.6	0.5	-2.3	1.8	5	silty SAND to sandy SILT	120	4.0	7	11	41	42	-	-	24	16	2.42	-	0.16	49.2
4.10	25.4	40.8	92.0	0.5	-1.4	1.9	5	silty SAND to sandy SILT	120	4.0	6	10	37	42	-	-	26	16	2.50	-	0.16	51.2
4.27	23.7	38.1	83.0	0.4	-0.6	1.6	5	silty SAND to sandy SILT	120	4.0	6	10	35	41	-	-	25	16	2.72	-	0.15	51.2
4.43	22.4	36.0	94.0	0.5	-0.2	2.2	5	silty SAND to sandy SILT	120	4.0	6	9	33	41	-	-	29	16	2.46	-	0.15	51.2
4.59	25.1	40.2	90.5	0.5	0.0	1.8	5	silty SAND to sandy SILT	120	4.0	6	10	37	41	-	-	26	16	2.54	-	0.14	51.2
4.76	19.0	30.5	80.0	0.3	0.1	1.7	5	silty SAND to sandy SILT	120	4.0	5	8	28	40	-	-	29	16	2.81	-	0.14	51.2
4.92	14.9	23.9	75.4	0.3	0.1	1.8	4	clayy SILT to silty CLAY	115	2.0	7	12	-	-	1.0	9.9	34	15	2.95	-	0.14	51.2
5.09	13.2	21.1	-	0.4	0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	43	15	-	-	0.13	-
5.25	18.3	29.4	-	0.8	0.2	4.3	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	42	15	-	-	0.13	-
5.41	39.1	62.7	110.2	0.7	0.3	1.8	5	silty SAND to sandy SILT	120	4.0	10	16	52	43	-	-	20	16	2.16	-	0.13	32.3
5.58	32.0	51.3	94.4	0.5	0.3	1.6	5	silty SAND to sandy SILT	120	4.0	8	13	45	42	-	-	21	16	2.45	-	0.13	42.7
5.74	25.9	41.6	87.3	0.4	0.3	1.6	5	silty SAND to sandy SILT	120	4.0	6	10	38	41	-	-	24	16	2.61	-	0.12	51.2
5.91	22.8	36.5	84.9	0.4	0.3	1.7	5	silty SAND to sandy SILT	120	4.0	6	9	34	40	-	-	27	16	2.67	-	0.12	51.2
6.07	24.2	38.9	90.1	0.4	0.3	1.8	5	silty SAND to sandy SILT	120	4.0	6	10	36	40	-	-	26	16	2.55	-	0.12	51.2
6.23	31.5	50.6	93.9	0.5	0.3	1.6	5	silty SAND to sandy SILT	120	4.0	8	13	45	41	-	-	21	16	2.46	-	0.11	43.5
6.40	23.9	38.3	91.8	0.5	0.3	1.9	5	silty SAND to sandy SILT	120	4.0	6	10	35	40	-	-	27	16	2.51	-	0.11	51.2
6.56	20.3	32.0	82.3	0.4	0.4	1.8	5	silty SAND to sandy SILT	120	4.0	5	8	29	39	-	-	29	16	2.74	-	0.10	51.2
6.73	17.6	27.5	72.9	0.3	0.4	1.5	5	silty SAND to sandy SILT	120	4.0	4	7	24	38	-	-	30	16	3.03	-	0.10	51.2
6.89	18.4	28.3	80.6	0.3	0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	9	14	-	-	1.3	9.9	31	15	2.79	-	0.09	51.2
7.05	28.6	43.5	80.4	0.4	0.4	1.3	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	21	16	2.80	-	0.09	51.2
7.22	32.4	48.7	89.1	0.5	0.4	1.5	5	silty SAND to sandy SILT	120	4.0	8	12	43	41	-	-	21	16	2.57	-	0.08	45.7
7.38	27.7	41.2	80.1	0.4	0.4	1.3	5	silty SAND to sandy SILT	120	4.0	7	10	38	40	-	-	22	16	2.80	-	0.08	51.2
7.55	24.5	36.0	87.8	0.4	0.4	1.9	5	silty SAND to sandy SILT	120	4.0	6	9	33	39	-	-	28	16	2.60	-	0.08	51.2
7.71	26.2	38.0	88.5	0.5	0.4	1.8	5	silty SAND to sandy SILT	120	4.0	7	10	35	40	-	-	27	16	2.58	-	0.07	51.2
7.87	22.8	32.7	87.4	0.4	0.4	2.0	5	silty SAND to sandy SILT	120	4.0	6	8	30	39	-	-	30	16	2.61	-	0.07	51.2
8.04	20.3	28.8	81.4	0.4	0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	10	14	-	-	1.4	9.9	31	15	2.77	-	0.06	51.2
8.20	18.7	26.3	81.0	0.4	0.4	2.0	4	clayy SILT to silty CLAY	115	2.0	9	13	-	-	1.3	9.9	33	15	2.78	-	0.06	51.2
8.37	16.7	26.8	87.3	0.4	0.4	2.3	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.2	9.9	35	15	2.61	-	0.05	51.2
8.53	12.7	20.4	-	0.5	0.4	3.8	3	silty CLAY to CLAY	115	1.5	8	14	-	-	0.9	9.9	47	15	-	-	0.05	-
8.69	12.4	19.9	-	0.5	0.4	4.0	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	49	15	-	-	0.05	-
8.86	13.7	22.0	-	0.8	0.4	6.0	3	silty CLAY to CLAY	115	1.5	9	15	-	-	0.9	9.9	54	15	-	-	0.05	-
9.02	16.7	26.8	-	1.0	0.4	6.4	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	51	15	-	-	0.05	-
9.19	14.8	23.8	-	1.0	0.4	7.1	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	56	15	-	-	0.05	-
9.35	13.7	21.9	-	0.9	0.4	6.6	3	silty CLAY to CLAY	115	1.5	9	15	-	-	0.9	9.9	56	15	-	-	0.05	-
9.51	14.5	23.3	-	0.9	0.3	6.1	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	53	15	-	-	0.05	-
9.68	15.2	24.4	-	0.9	0.3	6.0	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	52	15	-	-	0.05	-
9.84	12.8	20.5	-	0.8	-0.4	6.5	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	57	15	-	-	0.05	-
10.01	11.8	19.0	-	0.7	-1.4	6.3	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	58	15	-	-	0.05	-
10.17	11.2	17.9	-	0.7	-1.7	6.2	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.5	59	15	-	-	0.05	-
10.34	12.1	19.4	-	0.6	-1.7	5.5	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	55	15	-	-	0.05	-
10.50	10.8	17.4	-	0.7	-1.7	6.7	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.7	8.9	62	15	-	-	0.05	-
10.66	10.9	17.4	-	0.6	-1.7	6.3	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.7	8.8	60	15	-	-	0.05	-
10.83	8.6	13.7	-	0.5	-2.1	6.7	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	6.8	68	15	-	-	0.05	-
10.99	7.2	11.3	-	0.4	-2.5	6.0	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	5.5	71	15	-	-	0.05	-
11.16	7.2	11.1	-	0.4	-2.5	6.4	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	5.5	72	15	-	-	0.05	-
11.32	11.5	17.5	-	0.5	-2.8	4.4	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	8.9	54	15	-	-	0.05	-
11.48	7.5	11.2	-	0.6	-5.2	9.0	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	5.6	80	15	-	-	0.05	-
11.65	7.7	11.5	-	0.5	-5.5	6.6	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	5.7	72	15	-	-	0.05	-
11.81	6.8	10.0	-	0.4	-5.5	6.8	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	4.9	77	15	-	-	0.05	-
11.98	7.0	10.0	-	0.4	-5.5	7.1	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	5.0	78	15	-	-	0.05	-
12.14	7.6	10.8	-	0.4	-5.5	6.4	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	5.4	73	15	-	-	0.05	-
12.30	9.4	13.3	-	0.5	-5.5	6.1	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	6.8	67	15	-	-	0.05	-
12.47	9.0	12.5	-	0.6	-5.5	7.5	3	silty CLAY to CLAY	115	1.5	6	8	-	-	0.6	6.4	73	15	-	-	0.05	-
12.63	11.2	15.4	-	0.7	-5.6	6.4	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.8	8.0	64	15	-	-	0.05	-
12.80	11.9	16.1	-	0.7	-5.7	5.9	3	silty CLAY to CLAY	115	1.5	8	11	-	-	0.8	8.4	61	15	-	-	0.05	-
12.96	11.0	14.7	-	0.7	-5.7	7.1	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	7.7	67	15	-	-	0.05	-
13.12	9.9	13.0	-	0.7	-5.7	7.8	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	6.7	72	15	-	-	0.05	-
13.29	12.1	15.7	-	0.7	-5.8	6.3	3	silty CLAY to CLAY	115	1.5	8	10	-	-	0.8	8.3	63	15	-	-	0.05	-
13.45	11.6	14.9	-	0.7	-5.8	6.5	3	silty CLAY to CLAY	115	1.5	8	10	-	-	0.8	7.8	65	15	-	-	0.05	-
13.62	10.3	13.1	-	0.7	-5.8	7.0	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	6.8	70	15	-	-	0.05	-
13.78	9.8	12.3	-	0.8	-5.8	8.9	3	silty CLAY to CLAY	115	1.5	7	8	-	-	0.7	6.4	77	15	-	-	0.05	-
13.94	11.9	14.8	-	0.8	-5.8	7.3	3	silty CLAY to CLAY	115	1.5	8	10	-	-	0.8	7.8	67	15	-	-	0.05	-
14.11	10.9	13.3	-	0.7	-5.9	7.2	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	7.0	70	15	-	-	0.05	-
14.27	11.0	13.4	-	0.8	-5.9	7.6	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	7.1	71	15	-	-	0.05	-
14.44	14.1	16.9	-	1.0	-5.9	7.9	3	silty CLAY to CLAY	115	1.5	9	11	-	-	1.0	9.1	66	15	-	-	0.05	-
14.60	18.2	21.6	-	1.1	-5.9	6.6	3	silty CLAY to CLAY	115	1.5	12	14	-	-	1.3	9.9	56	15	-	-	0.05	-
14.76	13.7	16.0	-	1.0	-5.9	7.6	3	silty CLAY to CLAY	115	1.5	9	11	-	-	0.9	8.6	66	15	-	-	0.05	-
14.93	12.7	14.7	-	0.8	-5.9	7.0	3	silty CLAY to CLAY	115	1.5	8	10	-	-	0.9	7.9	67	15	-	-	0.05	-
15.09	16.9	19.4	-	0.9	-5.9	5.3	3	silty CLAY to CLAY	115	1.5	11	13	-	-	1.2	9.9	55	15	-	-	0.05	-
15.26	15.7	17.8	-	1.0	-5.9	6.5	3	silty CLAY to CLAY	115	1.5	10	12	-	-	1.1	9.7	60	15	-	-	0.05	-
15.42	13.5	15.2	-	0.9	-5.9	7.1	3	silty CLAY to CLAY	115	1.5	9	10	-	-	0.9	8.2	66	15	-	-	0.05	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
15.58	12.4	13.7	-	0.9	-5.8	7.7	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	7.4	71	15	-	-	0.05	-
15.75	12.5	13.8	-	0.9	-5.8	8.1	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	7.4	72	15	-	-	0.05	-
15.91	15.1	16.5	-	1.2	-5.8	8.4	3	silty CLAY to CLAY	115	1.5	10	11	-	-	1.0	9.0	68	15	-	-	0.05	-
16.08	25.3	27.3	-	1.8	-5.8	7.4	3	silty CLAY to CLAY	115	1.5	17	18	-	-	1.8	9.9	54	15	-	-	0.05	-
16.24	159.9	160.3	169.8	1.4	-5.0	0.9	6	clean SAND to silty SAND	125	5.0	32	32	83	46	-	-	7	16	0.00	-	0.05	0.0
16.40	128.0	127.7	160.7	2.0	0.6	1.6	6	clean SAND to silty SAND	125	5.0	26	26	75	45	-	-	12	16	0.00	-	0.05	0.0
16.57	82.8	82.1	129.3	1.5	0.6	1.9	5	silty SAND to sandy SILT	120	4.0	21	21	61	43	-	-	18	16	1.83	-	0.05	22.2
16.73	37.0	38.2	-	1.5	0.7	4.1	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.6	9.9	37	15	-	-	0.05	-
16.90	22.4	22.9	-	1.5	0.7	6.9	3	silty CLAY to CLAY	115	1.5	15	15	-	-	1.5	9.9	56	15	-	-	0.05	-
17.06	20.5	20.8	-	1.1	0.7	5.8	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.4	9.9	55	15	-	-	0.05	-
17.23	18.0	18.1	-	1.0	0.7	6.1	3	silty CLAY to CLAY	115	1.5	12	12	-	-	1.2	9.9	59	15	-	-	0.05	-
17.39	17.4	17.3	-	1.0	0.7	6.2	3	silty CLAY to CLAY	115	1.5	12	12	-	-	1.2	9.6	60	15	-	-	0.05	-
17.55	16.1	15.9	-	1.1	0.7	7.5	3	silty CLAY to CLAY	115	1.5	11	11	-	-	1.1	8.8	66	15	-	-	0.05	-
17.72	17.9	17.5	-	1.3	0.7	7.6	3	silty CLAY to CLAY	115	1.5	12	12	-	-	1.2	9.8	64	15	-	-	0.05	-
17.88	21.0	20.3	-	1.0	0.7	4.8	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.4	9.9	52	15	-	-	0.05	-
18.05	16.4	15.7	-	1.0	0.6	6.3	3	silty CLAY to CLAY	115	1.5	11	10	-	-	1.1	8.7	63	15	-	-	0.05	-
18.21	25.0	23.7	-	1.8	0.0	7.7	3	silty CLAY to CLAY	115	1.5	17	16	-	-	1.7	9.9	57	15	-	-	0.05	-
18.37	67.8	63.8	158.5	2.4	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	34	32	-	-	4.7	9.9	28	15	0.58	-	0.05	4.1
18.54	41.9	39.0	-	2.3	0.6	5.6	3	silty CLAY to CLAY	115	1.5	28	26	-	-	2.9	9.9	42	15	-	-	0.05	-
18.70	28.6	26.4	-	1.3	0.6	4.8	3	silty CLAY to CLAY	115	1.5	19	18	-	-	2.0	9.9	47	15	-	-	0.05	-
18.87	23.8	21.8	-	0.9	0.6	4.1	3	silty CLAY to CLAY	115	1.5	16	15	-	-	1.6	9.9	48	15	-	-	0.05	-
19.03	20.9	19.0	-	0.8	0.6	4.1	3	silty CLAY to CLAY	115	1.5	14	13	-	-	1.4	9.9	50	15	-	-	0.05	-
19.19	21.1	19.0	-	1.1	0.6	5.3	3	silty CLAY to CLAY	115	1.5	14	13	-	-	1.4	9.9	55	15	-	-	0.05	-
19.36	25.9	23.1	-	1.2	0.6	4.9	3	silty CLAY to CLAY	115	1.5	17	15	-	-	1.8	9.9	50	15	-	-	0.05	-
19.52	78.1	71.4	137.9	1.9	0.5	2.5	5	silty SAND to sandy SILT	120	4.0	20	18	56	42	-	-	22	16	1.56	-	0.05	24.2
19.69	80.1	72.9	174.5	3.0	0.5	3.8	4	clayy SILT to silty CLAY	115	2.0	40	36	-	-	5.6	9.9	27	15	0.00	-	0.04	0.0
19.85	63.5	57.5	170.8	2.8	0.5	4.5	4	clayy SILT to silty CLAY	115	2.0	32	29	-	-	4.4	9.9	32	15	0.00	-	0.04	0.0
20.01	41.4	35.7	-	2.1	0.5	5.2	3	silty CLAY to CLAY	115	1.5	28	24	-	-	2.9	9.9	42	15	-	-	0.04	-
20.18	31.7	27.2	-	1.4	0.5	4.5	3	silty CLAY to CLAY	115	1.5	21	18	-	-	2.2	9.9	45	15	-	-	0.04	-
20.34	21.8	18.5	-	1.0	0.5	4.9	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	9.9	54	15	-	-	0.04	-
20.51	19.9	16.8	-	0.8	0.5	4.5	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.4	9.6	55	15	-	-	0.04	-
20.67	16.9	14.1	-	0.7	0.5	4.5	3	silty CLAY to CLAY	115	1.5	11	9	-	-	1.1	8.0	59	15	-	-	0.04	-
20.83	14.7	12.2	-	0.6	0.5	4.8	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.8	64	15	-	-	0.04	-
21.00	14.6	12.0	-	0.6	0.5	4.5	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.7	63	15	-	-	0.04	-
21.16	22.0	18.0	-	1.2	0.5	5.6	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	9.9	57	15	-	-	0.04	-
21.33	41.2	33.4	-	1.6	0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	2.9	9.9	39	15	-	-	0.04	-
21.49	41.1	33.1	-	1.7	0.2	4.3	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	2.9	9.9	41	15	-	-	0.04	-
21.65	37.1	29.6	-	1.7	0.0	4.7	3	silty CLAY to CLAY	115	1.5	25	20	-	-	2.6	9.9	44	15	-	-	0.04	-
21.82	39.7	31.5	-	1.8	-0.1	4.6	3	silty CLAY to CLAY	115	1.5	26	21	-	-	2.8	9.9	42	15	-	-	0.04	-
21.98	38.4	30.2	-	1.6	-0.2	4.4	3	silty CLAY to CLAY	115	1.5	26	20	-	-	2.7	9.9	43	15	-	-	0.04	-
22.15	42.5	33.2	-	1.9	-0.2	4.6	3	silty CLAY to CLAY	115	1.5	28	22	-	-	3.0	9.9	41	15	-	-	0.04	-
22.31	47.0	36.5	-	2.0	-0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	24	18	-	-	3.3	9.9	39	15	-	-	0.04	-
22.47	42.0	32.3	-	2.2	-0.3	5.4	3	silty CLAY to CLAY	115	1.5	28	22	-	-	2.9	9.9	45	15	-	-	0.04	-
22.64	40.6	31.0	-	1.8	-0.6	4.5	3	silty CLAY to CLAY	115	1.5	27	21	-	-	2.8	9.9	42	15	-	-	0.04	-
22.80	29.6	22.5	-	1.5	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	20	15	-	-	2.0	9.9	51	15	-	-	0.04	-
22.97	26.0	19.6	-	1.1	-0.6	4.3	3	silty CLAY to CLAY	115	1.5	17	13	-	-	1.8	9.9	51	15	-	-	0.04	-
23.13	27.7	20.7	-	1.2	-0.6	4.5	3	silty CLAY to CLAY	115	1.5	18	14	-	-	1.9	9.9	50	15	-	-	0.04	-
23.30	31.6	23.5	-	1.2	-0.6	4.0	3	silty CLAY to CLAY	115	1.5	21	16	-	-	2.2	9.9	46	15	-	-	0.04	-
23.46	26.1	19.3	-	1.1	-0.6	4.6	3	silty CLAY to CLAY	115	1.5	17	13	-	-	1.8	9.9	52	15	-	-	0.04	-
23.62	28.1	20.6	-	1.0	-0.6	3.7	3	silty CLAY to CLAY	115	1.5	19	14	-	-	1.9	9.9	47	15	-	-	0.04	-
23.79	28.3	20.6	-	1.0	-0.6	3.9	3	silty CLAY to CLAY	115	1.5	19	14	-	-	2.0	9.9	48	15	-	-	0.04	-
23.95	31.4	22.7	-	1.0	-0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	16	11	-	-	2.2	9.9	44	15	-	-	0.04	-
24.12	29.0	20.8	-	1.0	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	19	14	-	-	2.0	9.9	47	15	-	-	0.04	-
24.28	22.9	16.3	-	0.9	-0.6	4.3	3	silty CLAY to CLAY	115	1.5	15	11	-	-	1.6	9.6	55	15	-	-	0.04	-
24.44	18.2	12.9	-	0.8	-0.6	4.5	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.4	61	15	-	-	0.04	-
24.61	18.4	13.0	-	0.8	-0.6	4.5	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.5	61	15	-	-	0.04	-
24.77	22.5	15.7	-	0.9	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.5	9.2	56	15	-	-	0.04	-
24.94	24.3	16.8	-	1.1	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	16	11	-	-	1.7	9.9	56	15	-	-	0.04	-
25.10	25.0	17.2	-	1.4	-0.6	5.9	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	9.9	59	15	-	-	0.04	-
25.26	30.9	21.2	-	1.1	-1.0	3.7	3	silty CLAY to CLAY	115	1.5	21	14	-	-	2.1	9.9	46	15	-	-	0.04	-
25.43	74.5	59.7	177.2	3.4	-1.0	4.6	4	clayy SILT to silty CLAY	115	2.0	37	30	-	-	5.2	9.9	32	15	0.00	-	0.04	0.0
25.59	234.5	187.3	226.7	4.5	0.3	1.9	6	clean SAND to silty SAND	125	5.0	47	37	88	46	-	-	11	16	0.00	-	0.04	0.0
25.76	229.6	182.8	206.8	3.3	0.7	1.4	6	clean SAND to silty SAND	125	5.0	46	37	87	46	-	-	9	16	0.00	-	0.04	0.0
25.92	290.5	230.5	230.5	2.2	0.7	0.7	6	clean SAND to silty SAND	125	5.0	58	46	95	47	-	-	5	16	0.00	-	0.04	0.0
26.08	305.9	241.9	241.9	2.3	0.6	0.8	6	clean SAND to silty SAND	125	5.0	61	48	95	47	-	-	5	16	0.00	-	0.04	0.0
26.25	239.6	188.8	210.6	3.3	0.7	1.4	6	clean SAND to silty SAND	125	5.0	48	38	88	46	-	-	8	16	0.00	-	0.04	0.0
26.41	230.4	180.9	199.8	2.9	0.8	1.3	6	clean SAND to silty SAND	125	5.0	46	36	87	46	-	-	8	16	0.00	-	0.04	0.0
26.58	225.3	176.4	176.4	1.4	0.8	0.6	6	clean SAND to silty SAND	125	5.0	45	35	86	46	-	-	5	16	0.00	-	0.04	0.0
26.74	200.1	156.1	162.7	1.6	0.8	0.8	6	clean SAND to silty SAND	125	5.0	40	31	82	45	-	-	6	16	0.00	-	0.04	0.0
26.90	311.3	242.1	242.1	1.9	0.8	0.6	6	clean SAND to silty SAND	125	5.0	62	48	95	47	-	-	5	16	0.00	-	0.04	0.0
27.07	163.3	126.6	145.7	1.7	1.0	1.1	6	clean SAND to silty SAND	125	5.0	33	25	75	44	-	-	9	16	1.49	-	0.04	8.4
27.23	75.6	58.4	112.1	1.5	1.1	2.0	5	silty SAND to sandy SILT	120	4.0	19	15	49	40	-	-	22	16	2.13	-	0.04	35.4
27.40	35.3	22.2	-	1.3	1.1	3.9	3	silty CLAY to CLAY	115	1.5	24	15	-	-	2.4	9.9	46	15	-	-	0.04	-
27.56	25.3	15.8	-	0.9	1.1	3.9	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	9.3	54	15	-	-	0.04	-
27.72	24.6	15.3	-	0.7	1.1	3.0	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.7	9.0	50	15	-	-	0.04	-
27.89	20.3	12.5	-	0.8	1.1	4.1	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	7.3	60	15	-	-	0.04	-
28.05	18.7	11.5	-	0.6	0.9	3.6	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.3	6.6	60	15	-	-	0.04	-
28.22	18.2	11.1	-	0.5	0.1	3.0	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	6.4	58	15	-	-	0.04	-
28.38	15.1	9.2	-	0.4	0.0	3.3	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	5.2	65	15	-	-	0.04	-
28.54	14.7	8.9	-	0.5	0.0	4.2	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	5.0	71	15	-	-	0.04	-
28.71	17.3	10.4	-	0.6	-0.1	3.7	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	5.9	63	15	-	-	0.04	-
28.87	16.4	9.8	-	0.5	-0.1	3.7	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	5.6	65	15	-	-	0.04	-
29.04	15.4	9.2	-	0.5	-0.1	3.9	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	5.2	68	15	-	-	0.04	-
29.20	14.7	8.7	-	0.7	-0.2	5.2	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.9	75	15	-	-	0.04	-
29.36	18.6	10.9	-	0.6	-0.2	3.3	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	6.3	60	15	-	-	0.04	-
29.53	23.1	13.5	-	0.5	-0.2	2.5	4	clayy SILT to silty CLAY	115	2.0	12	7	-	-	1.6	7.9	50	15	-	-	0.04	-
29.69	28.4	16.5	-	0.9	-0.3	3.3	3	silty CLAY to CLAY	115	1.5	19	11	-	-	1.9	9.9	50	15	-	-	0.04	-
29.86	39.6	22.9	-	1.5	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.7	9.9	46	15	-	-	0.04	-
30.02	38.8	22.3	-	1.7	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.7	9.9	49	15	-	-	0.04	-
30.19	26.9	15.4	-	1.5	-0.6	6.0	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	9.2	62	15	-	-	0.04	-
30.35	24.6	14.0	-	1.6	-0.6	7.0	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.7	8.3	68	15	-	-	0.04	-
30.51	39.2	22.1	-	1.6	-1.2	4.3	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.7	9.9	48	15	-	-	0.04	-
30.68	41.3	23.2	-	1.7	-4.3	4.4	3	silty CLAY to CLAY	115	1.5	28	15	-	-	2.9	9.9	47	15	-	-	0.04	-
30.84	25.4	14.2	-	1.3	-5.6	5.3	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.4	62	15	-	-	0.04	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn
31.01	35.7	19.8	-	1.4	-5.9	4.1	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	50	15	-	-	0.04	-
31.17	49.2	27.2	-	1.4	-5.8	2.9	4	clayy SILT to silty CLAY	115	2.0	25	14	-	-	3.4	9.9	38	15	-	-	0.04	-
31.33	24.8	13.7	-	1.3	-5.8	5.8	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.1	65	15	-	-	0.04	-
31.50	15.3	8.4	-	1.0	-6.8	7.1	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.7	83	15	-	-	0.04	-
31.66	16.2	8.8	-	0.8	-6.8	5.5	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	5.0	76	15	-	-	0.04	-
31.83	15.5	8.4	-	0.7	-6.8	5.3	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.7	77	15	-	-	0.04	-
31.99	14.8	8.0	-	0.7	-6.8	5.8	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.5	80	15	-	-	0.04	-
32.15	16.1	8.6	-	0.8	-6.8	5.9	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.9	78	15	-	-	0.04	-
32.32	19.5	10.4	-	0.8	-6.8	4.7	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	6.1	68	15	-	-	0.04	-
32.48	19.3	10.3	-	1.0	-6.8	5.6	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	5.9	72	15	-	-	0.04	-
32.65	20.0	10.6	-	0.9	-6.8	4.9	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	6.2	68	15	-	-	0.04	-
32.81	16.2	8.5	-	0.8	-6.8	5.4	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.8	77	15	-	-	0.04	-
32.97	18.0	9.4	-	0.9	-6.8	5.6	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	5.4	74	15	-	-	0.04	-
33.14	20.8	10.8	-	1.0	-6.8	5.6	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.3	70	15	-	-	0.04	-
33.30	18.3	9.5	-	1.0	-7.1	6.3	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	5.5	77	15	-	-	0.04	-
33.47	15.2	7.8	-	0.9	-7.3	7.0	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.4	85	15	-	-	0.04	-
33.63	14.0	7.2	-	0.8	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	4.0	86	15	-	-	0.04	-
33.79	15.0	7.7	-	0.8	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.3	84	15	-	-	0.04	-
33.96	19.9	10.1	-	1.2	-7.7	6.6	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	5.9	76	15	-	-	0.04	-
34.12	16.8	8.5	-	1.2	-7.8	7.8	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.8	85	15	-	-	0.04	-
34.29	15.0	7.6	-	1.0	-7.8	7.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.2	89	15	-	-	0.04	-
34.45	14.3	7.2	-	0.9	-7.8	7.3	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	4.0	89	15	-	-	0.04	-
34.61	13.5	6.7	-	0.7	-7.8	6.1	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	3.7	87	15	-	-	0.04	-
34.78	13.1	6.5	-	0.7	-7.8	6.2	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	3.5	89	15	-	-	0.04	-
34.94	13.8	6.8	-	0.7	-7.8	6.1	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	3.8	87	15	-	-	0.04	-
35.11	16.3	8.0	-	1.1	-7.7	7.5	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.5	86	15	-	-	0.04	-
35.27	18.1	8.8	-	1.4	-7.7	8.7	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	5.1	86	15	-	-	0.04	-
35.43	17.9	8.7	-	1.4	-7.7	8.7	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	5.0	87	15	-	-	0.04	-
35.60	19.0	9.2	-	1.3	-7.7	7.5	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.3	81	15	-	-	0.04	-
35.76	20.0	9.7	-	1.1	-7.7	6.2	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.6	76	15	-	-	0.04	-
35.93	17.8	8.6	-	1.1	-7.7	7.0	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.9	82	15	-	-	0.04	-
36.09	15.7	7.5	-	1.0	-7.7	7.7	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.2	89	15	-	-	0.04	-
36.26	15.9	7.6	-	0.9	-7.7	6.8	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.0	4.3	86	15	-	-	0.04	-
36.42	21.2	10.0	-	1.1	-7.7	5.8	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	73	15	-	-	0.04	-
36.58	27.0	12.8	-	1.3	-7.7	5.0	3	silty CLAY to CLAY	115	1.5	18	9	-	-	1.8	7.6	64	15	-	-	0.04	-
36.75	19.0	8.9	-	1.2	-7.7	7.0	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.1	81	15	-	-	0.04	-
36.91	15.3	7.2	-	1.0	-7.7	8.0	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	4.0	91	15	-	-	0.04	-
37.08	18.2	8.5	-	1.2	-7.7	7.3	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.9	83	15	-	-	0.04	-
37.24	21.1	9.8	-	1.1	-7.7	5.7	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.7	74	15	-	-	0.04	-
37.40	20.3	9.4	-	1.2	-7.7	6.5	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.4	78	15	-	-	0.04	-
37.57	24.4	11.2	-	1.2	-7.7	5.3	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.7	68	15	-	-	0.04	-
37.73	20.7	9.5	-	1.1	-7.7	6.0	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	76	15	-	-	0.04	-
37.90	18.3	8.3	-	1.0	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.8	81	15	-	-	0.04	-
38.06	16.3	7.4	-	0.9	-7.6	6.6	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.2	86	15	-	-	0.04	-
38.22	13.9	6.3	-	0.9	-7.6	7.7	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	3.4	95	15	-	-	0.04	-
38.39	14.6	6.6	-	0.9	-7.6	7.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.6	92	15	-	-	0.04	-
38.55	16.4	7.3	-	1.0	-7.6	6.8	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.1	87	15	-	-	0.04	-
38.72	18.9	8.4	-	0.9	-7.6	5.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	4.9	78	15	-	-	0.04	-
38.88	17.7	7.9	-	0.9	-7.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.5	81	15	-	-	0.04	-
39.04	15.6	6.9	-	0.9	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	3.9	88	15	-	-	0.04	-
39.21	16.8	7.4	-	0.9	-7.6	5.9	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.2	83	15	-	-	0.04	-
39.37	17.0	7.5	-	0.9	-7.6	6.0	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.2	83	15	-	-	0.04	-
39.54	22.3	9.7	-	1.0	-7.6	5.2	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.7	72	15	-	-	0.04	-
39.70	19.2	8.3	-	1.1	-7.6	6.8	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	4.8	82	15	-	-	0.04	-
39.86	19.1	8.3	-	1.0	-7.6	6.2	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	4.8	81	15	-	-	0.04	-
40.03	17.7	7.7	-	0.9	-7.6	5.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.4	82	15	-	-	0.04	-
40.19	16.5	7.1	-	0.9	-7.6	6.2	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.0	86	15	-	-	0.04	-
40.36	15.6	6.7	-	0.9	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.7	89	15	-	-	0.04	-
40.52	16.3	7.0	-	0.9	-7.6	6.2	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	3.9	86	15	-	-	0.04	-
40.68	15.9	6.8	-	0.9	-7.6	6.5	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.0	3.8	89	15	-	-	0.04	-
40.85	19.0	8.0	-	1.0	-7.6	6.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.6	81	15	-	-	0.04	-
41.01	19.5	8.2	-	1.1	-7.6	6.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.7	81	15	-	-	0.04	-
41.18	22.5	9.4	-	1.3	-7.6	6.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.5	77	15	-	-	0.04	-
41.34	28.0	11.7	-	1.5	-7.6	5.7	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.0	68	15	-	-	0.04	-
41.50	21.2	8.8	-	1.3	-7.5	6.7	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.2	80	15	-	-	0.04	-
41.67	17.0	7.1	-	0.9	-7.5	6.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.0	87	15	-	-	0.04	-
41.83	20.8	8.6	-	1.1	-7.6	5.9	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.0	79	15	-	-	0.04	-
42.00	22.4	9.2	-	1.2	-7.5	6.2	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	77	15	-	-	0.04	-
42.16	22.5	9.2	-	1.3	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	78	15	-	-	0.04	-
42.32	28.4	11.6	-	1.4	-7.5	5.3	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.0	67	15	-	-	0.04	-
42.49	26.8	10.9	-	1.5	-7.5	6.0	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.5	72	15	-	-	0.04	-
42.65	24.4	9.9	-	1.3	-7.5	6.1	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	5.9	75	15	-	-	0.04	-
42.82	22.8	9.2	-	1.2	-7.5	5.7	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	75	15	-	-	0.04	-
42.98	21.5	8.7	-	1.2	-7.5	6.0	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.1	79	15	-	-	0.04	-
43.15	21.4	8.6	-	1.2	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.0	80	15	-	-	0.04	-
43.31	18.7	7.5	-	1.0	-7.5	6.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.3	85	15	-	-	0.04	-
43.47	15.2	6.1	-	0.9	-7.5	7.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.3	95	15	-	-	0.04	-
43.64	16.5	6.5	-	0.9	-7.5	6.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.7	89	15	-	-	0.04	-
43.80	15.3	6.0	-	0.7	-7.5	5.9	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.3	90	15	-	-	0.04	-
43.97	15.9	6.3	-	1.0	-7.5	7.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.5	95	15	-	-	0.04	-
44.13	28.8	11.3	-	1.3	-7.5	4.9	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	6.8	66	15	-	-	0.04	-
44.29	21.0	8.2	-	1.3	-7.5	7.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.8	84	15	-	-	0.04	-
44.46	20.9	8.1	-	1.3	-7.5	7.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.7	84	15	-	-	0.04	-
44.62	25.4	9.8	-	1.4	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.8	76	15	-	-	0.04	-
44.79	22.6	8.7	-	1.3	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.1	79	15	-	-	0.04	-
44.95	24.8	9.5	-	1.0	-7.5	4.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.6	70	15	-	-	0.04	-
45.11	22.5	8.6	-	1.1	-7.5	5.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.1	77	15	-	-	0.04	-
45.28	19.5	7.4	-	1.0	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	83	15	-	-	0.04	-
45.44	16.8	6.4	-	0.8	-7.5	5.9	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.6	88	15	-	-	0.04	-
45.61	17.1	6.5	-	0.9	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.6	89	15	-	-	0.04	-
45.77	29.6	11.2	-	1.3	-7.5	4.8	3	silty CLAY to CLAY	115	1.5	20	7	-	-	2.0	6.8	66	15	-	-	0.04	-
45.93	36.8	13.9	-	1.6	-7.5	4.8	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	8.5	61	15	-	-	0.04	-
46.10	31.9	12.0	-	1.8	-7.5	6.2	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	7.3	69	15	-	-	0.04	-
46.26	34.3	13.0	-	1.7	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.9	65	15	-	-	0.04	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
46.43	24.7	9.3	-	1.5	-7.5	6.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.7	5.4	79	15	-	-	0.04	-
46.59	20.7	7.8	-	1.2	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.4	84	15	-	-	0.04	-
46.75	19.0	7.2	-	1.1	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	4.0	87	15	-	-	0.04	-
46.92	19.6	7.4	-	0.9	-7.5	5.6	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.1	82	15	-	-	0.04	-
47.08	17.8	6.7	-	1.1	-7.5	7.3	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.7	92	15	-	-	0.04	-
47.25	19.8	7.5	-	1.4	-7.5	8.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.2	91	15	-	-	0.04	-
47.41	31.1	11.7	-	1.4	-7.5	4.9	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	6.9	66	15	-	-	0.04	-
47.57	28.8	10.9	-	1.5	-7.5	5.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.3	71	15	-	-	0.04	-
47.74	25.5	9.6	-	1.3	-7.5	5.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.5	74	15	-	-	0.04	-
47.90	25.2	9.5	-	1.2	-7.5	5.2	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.4	73	15	-	-	0.04	-
48.07	21.1	8.0	-	1.1	-7.5	6.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.4	82	15	-	-	0.04	-
48.23	19.5	7.3	-	1.2	-7.5	7.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.0	88	15	-	-	0.04	-
48.39	23.9	9.0	-	1.3	-7.5	6.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.0	78	15	-	-	0.04	-
48.56	27.4	10.4	-	1.6	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.9	75	15	-	-	0.04	-
48.72	26.7	10.1	-	1.6	-7.5	6.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.6	76	15	-	-	0.04	-
48.89	28.6	10.8	-	1.6	-7.5	6.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.1	72	15	-	-	0.04	-
49.05	33.8	12.7	-	1.6	-7.5	5.2	3	silty CLAY to CLAY	115	1.5	23	8	-	-	2.3	7.3	64	15	-	-	0.04	-
49.22	33.7	12.7	-	1.7	-7.5	5.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	7.2	66	15	-	-	0.04	-
49.38	34.1	12.9	-	1.5	-7.5	5.0	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.3	63	15	-	-	0.04	-
49.54	32.4	12.2	-	1.3	-7.5	4.4	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	62	15	-	-	0.04	-
49.71	23.8	9.0	-	1.3	-7.5	6.1	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.9	78	15	-	-	0.04	-
49.87	27.3	10.3	-	1.5	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.7	74	15	-	-	0.04	-
50.04	27.5	10.4	-	1.5	-7.5	6.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.7	74	15	-	-	0.04	-
50.20	26.1	9.8	-	1.4	-7.5	5.9	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.3	74	15	-	-	0.04	-
50.36	28.8	10.9	-	1.2	-7.5	4.8	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.9	67	15	-	-	0.04	-
50.53	32.7	12.3	-	1.3	-7.5	4.3	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.8	62	15	-	-	0.04	-
50.69	33.1	12.5	-	1.6	-7.5	5.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	65	15	-	-	0.04	-
50.86	33.2	12.5	-	1.7	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	67	15	-	-	0.04	-
51.02	35.5	13.4	-	1.6	-7.5	4.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.4	62	15	-	-	0.04	-
51.18	36.8	13.9	-	1.5	-7.5	4.5	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.7	59	15	-	-	0.04	-
51.35	32.5	12.3	-	1.5	-7.5	5.0	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.7	65	15	-	-	0.04	-
51.51	32.8	12.4	-	1.6	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.7	66	15	-	-	0.04	-
51.68	34.4	13.0	-	1.7	-7.5	5.6	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.0	65	15	-	-	0.04	-
51.84	42.8	16.1	-	1.9	-7.5	4.7	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.9	57	15	-	-	0.04	-
52.00	39.9	15.0	-	2.0	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	8.2	61	15	-	-	0.04	-
52.17	43.3	16.3	-	2.1	-7.5	5.3	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.9	59	15	-	-	0.04	-
52.33	38.4	14.5	-	2.3	-7.5	6.5	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	7.8	66	15	-	-	0.04	-
52.50	37.9	14.3	-	2.0	-7.5	5.9	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	7.7	64	15	-	-	0.04	-
52.66	35.4	13.4	-	1.9	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.1	66	15	-	-	0.04	-
52.82	38.7	14.6	-	2.1	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	7.8	63	15	-	-	0.04	-
52.99	52.3	19.7	-	2.7	-7.5	5.5	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	55	15	-	-	0.04	-
53.15	69.9	26.4	-	3.3	-7.5	5.0	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.8	9.9	47	15	-	-	0.04	-
53.32	60.6	22.9	-	3.1	-7.5	5.3	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	51	15	-	-	0.04	-
53.48	44.7	16.9	-	2.4	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.1	9.0	60	15	-	-	0.04	-
53.64	43.1	16.3	-	1.5	-7.5	3.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.7	53	15	-	-	0.04	-
53.81	43.5	16.4	-	1.4	-7.5	3.5	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.7	51	15	-	-	0.04	-
53.97	46.4	17.5	-	1.8	-7.5	4.1	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.3	53	15	-	-	0.04	-
54.14	47.1	17.8	-	1.9	-7.5	4.3	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.4	53	15	-	-	0.04	-
54.30	43.7	16.5	-	2.3	-7.5	5.6	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.7	60	15	-	-	0.04	-
54.46	47.8	18.0	-	2.4	-7.5	5.3	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.5	57	15	-	-	0.04	-
54.63	49.0	18.5	-	2.3	-7.5	5.1	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.8	55	15	-	-	0.04	-
54.79	44.4	16.8	-	2.3	-7.5	5.5	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	8.8	59	15	-	-	0.04	-
54.96	41.4	15.6	-	2.2	-7.5	5.8	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	8.1	62	15	-	-	0.04	-
55.12	43.8	16.5	-	2.2	-7.5	5.5	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.6	59	15	-	-	0.04	-
55.28	50.3	19.0	-	2.3	-7.5	5.0	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	9.9	54	15	-	-	0.04	-
55.45	47.3	17.9	-	2.4	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	9.3	57	15	-	-	0.04	-
55.61	44.0	16.6	-	2.1	-7.5	5.2	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.5	58	15	-	-	0.04	-
55.78	45.8	17.3	-	2.0	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.9	55	15	-	-	0.04	-
55.94	45.8	17.3	-	2.0	-7.6	4.6	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.9	55	15	-	-	0.04	-
56.11	46.1	17.4	-	1.9	-7.6	4.5	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.9	54	15	-	-	0.04	-
56.27	42.9	16.2	-	1.7	-7.5	4.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.2	55	15	-	-	0.04	-
56.43	42.8	16.2	-	1.9	-7.5	4.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.2	57	15	-	-	0.04	-
56.60	40.5	15.3	-	2.0	-7.5	5.4	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.7	61	15	-	-	0.04	-
56.76	42.6	16.1	-	1.8	-7.6	4.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.1	57	15	-	-	0.04	-
56.93	37.2	14.0	-	1.7	-7.5	4.9	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.9	61	15	-	-	0.04	-
57.09	36.7	13.8	-	1.6	-7.6	4.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.8	61	15	-	-	0.04	-
57.25	37.5	14.1	-	1.6	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.0	60	15	-	-	0.04	-
57.42	41.0	15.5	-	1.8	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.7	58	15	-	-	0.04	-
57.58	43.1	16.2	-	2.0	-7.6	4.9	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	8.1	58	15	-	-	0.04	-
57.75	36.4	13.7	-	1.9	-7.6	5.8	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.7	65	15	-	-	0.04	-
57.91	36.9	13.9	-	1.9	-7.6	5.6	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.8	64	15	-	-	0.04	-
58.07	40.5	15.3	-	1.8	-7.6	4.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.5	59	15	-	-	0.04	-
58.24	38.9	14.7	-	1.6	-7.7	4.4	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	7.1	58	15	-	-	0.04	-
58.40	40.2	15.2	-	1.6	-7.6	4.4	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.4	57	15	-	-	0.04	-
58.57	53.9	20.3	-	2.3	-7.6	4.5	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	51	15	-	-	0.04	-
58.73	69.2	26.1	-	3.4	-7.6	5.1	3	silty CLAY to CLAY	115	1.5	46	17	-	-	4.8	9.9	48	15	-	-	0.04	-
58.89	54.8	20.7	-	3.4	-7.6	6.7	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	58	15	-	-	0.04	-
59.06	48.3	18.2	-	2.6	-7.6	5.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.9	58	15	-	-	0.04	-
59.22	43.2	16.3	-	2.2	-7.6	5.5	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	7.9	60	15	-	-	0.04	-
59.39	42.0	15.8	-	2.6	-7.6	6.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	7.6	64	15	-	-	0.04	-
59.55	51.6	19.5	-	2.9	-7.6	5.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.5	57	15	-	-	0.04	-
59.71	52.9	20.0	-	3.4	-7.6	6.8	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	59	15	-	-	0.04	-
59.88	69.5	26.2	-	3.3	-7.6	5.0	3	silty CLAY to CLAY	115	1.5	46	17	-	-	4.8	9.9	48	15	-	-	0.04	-
60.04	48.6	18.4	-	2.5	-7.6	5.6	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.8	57	15	-	-	0.04	-
60.21	37.8	14.3	-	2.0	-7.6	5.8	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	6.7	64	15	-	-	0.04	-
60.37	38.0	14.4	-	1.6	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	6.7	60	15	-	-	0.04	-
60.53	33.7	12.7	-	1.4	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	5.8	63	15	-	-	0.04	-
60.70	35.9	13.5	-	1.4	-7.6	4.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.3	60	15	-	-	0.04	-
60.86	36.6	13.8	-	1.5	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.4	61	15	-	-	0.04	-
61.03	37.5	14.2	-	1.7	-7.6	5.1	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.5	62	15	-	-	0.04	-
61.19	39.4	14.9	-	1.7	-7.6	4.7	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	6.9	59	15	-	-	0.04	-
61.35	30.7	11.6	-	1.8	-7.6	6.6	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	5.2	73	15	-	-	0.04	-
61.52	44.7	16.9	-	1.9	-7.7	4.7	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	7.8	56	15	-	-	0.04	-
61.68	58.5	22.1	-	1.5	-7.7	2.8	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	42	15	-	-	0.04	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.17	Cycl SStn %
61.85	63.8	32.8	65.3	0.6	-7.7	0.9	5	silty SAND to sandy SILT	120	4.0	16	8	30	35	-	-	23	16	3.32	-	0.04	51.2
62.01	66.2	34.0	82.2	1.0	-7.7	1.6	5	silty SAND to sandy SILT	120	4.0	17	8	31	35	-	-	27	16	2.74	-	0.03	51.2
62.17	54.1	20.4	-	1.5	-6.9	3.0	4	clayy SILT to silty CLAY	115	2.0	27	10	-	-	3.7	9.5	44	15	-	-	0.03	-
62.34	51.9	19.6	-	1.6	-6.7	3.2	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	9.1	46	15	-	-	0.03	-
62.50	50.2	18.9	-	1.0	-6.5	2.1	4	clayy SILT to silty CLAY	115	2.0	25	9	-	-	3.4	8.7	41	15	-	-	0.03	-
62.67	44.9	16.9	-	1.0	-6.2	2.5	4	clayy SILT to silty CLAY	115	2.0	22	8	-	-	3.0	7.7	46	15	-	-	0.03	-
62.83	43.6	16.5	-	1.8	-5.5	4.5	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.5	56	15	-	-	0.03	-
63.00	47.6	18.0	-	2.2	-5.5	5.1	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	8.2	56	15	-	-	0.03	-
63.16	57.8	21.8	-	2.6	-5.4	4.7	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	50	15	-	-	0.03	-
63.32	64.8	24.4	-	2.6	-5.2	4.3	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.5	9.9	46	15	-	-	0.03	-
63.49	68.5	25.9	-	2.5	-5.2	3.9	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	44	15	-	-	0.03	-
63.65	68.9	26.0	-	2.8	-5.2	4.4	3	silty CLAY to CLAY	115	1.5	46	17	-	-	4.7	9.9	45	15	-	-	0.03	-
63.82	72.2	27.2	-	3.0	-5.2	4.3	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	44	15	-	-	0.03	-
63.98	69.6	26.3	-	3.2	-5.2	4.8	3	silty CLAY to CLAY	115	1.5	46	18	-	-	4.8	9.9	47	15	-	-	0.03	-
64.14	73.3	27.7	-	3.3	-5.2	4.7	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	45	15	-	-	0.03	-
64.31	72.4	27.3	-	3.1	-5.2	4.5	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	45	15	-	-	0.03	-
64.47	72.7	27.4	-	2.9	-5.3	4.2	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	44	15	-	-	0.03	-
64.64	68.9	26.0	-	2.7	-5.3	4.1	3	silty CLAY to CLAY	115	1.5	46	17	-	-	4.7	9.9	44	15	-	-	0.03	-
64.80	81.2	30.6	-	2.9	-5.3	3.7	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.6	9.9	40	15	-	-	0.03	-
64.96	72.0	27.2	-	2.9	-5.3	4.3	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	44	15	-	-	0.03	-
65.13	62.5	23.6	-	2.3	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.03	-
65.29	59.2	22.4	-	2.2	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.1	9.9	47	15	-	-	0.03	-
65.46	54.5	20.6	-	1.9	-5.3	3.8	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.1	48	15	-	-	0.03	-
65.62	54.6	20.6	-	1.8	-5.3	3.6	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.1	47	15	-	-	0.03	-
65.78	53.6	20.2	-	2.0	-5.2	3.9	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.7	8.9	49	15	-	-	0.03	-
65.95	56.5	21.3	-	2.1	-5.2	4.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.4	48	15	-	-	0.03	-
66.11	60.6	22.9	-	2.3	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	47	15	-	-	0.03	-
66.28	73.2	27.6	-	2.7	-5.3	3.9	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.0	9.9	43	15	-	-	0.03	-
66.44	75.0	28.3	-	2.4	-5.3	3.3	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	40	15	-	-	0.03	-
66.60	59.9	22.6	-	1.8	-5.3	3.3	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	44	15	-	-	0.03	-
66.77	58.4	22.1	-	1.5	-5.3	2.8	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.6	42	15	-	-	0.03	-
66.93	60.6	22.9	-	1.6	-5.3	2.8	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.2	9.9	41	15	-	-	0.03	-
67.10	54.2	20.4	-	2.1	-5.3	4.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	8.8	49	15	-	-	0.03	-
67.26	58.1	21.9	-	2.1	-5.3	3.9	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.5	47	15	-	-	0.03	-
67.42	59.5	22.5	-	2.2	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.7	47	15	-	-	0.03	-
67.59	49.9	18.8	-	2.0	-5.3	4.3	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	8.0	52	15	-	-	0.03	-
67.75	41.9	15.8	-	1.8	-5.3	4.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	6.6	58	15	-	-	0.03	-
67.92	48.4	18.3	-	1.8	-5.3	4.1	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	7.7	52	15	-	-	0.03	-
68.08	57.7	21.8	-	2.5	-5.3	4.7	3	silty CLAY to CLAY	115	1.5	38	15	-	-	3.9	9.3	50	15	-	-	0.03	-
68.24	63.4	23.9	-	2.1	-5.3	3.5	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.3	9.9	44	15	-	-	0.03	-
68.41	59.6	22.5	-	2.0	-5.3	3.6	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.6	45	15	-	-	0.03	-
68.57	60.9	23.0	-	2.0	-5.3	3.5	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.2	9.8	45	15	-	-	0.03	-
68.74	62.8	23.7	-	2.4	-5.3	4.1	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.03	-
68.90	57.3	21.6	-	2.4	-5.3	4.5	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.1	50	15	-	-	0.03	-
69.07	57.1	21.6	-	2.4	-5.3	4.5	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.1	50	15	-	-	0.03	-
69.23	58.9	22.2	-	2.6	-5.3	4.8	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.4	50	15	-	-	0.03	-
69.39	57.4	21.7	-	2.4	-5.3	4.6	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.1	50	15	-	-	0.03	-
69.56	60.0	22.6	-	2.2	-5.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.5	47	15	-	-	0.03	-
69.72	52.4	19.8	-	2.0	-5.3	4.2	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	8.2	50	15	-	-	0.03	-
69.89	55.0	20.8	-	2.3	-5.3	4.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	8.6	51	15	-	-	0.03	-
70.05	85.3	32.2	-	2.9	-5.4	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.03	-
70.21	89.8	33.9	-	3.2	-5.3	3.7	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	38	15	-	-	0.03	-
70.38	81.9	30.9	-	2.9	-5.3	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.03	-
70.54	76.1	28.7	-	2.5	-5.3	3.5	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	40	15	-	-	0.03	-
70.71	73.2	27.6	-	2.5	-5.3	3.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.0	9.9	41	15	-	-	0.03	-
70.87	72.7	27.4	-	1.7	-5.3	2.5	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	36	15	-	-	0.03	-
71.03	78.9	29.8	-	2.6	-5.4	3.5	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	40	15	-	-	0.03	-
71.20	68.0	25.6	-	3.1	-5.4	4.8	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.7	9.9	47	15	-	-	0.03	-
71.36	78.5	29.6	-	3.0	-5.3	4.0	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	42	15	-	-	0.03	-
71.53	77.1	29.1	-	3.5	-5.3	4.8	3	silty CLAY to CLAY	115	1.5	51	19	-	-	5.3	9.9	45	15	-	-	0.03	-
71.69	60.0	22.6	-	3.3	-5.3	5.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.2	53	15	-	-	0.03	-
71.85	73.1	27.6	-	3.3	-5.3	4.8	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.0	9.9	46	15	-	-	0.03	-
72.02	89.2	33.7	-	3.3	-5.3	3.9	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	39	15	-	-	0.03	-
72.18	93.1	35.1	-	3.7	-5.4	4.1	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	39	15	-	-	0.03	-
72.35	99.6	37.6	-	4.3	-5.4	4.5	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	39	15	-	-	0.03	-
72.51	101.2	38.2	-	3.9	-5.3	4.0	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.0	9.9	37	15	-	-	0.03	-
72.67	97.1	36.7	-	3.3	-5.3	3.5	4	clayy SILT to silty CLAY	115	2.0	49	18	-	-	6.7	9.9	36	15	-	-	0.03	-
72.84	97.4	46.1	125.3	2.8	-5.3	3.0	4	clayy SILT to silty CLAY	115	2.0	49	23	-	-	6.7	9.9	30	15	1.89	-	0.03	48.7
73.00	95.8	45.3	132.0	3.0	-5.3	3.3	4	clayy SILT to silty CLAY	115	2.0	48	23	-	-	6.6	9.9	32	15	1.63	-	0.02	49.7
73.17	87.6	33.1	-	3.0	-5.3	3.7	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.0	9.9	38	15	-	-	0.02	-
73.33	88.6	33.4	-	3.2	-5.3	3.8	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	39	15	-	-	0.02	-
73.49	86.4	32.6	-	3.1	-5.3	3.8	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	39	15	-	-	0.02	-
73.66	83.3	31.4	-	3.5	-5.3	4.4	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.7	9.9	42	15	-	-	0.02	-
73.82	87.9	33.2	-	3.4	-5.3	4.0	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	40	15	-	-	0.02	-
73.99	90.4	34.1	-	3.8	-5.3	4.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	40	15	-	-	0.02	-
74.15	81.2	30.7	-	3.5	-5.3	4.5	3	silty CLAY to CLAY	115	1.5	54	20	-	-	5.6	9.9	43	15	-	-	0.02	-
74.31	95.2	35.9	-	4.1	-5.5	4.5	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	40	15	-	-	0.02	-
74.48	112.2	42.4	-	4.4	-5.4	4.0	4	clayy SILT to silty CLAY	115	2.0	56	21	-	-	7.8	9.9	36	15	-	-	0.02	-
74.64	104.0	39.3	-	4.1	-5.4	4.1	4	clayy SILT to silty CLAY	115	2.0	52	20	-	-	7.2	9.9	37	15	-	-	0.02	-
74.81	105.2	49.2	137.9	3.4	-5.4	3.4	4	clayy SILT to silty CLAY	115	2.0	53	25	-	-	7.3	9.9	31	15	1.32	-	0.02	40.2
74.97	105.4	49.2	133.1	3.2	-5.4	3.2	4	clayy SILT to silty CLAY	115	2.0	53	25	-	-	7.3	9.9	30	15	1.56	-	0.02	44.7
75.13	102.1	47.6	133.5	3.2	-5.4	3.3	4	clayy SILT to silty CLAY	115	2.0	51	24	-	-	7.1	9.9	31	15	1.53	-	0.02	45.9
75.30	95.7	36.1	-	3.1	-5.4	3.4	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	36	15	-	-	0.01	-
75.46	92.9	35.1	-	3.3	-5.4	3.8	4	clayy SILT to silty CLAY	115	2.0	46	18	-	-	6.4	9.9	38	15	-	-	0.01	-
75.63	90.4	34.1	-	3.8	-5.4	4.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	41	15	-	-	0.01	-
75.79	90.4	34.1	-	4.2	-5.4	4.9	3	silty CLAY to CLAY	115	1.5	60	23	-	-	6.2	9.9	42	15	-	-	0.01	-
75.96	94.0	35.5	-	3.2	-5.4	3.6	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.01	-
76.12	86.9	32.8	-	3.5	-5.4	4.2	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	41	15	-	-	0.01	-
76.28	81.6	30.8	-	3.4	-5.4	4.3	3	silty CLAY to CLAY	115	1.5	54	21	-	-	5.6	9.9	42	15	-	-	0.01	-
76.45	81.7	30.8	-	3.6	-5.4	4.6	3	silty CLAY to CLAY	115	1.5	54	21	-	-	5.6	9.9	43	15	-	-	0.01	-
76.61	99.7	37.6	-	3.6	-5.4	3.8	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	37	15	-	-	0.01	-
76.78	99.3	37.5	-	3.6	-5.4	3.8	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	37	15	-	-	0.01	-
76.94	96.7	36.5	-	3.6	-5.4	3.9	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	38	15	-	-	0.01	-
77.10	90.7	34.2	-	3.4	-5.4	4.0	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	39	15	-	-	0.01	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(577).cpt
CPT Date: 10/11/2011 11:42:23 PM
GW During Test: No GW

Sounding ID: CPT-11-209
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	*qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	*Mat Typ Zon	*Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	*SPT R-N1 60%	*Rel Den %	*Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	*Nk -	*Vol Strn %	*Dry Stlmt 0.00	*Liq Stlmt 0.17	*Cycl SStn ½
77.27	88.9	33.5	-	4.0	-5.4	4.8	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	42	15	-	-	0.01	-
77.43	109.9	41.5	-	4.3	-5.4	4.1	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	36	15	-	-	0.01	-
77.60	99.8	37.7	-	4.7	-5.5	5.0	3	silty CLAY to CLAY	115	1.5	67	25	-	-	6.9	9.9	41	15	-	-	0.01	-
77.76	113.9	43.0	-	4.6	-5.5	4.2	4	clayy SILT to silty CLAY	115	2.0	57	21	-	-	7.9	9.9	36	15	-	-	0.01	-
77.92	115.3	43.5	-	4.6	-5.5	4.1	4	clayy SILT to silty CLAY	115	2.0	58	22	-	-	8.0	9.9	36	15	-	-	0.01	-
78.09	116.4	53.2	152.0	4.2	-5.5	3.8	4	clayy SILT to silty CLAY	115	2.0	58	27	-	-	8.1	9.9	31	15	0.67	-	0.01	22.6
78.25	116.4	53.2	153.3	4.3	-5.4	3.8	4	clayy SILT to silty CLAY	115	2.0	58	27	-	-	8.1	9.9	32	15	0.61	-	0.01	22.3
78.42	112.2	42.3	-	4.3	-5.4	4.0	4	clayy SILT to silty CLAY	115	2.0	56	21	-	-	7.8	9.9	35	15	-	-	0.01	-
78.58	109.6	41.3	-	4.0	-5.4	3.9	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	35	15	-	-	0.01	-
78.74	103.6	39.1	-	3.8	-5.4	3.9	4	clayy SILT to silty CLAY	115	2.0	52	20	-	-	7.2	9.9	36	15	-	-	0.01	-
78.91	102.7	46.7	135.6	3.3	-5.4	3.4	4	clayy SILT to silty CLAY	115	2.0	51	23	-	-	7.1	9.9	32	15	1.39	-	0.01	45.7
79.07	105.6	48.0	136.2	3.4	-5.4	3.4	4	clayy SILT to silty CLAY	115	2.0	53	24	-	-	7.3	9.9	31	15	1.37	-	0.01	43.0
79.24	99.7	37.6	-	3.4	-5.4	3.6	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	36	15	-	-	0.01	-
79.40	102.8	46.7	137.7	3.4	-5.4	3.5	4	clayy SILT to silty CLAY	115	2.0	51	23	-	-	7.1	9.9	32	15	1.28	-	0.01	45.1
79.56	106.3	48.2	134.7	3.3	-5.5	3.3	4	clayy SILT to silty CLAY	115	2.0	53	24	-	-	7.4	9.9	31	15	1.45	-	0.01	43.8
79.73	106.4	48.2	130.8	3.2	-5.5	3.1	4	clayy SILT to silty CLAY	115	2.0	53	24	-	-	7.4	9.9	30	15	1.66	-	0.00	46.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
0.33	13.9	22.3	-	2.0	0.3	9.9	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	63	15	N/A	0.00	N/A	N/A
0.49	18.1	29.1	-	1.5	0.3	8.3	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	54	15	N/A	0.00	N/A	N/A
0.66	10.4	16.6	-	0.6	0.2	6.0	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	59	15	N/A	0.00	N/A	N/A
0.82	9.7	15.5	-	0.1	0.2	1.2	4	clayy SILT to silty CLAY	115	2.0	5	8	-	-	0.7	9.9	36	15	N/A	0.00	N/A	N/A
0.98	4.6	7.4	-	0.2	0.2	5.1	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	76	15	N/A	0.00	N/A	N/A
1.15	10.7	17.1	-	1.2	0.3	9.9	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.8	9.9	69	15	N/A	0.00	N/A	N/A
1.31	62.5	100.2	179.6	1.9	0.3	3.0	5	silty SAND to sandy SILT	120	4.0	16	25	67	48	-	-	21	16	N/A	0.00	N/A	N/A
1.48	45.0	72.1	155.0	1.4	0.3	3.2	5	silty SAND to sandy SILT	120	4.0	11	18	56	48	-	-	25	16	N/A	0.00	N/A	N/A
1.64	54.8	87.9	171.9	1.7	0.4	3.2	5	silty SAND to sandy SILT	120	4.0	14	22	63	48	-	-	23	16	N/A	0.00	N/A	N/A
1.80	57.6	92.4	169.6	1.7	0.3	2.9	5	silty SAND to sandy SILT	120	4.0	14	23	64	48	-	-	21	16	N/A	0.00	N/A	N/A
1.97	54.2	86.8	183.0	1.9	0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	24	15	N/A	0.00	N/A	N/A
2.13	52.5	84.2	191.6	2.1	0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	26	42	-	-	3.7	9.9	26	15	N/A	0.00	N/A	N/A
2.30	48.7	78.2	195.3	2.1	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	28	15	N/A	0.00	N/A	N/A
2.46	44.4	71.2	197.7	2.2	0.3	4.9	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.1	9.9	31	15	N/A	0.00	N/A	N/A
2.62	43.1	69.1	197.0	2.1	0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.0	9.9	31	15	N/A	0.00	N/A	N/A
2.79	50.1	80.3	184.3	2.0	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	26	15	N/A	0.00	N/A	N/A
2.95	53.0	85.0	202.5	2.3	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.7	9.9	27	15	N/A	0.00	N/A	N/A
3.12	63.9	102.5	223.2	2.8	0.3	4.4	9	very stiff fine SOIL	120	2.0	32	51	68	47	-	-	25	30	N/A	0.00	N/A	N/A
3.28	70.2	112.7	233.3	3.0	0.3	4.3	9	very stiff fine SOIL	120	2.0	35	56	71	47	-	-	24	30	0.00	-	0.11	0.0
3.45	62.1	99.7	242.7	3.2	0.3	5.1	9	very stiff fine SOIL	120	2.0	31	50	67	46	-	-	28	30	0.00	-	0.11	0.0
3.61	58.0	93.0	237.4	3.0	0.3	5.3	9	very stiff fine SOIL	120	2.0	29	46	65	46	-	-	29	30	0.00	-	0.11	0.0
3.77	58.2	93.4	219.6	2.7	0.3	4.6	9	very stiff fine SOIL	120	2.0	29	47	65	46	-	-	27	30	0.00	-	0.11	0.0
3.94	51.3	82.3	216.8	2.6	0.3	5.0	9	very stiff fine SOIL	120	2.0	26	41	61	45	-	-	29	30	0.00	-	0.11	0.0
4.10	47.8	76.7	222.1	2.6	0.1	5.5	9	very stiff fine SOIL	120	2.0	24	38	58	45	-	-	32	30	0.00	-	0.11	0.0
4.27	49.0	78.5	210.4	2.4	-0.5	5.0	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	30	15	0.00	-	0.11	0.0
4.43	44.8	71.8	207.2	2.3	-0.5	5.2	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.2	9.9	32	15	0.00	-	0.11	0.0
4.59	43.6	69.9	207.2	2.3	-0.5	5.3	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	32	15	0.00	-	0.11	0.0
4.76	39.9	64.0	197.0	2.1	-0.5	5.2	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	33	15	0.00	-	0.11	0.0
4.92	37.8	60.7	196.2	2.0	-0.5	5.4	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
5.09	35.8	57.3	-	2.0	-0.5	5.7	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	36	15	-	-	0.11	-
5.25	35.7	57.2	187.4	1.9	-0.5	5.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
5.41	34.3	55.0	182.9	1.8	-0.6	5.2	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	35	15	0.00	-	0.11	0.0
5.58	37.2	59.6	-	2.1	-0.6	5.7	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	36	15	-	-	0.11	-
5.74	45.4	72.9	203.6	2.3	-0.6	5.0	4	clayy SILT to silty CLAY	115	2.0	23	36	-	-	3.2	9.9	31	15	0.00	-	0.11	0.0
5.91	50.2	80.4	211.5	2.4	-0.6	4.9	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	29	15	0.00	-	0.11	0.0
6.07	43.0	69.0	209.8	2.3	-0.6	5.5	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.0	9.9	33	15	0.00	-	0.11	0.0
6.23	36.2	58.1	-	2.1	-0.6	5.9	3	silty CLAY to CLAY	115	1.5	24	39	-	-	2.5	9.9	36	15	-	-	0.11	-
6.40	36.5	58.5	194.3	2.0	-0.6	5.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	35	15	0.00	-	0.11	0.0
6.56	34.3	55.0	-	1.8	-0.9	5.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	36	15	-	-	0.11	-
6.73	32.2	51.6	-	1.6	-0.9	5.1	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	36	15	-	-	0.11	-
6.89	35.0	53.6	175.6	1.7	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
7.05	37.6	57.0	178.9	1.8	-0.9	4.9	4	clayy SILT to silty CLAY	115	2.0	19	28	-	-	2.6	9.9	34	15	0.00	-	0.11	0.0
7.22	38.0	57.1	187.4	2.0	-0.9	5.3	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
7.38	38.8	57.6	189.7	2.1	-0.8	5.3	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	35	15	0.00	-	0.11	0.0
7.55	49.0	71.8	194.9	2.3	-0.9	4.7	4	clayy SILT to silty CLAY	115	2.0	24	36	-	-	3.4	9.9	30	15	0.00	-	0.11	0.0
7.71	55.5	80.6	204.1	2.5	-0.9	4.6	4	clayy SILT to silty CLAY	115	2.0	28	40	-	-	3.9	9.9	29	15	0.00	-	0.11	0.0
7.87	52.0	74.7	189.6	2.2	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	26	37	-	-	3.7	9.9	29	15	0.00	-	0.11	0.0
8.04	46.5	66.2	179.6	2.0	-0.9	4.4	4	clayy SILT to silty CLAY	115	2.0	23	33	-	-	3.3	9.9	30	15	0.00	-	0.11	0.0
8.20	41.8	58.9	159.8	1.6	-0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	2.9	9.9	30	15	0.29	-	0.11	1.3
8.37	35.4	49.4	156.6	1.5	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	34	15	0.37	-	0.11	1.4
8.53	32.2	51.7	162.7	1.4	-0.9	4.5	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	34	15	0.00	-	0.11	0.0
8.69	33.9	46.4	152.9	1.5	-0.9	4.4	4	clayy SILT to silty CLAY	115	2.0	17	23	-	-	2.4	9.9	35	15	0.49	-	0.11	2.2
8.86	31.0	49.6	-	1.5	-0.9	4.9	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	36	15	-	-	0.11	-
9.02	35.2	54.4	178.4	1.7	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	18	27	-	-	2.5	9.9	35	15	0.00	-	0.11	0.0
9.19	45.3	60.3	163.8	1.8	-0.9	4.0	4	clayy SILT to silty CLAY	115	2.0	23	30	-	-	3.2	9.9	30	15	0.00	-	0.11	0.0
9.35	47.2	62.3	173.2	2.0	-1.0	4.3	4	clayy SILT to silty CLAY	115	2.0	24	31	-	-	3.3	9.9	31	15	0.00	-	0.11	0.0
9.51	44.6	58.3	183.7	2.2	-0.9	5.0	4	clayy SILT to silty CLAY	115	2.0	22	29	-	-	3.1	9.9	34	15	0.00	-	0.11	0.0
9.68	35.3	56.6	-	2.0	-0.9	5.7	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	36	15	-	-	0.11	-
9.84	27.6	44.3	-	1.7	-0.9	6.2	3	silty CLAY to CLAY	115	1.5	18	30	-	-	1.9	9.9	42	15	-	-	0.11	-
10.01	22.6	36.2	-	1.5	-0.9	6.7	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	46	15	-	-	0.11	-
10.17	22.3	35.8	-	1.6	-0.9	7.4	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	49	15	-	-	0.11	-
10.34	26.4	42.4	-	1.9	-0.9	7.2	3	silty CLAY to CLAY	115	1.5	18	28	-	-	1.8	9.9	45	15	-	-	0.11	-
10.50	38.6	61.8	-	2.3	-1.0	6.0	3	silty CLAY to CLAY	115	1.5	26	41	-	-	2.7	9.9	36	15	-	-	0.11	-
10.66	47.6	58.8	176.1	2.2	-1.4	4.6	4	clayy SILT to silty CLAY	115	2.0	24	29	-	-	3.3	9.9	33	15	0.00	-	0.11	0.0
10.83	86.0	105.5	162.1	1.9	-1.6	2.3	5	silty SAND to sandy SILT	120	4.0	22	26	69	45	-	-	17	16	0.00	-	0.11	0.0
10.99	52.8	64.2	156.2	1.8	-1.5	3.5	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.7	9.9	28	15	0.49	-	0.11	3.0
11.16	27.9	43.2	-	1.7	-1.5	6.1	3	silty CLAY to CLAY	115	1.5	19	29	-	-	1.9	9.9	42	15	-	-	0.11	-
11.32	32.1	49.0	-	1.7	-1.5	5.5	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	38	15	-	-	0.11	-
11.48	48.7	73.2	-	6.7	-1.3	9.9	9	very stiff fine SOIL	120	2.0	24	37	57	41	-	-	43	30	-	-	0.11	-
11.65	152.0	179.7	326.7	7.3	0.3	4.8	9	very stiff fine SOIL	120	2.0	76	90	86	47	-	-	21	30	0.00	-	0.11	0.0
11.81	75.3	96.4	316.4	6.0	0.0	8.0	9	very stiff fine SOIL	120	2.0	38	48	66	44	-	-	35	30	0.00	-	0.11	0.0
11.98	50.7	59.1	191.8	2.7	0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.6	9.9	35	15	0.00	-	0.11	0.0
12.14	37.1	52.7	-	2.0	0.4	5.4	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.6	9.9	37	15	-	-	0.11	-
12.30	35.5	44.1	-	1.5	0.4	4.2	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.5	9.9	36	15	-	-	0.11	-
12.47	27.8	38.5	-	1.3	0.4	4.9	3	silty CLAY to CLAY	115	1.5	19	26	-	-	1.9	9.9	40	15	-	-	0.11	-
12.63	29.6	40.4	-	1.3	0.4	4.5	4	clayy SILT to silty CLAY	115	2.0	15	20	-	-	2.1	9.9	38	15	-	-	0.11	-
12.80	33.2	40.2	-	1.3	0.4	4.0	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.11	-
12.96	27.9	37.1	-	1.4	0.4	5.0	3	silty CLAY to CLAY	115	1.5	19	25	-	-	1.9	9.9	41	15	-	-	0.11	-
13.12	26.1	34.3	-	1.4	0.3	5.4	3	silty CLAY to CLAY	115	1.5	17	23	-	-	1.8	9.9	44	15	-	-	0.11	-
13.29	27.8	36.1	-	1.5	0.3	5.7	3	silty CLAY to CLAY	115	1.5	19	24	-	-	1.9	9.9	44	15	-	-	0.11	-
13.45	37.3	43.7	-	1.5	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	36	15	-	-	0.11	-
13.62	42.8	46.8	142.9	1.6	0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	3.0	9.9	33	15	1.16	-	0.11	44.3
13.78	36.2	45.3	-	1.7	0.2	4.7	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	37	15	-	-	0.10	-
13.94	30.9	38.3	-	1.5	0.2	4.9	3	silty CLAY to CLAY	115	1.5	21	26	-	-	2.2	9.9	40	15	-	-	0.10	-
14.11	41.4	50.6	-	2.0	0.2	4.8	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	2.9	9.9	35	15	-	-	0.10	-
14.27	48.7	52.0	166.2	2.2	0.2	4.6	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.4	9.9	34	15	0.00	-	0.10	0.0
14.44	35.9	43.0	-	2.0	0.2	5.8	3	silty CLAY to CLAY	115	1.5	24	29	-	-	2.5	9.9	41	15	-	-	0.10	-
14.60	35.8	42.4	-	1.7	0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.5	9.9	38	15	-	-	0.10	-
14.76	33.6	39.3	-	1.5	0.1	4.6	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	38	15	-	-	0.10	-
14.93	29.7	34.4	-	1.4	0.1	4.8	3	silty CLAY to CLAY	115	1.5	20	23	-	-	2.1	9.9	42	15	-	-	0.10	-
15.09	30.9	35.3	-	1.5	0.1	5.1	3	silty CLAY to CLAY	115	1.5	21	24	-	-	2.1	9.9	42	15	-	-	0.10	-
15.26	35.9	40.6	-	1.7	0.1	4.9	3	silty CLAY to CLAY	115	1.5	24	27	-	-	2.5	9.9	39	15	-	-	0.10	-
15.42	33.3	37.3	-	1.8	0.1	5.5	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.3	9.9	43	15	-	-	0.10	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
15.58	33.4	37.0	-	1.8	0.1	5.7	3	silty CLAY to CLAY	115	1.5	22	25	-	-	2.3	9.9	43	15	-	-	0.10	-
15.75	36.9	40.5	-	1.9	0.1	5.3	3	silty CLAY to CLAY	115	1.5	25	27	-	-	2.6	9.9	40	15	-	-	0.10	-
15.91	37.0	40.2	-	1.7	0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.6	9.9	39	15	-	-	0.10	-
16.08	34.8	37.4	-	1.7	0.1	4.9	3	silty CLAY to CLAY	115	1.5	23	25	-	-	2.4	9.9	41	15	-	-	0.10	-
16.24	29.1	31.0	-	1.7	0.1	6.0	3	silty CLAY to CLAY	115	1.5	19	21	-	-	2.0	9.9	47	15	-	-	0.10	-
16.40	28.4	29.9	-	1.4	0.0	5.2	3	silty CLAY to CLAY	115	1.5	19	20	-	-	2.0	9.9	45	15	-	-	0.10	-
16.57	27.8	29.0	-	1.5	0.0	5.5	3	silty CLAY to CLAY	115	1.5	19	19	-	-	1.9	9.9	47	15	-	-	0.10	-
16.73	27.6	28.5	-	1.5	0.0	5.6	3	silty CLAY to CLAY	115	1.5	18	19	-	-	1.9	9.9	48	15	-	-	0.10	-
16.90	28.6	29.3	-	1.3	0.0	4.6	3	silty CLAY to CLAY	115	1.5	19	20	-	-	2.0	9.9	44	15	-	-	0.10	-
17.06	28.1	28.5	-	1.4	0.0	5.1	3	silty CLAY to CLAY	115	1.5	19	19	-	-	2.0	9.9	46	15	-	-	0.10	-
17.23	34.1	34.2	-	1.4	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	17	17	-	-	2.4	9.9	40	15	-	-	0.10	-
17.39	26.8	26.6	-	1.3	0.0	5.2	3	silty CLAY to CLAY	115	1.5	18	18	-	-	1.9	9.9	48	15	-	-	0.10	-
17.55	24.4	24.0	-	1.1	0.0	4.5	3	silty CLAY to CLAY	115	1.5	16	16	-	-	1.7	9.9	47	15	-	-	0.10	-
17.72	21.0	20.5	-	0.9	-0.1	4.4	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.4	9.9	50	15	-	-	0.10	-
17.88	20.8	20.1	-	0.8	-0.1	3.9	3	silty CLAY to CLAY	115	1.5	14	13	-	-	1.4	9.9	48	15	-	-	0.10	-
18.05	21.4	20.5	-	0.7	-0.1	3.5	3	silty CLAY to CLAY	115	1.5	14	14	-	-	1.5	9.9	46	15	-	-	0.10	-
18.21	22.9	21.8	-	0.9	-0.1	4.0	3	silty CLAY to CLAY	115	1.5	15	15	-	-	1.6	9.9	47	15	-	-	0.10	-
18.37	31.5	29.7	-	1.2	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	16	15	-	-	2.2	9.9	41	15	-	-	0.10	-
18.54	35.2	32.8	-	1.6	-0.1	4.8	3	silty CLAY to CLAY	115	1.5	23	22	-	-	2.4	9.9	42	15	-	-	0.10	-
18.70	39.4	36.4	-	1.5	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	20	18	-	-	2.7	9.9	38	15	-	-	0.10	-
18.87	30.6	28.0	-	1.5	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	20	19	-	-	2.1	9.9	46	15	-	-	0.10	-
19.03	46.1	42.7	128.1	1.5	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	23	21	-	-	3.2	9.9	33	15	1.90	-	0.10	51.2
19.19	43.4	39.1	-	1.7	-1.0	4.0	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.0	9.9	37	15	-	-	0.10	-
19.36	46.5	42.7	128.5	1.5	-1.0	3.4	4	clayy SILT to silty CLAY	115	2.0	23	21	-	-	3.2	9.9	33	15	1.89	-	0.10	51.2
19.52	60.3	55.2	131.4	1.7	-0.9	2.9	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	27	15	1.81	-	0.10	38.6
19.69	44.2	38.8	-	1.8	-0.9	4.1	4	clayy SILT to silty CLAY	115	2.0	22	19	-	-	3.1	9.9	37	15	-	-	0.10	-
19.85	34.6	30.1	-	1.8	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	23	20	-	-	2.4	9.9	46	15	-	-	0.10	-
20.01	32.8	28.3	-	1.8	-0.9	5.6	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	48	15	-	-	0.10	-
20.18	36.4	31.2	-	1.9	-0.9	5.2	3	silty CLAY to CLAY	115	1.5	24	21	-	-	2.5	9.9	45	15	-	-	0.10	-
20.34	36.8	31.3	-	1.9	-0.9	5.3	3	silty CLAY to CLAY	115	1.5	25	21	-	-	2.6	9.9	45	15	-	-	0.10	-
20.51	33.5	28.3	-	1.9	-0.9	6.0	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	49	15	-	-	0.10	-
20.67	31.8	26.6	-	1.7	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	21	18	-	-	2.2	9.9	48	15	-	-	0.10	-
20.83	30.5	25.3	-	1.7	-0.9	5.8	3	silty CLAY to CLAY	115	1.5	20	17	-	-	2.1	9.9	51	15	-	-	0.10	-
21.00	35.7	29.4	-	1.9	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	24	20	-	-	2.5	9.9	47	15	-	-	0.10	-
21.16	42.9	35.1	-	2.0	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	29	23	-	-	3.0	9.9	41	15	-	-	0.10	-
21.33	46.5	37.8	-	2.0	-0.9	4.5	4	clayy SILT to silty CLAY	115	2.0	23	19	-	-	3.2	9.9	39	15	-	-	0.10	-
21.49	38.0	30.6	-	2.0	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	25	20	-	-	2.6	9.9	46	15	-	-	0.10	-
21.65	39.5	31.6	-	1.9	-0.9	5.0	3	silty CLAY to CLAY	115	1.5	26	21	-	-	2.7	9.9	44	15	-	-	0.10	-
21.82	42.4	33.7	-	2.0	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	28	22	-	-	3.0	9.9	42	15	-	-	0.10	-
21.98	46.3	36.5	-	2.2	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	31	24	-	-	3.2	9.9	41	15	-	-	0.10	-
22.15	50.8	39.7	-	2.1	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	25	20	-	-	3.5	9.9	37	15	-	-	0.10	-
22.31	43.0	33.3	-	1.7	-0.9	4.1	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	3.0	9.9	40	15	-	-	0.10	-
22.47	44.8	34.5	-	1.7	-0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	22	17	-	-	3.1	9.9	38	15	-	-	0.10	-
22.64	46.7	35.7	-	2.2	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	31	24	-	-	3.2	9.9	41	15	-	-	0.10	-
22.80	52.9	40.1	-	2.8	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	35	27	-	-	3.7	9.9	41	15	-	-	0.10	-
22.97	51.0	38.4	-	2.6	-0.9	5.2	3	silty CLAY to CLAY	115	1.5	34	26	-	-	3.6	9.9	41	15	-	-	0.10	-
23.13	42.6	31.9	-	1.9	-0.9	4.6	3	silty CLAY to CLAY	115	1.5	28	21	-	-	3.0	9.9	42	15	-	-	0.10	-
23.30	39.5	29.3	-	2.1	-0.9	5.5	3	silty CLAY to CLAY	115	1.5	26	20	-	-	2.7	9.9	47	15	-	-	0.10	-
23.46	45.6	38.0	100.6	1.0	-0.9	2.3	5	silty SAND to sandy SILT	120	4.0	11	10	35	38	-	-	30	16	2.33	-	0.10	51.2
23.62	90.6	75.3	167.6	3.1	-0.9	3.5	4	clayy SILT to silty CLAY	115	2.0	45	38	-	-	6.3	9.9	26	15	0.00	-	0.09	0.0
23.79	128.2	106.3	188.1	3.9	-0.9	3.1	5	silty SAND to sandy SILT	120	4.0	32	27	69	43	-	-	20	16	0.00	-	0.09	0.0
23.95	59.3	42.8	-	4.0	-0.4	6.9	3	silty CLAY to CLAY	115	1.5	40	29	-	-	4.1	9.9	44	15	-	-	0.09	-
24.12	56.7	40.7	-	3.2	0.0	5.8	3	silty CLAY to CLAY	115	1.5	38	27	-	-	4.0	9.9	42	15	-	-	0.09	-
24.28	58.3	41.5	-	3.1	-0.3	5.5	3	silty CLAY to CLAY	115	1.5	39	28	-	-	4.1	9.9	41	15	-	-	0.09	-
24.44	49.7	35.2	-	3.0	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	33	23	-	-	3.5	9.9	45	15	-	-	0.09	-
24.61	43.6	30.7	-	2.4	-0.3	5.7	3	silty CLAY to CLAY	115	1.5	29	20	-	-	3.0	9.9	46	15	-	-	0.09	-
24.77	39.3	27.5	-	2.2	-0.8	5.8	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	49	15	-	-	0.09	-
24.94	39.2	27.2	-	2.2	-0.3	5.7	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	49	15	-	-	0.09	-
25.10	39.2	27.1	-	2.3	-0.5	6.0	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.7	9.9	50	15	-	-	0.09	-
25.26	41.7	28.6	-	2.2	-0.9	5.4	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	47	15	-	-	0.09	-
25.43	42.4	28.8	-	2.0	-1.2	4.9	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	45	15	-	-	0.09	-
25.59	50.6	40.4	117.9	1.5	-1.1	3.0	4	clayy SILT to silty CLAY	115	2.0	25	20	-	-	3.5	9.9	32	15	2.04	-	0.09	51.2
25.76	57.0	45.4	94.8	1.0	-0.2	1.8	5	silty SAND to sandy SILT	120	4.0	14	11	41	39	-	-	24	16	2.44	-	0.09	49.6
25.92	47.5	37.7	78.3	0.6	-0.1	1.4	5	silty SAND to sandy SILT	120	4.0	12	9	35	38	-	-	24	16	2.85	-	0.08	51.2
26.08	39.9	31.6	78.3	0.6	-0.1	1.6	5	silty SAND to sandy SILT	120	4.0	10	8	29	37	-	-	28	16	2.86	-	0.08	51.2
26.25	32.3	21.3	-	0.8	-0.1	2.4	4	clayy SILT to silty CLAY	115	2.0	16	11	-	-	2.2	9.9	40	15	-	-	0.08	-
26.41	26.5	17.4	-	1.0	-0.1	4.1	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.8	9.9	52	15	-	-	0.08	-
26.58	21.2	13.8	-	1.1	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	8.1	64	15	-	-	0.08	-
26.74	21.2	13.7	-	1.2	-0.4	6.3	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	8.0	66	15	-	-	0.08	-
26.90	27.1	17.4	-	1.3	-0.7	5.3	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.9	9.9	57	15	-	-	0.08	-
27.07	31.4	20.1	-	1.5	-0.7	5.2	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	53	15	-	-	0.08	-
27.23	31.5	20.0	-	1.5	-1.0	5.2	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	53	15	-	-	0.08	-
27.40	32.4	20.5	-	1.3	-1.0	4.1	3	silty CLAY to CLAY	115	1.5	22	14	-	-	2.2	9.9	49	15	-	-	0.08	-
27.56	34.2	21.5	-	1.5	-1.2	4.6	3	silty CLAY to CLAY	115	1.5	23	14	-	-	2.4	9.9	50	15	-	-	0.08	-
27.72	41.0	25.6	-	1.8	-1.2	4.5	3	silty CLAY to CLAY	115	1.5	27	17	-	-	2.8	9.9	46	15	-	-	0.08	-
27.89	39.4	24.5	-	1.7	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	26	16	-	-	2.7	9.9	47	15	-	-	0.08	-
28.05	37.8	23.3	-	1.4	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	25	16	-	-	2.6	9.9	46	15	-	-	0.08	-
28.22	32.0	19.6	-	1.2	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	49	15	-	-	0.08	-
28.38	29.0	17.7	-	1.1	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	19	12	-	-	2.0	9.9	52	15	-	-	0.08	-
28.54	25.5	15.5	-	1.0	-1.7	4.3	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.2	56	15	-	-	0.08	-
28.71	26.1	15.7	-	1.0	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.8	9.4	55	15	-	-	0.08	-
28.87	30.3	18.2	-	0.9	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	48	15	-	-	0.08	-
29.04	28.7	17.1	-	0.7	-1.7	2.5	4	clayy SILT to silty CLAY	115	2.0	14	9	-	-	2.0	9.9	45	15	-	-	0.08	-
29.20	24.5	14.5	-	1.0	-1.8	4.4	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.7	8.6	58	15	-	-	0.08	-
29.36	41.4	24.4	-	1.3	-1.8	3.3	4	clayy SILT to silty CLAY	115	2.0	21	12	-	-	2.9	9.9	42	15	-	-	0.08	-
29.53	41.7	24.5	-	1.6	-2.5	4.1	3	silty CLAY to CLAY	115	1.5	28	16	-	-	2.9	9.9	45	15	-	-	0.08	-
29.69	36.9	21.5	-	1.6	-2.9	4.5	3	silty CLAY to CLAY	115	1.5	25	14	-	-	2.5	9.9	49	15	-	-	0.08	-
29.86	30.0	17.4	-	1.1	-3.0	4.0	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	52	15	-	-	0.08	-
30.02	24.9	14.3	-	0.8	-3.0	3.2	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	53	15	-	-	0.08	-
30.19	24.2	13.9	-	0.7	-3.0	3.1	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	8.3	53	15	-	-	0.08	-
30.35	24.8	14.2	-	0.9	-3.0	4.0	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.4	57	15	-	-	0.08	-
30.51	25.3	14.3	-	1.3	-3.0	5.5	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	62	15	-	-	0.08	-
30.68	25.5	14.4	-	1.4	-3.0	5.9	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.6	64	15	-	-	0.08	-
30.84	26.4	14.8	-	1.5	-3.0	6.1	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	8.9	64	15	-	-	0.08	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
31.01	25.6	14.3	-	1.3	-3.0	5.7	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	8.5	63	15	-	-	0.08	-
31.17	26.6	14.8	-	1.3	-3.0	5.1	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	8.9	60	15	-	-	0.08	-
31.33	28.1	15.5	-	1.3	-3.0	5.1	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.3	59	15	-	-	0.08	-
31.50	27.6	15.2	-	1.3	-3.0	5.2	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	9.1	60	15	-	-	0.08	-
31.66	27.9	15.3	-	1.4	-3.0	5.3	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.2	60	15	-	-	0.08	-
31.83	28.2	15.3	-	1.3	-3.0	5.0	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	9.2	59	15	-	-	0.08	-
31.99	27.3	14.8	-	1.3	-3.0	5.2	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	8.9	60	15	-	-	0.08	-
32.15	25.1	13.5	-	1.2	-3.0	5.0	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.1	62	15	-	-	0.08	-
32.32	24.9	13.4	-	1.0	-3.0	4.5	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	8.0	60	15	-	-	0.08	-
32.48	23.3	12.4	-	1.1	-3.0	5.3	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.4	65	15	-	-	0.08	-
32.65	23.5	12.5	-	1.0	-3.0	4.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.4	63	15	-	-	0.08	-
32.81	80.6	56.9	85.5	0.8	-3.0	1.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	40	-	-	17	16	2.66	-	0.08	36.9
32.97	81.1	57.1	86.1	0.8	-3.0	1.1	5	silty SAND to sandy SILT	120	4.0	20	14	48	40	-	-	17	16	2.64	-	0.07	36.7
33.14	84.3	59.2	92.1	1.0	-3.0	1.2	5	silty SAND to sandy SILT	120	4.0	21	15	50	40	-	-	17	16	2.50	-	0.07	34.6
33.30	80.6	56.5	110.9	1.6	-3.0	2.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	39	-	-	23	16	2.15	-	0.06	37.3
33.47	79.8	55.7	109.2	1.5	-2.9	2.0	5	silty SAND to sandy SILT	120	4.0	20	14	48	39	-	-	23	16	2.17	-	0.06	38.1
33.63	76.9	53.6	120.3	1.9	-2.9	2.5	5	silty SAND to sandy SILT	120	4.0	19	13	46	39	-	-	26	16	2.01	-	0.06	40.3
33.79	52.6	26.9	-	2.0	-2.9	4.0	4	clayy SILT to silty CLAY	115	2.0	26	13	-	-	3.6	9.9	43	15	-	-	0.05	-
33.96	33.7	17.2	-	1.7	-2.9	5.3	3	silty CLAY to CLAY	115	1.5	22	11	-	-	2.3	9.9	57	15	-	-	0.05	-
34.12	23.6	12.0	-	1.3	-2.9	6.1	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	7.1	69	15	-	-	0.05	-
34.29	23.0	11.6	-	1.2	-2.8	5.9	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.6	6.9	69	15	-	-	0.05	-
34.45	20.7	10.4	-	1.2	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.1	75	15	-	-	0.05	-
34.61	18.8	9.4	-	1.1	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.4	78	15	-	-	0.05	-
34.78	16.0	8.0	-	1.0	-2.8	7.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.5	86	15	-	-	0.05	-
34.94	16.2	8.0	-	0.9	-2.8	6.3	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.6	82	15	-	-	0.05	-
35.11	16.3	8.0	-	1.1	-2.8	7.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.6	86	15	-	-	0.05	-
35.27	20.9	10.2	-	1.2	-2.8	6.2	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.0	74	15	-	-	0.05	-
35.43	22.9	11.2	-	1.3	-2.8	6.4	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.6	72	15	-	-	0.05	-
35.60	18.8	9.1	-	1.1	-2.8	6.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.3	79	15	-	-	0.05	-
35.76	20.3	9.8	-	1.0	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.8	72	15	-	-	0.05	-
35.93	20.8	10.0	-	1.0	-2.8	5.5	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	72	15	-	-	0.05	-
36.09	22.1	10.6	-	1.0	-2.8	4.9	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.3	68	15	-	-	0.05	-
36.26	21.4	10.2	-	1.0	-2.8	5.1	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	6.0	70	15	-	-	0.05	-
36.42	20.1	9.5	-	1.0	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.6	73	15	-	-	0.05	-
36.58	23.7	11.2	-	1.0	-2.8	4.5	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	65	15	-	-	0.05	-
36.75	23.9	11.3	-	1.0	-2.8	4.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.7	66	15	-	-	0.05	-
36.91	23.9	11.2	-	1.0	-2.8	4.6	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.7	65	15	-	-	0.05	-
37.08	21.5	10.1	-	1.0	-2.8	5.3	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	71	15	-	-	0.05	-
37.24	20.9	9.7	-	1.0	-2.8	5.6	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.7	73	15	-	-	0.05	-
37.40	19.0	8.8	-	0.9	-2.8	5.4	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.1	76	15	-	-	0.05	-
37.57	18.5	8.5	-	1.0	-2.8	5.8	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	4.9	78	15	-	-	0.05	-
37.73	17.2	7.9	-	0.9	-2.8	6.3	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.5	83	15	-	-	0.05	-
37.90	16.6	7.6	-	0.9	-2.8	6.1	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.3	83	15	-	-	0.05	-
38.06	14.9	6.8	-	0.4	-2.8	2.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	3.8	72	15	-	-	0.05	-
38.22	14.6	6.6	-	0.4	-2.8	3.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.7	75	15	-	-	0.05	-
38.39	47.6	21.5	-	1.1	-2.9	2.3	4	clayy SILT to silty CLAY	115	2.0	24	11	-	-	3.3	9.9	39	15	-	-	0.05	-
38.55	61.9	27.8	-	2.1	-3.3	3.6	4	clayy SILT to silty CLAY	115	2.0	31	14	-	-	4.3	9.9	41	15	-	-	0.05	-
38.72	62.4	27.9	-	3.2	-5.9	5.3	3	silty CLAY to CLAY	115	1.5	42	19	-	-	4.3	9.9	47	15	-	-	0.05	-
38.88	50.1	22.3	-	3.3	-7.0	6.9	3	silty CLAY to CLAY	115	1.5	33	15	-	-	3.5	9.9	56	15	-	-	0.05	-
39.04	36.2	16.0	-	2.4	-7.6	7.0	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	65	15	-	-	0.05	-
39.21	42.9	18.9	-	1.6	-7.7	3.9	3	silty CLAY to CLAY	115	1.5	29	13	-	-	3.0	9.9	50	15	-	-	0.05	-
39.37	31.7	13.9	-	1.4	-7.7	4.7	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.2	8.5	60	15	-	-	0.05	-
39.54	30.1	13.2	-	1.1	-7.7	4.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.0	8.0	58	15	-	-	0.05	-
39.70	29.0	12.7	-	1.1	-7.7	3.9	3	silty CLAY to CLAY	115	1.5	19	8	-	-	2.0	7.7	59	15	-	-	0.05	-
39.86	26.5	11.5	-	1.1	-7.7	4.4	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	6.9	64	15	-	-	0.05	-
40.03	30.5	13.2	-	1.0	-7.7	3.7	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.1	8.0	57	15	-	-	0.05	-
40.19	38.0	16.4	-	1.2	-7.7	3.4	3	silty CLAY to CLAY	115	1.5	25	11	-	-	2.6	9.9	50	15	-	-	0.05	-
40.36	40.1	17.2	-	1.2	-7.7	3.3	3	silty CLAY to CLAY	115	1.5	27	11	-	-	2.7	9.9	49	15	-	-	0.05	-
40.52	36.4	15.5	-	1.6	-7.7	4.8	3	silty CLAY to CLAY	115	1.5	24	10	-	-	2.5	9.6	58	15	-	-	0.05	-
40.68	34.9	14.9	-	1.6	-7.7	5.0	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.4	9.1	60	15	-	-	0.05	-
40.85	49.2	20.9	-	1.6	-7.7	3.3	4	clayy SILT to silty CLAY	115	2.0	25	10	-	-	3.4	9.9	45	15	-	-	0.05	-
41.01	46.4	19.6	-	1.4	-7.7	3.2	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	46	15	-	-	0.05	-
41.18	37.4	15.7	-	1.2	-7.6	3.3	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.7	51	15	-	-	0.05	-
41.34	31.5	13.2	-	1.0	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.1	56	15	-	-	0.05	-
41.50	33.4	13.9	-	0.9	-7.6	2.9	3	silty CLAY to CLAY	115	1.5	22	9	-	-	2.3	8.5	52	15	-	-	0.05	-
41.67	37.6	15.6	-	1.1	-7.7	3.1	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.7	50	15	-	-	0.05	-
41.83	38.1	15.8	-	1.1	-7.7	3.1	3	silty CLAY to CLAY	115	1.5	25	11	-	-	2.6	9.8	50	15	-	-	0.05	-
42.00	37.4	15.4	-	1.2	-7.7	3.5	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	9.5	53	15	-	-	0.05	-
42.16	33.1	13.6	-	1.2	-7.6	4.0	3	silty CLAY to CLAY	115	1.5	22	9	-	-	2.3	8.3	58	15	-	-	0.05	-
42.32	30.1	12.3	-	1.2	-7.6	4.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	7.5	61	15	-	-	0.05	-
42.49	41.3	16.8	-	1.3	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.9	50	15	-	-	0.05	-
42.65	45.6	18.5	-	1.4	-7.6	3.4	3	silty CLAY to CLAY	115	1.5	30	12	-	-	3.1	9.9	48	15	-	-	0.05	-
42.82	53.1	21.5	-	1.5	-7.6	3.0	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	43	15	-	-	0.05	-
42.98	54.7	22.0	-	1.9	-7.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	45	15	-	-	0.05	-
43.15	62.3	25.0	-	1.9	-7.6	3.1	4	clayy SILT to silty CLAY	115	2.0	31	13	-	-	4.3	9.9	41	15	-	-	0.05	-
43.31	58.8	23.5	-	1.7	-7.6	3.0	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.1	9.9	41	15	-	-	0.05	-
43.47	55.9	22.3	-	1.5	-7.6	2.9	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	42	15	-	-	0.05	-
43.64	57.0	22.6	-	1.6	-7.6	2.9	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	41	15	-	-	0.05	-
43.80	63.7	25.2	-	2.2	-7.6	3.6	4	clayy SILT to silty CLAY	115	2.0	32	13	-	-	4.4	9.9	43	15	-	-	0.05	-
43.97	73.0	28.8	-	2.8	-7.6	4.0	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.1	9.9	42	15	-	-	0.05	-
44.13	71.7	28.1	-	2.7	-7.6	3.9	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	42	15	-	-	0.05	-
44.29	74.9	29.3	-	2.5	-7.4	3.5	4	clayy SILT to silty CLAY	115	2.0	37	15	-	-	5.2	9.9	40	15	-	-	0.05	-
44.46	61.5	23.9	-	2.5	-7.4	4.3	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	46	15	-	-	0.05	-
44.62	70.0	27.2	-	2.7	-7.4	4.0	4	clayy SILT to silty CLAY	115	2.0	35	14	-	-	4.9	9.9	43	15	-	-	0.05	-
44.79	71.8	27.7	-	2.8	-7.4	4.0	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	43	15	-	-	0.05	-
44.95	66.5	25.6	-	2.5	-7.3	4.0	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.6	9.9	44	15	-	-	0.05	-
45.11	76.3	29.3	-	2.3	-7.4	3.2	4	clayy SILT to silty CLAY	115	2.0	38	15	-	-	5.3	9.9	38	15	-	-	0.05	-
45.28	74.2	28.4	-	2.4	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.2	9.9	39	15	-	-	0.05	-
45.44	85.3	32.5	-	3.6	-7.3	4.3	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	41	15	-	-	0.05	-
45.61	103.4	61.9	157.5	3.7	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	52	31	-	-	7.2	9.9	29	15	0.96	-	0.05	12.7
45.77	85.3	32.3	-	3.4	-7.3	4.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	40	15	-	-	0.05	-
45.93	107.4	64.1	155.1	3.6	-7.2	3.4	4	clayy SILT to silty CLAY	115	2.0	54	32	-	-	7.5	9.9	27	15	1.07	-	0.05	15.6
46.10	108.1	64.3	159.4	3.8	-7.2	3.6	4	clayy SILT to silty CLAY	115	2.0	54	32	-	-	7.5	9.9	28	15	0.89	-	0.05	10.3
46.26	113.1	67.2	153.4	3.6	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	57	34	-	-	7.9	9.9	26	15	1.15	-	0.05	17.4

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(576).cpt
CPT Date: 10/11/2011 10:34:01 PM
GW During Test: No GW

Sounding ID: CPT-11-215
Project No: 11-136
Cone/Rig: DSG1023

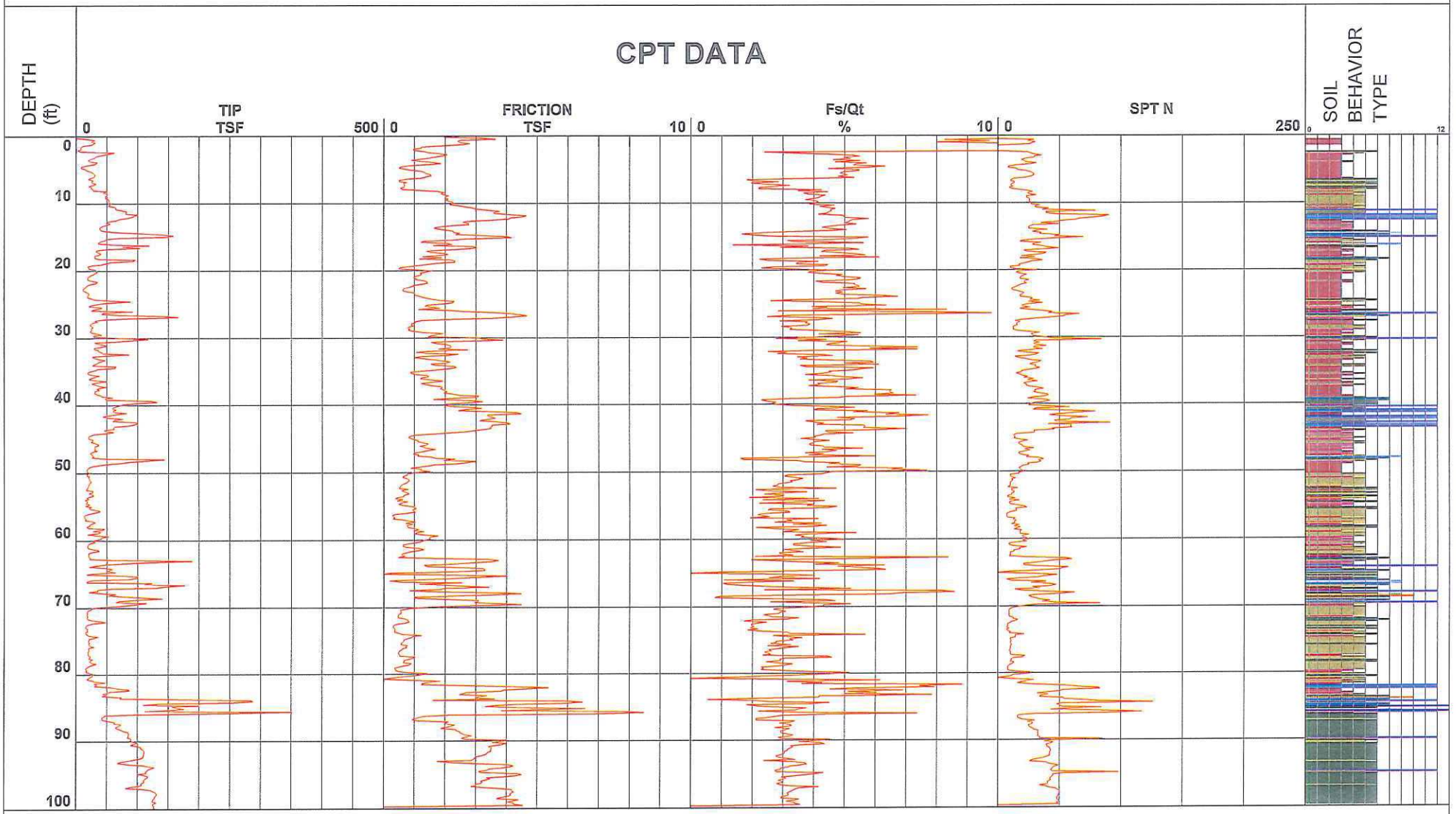
Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.11	Cycl SStn %
46.43	116.1	68.9	164.4	4.1	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	58	34	-	-	8.1	9.9	27	15	0.00	-	0.05	0.0
46.59	101.2	38.2	-	3.6	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.1	9.9	36	15	-	-	0.05	-
46.75	87.4	33.0	-	3.0	-7.1	3.6	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	38	15	-	-	0.05	-
46.92	86.1	32.5	-	2.7	-7.1	3.2	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	37	15	-	-	0.05	-
47.08	89.9	53.0	131.3	2.6	-7.1	2.9	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	28	15	1.87	-	0.05	40.9
47.25	91.3	53.7	136.2	2.8	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	46	27	-	-	6.4	9.9	29	15	1.79	-	0.04	40.1
47.41	93.1	35.1	-	4.0	-7.1	4.4	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	40	15	-	-	0.04	-
47.57	120.1	70.4	171.2	4.4	-7.1	3.8	4	clayy SILT to silty CLAY	115	2.0	60	35	-	-	8.4	9.9	28	15	0.00	-	0.04	0.0
47.74	90.1	34.0	-	3.4	-7.1	3.9	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	39	15	-	-	0.04	-
47.90	77.7	29.3	-	2.3	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	38	15	-	-	0.04	-
48.07	79.9	30.2	-	2.5	-7.1	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	38	15	-	-	0.04	-
48.23	84.4	31.8	-	2.8	-7.1	3.4	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	38	15	-	-	0.04	-
48.39	87.0	32.8	-	2.6	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	36	15	-	-	0.04	-
48.56	90.0	52.2	130.6	2.6	-7.1	2.9	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	28	15	1.88	-	0.04	41.7
48.72	87.8	33.1	-	2.8	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	36	15	-	-	0.04	-
48.89	87.2	32.9	-	2.7	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	36	15	-	-	0.04	-
49.05	92.6	53.4	137.9	2.9	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	46	27	-	-	6.4	9.9	29	15	1.72	-	0.04	40.4
49.22	90.3	34.1	-	2.9	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.03	-
49.38	100.6	57.9	136.7	2.9	-7.2	3.0	4	clayy SILT to silty CLAY	115	2.0	50	29	-	-	7.0	9.9	27	15	1.78	-	0.03	35.9
49.54	102.2	58.7	133.5	2.8	-7.1	2.8	5	silty SAND to sandy SILT	120	4.0	26	15	49	39	-	-	26	16	1.84	-	0.03	35.1
49.71	90.4	51.8	134.5	2.7	-7.1	3.1	4	clayy SILT to silty CLAY	115	2.0	45	26	-	-	6.3	9.9	29	15	1.83	-	0.03	42.1
49.87	90.1	34.0	-	2.9	-7.1	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.02	-
50.04	89.0	33.6	-	2.9	-7.1	3.4	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.2	9.9	37	15	-	-	0.02	-
50.20	89.1	33.6	-	3.4	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	39	15	-	-	0.02	-
50.36	100.9	57.5	141.8	3.1	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	50	29	-	-	7.0	9.9	28	15	1.58	-	0.02	36.3
50.53	88.3	33.3	-	3.7	-7.2	4.3	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	40	15	-	-	0.02	-
50.69	82.3	31.1	-	3.1	-7.2	3.9	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.02	-
50.86	86.7	32.7	-	2.9	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	37	15	-	-	0.02	-
51.02	77.5	29.3	-	3.0	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	42	15	-	-	0.02	-
51.18	82.7	31.2	-	2.7	-7.2	3.3	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	38	15	-	-	0.02	-
51.35	78.0	29.4	-	2.8	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	40	15	-	-	0.02	-
51.51	77.7	29.3	-	2.8	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	41	15	-	-	0.02	-
51.68	79.3	29.9	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	40	15	-	-	0.02	-
51.84	81.9	30.9	-	3.0	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.02	-
52.00	79.3	29.9	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	41	15	-	-	0.02	-
52.17	75.0	28.3	-	2.8	-7.2	3.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	42	15	-	-	0.02	-
52.33	73.6	27.8	-	2.5	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	40	15	-	-	0.02	-
52.50	63.1	23.8	-	1.5	-7.2	2.5	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	39	15	-	-	0.02	-
52.66	62.0	23.4	-	1.9	-7.2	3.3	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	43	15	-	-	0.02	-
52.82	59.2	22.3	-	2.2	-7.2	3.9	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.1	9.9	47	15	-	-	0.02	-
52.99	54.4	20.5	-	2.6	-7.2	5.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	53	15	-	-	0.02	-
53.15	88.5	33.4	-	3.0	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	37	15	-	-	0.02	-
53.32	85.9	32.4	-	3.3	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	40	15	-	-	0.02	-
53.48	80.8	30.5	-	2.9	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	40	15	-	-	0.02	-
53.64	82.4	31.1	-	3.2	-7.2	4.0	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.02	-
53.81	84.8	32.0	-	3.1	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	39	15	-	-	0.02	-
53.97	83.9	31.7	-	3.0	-7.3	3.7	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.02	-
54.14	85.4	32.2	-	2.9	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.02	-
54.30	84.3	31.8	-	2.9	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.02	-
54.46	83.4	31.5	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	38	15	-	-	0.02	-
54.63	83.0	31.3	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.8	9.9	38	15	-	-	0.02	-
54.79	81.2	30.6	-	2.7	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.6	9.9	38	15	-	-	0.02	-
54.96	82.1	31.0	-	2.8	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	39	15	-	-	0.02	-
55.12	81.6	30.8	-	2.9	-7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.02	-
55.28	86.5	32.6	-	3.0	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	38	15	-	-	0.02	-
55.45	87.7	33.1	-	3.1	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	38	15	-	-	0.02	-
55.61	89.7	33.8	-	3.0	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	37	15	-	-	0.02	-
55.78	91.8	34.6	-	3.0	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	36	15	-	-	0.02	-
55.94	91.4	34.5	-	3.1	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.3	9.9	37	15	-	-	0.02	-
56.11	91.3	34.4	-	3.1	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.3	9.9	37	15	-	-	0.02	-
56.27	93.4	35.2	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	36	15	-	-	0.02	-
56.43	95.4	36.0	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	36	15	-	-	0.02	-
56.60	93.5	35.3	-	3.2	-7.2	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.02	-
56.76	94.4	50.7	135.4	2.9	-7.2	3.2	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.6	9.9	30	15	1.74	-	0.02	43.4
56.93	96.5	51.7	127.1	2.6	-7.3	2.8	4	clayy SILT to silty CLAY	115	2.0	48	26	-	-	6.7	9.9	28	15	1.92	-	0.02	42.2
57.09	95.2	50.9	128.1	2.7	-7.2	2.9	4	clayy SILT to silty CLAY	115	2.0	48	25	-	-	6.6	9.9	28	15	1.91	-	0.02	43.1
57.25	95.0	50.7	131.4	2.8	-7.3	3.0	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.6	9.9	29	15	1.87	-	0.01	43.3
57.42	90.6	34.2	-	2.9	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	36	15	-	-	0.01	-
57.58	79.4	30.0	-	2.4	-7.3	3.1	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.01	-
57.75	68.6	25.9	-	1.9	-7.3	2.9	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	39	15	-	-	0.01	-
57.91	69.8	26.3	-	1.6	-7.3	2.4	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	36	15	-	-	0.01	-
58.07	72.8	27.5	-	1.9	-7.3	2.7	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	37	15	-	-	0.01	-
58.24	70.0	26.4	-	1.7	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	37	15	-	-	0.01	-
58.40	70.6	26.6	-	1.8	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.9	9.9	37	15	-	-	0.01	-
58.57	81.6	43.1	114.1	2.1	-7.3	2.6	4	clayy SILT to silty CLAY	115	2.0	41	22	-	-	5.6	9.9	30	15	2.10	-	0.01	51.2
58.73	87.3	46.1	124.6	2.5	-7.3	3.0	4	clayy SILT to silty CLAY	115	2.0	44	23	-	-	6.1	9.9	30	15	1.95	-	0.01	48.8
58.89	91.5	48.2	129.9	2.7	-7.3	3.1	4	clayy SILT to silty CLAY	115	2.0	46	24	-	-	6.4	9.9	30	15	1.89	-	0.00	46.2
59.06	93.4	35.3	-	3.1	-7.3	3.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	36	15	-	-	0.00	-
59.22	88.7	33.5	-	2.9	-7.3	3.4	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.2	9.9	37	15	-	-	0.00	-
59.39	81.0	30.6	-	2.6	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	38	15	-	-	0.00	-
59.55	79.6	30.0	-	2.5	-7.3	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.00	-
59.71	80.4	30.3	-	2.8	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	40	15	-	-	0.00	-
59.88	84.7	32.0	-	2.9	-7.3	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.9	9.9	39	15	-	-	0.00	-
60.04	94.3	35.6	-	3.3	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.00	-
60.21	98.7	37.3	-	3.5	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	49	19	-	-	6.9	9.9	36	15	-	-	0.00	-
60.37	92.7	35.0	-	3.3	-7.2	3.7	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	38	15	-	-	0.00	-
60.53	92.4	34.9	-	3.0	-7.2	3.4	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.4	9.9	36	15	-	-	0.00	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(568).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-222	Date and Time	10/10/2011 12:58:35 AM	Maximum Depth	99.90 ft
Water Table Depth	>99.90 ft				

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nj 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
0.33	3.1	4.9	-	3.2	0.1	9.9	2	Organic SOILS - Peats	100	1.0	3	5	-	-	0.3	9.9	95	10	N/A	0.00	N/A	N/A
0.49	22.8	36.5	-	3.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	54	15	N/A	0.00	N/A	N/A
0.66	30.5	48.9	-	2.5	0.3	8.3	3	silty CLAY to CLAY	115	1.5	20	33	-	-	2.2	9.9	45	15	N/A	0.00	N/A	N/A
0.82	24.8	39.8	-	2.4	0.3	9.7	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	52	15	N/A	0.00	N/A	N/A
0.98	31.0	49.7	-	2.5	0.3	8.1	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	44	15	N/A	0.00	N/A	N/A
1.15	28.0	44.9	-	2.8	0.3	10.0	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	50	15	N/A	0.00	N/A	N/A
1.31	25.6	41.1	-	2.6	0.4	9.9	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	51	15	N/A	0.00	N/A	N/A
1.48	11.3	18.2	-	1.9	0.4	9.9	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	68	15	N/A	0.00	N/A	N/A
1.64	8.3	13.4	-	1.2	0.5	9.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	75	15	N/A	0.00	N/A	N/A
1.80	7.8	12.6	-	1.2	0.5	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.97	8.8	14.2	-	1.0	0.5	9.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	74	15	N/A	0.00	N/A	N/A
2.13	2.7	4.4	-	1.0	0.5	9.9	2	Organic SOILS - Peats	100	1.0	3	4	-	-	0.3	7.3	95	10	N/A	0.00	N/A	N/A
2.30	6.6	10.6	-	1.3	0.6	9.9	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.5	9.9	82	15	N/A	0.00	N/A	N/A
2.46	62.1	99.7	160.1	1.5	0.7	2.4	5	silty SAND to sandy SILT	120	4.0	16	25	67	48	-	-	18	16	N/A	0.00	N/A	N/A
2.62	54.8	87.8	175.2	1.8	0.8	3.3	5	silty SAND to sandy SILT	120	4.0	14	22	63	47	-	-	23	16	N/A	0.00	N/A	N/A
2.79	45.9	73.6	191.4	2.1	0.8	4.5	4	clayy SILT to silty CLAY	115	2.0	23	37	-	-	3.2	9.9	29	15	N/A	0.00	N/A	N/A
2.95	36.5	58.5	189.6	1.9	0.6	5.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	35	15	N/A	0.00	N/A	N/A
3.12	31.5	50.5	-	1.7	0.5	5.5	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.2	9.9	37	15	N/A	0.00	N/A	N/A
3.28	30.2	48.5	-	1.5	0.5	5.0	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	36	15	-	-	0.24	-
3.45	23.5	37.6	-	1.2	0.5	5.2	3	silty CLAY to CLAY	115	1.5	16	25	-	-	1.6	9.9	41	15	-	-	0.24	-
3.61	19.6	31.4	-	0.9	0.5	4.7	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	42	15	-	-	0.24	-
3.77	21.7	34.8	-	1.2	0.4	5.6	3	silty CLAY to CLAY	115	1.5	14	23	-	-	1.5	9.9	44	15	-	-	0.24	-
3.94	34.4	55.1	172.3	1.6	0.4	4.7	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	34	15	0.00	-	0.24	0.0
4.10	32.5	52.1	-	1.9	0.4	5.7	3	silty CLAY to CLAY	115	1.5	22	35	-	-	2.3	9.9	38	15	-	-	0.24	-
4.27	28.2	45.2	-	1.5	0.4	5.4	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	39	15	-	-	0.24	-
4.43	15.8	25.4	-	0.8	0.5	5.4	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	49	15	-	-	0.24	-
4.59	9.2	14.7	-	0.6	0.4	6.5	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	9.9	64	15	-	-	0.24	-
4.76	8.9	14.2	-	0.5	0.4	5.9	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	63	15	-	-	0.24	-
4.92	15.5	24.9	-	0.7	0.4	4.6	3	silty CLAY to CLAY	115	1.5	10	17	-	-	1.1	9.9	46	15	-	-	0.24	-
5.09	16.9	27.1	-	0.9	0.3	5.6	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	48	15	-	-	0.24	-
5.25	22.6	36.2	-	1.2	0.3	5.5	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	43	15	-	-	0.24	-
5.41	26.7	42.8	-	1.3	0.3	5.1	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	39	15	-	-	0.24	-
5.58	28.8	46.1	-	1.4	0.3	4.9	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.24	-
5.74	30.7	49.2	-	1.5	0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	15	25	-	-	2.2	9.9	36	15	-	-	0.24	-
5.91	30.4	48.8	-	1.5	0.3	5.2	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	37	15	-	-	0.24	-
6.07	28.7	46.0	-	1.4	0.3	4.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.24	-
6.23	22.9	36.8	-	1.2	0.3	5.4	3	silty CLAY to CLAY	115	1.5	15	25	-	-	1.6	9.9	42	15	-	-	0.24	-
6.40	20.3	32.5	-	0.7	0.4	3.8	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	39	15	-	-	0.24	-
6.56	28.0	44.4	95.2	0.5	0.4	1.8	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	25	16	2.43	-	0.24	50.8
6.73	25.3	39.7	96.0	0.5	0.4	2.1	5	silty SAND to sandy SILT	120	4.0	6	10	36	40	-	-	27	16	2.42	-	0.24	51.2
6.89	26.3	40.7	115.2	0.7	0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	31	15	2.08	-	0.23	51.2
7.05	32.6	49.9	103.5	0.6	0.2	2.0	5	silty SAND to sandy SILT	120	4.0	8	12	44	41	-	-	24	16	2.27	-	0.23	44.3
7.22	29.1	44.0	108.3	0.7	0.3	2.4	5	silty SAND to sandy SILT	120	4.0	7	11	40	41	-	-	28	16	2.19	-	0.23	51.2
7.38	21.1	33.8	-	0.7	0.4	3.3	4	clayy SILT to silty CLAY	115	2.0	11	17	-	-	1.5	9.9	36	15	-	-	0.22	-
7.55	25.6	37.8	107.1	0.7	0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	13	19	-	-	1.8	9.9	31	15	2.21	-	0.22	51.2
7.71	24.4	35.7	97.1	0.5	0.4	2.3	4	clayy SILT to silty CLAY	115	2.0	12	18	-	-	1.7	9.9	30	15	2.39	-	0.22	51.2
7.87	28.2	40.7	100.9	0.6	0.4	2.2	5	silty SAND to sandy SILT	120	4.0	7	10	37	40	-	-	28	16	2.32	-	0.21	51.2
8.04	28.3	45.5	151.1	1.2	0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	35	15	0.52	-	0.21	2.4
8.20	50.3	71.2	163.9	1.8	0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	25	36	-	-	3.5	9.9	26	15	0.00	-	0.21	0.0
8.37	44.2	62.0	177.3	2.0	0.4	4.5	4	clayy SILT to silty CLAY	115	2.0	22	31	-	-	3.1	9.9	31	15	0.00	-	0.21	0.0
8.53	51.0	70.8	168.6	1.9	0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.6	9.9	27	15	0.00	-	0.21	0.0
8.69	51.5	70.9	172.3	2.0	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.6	9.9	28	15	0.00	-	0.21	0.0
8.86	48.4	66.0	180.4	2.1	0.3	4.4	4	clayy SILT to silty CLAY	115	2.0	24	33	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.02	47.8	64.5	175.2	2.0	0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.19	48.2	64.5	174.0	2.0	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.4	9.9	30	15	0.00	-	0.21	0.0
9.35	52.2	69.2	175.7	2.1	0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.7	9.9	29	15	0.00	-	0.21	0.0
9.51	54.5	71.6	170.9	2.0	0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	27	36	-	-	3.8	9.9	27	15	0.00	-	0.21	0.0
9.68	52.8	68.7	176.3	2.1	0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	29	15	0.00	-	0.21	0.0
9.84	54.4	70.3	180.6	2.3	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	27	35	-	-	3.8	9.9	29	15	0.00	-	0.21	0.0
10.01	56.4	72.3	180.3	2.3	0.4	4.1	4	clayy SILT to silty CLAY	115	2.0	28	36	-	-	4.0	9.9	28	15	0.00	-	0.21	0.0
10.17	55.7	70.8	173.8	2.2	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	28	35	-	-	3.9	9.9	28	15	0.00	-	0.21	0.0
10.34	52.8	66.5	188.6	2.5	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	26	33	-	-	3.7	9.9	31	15	0.00	-	0.21	0.0
10.50	63.7	79.6	192.9	2.7	0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	32	40	-	-	4.5	9.9	27	15	0.00	-	0.21	0.0
10.66	65.0	80.7	200.2	2.9	0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	33	40	-	-	4.6	9.9	28	15	0.00	-	0.21	0.0
10.83	64.4	79.3	205.8	3.0	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	32	40	-	-	4.5	9.9	29	15	0.00	-	0.21	0.0
10.99	74.4	90.9	216.2	3.4	0.3	4.6	9	very stiff fine SOIL	120	2.0	37	45	64	44	-	-	27	30	0.00	-	0.21	0.0
11.16	82.7	100.4	228.1	3.8	0.3	4.6	9	very stiff fine SOIL	120	2.0	41	50	67	44	-	-	26	30	0.00	-	0.21	0.0
11.32	80.6	97.0	220.8	3.6	0.4	4.5	9	very stiff fine SOIL	120	2.0	40	48	66	44	-	-	26	30	0.00	-	0.21	0.0
11.48	81.1	97.0	220.9	3.6	0.3	4.5	9	very stiff fine SOIL	120	2.0	41	48	66	44	-	-	26	30	0.00	-	0.21	0.0
11.65	99.6	118.2	235.4	4.1	0.3	4.2	9	very stiff fine SOIL	120	2.0	50	59	73	45	-	-	23	30	0.00	-	0.21	0.0
11.81	94.1	110.8	252.0	4.6	0.3	5.0	9	very stiff fine SOIL	120	2.0	47	55	70	45	-	-	26	30	0.00	-	0.21	0.0
11.98	91.1	106.5	247.8	4.5	0.3	5.0	9	very stiff fine SOIL	120	2.0	46	53	69	44	-	-	27	30	0.00	-	0.21	0.0
12.14	82.8	96.1	235.9	4.1	0.3	5.1	9	very stiff fine SOIL	120	2.0	41	48	66	44	-	-	28	30	0.00	-	0.21	0.0
12.30	70.4	81.2	236.7	4.1	0.3	5.8	9	very stiff fine SOIL	120	2.0	35	41	60	43	-	-	32	30	0.00	-	0.21	0.0
12.47	65.5	75.0	215.2	3.5	0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	33	37	-	-	4.6	9.9	32	15	0.00	-	0.21	0.0
12.63	53.0	60.3	191.5	2.7	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	27	30	-	-	3.7	9.9	34	15	0.00	-	0.21	0.0
12.80	50.1	56.7	186.5	2.6	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	25	28	-	-	3.5	9.9	35	15	0.00	-	0.21	0.0
12.96	55.4	62.2	190.7	2.8	0.4	5.1	4	clayy SILT to silty CLAY	115	2.0	28	31	-	-	3.9	9.9	33	15	0.00	-	0.21	0.0
13.12	51.5	61.5	198.5	2.8	0.4	5.5	4	clayy SILT to silty CLAY	115	2.0	26	31	-	-	3.6	9.9	35	15	0.00	-	0.21	0.0
13.29	45.4	53.7	177.5	2.2	0.4	5.0	4	clayy SILT to silty CLAY	115	2.0	23	27	-	-	3.2	9.9	35	15	0.00	-	0.21	0.0
13.45	40.5	47.5	-	1.8	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.8	9.9	36	15	-	-	0.21	-
13.62	38.5	44.8	-	1.6	0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	36	15	-	-	0.21	-
13.78	39.6	45.7	-	1.8	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	20	23	-	-	2.8	9.9	36	15	-	-	0.21	-
13.94	41.4	51.4	-	2.1	0.4	5.2	4	clayy SILT to silty CLAY	115	2.0	21	26	-	-	2.9	9.9	36	15	-	-	0.21	-
14.11	50.7	54.6	168.8	2.3	0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	25	27	-	-	3.6	9.9	33	15	0.00	-	0.21	0.0
14.27	73.5	78.7	162.2	2.3	0.4	3.1	5	silty SAND to sandy SILT	120	4.0	18	20	59	43	-	-	24	16	0.00	-	0.21	0.0
14.44	108.1	115.0	172.2	2.5	0.3	2.3	5	silty SAND to sandy SILT	120	4.0	27	29	72	45	-	-	17	16	0.00	-	0.21	0.0
14.60	141.0	149.1	183.8	2.4	0.3	1.7	6	clean SAND to silty SAND	125	5.0	28	30	80	46	-	-	11	16	0.00	-	0.21	0.0
14.76	158.0	166.1	213.8	3.3	0.2	2.1	5	silty SAND to sandy SILT	120	4.0	40	42	84	46	-	-	13	16	0.00	-	0.21	0.0
14.93	145.4	152.0	223.6	4.1	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	36	38	81	46	-	-	16	16	0.00	-	0.21	0.0
15.09	72.0	74.9	227.8	4.2	0.3	5.8	9	very stiff fine SOIL	120	2.0	36	37	57	42	-	-	33	30	0.00	-	0.21	0.0
15.26	49.1	55.6	-	2.7	0.3	5.5	4	clayy SILT to silty CLAY	115	2.0	25	28	-	-	3.4	9.9	36	15	-	-	0.21	-
15.42	47.7	50.7	167.2	2.2	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	24	25	-	-	3.3	9.9	35	15	0.00	-	0.21	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
15.58	41.3	42.3	124.4	1.3	0.3	3.2	4	clayy SILT to silty CLAY	115	2.0	21	21	-	-	2.9	9.9	32	15	1.95	-	0.21	51.2
15.75	37.3	37.9	122.4	1.2	0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	19	19	-	-	2.6	9.9	35	15	1.98	-	0.20	51.2
15.91	36.8	40.0	-	2.1	0.3	5.8	3	silty CLAY to CLAY	115	1.5	25	27	-	-	2.6	9.9	42	15	-	-	0.20	-
16.08	59.5	59.9	158.5	2.2	0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	30	30	-	-	4.2	9.9	30	15	0.55	-	0.20	3.8
16.24	118.8	119.1	147.6	1.6	0.2	1.4	6	clean SAND to silty SAND	125	5.0	24	24	73	45	-	-	12	16	1.00	-	0.20	4.9
16.40	76.0	75.8	178.9	2.9	0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	38	38	-	-	5.3	9.9	27	15	0.00	-	0.20	0.0
16.57	104.0	103.1	180.6	3.0	0.1	2.9	5	silty SAND to sandy SILT	120	4.0	26	26	68	44	-	-	20	16	0.00	-	0.20	0.0
16.73	51.4	53.0	-	2.7	0.2	5.3	4	clayy SILT to silty CLAY	115	2.0	26	27	-	-	3.6	9.9	36	15	-	-	0.20	-
16.90	35.0	35.8	-	1.9	0.2	5.6	3	silty CLAY to CLAY	115	1.5	23	24	-	-	2.4	9.9	44	15	-	-	0.20	-
17.06	32.4	32.8	-	1.4	0.2	4.5	3	silty CLAY to CLAY	115	1.5	22	22	-	-	2.3	9.9	41	15	-	-	0.20	-
17.23	35.7	35.8	-	1.5	0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	39	15	-	-	0.20	-
17.39	40.3	40.0	-	2.0	0.1	5.0	3	silty CLAY to CLAY	115	1.5	27	27	-	-	2.8	9.9	40	15	-	-	0.20	-
17.55	38.8	38.2	-	2.1	0.2	5.6	3	silty CLAY to CLAY	115	1.5	26	25	-	-	2.7	9.9	42	15	-	-	0.20	-
17.72	30.5	29.8	-	1.7	0.2	5.9	3	silty CLAY to CLAY	115	1.5	20	20	-	-	2.1	9.9	48	15	-	-	0.20	-
17.88	30.4	29.4	-	1.3	0.0	4.3	3	silty CLAY to CLAY	115	1.5	20	20	-	-	2.1	9.9	43	15	-	-	0.20	-
18.05	30.9	29.6	-	1.9	-2.1	6.3	3	silty CLAY to CLAY	115	1.5	21	20	-	-	2.1	9.9	49	15	-	-	0.20	-
18.21	37.4	35.4	116.1	1.2	-4.3	3.2	4	clayy SILT to silty CLAY	115	2.0	19	18	-	-	2.6	9.9	35	15	2.07	-	0.20	51.2
18.37	96.4	90.8	148.4	2.2	-4.3	2.3	5	silty SAND to sandy SILT	120	4.0	24	23	64	43	-	-	19	16	1.01	-	0.20	6.5
18.54	93.1	87.3	152.8	2.3	-4.3	2.5	5	silty SAND to sandy SILT	120	4.0	23	22	63	43	-	-	20	16	0.81	-	0.19	5.1
18.70	56.0	52.3	158.7	2.3	-4.2	4.2	4	clayy SILT to silty CLAY	115	2.0	28	26	-	-	3.9	9.9	33	15	0.59	-	0.19	25.1
18.87	50.2	46.6	137.4	1.8	-3.0	3.6	4	clayy SILT to silty CLAY	115	2.0	25	23	-	-	3.5	9.9	32	15	1.55	-	0.19	48.1
19.03	41.5	38.4	126.0	1.4	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	2.9	9.9	35	15	1.93	-	0.19	51.2
19.19	26.2	23.6	-	1.2	-1.0	4.6	3	silty CLAY to CLAY	115	1.5	17	16	-	-	1.8	9.9	48	15	-	-	0.19	-
19.36	19.2	17.1	-	0.8	-1.0	4.7	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.7	55	15	-	-	0.19	-
19.52	20.5	18.1	-	0.6	-0.9	2.9	4	clayy SILT to silty CLAY	115	2.0	10	9	-	-	1.4	9.9	46	15	-	-	0.19	-
19.69	21.9	19.2	-	0.5	-0.9	2.4	4	clayy SILT to silty CLAY	115	2.0	11	10	-	-	1.5	9.9	42	15	-	-	0.19	-
19.85	32.1	28.0	-	1.1	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	16	14	-	-	2.2	9.9	40	15	-	-	0.19	-
20.01	32.9	28.4	-	1.5	-0.8	4.9	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.3	9.9	45	15	-	-	0.19	-
20.18	34.8	29.8	-	1.4	-0.8	4.1	4	clayy SILT to silty CLAY	115	2.0	17	15	-	-	2.4	9.9	41	15	-	-	0.19	-
20.34	31.0	26.4	-	1.2	-0.8	4.0	4	clayy SILT to silty CLAY	115	2.0	16	13	-	-	2.1	9.9	43	15	-	-	0.19	-
20.51	28.8	24.3	-	1.2	-0.8	4.5	3	silty CLAY to CLAY	115	1.5	19	16	-	-	2.0	9.9	47	15	-	-	0.19	-
20.67	24.2	20.2	-	1.2	-0.8	5.2	3	silty CLAY to CLAY	115	1.5	16	13	-	-	1.7	9.9	53	15	-	-	0.19	-
20.83	22.2	18.4	-	1.0	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	9.9	55	15	-	-	0.19	-
21.00	19.6	16.1	-	1.0	-0.8	5.4	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.2	59	15	-	-	0.19	-
21.16	19.2	15.7	-	1.1	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	9.0	62	15	-	-	0.19	-
21.33	19.2	15.6	-	1.1	-0.8	5.8	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	8.9	61	15	-	-	0.19	-
21.49	25.7	20.6	-	1.3	-0.8	5.4	3	silty CLAY to CLAY	115	1.5	17	14	-	-	1.8	9.9	54	15	-	-	0.19	-
21.65	34.9	27.8	-	1.4	-0.8	4.2	3	silty CLAY to CLAY	115	1.5	23	19	-	-	2.4	9.9	43	15	-	-	0.19	-
21.82	33.5	26.5	-	1.4	-0.8	4.5	3	silty CLAY to CLAY	115	1.5	22	18	-	-	2.3	9.9	45	15	-	-	0.19	-
21.98	23.8	18.7	-	1.3	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	16	12	-	-	1.6	9.9	56	15	-	-	0.19	-
22.15	19.5	15.2	-	1.0	-0.8	5.7	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	8.8	61	15	-	-	0.19	-
22.31	17.4	13.5	-	0.9	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.7	65	15	-	-	0.19	-
22.47	15.2	11.7	-	0.8	-0.8	6.0	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.6	70	15	-	-	0.19	-
22.64	13.7	10.5	-	0.7	-0.8	5.5	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.8	71	15	-	-	0.19	-
22.80	11.2	8.5	-	0.6	-0.7	6.4	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.6	80	15	-	-	0.19	-
22.97	12.6	9.5	-	0.6	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	5.3	74	15	-	-	0.19	-
23.13	16.5	12.3	-	0.8	-0.8	5.1	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	7.0	65	15	-	-	0.19	-
23.30	20.3	15.1	-	1.0	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.7	60	15	-	-	0.19	-
23.46	21.6	15.9	-	1.0	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	14	11	-	-	1.5	9.2	58	15	-	-	0.19	-
23.62	20.8	15.2	-	1.0	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.8	60	15	-	-	0.19	-
23.79	18.8	13.7	-	1.2	-0.8	6.6	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	7.9	67	15	-	-	0.19	-
23.95	18.9	13.7	-	1.3	-0.8	7.3	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	7.9	69	15	-	-	0.19	-
24.12	25.8	18.5	-	1.4	-0.8	5.9	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.8	9.9	58	15	-	-	0.19	-
24.28	29.1	20.8	-	1.6	-0.8	5.7	3	silty CLAY to CLAY	115	1.5	19	14	-	-	2.0	9.9	54	15	-	-	0.19	-
24.44	54.5	44.5	134.2	1.9	-0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	27	22	-	-	3.8	9.9	33	15	1.79	-	0.19	50.7
24.61	88.3	71.9	141.8	2.3	-0.9	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	41	-	-	23	16	1.54	-	0.18	24.9
24.77	52.6	36.7	-	2.3	-0.8	4.4	4	clayy SILT to silty CLAY	115	2.0	26	18	-	-	3.7	9.9	39	15	-	-	0.18	-
24.94	37.1	25.7	-	2.0	-1.2	5.7	3	silty CLAY to CLAY	115	1.5	25	17	-	-	2.6	9.9	50	15	-	-	0.18	-
25.10	26.1	18.0	-	1.4	-1.2	5.9	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.8	9.9	58	15	-	-	0.18	-
25.26	21.2	14.5	-	1.3	-1.2	6.8	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	8.5	66	15	-	-	0.18	-
25.43	41.2	28.0	-	1.6	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	21	14	-	-	2.9	9.9	43	15	-	-	0.18	-
25.59	41.2	27.9	-	1.8	-1.2	4.6	3	silty CLAY to CLAY	115	1.5	27	19	-	-	2.9	9.9	45	15	-	-	0.18	-
25.76	28.8	19.3	-	1.1	-1.2	4.2	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	9.9	50	15	-	-	0.18	-
25.92	25.5	17.0	-	2.1	-1.2	8.9	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	9.9	68	15	-	-	0.18	-
26.08	92.7	73.3	150.0	2.6	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	24	16	1.21	-	0.18	15.4
26.25	45.9	30.3	-	3.6	-1.6	8.2	3	silty CLAY to CLAY	115	1.5	31	20	-	-	3.2	9.9	54	15	-	-	0.18	-
26.41	42.5	27.8	-	4.2	-1.6	9.9	3	silty CLAY to CLAY	115	1.5	28	19	-	-	2.9	9.9	59	15	-	-	0.18	-
26.58	69.4	45.2	-	4.4	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	46	30	-	-	4.8	9.9	42	15	-	-	0.18	-
26.74	143.8	112.3	200.5	4.7	-1.5	3.3	5	silty SAND to sandy SILT	120	4.0	36	28	71	43	-	-	21	16	0.00	-	0.18	0.0
26.90	166.4	129.6	192.6	4.1	-1.5	2.5	5	silty SAND to sandy SILT	120	4.0	42	32	76	44	-	-	16	16	0.00	-	0.18	0.0
27.07	84.6	65.7	177.9	3.6	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	42	33	-	-	5.9	9.9	30	15	0.00	-	0.18	0.0
27.23	48.5	30.8	-	2.2	-1.4	4.8	3	silty CLAY to CLAY	115	1.5	32	21	-	-	3.4	9.9	43	15	-	-	0.18	-
27.40	31.0	19.6	-	1.3	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.1	9.9	51	15	-	-	0.18	-
27.56	35.6	22.3	-	1.0	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	18	11	-	-	2.5	9.9	42	15	-	-	0.18	-
27.72	27.5	17.2	-	1.0	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	18	11	-	-	1.9	9.9	52	15	-	-	0.18	-
27.89	24.9	15.4	-	0.9	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.1	55	15	-	-	0.18	-
28.05	23.3	14.3	-	0.9	-1.2	4.2	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.6	8.5	57	15	-	-	0.18	-
28.22	25.5	15.6	-	1.0	-1.3	4.1	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.3	55	15	-	-	0.18	-
28.38	27.8	16.9	-	0.8	-2.2	3.1	3	silty CLAY to CLAY	115	1.5	19	11	-	-	1.9	9.9	49	15	-	-	0.18	-
28.54	25.1	15.2	-	0.8	-2.4	3.4	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	53	15	-	-	0.18	-
28.71	26.2	15.8	-	0.9	-2.5	3.5	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.8	9.4	52	15	-	-	0.18	-
28.87	25.2	15.1	-	0.8	-2.7	3.5	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	53	15	-	-	0.18	-
29.04	23.4	14.0	-	1.0	-3.0	4.5	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	8.2	59	15	-	-	0.18	-
29.20	25.5	15.1	-	1.3	-3.2	5.3	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	9.0	60	15	-	-	0.18	-
29.36	35.1	20.7	-	1.9	-3.3	5.8	3	silty CLAY to CLAY	115	1.5	23	14	-	-	2.4	9.9	55	15	-	-	0.18	-
29.53	41.9	24.5	-	1.7	-4.2	4.3	3	silty CLAY to CLAY	115	1.5	28	16	-	-	2.9	9.9	46	15	-	-	0.18	-
29.69	28.9	16.8	-	1.6	-5.6	5.8	3	silty CLAY to CLAY	115	1.5	19	11	-	-	2.0	9.9	59	15	-	-	0.18	-
29.86	30.2	17.5	-	1.5	-5.9	5.1	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	9.9	56	15	-	-	0.18	-
30.02	77.2	56.9	161.6	3.1	-5.9	4.1	4	clayy SILT to silty CLAY	115	2.0	39	28	-	-	5.4	9.9	31	15	0.00	-	0.18	0.0
30.19	117.4	86.3	160.6	3.3	-5.8	2.8	5	silty SAND to sandy SILT	120	4.0	29	22	62	42	-	-	21	16	0.00	-	0.18	0.0
30.35	88.0	64.6	181.6	3.9	-5.8	4.5	4	clayy SILT to silty CLAY	115	2.0	44	32	-	-	6.2	9.9	31	15	0.00	-	0.18	0.0
30.51	64.8	36.8	-	2.3	-5.0	3.6	4	clayy SILT to silty CLAY	115	2.0	32	18	-	-	4.5	9.9	36	15	-	-	0.18	-
30.68	30.5	17.2	-	1.6	-2.5	5.4	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.1	9.9	58	15	-	-	0.18	-
30.84	35.8	20.1	-	1.7	-1.5	5.1	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	53	15	-	-	0.18	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic -	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
31.01	44.9	25.1	-	2.0	-1.6	4.7	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	47	15	-	-	0.18	-
31.17	49.3	27.3	-	2.2	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	33	18	-	-	3.4	9.9	45	15	-	-	0.18	-
31.33	40.6	22.4	-	2.2	-1.5	5.7	3	silty CLAY to CLAY	115	1.5	27	15	-	-	2.8	9.9	53	15	-	-	0.18	-
31.50	29.8	16.4	-	2.2	-1.7	7.8	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.0	9.9	66	15	-	-	0.18	-
31.66	30.9	16.9	-	1.8	-1.7	6.2	3	silty CLAY to CLAY	115	1.5	21	11	-	-	2.1	9.9	61	15	-	-	0.18	-
31.83	37.1	20.2	-	2.7	-1.8	7.8	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.6	9.9	61	15	-	-	0.18	-
31.99	37.4	20.2	-	1.6	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.6	9.9	51	15	-	-	0.18	-
32.15	42.7	23.0	-	1.1	-3.0	2.6	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	3.0	9.9	40	15	-	-	0.18	-
32.32	44.0	23.5	-	1.4	0.3	3.3	4	clayy SILT to silty CLAY	115	2.0	22	12	-	-	3.0	9.9	42	15	-	-	0.18	-
32.48	86.2	61.1	137.8	2.4	0.3	2.9	5	silty SAND to sandy SILT	120	4.0	22	15	51	40	-	-	26	16	1.78	-	0.18	33.2
32.65	48.4	25.6	-	2.1	0.4	4.5	3	silty CLAY to CLAY	115	1.5	32	17	-	-	3.4	9.9	46	15	-	-	0.18	-
32.81	27.3	14.4	-	1.3	0.4	5.0	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.9	8.6	60	15	-	-	0.18	-
32.97	29.7	15.6	-	1.0	0.4	3.7	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.0	9.4	53	15	-	-	0.18	-
33.14	36.0	18.8	-	1.4	0.4	4.0	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.5	9.9	50	15	-	-	0.18	-
33.30	47.2	24.5	-	1.7	0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	24	12	-	-	3.3	9.9	44	15	-	-	0.18	-
33.47	42.0	21.7	-	2.0	0.4	4.9	3	silty CLAY to CLAY	115	1.5	28	14	-	-	2.9	9.9	51	15	-	-	0.18	-
33.63	37.0	19.1	-	2.2	0.4	6.2	3	silty CLAY to CLAY	115	1.5	25	13	-	-	2.5	9.9	58	15	-	-	0.18	-
33.79	34.2	17.5	-	2.0	0.4	6.3	3	silty CLAY to CLAY	115	1.5	23	12	-	-	2.3	9.9	60	15	-	-	0.18	-
33.96	30.7	15.7	-	1.5	0.4	5.4	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	9.5	60	15	-	-	0.18	-
34.12	27.3	13.8	-	1.7	0.4	6.6	3	silty CLAY to CLAY	115	1.5	18	9	-	-	1.9	8.3	67	15	-	-	0.18	-
34.29	65.1	32.8	-	2.3	0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	33	16	-	-	4.5	9.9	38	15	-	-	0.18	-
34.45	63.5	31.9	-	2.4	0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	32	16	-	-	4.4	9.9	39	15	-	-	0.18	-
34.61	35.4	17.7	-	2.1	0.3	6.3	3	silty CLAY to CLAY	115	1.5	24	12	-	-	2.4	9.9	60	15	-	-	0.18	-
34.78	32.5	16.2	-	1.8	0.3	5.9	3	silty CLAY to CLAY	115	1.5	22	11	-	-	2.2	9.8	61	15	-	-	0.18	-
34.94	24.7	12.2	-	1.3	0.3	5.8	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.7	7.3	67	15	-	-	0.18	-
35.11	19.8	9.7	-	0.9	0.2	5.0	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.7	71	15	-	-	0.18	-
35.27	19.8	9.7	-	0.9	0.2	5.1	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.7	71	15	-	-	0.18	-
35.43	23.7	11.6	-	1.0	0.2	4.7	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.9	65	15	-	-	0.18	-
35.60	38.1	18.5	-	1.4	0.2	3.9	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.6	9.9	50	15	-	-	0.18	-
35.76	32.0	15.5	-	1.5	0.2	4.9	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.2	9.4	58	15	-	-	0.18	-
35.93	25.4	12.2	-	1.3	0.2	5.4	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.7	7.3	66	15	-	-	0.18	-
36.09	21.6	10.3	-	1.2	0.2	6.2	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.5	6.1	74	15	-	-	0.18	-
36.26	30.6	14.6	-	1.6	0.2	5.5	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	8.9	62	15	-	-	0.18	-
36.42	50.3	23.9	-	1.9	0.2	4.0	3	silty CLAY to CLAY	115	1.5	34	16	-	-	3.5	9.9	45	15	-	-	0.18	-
36.58	33.0	15.6	-	1.6	0.2	5.1	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.3	9.5	59	15	-	-	0.18	-
36.75	25.9	12.2	-	1.2	0.2	5.1	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.8	7.3	65	15	-	-	0.18	-
36.91	32.7	15.3	-	1.3	0.2	4.4	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.2	9.4	57	15	-	-	0.18	-
37.08	36.5	17.0	-	1.5	0.2	4.5	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	54	15	-	-	0.18	-
37.24	48.5	22.5	-	1.9	0.2	4.0	3	silty CLAY to CLAY	115	1.5	32	15	-	-	3.3	9.9	47	15	-	-	0.18	-
37.40	40.8	18.9	-	1.9	0.2	5.0	3	silty CLAY to CLAY	115	1.5	27	13	-	-	2.8	9.9	54	15	-	-	0.18	-
37.57	34.1	15.7	-	1.9	0.2	5.8	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.3	9.6	61	15	-	-	0.18	-
37.73	38.7	17.7	-	1.9	0.1	5.3	3	silty CLAY to CLAY	115	1.5	26	12	-	-	2.7	9.9	57	15	-	-	0.18	-
37.90	31.0	14.2	-	2.0	0.1	7.0	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.6	68	15	-	-	0.18	-
38.06	31.9	14.5	-	2.1	0.1	6.9	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.2	8.8	67	15	-	-	0.18	-
38.22	30.4	13.8	-	2.0	0.0	7.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.1	8.4	68	15	-	-	0.18	-
38.39	34.2	15.4	-	2.3	0.0	7.1	3	silty CLAY to CLAY	115	1.5	23	10	-	-	2.3	9.4	66	15	-	-	0.18	-
38.55	41.2	18.5	-	2.5	0.0	6.3	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	59	15	-	-	0.18	-
38.72	42.3	18.9	-	3.1	0.0	7.7	3	silty CLAY to CLAY	115	1.5	28	13	-	-	2.9	9.9	63	15	-	-	0.18	-
38.88	59.8	26.6	-	3.1	0.0	5.3	3	silty CLAY to CLAY	115	1.5	40	18	-	-	4.1	9.9	48	15	-	-	0.18	-
39.04	47.6	21.1	-	2.3	0.1	5.0	3	silty CLAY to CLAY	115	1.5	32	14	-	-	3.3	9.9	52	15	-	-	0.18	-
39.21	50.8	22.4	-	1.6	0.1	3.4	4	clayy SILT to silty CLAY	115	2.0	25	11	-	-	3.5	9.9	44	15	-	-	0.18	-
39.37	123.4	79.5	140.4	2.8	0.0	2.3	5	silty SAND to sandy SILT	120	4.0	31	20	59	41	-	-	20	16	1.75	-	0.18	23.4
39.54	131.6	84.6	149.8	3.2	0.1	2.5	5	silty SAND to sandy SILT	120	4.0	33	21	61	41	-	-	20	16	1.38	-	0.17	15.8
39.70	96.2	61.7	137.5	2.7	0.1	2.8	5	silty SAND to sandy SILT	120	4.0	24	15	51	40	-	-	26	16	1.80	-	0.17	32.9
39.86	78.5	50.2	122.9	2.1	0.1	2.7	5	silty SAND to sandy SILT	120	4.0	20	13	44	38	-	-	28	16	1.97	-	0.17	43.9
40.03	71.4	30.9	-	2.0	0.1	2.9	4	clayy SILT to silty CLAY	115	2.0	36	15	-	-	5.0	9.9	36	15	-	-	0.16	-
40.19	65.1	28.0	-	2.2	0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	33	14	-	-	4.5	9.9	40	15	-	-	0.16	-
40.36	60.7	26.0	-	2.7	0.2	4.7	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	46	15	-	-	0.16	-
40.52	60.1	25.6	-	3.2	0.2	5.6	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	50	15	-	-	0.16	-
40.68	65.5	27.8	-	2.7	0.2	4.3	3	silty CLAY to CLAY	115	1.5	44	19	-	-	4.5	9.9	43	15	-	-	0.16	-
40.85	60.6	25.7	-	2.4	0.2	4.2	3	silty CLAY to CLAY	115	1.5	40	17	-	-	4.2	9.9	45	15	-	-	0.16	-
41.01	64.0	27.0	-	3.7	0.1	6.0	3	silty CLAY to CLAY	115	1.5	43	18	-	-	4.4	9.9	50	15	-	-	0.16	-
41.18	82.2	34.6	-	4.4	0.2	5.5	3	silty CLAY to CLAY	115	1.5	55	23	-	-	5.7	9.9	44	15	-	-	0.16	-
41.34	66.0	27.6	-	4.5	0.2	7.0	3	silty CLAY to CLAY	115	1.5	44	18	-	-	4.6	9.9	52	15	-	-	0.16	-
41.50	53.6	22.4	-	3.4	0.0	6.6	3	silty CLAY to CLAY	115	1.5	36	15	-	-	3.7	9.9	56	15	-	-	0.16	-
41.67	44.0	18.3	-	3.4	0.0	8.2	3	silty CLAY to CLAY	115	1.5	29	12	-	-	3.0	9.9	65	15	-	-	0.16	-
41.83	51.9	21.5	-	3.5	0.0	7.1	3	silty CLAY to CLAY	115	1.5	35	14	-	-	3.6	9.9	58	15	-	-	0.16	-
42.00	76.5	31.5	-	3.6	0.0	4.9	3	silty CLAY to CLAY	115	1.5	51	21	-	-	5.3	9.9	44	15	-	-	0.16	-
42.16	62.7	25.7	-	3.3	0.0	5.5	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.3	9.9	49	15	-	-	0.16	-
42.32	60.5	24.7	-	3.1	0.0	5.4	3	silty CLAY to CLAY	115	1.5	40	16	-	-	4.2	9.9	50	15	-	-	0.16	-
42.49	96.8	39.4	-	3.6	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.8	9.9	36	15	-	-	0.16	-
42.65	101.0	41.0	-	4.0	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	50	20	-	-	7.0	9.9	36	15	-	-	0.16	-
42.82	95.3	38.5	-	4.1	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	48	19	-	-	6.6	9.9	38	15	-	-	0.16	-
42.98	85.7	34.5	-	3.5	0.0	4.2	4	clayy SILT to silty CLAY	115	2.0	43	17	-	-	6.0	9.9	39	15	-	-	0.16	-
43.15	63.1	25.3	-	3.6	0.0	5.9	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.4	9.9	51	15	-	-	0.16	-
43.31	61.2	24.5	-	3.5	0.0	5.9	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	52	15	-	-	0.16	-
43.47	62.6	24.9	-	3.5	0.1	5.8	3	silty CLAY to CLAY	115	1.5	42	17	-	-	4.3	9.9	51	15	-	-	0.16	-
43.64	46.4	18.4	-	3.2	0.1	7.4	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.9	62	15	-	-	0.16	-
43.80	47.9	18.9	-	3.0	0.1	6.6	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	59	15	-	-	0.16	-
43.97	61.0	24.0	-	2.7	0.1	4.6	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	47	15	-	-	0.16	-
44.13	47.5	18.7	-	2.1	0.1	4.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	53	15	-	-	0.16	-
44.29	30.7	12.0	-	1.6	0.1	5.8	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	7.3	68	15	-	-	0.16	-
44.46	24.0	9.3	-	1.0	0.1	4.8	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.5	72	15	-	-	0.16	-
44.62	20.6	8.0	-	0.9	0.0	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	76	15	-	-	0.16	-
44.79	20.5	7.9	-	0.8	0.0	4.6	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	75	15	-	-	0.16	-
44.95	21.9	8.4	-	0.9	0.0	4.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.9	74	15	-	-	0.16	-
45.11	28.0	10.7	-	1.0	0.7	3.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.5	64	15	-	-	0.16	-
45.28	27.7	10.6	-	1.1	0.7	4.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.9	6.4	66	15	-	-	0.16	-
45.44	24.9	9.5	-	1.1	0.7	5.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.6	72	15	-	-	0.16	-
45.61	31.4	11.9	-	1.3	0.7	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	7.3	63	15	-	-	0.16	-
45.77	36.4	13.8	-	1.5	0.7	4.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	8.5	59	15	-	-	0.16	-
45.93	36.4	13.7	-	1.4	0.7	4.2	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	8.5	58	15	-	-	0.16	-
46.10	30.4	11.5	-	1.2	0.7	4.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.9	64	15	-	-	0.16	-
46.26	30.7	11.6	-	1.3	0.7	4.7	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	7.0	65	15	-	-	0.16	-

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The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
46.43	32.1	12.1	-	1.4	0.7	4.7	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	7.3	64	15	-	-	0.16	-
46.59	30.1	11.3	-	1.7	0.7	6.1	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	6.8	71	15	-	-	0.16	-
46.75	34.4	13.0	-	1.5	0.7	4.6	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.8	62	15	-	-	0.16	-
46.92	27.3	10.3	-	1.3	0.7	5.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.0	70	15	-	-	0.16	-
47.08	23.4	8.8	-	1.0	0.7	5.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	5.1	74	15	-	-	0.16	-
47.25	26.2	9.9	-	1.0	0.7	4.2	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.8	5.7	67	15	-	-	0.16	-
47.41	26.4	10.0	-	1.1	0.7	4.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.8	70	15	-	-	0.16	-
47.57	29.2	11.0	-	1.1	0.7	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	2.0	6.4	64	15	-	-	0.16	-
47.74	26.3	9.9	-	1.6	0.7	6.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.7	77	15	-	-	0.16	-
47.90	48.7	18.4	-	1.7	0.7	3.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	50	15	-	-	0.16	-
48.07	143.6	83.7	124.7	2.3	0.6	1.7	5	silty SAND to sandy SILT	120	4.0	36	21	61	41	-	-	16	16	1.95	-	0.16	21.8
48.23	114.6	66.7	112.9	2.0	0.7	1.8	5	silty SAND to sandy SILT	120	4.0	29	17	54	40	-	-	19	16	2.11	-	0.16	30.0
48.39	87.0	32.8	-	3.0	0.7	3.6	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	38	15	-	-	0.16	-
48.56	72.6	27.4	-	2.7	0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	9.9	42	15	-	-	0.16	-
48.72	49.4	18.6	-	2.4	0.7	5.1	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.9	55	15	-	-	0.16	-
48.89	37.0	14.0	-	1.7	0.8	4.9	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	8.1	61	15	-	-	0.16	-
49.05	26.0	9.8	-	1.4	0.5	6.2	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.5	75	15	-	-	0.16	-
49.22	21.1	8.0	-	1.2	-0.8	6.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.3	83	15	-	-	0.16	-
49.38	20.2	7.6	-	0.9	-1.3	5.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.1	80	15	-	-	0.16	-
49.54	18.0	6.8	-	1.2	-1.6	8.2	2	Organic SOILS - Peats	100	1.0	18	7	-	-	1.8	3.5	95	10	-	-	0.16	-
49.71	18.6	7.0	-	1.2	-1.7	7.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.7	92	15	-	-	0.16	-
49.87	19.8	7.5	-	1.5	-1.7	9.0	2	Organic SOILS - Peats	100	1.0	20	7	-	-	1.9	3.9	93	10	-	-	0.16	-
50.04	22.2	8.4	-	1.0	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	77	15	-	-	0.16	-
50.20	18.1	6.8	-	0.8	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	84	15	-	-	0.16	-
50.36	18.2	6.9	-	0.8	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	83	15	-	-	0.16	-
50.53	21.9	8.3	-	0.7	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.4	70	15	-	-	0.16	-
50.69	20.5	7.7	-	0.6	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	4.0	72	15	-	-	0.16	-
50.86	22.2	8.4	-	0.7	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.4	71	15	-	-	0.16	-
51.02	22.5	8.5	-	0.8	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	72	15	-	-	0.16	-
51.18	23.9	9.0	-	0.8	-1.8	4.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.8	69	15	-	-	0.16	-
51.35	24.8	9.4	-	0.8	-1.8	3.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.0	67	15	-	-	0.16	-
51.51	22.7	8.6	-	0.8	-1.8	3.8	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.5	70	15	-	-	0.16	-
51.68	21.9	8.3	-	0.7	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.3	70	15	-	-	0.16	-
51.84	21.2	8.0	-	0.6	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.1	70	15	-	-	0.16	-
52.00	19.9	7.5	-	0.6	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.8	72	15	-	-	0.16	-
52.17	20.0	7.5	-	0.5	-1.8	3.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.8	71	15	-	-	0.16	-
52.33	17.5	6.6	-	0.5	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	3.2	77	15	-	-	0.16	-
52.50	17.1	6.4	-	0.8	-1.8	5.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.1	88	15	-	-	0.16	-
52.66	28.1	10.6	-	0.6	-1.8	2.4	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.5	56	15	-	-	0.16	-
52.82	27.5	10.4	-	0.7	-1.8	2.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.4	59	15	-	-	0.16	-
52.99	21.2	8.0	-	0.8	-1.8	4.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.0	75	15	-	-	0.16	-
53.15	27.4	10.3	-	0.8	-1.8	3.4	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.3	62	15	-	-	0.16	-
53.32	28.5	10.8	-	0.7	-1.8	2.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.6	57	15	-	-	0.16	-
53.48	22.0	8.3	-	0.7	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	4.1	70	15	-	-	0.16	-
53.64	17.5	6.6	-	0.5	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	3.1	78	15	-	-	0.16	-
53.81	20.7	7.8	-	0.4	-1.7	2.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.8	64	15	-	-	0.16	-
53.97	15.0	5.7	-	0.6	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.6	92	15	-	-	0.16	-
54.14	18.9	7.1	-	0.4	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.4	71	15	-	-	0.16	-
54.30	18.2	6.9	-	0.8	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.2	84	15	-	-	0.16	-
54.46	16.4	6.2	-	0.6	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.8	85	15	-	-	0.16	-
54.63	22.7	8.6	-	0.5	-1.7	2.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.2	63	15	-	-	0.16	-
54.79	16.1	6.1	-	0.6	-1.7	4.9	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.7	88	15	-	-	0.16	-
54.96	25.3	9.5	-	1.0	-1.8	4.3	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.7	69	15	-	-	0.16	-
55.12	21.8	8.2	-	1.0	-1.7	5.6	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	3.9	79	15	-	-	0.16	-
55.28	23.9	9.0	-	1.1	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.4	75	15	-	-	0.16	-
55.45	36.1	13.6	-	0.9	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	52	15	-	-	0.16	-
55.61	39.2	14.8	-	1.0	-1.7	2.7	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.6	50	15	-	-	0.16	-
55.78	32.3	12.2	-	1.0	-1.7	3.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.1	59	15	-	-	0.16	-
55.94	23.3	8.8	-	0.8	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	4.2	69	15	-	-	0.16	-
56.11	15.7	5.9	-	0.4	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.6	79	15	-	-	0.16	-
56.27	13.7	5.2	-	0.3	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.2	83	15	-	-	0.16	-
56.43	14.1	5.3	-	0.3	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.2	83	15	-	-	0.16	-
56.60	14.7	5.6	-	0.4	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.4	83	15	-	-	0.16	-
56.76	16.5	6.2	-	0.3	-1.7	2.4	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	2.7	73	15	-	-	0.16	-
56.93	14.9	5.6	-	0.6	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.4	93	15	-	-	0.16	-
57.09	26.1	9.8	-	0.8	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.7	65	15	-	-	0.16	-
57.25	31.4	11.8	-	1.0	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.7	60	15	-	-	0.16	-
57.42	26.7	10.1	-	0.7	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	62	15	-	-	0.16	-
57.58	22.3	8.4	-	0.9	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	3.9	76	15	-	-	0.16	-
57.75	23.1	8.7	-	0.8	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.0	70	15	-	-	0.16	-
57.91	17.8	6.7	-	0.8	-1.7	5.4	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.9	86	15	-	-	0.16	-
58.07	20.3	7.7	-	0.8	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.4	79	15	-	-	0.16	-
58.24	46.6	17.6	-	1.0	-1.7	2.3	4	clayy SILT to silty CLAY	115	2.0	23	9	-	-	3.2	8.7	43	15	-	-	0.16	-
58.40	42.7	16.1	-	1.1	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	7.9	49	15	-	-	0.16	-
58.57	28.1	10.6	-	1.0	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	4.9	65	15	-	-	0.16	-
58.73	39.9	15.1	-	1.3	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.3	54	15	-	-	0.16	-
58.89	36.6	13.8	-	1.1	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.6	55	15	-	-	0.16	-
59.06	19.2	7.2	-	1.0	-1.7	6.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.1	88	15	-	-	0.16	-
59.22	36.8	13.9	-	1.4	-1.7	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.6	59	15	-	-	0.16	-
59.39	52.4	19.8	-	1.8	-1.7	3.6	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	48	15	-	-	0.16	-
59.55	41.5	15.6	-	1.5	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	7.5	55	15	-	-	0.16	-
59.71	41.6	15.7	-	1.5	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	7.5	54	15	-	-	0.16	-
59.88	34.7	13.1	-	1.5	-1.6	4.9	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.1	63	15	-	-	0.16	-
60.04	26.3	9.9	-	1.3	-1.6	5.7	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.5	74	15	-	-	0.16	-
60.21	31.3	11.8	-	1.2	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.4	64	15	-	-	0.16	-
60.37	23.9	9.0	-	1.1	-1.7	5.2	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.0	75	15	-	-	0.16	-
60.53	20.5	7.7	-	0.8	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.3	78	15	-	-	0.16	-
60.70	19.4	7.3	-	0.7	-1.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.1	77	15	-	-	0.16	-
60.86	19.2	7.2	-	0.6	-1.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.0	78	15	-	-	0.16	-
61.03	19.2	7.2	-	0.7	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.0	81	15	-	-	0.16	-
61.19	24.0	9.1	-	1.2	-1.7	5.7	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	3.9	77	15	-	-	0.16	-
61.35	35.6	13.4	-	1.3	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.1	59	15	-	-	0.16	-
61.52	37.9	14.3	-	1.2	-1.7	3.3	3	silty CLAY to CLAY	115	1.5	25	10	-	-	2.6	6.6	54	15	-	-	0.16	-
61.68	26.2	9.9	-	0.9	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.3	67	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
61.85	20.5	7.7	-	0.7	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.2	77	15	-	-	0.16	-
62.01	21.5	8.1	-	0.6	-1.7	3.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.4	71	15	-	-	0.16	-
62.17	20.2	7.6	-	0.6	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.1	74	15	-	-	0.16	-
62.34	20.9	7.9	-	0.7	-1.6	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	3.3	75	15	-	-	0.16	-
62.50	23.5	8.9	-	0.5	-1.6	2.5	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	3.8	62	15	-	-	0.16	-
62.67	22.7	8.6	-	1.9	-1.6	10.0	2	Organic SOILS - Peats	100	1.0	23	9	-	-	2.2	3.6	92	10	-	-	0.16	-
62.83	57.9	21.9	-	3.4	-1.7	6.3	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	55	15	-	-	0.16	-
63.00	189.2	96.4	146.7	3.7	-1.6	2.0	5	silty SAND to sandy SILT	120	4.0	47	24	66	41	-	-	17	16	1.42	-	0.16	12.3
63.16	117.9	60.0	141.7	3.5	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	59	30	-	-	8.2	9.9	27	15	1.46	-	0.16	33.8
63.32	81.8	30.9	-	2.9	-1.6	3.8	4	clayy SILT to silty CLAY	115	2.0	41	15	-	-	5.7	9.9	40	15	-	-	0.15	-
63.49	48.0	18.1	-	2.3	-1.6	5.2	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.2	56	15	-	-	0.15	-
63.65	32.7	12.3	-	1.3	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.4	64	15	-	-	0.15	-
63.82	22.3	8.4	-	1.4	-1.5	7.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	3.4	86	15	-	-	0.15	-
63.98	46.9	17.7	-	2.2	-1.6	5.2	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.0	57	15	-	-	0.15	-
64.14	59.3	22.4	-	3.2	-2.6	5.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	53	15	-	-	0.15	-
64.31	54.1	20.4	-	3.3	-5.1	6.5	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.2	58	15	-	-	0.15	-
64.47	52.2	19.7	-	3.3	-8.2	6.8	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	8.9	60	15	-	-	0.15	-
64.64	64.2	24.2	-	2.3	-8.2	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	44	15	-	-	0.15	-
64.80	27.5	10.4	-	0.2	-8.2	1.0	4	clayy SILT to silty CLAY	115	2.0	14	5	-	-	1.8	4.3	46	15	-	-	0.15	-
64.96	17.9	6.8	-	0.0	-8.2	0.1	1	sensitive fine SOIL	115	2.0	9	3	-	-	1.1	2.6	43	15	-	-	0.15	-
65.13	79.2	29.9	-	2.4	-8.3	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.15	-
65.29	100.7	38.0	-	4.0	-8.3	4.1	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	38	15	-	-	0.15	-
65.46	100.5	50.2	131.5	3.0	-8.3	3.1	4	clayy SILT to silty CLAY	115	2.0	50	25	-	-	7.0	9.9	29	15	1.79	-	0.15	43.9
65.62	86.8	43.3	115.2	2.2	-8.4	2.7	4	clayy SILT to silty CLAY	115	2.0	43	22	-	-	6.0	9.9	30	15	2.08	-	0.15	51.2
65.78	27.3	10.3	-	1.1	-8.5	4.9	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.2	70	15	-	-	0.15	-
65.95	19.1	7.2	-	0.2	-8.5	1.3	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.7	60	15	-	-	0.15	-
66.11	17.5	6.6	-	0.6	-8.6	4.3	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.4	83	15	-	-	0.15	-
66.28	123.6	61.4	119.1	2.6	-8.7	2.1	5	silty SAND to sandy SILT	120	4.0	31	15	51	38	-	-	22	16	2.02	-	0.15	33.0
66.44	111.5	55.3	85.8	1.2	-8.6	1.1	5	silty SAND to sandy SILT	120	4.0	28	14	47	38	-	-	17	16	2.65	-	0.14	38.4
66.60	176.8	87.7	115.3	2.1	-8.6	1.2	6	clean SAND to silty SAND	125	5.0	35	18	63	40	-	-	13	16	2.08	-	0.14	20.5
66.77	147.1	72.8	120.7	2.6	-8.6	1.8	5	silty SAND to sandy SILT	120	4.0	37	18	57	39	-	-	19	16	2.00	-	0.14	26.7
66.93	132.4	65.5	137.0	3.4	-8.5	2.7	5	silty SAND to sandy SILT	120	4.0	33	16	53	39	-	-	24	16	1.64	-	0.13	30.1
67.10	57.7	21.8	-	2.0	-8.5	3.8	3	silty CLAY to CLAY	115	1.5	38	15	-	-	3.9	9.5	47	15	-	-	0.13	-
67.26	35.1	13.3	-	1.8	-8.5	5.8	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	5.5	67	15	-	-	0.13	-
67.42	36.0	13.6	-	0.9	-8.7	2.7	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.6	52	15	-	-	0.13	-
67.59	21.4	8.1	-	1.8	-8.8	9.9	2	Organic SOILS - Peats	100	1.0	21	8	-	-	2.1	3.1	95	10	-	-	0.13	-
67.75	44.2	16.7	-	3.8	-8.8	9.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.0	71	15	-	-	0.13	-
67.92	64.8	24.4	-	4.5	-8.8	7.4	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	56	15	-	-	0.13	-
68.08	53.4	20.1	-	3.5	-8.9	7.0	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.6	8.6	60	15	-	-	0.13	-
68.24	79.2	29.9	-	2.1	-9.0	2.8	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	36	15	-	-	0.13	-
68.41	105.6	51.7	79.9	1.0	-9.0	1.0	5	silty SAND to sandy SILT	120	4.0	26	13	45	37	-	-	17	16	2.81	-	0.13	42.3
68.57	140.5	68.6	88.7	1.1	-9.0	0.8	6	clean SAND to silty SAND	125	5.0	28	14	55	39	-	-	13	16	2.58	-	0.13	28.9
68.74	97.7	47.7	110.9	2.2	-9.0	2.3	5	silty SAND to sandy SILT	120	4.0	24	12	43	37	-	-	27	16	2.15	-	0.12	46.9
68.90	70.6	26.6	-	3.1	-9.0	4.7	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.9	9.9	46	15	-	-	0.12	-
69.07	65.4	24.7	-	3.1	-9.0	5.0	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	49	15	-	-	0.12	-
69.23	114.0	55.4	127.8	3.0	-9.0	2.7	5	silty SAND to sandy SILT	120	4.0	29	14	48	38	-	-	26	16	1.89	-	0.12	38.3
69.39	99.0	37.4	-	3.8	-9.1	4.0	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	38	15	-	-	0.11	-
69.56	86.7	32.7	-	4.5	-9.1	5.4	3	silty CLAY to CLAY	115	1.5	58	22	-	-	6.0	9.9	45	15	-	-	0.11	-
69.72	66.0	24.9	-	2.8	-9.1	4.6	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.5	9.9	47	15	-	-	0.11	-
69.89	36.4	13.8	-	1.6	-9.1	4.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.5	62	15	-	-	0.11	-
70.05	25.1	9.5	-	1.0	-9.1	4.5	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.6	72	15	-	-	0.11	-
70.21	25.1	9.5	-	0.8	-9.2	3.6	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.6	67	15	-	-	0.11	-
70.38	20.4	7.7	-	0.5	-9.2	3.4	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.7	73	15	-	-	0.11	-
70.54	19.4	7.3	-	0.6	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.6	77	15	-	-	0.11	-
70.71	18.2	6.9	-	0.6	-9.2	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.4	80	15	-	-	0.11	-
70.87	19.8	7.5	-	0.6	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.6	76	15	-	-	0.11	-
71.03	18.1	6.8	-	0.5	-9.2	3.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.3	79	15	-	-	0.11	-
71.20	19.8	7.5	-	0.5	-9.2	3.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.6	72	15	-	-	0.11	-
71.36	19.2	7.2	-	0.5	-9.2	3.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	74	15	-	-	0.11	-
71.53	18.5	7.0	-	0.5	-9.2	3.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.4	77	15	-	-	0.11	-
71.69	19.6	7.4	-	0.7	-9.2	4.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.6	80	15	-	-	0.11	-
71.85	25.2	9.5	-	0.8	-9.2	3.8	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	3.5	68	15	-	-	0.11	-
72.02	40.7	15.4	-	0.8	-9.1	2.2	4	clayy SILT to silty CLAY	115	2.0	20	8	-	-	2.7	6.0	46	15	-	-	0.11	-
72.18	48.0	18.1	-	0.8	-9.2	1.9	4	clayy SILT to silty CLAY	115	2.0	24	9	-	-	3.3	7.2	41	15	-	-	0.11	-
72.35	28.8	10.8	-	0.7	-9.2	2.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	4.0	59	15	-	-	0.11	-
72.51	20.4	7.7	-	0.4	-9.2	2.7	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.7	69	15	-	-	0.11	-
72.67	17.8	6.7	-	0.4	-9.2	2.6	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.2	73	15	-	-	0.11	-
72.84	16.2	6.1	-	0.3	-9.1	2.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	78	15	-	-	0.11	-
73.00	16.0	6.1	-	0.3	-9.2	2.8	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	79	15	-	-	0.11	-
73.17	19.4	7.3	-	0.4	-9.1	2.5	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	70	15	-	-	0.11	-
73.33	17.9	6.8	-	0.4	-9.1	2.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.2	75	15	-	-	0.11	-
73.49	19.5	7.4	-	0.4	-9.1	2.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.5	69	15	-	-	0.11	-
73.66	16.2	6.1	-	0.4	-9.1	3.1	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	81	15	-	-	0.11	-
73.82	16.0	6.0	-	0.5	-9.1	4.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.9	88	15	-	-	0.11	-
73.99	19.0	7.2	-	0.6	-9.1	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.4	80	15	-	-	0.11	-
74.15	21.8	8.2	-	1.2	-9.1	7.1	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.8	86	15	-	-	0.11	-
74.31	35.5	13.4	-	1.0	-9.1	3.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.0	55	15	-	-	0.11	-
74.48	29.0	11.0	-	0.9	-9.1	3.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	3.9	63	15	-	-	0.11	-
74.64	21.8	8.2	-	0.8	-9.1	4.5	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.8	77	15	-	-	0.11	-
74.81	21.3	8.1	-	0.7	-9.1	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	2.7	75	15	-	-	0.11	-
74.97	20.0	7.5	-	0.7	-9.1	4.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.5	79	15	-	-	0.11	-
75.13	22.6	8.5	-	0.6	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.9	70	15	-	-	0.11	-
75.30	20.9	7.9	-	0.6	-9.1	3.5	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.6	73	15	-	-	0.11	-
75.46	21.7	8.2	-	0.6	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	2.7	71	15	-	-	0.11	-
75.63	23.9	9.0	-	0.8	-9.0	4.0	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	3.1	71	15	-	-	0.11	-
75.79	29.0	11.0	-	0.7	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	3.9	60	15	-	-	0.11	-
75.96	21.9	8.2	-	0.8	-9.0	4.4	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.7	76	15	-	-	0.11	-
76.12	20.3	7.6	-	0.6	-9.0	3.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	77	15	-	-	0.11	-
76.28	21.9	8.2	-	0.6	-9.0	3.5	3	silty CLAY to CLAY	115	1.5	15	5	-	-	1.4	2.7	72	15	-	-	0.11	-
76.45	21.2	8.0	-	0.5	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.6	71	15	-	-	0.11	-
76.61	19.8	7.5	-	0.5	-9.0	3.4	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	2.4	75	15	-	-	0.11	-
76.78	20.5	7.7	-	0.5	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	72	15	-	-	0.11	-
76.94	20.1	7.6	-	0.5	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	2.4	73	15	-	-	0.11	-
77.10	20.8	7.8	-	0.5	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	72	15	-	-	0.11	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
77.27	23.3	8.8	-	0.5	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	66	15	-	-	0.11	-
77.43	23.0	8.7	-	1.0	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	2.8	79	15	-	-	0.11	-
77.60	21.0	7.9	-	1.0	-9.0	5.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	84	15	-	-	0.11	-
77.76	27.3	10.3	-	0.8	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	3.5	65	15	-	-	0.11	-
77.92	23.5	8.9	-	0.7	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	70	15	-	-	0.11	-
78.09	23.6	8.9	-	0.7	-9.0	3.6	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	2.9	70	15	-	-	0.11	-
78.25	26.0	9.8	-	0.6	-9.0	3.0	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	3.3	63	15	-	-	0.11	-
78.42	32.8	12.4	-	0.9	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	4.3	58	15	-	-	0.11	-
78.58	25.8	9.7	-	0.9	-9.0	4.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	3.2	69	15	-	-	0.11	-
78.74	21.1	8.0	-	0.7	-9.0	3.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.5	76	15	-	-	0.11	-
78.91	18.7	7.1	-	0.5	-9.0	3.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	2.1	79	15	-	-	0.11	-
79.07	16.2	6.1	-	0.4	-9.0	3.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	82	15	-	-	0.11	-
79.24	16.4	6.2	-	0.4	-9.0	3.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	82	15	-	-	0.11	-
79.40	17.7	6.7	-	0.4	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.1	2.0	78	15	-	-	0.11	-
79.56	16.4	6.2	-	0.5	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	1.8	88	15	-	-	0.11	-
79.73	20.4	7.7	-	0.8	-9.0	5.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.4	82	15	-	-	0.11	-
79.89	27.6	10.4	-	1.4	-9.0	6.2	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	3.4	76	15	-	-	0.11	-
80.06	26.8	10.1	-	1.2	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	3.3	74	15	-	-	0.11	-
80.22	27.0	10.2	-	1.0	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	3.3	69	15	-	-	0.11	-
80.38	22.3	8.4	-	0.5	-9.0	2.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.6	68	15	-	-	0.11	-
80.55	20.8	7.9	-	0.3	-9.0	1.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	2.4	63	15	-	-	0.11	-
80.71	18.3	6.9	-	0.0	-9.0	0.1	1	sensitive fine SOIL	115	2.0	9	3	-	-	1.1	2.0	44	15	-	-	0.11	-
80.88	27.8	10.5	-	1.0	-9.0	4.3	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.8	3.4	68	15	-	-	0.11	-
81.04	30.1	11.4	-	1.9	-9.0	7.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	77	15	-	-	0.11	-
81.20	47.5	17.9	-	1.5	-9.0	3.5	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	6.3	50	15	-	-	0.11	-
81.37	30.0	11.3	-	1.3	-9.0	5.1	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	69	15	-	-	0.11	-
81.53	34.5	13.0	-	1.2	-9.0	4.2	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	4.4	61	15	-	-	0.11	-
81.70	30.2	11.4	-	2.7	-9.0	9.9	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	3.7	84	15	-	-	0.11	-
81.86	57.3	21.6	-	4.3	-9.0	8.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	7.7	61	15	-	-	0.11	-
82.02	67.8	25.6	-	5.4	-9.0	8.5	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.6	9.2	59	15	-	-	0.11	-
82.19	86.0	32.4	-	4.5	-9.0	5.5	3	silty CLAY to CLAY	115	1.5	57	22	-	-	5.9	9.9	46	15	-	-	0.11	-
82.35	86.9	32.8	-	3.9	-9.0	4.8	3	silty CLAY to CLAY	115	1.5	58	22	-	-	6.0	9.9	43	15	-	-	0.11	-
82.52	55.2	20.8	-	3.8	-9.0	7.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.7	7.3	61	15	-	-	0.11	-
82.68	52.6	19.9	-	2.7	-9.0	5.6	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	6.9	56	15	-	-	0.11	-
82.85	43.6	16.4	-	2.6	-8.9	6.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	5.6	64	15	-	-	0.11	-
83.01	49.6	18.7	-	2.5	-8.9	5.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	6.4	57	15	-	-	0.11	-
83.17	42.9	16.2	-	3.4	-8.9	8.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	5.5	71	15	-	-	0.11	-
83.34	74.1	28.0	-	3.1	-8.9	4.5	3	silty CLAY to CLAY	115	1.5	49	19	-	-	5.1	9.9	45	15	-	-	0.11	-
83.50	71.5	27.0	-	3.0	-9.0	4.5	3	silty CLAY to CLAY	115	1.5	48	18	-	-	4.9	9.5	45	15	-	-	0.11	-
83.67	166.2	73.5	133.2	3.6	-9.0	2.2	5	silty SAND to sandy SILT	120	4.0	42	18	57	39	-	-	21	16	1.71	-	0.11	25.7
83.83	284.5	125.7	129.6	1.6	-9.0	0.6	6	clean SAND to silty SAND	125	5.0	57	25	75	42	-	-	6	16	1.89	-	0.11	12.5
83.99	287.5	126.9	176.7	5.9	-8.9	2.1	5	silty SAND to sandy SILT	120	4.0	72	32	75	42	-	-	15	16	0.00	-	0.11	0.0
84.16	257.1	113.4	179.5	6.5	-9.0	2.6	5	silty SAND to sandy SILT	120	4.0	64	28	71	41	-	-	18	16	0.00	-	0.11	0.0
84.32	131.7	49.7	-	5.9	-9.0	4.7	4	clayy SILT to silty CLAY	115	2.0	66	25	-	-	9.1	9.9	35	15	-	-	0.11	-
84.49	109.4	41.3	-	4.2	-9.2	4.0	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	36	15	-	-	0.11	-
84.65	200.4	88.1	135.1	3.7	-9.1	1.9	5	silty SAND to sandy SILT	120	4.0	50	22	63	40	-	-	17	16	1.70	-	0.11	19.3
84.81	156.2	68.6	127.3	3.3	-9.0	2.2	5	silty SAND to sandy SILT	120	4.0	39	17	55	38	-	-	21	16	1.89	-	0.11	28.9
84.98	164.5	72.2	145.6	4.4	-9.1	2.7	5	silty SAND to sandy SILT	120	4.0	41	18	56	39	-	-	23	16	1.12	-	0.10	11.1
85.14	175.3	76.8	181.1	6.6	-9.0	3.9	4	clayy SILT to silty CLAY	115	2.0	88	38	-	-	12.2	9.9	27	15	0.00	-	0.10	0.0
85.31	153.5	67.2	165.7	5.5	-9.2	3.7	4	clayy SILT to silty CLAY	115	2.0	77	34	-	-	10.7	9.9	28	15	0.00	-	0.10	0.0
85.47	112.6	49.2	142.2	3.8	-9.2	3.6	4	clayy SILT to silty CLAY	115	2.0	56	25	-	-	7.8	9.9	32	15	1.06	-	0.10	36.9
85.63	351.2	153.5	206.2	7.7	-8.9	2.2	5	silty SAND to sandy SILT	120	4.0	88	38	81	43	-	-	14	16	0.00	-	0.10	0.0
85.80	244.7	106.8	203.7	8.5	-8.9	3.5	5	silty SAND to sandy SILT	120	4.0	61	27	69	41	-	-	22	16	0.00	-	0.10	0.0
85.96	94.3	35.6	-	6.9	-9.0	7.8	3	silty CLAY to CLAY	115	1.5	63	24	-	-	6.5	9.9	50	15	-	-	0.10	-
86.13	48.3	18.2	-	2.1	-9.1	4.9	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	6.0	55	15	-	-	0.10	-
86.29	45.4	17.1	-	1.4	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	5.6	51	15	-	-	0.10	-
86.45	42.5	16.1	-	1.2	-9.0	3.1	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	5.2	51	15	-	-	0.10	-
86.62	42.3	16.0	-	1.0	-9.0	2.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	5.2	49	15	-	-	0.10	-
86.78	43.7	16.5	-	0.9	-9.0	2.4	4	clayy SILT to silty CLAY	115	2.0	22	8	-	-	2.9	5.3	46	15	-	-	0.10	-
86.95	52.5	19.8	-	1.1	-9.1	2.3	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	6.5	42	15	-	-	0.10	-
87.11	63.0	23.8	-	2.1	-9.1	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.3	8.0	45	15	-	-	0.10	-
87.27	62.2	23.5	-	2.0	-9.1	3.5	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.2	7.8	45	15	-	-	0.10	-
87.44	72.2	27.2	-	2.1	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	9.2	40	15	-	-	0.10	-
87.60	72.4	27.3	-	2.3	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	9.2	41	15	-	-	0.10	-
87.77	66.4	25.1	-	2.2	-9.2	3.6	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.5	8.4	43	15	-	-	0.10	-
87.93	64.9	24.5	-	2.1	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	8.1	43	15	-	-	0.10	-
88.09	68.5	25.8	-	1.9	-9.2	3.0	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	8.6	40	15	-	-	0.10	-
88.26	73.5	27.7	-	2.4	-9.2	3.5	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.0	9.3	41	15	-	-	0.10	-
88.42	77.1	29.1	-	2.4	-9.2	3.3	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.7	39	15	-	-	0.10	-
88.59	85.1	32.1	-	2.5	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.8	9.9	37	15	-	-	0.10	-
88.75	84.8	32.0	-	2.5	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	37	15	-	-	0.10	-
88.92	87.3	32.9	-	2.6	-9.2	3.1	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.0	9.9	36	15	-	-	0.10	-
89.08	84.7	32.0	-	2.6	-9.2	3.3	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	38	15	-	-	0.10	-
89.24	85.9	32.4	-	2.9	-9.2	3.5	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	38	15	-	-	0.10	-
89.41	83.8	31.6	-	2.7	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.7	9.9	38	15	-	-	0.10	-
89.57	89.7	38.3	118.1	2.6	-9.1	3.0	4	clayy SILT to silty CLAY	115	2.0	45	19	-	-	6.2	9.9	33	15	2.04	-	0.10	51.2
89.74	89.6	33.8	-	2.7	-9.2	3.2	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.2	9.9	36	15	-	-	0.10	-
89.90	88.8	33.5	-	4.0	-9.1	4.8	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	43	15	-	-	0.10	-
90.06	93.1	35.1	-	3.9	-9.1	4.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	40	15	-	-	0.10	-
90.23	100.5	37.9	-	3.5	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	6.9	9.9	36	15	-	-	0.10	-
90.39	94.2	35.5	-	4.0	-9.0	4.5	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	40	15	-	-	0.10	-
90.56	89.1	33.6	-	3.9	-9.0	4.6	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	42	15	-	-	0.10	-
90.72	100.9	38.1	-	3.6	-8.9	3.8	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	36	15	-	-	0.10	-
90.88	105.3	44.7	134.0	3.4	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	33	15	1.40	-	0.10	50.0
91.05	105.7	44.8	135.9	3.5	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	33	15	1.30	-	0.09	49.5
91.21	108.6	46.0	135.1	3.5	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	54	23	-	-	7.5	9.9	32	15	1.36	-	0.09	47.0
91.38	110.6	46.8	134.3	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	32	15	1.42	-	0.09	45.7
91.54	111.4	47.1	134.2	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.7	9.9	31	15	1.43	-	0.09	45.2
91.70	111.6	47.1	132.2	3.4	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.7	9.9	31	15	1.53	-	0.08	46.3
91.87	110.9	46.8	131.7	3.4	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.7	9.9	31	15	1.55	-	0.08	47.0
92.03	109.7	46.2	130.5	3.3	-8.9	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.61	-	0.08	48.4
92.20	110.1	46.4	127.8	3.2	-8.9	3.1	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.75	-	0.08	48.4
92.36	109.0	45.8	124.0	3.0	-8.9	2.9	4	clayy SILT to silty CLAY	115	2.0	54	23	-	-	7.5	9.9	30	15	1.88	-	0.07	49.0
92.52	105.2	44.2	124.1	3.0	-8.9	3.0	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	31	15	1.87	-	0.07	51.1

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(568).cpt
CPT Date: 10/10/2011 12:58:35 AM
GW During Test: No GW

Sounding ID: CPT-11-222
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.24	Cycl SStn %
92.69	95.6	36.1	-	2.9	-8.9	3.3	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	35	15	-	-	0.07	-
92.85	84.9	32.0	-	2.9	-8.9	3.6	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	39	15	-	-	0.07	-
93.02	74.0	27.9	-	1.8	-8.9	2.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	8.9	36	15	-	-	0.07	-
93.18	68.0	25.6	-	2.2	-8.9	3.6	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.6	8.1	43	15	-	-	0.07	-
93.34	82.6	31.2	-	3.1	-8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	41	15	-	-	0.07	-
93.51	108.1	40.8	-	4.1	-8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	54	20	-	-	7.5	9.9	36	15	-	-	0.07	-
93.67	119.5	49.9	146.5	4.2	-8.9	3.7	4	clayy SILT to silty CLAY	115	2.0	60	25	-	-	8.3	9.9	32	15	0.82	-	0.07	33.2
93.84	127.2	53.1	142.8	4.1	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	64	27	-	-	8.8	9.9	30	15	1.05	-	0.07	26.8
94.00	121.2	50.6	138.2	3.8	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	61	25	-	-	8.4	9.9	30	15	1.25	-	0.06	35.7
94.16	117.5	49.0	131.4	3.5	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	59	24	-	-	8.1	9.9	30	15	1.58	-	0.06	44.6
94.33	116.1	48.4	130.1	3.4	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.0	9.9	30	15	1.65	-	0.06	46.0
94.49	113.1	47.1	124.6	3.1	-9.0	2.9	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.8	9.9	30	15	1.86	-	0.06	47.6
94.66	114.8	47.7	126.3	3.2	-9.0	2.9	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.9	9.9	30	15	1.81	-	0.05	46.8
94.82	102.2	38.6	-	4.4	-9.0	4.6	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.0	9.9	39	15	-	-	0.05	-
94.98	110.7	41.8	-	4.5	-9.0	4.3	4	clayy SILT to silty CLAY	115	2.0	55	21	-	-	7.6	9.9	37	15	-	-	0.05	-
95.15	116.7	48.4	148.1	4.3	-9.0	3.9	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.1	9.9	33	15	0.72	-	0.05	37.3
95.31	116.9	48.4	139.8	3.9	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	58	24	-	-	8.1	9.9	32	15	1.13	-	0.05	39.5
95.48	114.0	47.2	129.7	3.4	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	57	24	-	-	7.9	9.9	31	15	1.65	-	0.05	47.4
95.64	112.0	46.3	132.3	3.5	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	56	23	-	-	7.7	9.9	31	15	1.49	-	0.05	47.2
95.81	110.0	45.4	129.4	3.3	-9.0	3.2	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.6	9.9	31	15	1.64	-	0.04	49.6
95.97	111.1	45.9	126.0	3.2	-9.0	3.0	4	clayy SILT to silty CLAY	115	2.0	56	23	-	-	7.7	9.9	30	15	1.80	-	0.04	49.0
96.13	109.4	45.1	127.9	3.2	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	55	23	-	-	7.5	9.9	31	15	1.72	-	0.04	49.9
96.30	105.7	43.6	127.2	3.2	-9.0	3.2	4	clayy SILT to silty CLAY	115	2.0	53	22	-	-	7.3	9.9	32	15	1.74	-	0.03	51.2
96.46	107.8	44.4	123.5	3.0	-9.0	3.0	4	clayy SILT to silty CLAY	115	2.0	54	22	-	-	7.4	9.9	31	15	1.88	-	0.03	50.9
96.63	102.2	42.0	124.3	3.0	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	51	21	-	-	7.0	9.9	32	15	1.85	-	0.03	51.2
96.79	89.2	33.7	-	2.9	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.1	9.9	37	15	-	-	0.03	-
96.95	80.9	30.5	-	3.4	-9.0	4.5	3	silty CLAY to CLAY	115	1.5	54	20	-	-	5.5	9.3	43	15	-	-	0.03	-
97.12	107.5	40.6	-	3.8	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	54	20	-	-	7.4	9.9	35	15	-	-	0.03	-
97.28	122.3	50.1	144.2	4.2	-9.1	3.6	4	clayy SILT to silty CLAY	115	2.0	61	25	-	-	8.5	9.9	32	15	0.92	-	0.03	33.2
97.45	125.1	51.2	143.5	4.2	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	63	26	-	-	8.6	9.9	31	15	0.97	-	0.02	30.6
97.61	129.3	52.9	143.8	4.2	-9.0	3.4	4	clayy SILT to silty CLAY	115	2.0	65	26	-	-	9.0	9.9	30	15	0.97	-	0.02	26.2
97.77	130.9	53.6	142.2	4.2	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.1	9.9	30	15	1.06	-	0.02	25.9
97.94	131.8	53.9	141.0	4.1	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	66	27	-	-	9.1	9.9	29	15	1.13	-	0.02	26.2
98.10	130.2	53.2	141.8	4.2	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.0	9.9	30	15	1.07	-	0.02	27.0
98.27	128.6	52.5	140.3	4.1	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.9	9.9	30	15	1.14	-	0.02	29.7
98.43	128.3	52.3	135.4	3.8	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.9	9.9	29	15	1.37	-	0.01	34.4
98.59	126.4	51.5	133.7	3.7	-9.0	3.1	4	clayy SILT to silty CLAY	115	2.0	63	26	-	-	8.7	9.9	29	15	1.46	-	0.01	37.8
98.76	124.9	50.8	147.2	4.4	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	32	15	0.76	-	0.01	30.1
98.92	124.4	50.6	144.5	4.2	-9.0	3.6	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	31	15	0.89	-	0.01	31.6
99.09	130.7	53.1	139.6	4.1	-9.1	3.2	4	clayy SILT to silty CLAY	115	2.0	65	27	-	-	9.0	9.9	29	15	1.17	-	0.01	28.6
99.25	127.1	51.6	143.8	4.2	-9.0	3.5	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.8	9.9	31	15	0.94	-	0.00	29.3
99.41	124.9	50.7	144.4	4.2	-9.0	3.6	4	clayy SILT to silty CLAY	115	2.0	62	25	-	-	8.6	9.9	31	15	0.90	-	0.00	31.5
99.58	127.5	51.7	149.2	4.5	-9.0	3.7	4	clayy SILT to silty CLAY	115	2.0	64	26	-	-	8.8	9.9	32	15	0.68	-	0.00	27.2

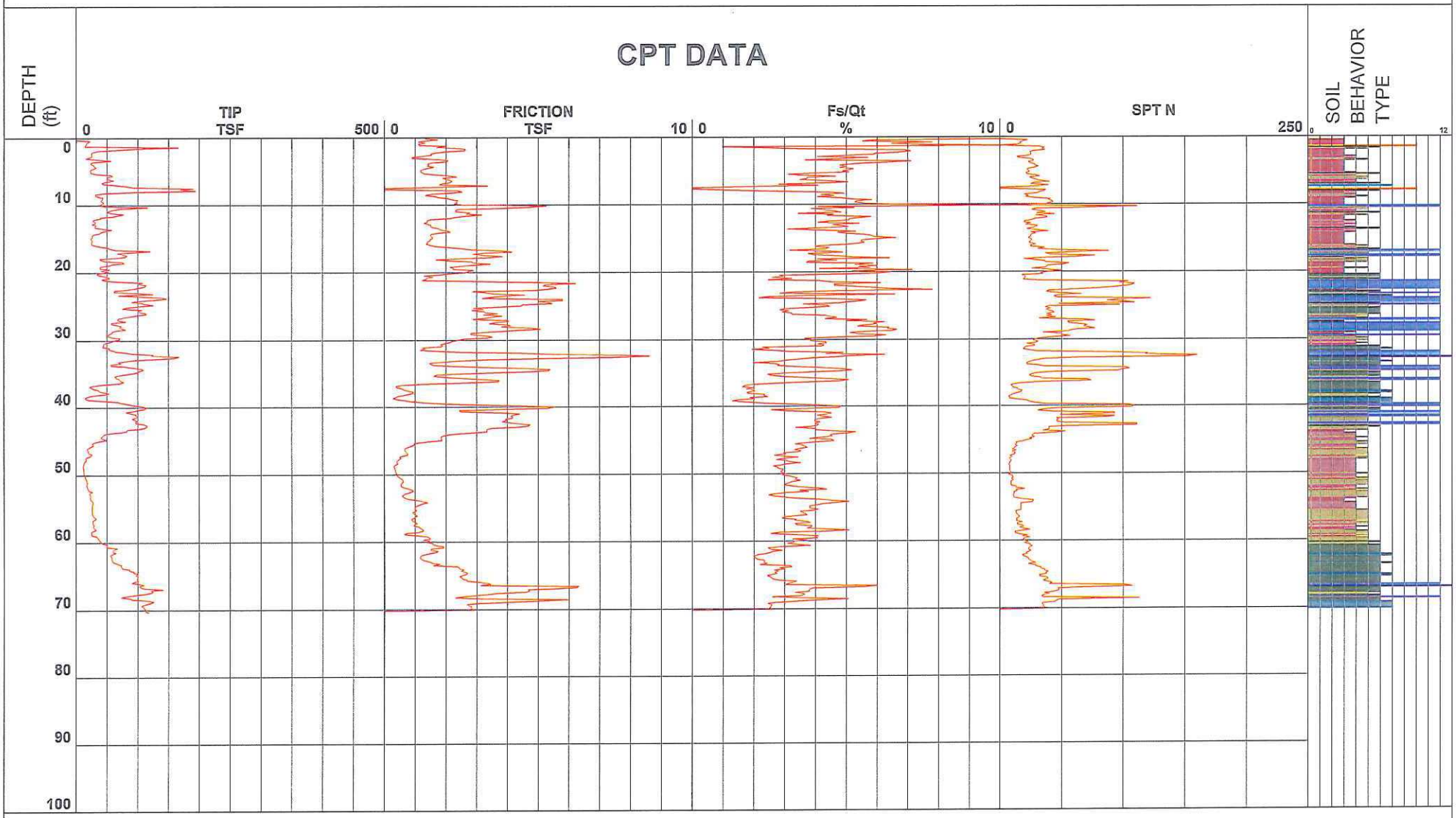
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(567).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-223	Date and Time	10/9/2011 11:47:56 PM	Maximum Depth	70.37 ft
Water Table Depth		>70.37 ft			

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Depth Increment

(*)Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-Nl 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
0.33	1.1	0.0	-	1.7	0.2	0.1	1	sensitive fine SOIL	115	2.0	1	0	-	-	0.1	9.9	95	15	N/A	0.00	N/A	N/A
0.49	22.8	36.6	-	1.3	0.3	5.9	3	silty CLAY to CLAY	115	1.5	15	24	-	-	1.6	9.9	43	15	N/A	0.00	N/A	N/A
0.66	20.0	32.1	-	1.1	0.3	5.5	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	45	15	N/A	0.00	N/A	N/A
0.82	17.1	27.4	-	1.3	0.4	7.8	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	54	15	N/A	0.00	N/A	N/A
0.98	17.2	27.6	-	1.1	0.4	6.5	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	50	15	N/A	0.00	N/A	N/A
1.15	15.1	24.2	-	1.1	0.4	7.6	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	56	15	N/A	0.00	N/A	N/A
1.31	14.6	23.5	-	2.0	0.4	9.9	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	62	15	N/A	0.00	N/A	N/A
1.48	166.0	266.2	266.2	1.7	0.5	1.0	6	clean SAND to silty SAND	125	5.0	33	53	95	48	-	-	5	16	N/A	0.00	N/A	N/A
1.64	94.2	151.1	215.9	2.5	0.6	2.6	5	silty SAND to sandy SILT	120	4.0	24	38	81	48	-	-	15	16	N/A	0.00	N/A	N/A
1.80	71.8	115.1	215.6	2.6	0.7	3.7	5	silty SAND to sandy SILT	120	4.0	18	29	72	48	-	-	22	16	N/A	0.00	N/A	N/A
1.97	37.8	60.6	-	2.6	0.7	6.9	3	silty CLAY to CLAY	115	1.5	25	40	-	-	2.7	9.9	39	15	N/A	0.00	N/A	N/A
2.13	28.1	45.0	-	2.0	0.7	7.1	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	44	15	N/A	0.00	N/A	N/A
2.30	24.7	39.6	-	1.7	0.7	6.7	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	45	15	N/A	0.00	N/A	N/A
2.46	25.6	41.1	-	1.5	0.4	6.0	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	42	15	N/A	0.00	N/A	N/A
2.62	26.2	42.0	-	1.5	0.4	5.9	3	silty CLAY to CLAY	115	1.5	17	28	-	-	1.8	9.9	41	15	N/A	0.00	N/A	N/A
2.79	25.4	40.7	-	1.3	0.4	5.0	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	39	15	N/A	0.00	N/A	N/A
2.95	22.3	35.8	-	0.9	-0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	38	15	N/A	0.00	N/A	N/A
3.12	16.0	25.6	-	0.9	0.6	5.8	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	50	15	N/A	0.00	N/A	N/A
3.28	37.7	60.5	181.5	1.8	0.6	4.8	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	33	15	0.00	-	0.16	0.0
3.45	56.5	90.7	189.4	2.1	0.6	3.7	4	clayy SILT to silty CLAY	115	2.0	28	45	-	-	4.0	9.9	24	15	0.00	-	0.16	0.0
3.61	28.5	45.7	-	2.0	0.5	7.2	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	43	15	-	-	0.16	-
3.77	24.1	38.6	-	1.6	0.5	6.6	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	45	15	-	-	0.16	-
3.94	25.4	40.8	-	1.4	-0.3	5.6	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	41	15	-	-	0.16	-
4.10	29.0	46.6	-	1.5	-0.7	5.1	4	clayy SILT to silty CLAY	115	2.0	15	23	-	-	2.0	9.9	37	15	-	-	0.16	-
4.27	29.0	46.5	-	1.4	0.0	4.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.16	-
4.43	32.4	51.9	-	1.6	-0.1	5.0	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	36	15	-	-	0.16	-
4.59	29.7	47.6	-	1.4	-0.8	4.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	36	15	-	-	0.16	-
4.76	24.2	38.8	-	1.3	-1.6	5.3	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	41	15	-	-	0.16	-
4.92	23.3	37.4	-	1.2	-1.6	5.1	3	silty CLAY to CLAY	115	1.5	16	25	-	-	1.6	9.9	41	15	-	-	0.16	-
5.09	24.2	38.8	-	1.2	-1.7	5.0	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	40	15	-	-	0.16	-
5.25	24.6	39.5	-	1.2	-2.4	5.1	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	40	15	-	-	0.16	-
5.41	33.2	53.2	154.1	1.3	-2.5	4.0	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.3	9.9	32	15	0.25	-	0.16	0.8
5.58	56.4	90.4	173.7	1.8	-2.5	3.1	5	silty SAND to sandy SILT	120	4.0	14	23	64	45	-	-	22	16	0.00	-	0.16	0.0
5.74	59.4	95.3	189.9	2.1	-1.9	3.5	5	silty SAND to sandy SILT	120	4.0	15	24	65	45	-	-	23	16	0.00	-	0.16	0.0
5.91	50.5	81.0	206.4	2.4	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	29	15	0.00	-	0.16	0.0
6.07	51.1	81.9	182.2	1.9	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	26	15	0.00	-	0.16	0.0
6.23	53.8	86.3	186.9	2.0	-0.1	3.7	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	25	15	0.00	-	0.16	0.0
6.40	61.0	97.4	192.1	2.1	0.0	3.5	5	silty SAND to sandy SILT	120	4.0	15	24	66	45	-	-	23	16	0.00	-	0.16	0.0
6.56	50.2	79.1	197.3	2.2	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	28	15	0.00	-	0.16	0.0
6.73	42.0	65.3	195.6	2.1	0.0	5.1	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	33	15	0.00	-	0.16	0.0
6.89	43.7	67.3	180.3	1.9	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.1	9.9	30	15	0.00	-	0.16	0.0
7.05	64.0	97.3	171.0	1.8	0.0	2.8	5	silty SAND to sandy SILT	120	4.0	16	24	66	45	-	-	20	16	0.00	-	0.16	0.0
7.22	82.1	123.3	238.6	3.4	0.0	4.1	9	very stiff fine SOIL	120	2.0	41	62	74	46	-	-	22	30	0.00	-	0.16	0.0
7.38	93.6	138.9	174.3	1.6	0.1	1.7	6	clean SAND to silty SAND	125	5.0	19	28	78	46	-	-	12	16	0.00	-	0.16	0.0
7.55	190.5	279.4	279.4	0.0	0.0	0.1	7	grvly SAND to dense SAND	130	6.0	32	47	95	48	-	-	5	16	0.00	-	0.16	0.0
7.71	169.9	246.3	246.3	0.0	0.0	0.1	7	grvly SAND to dense SAND	130	6.0	28	41	95	48	-	-	5	16	0.00	-	0.16	0.0
7.87	193.9	277.8	281.9	2.4	0.2	1.2	6	clean SAND to silty SAND	125	5.0	39	56	95	48	-	-	6	16	0.00	-	0.16	0.0
8.04	90.5	128.2	200.2	2.5	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	23	32	75	46	-	-	17	16	0.00	-	0.16	0.0
8.20	50.0	70.1	187.4	2.2	0.2	4.5	4	clayy SILT to silty CLAY	115	2.0	25	35	-	-	3.5	9.9	30	15	0.00	-	0.16	0.0
8.37	31.7	50.8	-	1.6	0.2	5.0	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	36	15	-	-	0.16	-
8.53	32.1	51.3	157.5	1.3	0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.2	9.9	33	15	0.35	-	0.16	1.4
8.69	35.8	56.6	174.0	1.6	0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	33	15	0.00	-	0.16	0.0
8.86	43.3	68.5	163.7	1.8	0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	22	29	-	-	3.0	9.9	31	15	0.00	-	0.16	0.0
9.02	43.0	67.5	179.9	2.1	0.1	4.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	3.0	9.9	34	15	0.00	-	0.16	0.0
9.19	42.3	66.1	185.1	2.2	0.1	5.2	4	clayy SILT to silty CLAY	115	2.0	21	28	-	-	3.0	9.9	35	15	0.00	-	0.16	0.0
9.35	41.1	61.6	-	2.4	0.1	5.9	4	clayy SILT to silty CLAY	115	2.0	21	31	-	-	2.9	9.9	36	15	-	-	0.16	-
9.51	43.6	64.7	202.2	2.3	0.1	5.4	4	clayy SILT to silty CLAY	115	2.0	22	32	-	-	3.1	9.9	34	15	0.00	-	0.16	0.0
9.68	45.0	58.2	191.1	2.4	0.1	5.4	4	clayy SILT to silty CLAY	115	2.0	23	29	-	-	3.2	9.9	35	15	0.00	-	0.16	0.0
9.84	40.8	59.1	-	2.3	0.1	5.7	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.9	9.9	36	15	-	-	0.16	-
10.01	39.4	63.2	-	2.5	0.1	6.5	9	very stiff fine SOIL	120	2.0	20	32	52	41	-	-	37	30	-	-	0.16	-
10.17	46.7	75.0	-	5.3	0.1	9.9	9	very stiff fine SOIL	120	2.0	23	37	57	42	-	-	42	30	-	-	0.16	-
10.34	116.1	145.2	262.7	4.7	0.0	4.1	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	7.7	9.9	21	16	0.00	-	0.16	0.0
10.50	73.2	90.8	236.1	3.8	-0.1	5.3	9	very stiff fine SOIL	120	2.0	37	45	64	44	-	-	29	30	0.00	-	0.16	0.0
10.66	62.6	77.1	180.9	2.4	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	31	39	-	-	4.4	9.9	27	15	0.00	-	0.16	0.0
10.83	54.3	66.4	179.3	2.3	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	27	33	-	-	3.8	9.9	30	15	0.00	-	0.16	0.0
10.99	50.6	61.3	180.4	2.3	0.0	4.7	4	clayy SILT to silty CLAY	115	2.0	25	31	-	-	3.5	9.9	32	15	0.00	-	0.16	0.0
11.16	57.6	69.4	196.5	2.8	0.0	4.9	4	clayy SILT to silty CLAY	115	2.0	29	35	-	-	4.0	9.9	31	15	0.00	-	0.16	0.0
11.32	77.4	92.5	185.8	2.7	0.0	3.5	5	silty SAND to sandy SILT	120	4.0	19	23	64	44	-	-	23	16	0.00	-	0.16	0.0
11.48	68.8	81.7	206.1	3.2	0.0	4.6	4	clayy SILT to silty CLAY	115	2.0	34	41	-	-	4.8	9.9	28	15	0.00	-	0.16	0.0
11.65	60.3	71.1	187.5	2.6	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	30	36	-	-	4.2	9.9	30	15	0.00	-	0.16	0.0
11.81	39.7	57.6	-	2.3	-0.1	5.9	3	silty CLAY to CLAY	115	1.5	26	38	-	-	2.8	9.9	37	15	-	-	0.16	-
11.98	40.0	57.3	-	2.2	-0.1	5.5	4	clayy SILT to silty CLAY	115	2.0	20	29	-	-	2.8	9.9	36	15	-	-	0.16	-
12.14	30.0	42.3	-	1.5	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	20	28	-	-	2.1	9.9	39	15	-	-	0.16	-
12.30	27.4	38.2	-	1.4	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	18	25	-	-	1.9	9.9	41	15	-	-	0.16	-
12.47	31.9	43.9	-	1.4	-0.1	4.5	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.2	9.9	37	15	-	-	0.16	-
12.63	31.8	43.2	-	1.3	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.2	9.9	36	15	-	-	0.16	-
12.80	26.4	35.4	-	1.4	-0.1	5.6	3	silty CLAY to CLAY	115	1.5	18	24	-	-	1.8	9.9	44	15	-	-	0.16	-
12.96	33.1	43.9	-	1.5	-0.1	4.7	4	clayy SILT to silty CLAY	115	2.0	17	22	-	-	2.3	9.9	37	15	-	-	0.16	-
13.12	30.9	40.5	-	1.5	-0.1	5.0	3	silty CLAY to CLAY	115	1.5	21	27	-	-	2.2	9.9	40	15	-	-	0.16	-
13.29	31.0	40.0	-	1.6	-0.1	5.2	3	silty CLAY to CLAY	115	1.5	21	27	-	-	2.2	9.9	40	15	-	-	0.16	-
13.45	42.6	46.8	151.5	1.8	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	3.0	9.9	35	15	0.74	-	0.16	42.6
13.62	58.1	63.4	146.5	1.8	-0.1	3.2	4	clayy SILT to silty CLAY	115	2.0	29	32	-	-	4.1	9.9	26	15	0.98	-	0.16	9.7
13.78	47.4	51.4	161.4	2.1	-0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.3	9.9	34	15	0.00	-	0.16	0.0
13.94	40.3	49.7	-	2.1	-0.2	5.4	3	silty CLAY to CLAY	115	1.5	27	33	-	-	2.8	9.9	38	15	-	-	0.16	-
14.11	38.7	47.2	-	1.8	-0.5	4.8	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	37	15	-	-	0.16	-
14.27	30.6	36.8	-	1.5	-0.4	5.2	3	silty CLAY to CLAY	115	1.5	20	25	-	-	2.1	9.9	42	15	-	-	0.16	-
14.44	27.0	32.2	-	1.5	-0.4	5.8	3	silty CLAY to CLAY	115	1.5	18	21	-	-	1.9	9.9	46	15	-	-	0.16	-
14.60	26.3	31.0	-	1.5	-0.4	6.0	3	silty CLAY to CLAY	115	1.5	18	21	-	-	1.8	9.9	47	15	-	-	0.16	-
14.76	26.4	30.7	-	1.6	-0.4	6.1	3	silty CLAY to CLAY	115	1.5	18	20	-	-	1.8	9.9	48	15	-	-	0.16	-
14.93	23.8	27.5	-	1.6	-0.4	6.9	3	silty CLAY to CLAY	115	1.5	16	18	-	-	1.6	9.9	52	15	-	-	0.16	-
15.09	25.0	28.5	-	1.5	-0.5	6.2	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.7	9.9	49	15	-	-	0.16	-
15.26	27.0	30.4	-	1.5	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	18	20	-	-	1.9	9.9	47	15	-	-	0.16	-
15.42	25.6	28.6	-	1.4	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.8	9.9	48	15	-	-	0.16	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
15.58	25.3	28.0	-	1.4	-0.4	5.8	3	silty CLAY to CLAY	115	1.5	17	19	-	-	1.8	9.9	49	15	-	-	0.16	-
15.75	25.4	27.7	-	1.4	-0.4	5.6	3	silty CLAY to CLAY	115	1.5	17	18	-	-	1.8	9.9	48	15	-	-	0.16	-
15.91	30.1	32.5	-	1.5	-0.5	5.1	3	silty CLAY to CLAY	115	1.5	20	22	-	-	2.1	9.9	44	15	-	-	0.16	-
16.08	39.6	42.4	-	1.6	-0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	36	15	-	-	0.16	-
16.24	51.4	51.4	154.1	2.1	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	26	26	-	-	3.6	9.9	33	15	0.71	-	0.16	28.3
16.40	55.7	55.4	169.2	2.5	-0.5	4.5	4	clayy SILT to silty CLAY	115	2.0	28	28	-	-	3.9	9.9	33	15	0.00	-	0.16	0.0
16.57	64.6	64.0	178.2	2.8	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	32	32	-	-	4.5	9.9	31	15	0.00	-	0.16	0.0
16.73	120.6	118.8	204.0	3.8	-0.4	3.2	5	silty SAND to sandy SILT	120	4.0	30	30	73	44	-	-	20	16	0.00	-	0.16	0.0
16.90	91.9	90.1	214.7	4.1	-0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	46	45	-	-	6.5	9.9	27	15	0.00	-	0.16	0.0
17.06	67.3	65.7	193.4	3.3	-0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	34	33	-	-	4.7	9.9	32	15	0.00	-	0.16	0.0
17.23	76.5	74.3	175.7	2.9	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	38	37	-	-	5.4	9.9	27	15	0.00	-	0.16	0.0
17.39	82.7	80.0	186.4	3.2	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	41	40	-	-	5.8	9.9	27	15	0.00	-	0.16	0.0
17.55	80.4	77.4	206.0	3.8	-0.3	4.8	4	clayy SILT to silty CLAY	115	2.0	40	39	-	-	5.6	9.9	30	15	0.00	-	0.16	0.0
17.72	64.5	61.8	195.2	3.3	-0.3	5.3	4	clayy SILT to silty CLAY	115	2.0	32	31	-	-	4.5	9.9	34	15	0.00	-	0.16	0.0
17.88	38.4	37.0	-	2.5	-0.2	6.6	3	silty CLAY to CLAY	115	1.5	26	25	-	-	2.7	9.9	46	15	-	-	0.16	-
18.05	41.6	39.7	-	1.7	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	37	15	-	-	0.16	-
18.21	47.3	44.8	-	2.2	-0.2	4.8	4	clayy SILT to silty CLAY	115	2.0	24	22	-	-	3.3	9.9	37	15	-	-	0.16	-
18.37	75.4	70.9	172.5	2.9	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	38	35	-	-	5.3	9.9	28	15	0.00	-	0.16	0.0
18.54	78.3	73.3	173.2	2.9	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	39	37	-	-	5.5	9.9	27	15	0.00	-	0.16	0.0
18.70	58.7	54.0	-	3.4	-0.2	6.0	3	silty CLAY to CLAY	115	1.5	39	36	-	-	4.1	9.9	38	15	-	-	0.16	-
18.87	54.8	50.0	-	2.9	-0.2	5.4	3	silty CLAY to CLAY	115	1.5	37	33	-	-	3.8	9.9	37	15	-	-	0.16	-
19.03	40.8	37.0	-	2.5	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	27	25	-	-	2.8	9.9	45	15	-	-	0.16	-
19.19	39.6	35.5	-	2.1	-0.2	5.6	3	silty CLAY to CLAY	115	1.5	26	24	-	-	2.8	9.9	44	15	-	-	0.16	-
19.36	39.1	34.8	-	2.3	-0.2	6.0	3	silty CLAY to CLAY	115	1.5	26	23	-	-	2.7	9.9	45	15	-	-	0.16	-
19.52	54.0	49.3	154.8	2.2	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	27	25	-	-	3.8	9.9	34	15	0.77	-	0.16	35.1
19.69	40.6	35.6	-	2.9	-0.2	7.4	3	silty CLAY to CLAY	115	1.5	27	24	-	-	2.8	9.9	49	15	-	-	0.16	-
19.85	52.4	45.5	-	2.7	-0.2	5.3	3	silty CLAY to CLAY	115	1.5	35	30	-	-	3.7	9.9	39	15	-	-	0.16	-
20.01	40.8	35.1	-	2.6	-0.2	6.6	3	silty CLAY to CLAY	115	1.5	27	23	-	-	2.8	9.9	47	15	-	-	0.16	-
20.18	34.1	29.1	-	2.1	-0.2	6.3	3	silty CLAY to CLAY	115	1.5	23	19	-	-	2.4	9.9	49	15	-	-	0.16	-
20.34	36.9	31.3	-	1.8	-0.2	5.1	3	silty CLAY to CLAY	115	1.5	25	21	-	-	2.6	9.9	44	15	-	-	0.16	-
20.51	45.8	40.8	116.2	1.3	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	23	20	-	-	3.2	9.9	31	15	2.07	-	0.16	51.2
20.67	53.3	47.2	126.5	1.6	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	27	24	-	-	3.7	9.9	30	15	1.93	-	0.15	47.3
20.83	54.2	47.9	118.2	1.4	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	14	12	43	39	-	-	28	16	2.04	-	0.15	46.6
21.00	41.9	34.4	-	1.4	-0.2	3.3	4	clayy SILT to silty CLAY	115	2.0	21	17	-	-	2.9	9.9	36	15	-	-	0.15	-
21.16	50.4	44.2	111.8	1.2	-0.2	2.5	5	silty SAND to sandy SILT	120	4.0	13	11	40	39	-	-	29	16	2.13	-	0.15	51.1
21.33	69.6	60.8	169.8	2.9	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	35	30	-	-	4.9	9.9	31	15	0.00	-	0.14	0.0
21.49	108.5	94.4	218.4	4.8	-0.2	4.5	9	very stiff fine SOIL	120	2.0	54	47	65	43	-	-	26	30	0.00	-	0.14	0.0
21.65	101.8	88.2	256.5	6.2	-0.2	6.2	9	very stiff fine SOIL	120	2.0	51	44	63	43	-	-	32	30	0.00	-	0.14	0.0
21.82	113.8	98.2	227.8	5.3	-0.2	4.7	9	very stiff fine SOIL	120	2.0	57	49	66	43	-	-	26	30	0.00	-	0.14	0.0
21.98	112.0	96.3	225.3	5.2	-0.2	4.7	9	very stiff fine SOIL	120	2.0	56	48	66	43	-	-	27	30	0.00	-	0.14	0.0
22.15	106.5	91.2	235.8	5.5	-0.2	5.3	9	very stiff fine SOIL	120	2.0	53	46	64	43	-	-	29	30	0.00	-	0.14	0.0
22.31	96.0	81.9	239.9	5.6	-0.2	5.9	9	very stiff fine SOIL	120	2.0	48	41	60	42	-	-	32	30	0.00	-	0.14	0.0
22.47	82.3	63.0	-	5.3	-0.2	6.5	9	very stiff fine SOIL	120	2.0	41	32	52	41	-	-	37	30	-	-	0.14	-
22.64	63.4	48.2	-	4.9	-0.1	8.0	3	silty CLAY to CLAY	115	1.5	42	32	-	-	4.4	9.9	45	15	-	-	0.14	-
22.80	61.9	46.7	-	2.9	-0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.3	9.9	36	15	-	-	0.14	-
22.97	99.4	83.6	173.9	3.3	-0.1	3.4	5	silty SAND to sandy SILT	120	4.0	25	21	61	42	-	-	24	16	0.00	-	0.14	0.0
23.13	125.2	104.9	180.2	3.6	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	26	69	43	-	-	20	16	0.00	-	0.14	0.0
23.30	69.4	51.2	-	4.6	-0.2	6.7	3	silty CLAY to CLAY	115	1.5	46	34	-	-	4.8	9.9	41	15	-	-	0.14	-
23.46	99.9	83.1	191.4	4.0	-0.2	4.0	4	clayy SILT to silty CLAY	115	2.0	50	42	-	-	7.0	9.9	26	15	0.00	-	0.14	0.0
23.62	139.3	115.5	179.3	3.5	-0.2	2.5	5	silty SAND to sandy SILT	120	4.0	35	29	72	44	-	-	17	16	0.00	-	0.14	0.0
23.79	146.8	121.3	174.4	3.2	-0.2	2.2	5	silty SAND to sandy SILT	120	4.0	37	30	73	44	-	-	16	16	0.00	-	0.14	0.0
23.95	127.8	105.2	233.6	5.8	-0.2	4.6	9	very stiff fine SOIL	120	2.0	64	53	69	43	-	-	25	30	0.00	-	0.14	0.0
24.12	102.6	84.1	238.7	5.8	-0.1	5.7	9	very stiff fine SOIL	120	2.0	51	42	61	42	-	-	31	30	0.00	-	0.14	0.0
24.28	91.0	74.3	221.0	5.0	0.0	5.6	9	very stiff fine SOIL	120	2.0	45	37	57	42	-	-	32	30	0.00	-	0.14	0.0
24.44	106.7	86.9	226.0	5.4	0.0	5.1	9	very stiff fine SOIL	120	2.0	53	43	62	42	-	-	29	30	0.00	-	0.14	0.0
24.61	113.4	92.0	226.1	5.5	0.0	4.9	9	very stiff fine SOIL	120	2.0	57	46	64	43	-	-	28	30	0.00	-	0.14	0.0
24.77	125.4	101.4	200.7	4.5	0.0	3.6	5	silty SAND to sandy SILT	120	4.0	31	25	67	43	-	-	23	16	0.00	-	0.14	0.0
24.94	101.1	81.5	201.5	4.4	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	51	41	-	-	7.1	9.9	28	15	0.00	-	0.14	0.0
25.10	82.8	66.6	184.9	3.7	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	41	33	-	-	5.8	9.9	31	15	0.00	-	0.14	0.0
25.26	76.2	61.0	162.3	2.9	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	38	31	-	-	5.3	9.9	30	15	0.00	-	0.14	0.0
25.43	107.3	85.6	166.9	3.2	-0.2	3.1	5	silty SAND to sandy SILT	120	4.0	27	21	62	42	-	-	23	16	0.00	-	0.14	0.0
25.59	100.4	79.9	156.5	2.9	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	23	16	0.92	-	0.14	7.4
25.76	103.6	82.2	167.0	3.2	-0.2	3.2	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	23	16	0.00	-	0.14	0.0
25.92	112.3	88.8	167.3	3.3	-0.2	3.0	5	silty SAND to sandy SILT	120	4.0	28	22	63	42	-	-	22	16	0.00	-	0.14	0.0
26.08	114.2	90.0	177.7	3.7	-0.2	3.3	5	silty SAND to sandy SILT	120	4.0	29	23	64	42	-	-	23	16	0.00	-	0.14	0.0
26.25	99.4	78.0	166.2	3.2	-0.2	3.3	5	silty SAND to sandy SILT	120	4.0	25	20	59	42	-	-	25	16	0.00	-	0.14	0.0
26.41	88.6	69.4	185.1	3.8	-0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	44	35	-	-	6.2	9.9	30	15	0.00	-	0.14	0.0
26.58	79.7	62.2	180.1	3.6	-0.1	4.6	4	clayy SILT to silty CLAY	115	2.0	40	31	-	-	5.6	9.9	32	15	0.00	-	0.14	0.0
26.74	69.7	44.8	-	3.3	-0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	35	22	-	-	4.9	9.9	37	15	-	-	0.14	-
26.90	67.0	42.7	-	2.9	-0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	33	21	-	-	4.7	9.9	37	15	-	-	0.14	-
27.07	70.7	44.9	-	4.0	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	47	30	-	-	4.9	9.9	40	15	-	-	0.14	-
27.23	80.6	50.8	-	4.1	-0.2	5.1	4	clayy SILT to silty CLAY	115	2.0	40	25	-	-	5.6	9.9	36	15	-	-	0.14	-
27.40	57.9	36.3	-	3.6	-0.2	6.4	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.0	9.9	46	15	-	-	0.14	-
27.56	58.3	36.3	-	3.4	-0.2	6.1	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.1	9.9	45	15	-	-	0.14	-
27.72	65.9	40.8	-	4.0	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	44	27	-	-	4.6	9.9	43	15	-	-	0.14	-
27.89	73.8	45.4	-	4.1	-0.2	5.7	3	silty CLAY to CLAY	115	1.5	49	30	-	-	5.2	9.9	40	15	-	-	0.14	-
28.05	70.9	43.4	-	3.8	-0.2	5.5	3	silty CLAY to CLAY	115	1.5	47	29	-	-	4.9	9.9	40	15	-	-	0.14	-
28.22	74.8	45.5	-	4.8	-0.2	6.5	3	silty CLAY to CLAY	115	1.5	50	30	-	-	5.2	9.9	42	15	-	-	0.14	-
28.38	80.2	48.5	-	5.1	-0.5	6.5	3	silty CLAY to CLAY	115	1.5	53	32	-	-	5.6	9.9	41	15	-	-	0.14	-
28.54	66.3	39.9	-	4.4	-0.5	6.8	3	silty CLAY to CLAY	115	1.5	44	27	-	-	4.6	9.9	45	15	-	-	0.14	-
28.71	59.2	35.4	-	3.8	-0.5	6.7	3	silty CLAY to CLAY	115	1.5	39	24	-	-	4.1	9.9	47	15	-	-	0.14	-
28.87	58.8	35.0	-	3.3	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	39	23	-	-	4.1	9.9	44	15	-	-	0.14	-
29.04	55.2	32.7	-	2.8	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	37	22	-	-	3.8	9.9	44	15	-	-	0.14	-
29.20	52.2	30.7	-	2.8	-0.5	5.6	3	silty CLAY to CLAY	115	1.5	35	20	-	-	3.6	9.9	46	15	-	-	0.14	-
29.36	52.5	30.7	-	3.3	-0.5	6.5	3	silty CLAY to CLAY	115	1.5	35	20	-	-	3.7	9.9	49	15	-	-	0.14	-
29.53	59.6	34.7	-	3.5	-0.5	6.1	3	silty CLAY to CLAY	115	1.5	40	23	-	-	4.1	9.9	45	15	-	-	0.14	-
29.69	71.1	41.2	-	3.3	-0.5	4.8	4	clayy SILT to silty CLAY	115	2.0	36	21	-	-	5.0	9.9	39	15	-	-	0.14	-
29.86	71.0	52.3	148.5	2.6	-0.5	3.7	4	clayy SILT to silty CLAY	115	2.0	36	26	-	-	5.0	9.9	31	15	1.30	-	0.14	38.9
30.02	61.6	35.3	-	2.4	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	31	18	-	-	4.3	9.9	38	15	-	-	0.14	-
30.19	57.4	32.7	-	2.2	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	29	16	-	-	4.0	9.9	39	15	-	-	0.14	-
30.35	48.9	27.7	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	33	18	-	-	3.4	9.9	44	15	-	-	0.14	-
30.51	44.9	25.3	-	2.0	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	46	15	-	-	0.14	-
30.68	45.1	25.3	-	1.8	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	30	17	-	-	3.1	9.9	45	15	-	-	0.14	-
30.84	44.3	24.7	-	1.9	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	16	-	-	3.1	9.9	46	15	-	-	0.14	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
31.01	44.0	24.4	-	1.9	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	29	16	-	-	3.0	9.9	47	15	-	-	0.14	-
31.17	54.6	39.4	103.4	1.2	-0.4	2.4	5	silty SAND to sandy SILT	120	4.0	14	10	36	37	-	-	29	16	2.27	-	0.14	51.2
31.33	53.4	38.4	107.7	1.3	-0.5	2.6	4	clayy SILT to silty CLAY	115	2.0	27	19	-	-	3.7	9.9	31	15	2.20	-	0.14	51.2
31.50	60.6	43.5	99.2	1.2	-0.5	2.0	5	silty SAND to sandy SILT	120	4.0	15	11	40	38	-	-	26	16	2.35	-	0.13	51.2
31.66	64.6	46.3	121.7	1.8	-0.5	2.9	4	clayy SILT to silty CLAY	115	2.0	32	23	-	-	4.5	9.9	29	15	1.99	-	0.13	48.5
31.83	78.8	56.3	140.5	2.5	-0.6	3.2	4	clayy SILT to silty CLAY	115	2.0	39	28	-	-	5.5	9.9	28	15	1.67	-	0.13	37.5
31.99	91.1	49.0	-	4.5	-0.6	5.0	4	clayy SILT to silty CLAY	115	2.0	46	24	-	-	6.4	9.9	37	15	-	-	0.12	-
32.15	125.8	89.3	210.1	5.5	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	63	45	-	-	8.8	9.9	27	15	0.00	-	0.12	0.0
32.32	122.8	65.3	-	7.7	-0.6	6.4	9	very stiff fine SOIL	120	2.0	61	33	53	42	-	-	36	30	-	-	0.12	-
32.48	167.4	118.3	268.9	8.6	-0.6	5.2	9	very stiff fine SOIL	120	2.0	84	59	73	43	-	-	26	30	0.00	-	0.12	0.0
32.65	160.2	112.9	246.6	7.4	-0.5	4.7	9	very stiff fine SOIL	120	2.0	80	56	71	43	-	-	25	30	0.00	-	0.12	0.0
32.81	134.1	94.3	202.9	5.3	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	67	47	-	-	9.4	9.9	25	15	0.00	-	0.12	0.0
32.97	95.6	67.0	162.0	3.4	-0.4	3.6	4	clayy SILT to silty CLAY	115	2.0	48	34	-	-	6.7	9.9	27	15	0.00	-	0.12	0.0
33.14	80.0	56.0	138.8	2.5	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	40	28	-	-	5.6	9.9	28	15	1.73	-	0.12	37.8
33.30	68.9	48.0	124.0	1.9	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	34	24	-	-	4.8	9.9	29	15	1.96	-	0.12	46.4
33.47	72.5	50.5	107.6	1.5	-0.3	2.1	5	silty SAND to sandy SILT	120	4.0	18	13	44	39	-	-	25	16	2.20	-	0.12	43.6
33.63	56.9	29.1	-	1.5	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	28	15	-	-	3.9	9.9	36	15	-	-	0.11	-
33.79	57.5	29.2	-	1.6	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.0	9.9	37	15	-	-	0.11	-
33.96	80.1	55.4	130.8	2.2	-0.3	2.8	5	silty SAND to sandy SILT	120	4.0	20	14	47	39	-	-	27	16	1.88	-	0.11	38.4
34.12	92.7	63.9	155.8	3.2	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	32	-	-	6.5	9.9	28	15	1.05	-	0.11	15.0
34.29	106.8	73.5	188.9	4.5	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	53	37	-	-	7.5	9.9	29	15	0.00	-	0.11	0.0
34.45	109.3	75.0	208.5	5.4	-0.3	5.0	4	clayy SILT to silty CLAY	115	2.0	55	37	-	-	7.7	9.9	31	15	0.00	-	0.11	0.0
34.61	102.9	51.1	-	5.3	-0.4	5.3	4	clayy SILT to silty CLAY	115	2.0	51	26	-	-	7.2	9.9	37	15	-	-	0.11	-
34.78	100.3	49.6	-	4.8	-0.5	4.9	4	clayy SILT to silty CLAY	115	2.0	50	25	-	-	7.0	9.9	36	15	-	-	0.11	-
34.94	93.4	63.7	166.0	3.6	-0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	47	32	-	-	6.5	9.9	29	15	0.00	-	0.11	0.0
35.11	80.0	54.4	133.8	2.3	-0.5	3.0	4	clayy SILT to silty CLAY	115	2.0	40	27	-	-	5.6	9.9	28	15	1.84	-	0.11	39.4
35.27	70.0	47.5	115.5	1.7	-0.5	2.5	5	silty SAND to sandy SILT	120	4.0	18	12	42	38	-	-	28	16	2.08	-	0.11	47.1
35.43	62.8	42.5	113.5	1.6	-0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	31	21	-	-	4.4	9.9	30	15	2.11	-	0.10	51.2
35.60	65.6	31.7	-	2.0	-0.4	3.1	4	clayy SILT to silty CLAY	115	2.0	33	16	-	-	4.6	9.9	36	15	-	-	0.10	-
35.76	69.5	33.4	-	2.6	-0.4	3.8	4	clayy SILT to silty CLAY	115	2.0	35	17	-	-	4.8	9.9	39	15	-	-	0.10	-
35.93	71.4	34.2	-	3.3	-0.4	4.7	3	silty CLAY to CLAY	115	1.5	48	23	-	-	5.0	9.9	41	15	-	-	0.10	-
36.09	73.7	35.1	-	3.7	-0.4	5.2	3	silty CLAY to CLAY	115	1.5	49	23	-	-	5.1	9.9	43	15	-	-	0.10	-
36.26	77.6	36.8	-	3.7	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	52	25	-	-	5.4	9.9	41	15	-	-	0.10	-
36.42	70.9	33.5	-	2.5	-0.5	3.7	4	clayy SILT to silty CLAY	115	2.0	35	17	-	-	4.9	9.9	38	15	-	-	0.10	-
36.58	46.4	21.8	-	1.2	-0.4	2.7	4	clayy SILT to silty CLAY	115	2.0	23	11	-	-	3.2	9.9	41	15	-	-	0.10	-
36.75	29.1	13.6	-	0.5	-0.4	2.0	4	clayy SILT to silty CLAY	115	2.0	15	7	-	-	2.0	8.2	47	15	-	-	0.10	-
36.91	22.6	10.5	-	0.4	-0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	11	5	-	-	1.5	6.2	52	15	-	-	0.10	-
37.08	25.3	11.7	-	0.4	-0.4	1.8	4	clayy SILT to silty CLAY	115	2.0	13	6	-	-	1.7	7.0	49	15	-	-	0.10	-
37.24	29.1	13.4	-	0.6	-0.4	2.2	4	clayy SILT to silty CLAY	115	2.0	15	7	-	-	2.0	8.1	48	15	-	-	0.10	-
37.40	36.1	16.6	-	0.6	-0.4	1.9	4	clayy SILT to silty CLAY	115	2.0	18	8	-	-	2.5	9.9	42	15	-	-	0.10	-
37.57	38.0	17.4	-	0.8	-0.4	2.1	4	clayy SILT to silty CLAY	115	2.0	19	9	-	-	2.6	9.9	42	15	-	-	0.10	-
37.73	45.8	20.9	-	0.9	-0.5	2.1	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	39	15	-	-	0.10	-
37.90	53.3	34.9	88.2	0.9	-0.5	1.9	5	silty SAND to sandy SILT	120	4.0	13	9	32	36	-	-	29	16	2.59	-	0.10	51.2
38.06	46.0	20.8	-	0.8	-0.6	1.9	4	clayy SILT to silty CLAY	115	2.0	23	10	-	-	3.2	9.9	37	15	-	-	0.09	-
38.22	28.0	12.6	-	0.7	-0.6	2.6	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.5	52	15	-	-	0.09	-
38.39	19.4	8.7	-	0.5	-0.6	2.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.0	63	15	-	-	0.09	-
38.55	15.4	6.9	-	0.4	-0.6	2.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	3.8	71	15	-	-	0.09	-
38.72	16.2	7.2	-	0.3	-0.6	2.2	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	4.0	65	15	-	-	0.09	-
38.88	21.4	9.5	-	0.4	-0.6	2.3	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	58	15	-	-	0.09	-
39.04	43.5	19.2	-	0.7	-0.7	1.6	4	clayy SILT to silty CLAY	115	2.0	22	10	-	-	3.0	9.9	37	15	-	-	0.09	-
39.21	68.2	43.9	83.5	0.9	-0.7	1.4	5	silty SAND to sandy SILT	120	4.0	17	11	40	38	-	-	22	16	2.71	-	0.09	51.2
39.37	76.1	48.9	98.9	1.3	-0.7	1.8	5	silty SAND to sandy SILT	120	4.0	19	12	43	38	-	-	23	16	2.36	-	0.09	45.5
39.54	86.4	55.4	119.4	2.0	-0.7	2.4	5	silty SAND to sandy SILT	120	4.0	22	14	47	39	-	-	25	16	2.02	-	0.09	38.4
39.70	96.2	61.5	149.8	3.1	-0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	48	31	-	-	6.7	9.9	28	15	1.29	-	0.08	28.6
39.86	108.1	69.0	180.2	4.4	-0.7	4.2	4	clayy SILT to silty CLAY	115	2.0	54	34	-	-	7.6	9.9	29	15	0.00	-	0.08	0.0
40.03	114.2	49.1	-	5.5	-0.7	4.9	4	clayy SILT to silty CLAY	115	2.0	57	25	-	-	8.0	9.9	36	15	-	-	0.08	-
40.19	111.7	47.8	-	5.3	-0.7	4.9	4	clayy SILT to silty CLAY	115	2.0	56	24	-	-	7.8	9.9	36	15	-	-	0.08	-
40.36	103.0	65.3	167.0	3.9	-0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	52	33	-	-	7.2	9.9	29	15	0.00	-	0.08	0.0
40.52	94.9	60.1	130.5	2.4	-0.6	2.6	5	silty SAND to sandy SILT	120	4.0	24	15	50	39	-	-	25	16	1.88	-	0.08	33.9
40.68	81.4	51.4	134.4	2.5	-0.7	3.2	4	clayy SILT to silty CLAY	115	2.0	41	26	-	-	5.7	9.9	29	15	1.83	-	0.08	42.6
40.85	88.8	37.4	-	3.8	-0.6	4.4	4	clayy SILT to silty CLAY	115	2.0	44	19	-	-	6.2	9.9	39	15	-	-	0.07	-
41.01	97.4	40.9	-	4.4	-0.6	4.6	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.18	97.1	40.6	-	4.2	-0.6	4.5	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.34	101.4	42.2	-	4.1	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	51	21	-	-	7.1	9.9	36	15	-	-	0.07	-
41.50	97.4	40.4	-	4.2	-0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.8	9.9	38	15	-	-	0.07	-
41.67	91.8	37.9	-	4.2	-0.5	4.6	4	clayy SILT to silty CLAY	115	2.0	46	19	-	-	6.4	9.9	39	15	-	-	0.07	-
41.83	95.4	39.2	-	3.9	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.7	9.9	37	15	-	-	0.07	-
42.00	99.9	40.9	-	4.0	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	50	20	-	-	7.0	9.9	36	15	-	-	0.07	-
42.16	96.7	39.4	-	3.8	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	48	20	-	-	6.7	9.9	37	15	-	-	0.07	-
42.32	98.9	40.2	-	4.1	-0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	49	20	-	-	6.9	9.9	37	15	-	-	0.07	-
42.49	110.3	68.2	176.1	4.4	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	55	34	-	-	7.7	9.9	29	15	0.00	-	0.07	0.0
42.65	115.7	71.4	182.8	4.7	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	58	36	-	-	8.1	9.9	29	15	0.00	-	0.07	0.0
42.82	115.5	71.1	181.5	4.7	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	58	36	-	-	8.1	9.9	29	15	0.00	-	0.07	0.0
42.98	111.7	68.6	172.6	4.3	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	56	34	-	-	7.8	9.9	28	15	0.00	-	0.07	0.0
43.15	103.9	63.8	155.1	3.5	-0.5	3.4	4	clayy SILT to silty CLAY	115	2.0	52	32	-	-	7.3	9.9	28	15	1.07	-	0.07	15.8
43.31	83.3	33.1	-	3.3	-0.5	4.1	4	clayy SILT to silty CLAY	115	2.0	42	17	-	-	5.8	9.9	40	15	-	-	0.07	-
43.47	82.9	32.8	-	3.3	-0.5	4.2	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.8	9.9	40	15	-	-	0.07	-
43.64	73.7	29.1	-	3.3	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	49	19	-	-	5.1	9.9	44	15	-	-	0.07	-
43.80	55.7	21.9	-	3.0	-0.4	5.6	3	silty CLAY to CLAY	115	1.5	37	15	-	-	3.8	9.9	53	15	-	-	0.07	-
43.97	46.7	18.3	-	2.4	-0.4	5.4	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	9.9	56	15	-	-	0.07	-
44.13	44.3	17.3	-	2.0	-0.4	4.9	3	silty CLAY to CLAY	115	1.5	30	12	-	-	3.0	9.9	56	15	-	-	0.07	-
44.29	42.9	16.7	-	1.9	-0.4	4.8	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	9.9	56	15	-	-	0.07	-
44.46	40.4	15.7	-	1.8	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	9.7	58	15	-	-	0.07	-
44.62	44.6	17.2	-	1.9	-0.7	4.4	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.1	9.9	54	15	-	-	0.07	-
44.79	49.2	18.9	-	1.9	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	9.9	50	15	-	-	0.07	-
44.95	41.4	15.9	-	1.9	-0.7	4.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.8	57	15	-	-	0.07	-
45.11	32.4	12.4	-	1.5	-0.7	5.0	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	7.5	64	15	-	-	0.07	-
45.28	27.5	10.4	-	1.1	-0.7	4.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.2	67	15	-	-	0.07	-
45.44	26.9	10.2	-	1.0	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	6.1	66	15	-	-	0.07	-
45.61	28.9	10.9	-	1.0	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.6	62	15	-	-	0.07	-
45.77	25.0	9.4	-	0.9	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.5	68	15	-	-	0.07	-
45.93	21.3	8.0	-	0.8	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.6	74	15	-	-	0.07	-
46.10	18.5	7.0	-	0.7	-0.7	4.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	79	15	-	-	0.07	-
46.26	19.1	7.2	-	0.7	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.0	77	15	-	-	0.07	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
46.43	20.5	7.7	-	0.7	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.4	73	15	-	-	0.07	-
46.59	20.1	7.6	-	0.7	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	75	15	-	-	0.07	-
46.75	21.0	7.9	-	0.7	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.5	73	15	-	-	0.07	-
46.92	26.0	9.8	-	0.8	-0.7	3.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.7	63	15	-	-	0.07	-
47.08	24.9	9.4	-	0.8	-0.7	3.4	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.4	65	15	-	-	0.07	-
47.25	21.9	8.3	-	0.6	-0.7	3.1	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.6	67	15	-	-	0.07	-
47.41	17.0	6.4	-	0.5	-0.7	3.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.4	78	15	-	-	0.07	-
47.57	15.9	6.0	-	0.5	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.2	83	15	-	-	0.07	-
47.74	16.6	6.3	-	0.5	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.3	79	15	-	-	0.07	-
47.90	16.5	6.2	-	0.5	-0.7	3.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.3	78	15	-	-	0.07	-
48.07	13.6	5.1	-	0.4	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.6	88	15	-	-	0.07	-
48.23	13.5	5.1	-	0.4	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.5	89	15	-	-	0.07	-
48.39	12.8	4.8	-	0.4	-0.7	4.5	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.8	2.4	94	15	-	-	0.07	-
48.56	12.1	4.6	-	0.4	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	94	15	-	-	0.07	-
48.72	11.4	4.3	-	0.3	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.7	2.0	95	15	-	-	0.07	-
48.89	12.0	4.5	-	0.3	-0.7	3.5	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.7	2.1	91	15	-	-	0.07	-
49.05	12.5	4.7	-	0.3	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.3	90	15	-	-	0.07	-
49.22	12.5	4.7	-	0.3	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	91	15	-	-	0.07	-
49.38	12.5	4.7	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.2	92	15	-	-	0.07	-
49.54	12.7	4.8	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	8	3	-	-	0.8	2.3	91	15	-	-	0.07	-
49.71	13.3	5.0	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.8	2.4	88	15	-	-	0.07	-
49.87	13.7	5.2	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.5	87	15	-	-	0.07	-
50.04	14.3	5.4	-	0.4	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.6	86	15	-	-	0.07	-
50.20	14.6	5.5	-	0.4	-0.7	3.7	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.7	85	15	-	-	0.07	-
50.36	15.1	5.7	-	0.5	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	2.8	85	15	-	-	0.07	-
50.53	15.8	6.0	-	0.5	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	2.9	84	15	-	-	0.07	-
50.69	17.0	6.4	-	0.6	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.2	81	15	-	-	0.07	-
50.86	18.2	6.8	-	0.6	-0.7	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	78	15	-	-	0.07	-
51.02	17.8	6.7	-	0.6	-0.7	4.2	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	80	15	-	-	0.07	-
51.18	18.7	7.1	-	0.6	-0.6	3.9	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.5	77	15	-	-	0.07	-
51.35	17.8	6.7	-	0.6	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	78	15	-	-	0.07	-
51.51	17.8	6.7	-	0.5	-0.6	3.7	3	silty CLAY to CLAY	115	1.5	12	4	-	-	1.2	3.3	77	15	-	-	0.07	-
51.68	18.2	6.9	-	0.5	-0.6	3.6	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	76	15	-	-	0.07	-
51.84	18.5	7.0	-	0.6	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.4	77	15	-	-	0.07	-
52.00	19.6	7.4	-	0.7	-0.6	4.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	3.7	77	15	-	-	0.07	-
52.17	20.3	7.7	-	0.8	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.3	3.8	78	15	-	-	0.07	-
52.33	21.3	8.0	-	0.9	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.0	78	15	-	-	0.07	-
52.50	27.0	10.2	-	0.9	-0.6	3.9	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.3	65	15	-	-	0.07	-
52.66	22.2	8.4	-	0.8	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.2	73	15	-	-	0.07	-
52.82	22.9	8.6	-	0.7	-0.6	3.5	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.3	68	15	-	-	0.07	-
52.99	24.1	9.1	-	0.6	-0.6	3.1	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.6	64	15	-	-	0.07	-
53.15	23.8	9.0	-	0.6	-0.6	2.9	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.5	64	15	-	-	0.07	-
53.32	23.2	8.8	-	0.6	-0.6	3.1	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	4.4	66	15	-	-	0.07	-
53.48	23.3	8.8	-	0.7	-0.6	3.5	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.5	4.4	68	15	-	-	0.07	-
53.64	24.5	9.3	-	0.8	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	16	6	-	-	1.6	4.6	68	15	-	-	0.07	-
53.81	26.0	9.8	-	1.1	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.9	70	15	-	-	0.07	-
53.97	27.8	10.5	-	1.3	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	70	15	-	-	0.07	-
54.14	27.8	10.5	-	1.4	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	72	15	-	-	0.07	-
54.30	26.9	10.1	-	1.3	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.0	72	15	-	-	0.07	-
54.46	27.2	10.2	-	1.2	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.1	69	15	-	-	0.07	-
54.63	26.3	9.9	-	1.1	-0.5	4.6	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.9	70	15	-	-	0.07	-
54.79	26.3	9.9	-	1.0	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.7	4.9	68	15	-	-	0.07	-
54.96	26.2	9.9	-	1.0	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	68	15	-	-	0.07	-
55.12	25.9	9.8	-	1.0	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	69	15	-	-	0.07	-
55.28	25.9	9.8	-	1.1	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.8	70	15	-	-	0.07	-
55.45	25.9	9.8	-	1.0	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.7	69	15	-	-	0.07	-
55.61	26.4	10.0	-	0.9	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	67	15	-	-	0.07	-
55.78	26.9	10.1	-	1.0	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.9	66	15	-	-	0.07	-
55.94	27.8	10.5	-	1.0	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.8	5.1	66	15	-	-	0.07	-
56.11	28.9	10.9	-	1.1	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.3	65	15	-	-	0.07	-
56.27	31.2	11.8	-	1.0	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.8	60	15	-	-	0.07	-
56.43	33.0	12.4	-	1.0	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.1	57	15	-	-	0.07	-
56.60	30.9	11.6	-	0.9	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	5.6	59	15	-	-	0.07	-
56.76	27.0	10.2	-	0.9	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	4.8	65	15	-	-	0.07	-
56.93	28.2	10.6	-	0.9	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	64	15	-	-	0.07	-
57.09	27.7	10.4	-	1.0	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.0	66	15	-	-	0.07	-
57.25	28.0	10.6	-	1.1	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.0	67	15	-	-	0.07	-
57.42	29.7	11.2	-	1.0	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	20	7	-	-	2.0	5.3	62	15	-	-	0.07	-
57.58	28.5	10.8	-	1.0	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	64	15	-	-	0.07	-
57.75	28.8	10.9	-	1.1	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	5.1	66	15	-	-	0.07	-
57.91	30.3	11.4	-	1.2	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	5.4	64	15	-	-	0.07	-
58.07	32.5	12.3	-	1.2	-0.4	4.2	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.8	62	15	-	-	0.07	-
58.24	29.5	11.1	-	1.3	-0.4	4.9	3	silty CLAY to CLAY	115	1.5	20	7	-	-	2.0	5.2	67	15	-	-	0.07	-
58.40	24.8	9.4	-	1.3	-0.4	5.9	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	4.3	76	15	-	-	0.07	-
58.57	25.9	9.8	-	1.1	-0.4	4.8	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	4.5	71	15	-	-	0.07	-
58.73	25.2	9.5	-	0.7	-0.4	3.3	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.3	65	15	-	-	0.07	-
58.89	25.7	9.7	-	0.7	-0.4	3.0	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	4.4	62	15	-	-	0.07	-
59.06	33.4	12.6	-	1.1	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	5.9	59	15	-	-	0.07	-
59.22	34.8	13.1	-	1.4	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.1	62	15	-	-	0.07	-
59.39	36.8	13.9	-	1.5	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.5	59	15	-	-	0.07	-
59.55	37.1	14.0	-	1.5	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.6	60	15	-	-	0.07	-
59.71	39.0	14.7	-	1.3	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	6.9	54	15	-	-	0.07	-
59.88	39.9	15.1	-	1.5	-0.3	4.1	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.1	56	15	-	-	0.07	-
60.04	41.8	15.8	-	1.4	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	7.4	53	15	-	-	0.07	-
60.21	47.6	18.0	-	1.6	-0.3	3.6	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	8.5	50	15	-	-	0.07	-
60.37	51.4	19.4	-	1.6	-0.3	3.3	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.2	47	15	-	-	0.07	-
60.53	49.3	18.6	-	1.7	-0.3	3.7	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	8.8	50	15	-	-	0.07	-
60.70	50.3	19.0	-	1.9	-0.3	4.1	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	9.0	51	15	-	-	0.07	-
60.86	67.1	25.3	-	1.9	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.6	9.9	40	15	-	-	0.07	-
61.03	62.7	23.6	-	1.5	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	39	15	-	-	0.07	-
61.19	59.8	22.6	-	1.5	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	41	15	-	-	0.07	-
61.35	59.9	22.6	-	1.7	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	43	15	-	-	0.07	-
61.52	64.7	24.4	-	1.7	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	40	15	-	-	0.07	-
61.68	59.3	22.4	-	1.5	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	41	15	-	-	0.07	-

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The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(567).cpt
CPT Date: 10/9/2011 11:47:56 PM
GW During Test: No GW

Sounding ID: CPT-11-223
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.16	Cycl SStn %
61.85	56.0	21.1	-	1.3	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.8	9.9	41	15	-	-	0.07	-
62.01	56.7	21.4	-	1.2	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	40	15	-	-	0.07	-
62.17	57.8	21.8	-	1.2	-0.3	2.2	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	39	15	-	-	0.07	-
62.34	58.5	22.1	-	1.2	-0.3	2.1	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	38	15	-	-	0.07	-
62.50	58.1	21.9	-	1.2	-0.3	2.2	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.9	39	15	-	-	0.07	-
62.67	59.4	22.4	-	1.3	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	38	15	-	-	0.07	-
62.83	59.4	22.4	-	1.4	-0.3	2.5	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	40	15	-	-	0.07	-
63.00	64.0	24.2	-	1.5	-0.2	2.5	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	38	15	-	-	0.07	-
63.16	68.8	25.9	-	1.6	-0.3	2.4	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	37	15	-	-	0.07	-
63.32	74.4	28.1	-	1.8	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	36	15	-	-	0.07	-
63.49	72.4	36.7	101.0	1.6	-0.3	2.3	4	clayy SILT to silty CLAY	115	2.0	36	18	-	-	5.0	9.9	31	15	2.32	-	0.07	51.2
63.65	74.7	28.2	-	2.4	-0.3	3.3	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.2	9.9	40	15	-	-	0.07	-
63.82	75.6	28.5	-	2.4	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	40	15	-	-	0.07	-
63.98	86.3	32.5	-	2.4	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	35	15	-	-	0.07	-
64.14	86.7	32.7	-	2.6	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	6.0	9.9	36	15	-	-	0.07	-
64.31	94.1	47.3	121.7	2.5	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	47	24	-	-	6.5	9.9	29	15	1.99	-	0.07	47.2
64.47	93.7	47.1	124.8	2.6	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	47	24	-	-	6.5	9.9	30	15	1.95	-	0.07	47.5
64.64	101.3	50.9	125.4	2.7	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	51	25	-	-	7.0	9.9	28	15	1.94	-	0.06	43.2
64.80	97.3	48.8	125.2	2.7	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	49	24	-	-	6.7	9.9	29	15	1.94	-	0.06	45.5
64.96	99.1	49.6	122.2	2.6	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	1.98	-	0.06	44.6
65.13	100.8	50.4	119.0	2.5	-0.3	2.5	5	silty SAND to sandy SILT	120	4.0	25	13	44	37	-	-	27	16	2.03	-	0.05	43.7
65.29	99.6	49.8	121.0	2.5	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	2.00	-	0.05	44.4
65.46	98.9	49.4	121.5	2.5	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	25	12	44	37	-	-	28	16	1.99	-	0.05	44.9
65.62	101.8	50.7	124.5	2.7	-0.3	2.7	4	clayy SILT to silty CLAY	115	2.0	51	25	-	-	7.1	9.9	28	15	1.95	-	0.04	43.4
65.78	95.7	47.6	125.7	2.7	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	48	24	-	-	6.6	9.9	30	15	1.94	-	0.04	46.9
65.95	90.7	34.2	-	3.1	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	37	15	-	-	0.04	-
66.11	103.2	51.2	140.6	3.4	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	52	26	-	-	7.2	9.9	30	15	1.38	-	0.04	39.4
66.28	110.2	54.6	140.7	3.5	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	55	27	-	-	7.7	9.9	29	15	1.41	-	0.03	35.8
66.44	103.1	51.1	134.7	3.1	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	52	26	-	-	7.2	9.9	30	15	1.66	-	0.03	43.0
66.60	105.1	39.7	-	6.3	-0.2	6.2	3	silty CLAY to CLAY	115	1.5	70	26	-	-	7.3	9.9	44	15	-	-	0.03	-
66.77	111.4	42.0	-	6.3	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	74	28	-	-	7.7	9.9	42	15	-	-	0.03	-
66.93	140.8	69.5	177.2	5.5	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	70	35	-	-	9.8	9.9	29	15	0.00	-	0.03	0.0
67.10	122.1	60.2	164.0	4.7	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.5	9.9	30	15	0.00	-	0.03	0.0
67.26	125.1	61.6	164.3	4.7	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	63	31	-	-	8.7	9.9	30	15	0.00	-	0.03	0.0
67.42	121.5	59.7	162.9	4.6	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.5	9.9	30	15	0.00	-	0.03	0.0
67.59	111.1	54.5	145.8	3.7	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	56	27	-	-	7.7	9.9	30	15	1.14	-	0.03	26.6
67.75	94.3	35.6	-	3.4	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.5	9.9	37	15	-	-	0.03	-
67.92	83.0	31.3	-	3.0	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	40	15	-	-	0.03	-
68.08	73.7	27.8	-	2.6	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.03	-
68.24	88.9	43.4	116.8	2.3	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	44	22	-	-	6.1	9.9	30	15	2.06	-	0.03	51.2
68.41	90.8	34.3	-	3.1	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	45	17	-	-	6.3	9.9	37	15	-	-	0.02	-
68.57	117.8	44.4	-	6.0	-0.2	5.2	3	silty CLAY to CLAY	115	1.5	79	30	-	-	8.2	9.9	39	15	-	-	0.02	-
68.74	126.1	61.4	169.6	5.0	-0.2	4.1	4	clayy SILT to silty CLAY	115	2.0	63	31	-	-	8.8	9.9	31	15	0.00	-	0.02	0.0
68.90	121.4	59.0	150.0	4.0	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	61	30	-	-	8.4	9.9	29	15	0.96	-	0.02	12.4
69.07	115.0	55.8	130.3	3.1	-0.3	2.8	5	silty SAND to sandy SILT	120	4.0	29	14	48	38	-	-	27	16	1.81	-	0.02	37.9
69.23	109.6	53.2	122.3	2.7	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	27	13	46	37	-	-	26	16	1.98	-	0.02	40.7
69.39	106.5	51.6	123.9	2.7	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	27	13	45	37	-	-	27	16	1.96	-	0.02	42.4
69.56	110.3	53.4	125.5	2.8	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	13	46	37	-	-	27	16	1.94	-	0.01	40.5
69.72	110.2	53.3	125.0	2.8	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	13	46	37	-	-	27	16	1.95	-	0.01	40.6
69.89	113.4	54.8	125.0	2.8	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	28	14	47	37	-	-	26	16	1.95	-	0.01	39.0
70.05	113.2	54.6	127.1	2.9	-0.3	2.7	5	silty SAND to sandy SILT	120	4.0	28	14	47	37	-	-	27	16	1.90	-	0.00	39.2

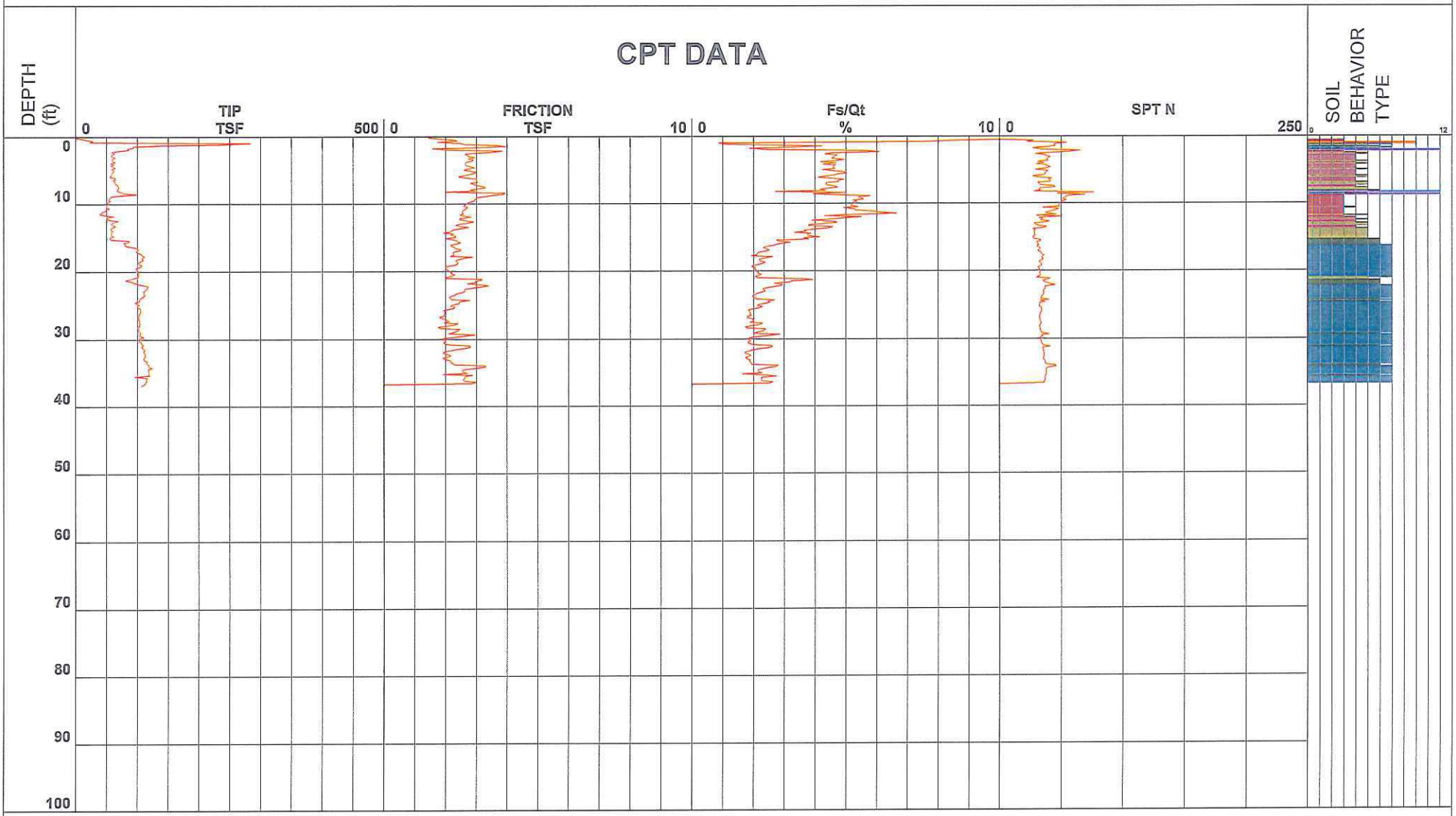
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(552).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-227	Date and Time	10/6/2011 11:09:49 PM	Maximum Depth	36.91 ft
Water Table Depth		>36.91 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(552).cpt
CPT Date: 10/6/2011 11:09:49 PM
GW During Test: No GW

Sounding ID: CPT-11-227
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic -	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.29	Cycl SStn %
0.33	10.3	16.5	-	1.8	0.0	9.9	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	70	15	N/A	0.00	N/A	N/A
0.49	19.3	30.9	-	2.3	-0.2	9.9	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	57	15	N/A	0.00	N/A	N/A
0.66	27.8	44.6	-	2.4	-0.1	8.6	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	47	15	N/A	0.00	N/A	N/A
0.82	23.2	37.2	-	1.7	0.0	7.6	3	silty CLAY to CLAY	115	1.5	15	25	-	-	1.6	9.9	48	15	N/A	0.00	N/A	N/A
0.98	283.2	454.1	454.1	2.5	-0.3	0.9	6	clean SAND to silty SAND	125	5.0	57	91	95	48	-	-	5	16	N/A	0.00	N/A	N/A
1.15	236.3	379.0	379.0	2.6	-0.1	1.1	6	clean SAND to silty SAND	125	5.0	47	76	95	48	-	-	5	16	N/A	0.00	N/A	N/A
1.31	138.4	221.9	284.8	3.6	0.1	2.6	5	silty SAND to sandy SILT	120	4.0	35	55	93	48	-	-	13	16	N/A	0.00	N/A	N/A
1.48	93.8	150.4	271.7	4.0	-0.1	4.2	9	very stiff fine SOIL	120	2.0	47	75	80	48	-	-	21	30	N/A	0.00	N/A	N/A
1.64	93.6	150.2	232.8	2.9	-0.3	3.1	5	silty SAND to sandy SILT	120	4.0	23	38	80	48	-	-	17	16	N/A	0.00	N/A	N/A
1.80	84.0	134.8	176.4	1.6	-0.4	1.9	5	silty SAND to sandy SILT	120	4.0	21	34	77	48	-	-	13	16	N/A	0.00	N/A	N/A
1.97	85.9	137.7	196.7	2.1	-0.3	2.4	5	silty SAND to sandy SILT	120	4.0	21	34	78	48	-	-	15	16	N/A	0.00	N/A	N/A
2.13	68.2	109.4	269.6	3.8	-0.9	5.6	9	very stiff fine SOIL	120	2.0	34	55	70	48	-	-	28	30	N/A	0.00	N/A	N/A
2.30	58.4	93.7	260.7	3.5	-1.3	6.1	9	very stiff fine SOIL	120	2.0	29	47	65	47	-	-	31	30	N/A	0.00	N/A	N/A
2.46	62.8	100.7	225.9	2.8	-1.4	4.5	9	very stiff fine SOIL	120	2.0	31	50	67	47	-	-	26	30	N/A	0.00	N/A	N/A
2.62	61.1	98.0	216.7	2.6	-0.5	4.3	9	very stiff fine SOIL	120	2.0	31	49	66	47	-	-	25	30	N/A	0.00	N/A	N/A
2.79	57.7	92.6	221.9	2.7	-0.5	4.7	9	very stiff fine SOIL	120	2.0	29	46	64	47	-	-	27	30	N/A	0.00	N/A	N/A
2.95	59.2	94.9	222.7	2.8	-0.6	4.7	9	very stiff fine SOIL	120	2.0	30	47	65	46	-	-	27	30	N/A	0.00	N/A	N/A
3.12	64.1	102.9	230.8	3.0	-0.7	4.6	9	very stiff fine SOIL	120	2.0	32	51	68	47	-	-	26	30	N/A	0.00	N/A	N/A
3.28	60.3	96.8	221.9	2.7	-0.4	4.6	9	very stiff fine SOIL	120	2.0	30	48	66	46	-	-	26	30	0.00	-	0.29	0.0
3.45	58.8	94.3	230.2	2.9	-0.6	5.0	9	very stiff fine SOIL	120	2.0	29	47	65	46	-	-	28	30	0.00	-	0.29	0.0
3.61	61.3	98.3	226.9	2.8	-0.6	4.7	9	very stiff fine SOIL	120	2.0	31	49	66	46	-	-	26	30	0.00	-	0.29	0.0
3.77	64.0	102.6	218.1	2.7	-0.6	4.2	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	24	30	0.00	-	0.29	0.0
3.94	56.9	91.2	219.2	2.7	-1.0	4.7	9	very stiff fine SOIL	120	2.0	28	46	64	45	-	-	27	30	0.00	-	0.29	0.0
4.10	62.1	99.7	217.4	2.7	-0.7	4.3	9	very stiff fine SOIL	120	2.0	31	50	67	46	-	-	25	30	0.00	-	0.29	0.0
4.27	57.3	91.9	219.7	2.7	-0.6	4.7	9	very stiff fine SOIL	120	2.0	29	46	64	45	-	-	27	30	0.00	-	0.29	0.0
4.43	60.9	97.7	224.4	2.8	-0.4	4.6	9	very stiff fine SOIL	120	2.0	30	49	66	45	-	-	26	30	0.00	-	0.29	0.0
4.59	64.2	102.9	230.8	2.9	-0.5	4.6	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	26	30	0.00	-	0.29	0.0
4.76	58.4	93.6	221.5	2.7	-0.5	4.7	9	very stiff fine SOIL	120	2.0	29	47	65	45	-	-	27	30	0.00	-	0.29	0.0
4.92	61.5	98.6	215.2	2.6	-1.0	4.3	9	very stiff fine SOIL	120	2.0	31	49	67	45	-	-	25	30	0.00	-	0.29	0.0
5.09	61.2	98.2	227.3	2.9	-0.8	4.7	9	very stiff fine SOIL	120	2.0	31	49	66	45	-	-	26	30	0.00	-	0.29	0.0
5.25	60.3	96.7	233.7	3.0	-0.7	5.0	9	very stiff fine SOIL	120	2.0	30	48	66	45	-	-	27	30	0.00	-	0.29	0.0
5.41	58.7	94.1	233.1	3.0	-0.7	5.1	9	very stiff fine SOIL	120	2.0	29	47	65	45	-	-	28	30	0.00	-	0.29	0.0
5.58	58.7	94.1	224.7	2.8	-0.9	4.8	9	very stiff fine SOIL	120	2.0	29	47	65	45	-	-	27	30	0.00	-	0.29	0.0
5.74	56.6	90.8	217.5	2.6	-0.9	4.6	9	very stiff fine SOIL	120	2.0	28	45	64	44	-	-	27	30	0.00	-	0.29	0.0
5.91	56.2	90.2	208.2	2.4	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	28	45	-	-	4.0	9.9	26	15	0.00	-	0.29	0.0
6.07	63.8	102.4	215.8	2.6	-0.9	4.1	9	very stiff fine SOIL	120	2.0	32	51	68	45	-	-	24	30	0.00	-	0.29	0.0
6.23	65.1	103.7	233.5	3.0	-0.8	4.7	9	very stiff fine SOIL	120	2.0	33	52	68	45	-	-	26	30	0.00	-	0.29	0.0
6.40	61.0	95.9	232.7	3.0	-0.7	5.0	9	very stiff fine SOIL	120	2.0	30	48	66	44	-	-	28	30	0.00	-	0.29	0.0
6.56	63.6	98.7	230.6	3.0	-0.8	4.8	9	very stiff fine SOIL	120	2.0	32	49	67	45	-	-	27	30	0.00	-	0.29	0.0
6.73	64.0	98.2	230.7	3.0	-0.9	4.8	9	very stiff fine SOIL	120	2.0	32	49	66	45	-	-	27	30	0.00	-	0.29	0.0
6.89	64.0	96.9	218.0	2.8	-0.9	4.4	9	very stiff fine SOIL	120	2.0	32	48	66	44	-	-	26	30	0.00	-	0.29	0.0
7.05	66.7	99.9	220.7	2.9	-0.8	4.4	9	very stiff fine SOIL	120	2.0	33	50	67	45	-	-	25	30	0.00	-	0.29	0.0
7.22	69.0	102.1	224.6	3.0	-0.8	4.4	9	very stiff fine SOIL	120	2.0	35	51	68	45	-	-	25	30	0.00	-	0.29	0.0
7.38	69.5	101.6	231.6	3.2	-0.9	4.7	9	very stiff fine SOIL	120	2.0	35	51	68	45	-	-	26	30	0.00	-	0.29	0.0
7.55	69.8	101.0	233.0	3.3	-0.9	4.7	9	very stiff fine SOIL	120	2.0	35	51	67	45	-	-	26	30	0.00	-	0.29	0.0
7.71	69.3	99.2	222.3	3.1	-0.9	4.5	9	very stiff fine SOIL	120	2.0	35	50	67	44	-	-	26	30	0.00	-	0.29	0.0
7.87	67.3	95.3	209.4	2.8	-0.9	4.2	4	clayy SILT to silty CLAY	115	2.0	34	48	-	-	4.7	9.9	25	15	0.00	-	0.29	0.0
8.04	68.4	95.9	215.6	3.0	-1.0	4.4	9	very stiff fine SOIL	120	2.0	34	48	66	44	-	-	26	30	0.00	-	0.29	0.0
8.20	74.0	102.7	173.2	2.0	-1.6	2.7	5	silty SAND to sandy SILT	120	4.0	18	26	68	45	-	-	19	16	0.00	-	0.29	0.0
8.37	79.0	108.5	250.5	3.9	-1.2	5.0	9	very stiff fine SOIL	120	2.0	39	54	70	45	-	-	26	30	0.00	-	0.29	0.0
8.53	98.4	133.9	245.0	3.9	-1.1	4.0	8	stiff SAND to clayy SAND	115	1.0	98	100	-	-	6.5	9.9	21	16	0.00	-	0.29	0.0
8.69	72.5	97.7	232.7	3.5	-1.0	4.9	9	very stiff fine SOIL	120	2.0	36	49	66	44	-	-	27	30	0.00	-	0.29	0.0
8.86	57.9	77.3	231.0	3.3	-1.0	5.8	9	very stiff fine SOIL	120	2.0	29	39	59	43	-	-	33	30	0.00	-	0.29	0.0
9.02	56.3	74.5	217.3	3.0	-1.4	5.4	4	clayy SILT to silty CLAY	115	2.0	28	37	-	-	4.0	9.9	32	15	0.00	-	0.29	0.0
9.19	54.6	71.7	216.4	3.0	-1.7	5.6	4	clayy SILT to silty CLAY	115	2.0	27	36	-	-	3.8	9.9	33	15	0.00	-	0.29	0.0
9.35	52.8	68.8	213.2	2.9	-2.8	5.6	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	34	15	0.00	-	0.29	0.0
9.51	56.4	72.7	210.7	2.9	-2.8	5.3	4	clayy SILT to silty CLAY	115	2.0	28	36	-	-	4.0	9.9	32	15	0.00	-	0.29	0.0
9.68	53.0	67.9	206.9	2.8	-1.9	5.4	4	clayy SILT to silty CLAY	115	2.0	27	34	-	-	3.7	9.9	33	15	0.00	-	0.29	0.0
9.84	52.0	66.0	201.1	2.7	-1.5	5.3	4	clayy SILT to silty CLAY	115	2.0	26	33	-	-	3.6	9.9	33	15	0.00	-	0.29	0.0
10.01	51.4	64.7	200.3	2.7	-1.6	5.3	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.6	9.9	33	15	0.00	-	0.29	0.0
10.17	50.5	63.1	196.3	2.6	-1.5	5.3	4	clayy SILT to silty CLAY	115	2.0	25	32	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
10.34	50.3	62.4	194.6	2.6	-1.5	5.2	4	clayy SILT to silty CLAY	115	2.0	25	31	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
10.50	50.4	62.0	199.5	2.7	-1.5	5.5	4	clayy SILT to silty CLAY	115	2.0	25	31	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
10.66	54.5	66.5	194.9	2.7	-1.5	5.0	4	clayy SILT to silty CLAY	115	2.0	27	33	-	-	3.8	9.9	32	15	0.00	-	0.29	0.0
10.83	50.1	60.7	194.5	2.6	-1.6	5.3	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
10.99	48.5	58.4	192.2	2.6	-1.6	5.4	4	clayy SILT to silty CLAY	115	2.0	24	29	-	-	3.4	9.9	35	15	0.00	-	0.29	0.0
11.16	43.4	57.0	-	2.6	-1.6	6.0	3	silty CLAY to CLAY	115	1.5	29	38	-	-	3.0	9.9	37	15	-	-	0.29	-
11.32	40.8	60.9	-	2.5	-1.6	6.3	3	silty CLAY to CLAY	115	1.5	27	41	-	-	2.9	9.9	37	15	-	-	0.29	-
11.48	38.9	57.2	-	2.6	-1.6	6.8	3	silty CLAY to CLAY	115	1.5	26	38	-	-	2.7	9.9	39	15	-	-	0.29	-
11.65	48.1	56.3	185.2	2.5	-1.7	5.2	4	clayy SILT to silty CLAY	115	2.0	24	28	-	-	3.4	9.9	35	15	0.00	-	0.29	0.0
11.81	61.8	71.7	186.2	2.7	-1.7	4.3	4	clayy SILT to silty CLAY	115	2.0	31	36	-	-	4.3	9.9	29	15	0.00	-	0.29	0.0
11.98	51.4	64.3	205.5	2.8	-1.4	5.6	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.6	9.9	34	15	0.00	-	0.29	0.0
12.14	50.3	57.6	182.7	2.5	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	25	29	-	-	3.5	9.9	34	15	0.00	-	0.29	0.0
12.30	54.4	62.0	179.7	2.5	-1.2	4.6	4	clayy SILT to silty CLAY	115	2.0	27	31	-	-	3.8	9.9	32	15	0.00	-	0.29	0.0
12.47	69.1	78.2	183.4	2.7	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	35	39	-	-	4.9	9.9	27	15	0.00	-	0.29	0.0
12.63	62.5	70.3	193.4	2.9	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	31	35	-	-	4.4	9.9	31	15	0.00	-	0.29	0.0
12.80	58.9	65.8	188.8	2.8	-1.1	4.8	4	clayy SILT to silty CLAY	115	2.0	29	33	-	-	4.1	9.9	32	15	0.00	-	0.29	0.0
12.96	57.5	63.9	177.0	2.5	-1.0	4.4	4	clayy SILT to silty CLAY	115	2.0	29	32	-	-	4.0	9.9	31	15	0.00	-	0.29	0.0
13.12	61.2	67.6	168.7	2.3	-1.0	3.9	4	clayy SILT to silty CLAY	115	2.0	31	34	-	-	4.3	9.9	28	15	0.00	-	0.29	0.0
13.29	64.8	71.0	172.1	2.4	-1.0	3.8	4	clayy SILT to silty CLAY	115	2.0	32	36	-	-	4.5	9.9	27	15	0.00	-	0.29	0.0
13.45	60.2	65.6	185.4	2.7	-1.1	4.6	4	clayy SILT to silty CLAY	115	2.0	30	33	-	-	4.2	9.9	31	15	0.00	-	0.29	0.0
13.62	57.0	61.9	177.2	2.5	-1.0	4.5	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.0	9.9	32	15	0.00	-	0.29	0.0
13.78	57.1	61.6	167.2	2.3	-1.0	4.1	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.0	9.9	30	15	0.00	-	0.29	0.0
13.94	60.3	64.6	161.3	2.2	-1.0	3.7	4	clayy SILT to silty CLAY	115	2.0	30	32	-	-	4.2	9.9	28	15	0.00	-	0.29	0.0
14.11	58.3	62.1	160.2	2.2	-0.9	3.8	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.1	9.9	29	15	0.00	-	0.29	0.0
14.27	58.2	61.6	150.3	1.9	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.1	9.9	28	15	0.80	-	0.29	6.9
14.44	58.3	61.4	163.4	2.3	-0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	29	31	-	-	4.1	9.9	30	15	0.00	-	0.29	0.0
14.60	57.7	60.5	159.0	2.2	-0.9	3.8	4	clayy SILT to silty CLAY	115	2.0	29	30	-	-	4.0	9.9	29	15	0.49	-	0.29	3.0
14.76	61.6	64.2	164.6	2.3	-0.9	3.8	4	clayy SILT to silty CLAY	115	2.0	31	32	-	-	4.3	9.9	29	15	0.00	-	0.29	0.0
14.93	56.2	58.2	166.1	2.3	-0.9	4.2	4	clayy SILT to silty CLAY	115	2.0	28	29	-	-	3.9	9.9	31	15	0.00	-	0.29	0.0
15.09	55.4	57.1	152.5	2.0	-0.8	3.7	4	clayy SILT to silty CLAY	115	2.0	28	29	-	-	3.9	9.9	30	15	0.73	-	0.29	12.8
15.26	58.5	60.0	159.7	2.2	-0.8	3.8	4	clayy SILT to silty CLAY	115	2.0	29	30	-	-	4.1	9.9	30	15	0.48	-	0.29	3.0
15.42	86.2	87.9	160.7	2.4	-0.9	2.8	5	silty SAND to sandy SILT	120	4.0	22	22	63	43	-	-	21	16	0.00	-	0.28	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(552).cpt
CPT Date: 10/6/2011 11:09:49 PM
GW During Test: No GW

Sounding ID: CPT-11-227
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.29	Cycl SStn %
15.58	86.4	87.7	162.0	2.4	-0.8	2.8	5	silty SAND to sandy SILT	120	4.0	22	22	63	43	-	-	21	16	0.00	-	0.28	0.0
15.75	78.3	79.1	164.5	2.5	-0.8	3.2	5	silty SAND to sandy SILT	120	4.0	20	20	59	43	-	-	24	16	0.00	-	0.28	0.0
15.91	80.9	81.2	159.4	2.4	-0.7	3.0	5	silty SAND to sandy SILT	120	4.0	20	20	60	43	-	-	23	16	0.50	-	0.28	2.9
16.08	80.2	80.1	152.6	2.2	-0.7	2.8	5	silty SAND to sandy SILT	120	4.0	20	20	60	43	-	-	22	16	0.74	-	0.28	4.8
16.24	82.7	82.1	152.3	2.2	-0.7	2.7	5	silty SAND to sandy SILT	120	4.0	21	21	61	43	-	-	21	16	0.76	-	0.28	4.8
16.40	94.7	93.6	156.1	2.3	-0.6	2.4	5	silty SAND to sandy SILT	120	4.0	24	23	65	43	-	-	19	16	0.61	-	0.28	3.5
16.57	100.4	98.7	157.9	2.3	-0.6	2.3	5	silty SAND to sandy SILT	120	4.0	25	25	67	44	-	-	18	16	0.55	-	0.28	3.2
16.73	102.3	100.1	162.7	2.5	-0.6	2.5	5	silty SAND to sandy SILT	120	4.0	26	25	67	44	-	-	18	16	0.00	-	0.28	0.0
16.90	99.7	97.1	162.2	2.5	-0.5	2.5	5	silty SAND to sandy SILT	120	4.0	25	24	66	43	-	-	19	16	0.00	-	0.28	0.0
17.06	98.0	95.0	156.6	2.3	-0.5	2.4	5	silty SAND to sandy SILT	120	4.0	24	24	65	43	-	-	19	16	0.60	-	0.28	3.5
17.23	102.8	99.2	154.0	2.2	-0.5	2.2	5	silty SAND to sandy SILT	120	4.0	26	25	67	43	-	-	17	16	0.70	-	0.28	3.9
17.39	106.8	102.5	155.2	2.3	-0.4	2.1	5	silty SAND to sandy SILT	120	4.0	27	26	68	44	-	-	17	16	0.66	-	0.28	3.6
17.55	107.6	102.8	155.6	2.3	-0.4	2.1	5	silty SAND to sandy SILT	120	4.0	27	26	68	44	-	-	17	16	0.65	-	0.28	3.6
17.72	111.4	105.9	152.9	2.2	-0.4	2.0	5	silty SAND to sandy SILT	120	4.0	28	26	69	44	-	-	16	16	0.76	-	0.27	4.0
17.88	110.0	104.0	172.3	2.9	-0.3	2.6	5	silty SAND to sandy SILT	120	4.0	27	26	68	44	-	-	19	16	0.00	-	0.27	0.0
18.05	107.2	101.0	162.7	2.6	-0.3	2.4	5	silty SAND to sandy SILT	120	4.0	27	25	67	43	-	-	18	16	0.00	-	0.27	0.0
18.21	110.1	103.2	159.1	2.4	-0.2	2.2	5	silty SAND to sandy SILT	120	4.0	28	26	68	44	-	-	17	16	0.54	-	0.27	3.1
18.37	108.1	100.9	155.8	2.4	-0.1	2.2	5	silty SAND to sandy SILT	120	4.0	27	25	67	43	-	-	17	16	0.67	-	0.27	3.7
18.54	104.1	96.7	153.8	2.3	-0.1	2.3	5	silty SAND to sandy SILT	120	4.0	26	24	66	43	-	-	18	16	0.75	-	0.27	4.3
18.70	101.8	94.1	155.4	2.4	-0.1	2.4	5	silty SAND to sandy SILT	120	4.0	25	24	65	43	-	-	19	16	0.70	-	0.27	4.1
18.87	104.3	96.0	154.9	2.4	-0.1	2.3	5	silty SAND to sandy SILT	120	4.0	26	24	66	43	-	-	18	16	0.72	-	0.27	4.2
19.03	107.2	98.3	153.1	2.3	-0.1	2.2	5	silty SAND to sandy SILT	120	4.0	27	25	66	43	-	-	17	16	0.81	-	0.27	4.6
19.19	106.1	96.8	146.6	2.1	0.0	2.0	5	silty SAND to sandy SILT	120	4.0	27	24	66	43	-	-	17	16	1.11	-	0.27	6.9
19.36	103.3	93.9	142.4	2.0	0.0	2.0	5	silty SAND to sandy SILT	120	4.0	26	23	65	43	-	-	17	16	1.31	-	0.26	9.5
19.52	98.3	88.9	141.0	2.0	0.0	2.1	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.39	-	0.26	11.5
19.69	99.2	89.4	141.7	2.0	0.0	2.1	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.37	-	0.26	11.1
19.85	100.8	90.5	143.5	2.1	0.1	2.1	5	silty SAND to sandy SILT	120	4.0	25	23	64	43	-	-	18	16	1.29	-	0.26	9.8
20.01	102.2	91.3	144.3	2.1	0.1	2.1	5	silty SAND to sandy SILT	120	4.0	26	23	64	43	-	-	18	16	1.26	-	0.26	9.3
20.18	102.6	91.3	146.8	2.2	0.1	2.2	5	silty SAND to sandy SILT	120	4.0	26	23	64	43	-	-	18	16	1.15	-	0.25	8.0
20.34	101.3	89.8	144.5	2.2	0.1	2.2	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.26	-	0.25	9.7
20.51	102.6	90.5	148.7	2.3	0.1	2.3	5	silty SAND to sandy SILT	120	4.0	26	23	64	43	-	-	19	16	1.07	-	0.25	7.3
20.67	102.0	89.6	145.2	2.2	0.1	2.2	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.24	-	0.25	9.5
20.83	100.6	88.1	140.5	2.1	0.2	2.1	5	silty SAND to sandy SILT	120	4.0	25	22	63	43	-	-	18	16	1.47	-	0.25	13.5
21.00	93.4	81.4	137.1	2.0	0.2	2.2	5	silty SAND to sandy SILT	120	4.0	23	20	60	42	-	-	19	16	1.62	-	0.24	19.7
21.16	86.6	75.2	174.1	3.2	0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	43	38	-	-	6.1	9.9	26	15	0.00	-	0.24	0.0
21.33	81.0	70.1	175.3	3.2	0.2	4.0	4	clayy SILT to silty CLAY	115	2.0	41	35	-	-	5.7	9.9	28	15	0.00	-	0.24	0.0
21.49	90.5	78.0	166.5	3.0	0.3	3.3	5	silty SAND to sandy SILT	120	4.0	23	19	59	42	-	-	25	16	0.00	-	0.24	0.0
21.65	94.6	81.3	166.2	3.0	0.4	3.2	5	silty SAND to sandy SILT	120	4.0	24	20	60	42	-	-	24	16	0.00	-	0.24	0.0
21.82	101.0	86.4	157.5	2.7	0.5	2.7	5	silty SAND to sandy SILT	120	4.0	25	22	62	42	-	-	21	16	0.75	-	0.24	4.8
21.98	108.7	92.6	171.0	3.2	0.4	3.0	5	silty SAND to sandy SILT	120	4.0	27	23	64	43	-	-	21	16	0.00	-	0.24	0.0
22.15	117.5	99.7	177.0	3.4	0.5	2.9	5	silty SAND to sandy SILT	120	4.0	29	25	67	43	-	-	20	16	0.00	-	0.24	0.0
22.31	117.2	99.1	168.9	3.1	0.5	2.7	5	silty SAND to sandy SILT	120	4.0	29	25	67	43	-	-	19	16	0.00	-	0.24	0.0
22.47	116.2	97.9	161.4	2.8	0.5	2.5	5	silty SAND to sandy SILT	120	4.0	29	24	66	43	-	-	19	16	0.00	-	0.24	0.0
22.64	114.5	96.2	155.2	2.6	0.5	2.3	5	silty SAND to sandy SILT	120	4.0	29	24	66	43	-	-	18	16	0.88	-	0.24	5.4
22.80	112.6	94.2	154.8	2.6	0.6	2.4	5	silty SAND to sandy SILT	120	4.0	28	24	65	43	-	-	19	16	0.90	-	0.24	5.7
22.97	109.9	91.6	153.5	2.6	0.6	2.4	5	silty SAND to sandy SILT	120	4.0	27	23	64	43	-	-	19	16	0.96	-	0.24	6.4
23.13	111.6	92.7	150.9	2.5	0.6	2.3	5	silty SAND to sandy SILT	120	4.0	28	23	64	43	-	-	18	16	1.08	-	0.23	7.6
23.30	110.8	91.7	145.4	2.3	0.7	2.1	5	silty SAND to sandy SILT	120	4.0	28	23	64	43	-	-	18	16	1.33	-	0.23	10.9
23.46	112.5	92.8	145.6	2.3	0.7	2.1	5	silty SAND to sandy SILT	120	4.0	28	23	65	43	-	-	18	16	1.33	-	0.23	10.7
23.62	111.0	91.2	141.3	2.2	0.7	2.0	5	silty SAND to sandy SILT	120	4.0	28	23	64	42	-	-	17	16	1.53	-	0.23	14.7
23.79	107.9	88.3	138.5	2.1	0.8	2.0	5	silty SAND to sandy SILT	120	4.0	27	22	63	42	-	-	18	16	1.65	-	0.23	19.2
23.95	105.5	86.0	138.7	2.2	0.7	2.1	5	silty SAND to sandy SILT	120	4.0	26	22	62	42	-	-	18	16	1.64	-	0.22	19.8
24.12	103.8	84.4	139.1	2.2	0.8	2.1	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	19	16	1.63	-	0.22	20.3
24.28	104.1	84.4	155.6	2.8	0.8	2.7	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	21	16	0.90	-	0.22	6.6
24.44	102.4	82.7	147.3	2.5	0.8	2.5	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	21	16	1.27	-	0.22	11.9
24.61	96.1	77.4	145.3	2.4	0.9	2.6	5	silty SAND to sandy SILT	120	4.0	24	19	59	42	-	-	22	16	1.36	-	0.21	16.6
24.77	100.1	80.3	144.9	2.4	0.9	2.5	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	21	16	1.39	-	0.21	15.3
24.94	103.3	82.6	140.0	2.3	0.9	2.2	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	19	16	1.61	-	0.21	20.7
25.10	101.0	80.5	136.1	2.1	0.9	2.2	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	19	16	1.76	-	0.21	22.9
25.26	100.4	79.7	140.1	2.3	1.0	2.3	5	silty SAND to sandy SILT	120	4.0	25	20	60	42	-	-	20	16	1.61	-	0.20	22.2
25.43	105.5	83.5	140.0	2.3	1.0	2.2	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	19	16	1.62	-	0.20	21.0
25.59	105.1	82.9	135.2	2.1	1.0	2.1	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	18	16	1.80	-	0.20	21.9
25.76	105.8	83.2	129.8	1.9	1.1	1.9	5	silty SAND to sandy SILT	120	4.0	26	21	61	42	-	-	17	16	1.89	-	0.20	22.0
25.92	106.1	83.2	130.9	2.0	1.1	1.9	5	silty SAND to sandy SILT	120	4.0	27	21	61	42	-	-	18	16	1.87	-	0.19	21.9
26.08	105.0	82.1	130.3	2.0	1.1	1.9	5	silty SAND to sandy SILT	120	4.0	26	21	60	42	-	-	18	16	1.88	-	0.19	22.3
26.25	104.0	81.0	130.0	2.0	1.2	1.9	5	silty SAND to sandy SILT	120	4.0	26	20	60	42	-	-	18	16	1.88	-	0.19	22.7
26.41	103.2	80.2	128.8	1.9	1.2	1.9	5	silty SAND to sandy SILT	120	4.0	26	20	60	42	-	-	18	16	1.90	-	0.18	23.0
26.58	103.5	80.1	130.1	2.0	1.2	2.0	5	silty SAND to sandy SILT	120	4.0	26	20	60	42	-	-	18	16	1.88	-	0.18	23.1
26.74	100.7	77.7	124.1	1.8	1.3	1.8	5	silty SAND to sandy SILT	120	4.0	25	19	59	41	-	-	18	16	1.96	-	0.18	24.2
26.90	103.6	79.7	126.2	1.9	1.3	1.8	5	silty SAND to sandy SILT	120	4.0	26	20	59	42	-	-	18	16	1.93	-	0.17	23.3
27.07	101.0	77.5	129.4	2.0	1.3	2.0	5	silty SAND to sandy SILT	120	4.0	25	19	59	41	-	-	19	16	1.89	-	0.17	24.3
27.23	104.1	79.6	131.0	2.1	1.4	2.0	5	silty SAND to sandy SILT	120	4.0	26	20	59	42	-	-	19	16	1.87	-	0.17	23.3
27.40	104.0	79.3	132.3	2.1	1.4	2.1	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	19	16	1.86	-	0.17	23.5
27.56	103.6	78.7	127.6	2.0	1.4	1.9	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	18	16	1.91	-	0.16	23.7
27.72	104.9	79.5	140.0	2.4	1.5	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	20	16	1.66	-	0.16	23.4
27.89	104.0	78.5	137.2	2.3	1.5	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	20	16	1.77	-	0.16	23.8
28.05	103.8	78.2	129.7	2.0	1.7	2.0	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	19	16	1.89	-	0.15	24.0
28.22	101.7	76.3	121.2	1.8	1.7	1.8	5	silty SAND to sandy SILT	120	4.0	25	19	58	41	-	-	18	16	2.00	-	0.15	24.9
28.38	102.2	76.5	123.2	1.8	1.8	1.8	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	18	16	1.97	-	0.15	24.8
28.54	102.9	76.8	140.6	2.5	1.8	2.4	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	21	16	1.65	-	0.14	24.7
28.71	102.8	76.5	139.4	2.4	1.9	2.4	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	21	16	1.70	-	0.14	24.8
28.87	102.8	76.3	137.4	2.4	2.0	2.3	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	21	16	1.77	-	0.14	24.9
29.04	105.4	78.0	134.2	2.2	2.1	2.2	5	silty SAND to sandy SILT	120	4.0	26	20	59	41	-	-	20	16	1.84	-	0.14	24.1
29.20	105.4	77.8	130.2	2.1	2.1	2.0	5	silty SAND to sandy SILT	120	4.0	26	19	59	41	-	-	19	16	1.88	-	0.13	24.2
29.36	103.5	76.2	153.1	3.0	2.2	2.9	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	23	16	1.13	-	0.13	12.4
29.53	105.9	77.7	144.9	2.7	2.2	2.6	5	silty SAND to sandy SILT	120	4.0	26	19	59	41	-	-	22	16	1.49	-	0.13	21.0
29.69	110.6	80.9	137.4	2.4	2.5	2.2	5	silty SAND to sandy SILT	120	4.0	28	20	60	41	-	-	19	16	1.79	-	0.13	22.7
29.86	104.3	76.1	126.3	2.0	2.5	2.0	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	19	16	1.93	-	0.12	25.0
30.02	103.9	75.6	122.5	1.9	2.6	1.8	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	18	16	1.98	-	0.12	25.2
30.19	103.2	74.9	124.4	1.9	2.6	1.9	5	silty SAND to sandy SILT	120	4.0	26	19	57	41	-	-	19	16	1.95	-	0.12	25.6
30.35	106.0	76.7	126.2	2.0	2.7	1.9	5	silty SAND to sandy SILT	120	4.0	26	19	58	41	-	-	19	16	1.93	-	0.11	24.7
30.51	107.2	77.4	124.4	1.9	2.7	1.8	5	silty SAND to sandy SILT	120	4.0	27	19	59	41	-	-	18	16	1.95	-	0.11	24.4
30.68	106.9	77.0	125.5	2.0	2.8	1.9	5	silty SAND to sandy SILT	120	4.0	27	19	58	41	-	-	18	16	1.94	-	0.11	24.6
30.84	110.2	79.1	130.7	2.2	2.9	2.0	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	19	16	1.88	-	0.10	23.5

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(552).cpt
CPT Date: 10/6/2011 11:09:49 PM
GW During Test: No GW

Sounding ID: CPT-11-227
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.29	Cycl SStn %
31.01	108.8	77.9	146.6	2.8	2.9	2.6	5	silty SAND to sandy SILT	120	4.0	27	19	59	41	-	-	22	16	1.43	-	0.10	19.6
31.17	107.3	76.6	147.0	2.8	3.0	2.7	5	silty SAND to sandy SILT	120	4.0	27	19	58	41	-	-	22	16	1.41	-	0.10	20.0
31.33	109.9	78.3	143.6	2.7	3.1	2.5	5	silty SAND to sandy SILT	120	4.0	27	20	59	41	-	-	21	16	1.57	-	0.10	23.2
31.50	110.9	78.8	135.5	2.4	3.2	2.2	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	20	16	1.82	-	0.09	23.7
31.66	112.6	79.7	130.8	2.2	3.3	2.0	5	silty SAND to sandy SILT	120	4.0	28	20	60	41	-	-	19	16	1.87	-	0.09	23.2
31.83	109.9	77.7	126.2	2.0	3.3	1.9	5	silty SAND to sandy SILT	120	4.0	27	19	59	41	-	-	18	16	1.93	-	0.09	24.2
31.99	111.9	78.8	123.2	1.9	3.4	1.8	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	18	16	1.97	-	0.08	23.7
32.15	113.0	79.4	124.1	2.0	3.4	1.8	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	17	16	1.96	-	0.08	23.4
32.32	113.1	79.3	127.4	2.1	3.5	1.9	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	18	16	1.92	-	0.08	23.4
32.48	113.7	79.5	129.3	2.2	3.6	1.9	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	18	16	1.89	-	0.07	23.3
32.65	112.2	78.3	126.1	2.1	3.6	1.9	5	silty SAND to sandy SILT	120	4.0	28	20	59	41	-	-	18	16	1.93	-	0.07	23.9
32.81	111.2	77.3	122.2	1.9	3.7	1.8	5	silty SAND to sandy SILT	120	4.0	28	19	59	41	-	-	18	16	1.98	-	0.07	24.4
32.97	110.3	76.6	123.1	2.0	3.8	1.8	5	silty SAND to sandy SILT	120	4.0	28	19	58	41	-	-	18	16	1.97	-	0.06	24.8
33.14	112.5	77.9	127.5	2.1	3.8	1.9	5	silty SAND to sandy SILT	120	4.0	28	19	59	41	-	-	19	16	1.91	-	0.06	24.1
33.30	116.4	80.4	128.7	2.2	3.8	1.9	5	silty SAND to sandy SILT	120	4.0	29	20	60	41	-	-	18	16	1.90	-	0.06	22.9
33.47	115.1	79.3	128.8	2.2	3.9	1.9	5	silty SAND to sandy SILT	120	4.0	29	20	59	41	-	-	18	16	1.90	-	0.05	23.5
33.63	116.4	80.0	130.2	2.2	4.0	2.0	5	silty SAND to sandy SILT	120	4.0	29	20	60	41	-	-	18	16	1.88	-	0.05	23.1
33.79	119.3	81.7	132.1	2.3	4.0	2.0	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	18	16	1.86	-	0.05	22.4
33.96	117.8	80.6	155.8	3.3	4.1	2.8	5	silty SAND to sandy SILT	120	4.0	29	20	60	41	-	-	22	16	1.07	-	0.05	9.8
34.12	120.0	81.9	156.1	3.3	4.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	22	16	1.06	-	0.04	9.5
34.29	124.3	84.6	150.8	3.1	4.5	2.5	5	silty SAND to sandy SILT	120	4.0	31	21	61	41	-	-	21	16	1.29	-	0.04	13.2
34.45	118.0	80.1	142.1	2.8	4.6	2.4	5	silty SAND to sandy SILT	120	4.0	29	20	60	41	-	-	20	16	1.65	-	0.04	23.1
34.61	118.7	80.4	137.1	2.6	4.7	2.2	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	20	16	1.80	-	0.04	22.9
34.78	119.2	80.5	137.2	2.6	4.8	2.2	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	19	16	1.80	-	0.03	22.9
34.94	118.9	80.1	137.4	2.6	4.9	2.2	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	20	16	1.80	-	0.03	23.0
35.11	119.3	80.2	140.5	2.7	5.0	2.3	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	20	16	1.71	-	0.03	23.0
35.27	119.0	79.8	121.6	2.0	5.1	1.7	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	17	16	1.99	-	0.03	23.2
35.43	120.3	80.5	144.3	2.9	5.2	2.4	5	silty SAND to sandy SILT	120	4.0	30	20	60	41	-	-	21	16	1.56	-	0.02	22.3
35.60	96.4	64.4	138.8	2.6	5.3	2.8	5	silty SAND to sandy SILT	120	4.0	24	16	52	40	-	-	25	16	1.73	-	0.02	31.3
35.76	116.5	77.6	137.7	2.6	5.4	2.3	5	silty SAND to sandy SILT	120	4.0	29	19	59	41	-	-	20	16	1.80	-	0.02	24.3
35.93	114.7	76.3	137.1	2.6	5.4	2.3	5	silty SAND to sandy SILT	120	4.0	29	19	58	41	-	-	21	16	1.80	-	0.01	24.9
36.09	115.0	76.3	136.1	2.6	5.5	2.3	5	silty SAND to sandy SILT	120	4.0	29	19	58	41	-	-	21	16	1.82	-	0.01	24.9
36.26	115.9	76.6	137.1	2.6	5.6	2.3	5	silty SAND to sandy SILT	120	4.0	29	19	58	41	-	-	21	16	1.80	-	0.01	24.7
36.42	113.3	74.8	145.8	3.0	5.7	2.7	5	silty SAND to sandy SILT	120	4.0	28	19	57	41	-	-	23	16	1.49	-	0.01	23.1
36.58	113.3	74.6	142.9	2.9	5.8	2.6	5	silty SAND to sandy SILT	120	4.0	28	19	57	41	-	-	22	16	1.61	-	0.00	25.7

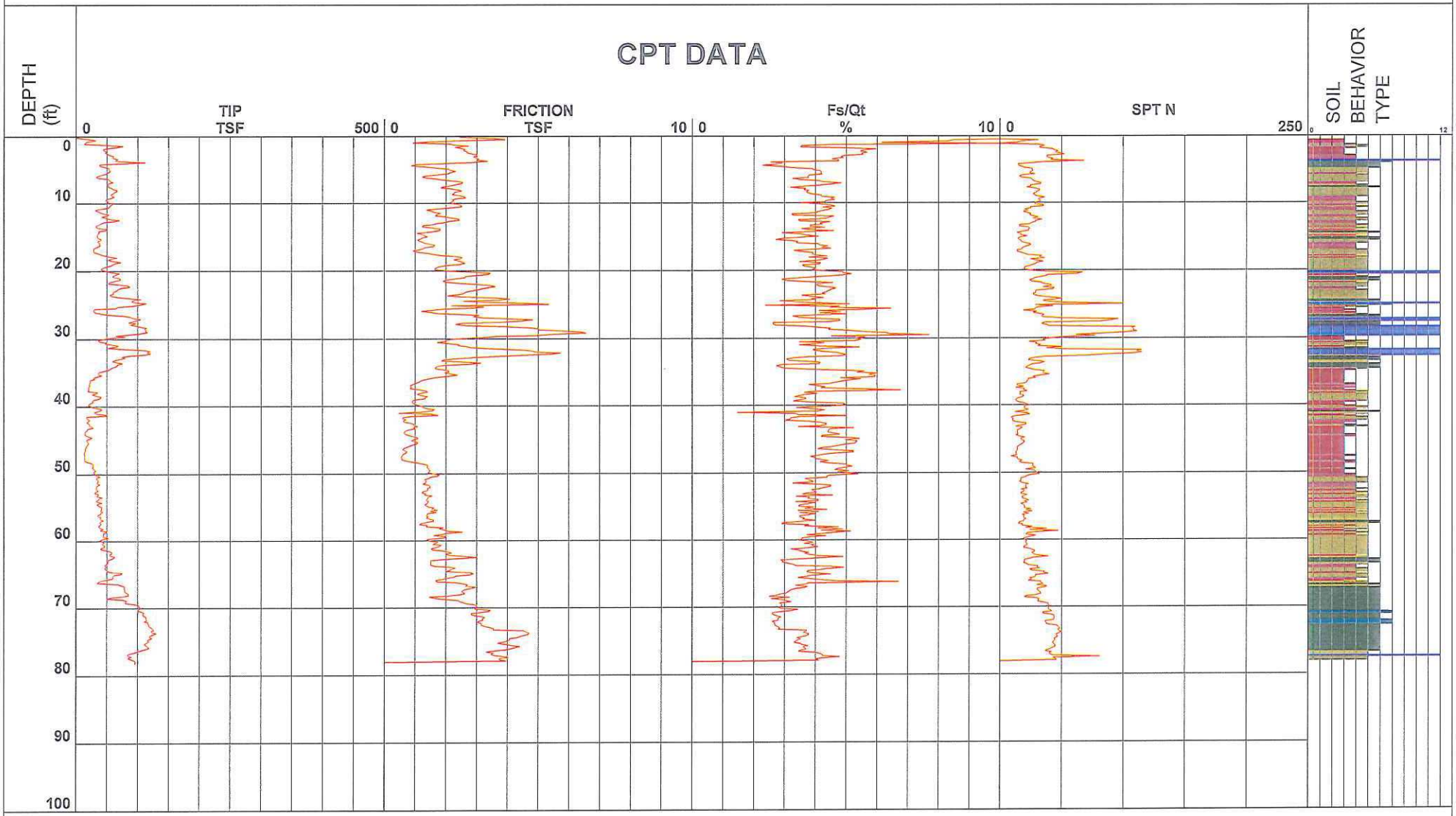
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-TF	Filename	SDF(566)-45-5.cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-229	Date and Time	10/9/2011 10:38:59 PM	Maximum Depth	78.25 ft
Water Table Depth		45.50 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

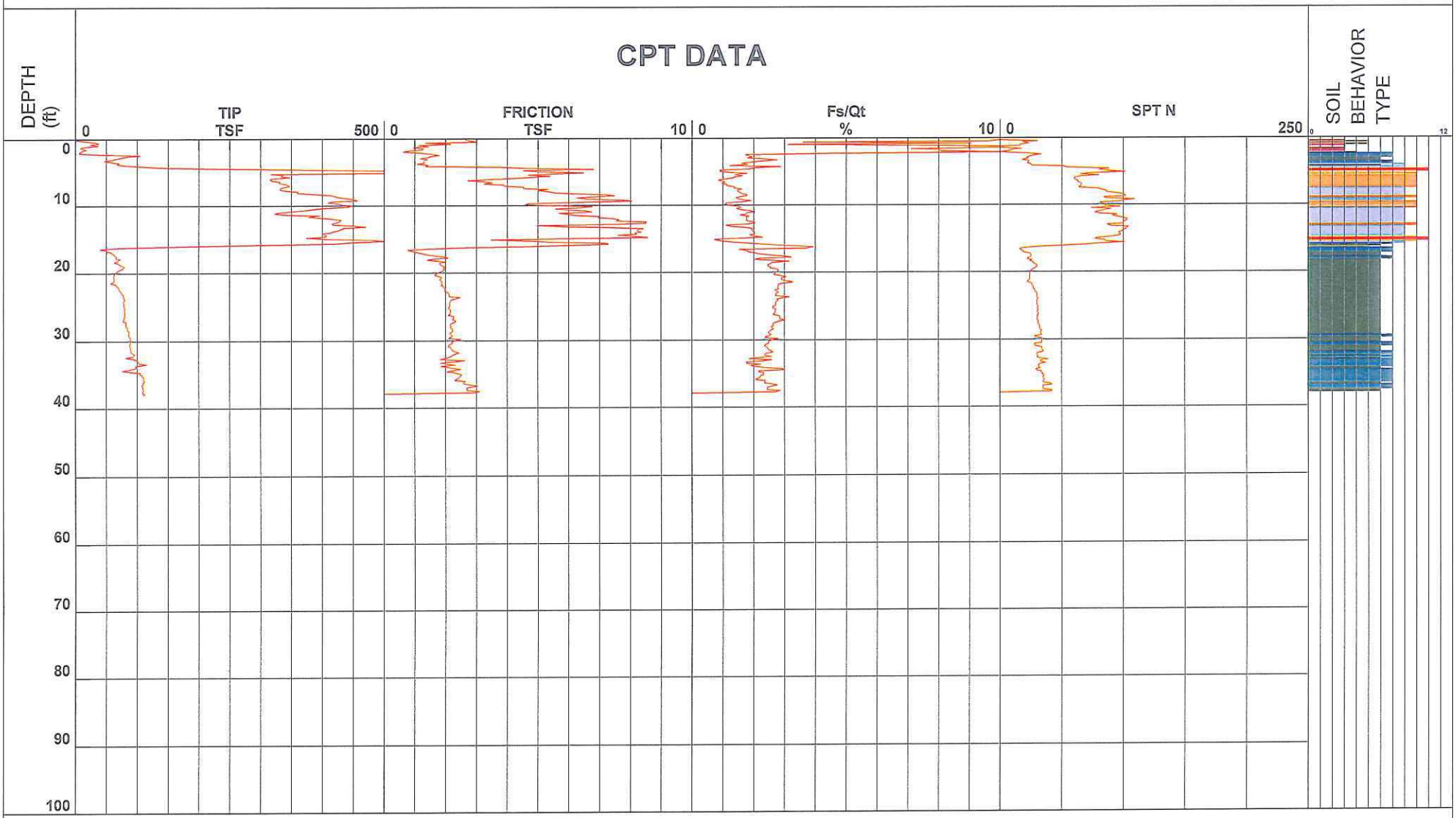
Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(554)-19.cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-234	Date and Time	10/7/2011 12:51:40 AM	Maximum Depth	38.06 ft
Water Table Depth	19.00 ft				

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
0.33	10.9	17.5	-	3.5	0.9	9.9	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	69	15	N/A	0.00	N/A	N/A
0.49	28.0	44.9	-	3.9	0.9	9.9	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	50	15	N/A	0.00	N/A	N/A
0.66	32.0	51.3	-	2.7	0.9	8.5	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.3	9.9	45	15	N/A	0.00	N/A	N/A
0.82	18.3	29.3	-	1.5	0.8	8.3	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	54	15	N/A	0.00	N/A	N/A
0.98	15.1	24.2	-	0.9	0.8	6.2	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	52	15	N/A	0.00	N/A	N/A
1.15	13.8	22.1	-	2.2	0.8	9.9	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	63	15	N/A	0.00	N/A	N/A
1.31	49.2	78.8	199.5	2.2	1.0	4.6	4	clayy SILT to silty CLAY	115	2.0	25	39	-	-	3.5	9.9	29	15	N/A	0.00	N/A	N/A
1.48	76.1	122.0	219.4	2.7	1.0	3.6	5	silty SAND to sandy SILT	120	4.0	19	31	74	48	-	-	21	16	N/A	0.00	N/A	N/A
1.64	65.8	105.6	200.2	2.3	1.1	3.5	5	silty SAND to sandy SILT	120	4.0	16	26	69	48	-	-	22	16	N/A	0.00	N/A	N/A
1.80	51.3	82.2	211.5	2.5	1.1	4.8	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	29	15	N/A	0.00	N/A	N/A
1.97	43.9	70.4	222.8	2.6	1.2	6.0	9	very stiff fine SOIL	120	2.0	22	35	55	47	-	-	34	30	N/A	0.00	N/A	N/A
2.13	46.1	74.0	219.6	2.6	1.3	5.6	9	very stiff fine SOIL	120	2.0	23	37	57	47	-	-	32	30	N/A	0.00	N/A	N/A
2.30	49.2	78.8	223.3	2.7	1.2	5.5	9	very stiff fine SOIL	120	2.0	25	39	59	47	-	-	31	30	N/A	0.00	N/A	N/A
2.46	47.4	76.1	224.7	2.7	0.5	5.7	9	very stiff fine SOIL	120	2.0	24	38	58	46	-	-	32	30	N/A	0.00	N/A	N/A
2.62	51.2	82.1	229.2	2.8	0.2	5.5	9	very stiff fine SOIL	120	2.0	26	41	61	46	-	-	31	30	N/A	0.00	N/A	N/A
2.79	54.1	86.7	236.6	3.0	0.2	5.6	9	very stiff fine SOIL	120	2.0	27	43	62	46	-	-	30	30	N/A	0.00	N/A	N/A
2.95	60.8	97.6	235.1	3.0	0.2	5.0	9	very stiff fine SOIL	120	2.0	30	49	66	47	-	-	27	30	N/A	0.00	N/A	N/A
3.12	60.1	96.3	229.8	2.9	0.1	4.9	9	very stiff fine SOIL	120	2.0	30	48	66	46	-	-	27	30	N/A	0.00	N/A	N/A
3.28	61.2	98.1	233.9	3.0	0.1	4.9	9	very stiff fine SOIL	120	2.0	31	49	66	46	-	-	27	30	0.00	-	0.16	0.0
3.45	67.6	108.4	235.6	3.1	-0.1	4.6	9	very stiff fine SOIL	120	2.0	34	54	70	47	-	-	25	30	0.00	-	0.16	0.0
3.61	63.6	102.0	233.8	3.0	-0.3	4.7	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	26	30	0.00	-	0.16	0.0
3.77	70.5	113.1	248.0	3.4	-1.3	4.8	9	very stiff fine SOIL	120	2.0	35	57	71	47	-	-	25	30	0.00	-	0.16	0.0
3.94	111.8	179.2	240.9	2.8	-1.1	2.6	5	silty SAND to sandy SILT	120	4.0	28	45	86	48	-	-	14	16	0.00	-	0.16	0.0
4.10	66.4	106.4	183.2	1.9	-1.1	2.9	5	silty SAND to sandy SILT	120	4.0	17	27	69	46	-	-	20	16	0.00	-	0.16	0.0
4.27	38.6	61.9	134.6	1.1	-1.0	2.8	5	silty SAND to sandy SILT	120	4.0	10	15	51	43	-	-	25	16	0.62	-	0.16	3.6
4.43	38.8	62.3	122.7	0.9	-1.0	2.3	5	silty SAND to sandy SILT	120	4.0	10	16	51	43	-	-	23	16	1.42	-	0.16	13.5
4.59	45.5	72.9	150.0	1.3	-1.0	2.9	5	silty SAND to sandy SILT	120	4.0	11	18	57	44	-	-	24	16	0.24	-	0.16	1.1
4.76	53.1	85.2	170.7	1.7	-1.0	3.2	5	silty SAND to sandy SILT	120	4.0	13	21	62	45	-	-	23	16	0.00	-	0.16	0.0
4.92	53.3	85.5	190.6	2.1	-1.0	3.9	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.7	9.9	26	15	0.00	-	0.16	0.0
5.09	55.1	88.3	194.8	2.2	-1.0	4.0	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	3.9	9.9	25	15	0.00	-	0.16	0.0
5.25	55.5	88.9	202.2	2.3	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	3.9	9.9	26	15	0.00	-	0.16	0.0
5.41	51.9	83.2	196.4	2.2	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	26	42	-	-	3.7	9.9	27	15	0.00	-	0.16	0.0
5.58	49.5	79.5	191.6	2.1	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	25	40	-	-	3.5	9.9	27	15	0.00	-	0.16	0.0
5.74	43.6	70.0	181.2	1.8	-1.0	4.2	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	29	15	0.00	-	0.16	0.0
5.91	37.0	59.3	158.3	1.4	-1.0	3.8	4	clayy SILT to silty CLAY	115	2.0	18	30	-	-	2.6	9.9	30	15	0.21	-	0.16	0.7
6.07	32.9	52.7	149.2	1.2	-1.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	31	15	0.40	-	0.16	1.7
6.23	37.1	59.5	157.9	1.4	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	30	15	0.23	-	0.15	0.9
6.40	52.1	82.6	169.6	1.7	-1.1	3.3	5	silty SAND to sandy SILT	120	4.0	13	21	61	44	-	-	24	16	0.00	-	0.15	0.0
6.56	54.4	85.1	180.0	1.9	-1.1	3.6	4	clayy SILT to silty CLAY	115	2.0	27	43	-	-	3.8	9.9	24	15	0.00	-	0.15	0.0
6.73	56.4	87.1	199.0	2.3	-1.1	4.1	4	clayy SILT to silty CLAY	115	2.0	28	44	-	-	4.0	9.9	26	15	0.00	-	0.15	0.0
6.89	59.7	91.1	207.4	2.5	-1.1	4.3	4	clayy SILT to silty CLAY	115	2.0	30	46	-	-	4.2	9.9	26	15	0.00	-	0.15	0.0
7.05	52.4	79.1	208.7	2.5	-1.1	4.9	4	clayy SILT to silty CLAY	115	2.0	26	40	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
7.22	51.9	77.5	198.2	2.3	-1.1	4.5	4	clayy SILT to silty CLAY	115	2.0	26	39	-	-	3.6	9.9	29	15	0.00	-	0.15	0.0
7.38	53.1	78.4	188.9	2.2	-1.1	4.2	4	clayy SILT to silty CLAY	115	2.0	27	39	-	-	3.7	9.9	27	15	0.00	-	0.15	0.0
7.55	53.2	77.7	174.4	1.9	-1.1	3.6	4	clayy SILT to silty CLAY	115	2.0	27	39	-	-	3.7	9.9	26	15	0.00	-	0.15	0.0
7.71	57.7	83.3	168.7	1.8	-1.1	3.2	5	silty SAND to sandy SILT	120	4.0	14	21	61	44	-	-	23	16	0.00	-	0.15	0.0
7.87	60.2	86.1	185.7	2.2	-1.1	3.7	4	clayy SILT to silty CLAY	115	2.0	30	43	-	-	4.2	9.9	25	15	0.00	-	0.15	0.0
8.04	67.2	95.1	193.8	2.4	-1.1	3.7	5	silty SAND to sandy SILT	120	4.0	17	24	65	44	-	-	24	16	0.00	-	0.15	0.0
8.20	66.3	92.8	195.8	2.5	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	33	46	-	-	4.7	9.9	24	15	0.00	-	0.15	0.0
8.37	62.0	85.9	186.2	2.3	-1.1	3.7	4	clayy SILT to silty CLAY	115	2.0	31	43	-	-	4.4	9.9	25	15	0.00	-	0.15	0.0
8.53	60.5	83.2	184.5	2.3	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	30	42	-	-	4.3	9.9	25	15	0.00	-	0.15	0.0
8.69	56.3	76.7	182.0	2.2	-1.2	4.0	4	clayy SILT to silty CLAY	115	2.0	28	38	-	-	4.0	9.9	27	15	0.00	-	0.15	0.0
8.86	58.1	78.3	190.8	2.4	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	29	39	-	-	4.1	9.9	28	15	0.00	-	0.15	0.0
9.02	61.8	82.6	196.5	2.6	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	31	41	-	-	4.3	9.9	27	15	0.00	-	0.15	0.0
9.19	57.1	75.7	199.1	2.6	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	29	38	-	-	4.0	9.9	29	15	0.00	-	0.15	0.0
9.35	51.4	67.5	185.6	2.3	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.6	9.9	31	15	0.00	-	0.15	0.0
9.51	48.0	62.5	182.0	2.2	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	24	31	-	-	3.4	9.9	32	15	0.00	-	0.15	0.0
9.68	52.2	67.4	181.3	2.3	-1.2	4.4	4	clayy SILT to silty CLAY	115	2.0	26	34	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
9.84	50.3	64.4	177.4	2.2	-1.2	4.4	4	clayy SILT to silty CLAY	115	2.0	25	32	-	-	3.5	9.9	31	15	0.00	-	0.15	0.0
10.01	61.0	77.5	172.5	2.2	-1.2	3.6	4	clayy SILT to silty CLAY	115	2.0	31	39	-	-	4.3	9.9	26	15	0.00	-	0.15	0.0
10.17	58.3	73.4	184.3	2.4	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	29	37	-	-	4.1	9.9	28	15	0.00	-	0.15	0.0
10.34	55.4	69.3	188.0	2.5	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	28	35	-	-	3.9	9.9	30	15	0.00	-	0.15	0.0
10.50	54.2	67.2	188.9	2.5	-1.2	4.7	4	clayy SILT to silty CLAY	115	2.0	27	34	-	-	3.8	9.9	31	15	0.00	-	0.15	0.0
10.66	52.4	64.5	175.8	2.2	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	26	32	-	-	3.7	9.9	30	15	0.00	-	0.15	0.0
10.83	38.6	52.3	166.5	1.7	-1.1	4.6	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	34	15	0.00	-	0.15	0.0
10.99	31.1	41.7	-	1.4	-1.2	4.5	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.2	9.9	37	15	-	-	0.15	-
11.16	36.2	48.0	154.6	1.5	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.5	9.9	34	15	0.54	-	0.15	2.9
11.32	40.2	48.1	150.7	1.6	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.8	9.9	34	15	0.70	-	0.15	38.3
11.48	45.2	53.7	157.6	1.8	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	23	27	-	-	3.2	9.9	32	15	0.46	-	0.15	2.5
11.65	52.9	62.4	148.4	1.7	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	26	31	-	-	3.7	9.9	27	15	0.81	-	0.15	6.8
11.81	50.6	59.3	146.3	1.7	-1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.5	9.9	28	15	0.92	-	0.15	10.1
11.98	42.5	49.4	163.7	1.9	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	3.0	9.9	35	15	0.00	-	0.15	0.0
12.14	48.2	55.6	169.5	2.1	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	24	28	-	-	3.4	9.9	33	15	0.00	-	0.15	0.0
12.30	55.8	64.0	177.4	2.4	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	28	32	-	-	3.9	9.9	31	15	0.00	-	0.15	0.0
12.47	70.5	80.3	173.3	2.4	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	35	40	-	-	4.9	9.9	25	15	0.00	-	0.15	0.0
12.63	60.4	68.4	161.6	2.1	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	30	34	-	-	4.2	9.9	27	15	0.00	-	0.15	0.0
12.80	45.0	50.6	163.0	2.0	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	22	25	-	-	3.1	9.9	35	15	0.00	-	0.15	0.0
12.96	41.4	46.3	150.4	1.7	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	2.9	9.9	35	15	0.78	-	0.15	44.0
13.12	37.2	44.1	-	1.6	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	36	15	-	-	0.15	-
13.29	33.2	39.1	-	1.3	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.14	-
13.45	32.5	41.5	-	1.2	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.3	9.9	35	15	-	-	0.14	-
13.62	36.5	46.1	-	1.6	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	-	-	0.14	-
13.78	51.1	55.4	148.6	1.8	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	26	28	-	-	3.6	9.9	30	15	0.88	-	0.14	19.1
13.94	48.1	51.8	149.8	1.8	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	24	26	-	-	3.4	9.9	32	15	0.83	-	0.14	28.1
14.11	36.7	44.8	-	1.7	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.6	9.9	37	15	-	-	0.14	-
14.27	38.0	40.5	132.6	1.4	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	35	15	1.68	-	0.14	51.2
14.44	36.7	39.0	115.8	1.1	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.6	9.9	32	15	2.07	-	0.14	51.2
14.60	34.5	38.1	-	1.2	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.4	9.9	36	15	-	-	0.13	-
14.76	35.1	38.4	-	1.3	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.4	9.9	36	15	-	-	0.13	-
14.93	34.3	39.5	-	1.4	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.4	9.9	37	15	-	-	0.13	-
15.09	35.7	38.5	127.7	1.3	-1.4	3.6	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	35	15	1.87	-	0.13	51.2
15.26	40.2	41.5	119.6	1.2	-1.4	3.0	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	32	15	2.02	-	0.12	51.2
15.42	40.3	41.3	113.9	1.1	-1.4	2.8	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	31	15	2.10	-	0.12	51.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qc1n PS -	qincs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
15.58	35.5	36.3	119.7	1.2	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	35	15	2.02	-	0.12	51.2
15.75	36.4	38.1	125.3	1.2	-1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	35	15	1.94	-	0.11	51.2
15.91	39.1	39.5	125.9	1.3	-1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	20	20	-	-	2.7	9.9	34	15	1.93	-	0.11	51.2
16.08	38.2	40.9	-	1.6	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	37	15	-	-	0.11	-
16.24	39.8	42.2	-	1.6	-1.4	4.2	4	clayy SILT to silty CLAY	115	2.0	20	21	-	-	2.8	9.9	36	15	-	-	0.11	-
16.40	36.4	38.2	-	1.6	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.5	9.9	39	15	-	-	0.11	-
16.57	31.7	33.0	-	1.3	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	16	-	-	2.2	9.9	41	15	-	-	0.11	-
16.73	28.3	29.1	-	1.3	-1.3	4.7	3	silty CLAY to CLAY	115	1.5	19	19	-	-	2.0	9.9	44	15	-	-	0.11	-
16.90	28.7	29.2	-	1.1	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	14	15	-	-	2.0	9.9	41	15	-	-	0.11	-
17.06	28.6	28.9	-	0.9	-1.3	3.4	4	clayy SILT to silty CLAY	115	2.0	14	14	-	-	2.0	9.9	39	15	-	-	0.11	-
17.23	29.7	29.7	-	1.1	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	15	15	-	-	2.1	9.9	40	15	-	-	0.11	-
17.39	36.2	35.9	-	1.4	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	18	18	-	-	2.5	9.9	38	15	-	-	0.11	-
17.55	41.3	40.6	-	1.6	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	36	15	-	-	0.11	-
17.72	47.5	45.5	146.8	1.9	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	24	23	-	-	3.3	9.9	35	15	1.06	-	0.11	47.3
17.88	53.8	51.3	162.4	2.4	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	27	26	-	-	3.8	9.9	34	15	0.00	-	0.11	0.0
18.05	66.6	63.2	163.7	2.5	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	33	32	-	-	4.7	9.9	29	15	0.00	-	0.11	0.0
18.21	56.6	53.4	165.7	2.5	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	28	27	-	-	4.0	9.9	34	15	0.00	-	0.11	0.0
18.37	52.5	49.4	158.3	2.3	-1.4	4.4	4	clayy SILT to silty CLAY	115	2.0	26	25	-	-	3.7	9.9	34	15	0.58	-	0.11	33.7
18.54	59.8	56.0	161.2	2.4	-1.4	4.1	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	32	15	0.00	-	0.11	0.0
18.70	72.4	67.5	161.1	2.5	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	36	34	-	-	5.1	9.9	27	15	0.00	-	0.11	0.0
18.87	62.9	58.4	167.2	2.6	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	31	29	-	-	4.4	9.9	31	15	0.00	-	0.11	0.0
19.03	59.6	55.1	162.2	2.5	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.2	9.9	32	15	0.00	-	0.11	0.0
19.19	57.0	52.5	146.6	2.0	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	29	26	-	-	4.0	9.9	31	15	1.12	-	0.11	30.7
19.36	49.9	45.7	138.9	1.8	-1.3	3.7	4	clayy SILT to silty CLAY	115	2.0	25	23	-	-	3.5	9.9	33	15	1.49	-	0.10	49.2
19.52	44.7	39.5	-	1.7	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.1	9.9	36	15	-	-	0.10	-
19.69	40.9	35.9	-	1.6	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	20	18	-	-	2.8	9.9	38	15	-	-	0.10	-
19.85	42.7	37.1	-	1.7	-1.2	4.0	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	3.0	9.9	37	15	-	-	0.10	-
20.01	51.0	43.9	-	2.1	-1.2	4.2	4	clayy SILT to silty CLAY	115	2.0	25	22	-	-	3.6	9.9	36	15	-	-	0.10	-
20.18	61.2	52.3	-	3.0	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	31	26	-	-	4.3	9.9	35	15	-	-	0.10	-
20.34	70.3	62.9	190.0	3.4	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	35	31	-	-	4.9	9.9	33	15	0.00	-	0.10	0.0
20.51	65.8	55.4	-	3.4	-1.2	5.3	4	clayy SILT to silty CLAY	115	2.0	33	28	-	-	4.6	9.9	35	15	-	-	0.10	-
20.67	60.9	50.8	-	3.0	-1.2	5.0	4	clayy SILT to silty CLAY	115	2.0	30	25	-	-	4.3	9.9	36	15	-	-	0.10	-
20.83	59.4	52.5	166.4	2.7	-1.2	4.6	4	clayy SILT to silty CLAY	115	2.0	30	26	-	-	4.1	9.9	34	15	0.00	-	0.10	0.0
21.00	68.6	60.4	162.1	2.6	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	34	30	-	-	4.8	9.9	30	15	0.00	-	0.10	0.0
21.16	72.5	63.6	149.5	2.3	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	36	32	-	-	5.1	9.9	27	15	1.07	-	0.10	13.3
21.33	71.6	62.5	140.9	2.1	-1.2	3.0	5	silty SAND to sandy SILT	120	4.0	18	16	52	41	-	-	26	16	1.47	-	0.10	31.3
21.49	62.6	54.5	136.4	1.9	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.4	9.9	28	15	1.66	-	0.10	39.3
21.65	54.3	47.1	141.7	2.0	-1.4	3.7	4	clayy SILT to silty CLAY	115	2.0	27	24	-	-	3.8	9.9	33	15	1.42	-	0.09	47.2
21.82	53.3	42.2	-	2.4	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	27	21	-	-	3.7	9.9	38	15	-	-	0.09	-
21.98	73.6	63.4	171.4	3.0	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	37	32	-	-	5.2	9.9	30	15	0.00	-	0.09	0.0
22.15	85.4	73.3	182.1	3.4	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	43	37	-	-	6.0	9.9	28	15	0.00	-	0.09	0.0
22.31	87.4	74.6	185.9	3.6	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	44	37	-	-	6.1	9.9	28	15	0.00	-	0.09	0.0
22.47	73.9	62.9	181.6	3.3	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	37	31	-	-	5.2	9.9	32	15	0.00	-	0.09	0.0
22.64	68.6	58.2	178.5	3.2	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	34	29	-	-	4.8	9.9	33	15	0.00	-	0.09	0.0
22.80	67.0	56.7	173.3	3.0	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	34	28	-	-	4.7	9.9	33	15	0.00	-	0.09	0.0
22.97	62.5	47.0	-	2.8	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.4	9.9	36	15	-	-	0.09	-
23.13	60.4	45.1	-	2.6	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	30	23	-	-	4.2	9.9	36	15	-	-	0.09	-
23.30	61.1	45.3	-	2.6	-1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	31	23	-	-	4.3	9.9	35	15	-	-	0.09	-
23.46	55.5	40.8	-	2.4	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	28	20	-	-	3.9	9.9	37	15	-	-	0.09	-
23.62	58.0	48.1	141.2	2.1	-1.2	3.7	4	clayy SILT to silty CLAY	115	2.0	29	24	-	-	4.0	9.9	32	15	1.50	-	0.09	46.3
23.79	67.1	55.5	156.3	2.6	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	34	28	-	-	4.7	9.9	31	15	0.85	-	0.09	19.4
23.95	86.2	71.1	185.7	3.7	-1.2	4.3	4	clayy SILT to silty CLAY	115	2.0	43	36	-	-	6.0	9.9	29	15	0.00	-	0.09	0.0
24.12	105.2	86.5	192.5	4.1	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	53	43	-	-	7.4	9.9	26	15	0.00	-	0.09	0.0
24.28	93.7	76.7	185.0	3.7	-1.2	4.1	4	clayy SILT to silty CLAY	115	2.0	47	38	-	-	6.6	9.9	27	15	0.00	-	0.09	0.0
24.44	90.4	73.8	150.4	2.6	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	24	16	1.15	-	0.09	12.9
24.61	95.6	77.8	168.0	3.2	-1.3	3.4	4	clayy SILT to silty CLAY	115	2.0	48	39	-	-	6.7	9.9	25	15	0.00	-	0.09	0.0
24.77	113.8	92.3	202.6	4.5	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	57	46	-	-	8.0	9.9	25	15	0.00	-	0.09	0.0
24.94	104.5	84.5	224.8	5.3	-1.4	5.2	9	very stiff fine SOIL	120	2.0	52	42	61	42	-	-	30	30	0.00	-	0.09	0.0
25.10	91.5	73.7	137.3	2.2	-1.2	2.4	5	silty SAND to sandy SILT	120	4.0	23	18	57	41	-	-	22	16	1.73	-	0.09	26.2
25.26	67.7	46.2	-	3.2	-1.2	4.9	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.7	9.9	37	15	-	-	0.08	-
25.43	65.4	44.4	-	2.9	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	33	22	-	-	4.6	9.9	37	15	-	-	0.08	-
25.59	30.3	20.4	-	2.0	-1.3	6.8	3	silty CLAY to CLAY	115	1.5	20	14	-	-	2.1	9.9	58	15	-	-	0.08	-
25.76	29.0	19.5	-	1.6	-1.3	5.7	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	9.9	56	15	-	-	0.08	-
25.92	29.4	19.6	-	1.2	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	20	13	-	-	2.0	9.9	51	15	-	-	0.08	-
26.08	31.2	20.7	-	1.5	-1.3	5.1	3	silty CLAY to CLAY	115	1.5	21	14	-	-	2.1	9.9	52	15	-	-	0.08	-
26.25	42.0	27.7	-	1.7	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	28	18	-	-	2.9	9.9	44	15	-	-	0.08	-
26.41	51.4	33.6	-	2.6	-1.3	5.2	3	silty CLAY to CLAY	115	1.5	34	22	-	-	3.6	9.9	43	15	-	-	0.08	-
26.58	75.9	59.4	166.4	3.1	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	38	30	-	-	5.3	9.9	31	15	0.00	-	0.08	0.0
26.74	88.5	69.0	157.5	2.9	-1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	44	35	-	-	6.2	9.9	26	15	0.90	-	0.08	9.2
26.90	92.1	71.7	165.7	3.2	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	46	36	-	-	6.5	9.9	26	15	0.00	-	0.08	0.0
27.07	104.7	81.2	189.8	4.2	-1.3	4.0	4	clayy SILT to silty CLAY	115	2.0	52	41	-	-	7.3	9.9	27	15	0.00	-	0.08	0.0
27.23	100.6	77.8	207.8	4.8	-1.3	4.9	4	clayy SILT to silty CLAY	115	2.0	50	39	-	-	7.1	9.9	30	15	0.00	-	0.08	0.0
27.40	93.5	72.1	200.6	4.5	-1.3	4.9	4	clayy SILT to silty CLAY	115	2.0	47	36	-	-	6.6	9.9	31	15	0.00	-	0.08	0.0
27.56	85.9	66.1	183.9	3.8	-1.3	4.5	4	clayy SILT to silty CLAY	115	2.0	43	33	-	-	6.0	9.9	31	15	0.00	-	0.08	0.0
27.72	97.5	74.8	145.6	2.6	-1.3	2.7	5	silty SAND to sandy SILT	120	4.0	24	19	57	41	-	-	22	16	1.45	-	0.08	21.8
27.89	88.6	67.7	138.6	2.3	-1.3	2.7	5	silty SAND to sandy SILT	120	4.0	22	17	54	41	-	-	24	16	1.72	-	0.08	29.4
28.05	98.0	74.7	147.5	2.7	-1.4	2.8	5	silty SAND to sandy SILT	120	4.0	25	19	57	41	-	-	23	16	1.37	-	0.08	20.4
28.22	105.6	80.2	181.3	3.9	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	53	40	-	-	7.4	9.9	26	15	0.00	-	0.07	0.0
28.38	114.8	87.0	199.3	4.7	-1.4	4.1	4	clayy SILT to silty CLAY	115	2.0	57	43	-	-	8.1	9.9	26	15	0.00	-	0.07	0.0
28.54	111.6	84.3	207.8	5.0	-1.4	4.6	4	clayy SILT to silty CLAY	115	2.0	56	42	-	-	7.8	9.9	28	15	0.00	-	0.07	0.0
28.71	114.0	85.9	208.0	5.0	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	57	43	-	-	8.0	9.9	27	15	0.00	-	0.07	0.0
28.87	112.5	84.5	223.7	5.7	-1.3	5.1	9	very stiff fine SOIL	120	2.0	56	42	61	42	-	-	30	30	0.00	-	0.07	0.0
29.04	116.2	87.0	238.6	6.4	-1.3	5.6	9	very stiff fine SOIL	120	2.0	58	44	62	42	-	-	30	30	0.00	-	0.07	0.0
29.20	104.2	61.6	-	6.6	-1.3	6.4	3	silty CLAY to CLAY	115	1.5	69	41	-	-	7.3	9.9	37	15	-	-	0.07	-
29.36	85.5	50.2	-	5.5	-1.2	6.6	3	silty CLAY to CLAY	115	1.5	57	33	-	-	6.0	9.9	41	15	-	-	0.07	-
29.53	64.8	37.9	-	5.0	-1.2	7.9	3	silty CLAY to CLAY	115	1.5	43	25	-	-	4.5	9.9	49	15	-	-	0.07	-
29.69	80.0	46.5	-	3.6	-1.3	4.6	4	clayy SILT to silty CLAY	115	2.0	40	23	-	-	5.6	9.9	36	15	-	-	0.07	-
29.86	57.6	33.3	-	3.2	-1.2	5.8	3	silty CLAY to CLAY	115	1.5	38	22	-	-	4.0	9.9	45	15	-	-	0.07	-
30.02	44.2	25.4	-	2.3	-1.2	5.5	3	silty CLAY to CLAY	115	1.5	29	17	-	-	3.1	9.9	50	15	-	-	0.07	-
30.19	36.4	20.8	-	2.0	-1.2	5.8	3	silty CLAY to CLAY	115	1.5	24	14	-	-	2.5	9.9	55	15	-	-	0.07	-
30.35	38.4	21.8	-	2.0	-1.2	5.5	3	silty CLAY to CLAY	115	1.5	26	15	-	-	2.6	9.9	53	15	-	-	0.07	-
30.51	49.6	28.1	-	1.7	-1.2	3.6	4	clayy SILT to silty CLAY	115	2.0	25	14	-	-	3.4	9.9	41	15	-	-	0.07	-
30.68	47.6	26.8	-	2.0	-1.2	4.5	3	silty CLAY to CLAY	115	1.5	32	18	-	-	3.3	9.9	45	15	-	-	0.07	-
30.84	60.8	34.1	-	2.4	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	30	17	-	-	4.2	9.9	39	15	-	-	0.07	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
31.01	69.0	50.0	142.2	2.4	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	34	25	-	-	4.8	9.9	31	15	1.58	-	0.07	44.2
31.17	65.2	36.1	-	2.7	-1.3	4.2	4	clayy SILT to silty CLAY	115	2.0	33	18	-	-	4.5	9.9	39	15	-	-	0.07	-
31.33	52.1	28.7	-	2.8	-1.4	5.6	3	silty CLAY to CLAY	115	1.5	35	19	-	-	3.6	9.9	48	15	-	-	0.07	-
31.50	80.1	43.9	-	3.5	-1.5	4.5	4	clayy SILT to silty CLAY	115	2.0	40	22	-	-	5.6	9.9	37	15	-	-	0.07	-
31.66	113.2	81.2	188.7	4.4	-1.5	4.0	4	clayy SILT to silty CLAY	115	2.0	57	41	-	-	7.9	9.9	27	15	0.00	-	0.07	0.0
31.83	120.4	86.1	195.3	4.8	-1.5	4.0	4	clayy SILT to silty CLAY	115	2.0	60	43	-	-	8.4	9.9	26	15	0.00	-	0.07	0.0
31.99	115.4	82.4	199.5	4.9	-1.5	4.3	4	clayy SILT to silty CLAY	115	2.0	58	41	-	-	8.1	9.9	27	15	0.00	-	0.07	0.0
32.15	120.5	85.8	217.0	5.7	-1.5	4.8	4	clayy SILT to silty CLAY	115	2.0	60	43	-	-	8.4	9.9	29	15	0.00	-	0.07	0.0
32.32	113.3	80.4	212.5	5.5	-1.4	4.9	4	clayy SILT to silty CLAY	115	2.0	57	40	-	-	7.9	9.9	30	15	0.00	-	0.07	0.0
32.48	88.8	47.2	-	4.4	-1.5	5.1	4	clayy SILT to silty CLAY	115	2.0	44	24	-	-	6.2	9.9	37	15	-	-	0.07	-
32.65	74.6	39.5	-	3.6	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	50	26	-	-	5.2	9.9	40	15	-	-	0.07	-
32.81	79.8	56.2	155.9	3.0	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	40	28	-	-	5.6	9.9	31	15	1.02	-	0.07	22.7
32.97	72.6	51.0	138.4	2.4	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	36	26	-	-	5.1	9.9	30	15	1.74	-	0.07	43.0
33.14	63.6	33.2	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	32	17	-	-	4.4	9.9	36	15	-	-	0.07	-
33.30	59.6	30.9	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.1	9.9	37	15	-	-	0.07	-
33.47	68.7	35.5	-	2.7	-1.4	4.0	4	clayy SILT to silty CLAY	115	2.0	34	18	-	-	4.8	9.9	38	15	-	-	0.07	-
33.63	75.5	38.8	-	3.1	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	38	19	-	-	5.3	9.9	38	15	-	-	0.07	-
33.79	67.1	34.3	-	2.8	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	34	17	-	-	4.7	9.9	40	15	-	-	0.07	-
33.96	67.8	47.0	126.4	2.0	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.7	9.9	30	15	1.93	-	0.07	47.7
34.12	63.6	44.0	118.7	1.7	-1.3	2.8	4	clayy SILT to silty CLAY	115	2.0	32	22	-	-	4.4	9.9	30	15	2.03	-	0.06	51.2
34.29	58.7	29.6	-	1.7	-1.3	3.0	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.1	9.9	37	15	-	-	0.06	-
34.45	55.8	28.0	-	1.7	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	28	14	-	-	3.9	9.9	38	15	-	-	0.06	-
34.61	52.3	26.1	-	1.9	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	26	13	-	-	3.6	9.9	43	15	-	-	0.06	-
34.78	44.5	22.1	-	2.1	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	30	15	-	-	3.1	9.9	50	15	-	-	0.06	-
34.94	37.9	18.7	-	2.1	-1.5	5.9	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.6	9.9	57	15	-	-	0.06	-
35.11	36.8	18.1	-	2.0	-1.5	5.7	3	silty CLAY to CLAY	115	1.5	25	12	-	-	2.5	9.9	57	15	-	-	0.06	-
35.27	36.1	17.7	-	2.2	-1.5	6.4	3	silty CLAY to CLAY	115	1.5	24	12	-	-	2.5	9.9	60	15	-	-	0.06	-
35.43	41.4	20.2	-	2.4	-1.5	6.0	3	silty CLAY to CLAY	115	1.5	28	13	-	-	2.9	9.9	56	15	-	-	0.06	-
35.60	34.1	16.6	-	2.0	-1.5	6.3	3	silty CLAY to CLAY	115	1.5	23	11	-	-	2.3	9.9	62	15	-	-	0.06	-
35.76	28.3	13.7	-	1.7	-1.5	6.4	3	silty CLAY to CLAY	115	1.5	19	9	-	-	1.9	8.2	67	15	-	-	0.06	-
35.93	30.7	14.8	-	1.5	-1.5	5.2	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.1	9.0	60	15	-	-	0.06	-
36.09	24.1	11.5	-	1.3	-1.5	6.0	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	6.8	70	15	-	-	0.06	-
36.26	23.5	11.2	-	1.2	-1.5	5.6	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	69	15	-	-	0.06	-
36.42	23.5	11.1	-	1.1	-1.5	5.3	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.6	69	15	-	-	0.06	-
36.58	22.6	10.7	-	1.0	-1.5	5.1	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.3	69	15	-	-	0.06	-
36.75	21.4	10.1	-	0.9	-1.5	4.9	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	70	15	-	-	0.06	-
36.91	22.6	10.6	-	0.9	-1.6	4.2	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	6.2	65	15	-	-	0.06	-
37.08	21.5	10.0	-	0.9	-1.6	4.5	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	5.9	68	15	-	-	0.06	-
37.24	20.2	9.4	-	0.9	-1.6	4.8	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.4	5.5	71	15	-	-	0.06	-
37.40	20.5	9.5	-	0.9	-1.6	4.7	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	71	15	-	-	0.06	-
37.57	20.8	9.6	-	1.1	-1.6	6.1	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.6	76	15	-	-	0.06	-
37.73	19.9	9.1	-	1.3	-1.7	7.6	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.3	5.3	82	15	-	-	0.06	-
37.90	34.9	15.9	-	1.4	-1.7	4.3	3	silty CLAY to CLAY	115	1.5	23	11	-	-	2.4	9.8	55	15	-	-	0.06	-
38.06	33.7	15.3	-	1.2	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.3	9.4	54	15	-	-	0.06	-
38.22	26.7	12.1	-	1.1	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	7.2	63	15	-	-	0.06	-
38.39	32.4	14.6	-	1.2	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	22	10	-	-	2.2	8.9	56	15	-	-	0.06	-
38.55	40.4	18.1	-	1.4	-1.7	3.7	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	50	15	-	-	0.06	-
38.72	40.4	18.1	-	1.3	-1.7	3.5	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	49	15	-	-	0.06	-
38.88	36.4	16.2	-	1.3	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.5	9.9	53	15	-	-	0.06	-
39.04	29.3	13.0	-	1.1	-1.6	4.0	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.0	7.9	59	15	-	-	0.06	-
39.21	27.1	11.9	-	0.9	-1.6	3.8	3	silty CLAY to CLAY	115	1.5	18	8	-	-	1.8	7.2	60	15	-	-	0.06	-
39.37	27.8	12.2	-	0.9	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	19	8	-	-	1.9	7.4	59	15	-	-	0.06	-
39.54	23.9	10.4	-	0.9	-1.6	4.3	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.6	6.2	66	15	-	-	0.06	-
39.70	20.5	8.9	-	1.0	-1.6	5.5	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.2	76	15	-	-	0.06	-
39.86	21.5	9.3	-	1.1	-1.6	5.6	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	5.5	74	15	-	-	0.06	-
40.03	25.6	11.1	-	1.2	-1.6	5.3	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	6.6	69	15	-	-	0.06	-
40.19	31.4	13.5	-	1.3	-1.6	4.4	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	8.2	60	15	-	-	0.06	-
40.36	40.7	17.5	-	1.4	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	27	12	-	-	2.8	9.9	50	15	-	-	0.06	-
40.52	41.5	17.7	-	1.6	-1.6	4.2	3	silty CLAY to CLAY	115	1.5	28	12	-	-	2.9	9.9	52	15	-	-	0.06	-
40.68	36.7	15.6	-	1.6	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	24	10	-	-	2.5	9.6	57	15	-	-	0.06	-
40.85	29.8	12.6	-	1.2	-1.6	4.4	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	7.7	61	15	-	-	0.06	-
41.01	32.0	13.5	-	0.5	-1.6	1.6	4	clayy SILT to silty CLAY	115	2.0	16	7	-	-	2.2	8.2	44	15	-	-	0.06	-
41.18	45.7	19.2	-	1.5	-1.6	3.5	3	silty CLAY to CLAY	115	1.5	30	13	-	-	3.1	9.9	48	15	-	-	0.06	-
41.34	51.1	21.4	-	1.7	-1.6	3.6	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	46	15	-	-	0.06	-
41.50	17.3	7.2	-	0.9	-1.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	4.1	84	15	-	-	0.06	-
41.67	18.0	7.5	-	0.6	-1.5	4.0	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.3	75	15	-	-	0.06	-
41.83	18.8	7.8	-	0.6	-0.9	3.7	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	4.5	72	15	-	-	0.06	-
42.00	22.2	9.1	-	0.7	-0.6	3.6	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.4	67	15	-	-	0.06	-
42.16	20.4	8.4	-	0.6	-0.6	3.4	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	4.9	68	15	-	-	0.06	-
42.32	17.5	7.2	-	0.7	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.1	78	15	-	-	0.06	-
42.49	20.4	8.3	-	0.8	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	4.8	75	15	-	-	0.06	-
42.65	22.1	8.9	-	1.0	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.2	73	15	-	-	0.06	-
42.82	22.0	8.9	-	1.0	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.5	5.2	73	15	-	-	0.06	-
42.98	25.9	10.4	-	1.1	-0.6	4.6	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	6.2	67	15	-	-	0.06	-
43.15	27.8	11.1	-	1.0	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.7	62	15	-	-	0.06	-
43.31	19.2	7.6	-	1.0	-0.6	6.0	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.4	83	15	-	-	0.06	-
43.47	18.0	7.2	-	0.8	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	4.1	82	15	-	-	0.06	-
43.64	15.9	6.3	-	0.7	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.5	86	15	-	-	0.06	-
43.80	14.9	5.9	-	0.7	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	89	15	-	-	0.06	-
43.97	14.7	5.8	-	0.6	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	90	15	-	-	0.06	-
44.13	14.8	5.8	-	0.7	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.2	91	15	-	-	0.06	-
44.29	16.1	6.3	-	0.8	-0.6	5.7	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.5	88	15	-	-	0.06	-
44.46	21.1	8.2	-	0.9	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.8	76	15	-	-	0.06	-
44.62	25.5	9.9	-	1.1	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	17	7	-	-	1.7	5.9	69	15	-	-	0.06	-
44.79	21.2	8.2	-	1.1	-0.6	5.9	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.8	80	15	-	-	0.06	-
44.95	17.9	6.9	-	1.0	-0.6	6.3	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	87	15	-	-	0.06	-
45.11	18.0	6.9	-	0.9	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	85	15	-	-	0.06	-
45.28	19.6	7.5	-	1.0	-0.6	6.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	84	15	-	-	0.06	-
45.44	20.4	7.8	-	1.1	-0.6	6.1	3	silty CLAY to CLAY	115	1.5	14	5	-	-	1.4	4.5	82	15	-	-	0.06	-
45.61	19.8	7.5	-	1.0	-0.6	6.1	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.3	4.3	83	15	-	-	0.06	-
45.77	18.3	6.9	-	0.9	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.2	3.9	85	15	-	-	0.06	-
45.93	17.1	6.5	-	0.8	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.1	3.6	87	15	-	-	0.06	-
46.10	15.9	6.0	-	0.7	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	11	4	-	-	1.0	3.3	89	15	-	-	0.06	-
46.26	15.0	5.7	-	0.6	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.1	90	15	-	-	0.06	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
46.43	14.8	5.6	-	0.6	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.0	90	15	-	-	0.06	-
46.59	15.0	5.7	-	0.7	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.0	92	15	-	-	0.06	-
46.75	14.1	5.3	-	0.7	-0.6	6.4	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.8	95	15	-	-	0.06	-
46.92	13.6	5.1	-	0.7	-0.6	6.5	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.7	95	15	-	-	0.06	-
47.08	13.8	5.2	-	0.6	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	9	3	-	-	0.9	2.7	95	15	-	-	0.06	-
47.25	14.0	5.3	-	0.6	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.7	94	15	-	-	0.06	-
47.41	14.2	5.4	-	0.6	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.9	2.8	92	15	-	-	0.06	-
47.57	14.4	5.4	-	0.6	-0.6	4.8	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	90	15	-	-	0.06	-
47.74	14.4	5.4	-	0.6	-0.6	4.9	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	91	15	-	-	0.06	-
47.90	14.3	5.4	-	0.6	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	10	4	-	-	0.9	2.8	92	15	-	-	0.06	-
48.07	15.5	5.9	-	0.7	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	10	4	-	-	1.0	3.1	89	15	-	-	0.06	-
48.23	19.0	7.2	-	0.8	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	13	5	-	-	1.2	3.9	82	15	-	-	0.06	-
48.39	25.5	9.6	-	1.1	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.7	5.4	70	15	-	-	0.06	-
48.56	28.0	10.6	-	1.3	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	69	15	-	-	0.06	-
48.72	28.2	10.6	-	1.4	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
48.89	28.3	10.7	-	1.4	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
49.05	26.8	10.1	-	1.4	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	18	7	-	-	1.8	5.6	73	15	-	-	0.06	-
49.22	28.9	10.9	-	1.4	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.1	70	15	-	-	0.06	-
49.38	30.6	11.5	-	1.5	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.5	67	15	-	-	0.06	-
49.54	32.3	12.2	-	1.5	-0.6	5.1	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.9	65	15	-	-	0.06	-
49.71	28.8	10.9	-	1.5	-0.5	5.7	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.9	6.0	71	15	-	-	0.06	-
49.87	30.1	11.4	-	1.4	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.0	6.3	68	15	-	-	0.06	-
50.04	31.7	12.0	-	1.6	-0.5	5.6	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	6.7	68	15	-	-	0.06	-
50.20	33.1	12.5	-	1.8	-0.5	5.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	7.0	68	15	-	-	0.06	-
50.36	38.7	14.6	-	1.7	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	8.2	60	15	-	-	0.06	-
50.53	34.4	13.0	-	1.5	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.2	62	15	-	-	0.06	-
50.69	33.3	12.6	-	1.5	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	6.9	63	15	-	-	0.06	-
50.86	36.0	13.6	-	1.3	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.5	58	15	-	-	0.06	-
51.02	36.3	13.7	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.6	58	15	-	-	0.06	-
51.18	34.9	13.2	-	1.4	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.4	7.2	60	15	-	-	0.06	-
51.35	34.1	12.9	-	1.3	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.0	61	15	-	-	0.06	-
51.51	38.6	14.6	-	1.3	-0.5	3.5	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	8.0	54	15	-	-	0.06	-
51.68	35.5	13.4	-	1.5	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.3	60	15	-	-	0.06	-
51.84	33.1	12.5	-	1.5	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.7	64	15	-	-	0.06	-
52.00	33.3	12.6	-	1.5	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.8	64	15	-	-	0.06	-
52.17	32.8	12.4	-	1.4	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.2	6.6	63	15	-	-	0.06	-
52.33	34.7	13.1	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	7.0	61	15	-	-	0.06	-
52.50	35.9	13.6	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	7.3	59	15	-	-	0.06	-
52.66	32.0	12.1	-	1.3	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.2	6.4	63	15	-	-	0.06	-
52.82	30.5	11.5	-	1.2	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	20	8	-	-	2.1	6.0	65	15	-	-	0.06	-
52.99	36.3	13.7	-	1.3	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.3	58	15	-	-	0.06	-
53.15	36.5	13.8	-	1.3	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	7.3	57	15	-	-	0.06	-
53.32	34.1	12.9	-	1.6	-0.5	5.0	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	6.8	64	15	-	-	0.06	-
53.48	42.6	16.1	-	1.4	-0.5	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.6	52	15	-	-	0.06	-
53.64	37.6	14.2	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.5	58	15	-	-	0.06	-
53.81	37.2	14.0	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	7.4	58	15	-	-	0.06	-
53.97	33.6	12.7	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.3	6.6	62	15	-	-	0.06	-
54.14	35.3	13.3	-	1.4	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	61	15	-	-	0.06	-
54.30	42.4	16.0	-	1.4	-0.5	3.6	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.4	53	15	-	-	0.06	-
54.46	34.9	13.2	-	1.4	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.4	6.8	61	15	-	-	0.06	-
54.63	35.5	13.4	-	1.3	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.9	59	15	-	-	0.06	-
54.79	39.8	15.0	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.8	55	15	-	-	0.06	-
54.96	42.5	16.0	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.3	53	15	-	-	0.06	-
55.12	41.3	15.6	-	1.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	8.1	56	15	-	-	0.06	-
55.28	42.2	15.9	-	1.5	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	8.2	54	15	-	-	0.06	-
55.45	39.6	14.9	-	1.7	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.7	59	15	-	-	0.06	-
55.61	43.6	16.4	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.5	52	15	-	-	0.06	-
55.78	41.1	15.5	-	1.7	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.9	57	15	-	-	0.06	-
55.94	40.2	15.2	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.7	55	15	-	-	0.06	-
56.11	35.5	13.4	-	1.4	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	6.7	60	15	-	-	0.06	-
56.27	36.6	13.8	-	1.4	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.5	6.9	58	15	-	-	0.06	-
56.43	41.0	15.5	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.8	54	15	-	-	0.06	-
56.60	39.1	14.8	-	1.4	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.4	55	15	-	-	0.06	-
56.76	40.7	15.4	-	1.5	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.7	55	15	-	-	0.06	-
56.93	44.5	16.8	-	1.6	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	8.5	52	15	-	-	0.06	-
57.09	40.4	15.2	-	1.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.6	57	15	-	-	0.06	-
57.25	39.3	14.8	-	1.4	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.3	56	15	-	-	0.06	-
57.42	40.7	15.4	-	1.2	-0.5	3.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.6	52	15	-	-	0.06	-
57.58	39.6	14.9	-	1.1	-0.5	3.2	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.7	7.4	52	15	-	-	0.06	-
57.75	36.8	13.9	-	1.4	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.5	6.8	58	15	-	-	0.06	-
57.91	37.7	14.2	-	1.4	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	25	9	-	-	2.6	6.9	57	15	-	-	0.06	-
58.07	40.2	15.2	-	1.9	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.4	60	15	-	-	0.06	-
58.24	44.1	16.6	-	1.8	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	8.2	55	15	-	-	0.06	-
58.40	39.9	15.0	-	1.9	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.3	61	15	-	-	0.06	-
58.57	49.6	18.7	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.2	53	15	-	-	0.06	-
58.73	49.3	18.6	-	2.5	-0.5	5.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	9.1	57	15	-	-	0.06	-
58.89	44.4	16.7	-	2.0	-0.5	5.0	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	8.1	57	15	-	-	0.06	-
59.06	45.4	17.1	-	1.9	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.1	8.3	55	15	-	-	0.06	-
59.22	43.5	16.4	-	1.6	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.9	54	15	-	-	0.06	-
59.39	46.0	17.4	-	2.0	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	8.4	55	15	-	-	0.06	-
59.55	52.5	19.8	-	2.0	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.7	50	15	-	-	0.06	-
59.71	43.6	16.5	-	1.6	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	29	11	-	-	3.0	7.9	53	15	-	-	0.06	-
59.88	38.7	14.6	-	1.4	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	6.9	56	15	-	-	0.06	-
60.04	42.3	16.0	-	1.5	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.9	7.6	53	15	-	-	0.06	-
60.21	46.3	17.5	-	1.7	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.3	53	15	-	-	0.06	-
60.37	43.2	16.3	-	1.7	-0.4	4.3	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	7.7	55	15	-	-	0.06	-
60.53	43.4	16.4	-	1.6	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	29	11	-	-	2.9	7.7	54	15	-	-	0.06	-
60.70	46.7	17.6	-	1.9	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.4	53	15	-	-	0.06	-
60.86	46.6	17.6	-	1.8	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.3	53	15	-	-	0.06	-
61.03	41.2	15.5	-	1.7	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.8	7.2	57	15	-	-	0.06	-
61.19	40.5	15.3	-	1.5	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	7.1	56	15	-	-	0.06	-
61.35	49.2	18.6	-	1.6	-0.5	3.5	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.4	8.7	49	15	-	-	0.06	-
61.52	54.9	20.7	-	1.9	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.8	47	15	-	-	0.06	-
61.68	58.5	22.1	-	2.1	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	46	15	-	-	0.06	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc tsf	qc1n PS -	qincs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
61.85	57.9	21.9	-	2.2	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	48	15	-	-	0.06	-
62.01	54.7	20.7	-	2.0	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.7	48	15	-	-	0.06	-
62.17	55.8	21.1	-	2.1	-0.5	4.1	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	48	15	-	-	0.06	-
62.34	62.9	23.7	-	2.6	-0.5	4.3	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	47	15	-	-	0.06	-
62.50	61.5	23.2	-	3.0	-0.5	5.2	3	silty CLAY to CLAY	115	1.5	41	15	-	-	4.2	9.9	51	15	-	-	0.06	-
62.67	57.0	21.5	-	2.3	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	49	15	-	-	0.06	-
62.83	52.6	19.8	-	1.9	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.2	49	15	-	-	0.06	-
63.00	52.4	19.8	-	1.5	-0.4	3.1	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.6	9.1	45	15	-	-	0.06	-
63.16	51.6	19.5	-	1.5	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	8.9	46	15	-	-	0.06	-
63.32	52.0	19.6	-	1.5	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	26	10	-	-	3.5	9.0	46	15	-	-	0.06	-
63.49	48.8	18.4	-	1.5	-0.4	3.4	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	8.4	48	15	-	-	0.06	-
63.65	46.4	17.5	-	1.5	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	7.9	50	15	-	-	0.06	-
63.82	49.0	18.5	-	1.6	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	33	12	-	-	3.3	8.4	49	15	-	-	0.06	-
63.98	48.0	18.1	-	2.2	-0.5	4.9	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	8.2	55	15	-	-	0.06	-
64.14	47.0	17.7	-	2.3	-0.5	5.3	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.2	8.0	57	15	-	-	0.06	-
64.31	49.7	18.8	-	2.2	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	8.4	54	15	-	-	0.06	-
64.47	51.0	19.2	-	2.1	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	8.6	52	15	-	-	0.06	-
64.64	54.2	20.5	-	2.0	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.2	49	15	-	-	0.06	-
64.80	75.0	28.3	-	2.8	-0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	42	15	-	-	0.06	-
64.96	73.4	27.7	-	2.9	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	43	15	-	-	0.06	-
65.13	61.8	23.3	-	2.8	-0.5	4.8	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	49	15	-	-	0.06	-
65.29	60.2	22.7	-	2.3	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.06	-
65.46	60.6	22.9	-	2.3	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	46	15	-	-	0.06	-
65.62	58.6	22.1	-	2.0	-0.4	3.7	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	46	15	-	-	0.06	-
65.78	50.6	19.1	-	1.9	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	8.4	51	15	-	-	0.06	-
65.95	40.2	15.2	-	1.7	-0.4	4.6	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	6.5	58	15	-	-	0.06	-
66.11	36.2	13.7	-	1.7	-0.4	5.3	3	silty CLAY to CLAY	115	1.5	24	9	-	-	2.4	5.8	64	15	-	-	0.06	-
66.28	34.6	13.1	-	2.3	-0.4	7.5	3	silty CLAY to CLAY	115	1.5	23	9	-	-	2.3	5.5	72	15	-	-	0.06	-
66.44	67.9	25.6	-	2.6	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	45	17	-	-	4.7	9.9	44	15	-	-	0.06	-
66.60	73.7	27.8	-	2.7	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.06	-
66.77	78.8	29.7	-	2.6	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	40	15	-	-	0.06	-
66.93	79.3	29.9	-	3.0	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	41	15	-	-	0.06	-
67.10	78.1	29.5	-	2.9	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	41	15	-	-	0.06	-
67.26	79.9	30.1	-	2.7	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
67.42	79.5	30.0	-	2.6	-0.4	3.4	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
67.59	80.0	30.2	-	2.5	-0.4	3.3	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.06	-
67.75	83.8	31.6	-	2.6	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.8	9.9	37	15	-	-	0.06	-
67.92	85.2	32.1	-	2.6	-0.3	3.2	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	37	15	-	-	0.06	-
68.08	85.1	32.1	-	2.4	-0.3	3.0	4	clayy SILT to silty CLAY	115	2.0	43	16	-	-	5.9	9.9	36	15	-	-	0.06	-
68.24	75.7	28.6	-	2.1	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	9.9	37	15	-	-	0.06	-
68.41	58.7	22.2	-	1.5	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	4.0	9.5	41	15	-	-	0.06	-
68.57	51.5	19.4	-	1.6	-0.3	3.4	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	8.2	48	15	-	-	0.06	-
68.74	77.1	29.1	-	2.0	-0.2	2.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.9	36	15	-	-	0.06	-
68.90	82.5	31.2	-	2.4	-0.2	3.1	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.7	9.9	37	15	-	-	0.06	-
69.07	80.3	30.3	-	2.5	-0.2	3.2	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	38	15	-	-	0.06	-
69.23	80.3	30.3	-	2.6	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.9	39	15	-	-	0.06	-
69.39	94.3	50.8	130.2	2.7	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	47	25	-	-	6.5	9.9	29	15	1.73	-	0.06	43.3
69.56	101.6	54.6	135.6	2.9	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	27	-	-	7.0	9.9	28	15	1.50	-	0.06	36.8
69.72	102.9	55.3	136.5	3.0	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	28	-	-	7.1	9.9	28	15	1.46	-	0.06	34.1
69.89	104.2	56.0	137.3	3.0	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	52	28	-	-	7.2	9.9	28	15	1.42	-	0.05	31.5
70.05	105.5	56.6	134.7	2.9	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	53	28	-	-	7.3	9.9	27	15	1.55	-	0.05	37.2
70.21	101.9	54.7	135.4	2.9	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	51	27	-	-	7.1	9.9	28	15	1.50	-	0.05	36.4
70.38	101.0	38.1	-	3.5	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	50	19	-	-	7.0	9.9	36	15	-	-	0.05	-
70.54	106.2	56.9	145.9	3.4	-0.2	3.3	4	clayy SILT to silty CLAY	115	2.0	53	28	-	-	7.4	9.9	29	15	0.98	-	0.05	16.9
70.71	110.9	59.4	139.0	3.2	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	55	30	-	-	7.7	9.9	27	15	1.34	-	0.04	22.7
70.87	109.0	58.4	131.8	2.9	-0.2	2.7	5	silty SAND to sandy SILT	120	4.0	27	15	49	37	-	-	26	16	1.68	-	0.04	35.4
71.03	108.5	58.0	131.3	2.8	-0.2	2.7	5	silty SAND to sandy SILT	120	4.0	27	15	49	37	-	-	26	16	1.70	-	0.04	35.8
71.20	110.6	59.1	133.7	2.9	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	28	15	50	37	-	-	26	16	1.59	-	0.04	34.7
71.36	114.1	60.9	138.4	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.36	-	0.03	22.4
71.53	113.6	60.6	141.0	3.3	-0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	57	30	-	-	7.9	9.9	27	15	1.22	-	0.03	16.9
71.69	114.3	60.9	139.0	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.32	-	0.03	20.6
71.85	114.7	61.1	139.5	3.2	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	29	15	51	37	-	-	26	16	1.30	-	0.03	19.3
72.02	111.6	59.4	137.2	3.1	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	28	15	50	37	-	-	26	16	1.39	-	0.02	24.7
72.18	116.8	62.1	135.0	3.0	-0.1	2.7	5	silty SAND to sandy SILT	120	4.0	29	16	51	37	-	-	25	16	1.52	-	0.02	29.6
72.35	117.2	62.3	137.1	3.1	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	29	16	51	37	-	-	25	16	1.41	-	0.02	23.5
72.51	118.0	62.7	137.7	3.2	-0.2	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	37	-	-	25	16	1.38	-	0.02	21.9
72.67	118.0	62.7	137.6	3.2	-0.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	37	-	-	25	16	1.38	-	0.02	21.8
72.84	120.4	63.9	139.8	3.3	-0.1	2.8	5	silty SAND to sandy SILT	120	4.0	30	16	52	38	-	-	25	16	1.27	-	0.01	17.0
73.00	123.4	65.4	143.3	3.4	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	16	53	38	-	-	25	16	1.11	-	0.01	11.8
73.17	124.8	66.1	145.4	3.5	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	31	17	53	38	-	-	25	16	1.00	-	0.01	9.5
73.33	126.8	67.1	145.2	3.6	-0.1	2.9	5	silty SAND to sandy SILT	120	4.0	32	17	54	38	-	-	25	16	1.01	-	0.01	9.5
73.49	121.6	64.4	167.1	4.5	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	61	32	-	-	8.4	9.9	29	15	0.00	-	0.01	0.0
73.66	124.2	65.7	168.3	4.6	-0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	62	33	-	-	8.6	9.9	29	15	0.00	-	0.01	0.0
73.82	130.3	68.9	169.1	4.7	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	65	34	-	-	9.1	9.9	28	15	0.00	-	0.01	0.0
73.99	124.3	65.6	169.8	4.7	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	62	33	-	-	8.6	9.9	29	15	0.00	-	0.01	0.0
74.15	120.5	63.6	167.7	4.6	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.4	9.9	30	15	0.00	-	0.01	0.0
74.31	119.5	63.0	165.2	4.4	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.3	9.9	29	15	0.00	-	0.01	0.0
74.48	123.1	64.9	162.2	4.3	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	62	32	-	-	8.6	9.9	28	15	0.00	-	0.01	0.0
74.64	120.3	63.4	157.7	4.1	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	60	32	-	-	8.4	9.9	28	15	0.45	-	0.01	2.6
74.81	116.0	61.0	158.4	4.1	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	58	31	-	-	8.0	9.9	29	15	0.41	-	0.01	2.3
74.97	118.1	62.1	156.7	4.0	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.2	9.9	28	15	0.47	-	0.00	2.8
75.13	115.9	60.9	154.3	3.9	-0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	58	30	-	-	8.0	9.9	29	15	0.53	-	0.00	3.4
75.30	111.7	58.7	150.5	3.7	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	56	29	-	-	7.7	9.9	29	15	0.65	-	0.00	7.5
75.46	111.4	58.5	155.1	3.9	-0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	56	29	-	-	7.7	9.9	30	15	0.48	-	0.00	2.9
75.63	115.3	60.5	159.2	4.1	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	58	30	-	-	8.0	9.9	29	15	0.38	-	0.00	2.0
75.79	117.3	61.5	165.0	4.4	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.1	9.9	30	15	0.00	-	0.00	0.0
75.96	118.5	62.1	161.5	4.3	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	59	31	-	-	8.2	9.9	29	15	0.00	-	0.00	0.0
76.12	112.9	59.1	160.0	4.1	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	56	30	-	-	7.8	9.9	30	15	0.36	-	0.00	1.8
76.28	106.2	40.1	-	3.9	-0.2	3.9	4	clayy SILT to silty CLAY	115	2.0	53	20	-	-	7.4	9.9	36	15	-	-	0.00	-
76.45	102.2	38.6	-	3.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	51	19	-	-	7.1	9.9	36	15	-	-	0.00	-
76.61	96.3	36.3	-	3.3	-0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	37	15	-	-	0.00	-
76.78	88.6	33.4	-	3.5	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	40	15	-	-	0.00	-
76.94	83.8	31.6	-	3.5	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	42	15	-	-	0.00	-
77.10	84.7	32.0	-	3.6	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	42	15	-	-	0.00	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(566)-45-5.cpt
CPT Date: 10/9/2011 10:38:59 PM
GW During Test: 5.5 ft

Sounding ID: CPT-11-229
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.15	Cycl SStn %
77.27	90.1	34.0	-	3.8	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	60	23	-	-	6.2	9.9	41	15	-	-	0.00	-
77.43	84.3	31.8	-	4.0	-0.3	5.1	3	silty CLAY to CLAY	115	1.5	56	21	-	-	5.8	9.9	44	15	-	-	0.00	-
77.60	89.1	33.6	-	3.7	-0.3	4.4	3	silty CLAY to CLAY	115	1.5	59	22	-	-	6.1	9.9	41	15	-	-	0.00	-
77.76	93.4	35.2	-	3.7	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	47	18	-	-	6.4	9.9	39	15	-	-	0.00	-
77.92	96.3	36.3	-	4.0	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	39	15	-	-	0.00	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
0.33	17.4	27.9	-	2.8	0.0	9.9	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	59	15	N/A	0.00	N/A	N/A
0.49	31.3	50.2	-	3.0	0.1	9.7	3	silty CLAY to CLAY	115	1.5	21	33	-	-	2.2	9.9	48	15	N/A	0.00	N/A	N/A
0.66	37.4	60.0	152.4	1.3	0.1	3.6	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	29	15	N/A	0.00	N/A	N/A
0.82	23.9	38.3	-	2.2	0.1	9.1	3	silty CLAY to CLAY	115	1.5	16	26	-	-	1.7	9.9	51	15	N/A	0.00	N/A	N/A
0.98	36.4	58.4	138.8	1.1	0.1	3.1	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	27	15	N/A	0.00	N/A	N/A
1.15	17.0	27.3	-	1.4	0.1	8.5	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	56	15	N/A	0.00	N/A	N/A
1.31	7.7	12.4	-	1.0	0.2	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.48	11.7	18.8	-	1.3	0.2	9.9	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.64	17.6	28.2	-	1.3	0.2	7.1	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	52	15	N/A	0.00	N/A	N/A
1.80	10.5	16.9	-	0.8	0.2	8.1	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	65	15	N/A	0.00	N/A	N/A
1.97	7.7	12.4	-	0.6	0.2	8.2	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	73	15	N/A	0.00	N/A	N/A
2.13	5.6	9.0	-	1.2	0.2	9.9	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	86	15	N/A	0.00	N/A	N/A
2.30	35.0	56.2	167.6	1.6	0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	33	15	N/A	0.00	N/A	N/A
2.46	103.9	166.6	201.2	1.8	0.1	1.7	6	clean SAND to silty SAND	125	5.0	21	33	84	48	-	-	11	16	N/A	0.00	N/A	N/A
2.62	84.7	135.8	176.1	1.5	0.1	1.8	6	clean SAND to silty SAND	125	5.0	17	27	77	48	-	-	13	16	N/A	0.00	N/A	N/A
2.79	74.2	119.1	163.9	1.4	0.1	1.9	5	silty SAND to sandy SILT	120	4.0	19	30	73	48	-	-	14	16	N/A	0.00	N/A	N/A
2.95	65.9	105.6	147.5	1.2	0.2	1.8	5	silty SAND to sandy SILT	120	4.0	16	26	69	47	-	-	15	16	N/A	0.00	N/A	N/A
3.12	59.6	95.6	155.3	1.4	0.2	2.4	5	silty SAND to sandy SILT	120	4.0	15	24	66	46	-	-	18	16	N/A	0.00	N/A	N/A
3.28	46.8	75.1	147.2	1.3	0.2	2.8	5	silty SAND to sandy SILT	120	4.0	12	19	58	45	-	-	23	16	0.18	-	0.33	0.7
3.45	59.5	95.5	150.1	1.3	0.2	2.2	5	silty SAND to sandy SILT	120	4.0	15	24	65	46	-	-	18	16	0.17	-	0.33	0.9
3.61	71.0	113.8	156.8	1.3	0.2	1.9	5	silty SAND to sandy SILT	120	4.0	18	28	71	47	-	-	14	16	0.13	-	0.33	0.9
3.77	67.5	108.2	144.2	1.1	0.2	1.6	5	silty SAND to sandy SILT	120	4.0	17	27	70	46	-	-	14	16	0.26	-	0.33	1.6
3.94	79.9	128.1	168.2	1.4	0.2	1.8	5	silty SAND to sandy SILT	120	4.0	20	32	75	47	-	-	13	16	0.00	-	0.33	0.0
4.10	110.4	177.1	194.8	1.3	0.2	1.2	6	clean SAND to silty SAND	125	5.0	22	35	86	48	-	-	8	16	0.00	-	0.33	0.0
4.27	133.4	213.9	286.6	3.8	0.1	2.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	8.8	9.9	14	16	0.00	-	0.33	0.0
4.43	227.9	365.4	398.6	4.6	0.0	2.0	6	clean SAND to silty SAND	125	5.0	46	73	95	48	-	-	8	16	0.00	-	0.33	0.0
4.59	367.0	588.5	588.3	6.8	-0.2	1.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.3	9.9	5	16	0.00	-	0.33	0.0
4.76	500.5	802.6	802.6	4.5	-0.3	0.9	7	grvly SAND to dense SAND	130	6.0	83	100	95	48	-	-	5	16	0.00	-	0.33	0.0
4.92	551.0	883.7	883.7	5.0	-1.9	0.9	7	grvly SAND to dense SAND	130	6.0	92	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.09	525.2	842.3	842.3	6.5	-1.6	1.2	6	clean SAND to silty SAND	125	5.0	100	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.25	316.9	508.2	512.2	5.6	-1.4	1.8	6	clean SAND to silty SAND	125	5.0	63	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.41	336.8	540.1	540.1	4.7	-1.4	1.4	6	clean SAND to silty SAND	125	5.0	67	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.58	332.7	533.5	533.5	5.4	-1.5	1.6	6	clean SAND to silty SAND	125	5.0	67	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.74	346.7	556.0	556.0	4.9	-1.5	1.4	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
5.91	319.5	512.4	512.4	4.2	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	64	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.07	315.0	505.2	505.2	3.4	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	63	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.23	319.4	507.8	507.8	2.7	-1.4	0.9	6	clean SAND to silty SAND	125	5.0	64	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.40	331.1	519.4	519.4	3.2	-1.4	1.0	6	clean SAND to silty SAND	125	5.0	66	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.56	329.7	510.4	510.4	3.5	-1.7	1.1	6	clean SAND to silty SAND	125	5.0	66	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.73	339.1	518.3	518.3	3.3	-1.8	1.0	6	clean SAND to silty SAND	125	5.0	68	100	95	48	-	-	5	16	0.00	-	0.33	0.0
6.89	344.2	519.5	519.5	3.9	-1.8	1.1	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
7.05	346.8	517.0	517.0	3.9	-1.8	1.1	6	clean SAND to silty SAND	125	5.0	69	100	95	48	-	-	5	16	0.00	-	0.33	0.0
7.22	337.0	496.5	496.5	4.5	-1.8	1.3	6	clean SAND to silty SAND	125	5.0	67	99	95	48	-	-	5	16	0.00	-	0.33	0.0
7.38	331.9	483.2	483.2	4.5	-1.7	1.4	6	clean SAND to silty SAND	125	5.0	66	97	95	48	-	-	5	16	0.00	-	0.33	0.0
7.55	332.1	478.1	478.1	5.3	-1.7	1.6	6	clean SAND to silty SAND	125	5.0	66	96	95	48	-	-	5	16	0.00	-	0.33	0.0
7.71	340.5	484.7	484.7	5.0	-1.7	1.5	6	clean SAND to silty SAND	125	5.0	68	97	95	48	-	-	5	16	0.00	-	0.33	0.0
7.87	360.4	507.5	507.5	5.3	-1.7	1.5	6	clean SAND to silty SAND	125	5.0	72	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.04	359.8	501.4	501.4	5.6	-1.8	1.5	6	clean SAND to silty SAND	125	5.0	72	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.20	382.2	527.0	527.0	6.1	-1.8	1.6	6	clean SAND to silty SAND	125	5.0	76	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.37	411.6	561.8	561.8	7.2	-1.9	1.8	6	clean SAND to silty SAND	125	5.0	82	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.53	420.3	567.9	567.9	7.5	-2.0	1.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.8	9.9	5	16	0.00	-	0.33	0.0
8.69	426.6	571.2	571.2	6.7	-2.0	1.6	6	clean SAND to silty SAND	125	5.0	85	100	95	48	-	-	5	16	0.00	-	0.33	0.0
8.86	438.7	581.8	581.8	6.3	-1.9	1.4	6	clean SAND to silty SAND	125	5.0	88	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.02	450.6	591.9	591.9	6.6	-1.9	1.5	6	clean SAND to silty SAND	125	5.0	90	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.19	456.8	594.5	594.5	7.7	-1.9	1.7	6	clean SAND to silty SAND	125	5.0	91	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.35	421.6	543.7	553.7	8.0	-1.7	1.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.9	9.9	6	16	0.00	-	0.33	0.0
9.51	409.5	523.8	523.8	6.5	-1.6	1.6	6	clean SAND to silty SAND	125	5.0	82	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.68	424.4	538.1	538.1	4.7	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	85	100	95	48	-	-	5	16	0.00	-	0.33	0.0
9.84	431.4	542.2	542.2	4.6	-1.4	1.1	6	clean SAND to silty SAND	125	5.0	86	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.01	447.8	558.1	558.1	5.2	-1.2	1.2	6	clean SAND to silty SAND	125	5.0	90	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.17	442.0	546.3	546.3	6.8	-1.1	1.5	6	clean SAND to silty SAND	125	5.0	88	100	95	48	-	-	5	16	0.00	-	0.33	0.0
10.34	405.4	496.9	496.9	6.4	-1.2	1.6	6	clean SAND to silty SAND	125	5.0	81	99	95	48	-	-	5	16	0.00	-	0.33	0.0
10.50	385.6	468.9	468.9	5.6	-1.1	1.4	6	clean SAND to silty SAND	125	5.0	77	94	95	48	-	-	5	16	0.00	-	0.33	0.0
10.66	376.3	453.8	453.8	5.9	-1.0	1.6	6	clean SAND to silty SAND	125	5.0	75	91	95	48	-	-	5	16	0.00	-	0.33	0.0
10.83	355.3	425.2	443.9	6.6	-0.9	1.8	6	clean SAND to silty SAND	125	5.0	71	85	95	48	-	-	6	16	0.00	-	0.33	0.0
10.99	332.4	394.7	426.0	6.8	-0.8	2.0	6	clean SAND to silty SAND	125	5.0	66	79	95	48	-	-	7	16	0.00	-	0.33	0.0
11.16	322.8	380.5	399.0	5.7	-0.8	1.8	6	clean SAND to silty SAND	125	5.0	65	76	95	48	-	-	6	16	0.00	-	0.33	0.0
11.32	340.7	398.6	415.7	6.0	-2.6	1.8	6	clean SAND to silty SAND	125	5.0	68	80	95	48	-	-	6	16	0.00	-	0.33	0.0
11.48	395.6	459.3	459.3	6.2	-2.4	1.6	6	clean SAND to silty SAND	125	5.0	79	92	95	48	-	-	5	16	0.00	-	0.33	0.0
11.65	378.4	436.3	453.6	7.0	-2.7	1.8	6	clean SAND to silty SAND	125	5.0	76	87	95	48	-	-	6	16	0.00	-	0.33	0.0
11.81	401.5	459.5	467.1	7.0	-2.8	1.7	6	clean SAND to silty SAND	125	5.0	80	92	95	48	-	-	6	16	0.00	-	0.33	0.0
11.98	417.3	474.3	482.8	7.4	-2.7	1.8	6	clean SAND to silty SAND	125	5.0	83	95	95	48	-	-	6	16	0.00	-	0.33	0.0
12.14	430.4	485.7	492.8	7.6	-2.5	1.8	6	clean SAND to silty SAND	125	5.0	86	97	95	48	-	-	5	16	0.00	-	0.33	0.0
12.30	429.3	481.2	487.5	7.5	-2.4	1.8	6	clean SAND to silty SAND	125	5.0	86	96	95	48	-	-	5	16	0.00	-	0.33	0.0
12.47	423.7	471.7	495.8	8.5	-2.5	2.0	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	28.0	9.9	6	16	0.00	-	0.33	0.0
12.63	416.3	460.6	487.4	8.5	-2.4	2.0	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.5	9.9	7	16	0.00	-	0.33	0.0
12.80	417.4	459.0	473.3	7.7	-2.4	1.8	6	clean SAND to silty SAND	125	5.0	83	92	95	48	-	-	6	16	0.00	-	0.33	0.0
12.96	452.5	494.4	494.4	5.0	-2.7	1.1	6	clean SAND to silty SAND	125	5.0	91	99	95	48	-	-	5	16	0.00	-	0.33	0.0
13.12	470.3	510.5	510.5	5.9	-2.0	1.3	6	clean SAND to silty SAND	125	5.0	94	100	95	48	-	-	5	16	0.00	-	0.33	0.0
13.29	435.1	469.4	472.0	7.3	-1.8	1.7	6	clean SAND to silty SAND	125	5.0	87	94	95	48	-	-	5	16	0.00	-	0.33	0.0
13.45	431.4	462.4	483.8	8.4	-2.1	2.0	6	clean SAND to silty SAND	125	5.0	86	92	95	48	-	-	6	16	0.00	-	0.33	0.0
13.62	427.0	454.9	475.9	8.3	-1.9	1.9	6	clean SAND to silty SAND	125	5.0	85	91	95	48	-	-	6	16	0.00	-	0.33	0.0
13.78	419.5	444.2	467.7	8.2	-1.9	2.0	6	clean SAND to silty SAND	125	5.0	84	89	95	48	-	-	7	16	0.00	-	0.33	0.0
13.94	413.9	435.6	463.1	8.4	-1.8	2.0	6	clean SAND to silty SAND	125	5.0	83	87	95	48	-	-	7	16	0.00	-	0.33	0.0
14.11	401.7	420.2	449.5	8.1	-1.8	2.0	6	clean SAND to silty SAND	125	5.0	80	84	95	48	-	-	7	16	0.00	-	0.33	0.0
14.27	403.1	419.2	448.9	8.2	-1.7	2.0	6	clean SAND to silty SAND	125	5.0	81	84	95	48	-	-	7	16	0.00	-	0.33	0.0
14.44	407.4	421.2	441.5	7.6	-1.7	1.9	6	clean SAND to silty SAND	125	5.0	81	84	95	48	-	-	6	16	0.00	-	0.33	0.0
14.60	402.9	414.2	443.6	8.1	-1.7	2.0	6	clean SAND to silty SAND	125	5.0	81	83	95	48	-	-	7	16	0.00	-	0.33	0.0
14.76	374.7	382.9	427.3	8.6	-3.1	2.3	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.8	9.9	8	16	0.00	-	0.33	0.0
14.93	414.1	421.1	421.1	5.5	-3.1	1.3	6	clean SAND to silty SAND	125	5.0	83	84	95	48	-	-	5	16	0.00	-	0.33	0.0
15.09	481.0	486.3	486.3	3.5	-3.1	0.7	6	clean SAND to silty SAND	125	5.0	96	97	95	48	-	-	5	16	0.00	-	0.33	0.0
15.26	530.5	533.4	533.4	4.7	-3.3	0.9	6	clean SAND to silty SAND	125	5.0	100	100	95	48	-	-	5	16	0.00	-	0.33	0.0
15.42	448.7	448.7	448.7	5.5	-2.5	1.2	6	clean SAND to silty SAND	125	5.0	90	90	95	48	-	-	5	16	0.00	-	0.33	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
15.58	421.5	419.2	430.6	7.2	-3.2	1.7	6	clean SAND to silty SAND	125	5.0	84	84	95	48	-	-	6	16	0.00	-	0.33	0.0
15.75	338.1	334.5	375.2	7.3	-3.2	2.2	6	clean SAND to silty SAND	125	5.0	68	67	95	48	-	-	9	16	0.00	-	0.33	0.0
15.91	217.9	214.4	281.8	5.9	-2.1	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	14.4	9.9	13	16	0.00	-	0.33	0.0
16.08	129.0	126.4	223.7	4.6	-1.9	3.6	5	silty SAND to sandy SILT	120	4.0	32	32	75	45	-	-	20	16	0.00	-	0.33	0.0
16.24	67.4	65.7	170.0	2.6	-1.8	4.0	4	clayy SILT to silty CLAY	115	2.0	34	33	-	-	4.7	9.9	29	15	0.00	-	0.33	0.0
16.40	39.7	39.6	-	1.5	-1.9	3.8	4	clayy SILT to silty CLAY	115	2.0	20	20	-	-	2.8	9.9	36	15	-	-	0.33	-
16.57	50.5	48.8	92.2	0.8	-2.7	1.6	5	silty SAND to sandy SILT	120	4.0	13	12	43	40	-	-	22	16	2.50	-	0.33	45.6
16.73	52.9	50.8	100.3	0.9	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	13	13	45	40	-	-	23	16	2.33	-	0.33	43.3
16.90	58.9	56.3	106.2	1.1	-2.7	1.9	5	silty SAND to sandy SILT	120	4.0	15	14	48	40	-	-	22	16	2.22	-	0.32	37.4
17.06	60.7	57.7	112.3	1.2	-2.9	2.0	5	silty SAND to sandy SILT	120	4.0	15	14	49	41	-	-	22	16	2.12	-	0.32	36.0
17.23	62.9	59.6	118.0	1.4	-3.0	2.2	5	silty SAND to sandy SILT	120	4.0	16	15	50	41	-	-	23	16	2.04	-	0.32	34.3
17.39	65.2	61.4	128.2	1.6	-3.0	2.5	5	silty SAND to sandy SILT	120	4.0	16	15	51	41	-	-	24	16	1.83	-	0.31	33.1
17.55	66.1	62.0	142.4	2.0	-3.1	3.0	4	clayy SILT to silty CLAY	115	2.0	33	31	-	-	4.6	9.9	26	15	1.19	-	0.31	15.6
17.72	65.2	60.9	146.6	2.1	-3.4	3.3	4	clayy SILT to silty CLAY	115	2.0	33	30	-	-	4.6	9.9	27	15	1.00	-	0.31	10.7
17.88	72.5	67.5	126.8	1.6	-3.5	2.3	5	silty SAND to sandy SILT	120	4.0	18	17	54	41	-	-	22	16	1.89	-	0.31	29.5
18.05	68.8	63.8	118.7	1.4	-3.4	2.1	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	21	16	2.03	-	0.30	31.7
18.21	68.0	62.7	133.9	1.8	-3.3	2.7	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	25	16	1.64	-	0.30	31.6
18.37	62.9	57.7	141.7	2.0	-3.4	3.2	4	clayy SILT to silty CLAY	115	2.0	31	29	-	-	4.4	9.9	28	15	1.26	-	0.30	23.3
18.54	69.9	63.9	133.8	1.8	-3.3	2.6	5	silty SAND to sandy SILT	120	4.0	17	16	52	41	-	-	24	16	1.65	-	0.30	30.7
18.70	71.7	65.3	133.8	1.8	-3.3	2.6	5	silty SAND to sandy SILT	120	4.0	18	16	53	41	-	-	24	16	1.66	-	0.29	29.7
18.87	76.7	69.5	135.5	1.9	-3.3	2.5	5	silty SAND to sandy SILT	120	4.0	19	17	55	41	-	-	23	16	1.59	-	0.29	25.7
19.03	79.5	71.9	137.5	2.0	-3.2	2.5	5	silty SAND to sandy SILT	120	4.0	20	18	56	41	-	-	22	16	1.50	-	0.29	22.4
19.19	78.2	70.6	138.1	2.0	-3.2	2.6	5	silty SAND to sandy SILT	120	4.0	20	18	55	41	-	-	23	16	1.47	-	0.28	22.3
19.36	76.2	68.7	136.5	1.9	-3.2	2.6	5	silty SAND to sandy SILT	120	4.0	19	17	55	41	-	-	23	16	1.56	-	0.28	26.0
19.52	72.0	64.8	138.4	2.0	-3.2	2.8	5	silty SAND to sandy SILT	120	4.0	18	16	53	41	-	-	25	16	1.47	-	0.28	27.1
19.69	68.7	61.6	137.1	1.9	-3.1	2.9	5	silty SAND to sandy SILT	120	4.0	17	15	51	41	-	-	26	16	1.53	-	0.28	32.3
19.85	66.2	59.2	134.6	1.8	-3.1	2.8	5	silty SAND to sandy SILT	120	4.0	17	15	50	40	-	-	26	16	1.65	-	0.27	34.6
20.01	64.4	57.5	130.9	1.7	-3.1	2.8	5	silty SAND to sandy SILT	120	4.0	16	14	49	40	-	-	26	16	1.79	-	0.27	36.3
20.18	62.8	56.0	128.6	1.7	-3.1	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	48	40	-	-	26	16	1.87	-	0.27	37.8
20.34	62.3	55.5	127.2	1.7	-3.1	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	48	40	-	-	26	16	1.91	-	0.27	38.3
20.51	62.5	55.5	133.0	1.8	-3.1	2.9	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.72	-	0.26	38.2
20.67	61.4	54.4	136.1	1.9	-3.1	3.1	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.3	9.9	28	15	1.60	-	0.26	39.3
20.83	63.3	56.0	135.3	1.9	-2.7	3.0	4	clayy SILT to silty CLAY	115	2.0	32	28	-	-	4.4	9.9	27	15	1.63	-	0.26	37.7
21.00	62.8	55.5	133.2	1.8	-2.6	2.9	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.72	-	0.25	38.2
21.16	63.0	55.5	134.5	1.8	-2.6	3.0	4	clayy SILT to silty CLAY	115	2.0	31	28	-	-	4.4	9.9	27	15	1.67	-	0.25	38.3
21.33	61.2	53.8	137.3	1.9	-2.6	3.2	4	clayy SILT to silty CLAY	115	2.0	31	27	-	-	4.3	9.9	29	15	1.56	-	0.25	40.0
21.49	57.2	50.2	136.9	1.9	-2.6	3.3	4	clayy SILT to silty CLAY	115	2.0	29	25	-	-	4.0	9.9	30	15	1.57	-	0.25	43.9
21.65	65.2	57.2	135.8	1.9	-2.6	3.0	4	clayy SILT to silty CLAY	115	2.0	33	29	-	-	4.6	9.9	27	15	1.63	-	0.24	36.5
21.82	66.7	58.4	133.9	1.9	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	17	15	49	40	-	-	26	16	1.70	-	0.24	35.3
21.98	68.9	60.2	136.1	1.9	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	17	15	50	40	-	-	26	16	1.62	-	0.24	33.7
22.15	70.1	61.1	135.9	1.9	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	26	16	1.63	-	0.24	33.0
22.31	70.9	61.8	137.2	2.0	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	25	16	1.58	-	0.23	32.3
22.47	71.2	61.9	138.0	2.0	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	18	15	51	40	-	-	26	16	1.55	-	0.23	32.1
22.64	73.3	63.6	136.3	2.0	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	18	16	52	40	-	-	25	16	1.63	-	0.23	31.1
22.80	74.3	64.3	138.4	2.0	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	19	16	52	40	-	-	25	16	1.54	-	0.23	29.9
22.97	75.1	64.9	140.8	2.1	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	19	16	53	40	-	-	25	16	1.43	-	0.22	26.7
23.13	77.1	66.5	140.6	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	19	17	54	40	-	-	24	16	1.44	-	0.22	26.1
23.30	78.1	67.2	140.7	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	24	16	1.44	-	0.22	25.6
23.46	78.6	67.5	140.5	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	24	16	1.45	-	0.22	26.0
23.62	78.7	67.5	152.5	2.5	-2.6	3.2	4	clayy SILT to silty CLAY	115	2.0	39	34	-	-	5.5	9.9	26	15	0.90	-	0.21	8.4
23.79	79.5	68.1	146.9	2.3	-2.6	3.0	5	silty SAND to sandy SILT	120	4.0	20	17	54	41	-	-	25	16	1.16	-	0.21	14.2
23.95	79.8	68.2	142.4	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.37	-	0.21	21.7
24.12	77.6	66.2	142.0	2.2	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	19	17	53	40	-	-	25	16	1.39	-	0.21	24.3
24.28	78.2	66.6	141.0	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.44	-	0.21	26.8
24.44	78.5	66.8	140.2	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.48	-	0.20	27.4
24.61	79.0	67.0	140.1	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.20	27.3
24.77	79.1	67.0	140.7	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.47	-	0.20	27.1
24.94	79.0	66.8	140.3	2.1	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.20	27.5
25.10	80.4	67.9	138.7	2.1	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.57	-	0.19	27.5
25.26	80.8	68.1	138.8	2.1	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.56	-	0.19	27.2
25.43	79.3	66.7	140.4	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.19	27.6
25.59	79.9	67.1	140.7	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.48	-	0.19	27.2
25.76	80.6	67.5	140.6	2.2	-2.5	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.49	-	0.18	26.9
25.92	79.6	66.6	139.8	2.1	-2.5	2.8	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.53	-	0.18	28.1
26.08	80.8	67.5	140.0	2.2	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.52	-	0.18	27.3
26.25	79.8	66.5	137.7	2.1	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.62	-	0.18	29.2
26.41	80.9	67.3	143.7	2.3	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	25	16	1.35	-	0.17	22.3
26.58	79.1	65.7	142.8	2.2	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	16	53	40	-	-	25	16	1.39	-	0.17	25.6
26.74	79.7	66.1	143.5	2.3	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	20	17	53	40	-	-	25	16	1.36	-	0.17	23.9
26.90	77.8	64.4	141.9	2.2	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	19	16	52	40	-	-	25	16	1.44	-	0.17	29.7
27.07	77.5	64.1	145.7	2.3	-2.6	3.1	4	clayy SILT to silty CLAY	115	2.0	39	32	-	-	5.4	9.9	26	15	1.27	-	0.16	20.6
27.23	82.0	67.7	144.4	2.3	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	25	16	1.33	-	0.16	21.5
27.40	82.2	67.7	141.6	2.2	-2.6	2.8	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	24	16	1.46	-	0.16	26.6
27.56	82.0	67.4	138.7	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.59	-	0.16	28.4
27.72	81.6	67.0	138.6	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	20	17	54	40	-	-	24	16	1.60	-	0.15	28.8
27.89	82.8	67.9	139.8	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	54	40	-	-	24	16	1.55	-	0.15	27.5
28.05	84.3	69.0	138.5	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	23	16	1.61	-	0.15	27.7
28.22	84.8	69.3	140.2	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	23	16	1.54	-	0.15	26.4
28.38	84.6	69.0	140.6	2.2	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	21	17	55	40	-	-	24	16	1.53	-	0.14	26.4
28.54	87.1	70.9	140.5	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.53	-	0.14	25.1
28.71	87.7	71.3	139.8	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.57	-	0.14	25.4
28.87	87.1	70.7	137.9	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.65	-	0.14	27.5
29.04	86.6	70.2	137.1	2.1	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	23	16	1.68	-	0.13	28.0
29.20	86.3	69.8	139.0	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	17	55	40	-	-	23	16	1.61	-	0.13	27.1
29.36	87.8	70.9	139.7	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.58	-	0.13	25.9
29.53	89.1	71.8	137.0	2.2	-2.5	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.69	-	0.13	27.2
29.69	89.3	71.9	135.6	2.1	-2.5	2.4	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.75	-	0.12	27.1
29.86	89.0	71.5	147.6	2.5	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	24	16	1.23	-	0.12	16.0
30.02	89.0	71.4	142.1	2.3	-2.5	2.7	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.48	-	0.12	24.0
30.19	89.2	71.4	138.7	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.63	-	0.12	26.8
30.35	89.3	71.4	138.9	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.62	-	0.11	26.6
30.51	87.5	69.8	137.2	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	17	55	40	-	-	23	16	1.69	-	0.11	28.2
30.68	88.2	70.3	135.5	2.1	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	22	16	1.75	-	0.11	28.0
30.84	88.6	70.5	134.1	2.1	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	22	18	55	40	-	-	22	16	1.80	-	0.11	27.9

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(554)-19.cpt
CPT Date: 10/7/2011 12:51:40 AM
GW During Test: 19 ft

Sounding ID: CPT-11-234
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.33	Cycl SStn %
31.01	89.7	71.2	136.2	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.72	-	0.10	27.5
31.17	89.6	71.1	137.4	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.68	-	0.10	27.6
31.33	89.6	71.0	137.6	2.2	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.67	-	0.10	27.6
31.50	89.7	70.9	138.8	2.2	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	23	16	1.62	-	0.09	26.9
31.66	91.1	71.9	141.9	2.4	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	23	18	56	40	-	-	23	16	1.49	-	0.09	23.7
31.83	92.5	72.9	144.2	2.4	-2.6	2.7	5	silty SAND to sandy SILT	120	4.0	23	18	57	40	-	-	23	16	1.39	-	0.09	20.6
31.99	96.0	75.6	140.6	2.3	-2.6	2.5	5	silty SAND to sandy SILT	120	4.0	24	19	58	40	-	-	21	16	1.55	-	0.09	22.5
32.15	94.3	74.1	137.5	2.2	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	24	19	57	40	-	-	21	16	1.68	-	0.08	26.0
32.32	92.9	72.9	137.0	2.2	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	23	18	57	40	-	-	22	16	1.70	-	0.08	26.6
32.48	81.8	64.1	134.6	2.1	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	20	16	52	39	-	-	24	16	1.77	-	0.08	31.5
32.65	94.3	73.8	130.4	2.0	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	24	18	57	40	-	-	20	16	1.88	-	0.08	26.2
32.81	99.0	77.3	125.8	1.8	-2.6	1.9	5	silty SAND to sandy SILT	120	4.0	25	19	59	40	-	-	18	16	1.94	-	0.07	24.4
32.97	101.5	79.1	148.8	2.6	-2.6	2.6	5	silty SAND to sandy SILT	120	4.0	25	20	59	40	-	-	22	16	1.19	-	0.07	11.4
33.14	102.5	79.8	140.2	2.3	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.57	-	0.07	20.5
33.30	104.0	80.9	126.5	1.8	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	18	16	1.93	-	0.06	22.7
33.47	115.7	89.8	134.8	2.1	-2.7	1.8	5	silty SAND to sandy SILT	120	4.0	29	22	63	41	-	-	17	16	1.79	-	0.06	19.3
33.63	103.8	80.5	139.8	2.3	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.59	-	0.06	20.6
33.79	97.0	75.1	125.7	1.9	-2.6	2.0	5	silty SAND to sandy SILT	120	4.0	24	19	58	40	-	-	19	16	1.94	-	0.06	25.5
33.96	100.3	77.5	131.3	2.0	-2.6	2.1	5	silty SAND to sandy SILT	120	4.0	25	19	59	40	-	-	19	16	1.87	-	0.05	24.3
34.12	95.9	74.0	137.5	2.3	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	24	19	57	40	-	-	21	16	1.67	-	0.05	26.0
34.29	85.7	66.0	145.7	2.5	-2.6	3.0	5	silty SAND to sandy SILT	120	4.0	21	17	53	39	-	-	25	16	1.30	-	0.05	21.6
34.45	75.9	58.4	140.7	2.3	-2.6	3.1	4	clayy SILT to silty CLAY	115	2.0	38	29	-	-	5.3	9.9	27	15	1.52	-	0.05	35.4
34.61	94.1	72.3	131.1	2.1	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	24	18	56	40	-	-	21	16	1.87	-	0.04	26.9
34.78	105.3	80.8	138.4	2.3	-2.6	2.2	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.65	-	0.04	22.7
34.94	104.3	79.9	142.0	2.4	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	26	20	60	40	-	-	20	16	1.50	-	0.04	18.0
35.11	108.8	83.3	145.2	2.5	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.36	-	0.03	13.4
35.27	108.0	82.5	144.1	2.5	-2.6	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.40	-	0.03	14.6
35.43	111.2	84.8	143.0	2.5	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	19	16	1.45	-	0.03	15.2
35.60	110.6	84.2	142.7	2.4	-2.6	2.3	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	19	16	1.47	-	0.03	15.6
35.76	110.9	84.4	140.4	2.4	-2.7	2.2	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	19	16	1.57	-	0.02	18.3
35.93	111.7	84.9	138.8	2.3	-2.6	2.1	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	19	16	1.63	-	0.02	20.3
36.09	112.0	84.9	148.0	2.7	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	28	21	62	40	-	-	20	16	1.23	-	0.02	10.7
36.26	109.1	82.6	145.9	2.6	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	20	16	1.32	-	0.02	12.8
36.42	110.5	83.6	146.3	2.6	-2.7	2.4	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	20	16	1.30	-	0.02	12.2
36.58	107.2	81.0	151.7	2.8	-2.7	2.7	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	22	16	1.06	-	0.01	8.7
36.75	109.4	82.5	157.6	3.0	-2.7	2.8	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	22	16	0.80	-	0.01	5.7
36.91	109.4	82.4	152.2	2.8	-2.7	2.6	5	silty SAND to sandy SILT	120	4.0	27	21	61	40	-	-	21	16	1.04	-	0.01	8.2
37.08	109.1	82.1	147.6	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	27	21	60	40	-	-	21	16	1.24	-	0.01	11.3
37.24	111.0	83.3	149.3	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	21	16	1.17	-	0.01	9.9
37.40	110.7	83.0	148.0	2.7	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	28	21	61	40	-	-	21	16	1.22	-	0.00	10.9
37.57	108.9	81.5	159.3	3.1	-2.7	2.9	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	23	16	0.74	-	0.00	5.1
37.73	109.2	81.6	155.0	3.0	-2.7	2.8	5	silty SAND to sandy SILT	120	4.0	27	20	60	40	-	-	22	16	0.91	-	0.00	6.8

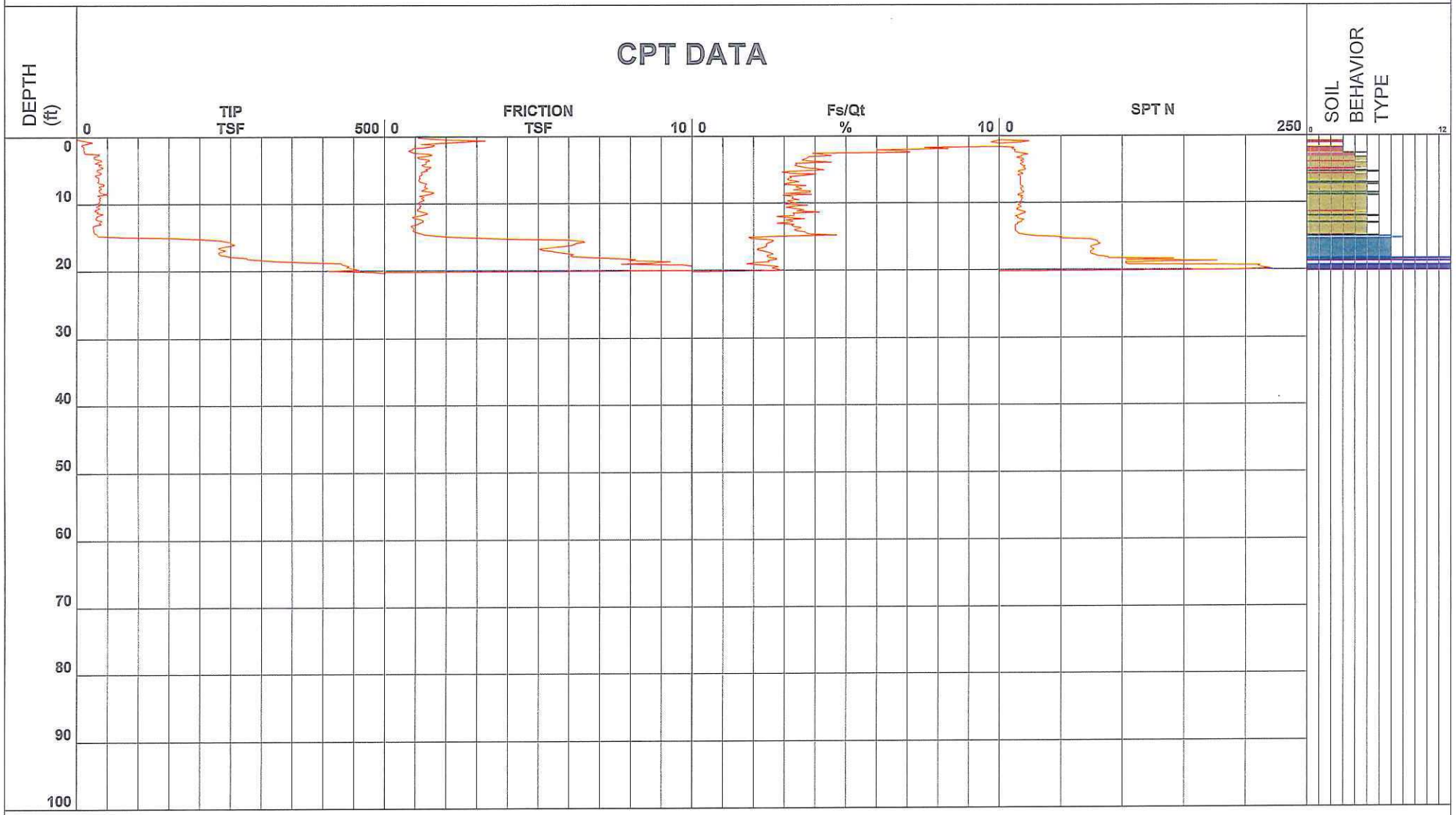
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JC	Filename	SDF(553).cpt
Job Number	11-136	Cone Number	DSG1023	GPS	
Hole Number	CPT-11-236	Date and Time	10/7/2011 12:08:14 AM	Maximum Depth	20.34 ft
Water Table Depth		>20.34 ft			

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(553).cpt
CPT Date: 10/7/2011 12:08:14 AM
GW During Test: No GW

Sounding ID: CPT-11-236
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.10	Cycl SStn %
0.33	1.1	1.6	-	1.5	0.0	9.9	2	Organic SOILS - Peats	100	1.0	1	2	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.49	7.1	11.4	-	2.2	0.1	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	79	15	N/A	0.00	N/A	N/A
0.66	15.9	25.5	-	3.3	0.1	9.9	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	60	15	N/A	0.00	N/A	N/A
0.82	25.5	40.9	-	2.5	0.2	9.9	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	52	15	N/A	0.00	N/A	N/A
0.98	18.3	29.4	-	1.8	0.2	9.8	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	57	15	N/A	0.00	N/A	N/A
1.15	9.5	15.3	-	1.2	0.2	9.9	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.7	9.9	72	15	N/A	0.00	N/A	N/A
1.31	7.7	12.3	-	1.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	77	15	N/A	0.00	N/A	N/A
1.48	11.5	18.5	-	1.6	0.3	9.9	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.64	12.0	19.2	-	1.3	0.3	9.9	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	67	15	N/A	0.00	N/A	N/A
1.80	12.3	19.7	-	0.9	1.2	7.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	60	15	N/A	0.00	N/A	N/A
1.97	10.9	17.6	-	0.9	1.2	8.4	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	65	15	N/A	0.00	N/A	N/A
2.13	13.2	21.2	-	0.8	1.2	6.1	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	54	15	N/A	0.00	N/A	N/A
2.30	12.4	19.9	-	0.9	1.2	7.0	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	59	15	N/A	0.00	N/A	N/A
2.46	13.9	22.3	-	1.0	0.9	7.2	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	57	15	N/A	0.00	N/A	N/A
2.62	36.9	59.1	159.7	1.4	0.5	3.9	4	clayy SILT to silty CLAY	115	2.0	18	30	-	-	2.6	9.9	30	15	N/A	0.00	N/A	N/A
2.79	36.2	58.1	166.5	1.5	0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	32	15	N/A	0.00	N/A	N/A
2.95	28.8	46.1	-	1.3	1.7	4.5	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	36	15	N/A	0.00	N/A	N/A
3.12	28.3	45.4	140.0	1.1	2.0	3.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	33	15	N/A	0.00	N/A	N/A
3.28	29.9	48.0	142.5	1.1	2.0	3.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	32	15	0.22	-	0.10	0.5
3.45	39.1	62.6	158.3	1.4	2.1	3.7	4	clayy SILT to silty CLAY	115	2.0	20	31	-	-	2.7	9.9	28	15	0.10	-	0.10	0.2
3.61	41.2	66.1	159.8	1.5	2.1	3.6	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	27	15	0.10	-	0.10	0.2
3.77	35.1	56.2	154.4	1.3	2.1	3.8	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	30	15	0.16	-	0.10	0.3
3.94	30.3	48.6	159.5	1.4	2.1	4.6	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	35	15	0.13	-	0.10	0.1
4.10	40.4	64.9	152.9	1.4	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	27	15	0.19	-	0.10	0.6
4.27	35.5	57.0	145.9	1.2	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	0.29	-	0.10	1.1
4.43	37.7	60.5	147.9	1.3	2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.7	9.9	28	15	0.27	-	0.10	1.1
4.59	42.9	68.9	161.7	1.5	2.0	3.5	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	27	15	0.00	-	0.10	0.0
4.76	39.6	63.4	160.0	1.5	2.0	3.7	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.16	-	0.10	0.4
4.92	33.1	53.1	155.7	1.3	2.1	4.1	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.3	9.9	32	15	0.20	-	0.10	0.5
5.09	32.8	52.5	160.4	1.4	1.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	33	15	0.00	-	0.10	0.0
5.25	36.0	57.7	149.1	1.3	1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	0.34	-	0.10	1.4
5.41	40.3	64.7	142.1	1.2	1.0	3.0	5	silty SAND to sandy SILT	120	4.0	10	16	53	43	-	-	25	16	0.56	-	0.10	3.3
5.58	38.3	61.4	145.6	1.2	1.0	3.2	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	27	15	0.46	-	0.10	2.5
5.74	30.2	48.5	149.5	1.2	1.0	4.1	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	33	15	0.37	-	0.10	1.3
5.91	31.3	50.2	143.4	1.1	0.9	3.7	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	31	15	0.58	-	0.09	3.1
6.07	35.8	57.5	140.7	1.1	0.9	3.2	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.73	-	0.09	11.0
6.23	36.1	57.8	142.8	1.2	0.9	3.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.65	-	0.09	9.4
6.40	35.9	57.6	140.1	1.1	0.9	3.2	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	28	15	0.82	-	0.09	11.7
6.56	35.7	56.6	138.5	1.1	0.8	3.1	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	28	15	0.93	-	0.09	15.4
6.73	34.5	54.0	141.1	1.2	0.8	3.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	29	15	0.81	-	0.09	21.3
6.89	35.8	55.5	146.3	1.2	0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	30	15	0.59	-	0.09	3.6
7.05	44.7	68.3	150.2	1.4	0.8	3.1	5	silty SAND to sandy SILT	120	4.0	11	17	54	43	-	-	25	16	0.47	-	0.09	2.7
7.22	44.1	66.6	146.5	1.3	0.8	3.0	5	silty SAND to sandy SILT	120	4.0	11	17	54	43	-	-	25	16	0.61	-	0.09	3.9
7.38	35.8	53.4	149.2	1.3	0.8	3.8	4	clayy SILT to silty CLAY	115	2.0	18	27	-	-	2.5	9.9	31	15	0.53	-	0.08	2.9
7.55	38.7	57.2	145.5	1.3	0.8	3.4	4	clayy SILT to silty CLAY	115	2.0	19	29	-	-	2.7	9.9	29	15	0.69	-	0.08	11.7
7.71	40.6	59.3	150.1	1.4	0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.8	9.9	29	15	0.53	-	0.08	3.2
7.87	36.4	52.6	144.9	1.3	0.8	3.6	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.5	9.9	31	15	0.75	-	0.08	24.8
8.04	36.7	52.5	138.5	1.2	0.8	3.3	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.6	9.9	30	15	1.10	-	0.08	28.5
8.20	38.3	54.3	153.0	1.5	0.8	3.9	4	clayy SILT to silty CLAY	115	2.0	19	27	-	-	2.7	9.9	31	15	0.47	-	0.08	2.4
8.37	41.7	58.4	158.6	1.6	0.8	3.9	4	clayy SILT to silty CLAY	115	2.0	21	29	-	-	2.9	9.9	30	15	0.34	-	0.08	1.6
8.53	49.7	69.0	149.7	1.5	0.7	3.1	5	silty SAND to sandy SILT	120	4.0	12	17	55	43	-	-	25	16	0.60	-	0.08	3.8
8.69	34.4	47.4	145.4	1.3	0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	17	24	-	-	2.4	9.9	33	15	0.80	-	0.08	40.8
8.86	38.2	52.1	130.4	1.1	0.7	3.0	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	28	15	1.60	-	0.08	40.9
9.02	39.7	53.6	139.2	1.3	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	20	27	-	-	2.8	9.9	29	15	1.15	-	0.07	26.9
9.19	36.4	48.6	134.3	1.2	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.5	9.9	31	15	1.41	-	0.07	42.1
9.35	39.1	51.9	136.8	1.3	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	20	26	-	-	2.7	9.9	30	15	1.29	-	0.07	33.5
9.51	37.3	49.0	138.9	1.3	0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.6	9.9	31	15	1.20	-	0.07	38.8
9.68	37.8	49.3	130.5	1.2	0.7	3.1	4	clayy SILT to silty CLAY	115	2.0	19	25	-	-	2.6	9.9	30	15	1.64	-	0.06	45.0
9.84	35.0	45.2	128.1	1.1	0.7	3.2	4	clayy SILT to silty CLAY	115	2.0	17	23	-	-	2.4	9.9	31	15	1.76	-	0.06	49.9
10.01	33.2	42.6	129.0	1.1	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	17	21	-	-	2.3	9.9	33	15	1.73	-	0.06	51.2
10.17	38.3	48.7	127.6	1.1	0.6	3.0	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	29	15	1.79	-	0.06	45.7
10.34	31.8	45.1	140.5	1.2	0.7	3.8	4	clayy SILT to silty CLAY	115	2.0	16	23	-	-	2.2	9.9	34	15	1.16	-	0.05	48.6
10.50	35.1	43.9	128.1	1.1	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.5	9.9	32	15	1.78	-	0.05	51.2
10.66	38.0	47.1	127.7	1.2	0.7	3.1	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	30	15	1.80	-	0.05	47.5
10.83	32.2	39.7	125.5	1.1	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.3	9.9	34	15	1.88	-	0.05	51.2
10.99	29.4	39.9	131.5	1.1	0.7	3.7	4	clayy SILT to silty CLAY	115	2.0	15	20	-	-	2.1	9.9	35	15	1.66	-	0.04	51.2
11.16	35.3	42.8	129.9	1.2	0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.5	9.9	33	15	1.73	-	0.04	51.2
11.32	32.8	43.5	-	1.4	0.7	4.2	4	clayy SILT to silty CLAY	115	2.0	16	22	-	-	2.3	9.9	36	15	-	-	0.04	-
11.48	42.8	51.2	137.0	1.4	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	21	26	-	-	3.0	9.9	30	15	1.39	-	0.03	37.8
11.65	37.8	44.9	131.0	1.3	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	32	15	1.70	-	0.03	50.3
11.81	32.9	38.8	123.4	1.1	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	16	19	-	-	2.3	9.9	34	15	1.96	-	0.03	51.2
11.98	33.3	39.0	112.0	0.9	0.6	2.8	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	32	15	2.13	-	0.03	51.2
12.14	30.9	35.9	114.7	0.9	0.6	3.1	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.2	9.9	34	15	2.09	-	0.02	51.2
12.30	32.1	40.3	132.3	1.2	0.6	3.7	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.2	9.9	35	15	1.66	-	0.02	51.2
12.47	41.4	47.5	127.6	1.3	0.6	3.1	4	clayy SILT to silty CLAY	115	2.0	21	24	-	-	2.9	9.9	30	15	1.84	-	0.02	47.1
12.63	38.5	43.9	128.9	1.3	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	32	15	1.80	-	0.01	51.2
12.80	36.8	41.7	124.8	1.2	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	18	21	-	-	2.6	9.9	33	15	1.94	-	0.01	51.2
12.96	39.9	44.9	118.8	1.1	0.6	2.8	4	clayy SILT to silty CLAY	115	2.0	20	22	-	-	2.8	9.9	30	15	2.03	-	0.01	50.2
13.12	30.8	36.9	121.4	1.0	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.1	9.9	35	15	1.99	-	0.00	51.2
13.29	27.1	35.6	-	0.9	0.7	3.3	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	35	15	-	-	0.00	-
13.45	26.9	34.8	-	0.9	0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	13	17	-	-	1.9	9.9	36	15	-	-	0.00	-
13.62	27.2	34.8	-	1.0	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	37	15	-	-	0.00	-
13.78	27.9	35.3	-	1.0	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	37	15	-	-	0.00	-
13.94	27.9	34.9	-	0.9	0.6	3.4	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	36	15	-	-	0.00	-
14.11	28.1	34.6	-	1.0	0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	1.9	9.9	37	15	-	-	0.00	-
14.27	29.1	35.5	-	1.1	0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.0	9.9	37	15	-	-	0.00	-
14.44	31.8	38.4	-	1.2	0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	16	19	-	-	2.2	9.9	36	15	-	-	0.00	-
14.60	33.7	40.1	-	1.3	0.6	3.9	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.00	-
14.76	34.6	40.8	-	1.6	0.6	4.8	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.4	9.9	39	15	-	-	0.00	-
14.93	77.4	81.2	152.8	2.1	0.5	2.7	5	silty SAND to sandy SILT	120	4.0	19	20	60	43	-	-	22	16	0.75	-	0.00	4.8
15.09	158.6	165.4	204.3	2.9	0.2	1.9	6	clean SAND to silty SAND	125	5.0	32	33	84	46	-	-	12	16	0.00	-	0.00	0.0
15.26	204.2	211.7	250.2	3.9	0.1	1.9	6	clean SAND to silty SAND	125	5.0	41	42	92	47	-	-	10	16	0.00	-	0.00	0.0
15.42	233.3	240.5	301.0	6.0	0.2	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	15.4	9.9	12	16	0.00	-	0.00	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(553).cpt
CPT Date: 10/7/2011 12:08:14 AM
GW During Test: No GW

Sounding ID: CPT-11-236
Project No: 11-136
Cone/Rig: DSG1023

Depth ft	qc PS tsf	qcln PS -	qIncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.10	Cycl SStn %
15.58	243.4	249.5	313.3	6.4	0.2	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.1	9.9	12	16	0.00	-	0.00	0.0
15.75	250.9	255.9	317.6	6.5	0.4	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.6	9.9	12	16	0.00	-	0.00	0.0
15.91	251.6	255.4	312.6	6.2	0.5	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	16.6	9.9	11	16	0.00	-	0.00	0.0
16.08	256.7	259.2	313.3	6.2	0.7	2.4	6	clean SAND to silty SAND	125	5.0	51	52	95	48	-	-	11	16	0.00	-	0.00	0.0
16.24	249.7	250.7	306.3	6.1	0.8	2.4	6	clean SAND to silty SAND	125	5.0	50	50	95	48	-	-	11	16	0.00	-	0.00	0.0
16.40	237.7	237.4	292.8	5.8	0.9	2.4	6	clean SAND to silty SAND	125	5.0	48	47	95	48	-	-	11	16	0.00	-	0.00	0.0
16.57	230.7	229.2	281.6	5.4	1.1	2.3	6	clean SAND to silty SAND	125	5.0	46	46	94	47	-	-	11	16	0.00	-	0.00	0.0
16.73	234.2	231.3	276.9	5.0	1.2	2.2	6	clean SAND to silty SAND	125	5.0	47	46	95	48	-	-	11	16	0.00	-	0.00	0.0
16.90	242.0	237.8	282.4	5.2	1.2	2.1	6	clean SAND to silty SAND	125	5.0	48	48	95	48	-	-	10	16	0.00	-	0.00	0.0
17.06	237.5	232.2	283.0	5.4	1.3	2.3	6	clean SAND to silty SAND	125	5.0	48	46	95	47	-	-	11	16	0.00	-	0.00	0.0
17.23	230.8	224.4	280.9	5.6	1.3	2.4	6	clean SAND to silty SAND	125	5.0	46	45	94	47	-	-	12	16	0.00	-	0.00	0.0
17.39	231.1	223.6	284.6	5.9	1.4	2.6	5	silty SAND to sandy SILT	120	4.0	58	56	94	47	-	-	12	16	0.00	-	0.00	0.0
17.55	233.9	225.2	289.1	6.2	1.4	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	15.5	9.9	13	16	0.00	-	0.00	0.0
17.72	244.2	234.1	291.8	6.1	1.4	2.5	6	clean SAND to silty SAND	125	5.0	49	47	95	47	-	-	12	16	0.00	-	0.00	0.0
17.88	250.5	238.9	295.0	6.1	1.4	2.4	6	clean SAND to silty SAND	125	5.0	50	48	95	48	-	-	12	16	0.00	-	0.00	0.0
18.05	275.6	261.6	318.6	6.8	-1.8	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	18.2	9.9	11	16	0.00	-	0.00	0.0
18.21	278.6	263.2	331.0	7.7	-1.8	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	18.4	9.9	12	16	0.00	-	0.00	0.0
18.37	297.3	279.6	347.1	8.2	-1.9	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	19.7	9.9	12	16	0.00	-	0.00	0.0
18.54	321.4	301.0	356.5	7.9	-2.1	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	21.3	9.9	10	16	0.00	-	0.00	0.0
18.70	369.4	344.5	400.7	9.3	-2.4	2.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	24.4	9.9	10	16	0.00	-	0.00	0.0
18.87	429.7	399.0	430.3	8.8	-2.5	2.0	6	clean SAND to silty SAND	125	5.0	86	80	95	48	-	-	7	16	0.00	-	0.00	0.0
19.03	431.7	398.9	416.9	7.7	-2.2	1.8	6	clean SAND to silty SAND	125	5.0	86	80	95	48	-	-	6	16	0.00	-	0.00	0.0
19.19	437.3	402.2	442.5	9.7	-2.2	2.2	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	28.9	9.9	8	16	0.00	-	0.00	0.0
19.36	442.8	405.6	466.7	11.7	-2.3	2.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.3	9.9	9	16	0.00	-	0.00	0.0
19.52	438.2	399.7	469.1	12.3	-2.3	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.0	9.9	10	16	0.00	-	0.00	0.0
19.69	447.8	406.7	465.4	11.6	-2.3	2.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	29.6	9.9	9	16	0.00	-	0.00	0.0
19.85	459.4	415.5	482.4	12.7	-2.3	2.8	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	30.4	9.9	10	16	0.00	-	0.00	0.0
20.01	409.7	369.1	442.8	11.9	-2.3	2.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	27.1	9.9	11	16	0.00	-	0.00	0.0

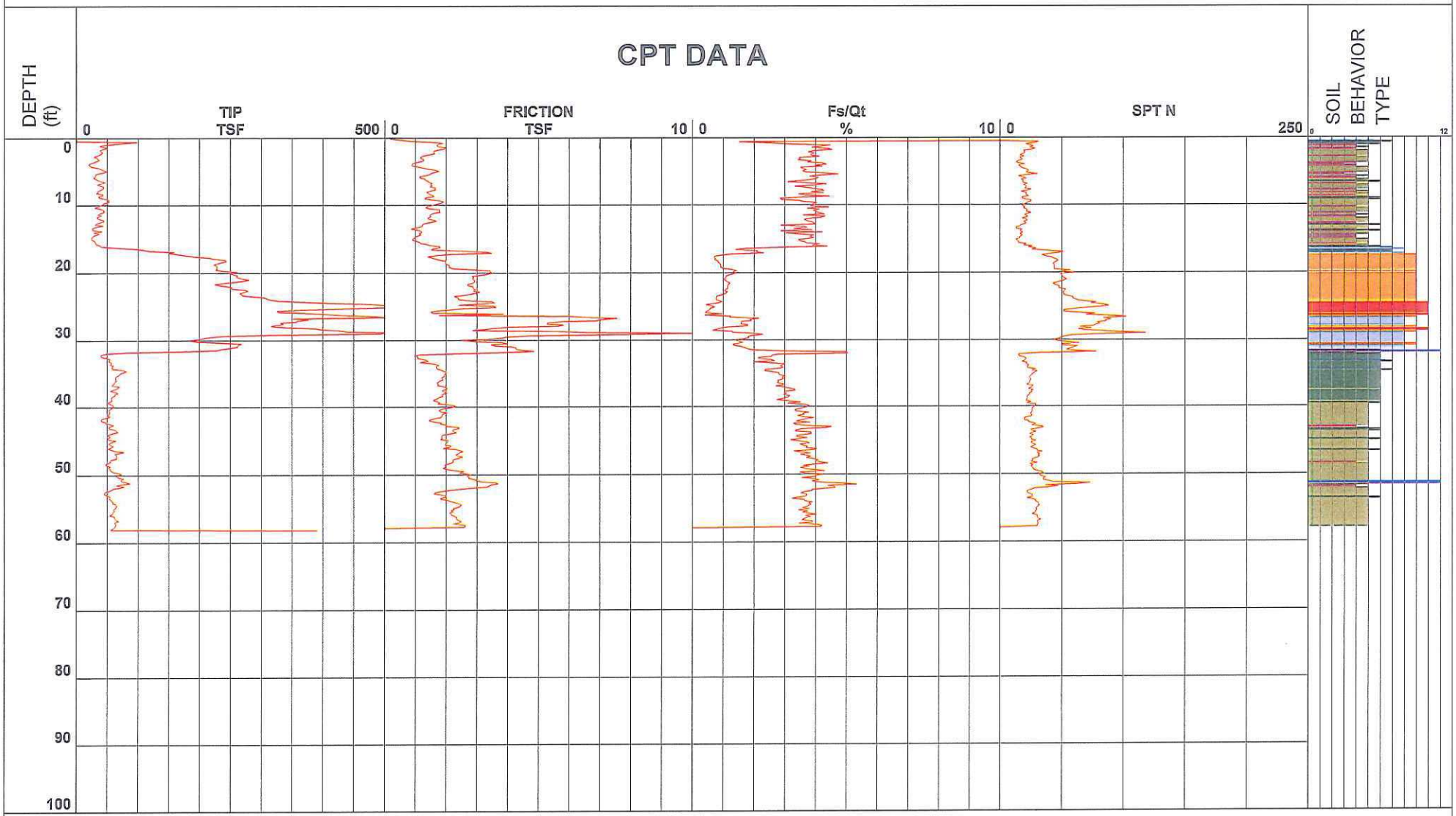
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Earth Mechanics

Location	I-5 HOV Widening Segment 2	Operator	BH-JB	Filename	SDF(535).cpt
Job Number	11-136	Cone Number	DSG1104	GPS	
Hole Number	CPT-11-245	Date and Time	9/28/2011 12:46:01 PM	Maximum Depth	58.23 ft
Water Table Depth		>58.23 ft			

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Depth Increment

*Soil behavior type and SPT based on data from UBC-1983

I-5 HOV Widening Segment 2

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
0.33	1.1	0.6	-	0.6	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.49	1.1	1.3	-	0.8	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	-	-	0.1	9.9	95	10	N/A	0.00	N/A	N/A
0.66	98.1	157.3	186.3	1.5	-0.1	1.5	6	clean SAND to silty SAND	125	5.0	20	31	82	48	-	-	10	16	N/A	0.00	N/A	N/A
0.82	73.6	118.1	182.9	1.9	-0.2	2.6	5	silty SAND to sandy SILT	120	4.0	18	30	72	48	-	-	17	16	N/A	0.00	N/A	N/A
0.98	54.0	86.6	171.3	1.7	-0.3	3.2	5	silty SAND to sandy SILT	120	4.0	14	22	62	48	-	-	23	16	N/A	0.00	N/A	N/A
1.15	38.1	61.2	174.8	1.7	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	31	15	N/A	0.00	N/A	N/A
1.31	41.8	67.1	176.2	1.8	-0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	29	15	N/A	0.00	N/A	N/A
1.48	51.1	81.9	185.0	2.0	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	26	15	N/A	0.00	N/A	N/A
1.64	43.9	70.4	185.5	1.9	-0.2	4.4	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	29	15	N/A	0.00	N/A	N/A
1.80	38.9	62.3	177.7	1.8	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	31	15	N/A	0.00	N/A	N/A
1.97	40.5	64.9	167.6	1.6	0.0	4.0	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.9	9.9	29	15	N/A	0.00	N/A	N/A
2.13	42.8	68.6	167.2	1.6	-0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	28	15	N/A	0.00	N/A	N/A
2.30	41.2	66.1	169.0	1.6	0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	29	15	N/A	0.00	N/A	N/A
2.46	38.3	61.5	160.6	1.5	0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	29	15	N/A	0.00	N/A	N/A
2.62	33.9	54.4	152.4	1.3	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	31	15	N/A	0.00	N/A	N/A
2.79	29.1	46.7	147.9	1.2	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	15	23	-	-	2.0	9.9	34	15	N/A	0.00	N/A	N/A
2.95	33.6	53.9	142.9	1.2	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	30	15	N/A	0.00	N/A	N/A
3.12	35.6	57.1	148.0	1.3	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	29	15	N/A	0.00	N/A	N/A
3.28	37.4	60.0	149.3	1.3	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	28	15	0.17	-	0.10	0.4
3.45	32.2	51.7	149.0	1.2	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	32	15	0.18	-	0.10	0.3
3.61	28.1	45.0	138.0	1.0	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	14	22	-	-	2.0	9.9	33	15	0.37	-	0.10	1.0
3.77	22.2	35.6	-	0.9	0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	39	15	-	-	0.10	-
3.94	20.5	32.8	-	0.9	0.1	4.4	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	41	15	-	-	0.10	-
4.10	22.9	36.6	-	0.9	0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	37	15	-	-	0.10	-
4.27	25.2	40.3	-	1.1	0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.8	9.9	37	15	-	-	0.10	-
4.43	35.4	56.7	147.8	1.2	0.1	3.5	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	29	15	0.27	-	0.10	1.0
4.59	39.7	63.7	157.3	1.4	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.17	-	0.10	0.5
4.76	44.9	72.0	169.8	1.7	0.0	3.7	4	clayy SILT to silty CLAY	115	2.0	22	36	-	-	3.2	9.9	27	15	0.00	-	0.10	0.0
4.92	49.0	78.6	174.1	1.8	-0.1	3.6	4	clayy SILT to silty CLAY	115	2.0	24	39	-	-	3.4	9.9	25	15	0.00	-	0.10	0.0
5.09	44.1	70.7	168.1	1.6	0.0	3.7	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	27	15	0.00	-	0.10	0.0
5.25	35.7	57.2	165.5	1.5	0.1	4.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	32	15	0.00	-	0.10	0.0
5.41	31.2	50.0	166.2	1.5	0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	35	15	0.00	-	0.10	0.0
5.58	31.8	51.0	156.0	1.3	0.0	4.2	4	clayy SILT to silty CLAY	115	2.0	16	25	-	-	2.2	9.9	33	15	0.23	-	0.10	0.7
5.74	30.4	48.8	145.2	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	15	24	-	-	2.1	9.9	32	15	0.50	-	0.10	2.3
5.91	28.4	45.5	147.0	1.2	0.0	4.1	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	35	15	0.45	-	0.10	1.8
6.07	32.5	52.1	154.5	1.3	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	16	26	-	-	2.3	9.9	32	15	0.29	-	0.10	1.0
6.23	34.9	55.9	154.8	1.3	0.0	3.9	4	clayy SILT to silty CLAY	115	2.0	17	28	-	-	2.4	9.9	31	15	0.29	-	0.10	1.2
6.40	39.8	63.9	156.4	1.4	0.0	3.5	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.8	9.9	28	15	0.28	-	0.10	1.2
6.56	46.9	74.4	156.7	1.5	0.0	3.1	5	silty SAND to sandy SILT	120	4.0	12	19	57	43	-	-	24	16	0.28	-	0.10	1.4
6.73	40.7	63.7	164.1	1.6	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	20	32	-	-	2.9	9.9	29	15	0.00	-	0.10	0.0
6.89	34.5	53.3	163.0	1.5	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	17	27	-	-	2.4	9.9	33	15	0.00	-	0.10	0.0
7.05	39.6	60.5	162.7	1.6	-0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	20	30	-	-	2.8	9.9	30	15	0.00	-	0.10	0.0
7.22	44.7	67.5	155.7	1.5	-0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	22	34	-	-	3.1	9.9	26	15	0.34	-	0.10	1.7
7.38	44.3	66.1	165.1	1.7	-0.2	3.8	4	clayy SILT to silty CLAY	115	2.0	22	33	-	-	3.1	9.9	28	15	0.00	-	0.10	0.0
7.55	41.9	62.0	164.3	1.6	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	21	31	-	-	2.9	9.9	30	15	0.00	-	0.10	0.0
7.71	39.5	57.8	165.9	1.7	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	20	29	-	-	2.8	9.9	32	15	0.00	-	0.10	0.0
7.87	35.1	50.8	158.5	1.5	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	34	15	0.31	-	0.10	1.1
8.04	35.8	51.2	149.6	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	18	26	-	-	2.5	9.9	32	15	0.57	-	0.10	3.2
8.20	33.0	46.7	152.5	1.4	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	16	23	-	-	2.3	9.9	35	15	0.48	-	0.09	2.2
8.37	43.1	60.5	151.3	1.5	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	22	30	-	-	3.0	9.9	28	15	0.53	-	0.09	3.3
8.53	43.2	60.0	155.7	1.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	22	30	-	-	3.0	9.9	29	15	0.41	-	0.09	2.2
8.69	36.2	49.9	161.0	1.6	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	18	25	-	-	2.5	9.9	35	15	0.00	-	0.09	0.0
8.86	38.1	52.0	144.2	1.4	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	19	26	-	-	2.7	9.9	31	15	0.88	-	0.09	27.6
9.02	46.1	62.2	138.1	1.3	-0.2	2.9	5	silty SAND to sandy SILT	120	4.0	12	16	51	42	-	-	25	16	1.21	-	0.09	14.0
9.19	53.6	71.7	148.6	1.5	-0.4	2.9	5	silty SAND to sandy SILT	120	4.0	13	18	56	43	-	-	24	16	0.69	-	0.09	4.5
9.35	52.5	69.7	161.6	1.8	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	26	35	-	-	3.7	9.9	26	15	0.00	-	0.09	0.0
9.51	53.2	69.9	166.2	1.9	-0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	27	35	-	-	3.7	9.9	27	15	0.00	-	0.09	0.0
9.68	45.6	59.4	164.4	1.8	-0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	23	30	-	-	3.2	9.9	31	15	0.00	-	0.09	0.0
9.84	43.8	56.7	157.5	1.7	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	22	28	-	-	3.1	9.9	31	15	0.42	-	0.09	2.2
10.01	40.1	51.4	152.7	1.6	-0.2	4.0	4	clayy SILT to silty CLAY	115	2.0	20	26	-	-	2.8	9.9	32	15	0.57	-	0.09	3.4
10.17	37.0	47.0	144.2	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	18	24	-	-	2.6	9.9	33	15	0.97	-	0.09	42.5
10.34	30.6	43.3	-	1.3	-0.3	4.5	4	clayy SILT to silty CLAY	115	2.0	15	22	-	-	2.1	9.9	37	15	-	-	0.08	-
10.50	39.1	48.9	144.6	1.5	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	20	24	-	-	2.7	9.9	32	15	0.96	-	0.08	37.0
10.66	43.4	53.9	159.6	1.8	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	22	27	-	-	3.0	9.9	32	15	0.39	-	0.08	1.9
10.83	45.8	56.5	158.0	1.8	-0.4	4.0	4	clayy SILT to silty CLAY	115	2.0	23	28	-	-	3.2	9.9	31	15	0.44	-	0.08	2.4
10.99	44.8	54.8	158.6	1.8	-0.4	4.1	4	clayy SILT to silty CLAY	115	2.0	22	27	-	-	3.1	9.9	32	15	0.43	-	0.08	2.3
11.16	38.9	47.3	150.8	1.6	-0.3	4.2	4	clayy SILT to silty CLAY	115	2.0	19	24	-	-	2.7	9.9	34	15	0.71	-	0.08	40.9
11.32	35.1	46.7	153.7	1.5	-0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	0.59	-	0.08	3.5
11.48	41.4	49.5	142.4	1.5	-0.4	3.7	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	2.9	9.9	32	15	1.12	-	0.08	37.0
11.65	35.2	45.8	-	1.5	-0.4	4.4	4	clayy SILT to silty CLAY	115	2.0	18	23	-	-	2.5	9.9	35	15	-	-	0.08	-
11.81	33.9	43.7	-	1.4	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	17	22	-	-	2.4	9.9	36	15	-	-	0.07	-
11.98	37.3	43.7	139.8	1.4	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.6	9.9	34	15	1.27	-	0.07	51.2
12.14	44.3	51.5	145.6	1.6	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	22	26	-	-	3.1	9.9	31	15	0.99	-	0.07	30.6
12.30	45.3	52.4	148.7	1.7	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	23	26	-	-	3.2	9.9	31	15	0.85	-	0.07	26.7
12.47	38.8	44.5	142.0	1.5	-0.3	3.9	4	clayy SILT to silty CLAY	115	2.0	19	22	-	-	2.7	9.9	34	15	1.18	-	0.07	50.3
12.63	33.2	40.9	-	1.3	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.3	9.9	36	15	-	-	0.07	-
12.80	31.0	42.2	-	1.2	-0.2	4.1	4	clayy SILT to silty CLAY	115	2.0	16	21	-	-	2.2	9.9	36	15	-	-	0.06	-
12.96	43.4	48.9	125.4	1.2	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	22	24	-	-	3.0	9.9	29	15	1.92	-	0.06	45.5
13.12	32.8	39.2	-	1.2	-0.3	3.7	4	clayy SILT to silty CLAY	115	2.0	16	20	-	-	2.3	9.9	35	15	-	-	0.06	-
13.29	27.3	35.8	-	1.0	-0.3	3.8	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	37	15	-	-	0.06	-
13.45	26.6	34.4	-	0.9	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	13	17	-	-	1.8	9.9	36	15	-	-	0.06	-
13.62	28.1	36.0	-	1.1	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	2.0	9.9	38	15	-	-	0.06	-
13.78	41.8	45.7	122.0	1.2	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	21	23	-	-	2.9	9.9	30	15	1.99	-	0.06	49.3
13.94	28.9	36.1	-	1.2	-0.3	4.3	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	2.0	9.9	39	15	-	-	0.05	-
14.11	37.1	40.0	119.4	1.1	-0.1	3.1	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.6	9.9	33	15	2.02	-	0.05	51.2
14.27	33.6	38.0	-	1.2	-0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	35	15	-	-	0.05	-
14.44	28.8	34.7	-	1.1	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	14	17	-	-	2.0	9.9	39	15	-	-	0.05	-
14.60	26.6	31.7	-	1.0	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	13	16	-	-	1.8	9.9	40	15	-	-	0.05	-
14.76	24.8	29.2	-	1.0	-0.1	4.1	4	clayy SILT to silty CLAY	115	2.0	12	15	-	-	1.7	9.9	42	15	-	-	0.05	-
14.93	24.7	28.8	-	0.9	-0.1	3.9	4	clayy SILT to silty CLAY	115	2.0	12	14	-	-	1.7	9.9	41	15	-	-	0.05	-
15.09	26.4	30.5	-	0.9	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	13	15	-	-	1.8	9.9	39	15	-	-	0.05	-
15.26	30.1	34.3	-	1.0	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	15	17	-	-	2.1	9.9	37	15	-	-	0.05	-
15.42	31.5	35.5	-	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	18	-	-	2.2	9.9	37	15	-	-	0.05	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
15.58	31.9	35.6	-	1.2	0.0	3.8	4	clayy SILT to silty CLAY	115	2.0	16	18	-	-	2.2	9.9	37	15	-	-	0.05	-
15.75	33.5	37.0	-	1.4	0.0	4.3	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.3	9.9	38	15	-	-	0.05	-
15.91	38.6	40.4	-	1.5	0.0	4.0	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.7	9.9	36	15	-	-	0.05	-
16.08	41.0	44.4	-	1.8	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	21	22	-	-	2.9	9.9	36	15	-	-	0.05	-
16.24	59.9	60.2	141.4	1.8	0.0	3.1	4	clayy SILT to silty CLAY	115	2.0	30	30	-	-	4.2	9.9	27	15	1.31	-	0.05	22.3
16.40	91.8	91.9	134.3	1.6	-0.1	1.8	5	silty SAND to sandy SILT	120	4.0	23	23	64	43	-	-	16	16	1.65	-	0.04	15.2
16.57	109.1	108.6	139.4	1.5	-0.1	1.4	6	clean SAND to silty SAND	125	5.0	22	22	70	44	-	-	13	16	1.42	-	0.04	7.7
16.73	119.8	118.6	169.8	2.5	-0.3	2.1	5	silty SAND to sandy SILT	120	4.0	30	30	73	45	-	-	15	16	0.00	-	0.04	0.0
16.90	159.4	157.0	204.6	3.3	0.0	2.1	5	silty SAND to sandy SILT	120	4.0	40	39	82	46	-	-	13	16	0.00	-	0.04	0.0
17.06	150.7	147.7	203.2	3.5	0.2	2.3	5	silty SAND to sandy SILT	120	4.0	38	37	80	46	-	-	14	16	0.00	-	0.04	0.0
17.23	165.8	161.7	183.4	2.1	0.1	1.3	6	clean SAND to silty SAND	125	5.0	33	32	83	46	-	-	9	16	0.00	-	0.04	0.0
17.39	178.9	173.6	182.2	1.7	0.1	0.9	6	clean SAND to silty SAND	125	5.0	36	35	85	46	-	-	6	16	0.00	-	0.04	0.0
17.55	193.2	186.4	186.4	1.4	0.1	0.7	6	clean SAND to silty SAND	125	5.0	39	37	88	47	-	-	5	16	0.00	-	0.04	0.0
17.72	217.8	209.2	209.2	1.6	0.1	0.7	6	clean SAND to silty SAND	125	5.0	44	42	91	47	-	-	5	16	0.00	-	0.04	0.0
17.88	223.2	213.3	213.3	1.7	0.2	0.8	6	clean SAND to silty SAND	125	5.0	45	43	92	47	-	-	5	16	0.00	-	0.04	0.0
18.05	241.8	229.9	229.9	1.8	0.2	0.7	6	clean SAND to silty SAND	125	5.0	48	46	94	47	-	-	5	16	0.00	-	0.04	0.0
18.21	244.0	230.9	230.9	2.0	0.3	0.8	6	clean SAND to silty SAND	125	5.0	49	46	95	47	-	-	5	16	0.00	-	0.04	0.0
18.37	238.1	224.2	224.2	2.0	0.3	0.8	6	clean SAND to silty SAND	125	5.0	48	45	94	47	-	-	5	16	0.00	-	0.04	0.0
18.54	231.5	216.9	216.9	2.0	0.3	0.9	6	clean SAND to silty SAND	125	5.0	46	43	93	47	-	-	5	16	0.00	-	0.04	0.0
18.70	223.7	208.7	209.5	2.0	0.2	0.9	6	clean SAND to silty SAND	125	5.0	45	42	91	47	-	-	5	16	0.00	-	0.04	0.0
18.87	227.7	211.4	212.5	2.1	0.3	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.03	229.3	211.8	212.8	2.1	0.4	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.19	228.9	210.5	211.6	2.1	0.4	0.9	6	clean SAND to silty SAND	125	5.0	46	42	92	47	-	-	5	16	0.00	-	0.04	0.0
19.36	228.7	209.4	214.3	2.3	0.4	1.0	6	clean SAND to silty SAND	125	5.0	46	42	91	47	-	-	6	16	0.00	-	0.04	0.0
19.52	227.1	207.0	222.6	2.9	0.4	1.3	6	clean SAND to silty SAND	125	5.0	45	41	91	47	-	-	7	16	0.00	-	0.04	0.0
19.69	238.3	216.2	237.4	3.4	0.7	1.4	6	clean SAND to silty SAND	125	5.0	48	43	92	47	-	-	8	16	0.00	-	0.04	0.0
19.85	261.6	236.3	250.7	3.5	0.3	1.3	6	clean SAND to silty SAND	125	5.0	52	47	95	47	-	-	7	16	0.00	-	0.04	0.0
20.01	249.1	224.1	243.4	3.5	0.1	1.4	6	clean SAND to silty SAND	125	5.0	50	45	94	47	-	-	8	16	0.00	-	0.04	0.0
20.18	256.1	229.3	243.5	3.3	0.0	1.3	6	clean SAND to silty SAND	125	5.0	51	46	94	47	-	-	7	16	0.00	-	0.04	0.0
20.34	262.3	233.9	243.2	3.1	0.0	1.2	6	clean SAND to silty SAND	125	5.0	52	47	95	47	-	-	6	16	0.00	-	0.04	0.0
20.51	260.2	231.0	236.6	2.9	0.0	1.1	6	clean SAND to silty SAND	125	5.0	52	46	95	47	-	-	6	16	0.00	-	0.04	0.0
20.67	264.0	233.4	238.8	2.9	0.1	1.1	6	clean SAND to silty SAND	125	5.0	53	47	95	47	-	-	6	16	0.00	-	0.04	0.0
20.83	270.0	237.6	240.2	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	54	48	95	47	-	-	5	16	0.00	-	0.04	0.0
21.00	280.2	245.6	245.3	2.9	-0.2	1.0	6	clean SAND to silty SAND	125	5.0	56	49	95	47	-	-	5	16	0.00	-	0.04	0.0
21.16	270.1	235.8	240.2	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	54	47	95	47	-	-	6	16	0.00	-	0.04	0.0
21.33	258.7	224.9	233.1	2.9	-0.2	1.1	6	clean SAND to silty SAND	125	5.0	52	45	94	47	-	-	6	16	0.00	-	0.04	0.0
21.49	239.7	207.5	221.2	2.9	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	48	42	91	47	-	-	7	16	0.00	-	0.04	0.0
21.65	225.4	194.4	209.8	2.7	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	45	39	89	46	-	-	7	16	0.00	-	0.04	0.0
21.82	234.4	201.3	214.0	2.7	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	47	40	90	46	-	-	7	16	0.00	-	0.04	0.0
21.98	248.7	212.7	223.9	2.9	-0.2	1.2	6	clean SAND to silty SAND	125	5.0	50	43	92	47	-	-	7	16	0.00	-	0.04	0.0
22.15	253.2	215.7	225.8	2.9	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	51	43	92	47	-	-	6	16	0.00	-	0.04	0.0
22.31	252.8	214.6	225.0	2.9	-0.3	1.2	6	clean SAND to silty SAND	125	5.0	51	43	92	47	-	-	6	16	0.00	-	0.04	0.0
22.47	274.9	232.4	237.0	3.0	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	55	46	95	47	-	-	6	16	0.00	-	0.04	0.0
22.64	279.0	234.9	236.8	2.9	-0.3	1.0	6	clean SAND to silty SAND	125	5.0	56	47	95	47	-	-	5	16	0.00	-	0.04	0.0
22.80	272.9	228.9	236.7	3.1	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	55	46	94	47	-	-	6	16	0.00	-	0.04	0.0
22.97	265.8	222.1	229.6	2.9	-0.3	1.1	6	clean SAND to silty SAND	125	5.0	53	44	93	47	-	-	6	16	0.00	-	0.04	0.0
23.13	269.1	224.0	228.0	2.8	-0.4	1.0	6	clean SAND to silty SAND	125	5.0	54	45	94	47	-	-	6	16	0.00	-	0.04	0.0
23.30	270.6	224.5	224.5	2.5	-0.4	0.9	6	clean SAND to silty SAND	125	5.0	54	45	94	47	-	-	5	16	0.00	-	0.04	0.0
23.46	285.7	236.1	236.1	2.3	-0.4	0.8	6	clean SAND to silty SAND	125	5.0	57	47	95	47	-	-	5	16	0.00	-	0.04	0.0
23.62	306.0	251.9	251.9	2.4	-0.5	0.8	6	clean SAND to silty SAND	125	5.0	61	50	95	47	-	-	5	16	0.00	-	0.04	0.0
23.79	310.2	254.4	254.4	2.4	-0.7	0.8	6	clean SAND to silty SAND	125	5.0	62	51	95	47	-	-	5	16	0.00	-	0.04	0.0
23.95	316.5	258.6	258.6	2.4	-0.7	0.8	6	clean SAND to silty SAND	125	5.0	63	52	95	47	-	-	5	16	0.00	-	0.04	0.0
24.12	328.6	267.6	267.6	2.8	-0.7	0.9	6	clean SAND to silty SAND	125	5.0	66	54	95	47	-	-	5	16	0.00	-	0.04	0.0
24.28	362.6	294.2	294.2	3.5	-0.8	1.0	6	clean SAND to silty SAND	125	5.0	73	59	95	48	-	-	5	16	0.00	-	0.04	0.0
24.44	406.0	328.3	328.3	3.6	-0.8	0.9	6	clean SAND to silty SAND	125	5.0	81	66	95	48	-	-	5	16	0.00	-	0.04	0.0
24.61	463.9	373.8	373.8	3.2	-0.9	0.7	6	clean SAND to silty SAND	125	5.0	93	75	95	48	-	-	5	16	0.00	-	0.04	0.0
24.77	528.6	424.4	424.4	2.4	-0.9	0.5	7	grvly SAND to dense SAND	130	6.0	88	71	95	48	-	-	5	16	0.00	-	0.04	0.0
24.94	550.5	440.3	440.3	3.5	-0.9	0.6	7	grvly SAND to dense SAND	130	6.0	92	73	95	48	-	-	5	16	0.00	-	0.04	0.0
25.10	505.4	402.8	402.8	3.6	-0.4	0.7	6	clean SAND to silty SAND	125	5.0	100	81	95	48	-	-	5	16	0.00	-	0.04	0.0
25.26	432.6	343.6	343.6	2.6	-0.6	0.6	6	clean SAND to silty SAND	125	5.0	87	69	95	48	-	-	5	16	0.00	-	0.04	0.0
25.43	364.3	288.4	288.4	2.1	-0.2	0.6	6	clean SAND to silty SAND	125	5.0	73	58	95	48	-	-	5	16	0.00	-	0.04	0.0
25.59	326.5	257.6	257.6	1.7	-0.3	0.5	6	clean SAND to silty SAND	125	5.0	65	52	95	47	-	-	5	16	0.00	-	0.04	0.0
25.76	328.3	258.1	258.1	1.5	-0.3	0.5	6	clean SAND to silty SAND	125	5.0	66	52	95	47	-	-	5	16	0.00	-	0.04	0.0
25.92	369.8	289.8	289.8	1.6	-0.3	0.4	7	grvly SAND to dense SAND	130	6.0	62	48	95	48	-	-	5	16	0.00	-	0.04	0.0
26.08	403.2	314.8	314.8	3.9	-0.3	1.0	6	clean SAND to silty SAND	125	5.0	81	63	95	48	-	-	5	16	0.00	-	0.04	0.0
26.25	438.6	341.4	341.4	1.8	-0.6	0.4	7	grvly SAND to dense SAND	130	6.0	73	57	95	48	-	-	5	16	0.00	-	0.04	0.0
26.41	487.1	377.8	377.8	6.0	-0.8	1.2	6	clean SAND to silty SAND	125	5.0	97	76	95	48	-	-	5	16	0.00	-	0.04	0.0
26.58	533.3	412.4	412.4	6.5	-1.1	1.2	6	clean SAND to silty SAND	125	5.0	100	82	95	48	-	-	5	16	0.00	-	0.04	0.0
26.74	352.1	271.3	314.9	7.5	-1.0	2.2	6	clean SAND to silty SAND	125	5.0	70	54	95	47	-	-	10	16	0.00	-	0.04	0.0
26.90	376.7	289.4	321.0	7.0	-1.0	1.9	6	clean SAND to silty SAND	125	5.0	75	58	95	48	-	-	8	16	0.00	-	0.04	0.0
27.07	359.0	274.9	309.3	6.9	-0.9	1.9	6	clean SAND to silty SAND	125	5.0	72	55	95	47	-	-	9	16	0.00	-	0.04	0.0
27.23	358.0	273.3	295.4	5.8	-0.9	1.6	6	clean SAND to silty SAND	125	5.0	72	55	95	47	-	-	7	16	0.00	-	0.04	0.0
27.40	331.7	252.4	276.4	5.3	-1.2	1.6	6	clean SAND to silty SAND	125	5.0	66	50	95	47	-	-	8	16	0.00	-	0.04	0.0
27.56	336.4	255.2	277.7	5.3	-1.3	1.6	6	clean SAND to silty SAND	125	5.0	67	51	95	47	-	-	8	16	0.00	-	0.04	0.0
27.72	324.6	245.4	277.1	5.8	-1.2	1.8	6	clean SAND to silty SAND	125	5.0	65	49	95	47	-	-	9	16	0.00	-	0.04	0.0
27.89	316.9	238.9	271.1	5.7	-1.2	1.8	6	clean SAND to silty SAND	125	5.0	63	48	95	47	-	-	9	16	0.00	-	0.04	0.0
28.05	339.2	254.9	260.5	4.0	-1.2	1.2	6	clean SAND to silty SAND	125	5.0	68	51	95	47	-	-	6	16	0.00	-	0.04	0.0
28.22	388.3	290.9	290.9	3.5	-1.2	0.9	6	clean SAND to silty SAND	125	5.0	78	58	95	48	-	-	5	16	0.00	-	0.04	0.0
28.38	399.1	298.1	298.1	3.2	-1.3	0.8	6	clean SAND to silty SAND	125	5.0	80	60	95	48	-	-	5	16	0.00	-	0.04	0.0
28.54	426.3	317.5	317.5	2.9	-1.4	0.7	6	clean SAND to silty SAND	125	5.0	85	63	95	48	-	-	5	16	0.00	-	0.04	0.0
28.71	440.0	326.7	325.7	5.7	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	88	65	95	48	-	-	5	16	0.00	-	0.04	0.0
28.87	501.8	371.5	371.5	6.5	-1.4	1.3	6	clean SAND to silty SAND	125	5.0	100	74	95	48	-	-	5	16	0.00	-	0.04	0.0
29.04	494.6	365.0	398.0	10.0	-1.4	2.0	6	clean SAND to silty SAND	125	5.0	99	73	95	48	-	-	8	16	0.00	-	0.04	0.0
29.20	326.6	240.4	290.8	7.5	-1.3	2.3	6	clean SAND to silty SAND	125	5.0	65	48	95	47	-	-	11	16	0.00	-	0.04	0.0
29.36	241.4	177.1	218.1	4.6	-0.5	1.9	6	clean SAND to silty SAND	125	5.0	48	35	86	45	-	-	11	16	0.00	-	0.04	0.0
29.53	218.9	160.2	198.6	4.0	-1.3	1.8	6	clean SAND to silty SAND	125	5.0	44	32	83	45	-	-	12	16	0.00	-	0.04	0.0
29.69	208.1	151.8	192.0	3.8	-1.4	1.9	6	clean SAND to silty SAND	125	5.0	42	30	81	44	-	-	12	16	0.00	-	0.04	0.0
29.86	200.0	145.5	181.2	3.4	-1.6	1.7	6	clean SAND to silty SAND	125	5.0	40	29	79	44	-	-	12	16	0.00	-	0.04	0.0
30.02	185.6	134.6	161.7	2.5	-1.8	1.4	6	clean SAND to silty SAND	125	5.0	37	27	77	44	-	-	11	16	0.00	-	0.04	0.0
30.19	195.7	141.6	172.4	3.0	-1.9	1.5	6	clean SAND to silty SAND	125	5.0	39	28	78	44	-	-	11	16	0.00	-	0.04	0.0
30.35	234.0	168.8	201.1	3.8	-2.9	1.7	6	clean SAND to silty SAND	125	5.0	47	34	84	45	-	-	10	16	0.00	-	0.04	0.0
30.51	268.0	192.7	218.3	4.0	-3.1	1.5	6	clean SAND to silty SAND	125	5.0	54	39	89	46	-	-	9	16	0.00	-	0.04	0.0
30.68	263.9	189.3	209.2	3.5	-3.1	1.3	6	clean SAND to silty SAND	125	5.0	53	38	88	45	-	-	8	16	0.00	-	0.04	0.0
30.84	262.2	187.5	209.5	3.6	-3.1	1.4	6	clean SAND to silty SAND	125	5.0	52	38	88	45	-	-	8	16	0.00	-	0.04	0.0

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic -	Nk - -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
31.01	261.2	186.3	215.4	4.1	-3.0	1.6	6	clean SAND to silty SAND	125	5.0	52	37	88	45	-	-	10	16	0.00	-	0.04	0.0
31.17	250.8	178.4	212.1	4.3	-3.0	1.7	6	clean SAND to silty SAND	125	5.0	50	36	86	45	-	-	10	16	0.00	-	0.04	0.0
31.33	236.4	167.7	205.6	4.3	-3.0	1.8	6	clean SAND to silty SAND	125	5.0	47	34	84	45	-	-	11	16	0.00	-	0.04	0.0
31.50	227.6	161.0	204.6	4.5	-3.0	2.0	6	clean SAND to silty SAND	125	5.0	46	32	83	45	-	-	12	16	0.00	-	0.04	0.0
31.66	161.5	113.9	194.8	4.9	-2.8	3.0	5	silty SAND to sandy SILT	120	4.0	40	28	71	43	-	-	20	16	0.00	-	0.04	0.0
31.83	81.0	42.5	-	4.0	-2.6	5.1	3	silty CLAY to CLAY	115	1.5	54	28	-	-	5.6	9.9	39	15	-	-	0.04	-
31.99	49.9	26.1	-	2.5	-2.6	5.2	3	silty CLAY to CLAY	115	1.5	33	17	-	-	3.5	9.9	48	15	-	-	0.04	-
32.15	41.3	21.5	-	1.1	-2.5	2.9	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	2.8	9.9	43	15	-	-	0.04	-
32.32	40.4	20.9	-	1.0	-2.3	2.7	4	clayy SILT to silty CLAY	115	2.0	20	10	-	-	2.8	9.9	42	15	-	-	0.04	-
32.48	42.3	21.7	-	1.1	-2.2	2.7	4	clayy SILT to silty CLAY	115	2.0	21	11	-	-	2.9	9.9	41	15	-	-	0.04	-
32.65	50.4	25.8	-	1.1	-2.0	2.2	4	clayy SILT to silty CLAY	115	2.0	25	13	-	-	3.5	9.9	36	15	-	-	0.04	-
32.81	55.0	38.2	99.3	1.2	-1.9	2.2	5	silty SAND to sandy SILT	120	4.0	14	10	35	37	-	-	29	16	2.35	-	0.04	51.2
32.97	54.0	27.4	-	1.4	-1.9	2.7	4	clayy SILT to silty CLAY	115	2.0	27	14	-	-	3.7	9.9	37	15	-	-	0.03	-
33.14	53.4	27.0	-	1.4	-1.9	2.8	4	clayy SILT to silty CLAY	115	2.0	27	13	-	-	3.7	9.9	38	15	-	-	0.03	-
33.30	57.3	39.5	98.1	1.2	-1.9	2.1	5	silty SAND to sandy SILT	120	4.0	14	10	36	37	-	-	28	16	2.37	-	0.03	51.2
33.47	57.2	28.6	-	1.5	-1.8	2.8	4	clayy SILT to silty CLAY	115	2.0	29	14	-	-	4.0	9.9	36	15	-	-	0.03	-
33.63	55.7	27.7	-	1.7	-1.9	3.1	4	clayy SILT to silty CLAY	115	2.0	28	14	-	-	3.9	9.9	39	15	-	-	0.03	-
33.79	60.8	30.1	-	1.8	-1.9	3.0	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.2	9.9	37	15	-	-	0.03	-
33.96	59.0	29.1	-	1.7	-1.9	3.0	4	clayy SILT to silty CLAY	115	2.0	29	15	-	-	4.1	9.9	37	15	-	-	0.03	-
34.12	58.1	28.5	-	1.7	-1.8	3.1	4	clayy SILT to silty CLAY	115	2.0	29	14	-	-	4.0	9.9	38	15	-	-	0.03	-
34.29	60.4	29.5	-	1.7	-1.7	3.0	4	clayy SILT to silty CLAY	115	2.0	30	15	-	-	4.2	9.9	37	15	-	-	0.03	-
34.45	76.9	52.1	118.1	1.8	-1.7	2.5	5	silty SAND to sandy SILT	120	4.0	19	13	45	39	-	-	26	16	2.04	-	0.03	41.9
34.61	81.9	55.3	120.2	1.9	-1.6	2.4	5	silty SAND to sandy SILT	120	4.0	20	14	47	39	-	-	25	16	2.01	-	0.03	38.5
34.78	77.9	52.5	123.2	2.0	-1.6	2.6	5	silty SAND to sandy SILT	120	4.0	19	13	46	39	-	-	27	16	1.97	-	0.02	41.4
34.94	72.0	48.4	124.8	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	36	24	-	-	5.0	9.9	29	15	1.95	-	0.02	45.9
35.11	70.2	47.1	123.6	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	35	24	-	-	4.9	9.9	29	15	1.96	-	0.02	47.6
35.27	68.6	45.9	123.4	2.0	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.8	9.9	30	15	1.97	-	0.01	49.0
35.43	64.9	30.7	-	2.0	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.5	9.9	37	15	-	-	0.01	-
35.60	63.9	30.1	-	1.9	-1.6	3.0	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.4	9.9	37	15	-	-	0.01	-
35.76	64.0	30.0	-	1.9	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.4	9.9	37	15	-	-	0.01	-
35.93	65.5	30.6	-	1.9	-1.6	3.0	4	clayy SILT to silty CLAY	115	2.0	33	15	-	-	4.5	9.9	37	15	-	-	0.01	-
36.09	65.4	30.4	-	1.8	-1.5	2.9	4	clayy SILT to silty CLAY	115	2.0	33	15	-	-	4.5	9.9	36	15	-	-	0.01	-
36.26	62.7	29.0	-	1.8	-1.5	2.9	4	clayy SILT to silty CLAY	115	2.0	31	15	-	-	4.4	9.9	37	15	-	-	0.01	-
36.42	62.0	28.6	-	1.7	-1.4	2.9	4	clayy SILT to silty CLAY	115	2.0	31	14	-	-	4.3	9.9	37	15	-	-	0.01	-
36.58	59.6	27.3	-	1.8	-1.4	3.1	4	clayy SILT to silty CLAY	115	2.0	30	14	-	-	4.1	9.9	39	15	-	-	0.01	-
36.75	58.6	26.8	-	1.7	-1.5	3.1	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.1	9.9	39	15	-	-	0.01	-
36.91	70.3	46.1	120.3	1.9	-1.4	2.8	4	clayy SILT to silty CLAY	115	2.0	35	23	-	-	4.9	9.9	29	15	2.01	-	0.01	48.8
37.08	68.0	30.8	-	2.0	-1.4	3.1	4	clayy SILT to silty CLAY	115	2.0	34	15	-	-	4.7	9.9	37	15	-	-	0.01	-
37.24	64.7	29.2	-	2.0	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	32	15	-	-	4.5	9.9	39	15	-	-	0.01	-
37.40	60.2	27.0	-	2.0	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	41	15	-	-	0.01	-
37.57	56.3	25.1	-	1.9	-1.3	3.5	4	clayy SILT to silty CLAY	115	2.0	28	13	-	-	3.9	9.9	42	15	-	-	0.01	-
37.73	64.8	28.9	-	2.0	-1.2	3.1	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.5	9.9	38	15	-	-	0.01	-
37.90	68.3	30.2	-	2.0	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	34	15	-	-	4.7	9.9	37	15	-	-	0.01	-
38.06	63.1	27.8	-	1.9	-1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.4	9.9	39	15	-	-	0.01	-
38.22	63.1	27.7	-	1.9	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	32	14	-	-	4.4	9.9	39	15	-	-	0.01	-
38.39	60.4	26.4	-	1.9	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	40	15	-	-	0.01	-
38.55	57.3	24.9	-	1.8	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.0	9.9	41	15	-	-	0.01	-
38.72	58.2	25.3	-	1.8	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.0	9.9	41	15	-	-	0.01	-
38.88	57.4	24.8	-	1.7	-1.2	3.0	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	4.0	9.9	40	15	-	-	0.01	-
39.04	58.2	25.0	-	1.6	-1.1	2.9	4	clayy SILT to silty CLAY	115	2.0	29	13	-	-	4.0	9.9	39	15	-	-	0.01	-
39.21	55.0	23.6	-	1.7	-1.1	3.3	4	clayy SILT to silty CLAY	115	2.0	27	12	-	-	3.8	9.9	42	15	-	-	0.01	-
39.37	51.8	22.1	-	1.8	-1.2	3.7	3	silty CLAY to CLAY	115	1.5	35	15	-	-	3.6	9.9	46	15	-	-	0.01	-
39.54	56.1	23.9	-	1.7	-1.1	3.2	4	clayy SILT to silty CLAY	115	2.0	28	12	-	-	3.9	9.9	42	15	-	-	0.01	-
39.70	59.9	25.4	-	2.2	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.1	9.9	43	15	-	-	0.01	-
39.86	60.9	25.7	-	2.3	-1.2	3.9	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.2	9.9	44	15	-	-	0.01	-
40.03	59.4	24.9	-	2.2	-0.7	3.9	4	clayy SILT to silty CLAY	115	2.0	30	12	-	-	4.1	9.9	44	15	-	-	0.01	-
40.19	56.3	23.6	-	2.0	-0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	28	12	-	-	3.9	9.9	45	15	-	-	0.01	-
40.36	53.6	22.3	-	1.8	-0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	45	15	-	-	0.01	-
40.52	53.4	22.2	-	1.8	-0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.7	9.9	45	15	-	-	0.01	-
40.68	55.0	22.7	-	1.9	-0.7	3.5	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	44	15	-	-	0.01	-
40.85	53.9	22.2	-	2.0	-0.7	3.9	3	silty CLAY to CLAY	115	1.5	36	15	-	-	3.7	9.9	47	15	-	-	0.01	-
41.01	53.2	21.8	-	1.9	-0.7	3.8	3	silty CLAY to CLAY	115	1.5	35	15	-	-	3.7	9.9	46	15	-	-	0.01	-
41.18	51.5	21.0	-	1.9	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	47	15	-	-	0.01	-
41.34	54.7	22.3	-	1.9	-0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	27	11	-	-	3.8	9.9	45	15	-	-	0.01	-
41.50	51.5	20.9	-	1.8	-0.5	3.8	3	silty CLAY to CLAY	115	1.5	34	14	-	-	3.5	9.9	47	15	-	-	0.01	-
41.67	43.0	17.4	-	1.7	-0.5	4.2	3	silty CLAY to CLAY	115	1.5	29	12	-	-	2.9	9.9	53	15	-	-	0.01	-
41.83	40.9	16.5	-	1.5	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	27	11	-	-	2.8	9.9	53	15	-	-	0.01	-
42.00	41.5	16.7	-	1.5	-0.5	3.7	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	9.9	52	15	-	-	0.01	-
42.16	47.6	19.0	-	1.6	-0.4	3.6	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	48	15	-	-	0.01	-
42.32	48.5	19.3	-	1.9	-0.3	4.0	3	silty CLAY to CLAY	115	1.5	32	13	-	-	3.3	9.9	50	15	-	-	0.01	-
42.49	55.6	22.0	-	1.8	-0.3	3.4	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.8	9.9	45	15	-	-	0.01	-
42.65	60.6	23.9	-	2.0	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	30	12	-	-	4.2	9.9	43	15	-	-	0.01	-
42.82	54.0	21.2	-	2.0	-0.3	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	47	15	-	-	0.01	-
42.98	53.4	21.0	-	2.4	-0.2	4.7	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	51	15	-	-	0.01	-
43.15	55.4	21.7	-	2.4	-0.2	4.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	50	15	-	-	0.01	-
43.31	63.6	24.8	-	2.3	4.1	3.7	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.4	9.9	43	15	-	-	0.01	-
43.47	65.4	25.4	-	2.2	4.4	3.5	4	clayy SILT to silty CLAY	115	2.0	33	13	-	-	4.5	9.9	42	15	-	-	0.01	-
43.64	67.7	26.2	-	2.3	4.5	3.5	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	41	15	-	-	0.01	-
43.80	61.1	23.5	-	2.3	4.6	4.0	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	46	15	-	-	0.01	-
43.97	54.7	21.0	-	2.1	4.6	4.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	48	15	-	-	0.01	-
44.13	50.7	19.4	-	1.9	4.6	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.9	49	15	-	-	0.01	-
44.29	55.5	21.2	-	1.9	4.7	3.6	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	46	15	-	-	0.01	-
44.46	54.4	20.7	-	1.8	4.8	3.6	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	46	15	-	-	0.01	-
44.62	50.7	19.2	-	1.9	4.8	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.5	9.9	50	15	-	-	0.01	-
44.79	53.4	20.1	-	1.8	4.8	3.6	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.7	9.9	47	15	-	-	0.01	-
44.95	64.7	24.4	-	2.1	5.0	3.3	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	42	15	-	-	0.01	-
45.11	59.8	22.6	-	2.1	5.2	3.6	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.1	9.9	45	15	-	-	0.01	-
45.28	54.8	20.7	-	2.0	5.2	3.9	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	48	15	-	-	0.01	-
45.44	52.9	19.9	-	2.0	5.4	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
45.61	56.6	21.4	-	2.0	5.6	3.7	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	46	15	-	-	0.01	-
45.77	60.2	22.7	-	2.2	5.8	3.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	45	15	-	-	0.01	-
45.93	56.9	21.5	-	2.1	5.8	3.9	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	47	15	-	-	0.01	-
46.10	52.2	19.7	-	1.9	5.9	3.9	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
46.26	56.8	21.5	-	2.3	6.1	4.2	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	48	15	-	-	0.01	-

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Earth Mechanics
Data File: SDF(535).cpt
CPT Date: 9/28/2011 12:46:01 PM
GW During Test: No GW

Sounding ID: CPT-11-245
Project No: 11-136
Cone/Rig: DSG1104

Depth ft	qc PS tsf	qcln PS -	qlncs PS -	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	SPT R-N1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	Nk -	Vol Strn %	Dry Stlmt 0.00	Liq Stlmt 0.09	Cycl SStn %
46.43	62.5	23.6	-	2.5	6.1	4.1	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
46.59	77.4	29.2	-	2.6	6.5	3.4	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.9	39	15	-	-	0.01	-
46.75	70.3	26.5	-	2.5	6.8	3.6	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.9	9.9	42	15	-	-	0.01	-
46.92	62.8	23.7	-	2.4	6.9	4.0	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
47.08	65.9	24.9	-	2.3	7.1	3.7	4	clayy SILT to silty CLAY	115	2.0	33	12	-	-	4.6	9.9	43	15	-	-	0.01	-
47.25	64.8	24.4	-	2.4	7.3	3.9	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
47.41	66.3	25.0	-	2.5	7.4	4.0	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	44	15	-	-	0.01	-
47.57	65.3	24.6	-	2.4	7.5	3.9	4	clayy SILT to silty CLAY	115	2.0	33	12	-	-	4.5	9.9	44	15	-	-	0.01	-
47.74	57.4	21.7	-	2.3	7.5	4.1	3	silty CLAY to CLAY	115	1.5	38	14	-	-	4.0	9.9	48	15	-	-	0.01	-
47.90	54.7	20.7	-	2.2	7.5	4.3	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	50	15	-	-	0.01	-
48.07	56.2	21.2	-	2.2	7.6	4.2	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.9	9.9	49	15	-	-	0.01	-
48.23	53.0	20.0	-	2.2	7.7	4.4	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	51	15	-	-	0.01	-
48.39	47.6	18.0	-	2.1	7.8	4.7	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.9	54	15	-	-	0.01	-
48.56	49.9	18.8	-	2.0	8.0	4.2	3	silty CLAY to CLAY	115	1.5	33	13	-	-	3.4	9.9	51	15	-	-	0.01	-
48.72	55.3	20.9	-	2.0	8.1	3.8	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	47	15	-	-	0.01	-
48.89	52.7	19.9	-	2.0	8.3	4.0	3	silty CLAY to CLAY	115	1.5	35	13	-	-	3.6	9.9	49	15	-	-	0.01	-
49.05	54.6	20.6	-	1.9	8.6	3.7	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.8	9.9	47	15	-	-	0.01	-
49.22	55.8	21.1	-	2.1	8.7	3.9	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.8	9.9	47	15	-	-	0.01	-
49.38	56.6	21.4	-	2.2	8.8	4.2	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	48	15	-	-	0.01	-
49.54	60.2	22.7	-	2.6	9.0	4.5	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	48	15	-	-	0.01	-
49.71	70.0	26.4	-	2.4	9.2	3.7	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	9.9	42	15	-	-	0.01	-
49.87	73.7	27.8	-	2.7	9.8	3.8	4	clayy SILT to silty CLAY	115	2.0	37	14	-	-	5.1	9.9	42	15	-	-	0.01	-
50.04	66.3	25.0	-	2.8	10.1	4.4	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	46	15	-	-	0.01	-
50.20	66.7	25.2	-	2.7	10.5	4.2	3	silty CLAY to CLAY	115	1.5	44	17	-	-	4.6	9.9	45	15	-	-	0.01	-
50.36	69.8	26.3	-	2.8	10.9	4.1	3	silty CLAY to CLAY	115	1.5	47	18	-	-	4.8	9.9	44	15	-	-	0.01	-
50.53	77.1	29.1	-	2.7	11.2	3.7	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.9	40	15	-	-	0.01	-
50.69	73.5	27.7	-	2.9	11.4	4.1	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	43	15	-	-	0.01	-
50.86	73.0	27.6	-	3.0	11.5	4.3	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.1	9.9	44	15	-	-	0.01	-
51.02	80.8	30.5	-	3.1	11.7	4.0	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.6	9.9	41	15	-	-	0.01	-
51.18	87.2	32.9	-	3.6	11.9	4.3	4	clayy SILT to silty CLAY	115	2.0	44	16	-	-	6.1	9.9	41	15	-	-	0.01	-
51.35	76.5	28.9	-	3.7	12.1	5.0	3	silty CLAY to CLAY	115	1.5	51	19	-	-	5.3	9.9	46	15	-	-	0.01	-
51.51	65.5	24.7	-	3.5	12.2	5.6	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	50	15	-	-	0.01	-
51.68	77.4	29.2	-	3.4	12.5	4.6	3	silty CLAY to CLAY	115	1.5	52	19	-	-	5.4	9.9	44	15	-	-	0.01	-
51.84	72.6	27.4	-	3.3	12.7	4.8	3	silty CLAY to CLAY	115	1.5	48	18	-	-	5.0	9.9	46	15	-	-	0.01	-
52.00	60.4	22.8	-	2.8	13.0	4.9	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.2	9.9	50	15	-	-	0.01	-
52.17	57.9	21.8	-	2.4	13.3	4.4	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	49	15	-	-	0.01	-
52.33	53.7	20.3	-	2.1	13.6	4.1	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	49	15	-	-	0.01	-
52.50	47.8	18.0	-	1.9	13.8	4.2	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.3	9.5	52	15	-	-	0.01	-
52.66	45.9	17.3	-	1.7	14.1	3.9	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	9.1	52	15	-	-	0.01	-
52.82	46.0	17.4	-	1.6	14.3	3.8	3	silty CLAY to CLAY	115	1.5	31	12	-	-	3.1	9.1	51	15	-	-	0.01	-
52.99	50.3	19.0	-	1.9	14.6	3.9	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	9.9	50	15	-	-	0.01	-
53.15	54.2	20.5	-	2.0	14.7	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	48	15	-	-	0.01	-
53.32	54.3	20.5	-	2.0	16.2	3.9	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	48	15	-	-	0.01	-
53.48	53.6	20.2	-	1.8	16.6	3.6	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.7	9.9	47	15	-	-	0.01	-
53.64	56.8	21.4	-	1.8	17.1	3.4	4	clayy SILT to silty CLAY	115	2.0	28	11	-	-	3.9	9.9	45	15	-	-	0.01	-
53.81	57.1	21.5	-	2.1	17.4	3.8	3	silty CLAY to CLAY	115	1.5	38	14	-	-	3.9	9.9	47	15	-	-	0.01	-
53.97	59.9	22.6	-	2.2	17.6	3.9	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
54.14	59.6	22.5	-	2.3	17.8	4.1	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.01	-
54.30	64.1	24.2	-	2.4	18.1	4.0	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	45	15	-	-	0.01	-
54.46	65.1	24.6	-	2.5	18.3	4.0	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.5	9.9	45	15	-	-	0.01	-
54.63	65.5	24.7	-	2.5	18.5	4.0	3	silty CLAY to CLAY	115	1.5	44	16	-	-	4.5	9.9	45	15	-	-	0.01	-
54.79	64.2	24.2	-	2.4	18.8	3.9	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	45	15	-	-	0.01	-
54.96	62.6	23.6	-	2.2	19.1	3.8	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	45	15	-	-	0.01	-
55.12	60.2	22.7	-	2.3	19.3	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	47	15	-	-	0.01	-
55.28	62.5	23.6	-	2.2	19.6	3.6	4	clayy SILT to silty CLAY	115	2.0	31	12	-	-	4.3	9.9	44	15	-	-	0.01	-
55.45	59.9	22.6	-	2.2	20.0	4.0	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
55.61	59.5	22.5	-	2.1	20.5	3.8	3	silty CLAY to CLAY	115	1.5	40	15	-	-	4.1	9.9	46	15	-	-	0.01	-
55.78	57.9	21.8	-	2.2	23.5	4.0	3	silty CLAY to CLAY	115	1.5	39	15	-	-	4.0	9.9	47	15	-	-	0.01	-
55.94	54.6	20.6	-	2.2	24.1	4.3	3	silty CLAY to CLAY	115	1.5	36	14	-	-	3.7	9.9	50	15	-	-	0.01	-
56.11	62.1	23.4	-	2.3	24.6	3.9	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	45	15	-	-	0.01	-
56.27	61.7	23.3	-	2.4	25.1	4.0	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.2	9.9	46	15	-	-	0.01	-
56.43	63.1	23.8	-	2.3	25.4	3.9	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	45	15	-	-	0.01	-
56.60	64.9	24.5	-	2.4	26.0	3.8	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
56.76	68.4	25.8	-	2.4	26.5	3.7	4	clayy SILT to silty CLAY	115	2.0	34	13	-	-	4.7	9.9	43	15	-	-	0.01	-
56.93	64.2	24.2	-	2.5	26.8	4.1	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	46	15	-	-	0.01	-
57.09	62.5	23.6	-	2.4	27.2	4.1	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	46	15	-	-	0.01	-
57.25	64.8	24.4	-	2.2	27.8	3.6	4	clayy SILT to silty CLAY	115	2.0	32	12	-	-	4.5	9.9	44	15	-	-	0.01	-
57.42	64.6	24.4	-	2.6	28.1	4.3	3	silty CLAY to CLAY	115	1.5	43	16	-	-	4.4	9.9	46	15	-	-	0.01	-
57.58	62.9	23.7	-	2.6	28.6	4.4	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.3	9.9	47	15	-	-	0.01	-
57.75	62.0	23.4	-	2.6	29.7	4.4	3	silty CLAY to CLAY	115	1.5	41	16	-	-	4.3	9.9	48	15	-	-	0.01	-
57.91	58.8	30.9	41.2	0.0	30.1	0.1	6	clean SAND to silty SAND	125	5.0	12	6	28	34	-	-	14	16	4.84	-	0.01	51.2

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Appendix B. Laboratory Test Results

MAXIMUM DENSITY, OPTIMUM MOISTURE, WASH, & ATTERBERG LIMITS

Borehole No.	Sample No.	Depth (feet)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Atterberg Limits		
					Liquid Limit	Plastic Limit	Plasticity Index
A-11-201	B-0	0 – 5	-	-	52	25	27
A-11-204	B-0	0 – 5	121.5	10.0	54	26	28
A-11-206	B-0	0 – 5	-	-	62	21	41
A-11-209	B-0	0 – 5	-	-	36	14	22
A-11-211	B-0	0 – 5	-	-	37	16	21
A-11-216	B-0	0 – 5	-	-	46	16	30
A-11-217	B-0	0 – 5	-	-	50	29	21
A-11-218	B-0	0 – 5	-	-	50	23	27
A-11-221	B-0	0 – 5	133.0	6.5	-	-	-
A-11-224	B-0	0 – 5	-	-	48	17	31
A-11-225	B-0	0 – 5	-	-	57	26	31
A-11-230	B-0	0 – 5	112.0	14.5	51	23	28
A-11-231	B-0	0 – 5	-	-	32	16	16
A-11-233	B-0	0 – 5	-	-	49	18	31
A-11-239	B-0	0 – 5	122.0	13.5	-	-	-
A-11-240	B-0	0 – 5	-	-	40	16	24
A-11-243	B-0	0 – 5	-	-	40	17	23
A-11-246	B-0	0 – 5	115.0	13.0	-	-	-
A-11-249	B-0	0 – 5	-	-	39	17	22
A-11-250	B-0	0 – 5	101.5	17.0	-	-	-
A-11-254	B-0	0 – 5	108.0	11.5	40	15	25
A-11-257	B-0	0 – 5	114.0	9.0	-	-	-

EXPANSION INDEX

Borehole No.	Depth (feet)	Description	Expansion Index	Expansion Potential
A-11-201	15/20	Elastic Silt (MH)	126	High
A-11-206	0 – 5	Sandy Fat Clay (CH)	157	Very High
A-11-225	20/25	Elastic Silt (MH)	95	High
A-11-232	15/20	Fat Clay (CH)	118	High
A-11-254	45/50	Elastic Silt (MH)	98	High
A-11-258	0 – 5	Lean Clay with Sand (CL)	99	High

SOIL CORROSION TEST RESULTS

Borehole No.	Sample Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
A-11-201	0 – 5	CL	255	7.7	2,914	1,800
A-11-201	10	MH	220	7.9	980	1,616
A-11-203	10	CL	160	4.5	1,060	4,391
A-11-206	5	CH	280	5.0	1,160	1,498
HA-11-207	0 – 5	SM	1,103	7.4	437	300
A-11-210	5	MH	320	6.2	1,320	673
A-11-212	5	MH	300	7.4	980	1,340
A-11-214	10	CL	290	7.6	260	2,216
A-11-216	20	CL	270	6.8	550	1,084
HA-11-217	0 – 5	CL	122	7.2	8,636	540
A-11-219	40	MH	300	8.1	550	768
A-11-220	15	CL	540	7.2	380	505
A-11-221	0 – 5	SM	909	7.8	636	120
A-11-221	20	CL	440	7.5	390	845
A-11-222	5	CL	400	6.8	510	1,011
A-11-224	10	CL	210	7.2	1,180	3,824
A-11-225	10	MH	380	4.3	930	1,004
A-11-226	35	MH	240	5.9	1,550	1,616
A-11-228	5	CL	320	6.4	710	2,435
A-11-230	5	MH	420	3.5	1,350	1,760
A-11-232	10	CH	320	6.6	570	1,253
A-11-235	20	MH	300	6.9	500	2,119
HA-11-241	0 – 5	CL	1,706	7.9	2,857	120
A-11-244	5	CL	380	6.2	530	1,392
A-11-247	40	MH	300	6.5	1,840	1,561
HA-11-250	0 – 5	SM	2,260	7.8	3,751	180
A-11-254	5	MH	310	6.8	600	907
A-11-254	25	CH	280	6.6	1,200	1,163
A-11-255	0 – 5	CL	749	7.5	1,791	1,200
A-11-255	5	CL	290	7.4	780	1,254
A-11-258	20	CL	390	7.6	220	1,239
A-11-259	15	CL	900	7.2	430	402

SOIL CORROSION TEST RESULTS (CONTINUED)

Borehole No.	Sample Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
A-11-260	10	CH	140	6.1	3,260	4,642
A-11-261	20	MH	250	7.3	960	1,874
A-11-262	10	CL	220	6.5	230	3,143
A-11-264	15	MH	270	6.1	1,090	1,271

R-VALUE TEST RESULTS

Borehole No.	*Sample Depth (feet)*	*Soil Type*	*R-Value*
A-11-201	0 – 5	CH	12
HA-11-204	0 – 5	CH	28
A-11-206	0 – 5	CH	7
HA-11-207	0 – 5	SP	81
A-11-209	0 – 5	CL	7
A-11-211	0 – 5	CL	10
A-11-216	0 – 5	CL	8
HA-11-217	0 – 5	MH	20
HA-11-218	0 – 5	ML	20
A-11-224	0 – 5	CL	8
A-11-225	0 – 5	CH	30
A-11-230	0 – 5	CH	19
HA-11-231	0 – 5	CL	19
A-11-233	0 – 5	CL	6
A-11-235	0 – 5	SP-SM	64
A-11-240	0 – 5	CL	12
HA-11-241	0 – 5	ML	12
HA-11-243	0 – 5	CL	6
A-11-247	0 – 5	CL	7
A-11-249	0 – 5	CL	12
HA-11-250	0 – 5	SM	74
A-11-254	0 – 5	CL	6
A-11-255	0 – 5	CL	17
HA-11-257	0 – 5	CL	16

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-201	D-1	5	MH	27.0	121.5	>4.5								
A-11-201	S-2	10	MH	26.7						65/33/32	220	7.9	980	1616
A-11-201	D-3	15	MH	24.9	122.8	>4.5								
A-11-201	S-4	20	MH	23.4				0:4:96						
A-11-201	D-5	25	MH	24.5	122.9	>4.5								
A-11-201	S-6	30	MH	25.1										
A-11-202	S-1	5	CL	26.6				2:5:93						
A-11-202	D-2	10	CL	28.8	111.8	3.5								
A-11-202	S-3	15	CH	32.9						56/27/29				
A-11-202	D-4	20	CL	26.4	117.8	3.25								
A-11-202	S-5	25	CH	28.3										
A-11-202	D-6	30	CH	30.8	119.6	>4.5								
A-11-203	D-1	5	CL	28.7	119.7	>4.5								
A-11-203	S-2	10	CL	30.5							160	4.6	1060	4391
A-11-203	D-3	15	CL	31.7	118.2	>4.5								
A-11-203	S-4	20	CL	27.9										
A-11-203	D-5	25	MH	27.3	120.7	>4.5								
A-11-203	S-6	30	MH	28.2						63/33/30				
A-11-205	S-1	5	CH	33.0						69/36/33				
A-11-206	S-1	5	CH	29.2						64/29/35	280	5.0	1160	1498
A-11-206	D-2	10	CH	30.4	115.7	>4.5								
A-11-206	S-3	15	MH	28.7						67/33/34				
A-11-206	D-4	20	MH	23.8	121.7	>4.5								
A-11-206	S-5	25	MH	27.1										
A-11-206	D-6	30	MH	26.0	120.5	>4.5								
A-11-209	S-1	5	SC	12.2				8:59:33						
A-11-210	D-1	2.5	SC	12.9	126.6			1:66:33						
A-11-210	S-2	5	MH	28.7							320	6.2	1320	673
A-11-210	D-3	10	MH	26.7	118.7	>4.5								
A-11-210	S-4	15	MH	28.3				0:4:96		66/41/25				
A-11-210	D-5	20	MH	24.6	121.2	>4.5								
A-11-210	S-6	25	MH	25.8										
A-11-210	D-7	30	MH	23.7	125.8	>4.5								
A-11-210	S-8	35	MH	25.1										
A-11-210	D-9	40	MH	26.7	120.8	>4.5								
A-11-210	S-10	45	MH	24.2										
A-11-210	D-11	50	MH	24.3	122.5	>4.5								
A-11-211	S-1	2.5	SM to CL	22.5										
A-11-211	D-2	5	MH	28.4	118.9	>4.5								
A-11-211	S-3	10	MH	29.6				0:3:97		69/38/31				

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-211	D-4	15	MH	26.5	121.5	>4.5								
A-11-211	S-5	20	MH	34.2										
A-11-211	D-6	25	MH	24.3	121.7	>4.5								
A-11-211	S-7	30	MH	25.2										
A-11-212	D-1	2.5	SM	5.3	121.2			0:81:19						
A-11-212	S-2	5	MH	27.6							300	7.4	980	1340
A-11-212	D-3	10	MH	26.9	118.8	>4.5								
A-11-212	S-4	15	MH	26.6										
A-11-212	D-5	20	MH	26.3	121.1	>4.5								
A-11-212	S-6	25	MH	27.3										
A-11-212	D-7	30	MH	23.6	121.8	>4.5								
A-11-214	S-1	2.5	CL	10.7										
A-11-214	D-2	5	SC	5.3	119.7									
A-11-214	S-3	10	CL	21.5							290	7.6	260	2216
A-11-214	D-4	15	CH	21.0	118.5	>4.5								
A-11-214	S-5	20	CH	22.3						64/30/34				
A-11-214	D-6	25	CH	22.1	121.8	>4.5								
A-11-214	S-7	30	CH	30.2										
A-11-214	D-8	35	MH	25.8	121.6	>4.5								
A-11-214	S-9	40	MH	28.0						74/37/37				
A-11-214	D-10	45	MH	27.0	120.1	>4.5								
A-11-214	S-11	50	MH	25.8										
A-11-216	S-1	2.5	CL	13.0										
A-11-216	D-2	5	SM	3.9	118.6			26:60:14						
A-11-216	S-3	10	CL	24.7										
A-11-216	D-4	15	CH	31.2	119.4	3.25								
A-11-216	S-5	20	CL	26.2							270	6.8	550	1084
A-11-216	D-6	25	CL	27.5	119.8	2.25								
A-11-216	S-7	30	CH	23.8				0:11:89		54/21/33				
A-11-216	D-8	35	CH	21.1	123.7	4.0								
A-11-216	S-9	40	CL	25.4										
A-11-216	D-10	45	CL	23.1	123.6	2.25								
A-11-216	S-11	50	CL	23.9										
A-11-219	D-3	15	CH	25.7	122.9	>4.5								
A-11-219	S-4	20	MH	27.3				0:1:99		71/36/35				
A-11-219	D-5	25	MH	28.6	118.9	>4.5								
A-11-219	S-6	30	MH	26.2										
A-11-219	D-7	35	MH	28.7	116.6	>4.5								
A-11-219	S-8	40	MH	23.8							300	8.1	550	768

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-219	D-9	45	MH	24.7	121.1	>4.5								
A-11-219	S-10	50	MH	24.2										
A-11-219	D-11	55	MH	30.9	114.4	>4.5								
A-11-219	S-12	60	MH	30.8										
A-11-219	D-13	65	MH	24.7	123.6	>4.5								
A-11-219	S-14	70	MH	21.7										
A-11-219	D-15	75	MH	23.9	122.9	>4.5								
A-11-219	S-16	80	MH	20.8										
A-11-219	D-17	85	MH	22.9	122.7	>4.5								
A-11-219	S-18	90	MH	25.3										
A-11-220	S-1	5	CL	28.9										
A-11-220	D-2	10	CH	30.6	119.4	>4.5								
A-11-220	S-3	15	CL	29.9							540	7.2	380	505
A-11-220	D-4	20	CL	17.8	126.4	2.5								
A-11-220	S-5	25	CH	31.7				0:6:94		80/27/53				
A-11-220	D-6	30	CL	26.3	121.5	>4.5								
A-11-220	S-7	35	CL	34.3										
A-11-220	D-8	40	CH	30.4	117.4	>4.5								
A-11-220	S-9	45	MH	27.8										
A-11-220	D-10	50	MH	27.1	122.2									
A-11-220	S-11	55	MH	31.8				0:2:98		78/45/33				
A-11-220	D-12	60	MH	36.6	112.8	>4.5								
A-11-220	S-13	65	MH	25.0										
A-11-220	D-14	70	MH	22.3	123.7	>4.5								
A-11-220	S-15	75	MH	24.2										
A-11-220	D-16	80	MH	20.8	124.7	>4.5								
A-11-220	S-17	85	MH	23.0										
A-11-220	D-18	90	MH	24.8	123.7	>4.5								
A-11-221	S-2	10	ML	12.3										
A-11-221	D-3	15	CL/CH	15.1	131.1	>4.5								
A-11-221	S-4	20	CL	14.2						43/18/25	440	7.5	390	845
A-11-221	D-5	25	CH	35.7	116.9	3.75								
A-11-221	S-6	30	CL	18.1										
A-11-221	D-7	35	CH	11.7	134.9	>4.5								
A-11-221	S-8	40	CL	15.9						40/17/23				
A-11-221	D-9	45	SM	7.7	115.4			6:74:20						
A-11-221	S-10	50	CH	18.4										
A-11-221	D-11	55	CL	20.3	129.9	2.25								
A-11-221	S-12	60	CH	25.6										
A-11-221	D-13	65	SC to SM	12.2	121.7									

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-221	S-14	70	CL	26.7										
A-11-221	D-15	75	CH	24.9	123.7	2.5								
A-11-221	S-16	80	CH	37.9										
A-11-221	D-17	85	CH	33.9	117.7	4.5								
A-11-221	S-18	90	MH	26.0				0:5:95		64/34/30				
A-11-222	S-1	5	CL	14.0							400	6.8	510	1011
A-11-222	D-2	10	CL	14.8	122.2	>4.5								
A-11-222	D-4	20	CH	33.7	111.2	>4.5								
A-11-222	S-5	25	CH	11.4						84/37/47				
A-11-222	D-6	30	CL	14.1	130.3	>4.5								
A-11-222	S-7	35	CL	16.7										
A-11-222	D-8	40	SC to CL	12.6	131.4	3.5								
A-11-222	S-9	45	CL	16.8										
A-11-222	D-10	50	CL	23.5	118.5	1.5								
A-11-222	S-11	55	CL	25.5										
A-11-222	D-12	60	CL	24.4	124.8	1.75								
A-11-222	S-13	65	CL	26.7				0:18:82						
A-11-222	D-14	70	CL	24.5	128.1	2.25								
A-11-222	S-15	75	CL	28.0										
A-11-222	D-16	80	CL	27.4	123.5	0.75								
A-11-222	S-17	85	CH	33.1										
A-11-222	D-18	90	CH to MH	31.7	122.2	3.5 to >4.5								
A-11-224	D-1	5	SP-SM to CL	14.2	121.9	>4.5								
A-11-224	S-2	10	CL	12.5				0:13:87			210	7.2	1180	3824
A-11-224	D-3	15	SC	6.4	129.8									
A-11-224	S-4	20	CL	30.1										
A-11-224	D-5	25	CL	28.1	121.4	3.5								
A-11-224	S-6	30	CL	14.1				2:35:63		44/17/27				
A-11-224	D-7	35	CL	11.5	127.9									
A-11-224	S-8	40	CL	14.4										
A-11-224	D-9	45	SP-SM to SC to CL	16.5	129.5	4.5								
A-11-224	S-10	50	CL	25.8										
A-11-225	D-1	5	MH	26.2	119.2	>4.5								
A-11-225	S-2	10	MH	26.8						69/36/33	380	4.4	930	1004
A-11-225	D-3	15	MH	31.9	117.1	>4.5								
A-11-225	S-4	20	MH	33.0										
A-11-225	D-5	25	MH	26.2	126.7	>4.5								
A-11-225	S-6	30	MH	27.5						63/36/27				
A-11-226	D-1	2.5	CL/CH	23.8	117.7	>4.5								
A-11-226	S-2	5	MH	28.2										

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-226	D-3	10	MH	28.9	118.2	>4.5								
A-11-226	S-4	15	MH	27.0				0:8:92		60/31/29				
A-11-226	D-5	20	MH	28.1	118.8	>4.5								
A-11-226	S-6	25	MH	35.2										
A-11-226	D-7	30	MH	26.6	119.2	>4.5								
A-11-226	S-8	35	MH	25.6						58/31/27	240	6.0	1550	1616
A-11-226	D-9	40	MH	26.7	122.0	>4.5								
A-11-226	S-10	45	MH	28.7										
A-11-226	D-11	50	MH	25.2	120.3	>4.5								
A-11-228	S-1	5	CL	22.5							320	6.5	710	2435
A-11-228	D-2	10	ML	12.4	105.8	>4.5								
A-11-228	S-3	15	CL	12.4				0:14:86		40/16/24				
A-11-228	D-4	20	CL-ML	11.5	118.5	>4.5		0:22:78						
A-11-228	S-5	25	CL	10.0										
A-11-228	D-6	30	CL	10.6	126.8	>4.5								
A-11-228	S-7	35	CH	14.9						54/23/31				
A-11-228	D-8	36.5	CH	14.4	129.6	>4.5								
A-11-230	D-1	2.5	CH	22.7	122.4	>4.5								
A-11-230	S-2	5	CH	21.3							420	3.5	1350	1760
A-11-230	D-3	10	CH	26.8	117.9	>4.5								
A-11-230	S-4	15	MH	30.3				0:1:99		76/37/39				
A-11-230	D-5	20	MH	32.0	114.5	>4.5								
A-11-230	S-6	25	MH	30.5										
A-11-230	D-7	30	MH	23.7	114.1	>4.5								
A-11-230	S-8	35	MH	29.7						65/35/30				
A-11-230	D-9	40	MH	26.1	119.7	>4.5								
A-11-230	S-10	45	MH	30.3										
A-11-230	D-11	50	CH	19.5										
A-11-232	S-1	5	SP-SM	3.8				26:66:8						
A-11-232	D-2	10	SP-SM	2.4	115.4			34:55:11						
A-11-232	S-3	15	CH	33.0						69/32/37	320	6.6	570.0	1253
A-11-232	D-4	20	CH	34.3	114.4	>4.5								
A-11-232	S-5	25	MH	34.4										
A-11-232	D-6	30	MH	32.2	115.1	>4.5								
A-11-232	S-7	35	MH	28.9						70/36/34				
A-11-232	D-8	40	MH	36.6	112.2	>4.5								
A-11-232	S-9	45	MH	29.3										
A-11-232	D-10	50	MH	27.2	115.0	>4.5								
A-11-233	S-1	2.5	CL	14.6										
A-11-233	D-2	5	CL	21.3	155.1	3.0		0:13:87						

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-233	S-3	10	SC	14.2				1:50:49						
A-11-233	D-4	15	GP	1.0										
A-11-233	S-5	20	SP to CL	40.4										
A-11-233	D-6	25	CH	26.3	116.0	>4.5								
A-11-233	S-7	30	MH	26.3						58/30/28				
A-11-233	D-8	35	MH	26.7	121.1	>4.5								
A-11-233	S-9	40	MH	25.9				0:13:87						
A-11-233	D-10	45	MH	31.1	116.4	>4.5								
A-11-233	S-11	50	MH	26.7										
A-11-235	S-1	2.5	SM	6.4										
A-11-235	D-2	5	SP	1.2	100.5									
A-11-235	S-3	10	SP	1.5				0:97:3						
A-11-235	D-4	15	SP	4.0	101.4									
A-11-235	S-5	20	MH	40.6						72/38/34	300	6.9	500	2119
A-11-235	D-6	25	MH	34.3	112.0	>4.5								
A-11-235	S-7	30	MH	41.9				0:3:97						
A-11-235	D-8	35	MH	34.1	112.2	>4.5								
A-11-235	S-9	40	MH	32.9						64/35/29				
A-11-235	D-10	45	MH	29.2	115.1	>4.5								
A-11-235	S-11	50	MH	27.1										
A-11-239	S-1	2.5	CL	15.5				0:13:87						
A-11-239	D-2	5	CL	23.5	121.3	3.5				49/24/25				
A-11-240	D-1	2.5	CL	20.2	122.4	3.25								
A-11-240	S-2	5	CL	21.2				0:14:86		39/18/21				
A-11-244	S-1	5	CL	18.5						41/21/20	388	6.2	530	1392
A-11-244	D-2	10	CL	23.0	121.9	2.5								
A-11-244	S-3	15	SP-SM	2.0				0:95:5						
A-11-244	D-4	20	SP-SM	1.6	124.5									
A-11-244	S-5	25	SP-SM	21.1										
A-11-244	D-6	30	MH	28.5	118.4	>4.5				61/33/28				
A-11-246	S-1	5	ML	18.0				0:9:91						
A-11-246	D-2	10	ML	24.5	121.2	4.25								
A-11-246	S-3	15	SP	1.1				1:96:3						
A-11-246	D-4	20	SP	1.4	110.4									
A-11-246	S-5	25	SP	5.7										
A-11-246	D-6	30	CH	30.9		4.25				57/27/30				
A-11-247	D-1	5	ML	20.5	124.9	4.0								
A-11-247	S-2	10	ML	21.9				0:16:84						
A-11-247	D-3	15	CL	23.2	123.1	1.75								
A-11-247	S-4	20	SP	2.0				29:67:4						

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No .	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-247	D-5	25	SP	2.7	101.6									
A-11-247	S-6	30	SP	21.1										
A-11-247	D-7	35	MH	30.1	115.6	>4.5								
A-11-247	S-8	40	MH	33.4						71/39/32	300	6.5	1840	1561
A-11-247	D-9	45	MH	30.2	117.4	>4.5								
A-11-247	S-10	50	MH	26.4										
A-11-248	D-1	2.5	SC to CL	12.5	126.1			6:19:75						
A-11-248	S-2	5	CL	13.4						37/15/22				
A-11-249	S-1	2.5	ML to CL	18.9						43/15/28				
A-11-249	D-2	5	CL	14.6	131.8	>4.5		0:7:93						
A-11-253	S-1	2.5	ML	13.4										
A-11-253	D-2	5	CL-ML	6.7	118.2	4.5								
A-11-253	S-3	10	ML	17.8				0:10:90						
A-11-253	D-4	15	SM	4.1	113.8			0:86:14						
A-11-253	S-5	20	SP	9.5										
A-11-253	D-6	25	SP-SM	25.7	125.0									
A-11-253	S-7	30	MH	37.7										
A-11-253	D-8	35	MH	31.5	116.6	>4.5								
A-11-253	S-9	40	MH	32.5						67/33/34				
A-11-253	D-10	45	MH	32.5	113.9	>4.5								
A-11-253	S-11	50	MH	33.8										
A-11-254	D-1	2.5	CL	15.5	123.7	>4.5								
A-11-254	S-2	5	CL	19.5						45/18/27	310	6.8	600	907
A-11-254	D-3	10	SP	2.8	106.7									
A-11-254	S-4	15	SP-SM	12.7										
A-11-254	D-5	20	SM	12.9	124.4									
A-11-254	S-6	25	CH	33.8							280	6.6	1200	1163
A-11-254	D-7	30	MH	27.8	118.4	>4.5								
A-11-254	S-8	35	MH	28.4				0:4:96		60/37/23				
A-11-254	D-9	40	MH	34.9	111.7	>4.5								
A-11-254	S-10	45	MH	26.7										
A-11-254	D-11	50	MH	26.8	119.6	>4.5								
A-11-255	D-1	2.5	CL	10.2	126.2	>4.5								
A-11-255	S-2	5	CL	13.1				0:9:91			300	7.4	780	1254
A-11-255	D-3	10	CL	18.5	126.2	>4.5								
A-11-255	S-4	15	CL	22.3						41/21/20				
A-11-255	D-5	20	GP-GM	1.8										
A-11-255	S-6	25	SP-SM	10.0				31:63:6						
A-11-255	D-7	30	CL	27.8	116.6	4.0								

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

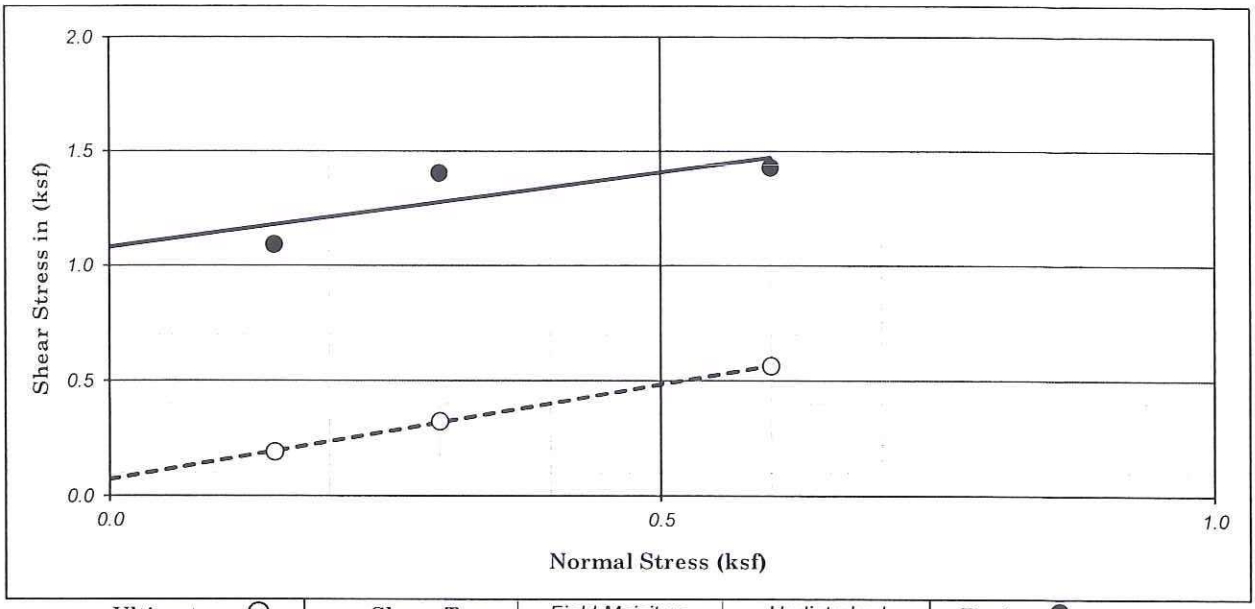
Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-256	S-1	2.5	CL	9.9				5:31:64						
A-11-256	D-2	5	CL	14.3	124.0	>4.5		1:15:84		42/19/23				
A-11-258	D-1	5	CL	20.3	118.0	>4.5								
A-11-258	S-2	10	CL	16.7				0:10:90		43/19/24				
A-11-258	D-3	15	CL	11.3	116.2	>4.5								
A-11-258	S-4	20	CL	16.0							390	7.6	220	1239
A-11-258	D-5	25	CL	13.5	115.2	2.0								
A-11-258	S-6	30	CL	23.1						41/22/19				
A-11-259	S-1	5	CL	4.6										
A-11-259	D-2	10	CL	13.8										
A-11-259	S-3	15	CL	13.0						36/19/17	900	7.2	430	402
A-11-259	D-4	20	CL	13.7	127.8	>4.5								
A-11-259	S-5	25	CL	20.4				0:13:87		35/21/14				
A-11-259	D-6	30	CL	22.8	113.1	3.50								
A-11-260	S-1	2.5	CL	21.7										
A-11-260	D-2	5	CL	25.9	110.7	3.0		3:10:87						
A-11-260	S-3	10	CH	29.7						60/28/32	140	6.2	3260	4642
A-11-260	D-4	15	MH	29.2	104.2	>4.5				55/36/19				
A-11-260	S-5	20	MH	39.4										
A-11-260	D-6	25	MH	26.8										
A-11-260	S-7	30	MH	26.1										
A-11-261	S-1	2.5	CL	31.6										
A-11-261	D-2	5	MH	28.3	116.4	>4.5								
A-11-261	S-3	10	MH	30.0				0:2:98		73/35/38				
A-11-261	D-4	15	MH	26.6	114.3	>4.5								
A-11-261	S-5	20	MH	25.8							250	7.3	960	1874
A-11-261	D-6	25	MH	24.0	110.3	4.5								
A-11-261	S-7	30	MH	25.3				0:2:98		54/31/23				
A-11-262	S-1	2.5	CL	16.4										
A-11-262	D-2	5	CL	11.7	121.2	>4.5								
A-11-262	S-3	10	CL	14.9						44/21/23	220	6.6	230	3143
A-11-262	D-4	15	ML to CL	15.3	121.9	>4.5				37/21/16				
A-11-262	S-5	20	ML	12.9										
A-11-262	D-6	25	ML	12.9	116.2	>4.5								
A-11-262	S-7	30	CH	18.4				0:2:98		74/32/42				
A-11-262	D-8	35	SP	1.1	100.2									
A-11-263	D-1	2.5	ML	12.3	116.7	>4.5								
A-11-263	S-2	5	CL	14.9				0:30:70						
A-11-263	D-3	10	CL	12.6	115.4	>4.5				29/19/10				
A-11-263	S-4	15	ML/CL	18.5										

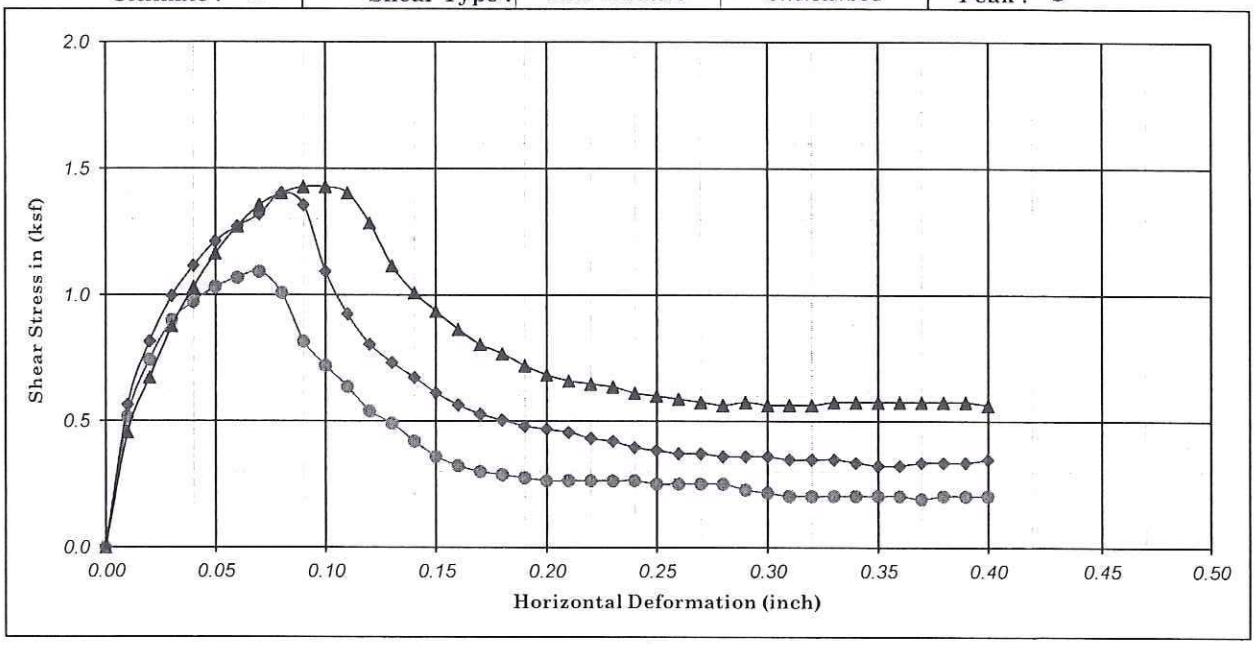
TABLE 1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-136 Project Name : AECOM/I-5 HOV Widening Segment 2

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (Kg/cm2)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-263	D-5	20	SP	1.0	107.6									
A-11-263	S-6	25	SM	2.6				2:81:17						
A-11-263	D-7	30	CH	31.4	118.7	2.25				64/29/35				
A-11-263	S-8	35	MH	31.4						79/37/42				
A-11-264	S-1	5	MH	29.2						69/36/33				
A-11-264	D-2	10	MH	27.7	118.7	>4.5								
A-11-264	S-3	15	MH	31.2							270	6.1	1090	1271
A-11-264	D-4	20	MH	27.0	119.3	>4.5								
A-11-264	S-5	25	MH	27.0										
A-11-264	D-6	30	MH	25.7	119.0	>4.5								
A-11-264	D-7	40	MH	27.7	118.2	>4.5								
A-11-264	D-8	50	MH	26.4	120.3	>4.5								



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-210	Strength Intercept (C) :	1.08	(ksf)	Peak	0.07	(ksf)	Ultimate
Sample No. : D-1		51.71	(kPa)		3.45	(kPa)	
Depth (ft/m) : 2.5 / 0.00	Friction Angle (ϕ) :	33.08	Degree		39.45	Degree	
Description : Pale brown, CLAYEY SAND (SC)					Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	12.74	117.84	18.55	0.43	0.15	7.18	1.09	52.28	0.19	9.19
◆	12.66	120.43	18.96	0.40	0.30	14.36	1.40	67.22	0.32	15.51
▲	13.45	114.73	18.06	0.47	0.60	28.73	1.43	68.37	0.56	27.00

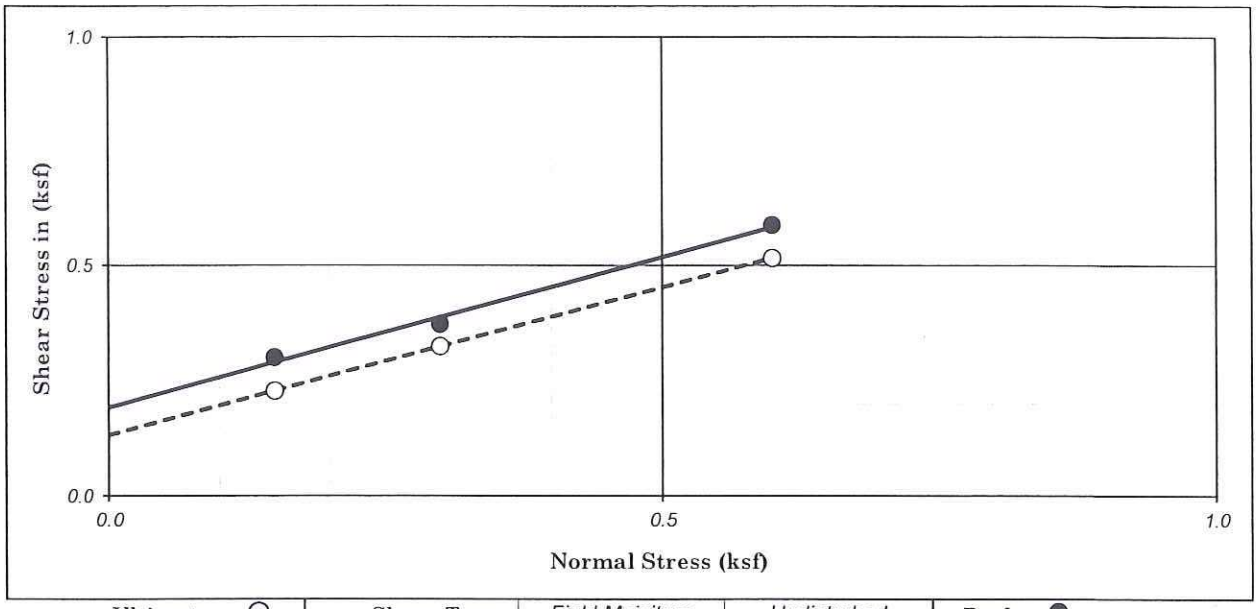
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

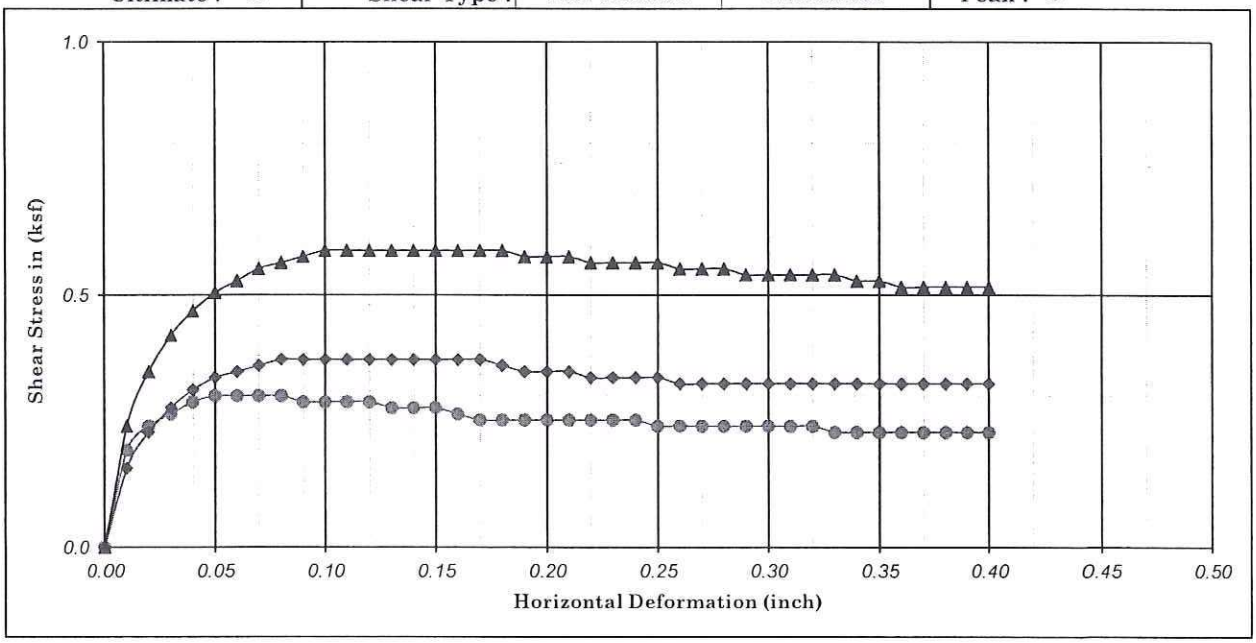
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-212		Strength Intercept (C) :	0.19	(ksf)	Peak	0.13	(ksf)	Ultimate
Sample No. : D-1			9.19	(kPa)		6.32	(kPa)	
Depth (ft/m) : 2.5	0.00	Friction Angle (ϕ) :	33.08	Degree		32.62	Degree	
Description : Olive-brown, SILTY SAND (SM)					Shear Rate (inch/minute) :			0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	20.75	100.82	15.87	0.67	0.15	7.18	0.30	14.36	0.23	10.92
◆	20.72	98.79	15.55	0.71	0.30	14.36	0.37	17.81	0.32	15.51
▲	20.95	98.79	15.55	0.71	0.60	28.73	0.59	28.15	0.52	24.71

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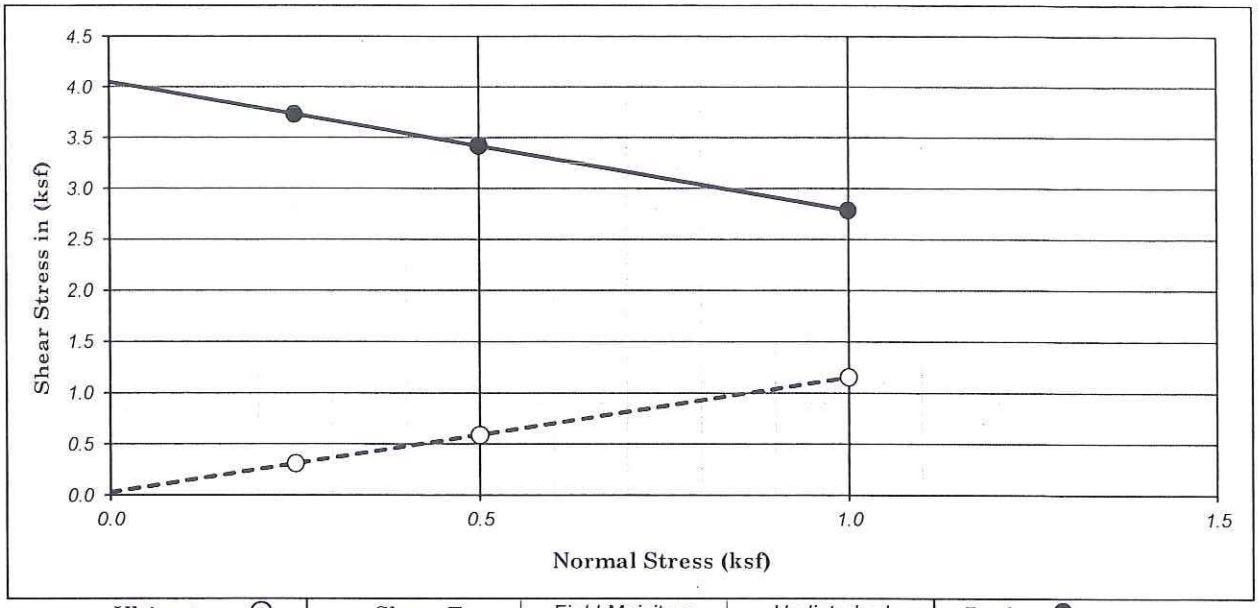
AECOM/I-5 HOV Widening Segment 2

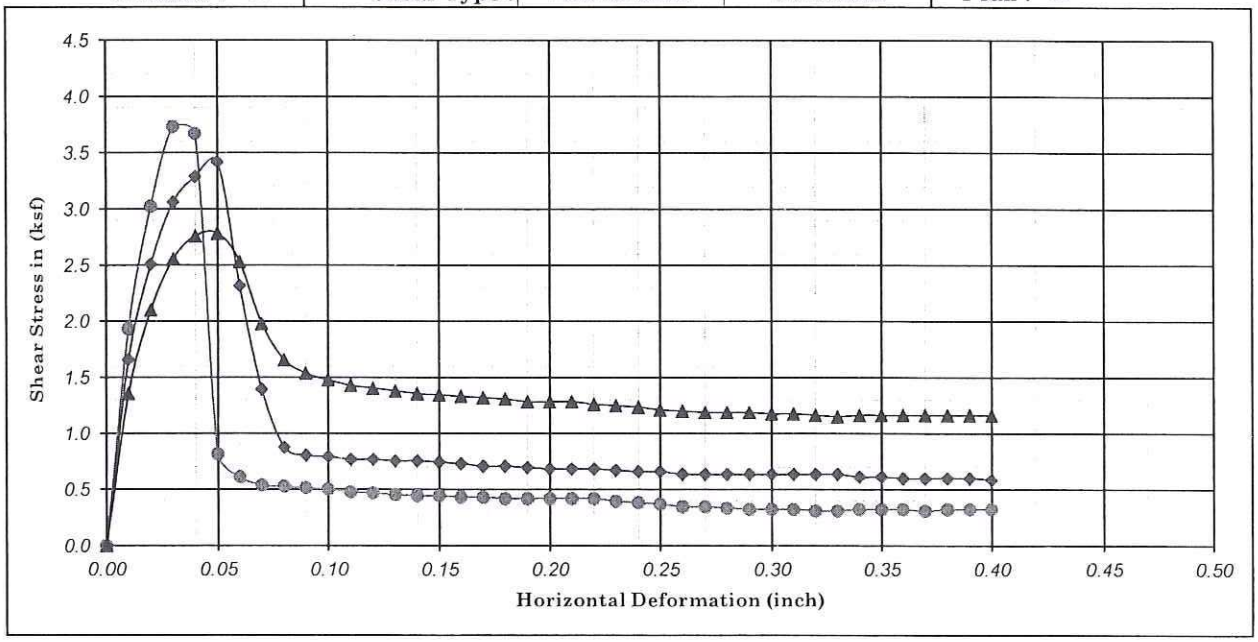
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-214		Strength Intercept (C) :	4.05	(ksf)	Peak	0.03	(ksf)	Ultimate
Sample No. : D-2			193.91	(kPa)		1.44	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	-51.68	Degree		48.27	Degree	
Description : Dark brown, CLAYEY SAND (SC)						Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	8.16	117.71	18.53	0.43	0.25	11.97	3.73	178.69	0.31	14.94
◆	7.98	114.14	17.97	0.48	0.50	23.94	3.42	163.75	0.59	28.15
▲	6.90	105.33	16.58	0.60	1.00	47.88	2.78	133.30	1.15	55.16

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AECOM/I-5 HOV Widening Segment 2

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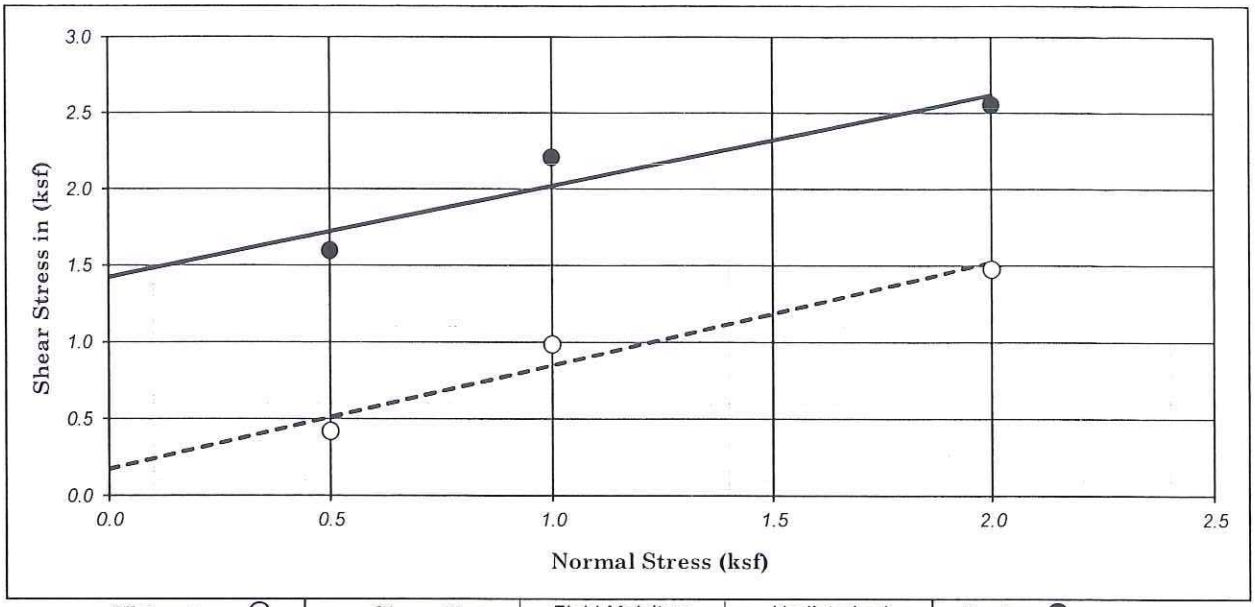
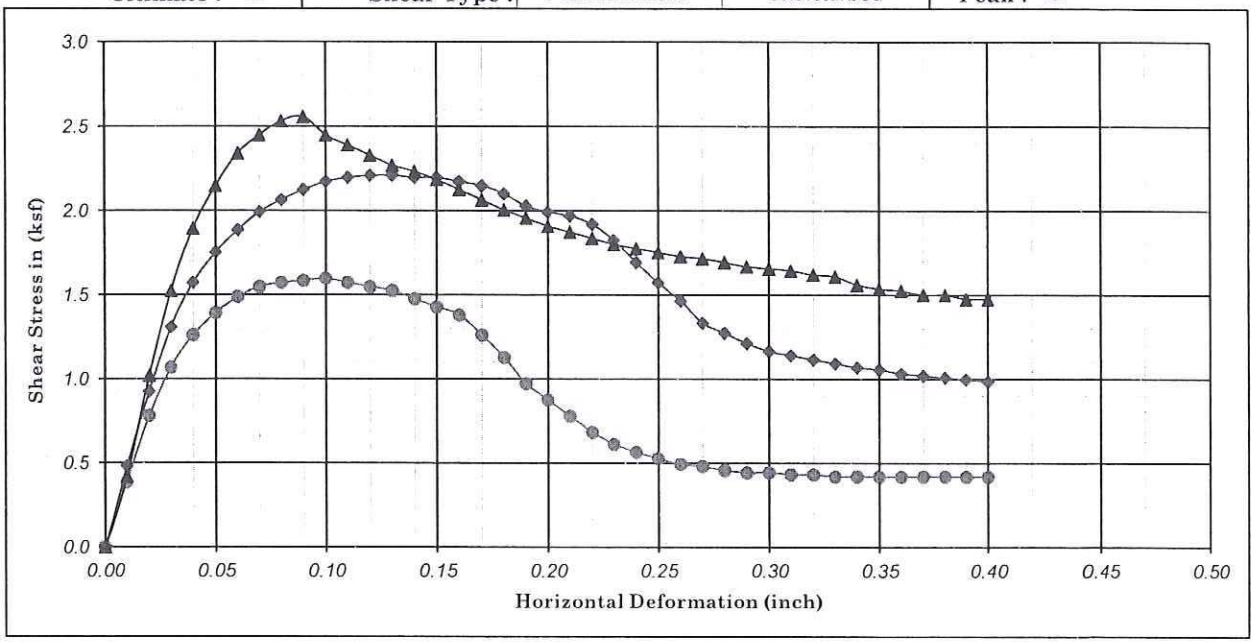
DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-220	Strength Intercept (C) :	1.42	(ksf)	Peak	0.17	(ksf)	Ultimate
Sample No. : D-2		68.09	(kPa)		8.33	(kPa)	
Depth (ft/m) : 10.0 / 0.00	Friction Angle (ϕ) :	30.89	Degree		33.97	Degree	
Description : Olive-gray, Fat CLAY (CH)					Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	27.16	94.91	14.94	0.78	0.50	23.94	1.60	76.42	0.42	20.11
◆	24.83	94.24	14.83	0.79	1.00	47.88	2.21	105.72	0.98	47.11
▲	28.91	93.53	14.72	0.80	2.00	95.76	2.56	122.38	1.48	70.67

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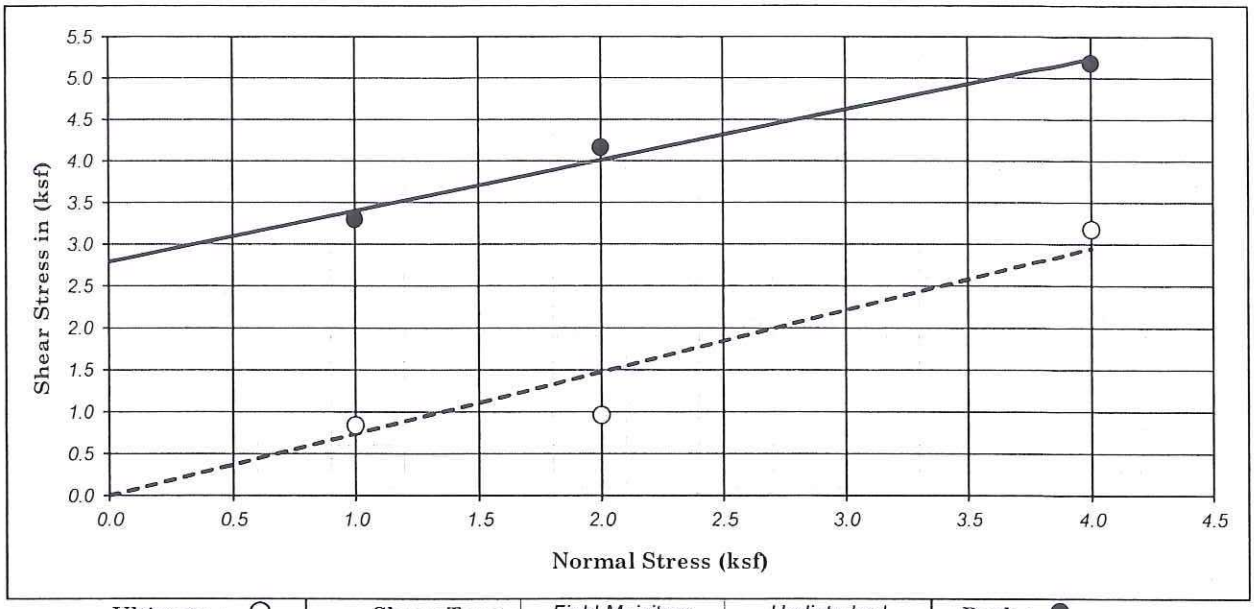
AECOM/I-5 HOV Widening Segment 2

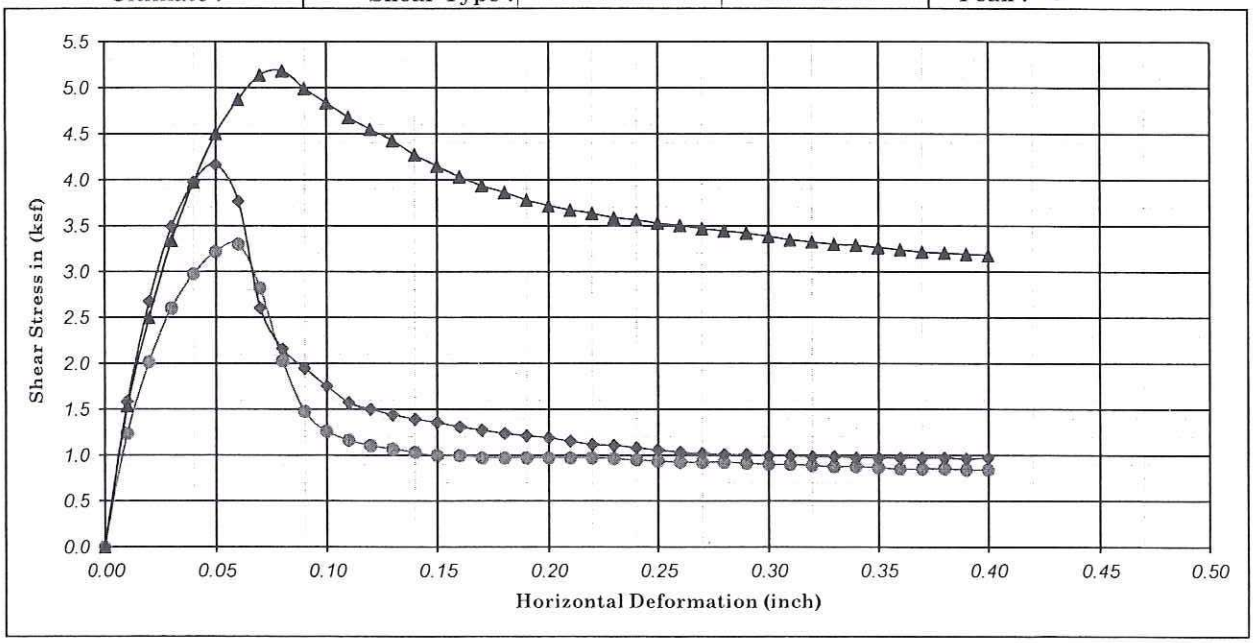
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-221		Strength Intercept (C) :	2.79	(ksf)	Peak	0.00	(ksf)	Ultimate	
Sample No. : D-3			133.59	(kPa)		0.00	(kPa)		
Depth (ft/m) : 15.0	0.00	Friction Angle (ϕ) :	31.43	Degree		36.40	Degree		
Description : Dark brown to olive-brown, Lean CLAY with SAND (CL)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	15.08	116.33	18.31	0.45	1.00	47.88	3.30	158.00	0.84	40.22
◆	17.09	110.07	17.32	0.53	2.00	95.76	4.16	199.37	0.96	45.96
▲	13.85	113.84	17.92	0.48	4.00	191.52	5.18	248.21	3.18	152.26

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Geotechnical and Earthquake Engineering

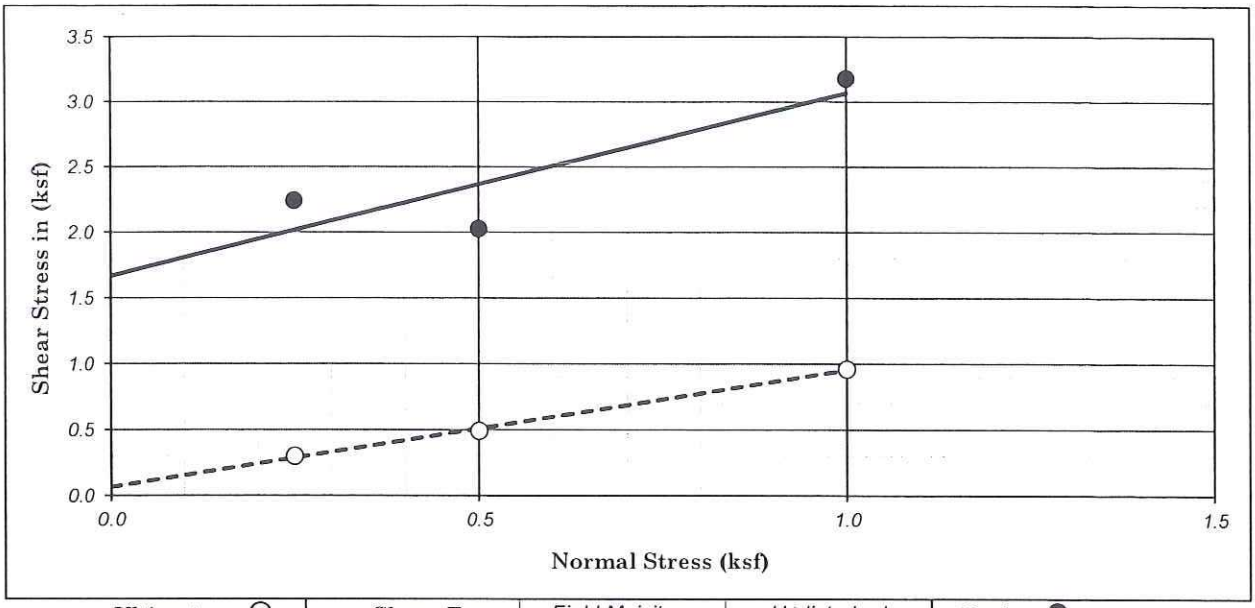
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136

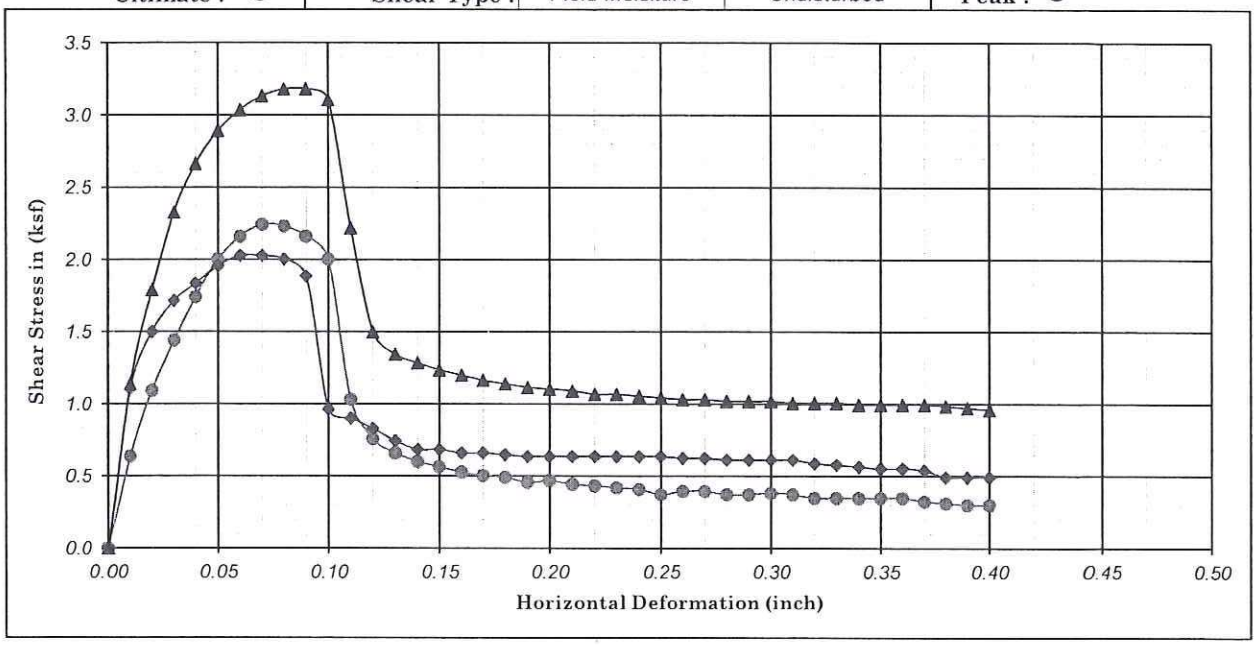
Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-224		Strength Intercept (C) :	1.67	(ksf)	Peak	0.07	(ksf)	Ultimate
Sample No. : D-1			79.86	(kPa)		3.16	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	54.44	Degree		41.61	Degree	
Description : Dark brown, Lean CLAY with SAND (CL)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	17.09	106.68	16.79	0.58	0.25	11.97	2.24	107.44	0.30	14.36
◆	23.87	96.36	15.17	0.75	0.50	23.94	2.03	97.10	0.49	23.56
▲	22.41	100.94	15.89	0.67	1.00	47.88	3.18	152.26	0.96	45.96

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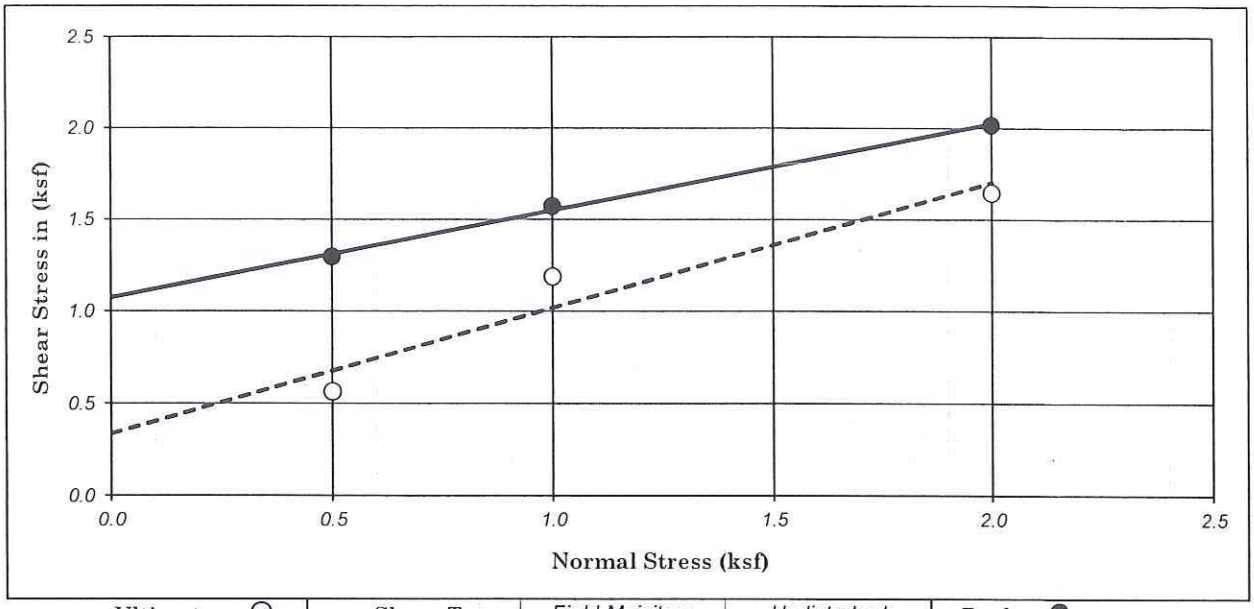
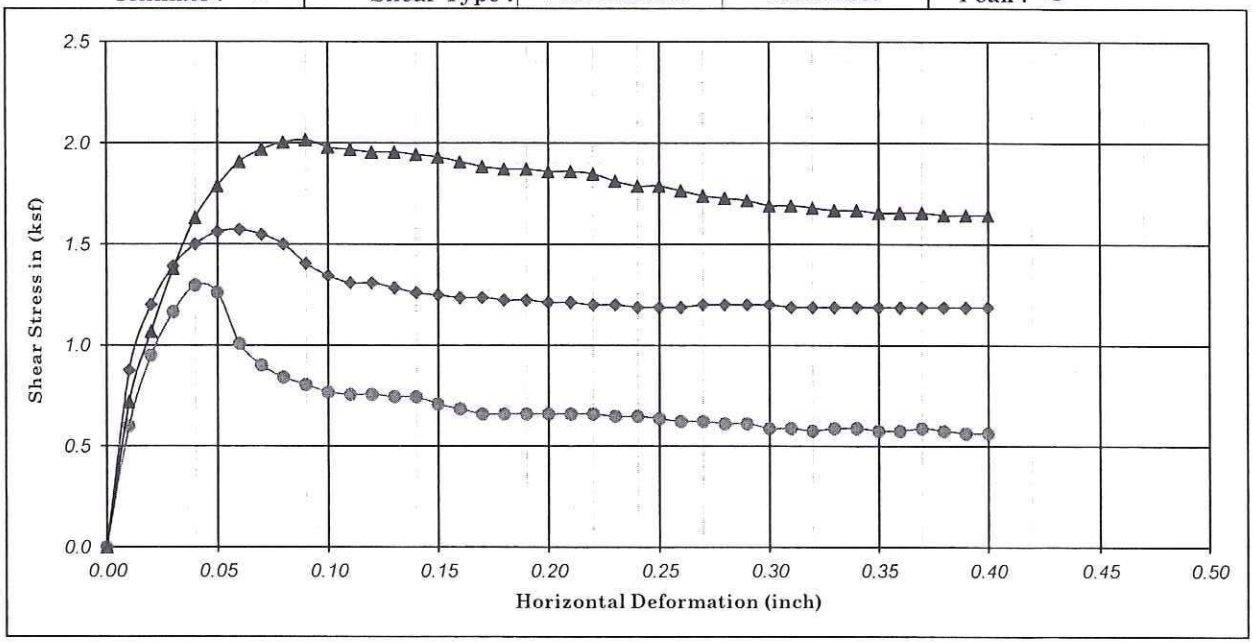
DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/11/11 | Figure No. :



Ultimate : ○ | Shear Type : *Field Moisiture* | *Undisturbed* | Peak : ●



Boring No. : *A-11-228*	Strength Intercept (C) :	*1.07*	(ksf)	Peak	*0.34*	(ksf)	Ultimate
Sample No. : *D-2*		*51.42*	(kPa)		*16.09*	(kPa)	
Depth (ft/m) : *10.0* *0.00*	Friction Angle (ϕ) :	*25.40*	Degree		*34.31*	Degree	
Description : *Olive-brown, SILT with SAND (ML)*					Shear Rate (inch/minute) :		*0.02*

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	*11.13*	*100.27*	*15.78*	*0.68*	*0.50*	*23.94*	*1.30*	*62.05*	*0.56*	*27.00*
◆	*11.39*	*98.84*	*15.56*	*0.71*	*1.00*	*47.88*	*1.57*	*75.27*	*1.19*	*56.88*
▲	*12.68*	*90.38*	*14.23*	*0.86*	*2.00*	*95.76*	*2.02*	*96.53*	*1.64*	*78.71*

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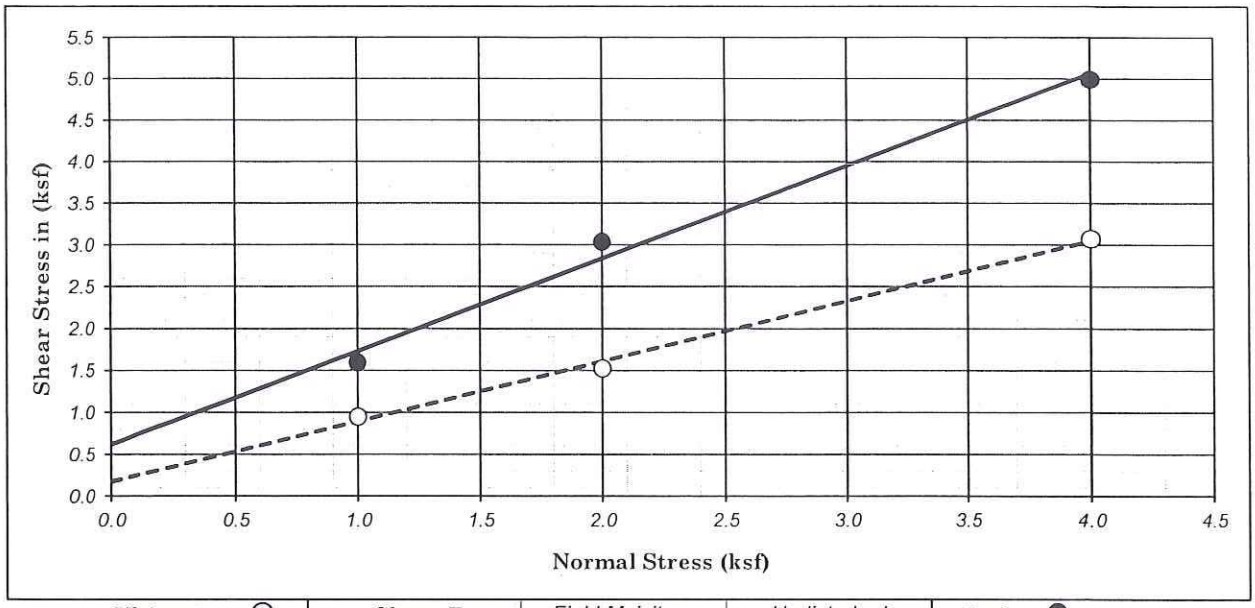
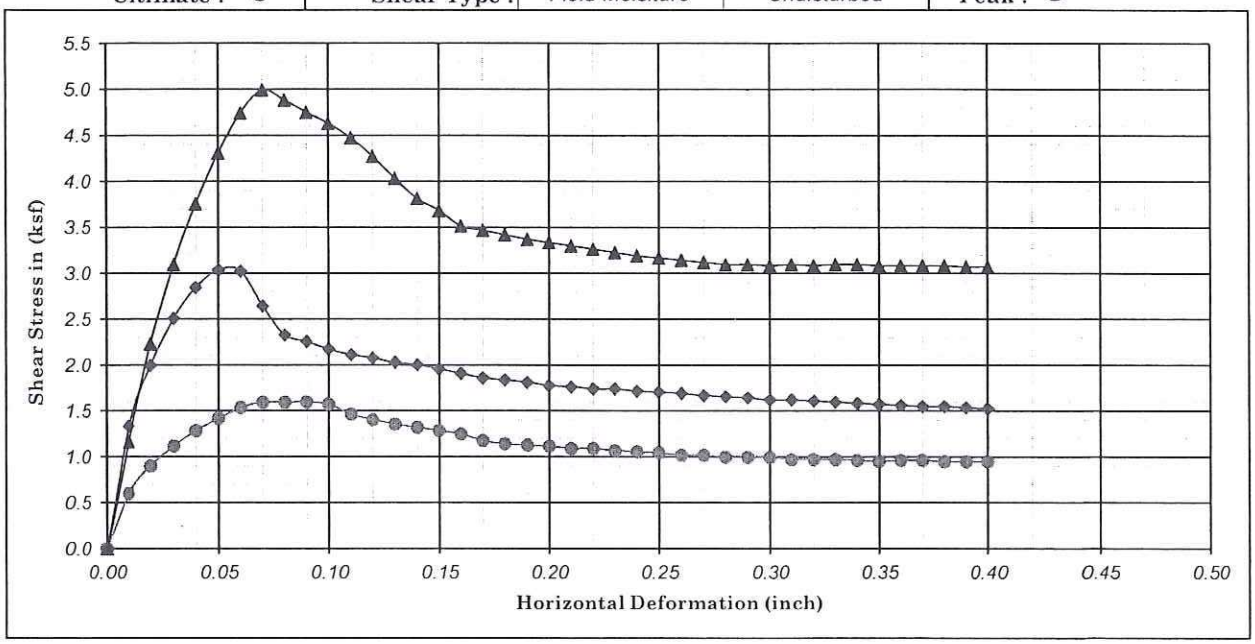
Project No. : *11-136* | Date : *11/11/11*

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-228		Strength Intercept (C) :	0.62	(ksf)	Peak	0.17	(ksf)	Ultimate
Sample No. : D-4			29.59	(kPa)		8.33	(kPa)	
Depth (ft/m) : 20.0	0.00	Friction Angle (ϕ) :	47.98	Degree		35.66	Degree	
Description : Olive-brown, SILTY CLAY (CL-ML)					Shear Rate (inch/minute) :			0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	11.81	92.34	14.54	0.83	1.00	47.88	1.60	76.42	0.95	45.39
◆	12.69	99.60	15.68	0.69	2.00	95.76	3.04	145.36	1.52	72.97
▲	12.93	105.36	16.58	0.60	4.00	191.52	4.99	239.02	3.07	147.09

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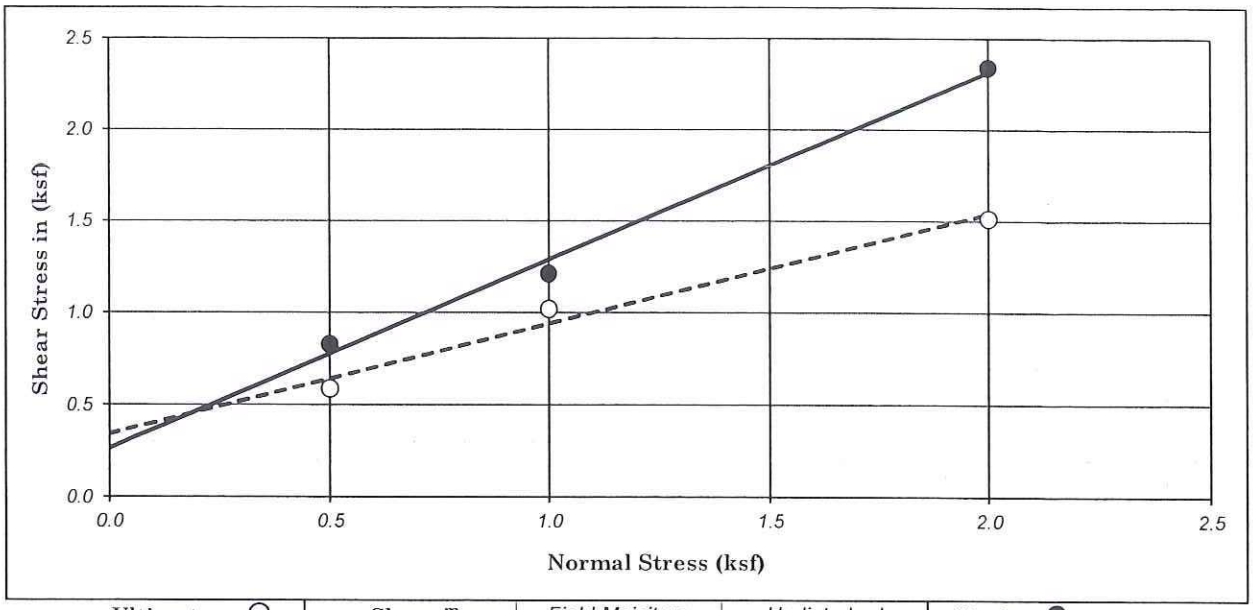
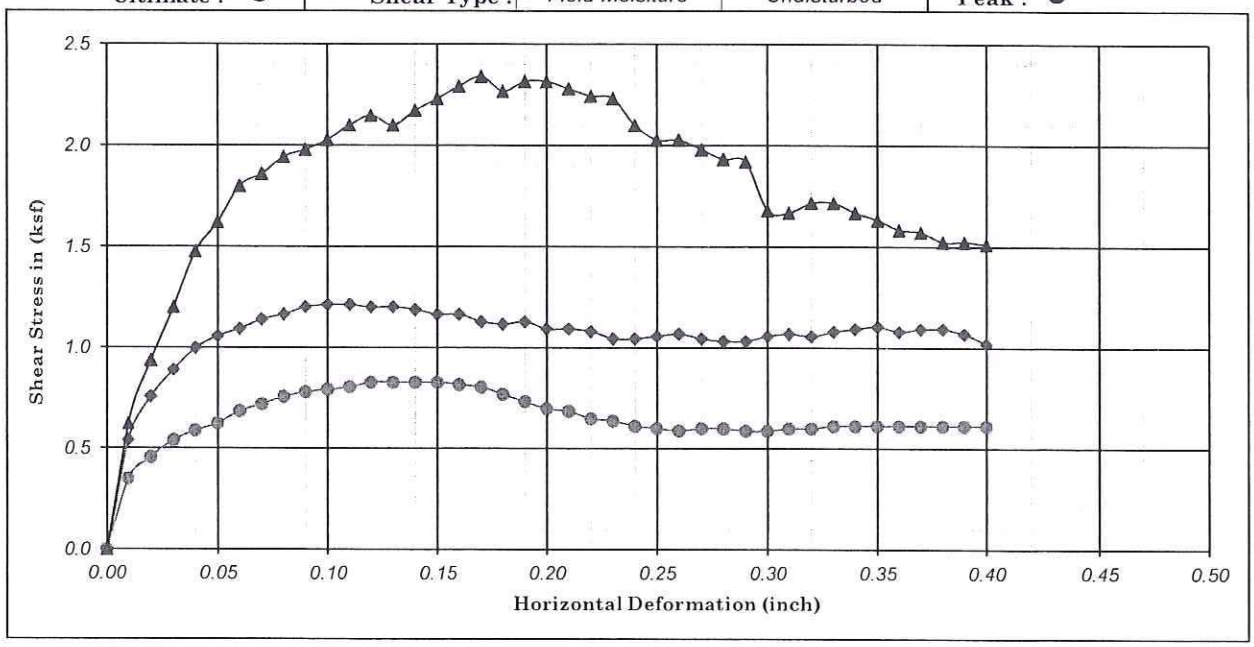
DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisture	Undisturbed	Peak : ●



Boring No. : A-11-232		Strength Intercept (C) :	0.26	(ksf)	Peak	0.34	(ksf)	Ultimate
Sample No. : D-2			12.64	(kPa)		16.37	(kPa)	
Depth (ft/m) : 10.0	0.00	Friction Angle (ϕ) :	45.71	Degree		30.89	Degree	
Description : Olive-brown, Poorly graded SAND with SILT (SP-SM)						Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	3.84	106.86	16.82	0.58	0.50	23.94	0.83	39.64	0.59	28.15
◆	2.33	118.75	18.69	0.42	1.00	47.88	1.21	58.03	1.02	48.84
▲	1.27	119.78	18.85	0.41	2.00	95.76	2.34	112.04	1.51	72.39

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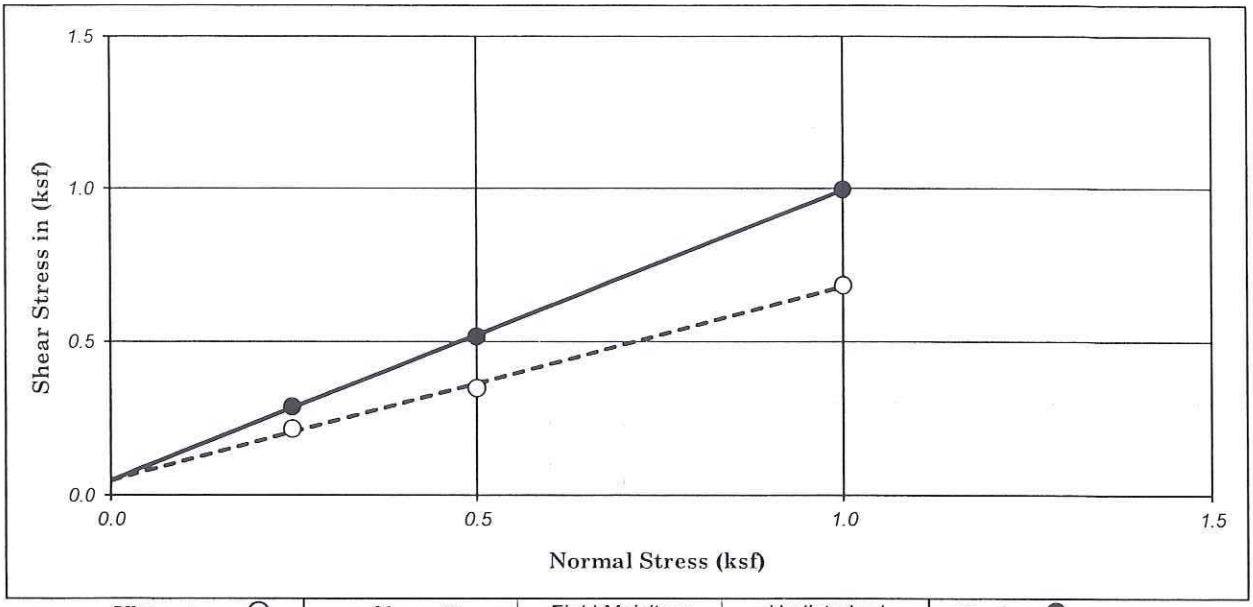
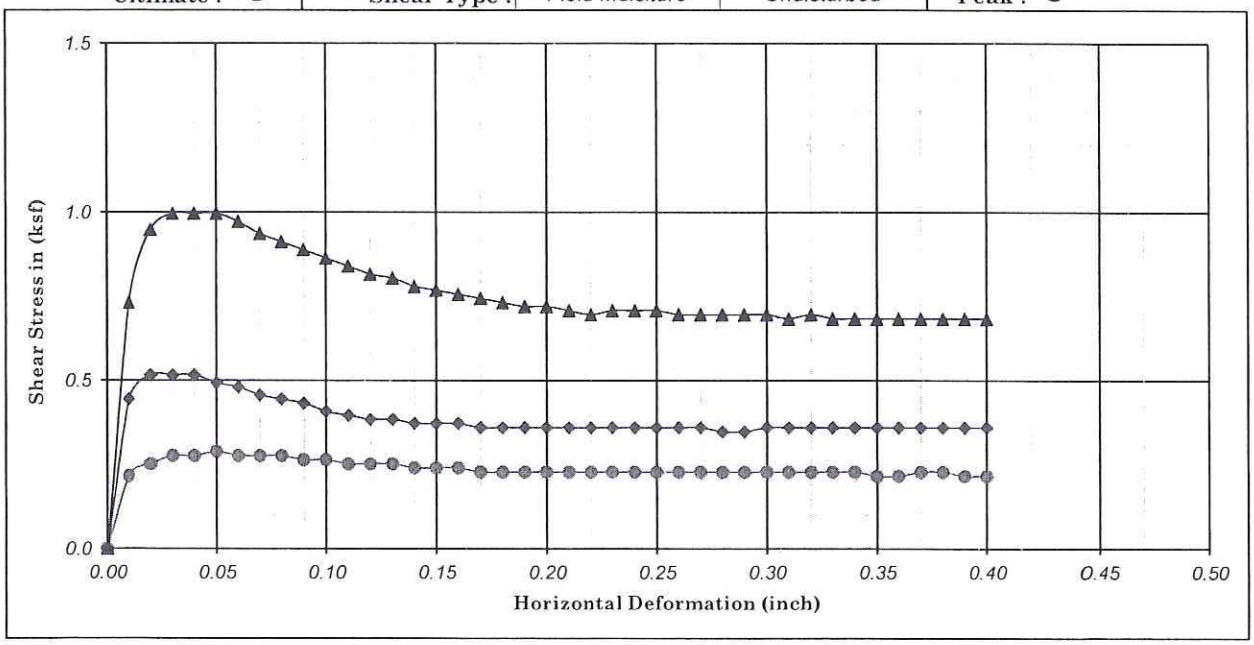
Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-235		Strength Intercept (C) :	0.05	(ksf)	Peak	0.05	(ksf)	Ultimate
Sample No. : D-2			2.30	(kPa)		2.30	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	43.42	Degree		32.25	Degree	
Description : Olive-brown, Poorly graded SAND (SP)						Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.94	98.37	15.48	0.71	0.25	11.97	0.29	13.79	0.22	10.34
◆	1.51	98.51	15.50	0.71	0.50	23.94	0.52	24.71	0.35	16.66
▲	2.57	99.69	15.69	0.69	1.00	47.88	1.00	47.69	0.68	32.75

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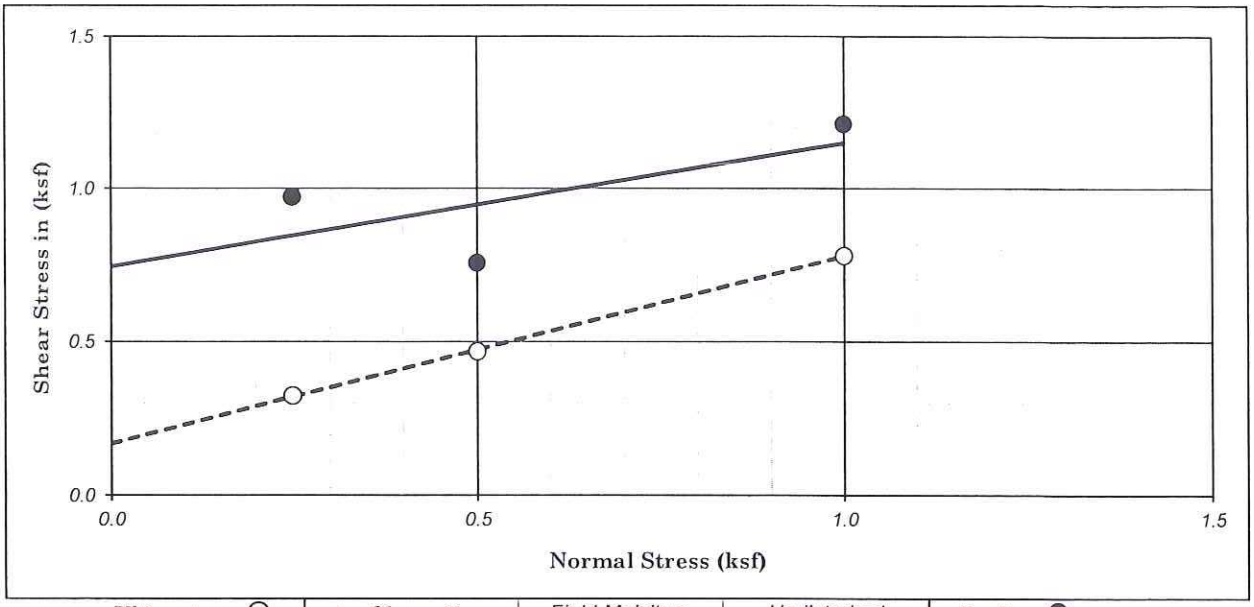
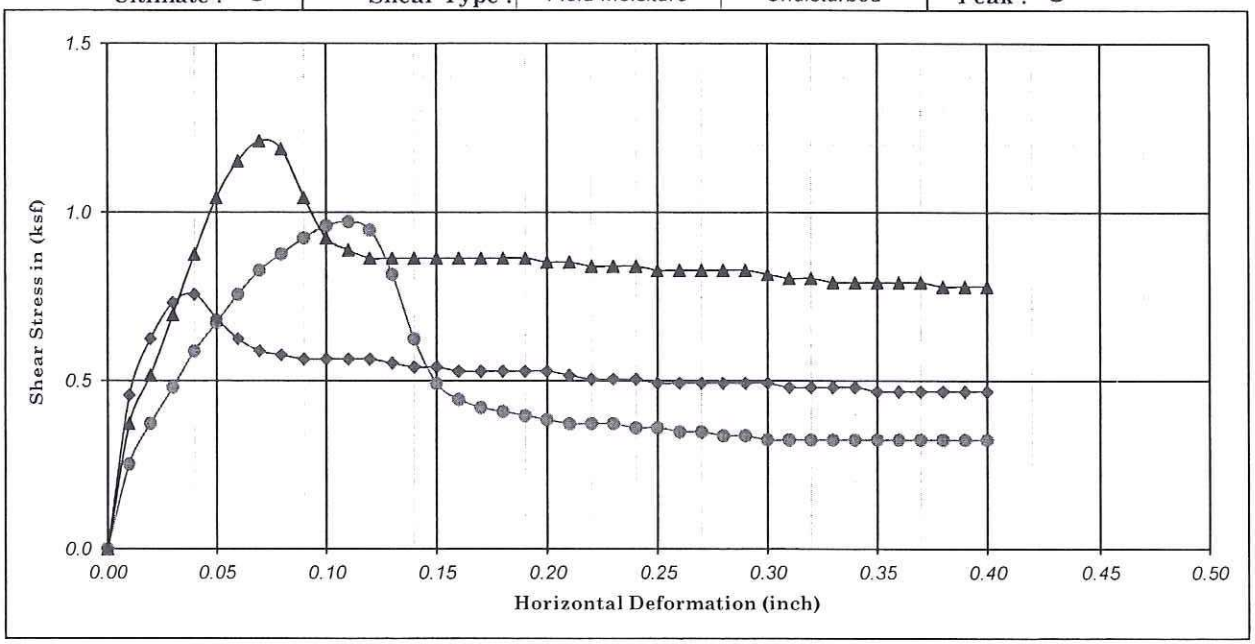
Project No. : 11-136 | Date : 11/11/11 | Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-253	Strength Intercept (C) :	0.74	(ksf)	Peak	0.17	(ksf)	Ultimate
Sample No. : D-2		35.62	(kPa)		8.04	(kPa)	
Depth (ft/m) : 5.0 | 0.00	Friction Angle (ϕ) :	22.03	Degree		31.40	Degree	
Description : Olive-brown, SILTY CLAY with SAND (CL-ML)					Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	14.04	114.44	18.01	0.47	0.25	11.97	0.97	46.54	0.32	15.51
◆	10.31	109.42	17.22	0.54	0.50	23.94	0.76	36.20	0.47	22.41
▲	12.09	104.83	16.50	0.61	1.00	47.88	1.21	58.03	0.78	37.35

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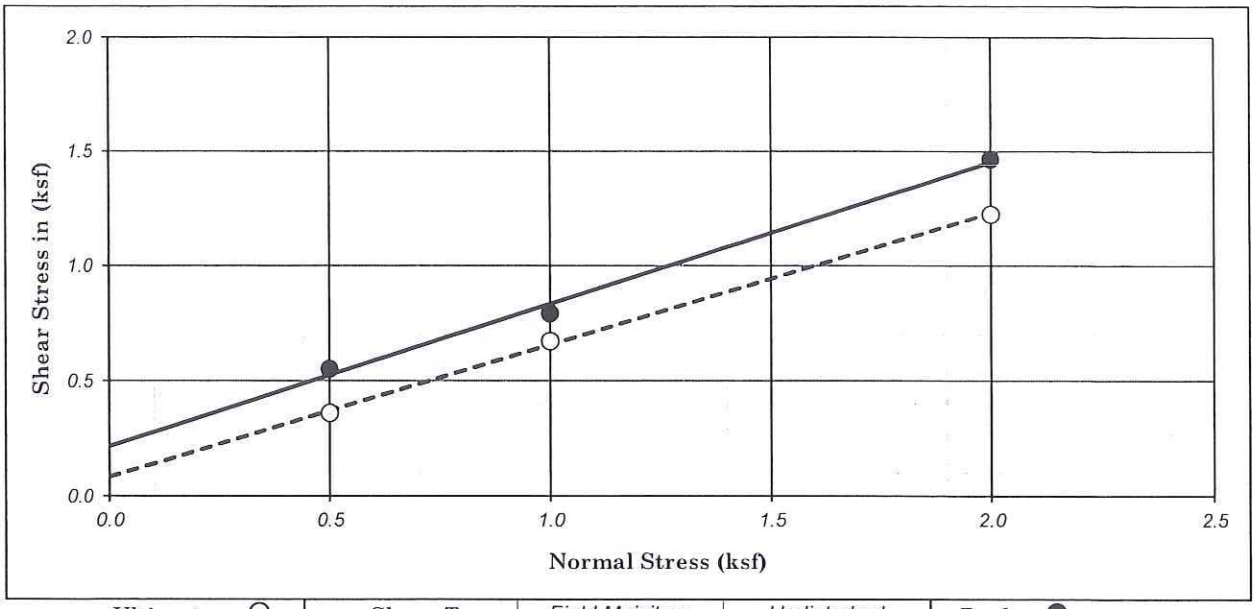
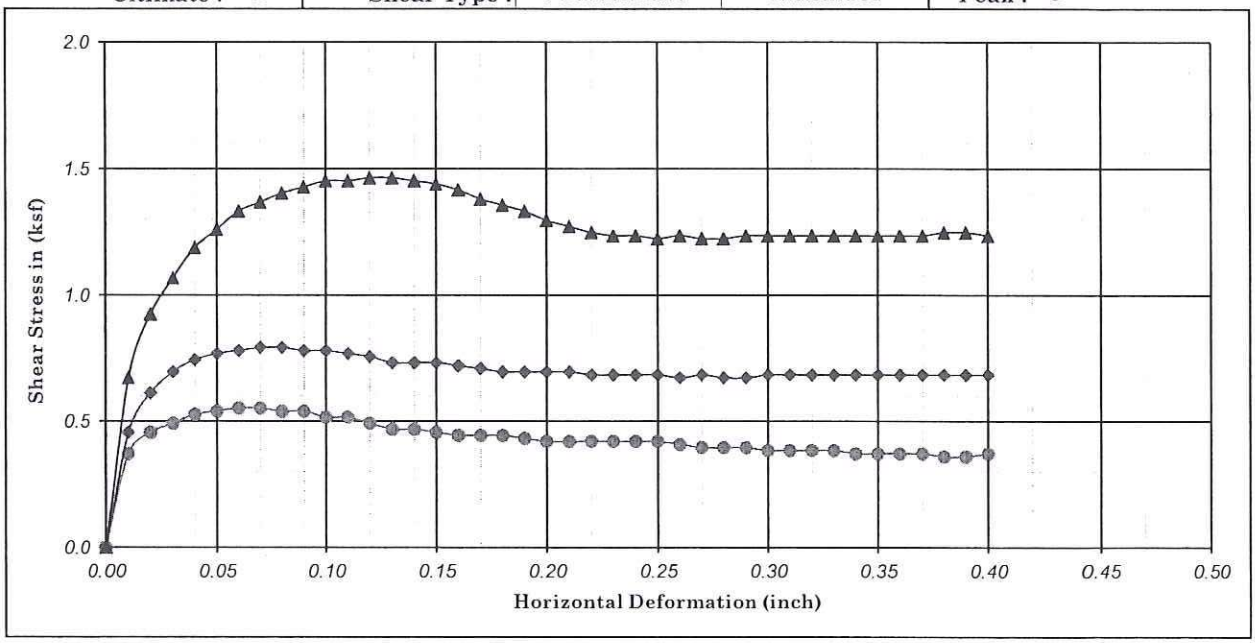
DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/15/11 | Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-254	Strength Intercept (C) :	0.22	(ksf)	Peak	0.08	(ksf)	Ultimate
Sample No. : D-3		10.34	(kPa)		4.02	(kPa)	
Depth (ft/m) : 10.0 | 0.00	Friction Angle (ϕ) :	31.68	Degree		29.79	Degree	
Description : Olive-brown, Poorly graded SAND (SP)					Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	2.70	105.83	16.66	0.59	0.50	23.94	0.55	26.43	0.36	17.24
◆	2.86	105.23	16.56	0.60	1.00	47.88	0.79	37.92	0.67	32.18
▲	2.83	100.34	15.79	0.68	2.00	95.76	1.46	70.10	1.22	58.61

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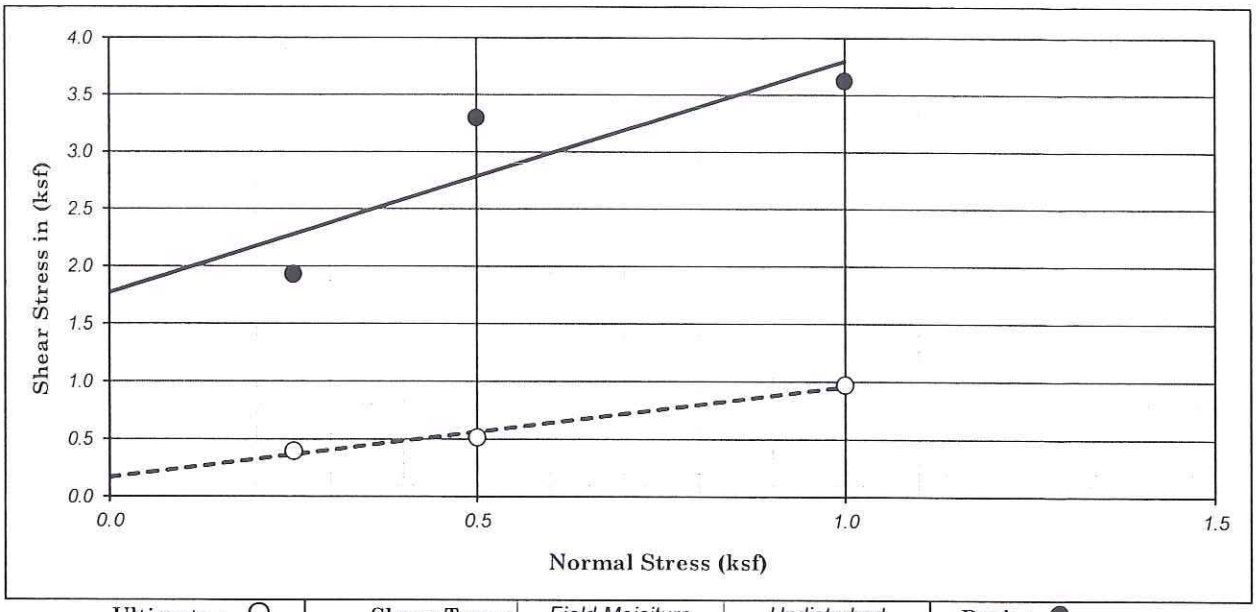
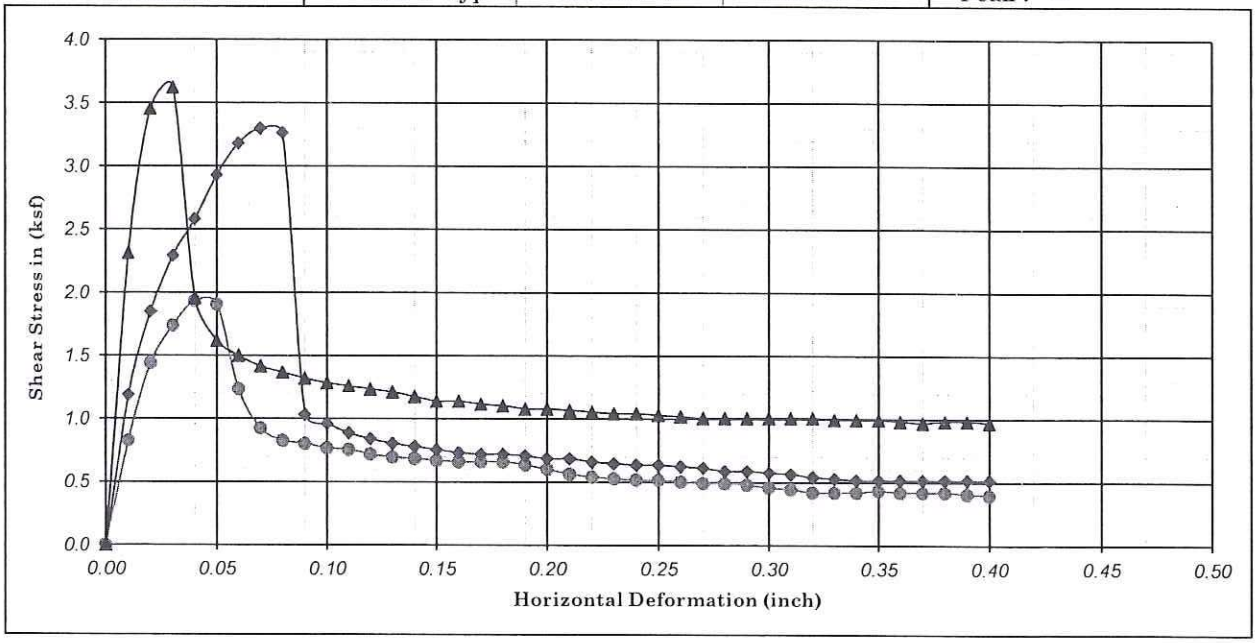
Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-255		Strength Intercept (C) :	1.77	(ksf)	Peak	0.17	(ksf)	Ultimate
Sample No. : D-1			84.75	(kPa)		8.04	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	63.73	Degree		38.26	Degree	
Description : Olive-brown, SANDY lean CLAY (CL)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	10.77	112.06	17.64	0.50	0.25	11.97	1.93	92.50	0.40	18.96
◆	10.38	117.84	18.55	0.43	0.50	23.94	3.30	158.00	0.52	24.71
▲	9.74	117.32	18.47	0.44	1.00	47.88	3.62	173.52	0.97	46.54

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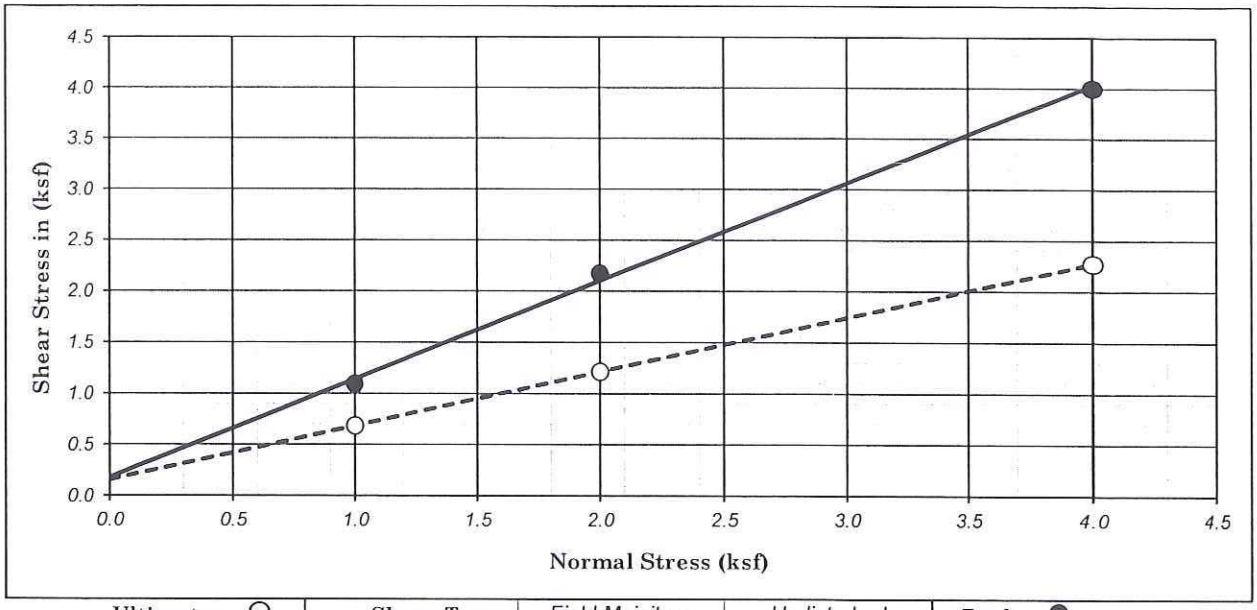
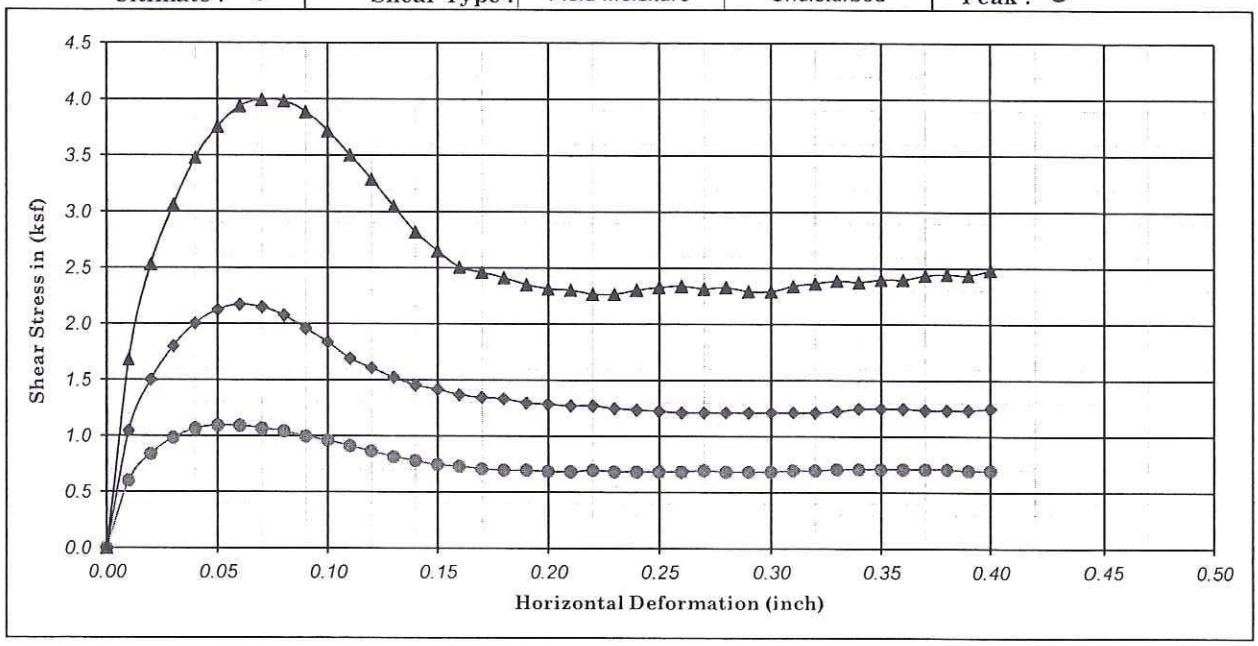
DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/17/11 | Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-246	Strength Intercept (C) :	0.18	(ksf)	Peak	0.16	(ksf)	Ultimate
Sample No. : D-4		8.62	(kPa)		7.47	(kPa)	
Depth (ft/m) : 20.0 / 0.00	Friction Angle (ϕ) :	43.83	Degree		27.83	Degree	
Description : Olive-brown, Poorly graded SAND (SP)					Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.95	112.27	17.67	0.50	1.00	47.88	1.09	52.28	0.68	32.75
◆	0.78	104.25	16.41	0.62	2.00	95.76	2.17	104.00	1.21	58.03
▲	0.79	105.22	16.56	0.60	4.00	191.52	4.00	191.33	2.27	108.59

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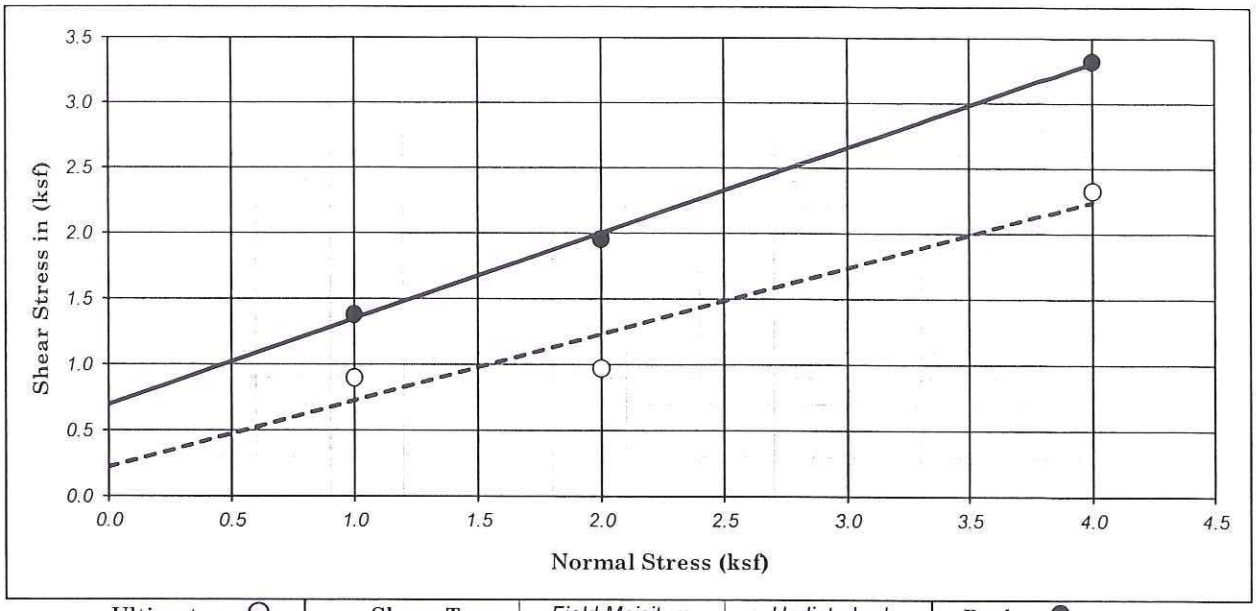
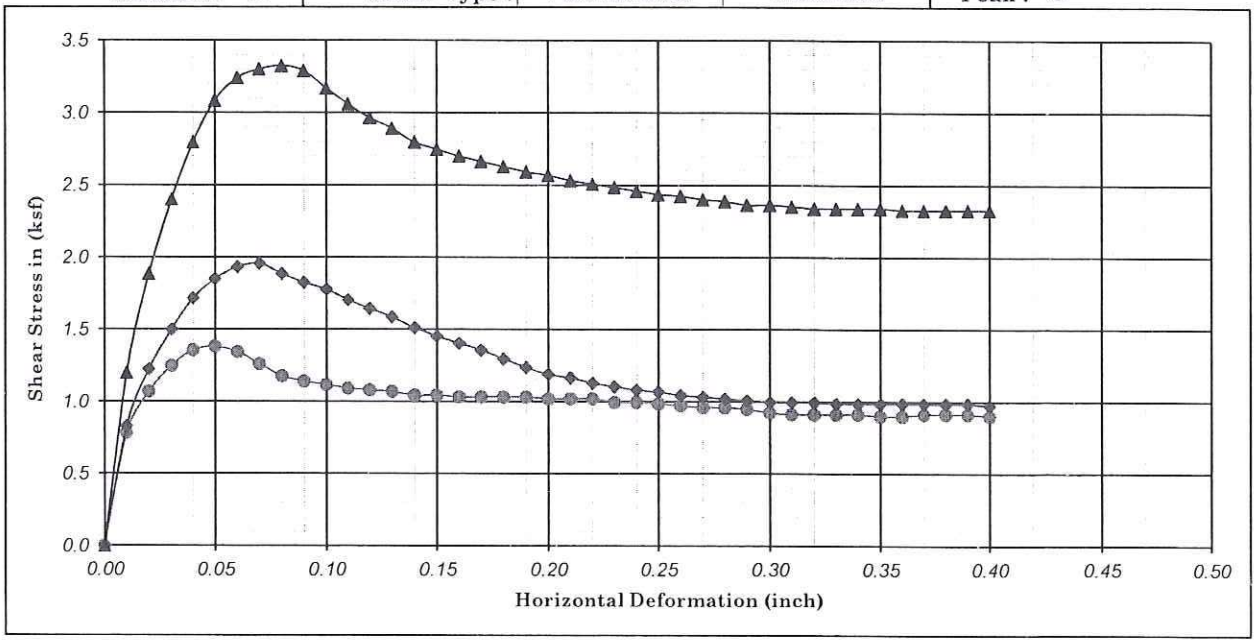
DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/15/11 | Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-258		Strength Intercept (C) :	0.70	(ksf)	Peak	0.22	(ksf)	Ultimate	
Sample No. : D-5			33.32	(kPa)		10.63	(kPa)		
Depth (ft/m) : 25.0	0.00	Friction Angle (ϕ) :	33.15	Degree		26.79	Degree		
Description : Olive-brown, SILTY CLAY (CL-ML)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	15.07	103.44	16.28	0.63	1.00	47.88	1.38	66.07	0.90	43.09
◆	17.59	104.17	16.40	0.62	2.00	95.76	1.96	93.65	0.97	46.54
▲	15.42	100.50	15.82	0.68	4.00	191.52	3.32	159.15	2.33	111.46

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

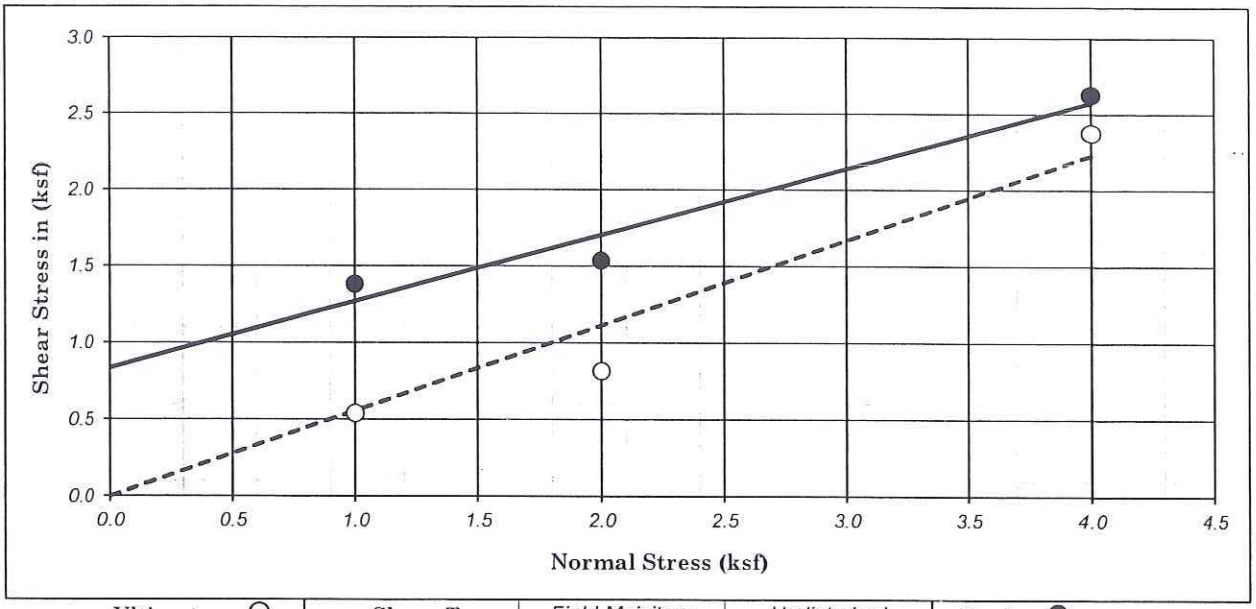
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136

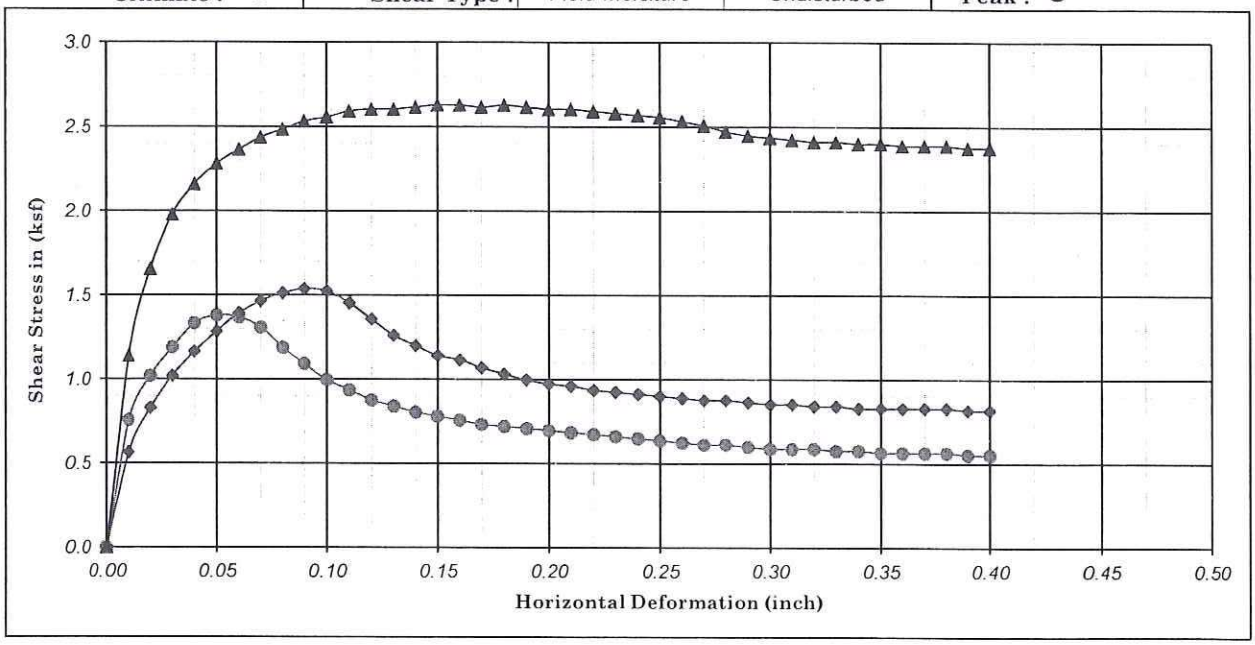
Date : 11/15/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-247		Strength Intercept (C) :	0.83	(ksf)	Peak	0.00	(ksf)	Ultimate
Sample No. : D-3			39.93	(kPa)		0.00	(kPa)	
Depth (ft/m) : 15.0	0.00	Friction Angle (ϕ) :	23.49	Degree		29.07	Degree	
Description : Olive-brown, Lean CLAY with SAND (CL)					Shear Rate (inch/minute) :			0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	23.36	99.67	15.69	0.69	1.00	47.88	1.38	66.07	0.54	25.86
◆	27.60	95.82	15.08	0.76	2.00	95.76	1.54	73.54	0.82	39.07
▲	20.32	106.03	16.69	0.59	4.00	191.52	2.63	125.83	2.38	113.76

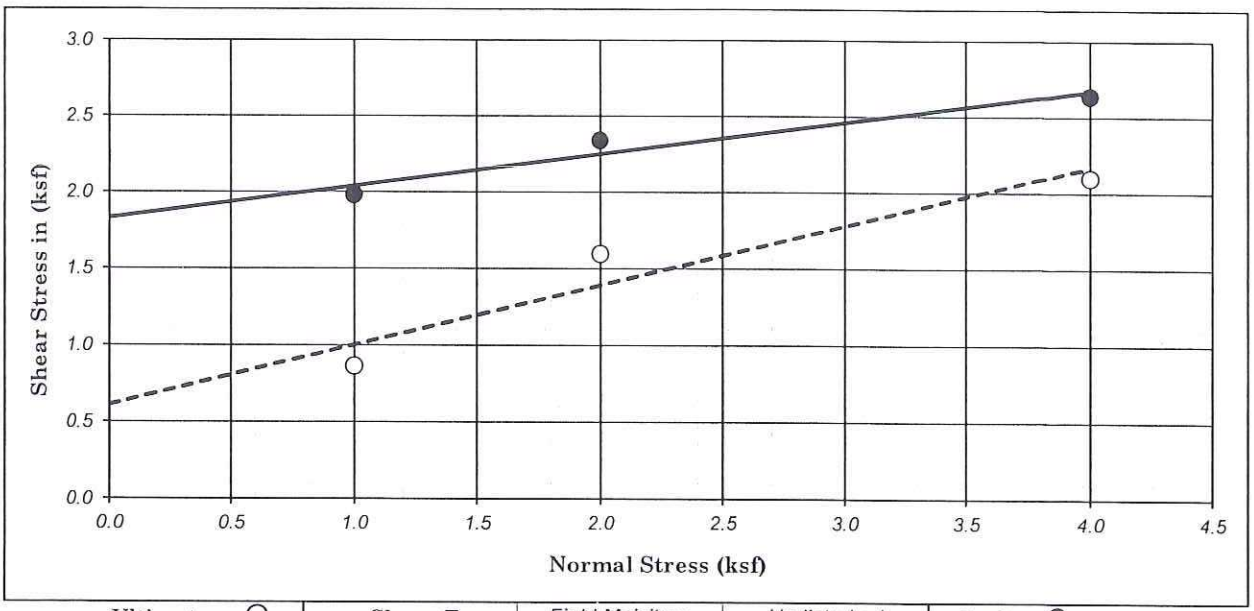
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

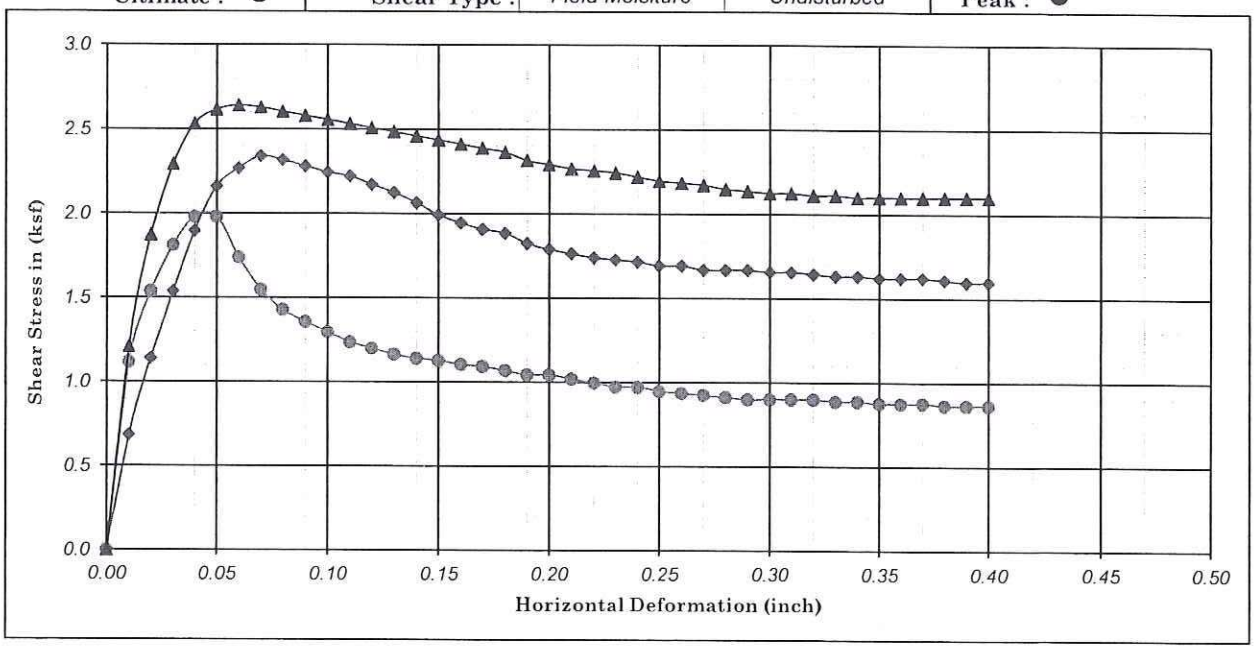
Project No. : 11-136 | Date : 11/11/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-259		Strength Intercept (C) :	1.83	(ksf)	Peak	0.61	(ksf)	Ultimate
Sample No. : D-4			87.62	(kPa)		29.30	(kPa)	
Depth (ft/m) : 20.0	0.00	Friction Angle (ϕ) :	11.86	Degree		21.26	Degree	
Description : Olive-brown, Lean CLAY with SAND (CL)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	38.60	90.32	14.22	0.87	1.00	47.88	1.98	94.80	0.86	41.37
◆	13.07	111.62	17.57	0.51	2.00	95.76	2.34	112.04	1.60	76.42
▲	17.03	110.17	17.34	0.53	4.00	191.52	2.64	126.40	2.10	100.55

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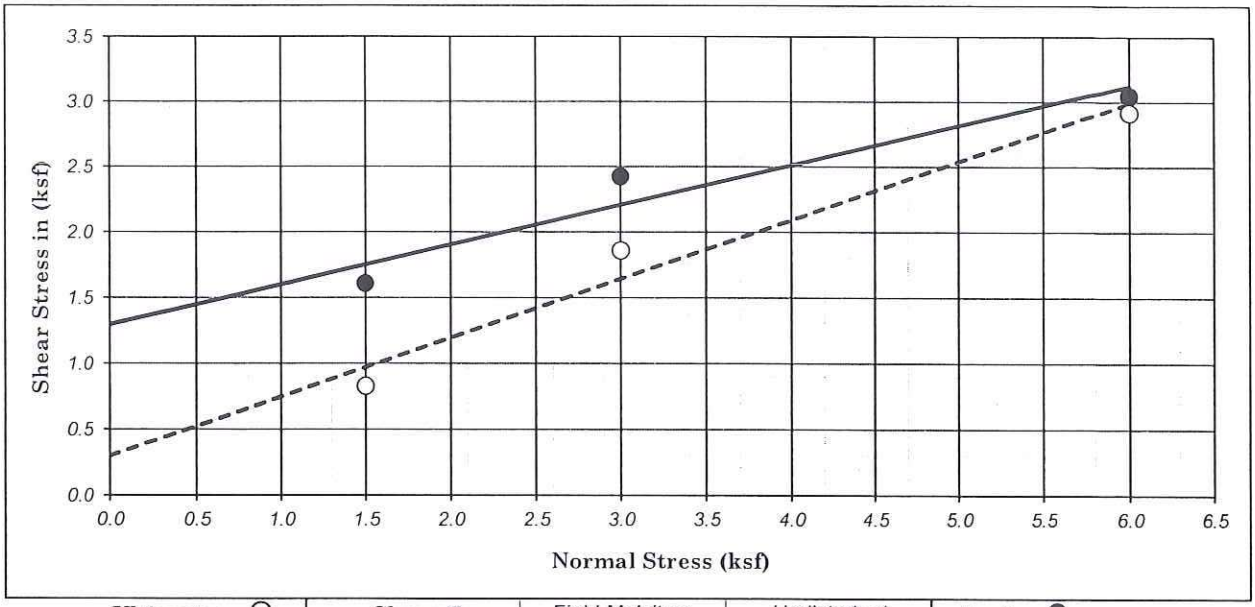
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

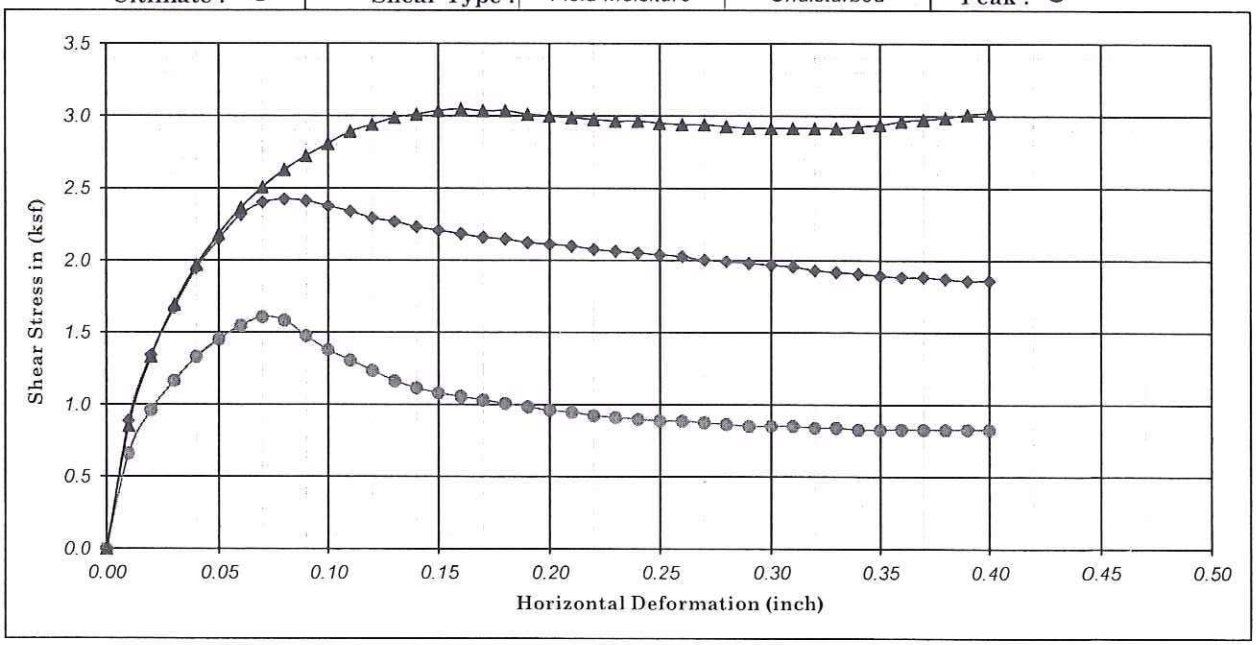
Project No. : 11-136 | Date : 11/17/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-259		Strength Intercept (C) :	1.30	(ksf)	Peak	0.30	(ksf)	Ultimate
Sample No. : D-6			62.05	(kPa)		14.36	(kPa)	
Depth (ft/m) : 30.0	0.00	Friction Angle (ϕ) :	16.91	Degree		24.13	Degree	
Description : Olive-brown, Lean CLAY with SAND (CL)					Shear Rate (inch/minute) :			0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	24.75	97.00	15.27	0.74	1.50	71.82	1.61	76.99	0.83	39.64
◆	20.10	97.38	15.33	0.73	3.00	143.64	2.42	116.06	1.86	89.06
▲	23.48	98.20	15.46	0.72	6.00	287.28	3.05	145.94	2.92	139.62

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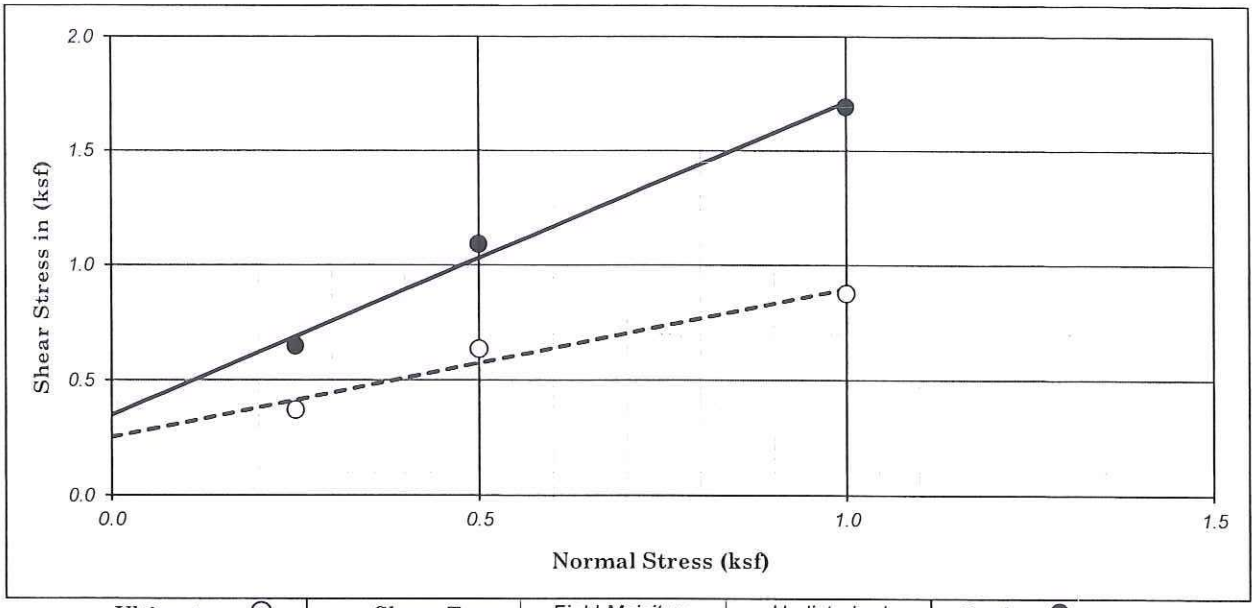
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

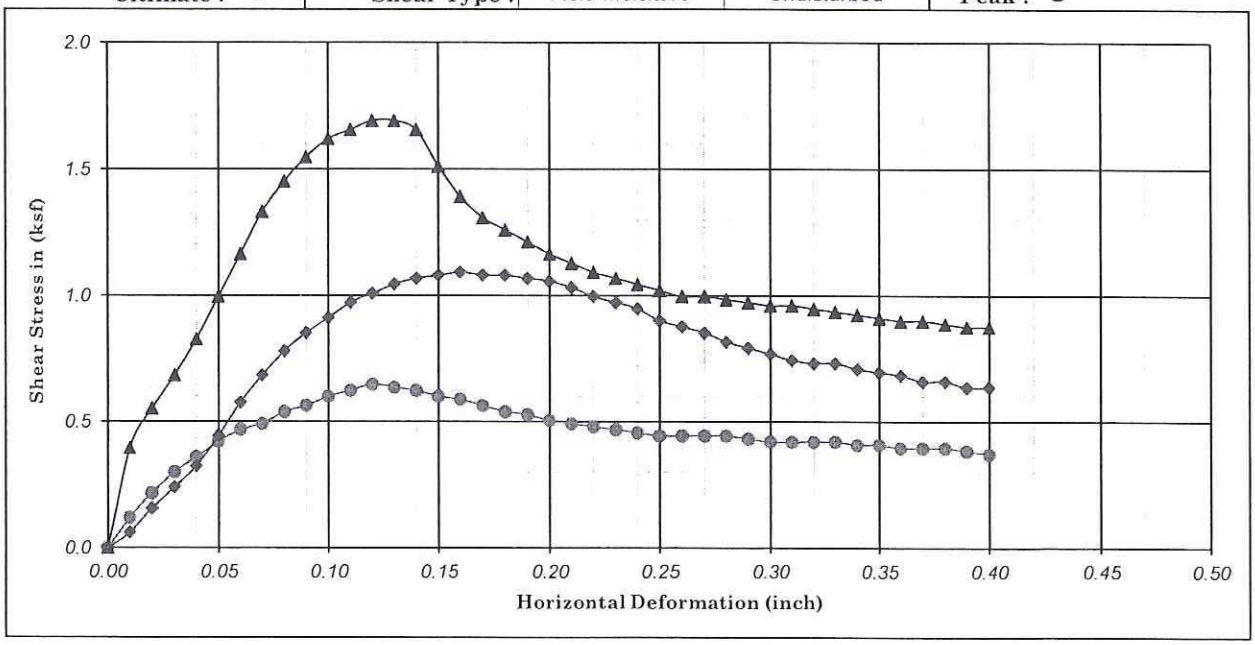
Project No. : 11-136 | Date : 11/15/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-260		Strength Intercept (C) :	0.35	(ksf)	Peak	0.25	(ksf)	Ultimate
Sample No. : D-2			16.66	(kPa)		12.07	(kPa)	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	53.76	Degree		32.80	Degree	
Description : Dark brown, Lean CLAY with SAND (CL)					Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	25.21	87.89	13.83	0.92	0.25	11.97	0.65	31.03	0.37	17.81
◆	26.43	87.50	13.77	0.93	0.50	23.94	1.09	52.28	0.64	30.45
▲	26.28	85.27	13.42	0.98	1.00	47.88	1.69	81.01	0.88	41.94

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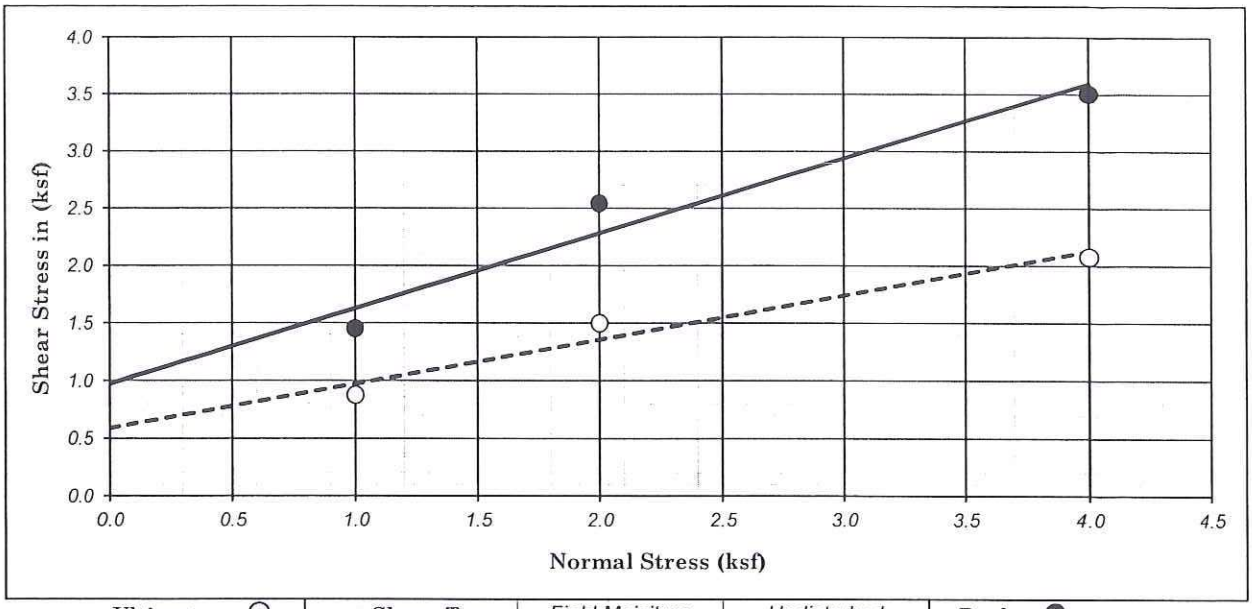
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

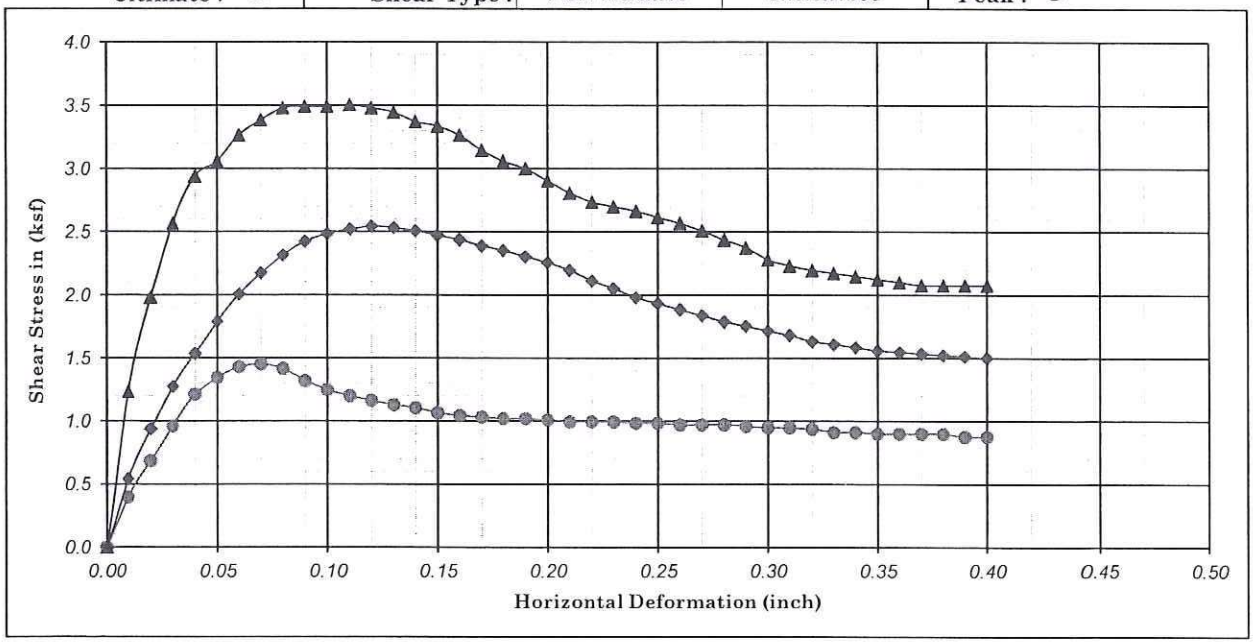
Project No. : 11-136 | Date : 11/19/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-260	Strength Intercept (C) :	0.97	(ksf)	Peak	0.59	(ksf)	Ultimate
Sample No. : D-4		46.54	(kPa)		28.15	(kPa)	
Depth (ft/m) : 15.0 | 0.00	Friction Angle (ϕ) :	33.22	Degree		21.01	Degree	

Description : Dark brown, Elastic SILT (MH) — Shear Rate (inch/minute) : 0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	29.59	84.97	13.37	0.98	1.00	47.88	1.45	69.52	0.88	41.94
◆	28.31	83.62	13.16	1.02	2.00	95.76	2.54	121.81	1.50	71.82
▲	28.72	84.00	13.22	1.01	4.00	191.52	3.50	167.77	2.08	99.40

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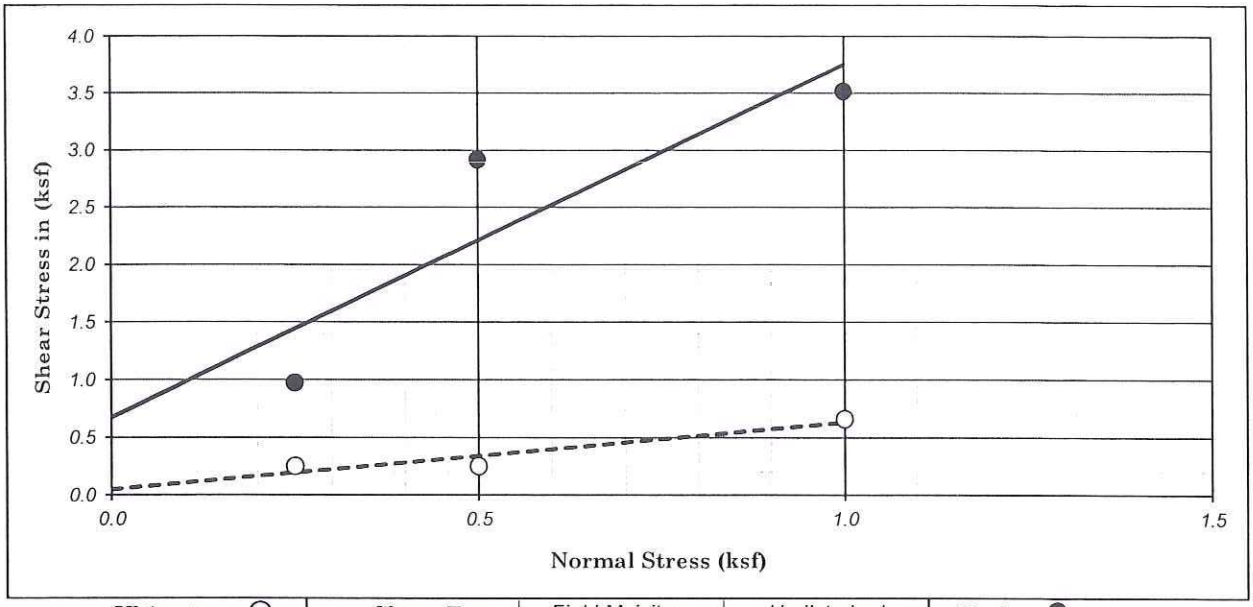
Geotechnical and Earthquake Engineering

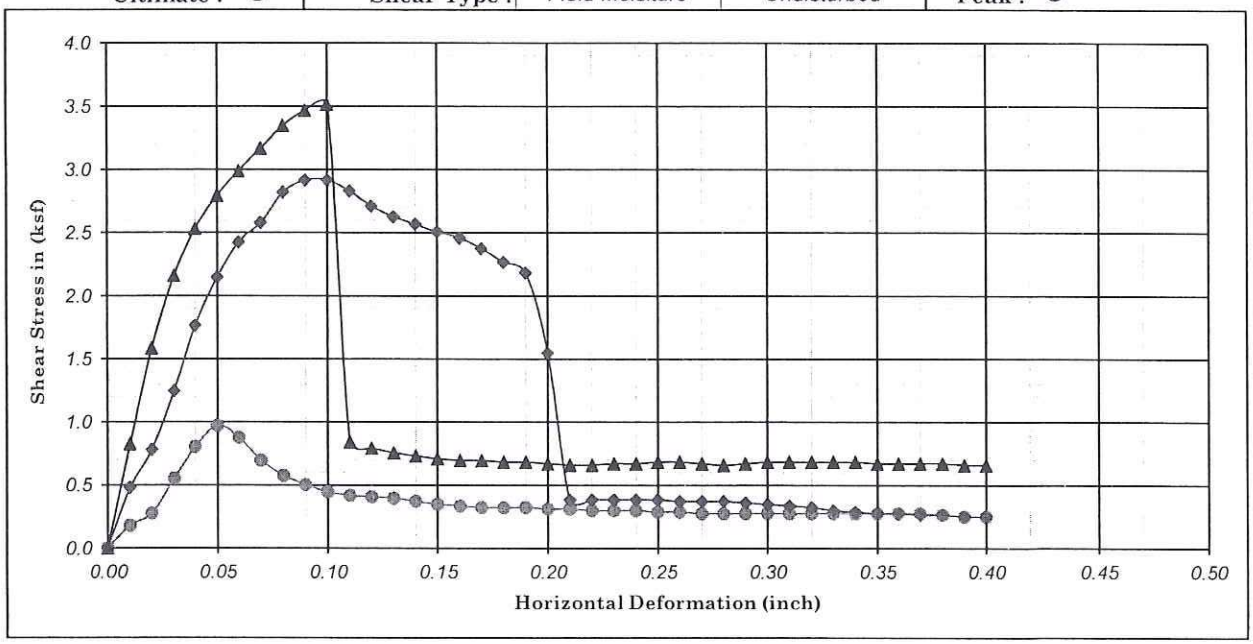
AECOM/I-5 HOV Widening Segment 2

DIRECT SHEAR TEST (ASTM D-3080)

Project No. : 11-136 | Date : 11/19/11 | Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-261		Strength Intercept (C) :	0.67	(ksf)		0.05	(ksf)		
Sample No. : D-2			32.18	(kPa)	Peak	2.30	(kPa)	Ultimate	
Depth (ft/m) : 5.0	0.00	Friction Angle (ϕ) :	72.01	Degree		30.24	Degree		
Description : Very dark grayish brown, Elastic SILT (MH)						Shear Rate (inch/minute) :		0.02	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	28.66	88.86	13.99	0.90	0.25	11.97	0.97	46.54	0.25	12.07
◆	28.51	91.26	14.36	0.85	0.50	23.94	2.92	139.62	0.25	12.07
▲	28.38	92.11	14.50	0.83	1.00	47.88	3.52	168.35	0.66	31.60

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DIRECT SHEAR TEST (ASTM D-3080)

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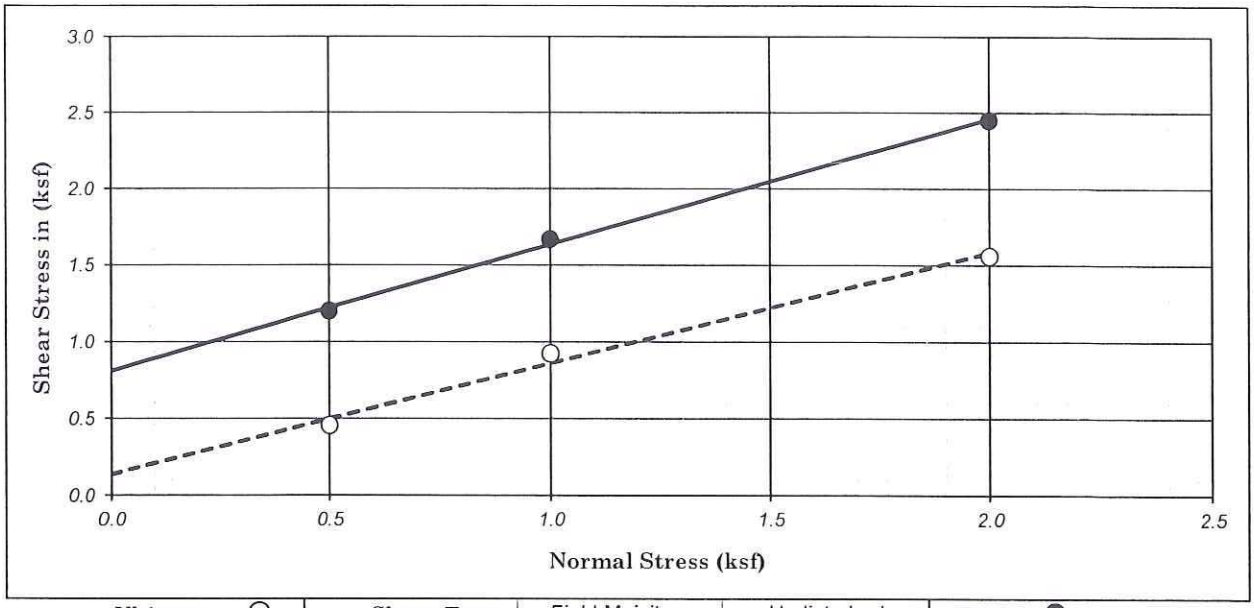
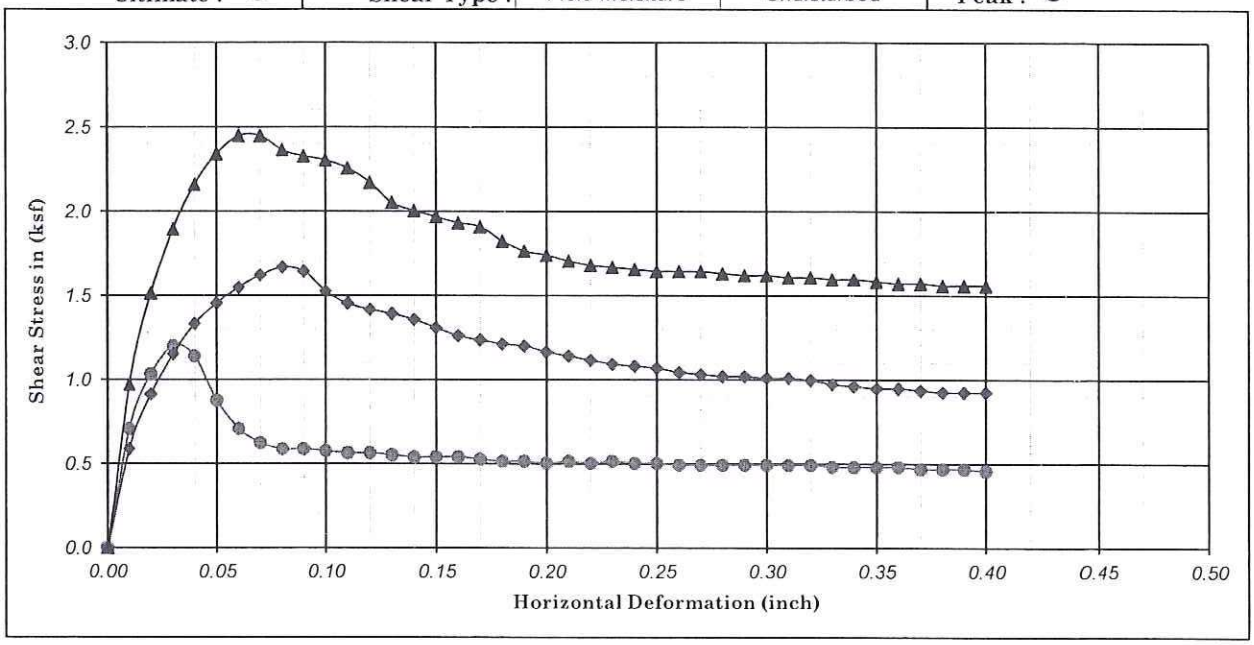
Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-263		Strength Intercept (C) :	0.81	(ksf)	Peak	0.14	(ksf)	Ultimate
Sample No. : D-3			38.78	(kPa)		6.61	(kPa)	
Depth (ft/m) : 10.0	0.00	Friction Angle (ϕ) :	39.51	Degree		35.82	Degree	
Description : Olive-brown, SANDY lean CLAY (CL)						Shear Rate (inch/minute) :		0.02

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	11.83	104.40	16.43	0.61	0.50	23.94	1.20	57.46	0.46	21.83
◆	12.71	103.78	16.33	0.62	1.00	47.88	1.67	79.86	0.92	44.24
▲	12.31	100.98	15.89	0.67	2.00	95.76	2.45	117.21	1.56	74.69

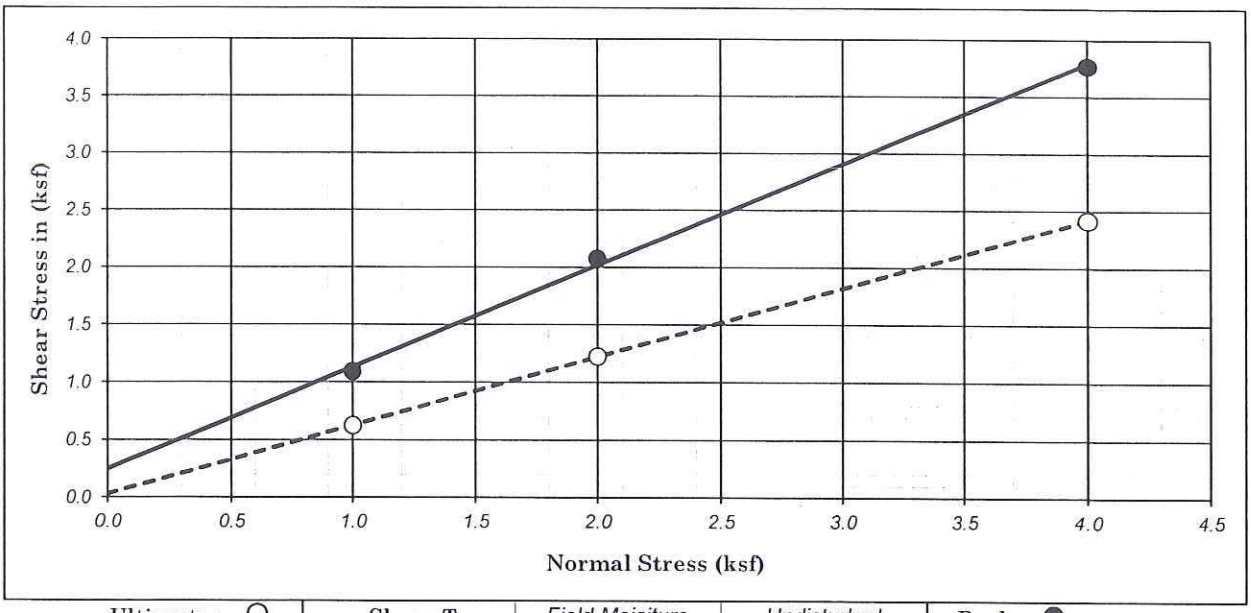
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

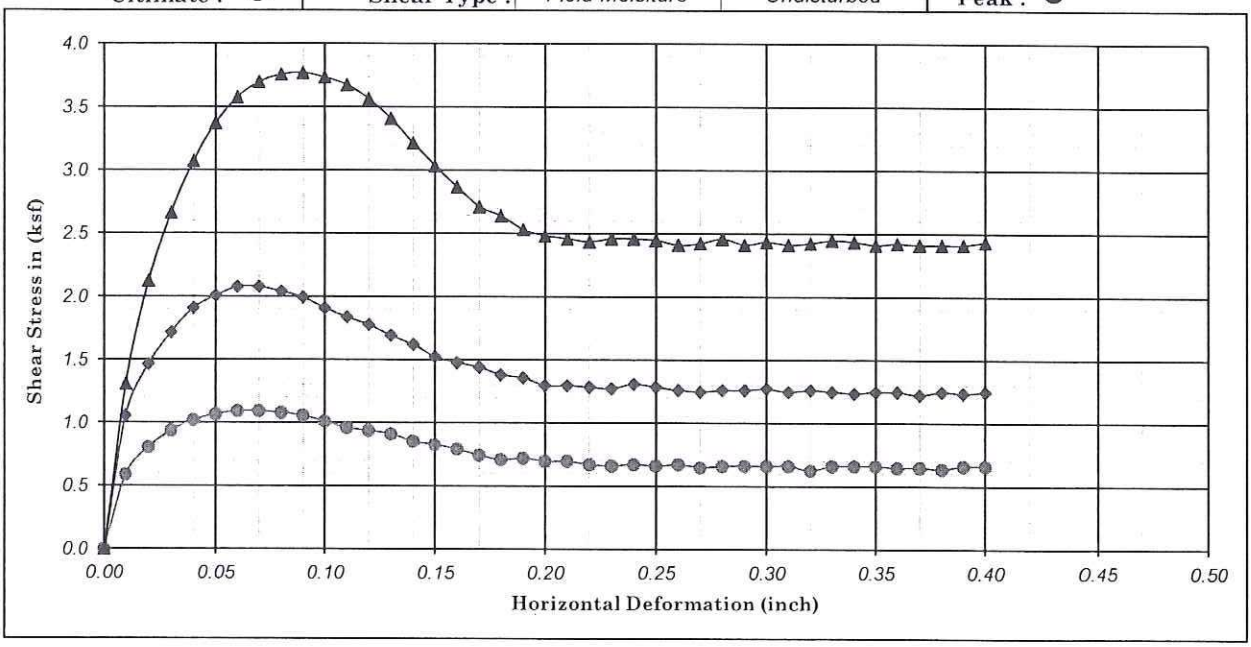
Project No. : 11-136 | Date : 11/19/11

DIRECT SHEAR TEST (ASTM D-3080)

Figure No. :



Ultimate : ○	Shear Type :	Field Moisiture	Undisturbed	Peak : ●



Boring No. : A-11-263		Strength Intercept (C) :	0.25	(ksf)	Peak	0.03	(ksf)	Ultimate
Sample No. : D-5			11.78	(kPa)		1.44	(kPa)	
Depth (ft/m) : 20.0	0.00	Friction Angle (ϕ) :	41.52	Degree		30.78	Degree	
Description : Olive-brown, Poorly graded SAND (SP)						Shear Rate (inch/minute) :		0.02

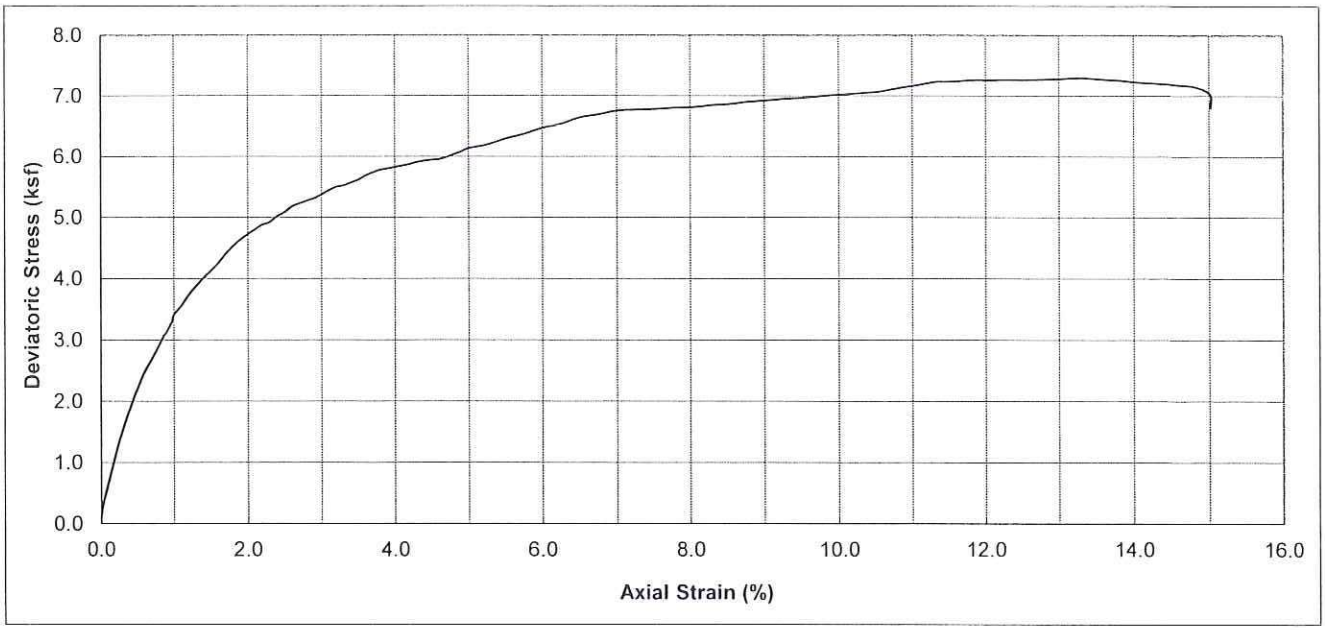
SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	0.90	108.17	17.03	0.56	1.00	47.88	1.09	52.28	0.62	29.88
◆	0.90	107.84	16.97	0.56	2.00	95.76	2.08	99.40	1.22	58.61
▲	0.95	108.23	17.04	0.56	4.00	191.52	3.77	180.41	2.41	115.49

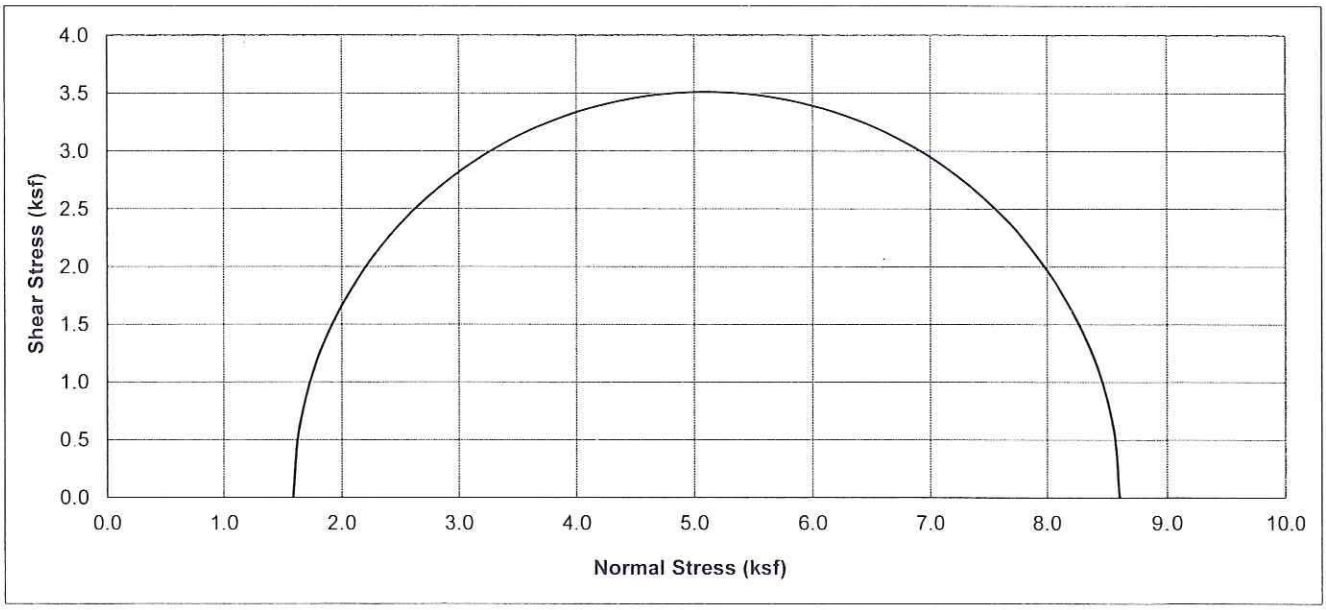
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

DIRECT SHEAR TEST (ASTM D-3080)

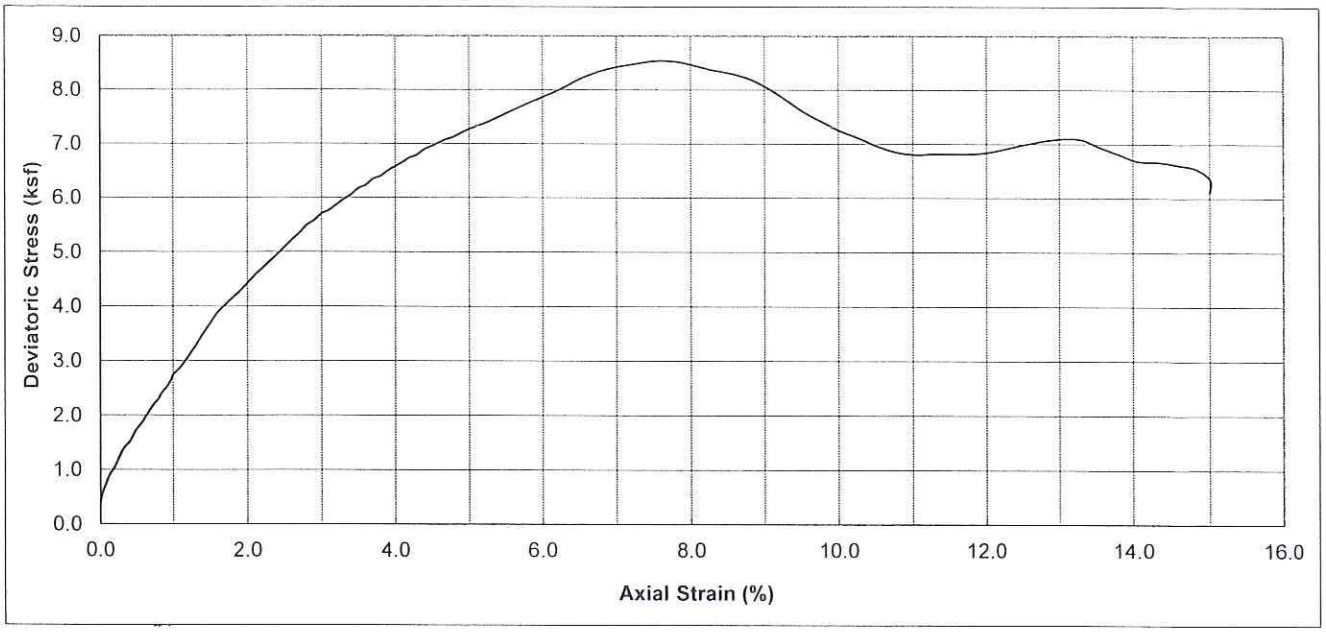
Project No. : 11-136 | Date : 11/19/11 | Figure No. :

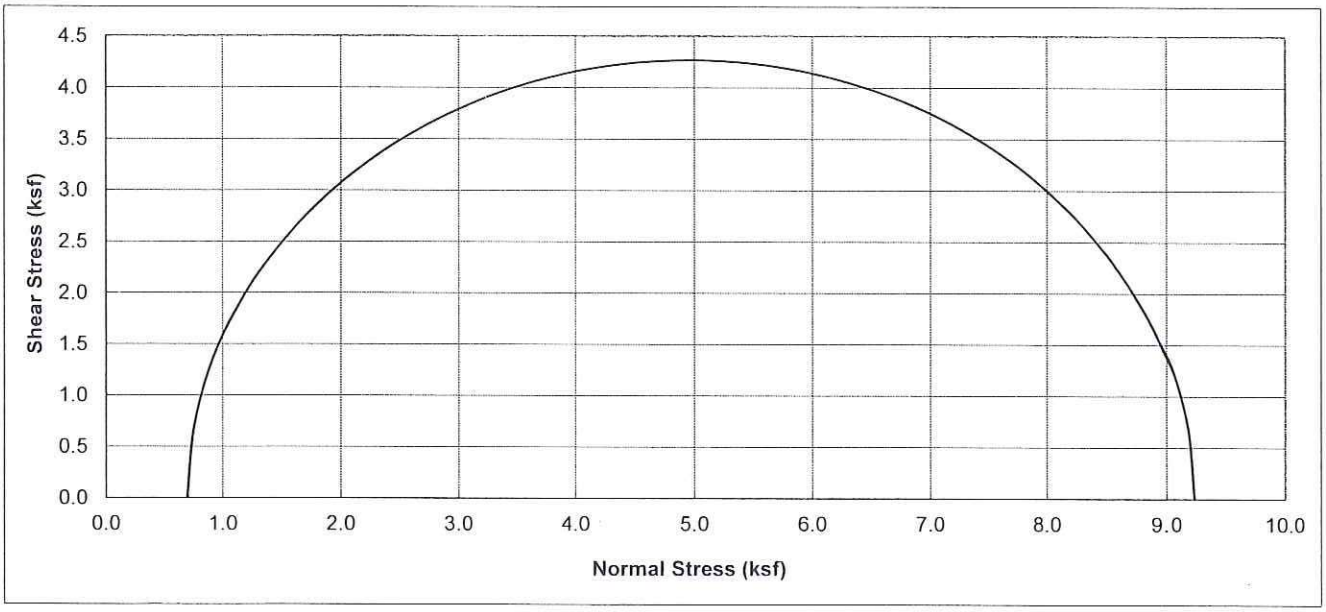




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-202	D-4	20	Dark gray , Lean CLAY (CL)	93.8	26.34	1.58	7.02	89.3

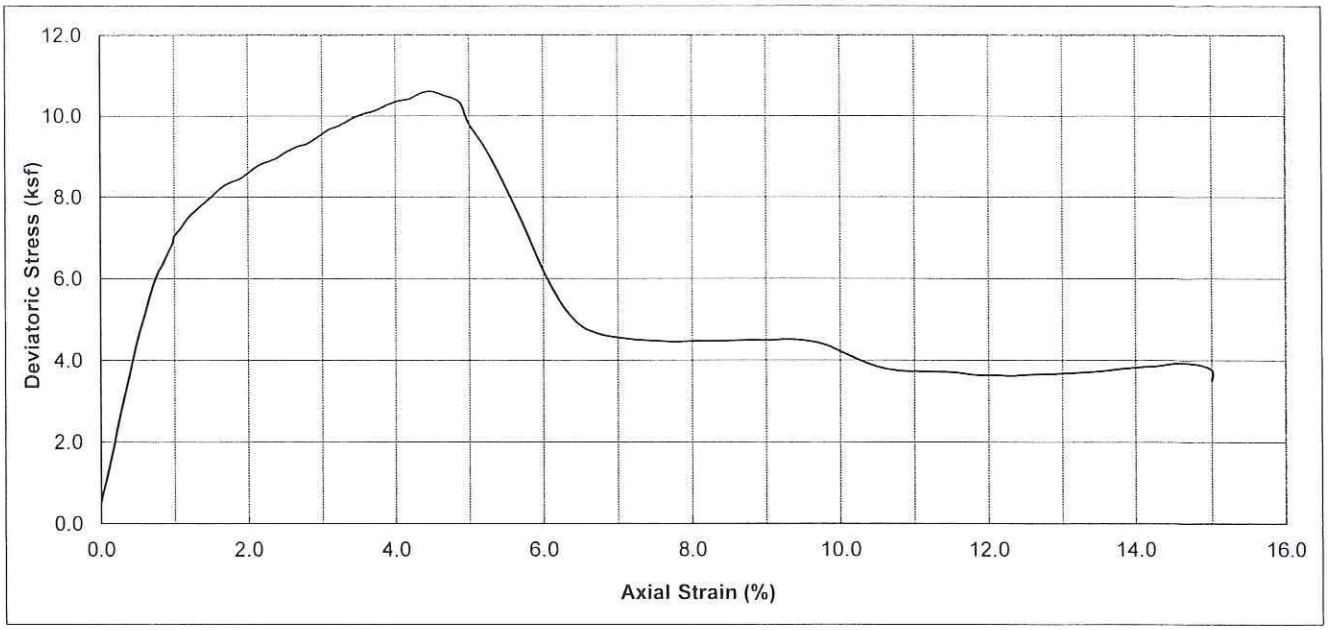
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 Date : 11/06/11	Figure No. :

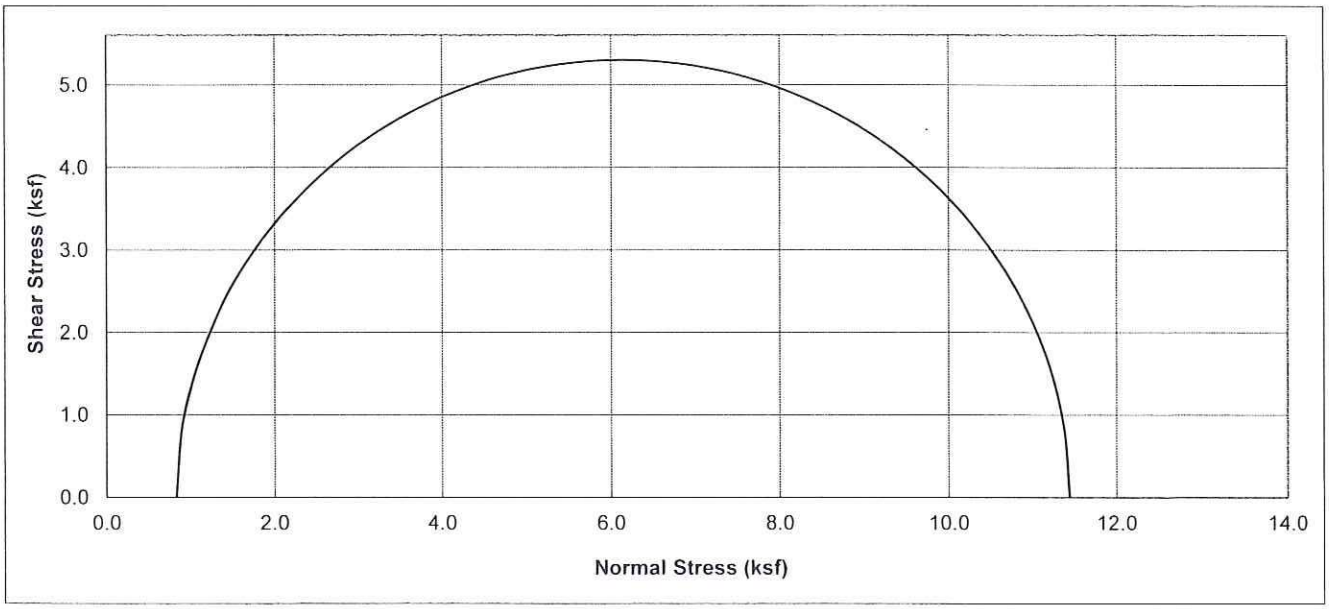




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-203	D-1	5	Olive-brown, Lean CLAY(CL)	93.3	28.72	0.69	8.54	96.2

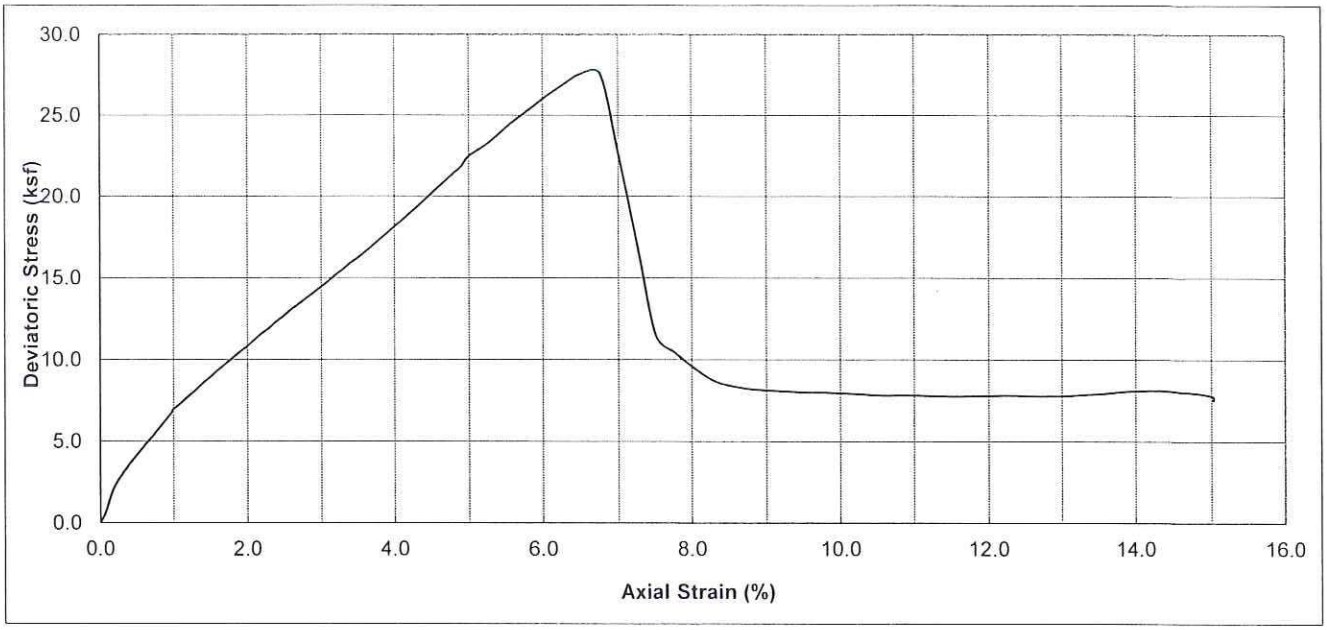
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136	Date : 11/06/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

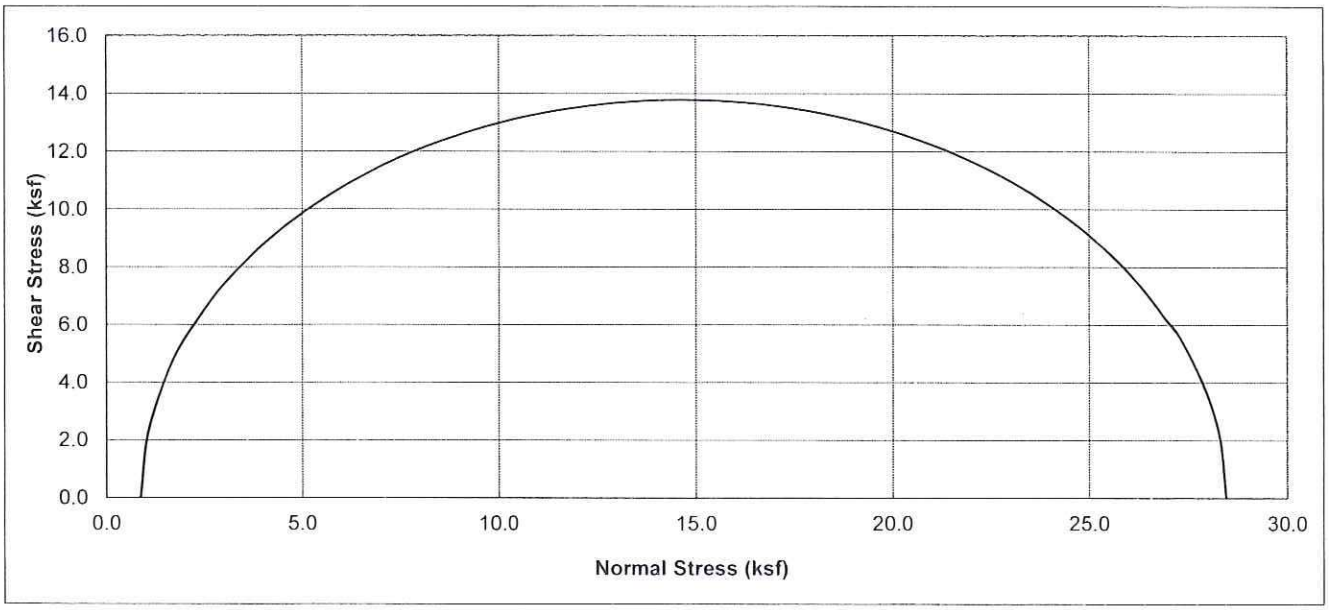




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-206	D-2	10	Olive brown , Fat CLAY (CH)	90.2	30.46	0.83	10.60	94.8

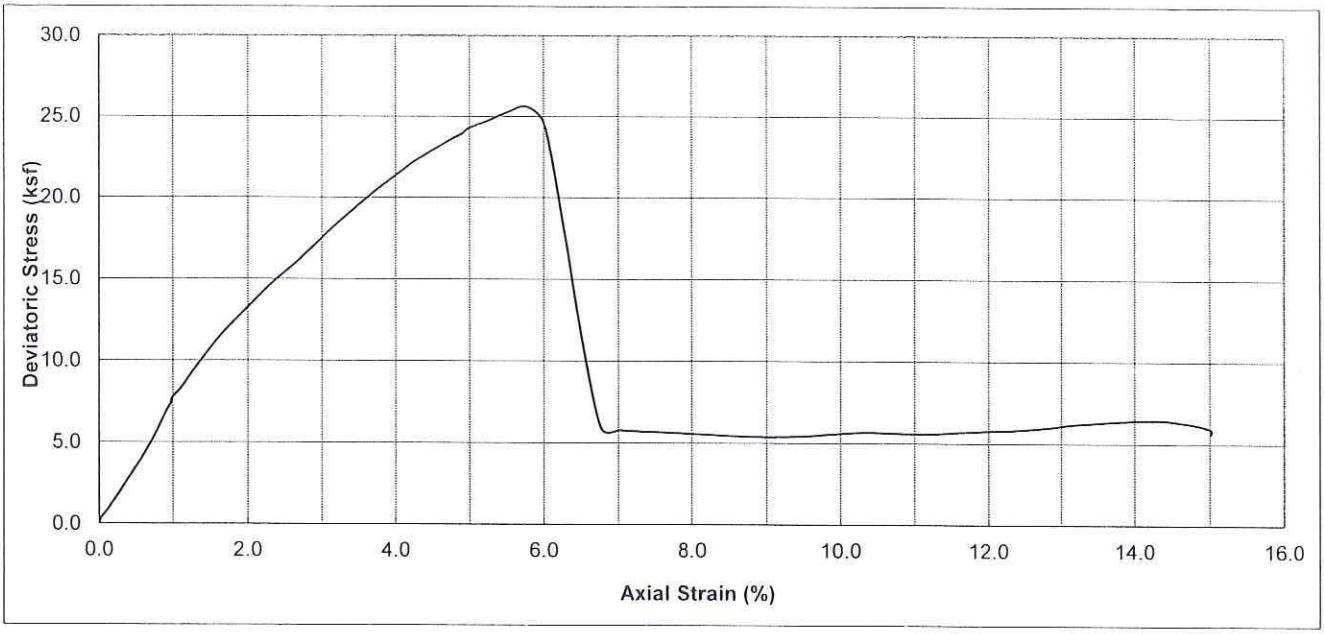
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 / Date : 11/06/11	Figure No. :

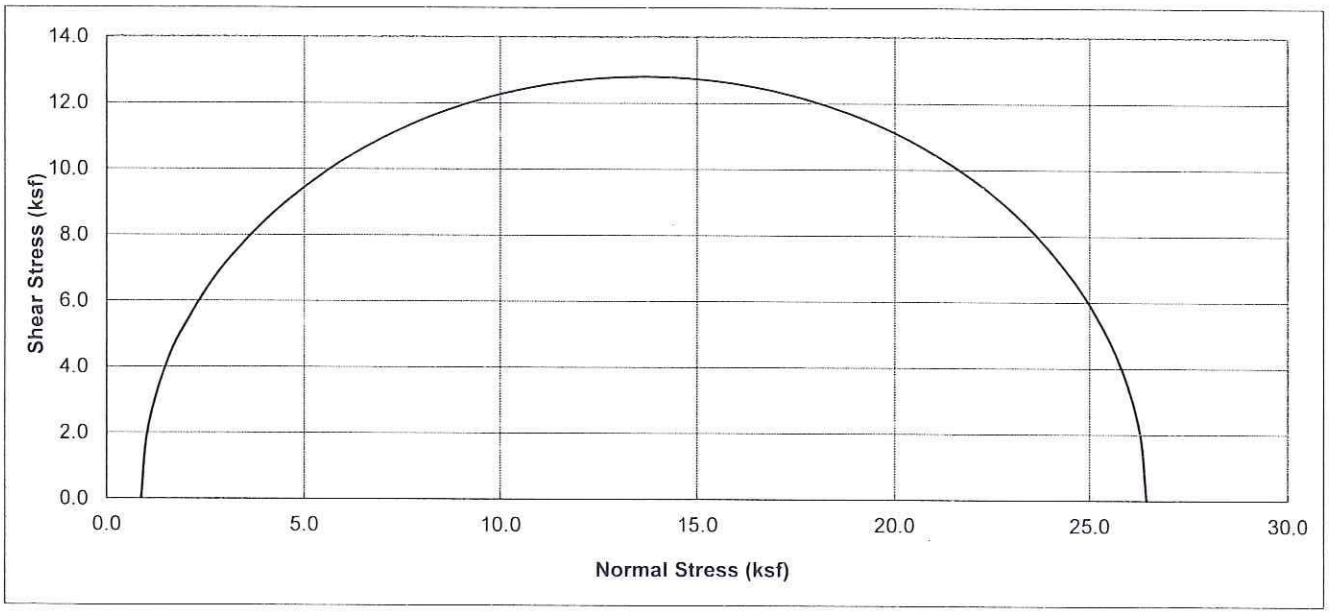




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-210	D-3	10	Very dark gray , Elastic SILT (MH)	95.1	26.67	0.86	27.57	93.2

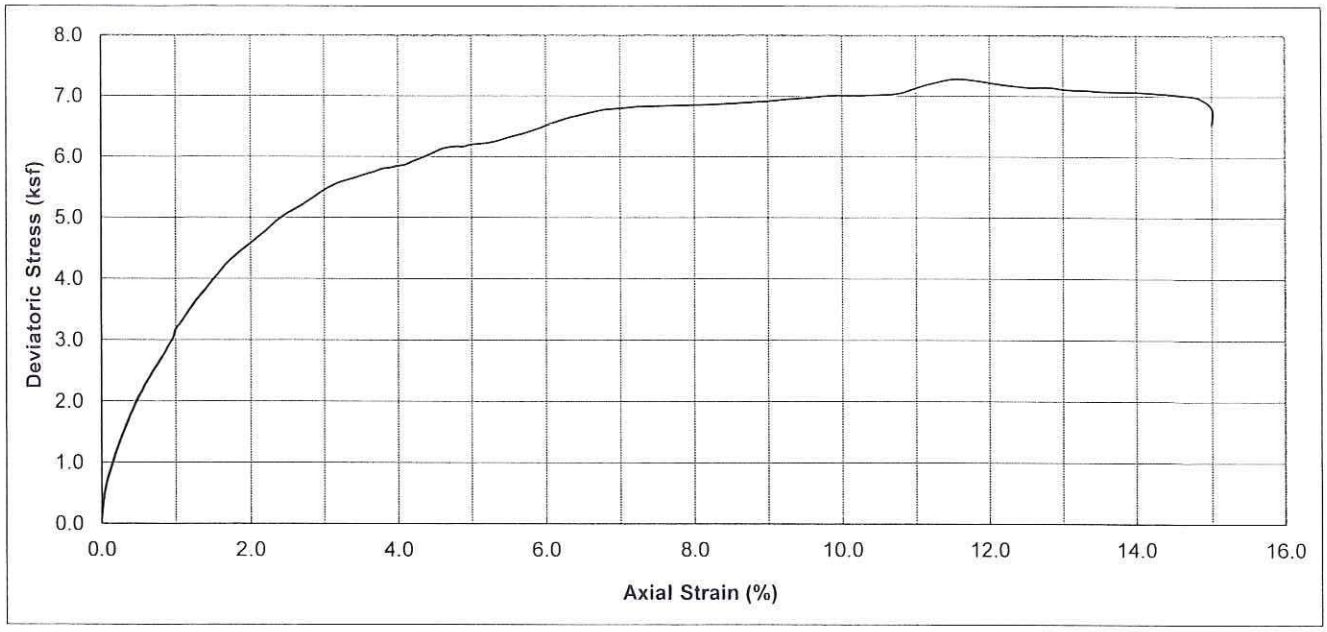
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/06/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

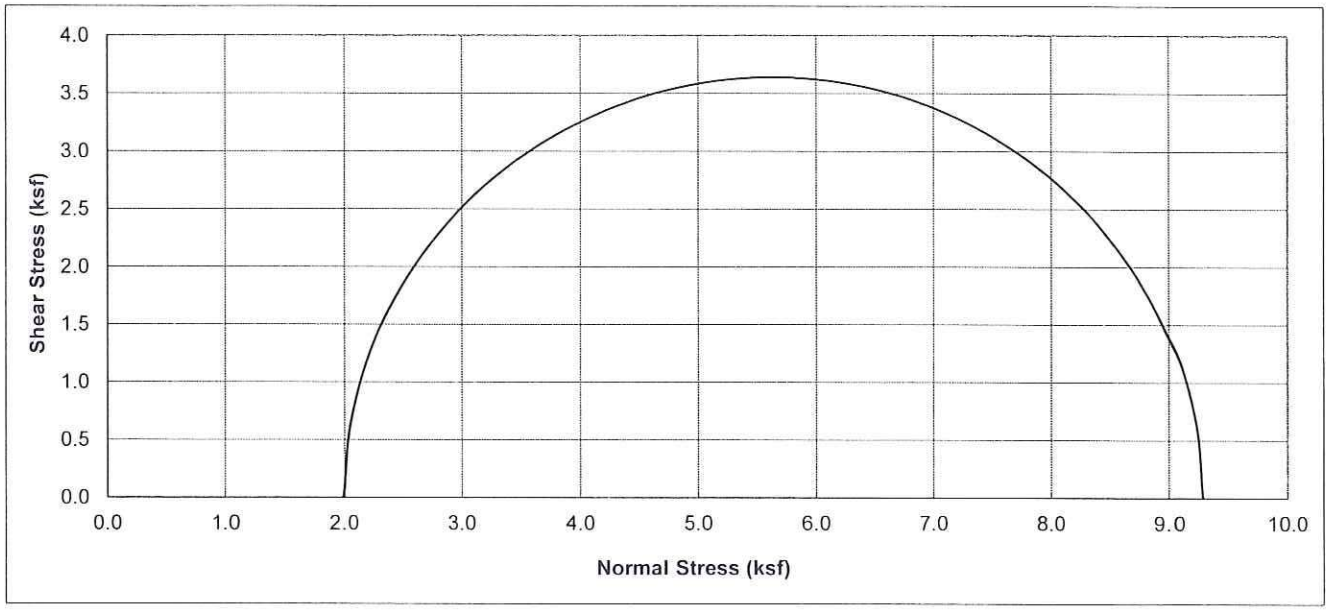




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-212	D-3	10	Very dark gray , Elastic SILT (MH)	95.1	26.94	0.85	25.61	94.2

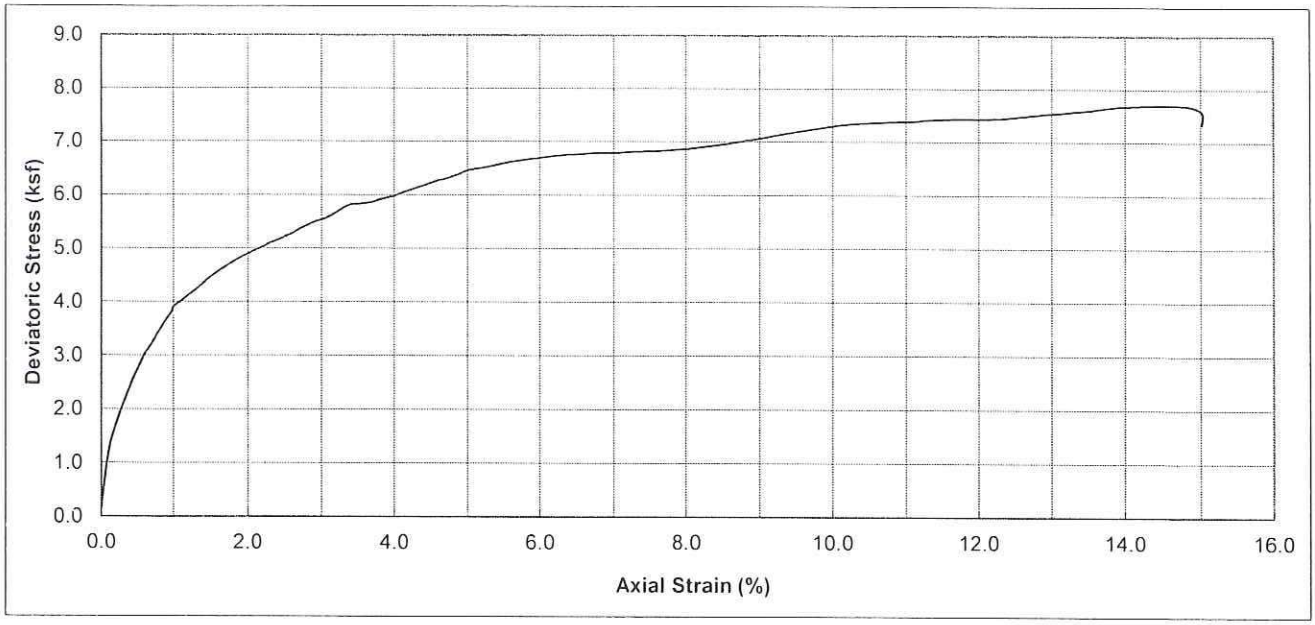
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/06/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

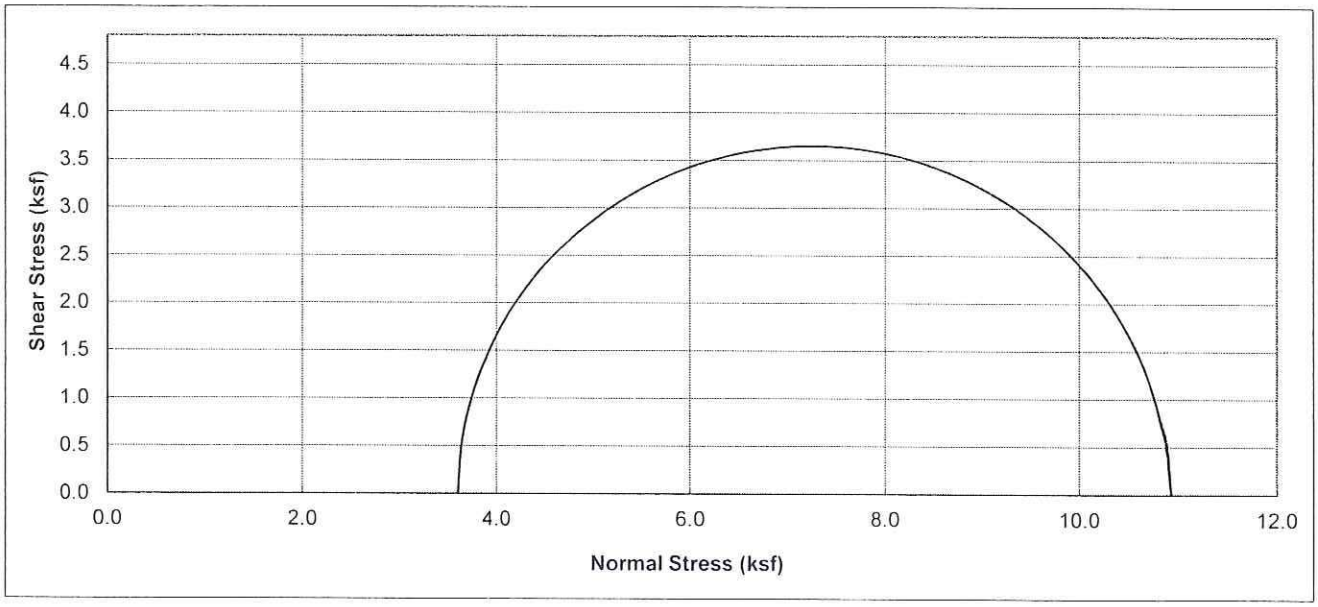




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-216	D-6	25	Olive-brown , Lean CLAY (CL)	92.9	27.84	1.99	7.28	92.4

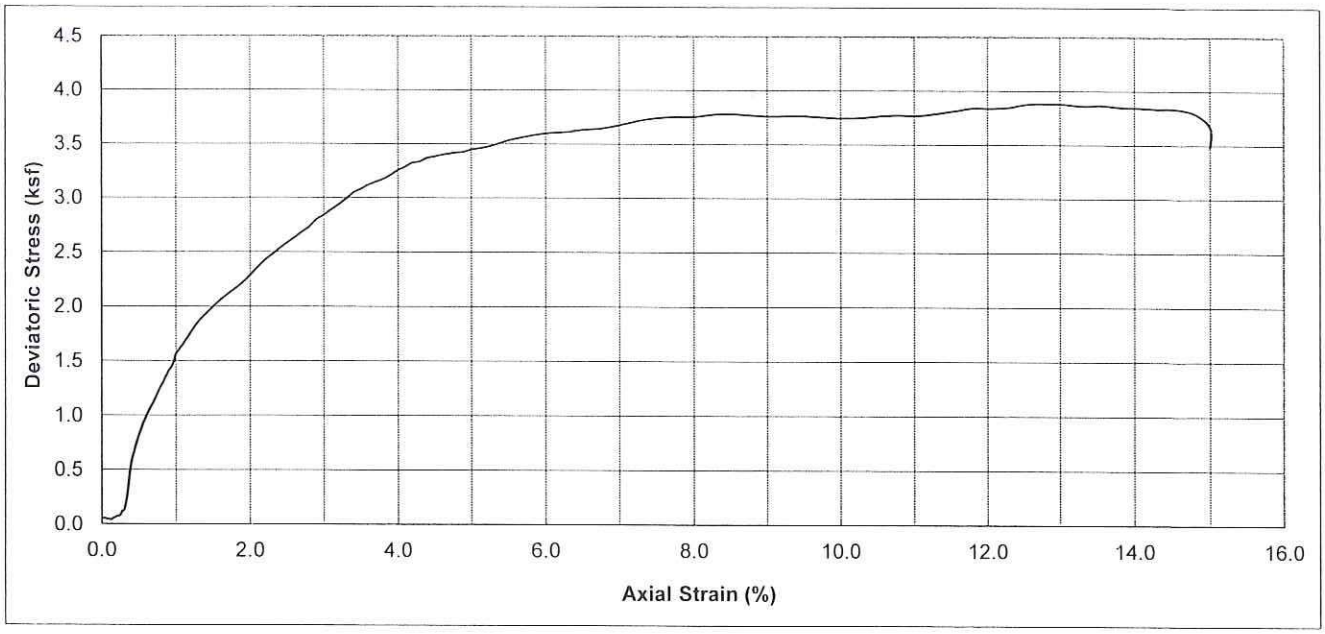
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
		UNCONSOLIDATED UNDRAINED TEST
Project No. : 11-136	Date : 11/07/11	(ASTM D2850) Figure No. :

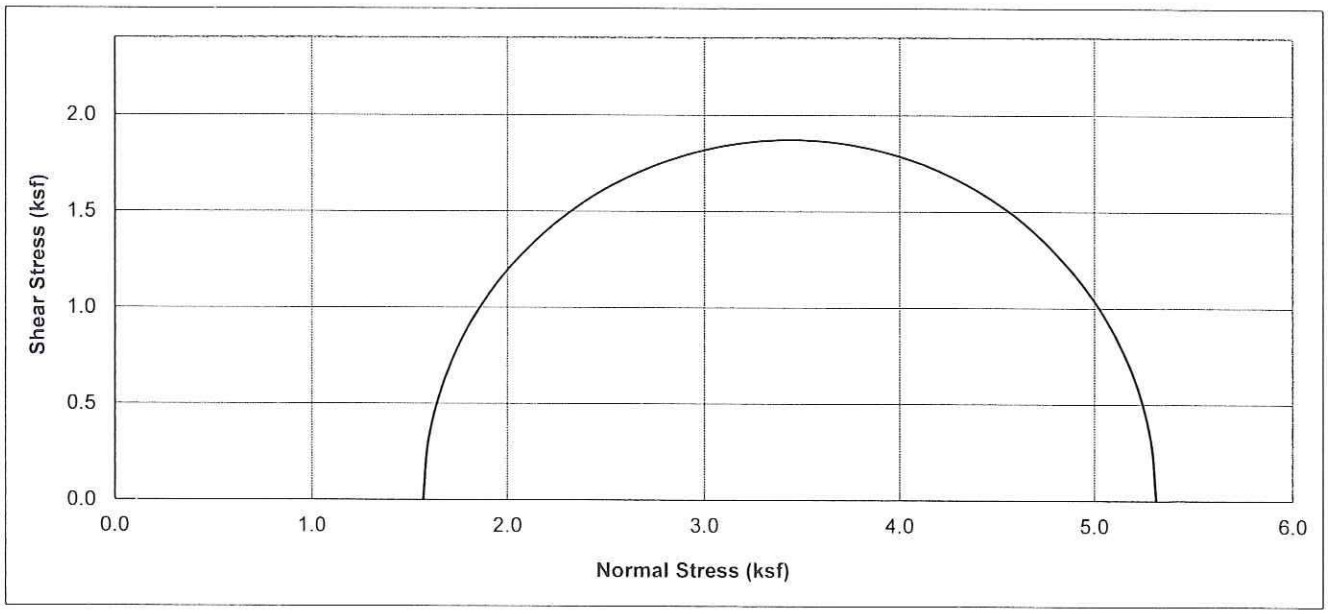




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-216	D-10	45	Olive-brown , Lean CLAY (CL)	101.9	23.06	3.60	7.31	95.4

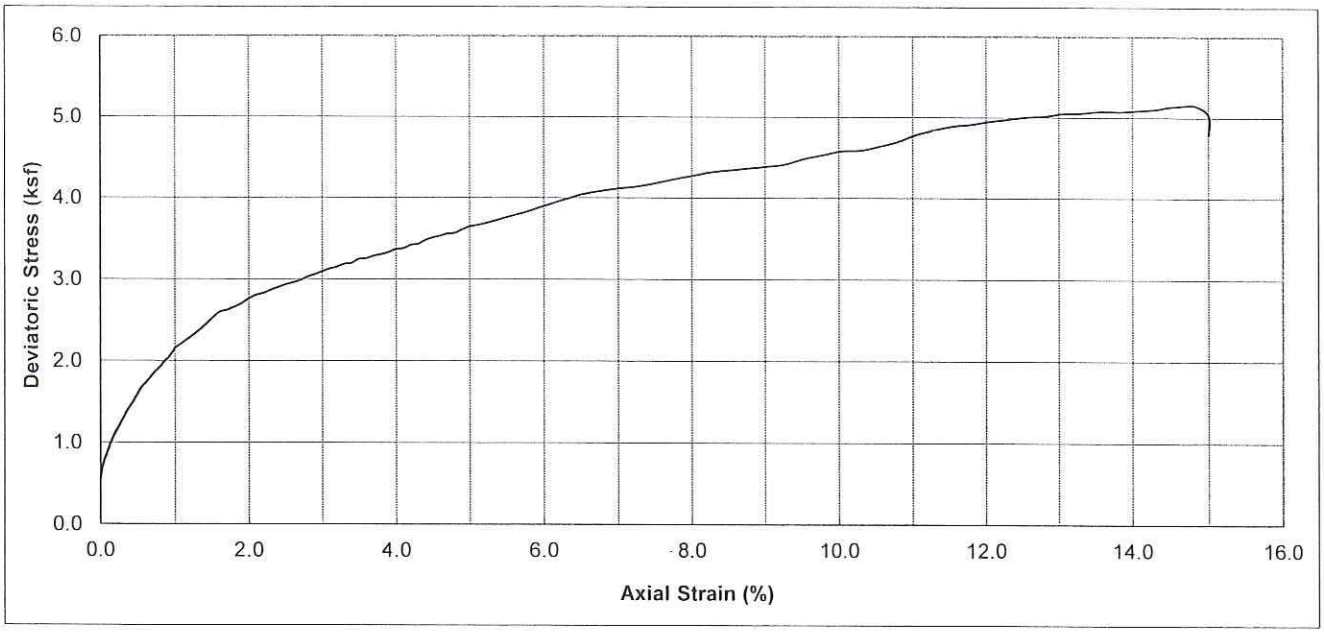
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

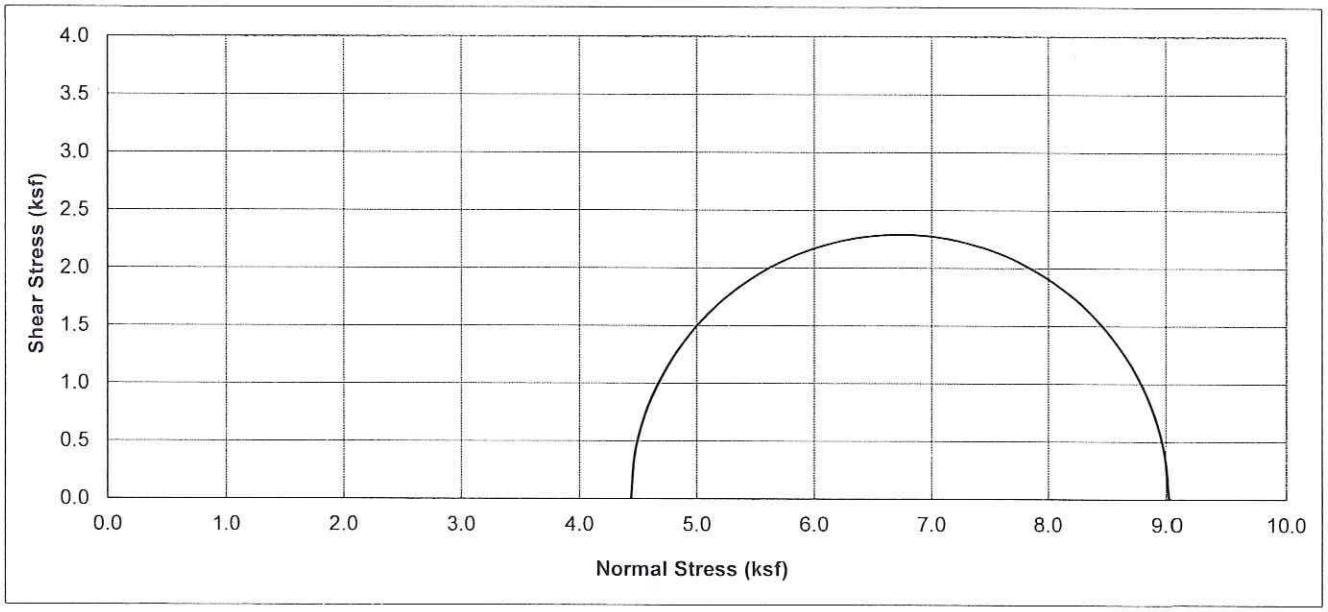




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-220	D-4	20	Olive-brown , SANDY lean CLAY (CL)	106.2	17.83	1.57	3.74	82.2

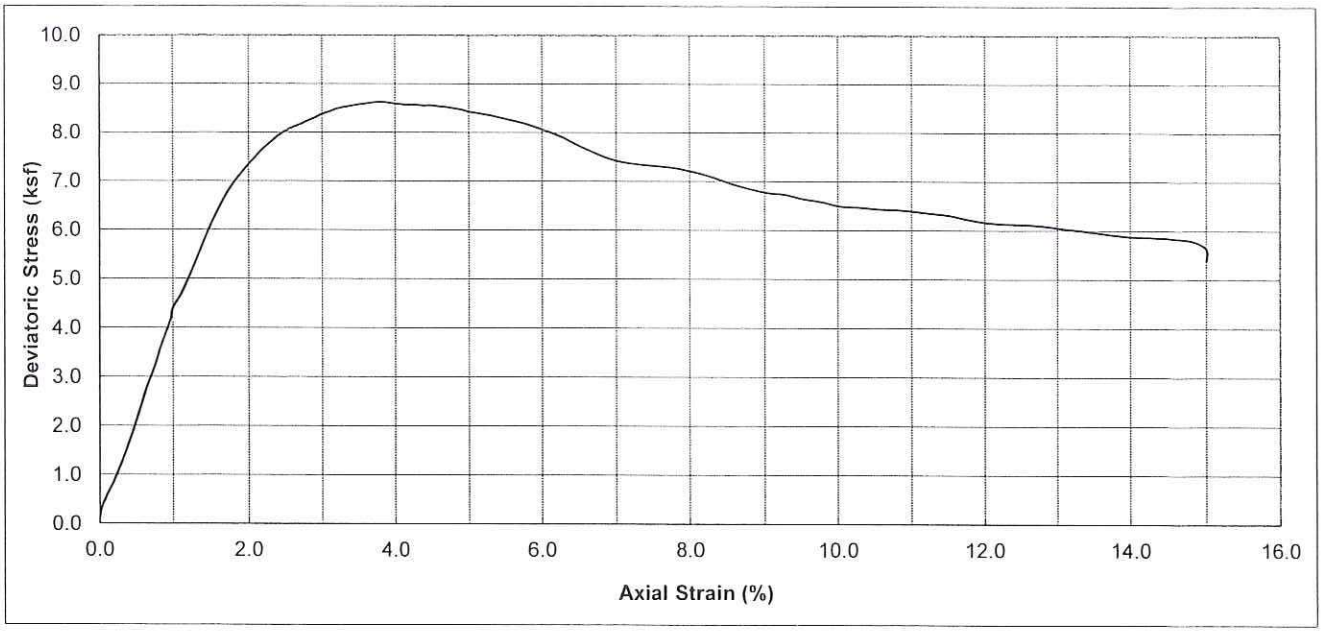
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

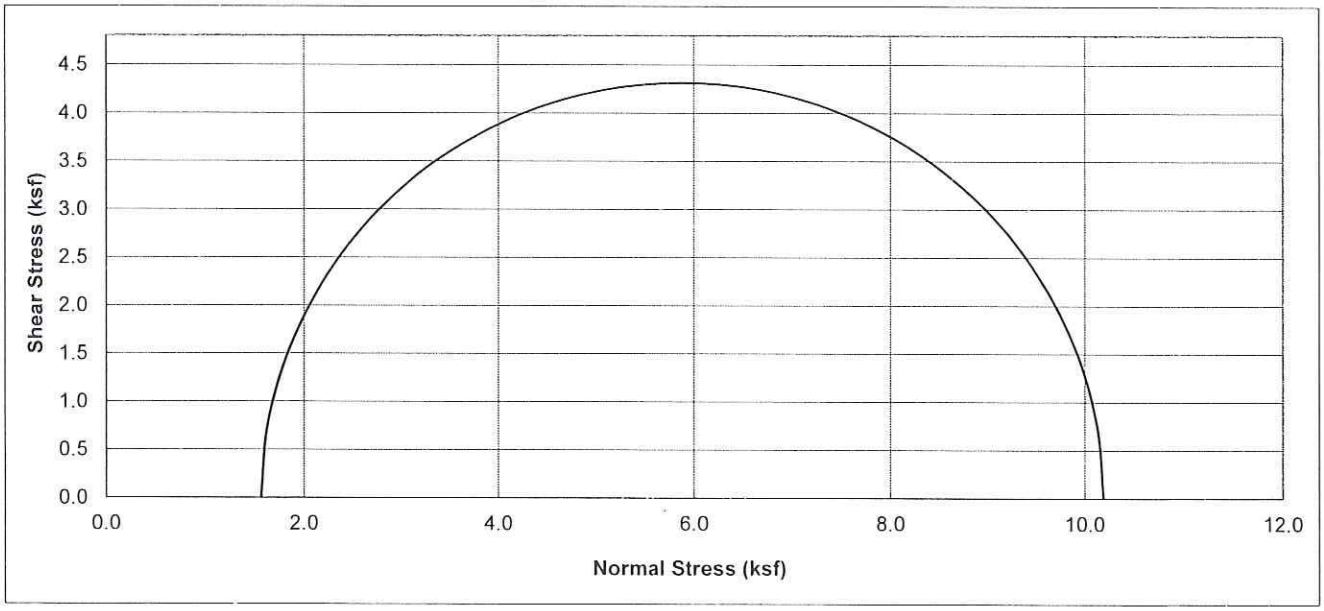




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-221	D-11	55	Dark brown , Lean CLAY (CL)	108.3	20.29	4.44	4.58	98.7

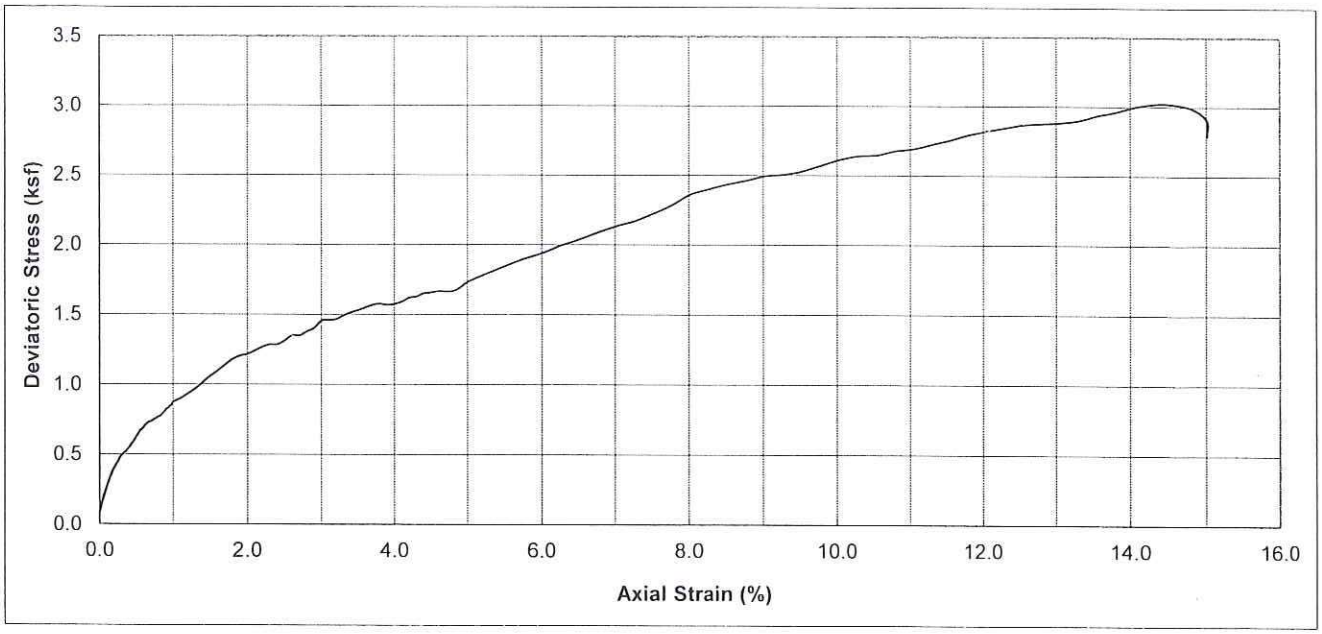
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/07/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

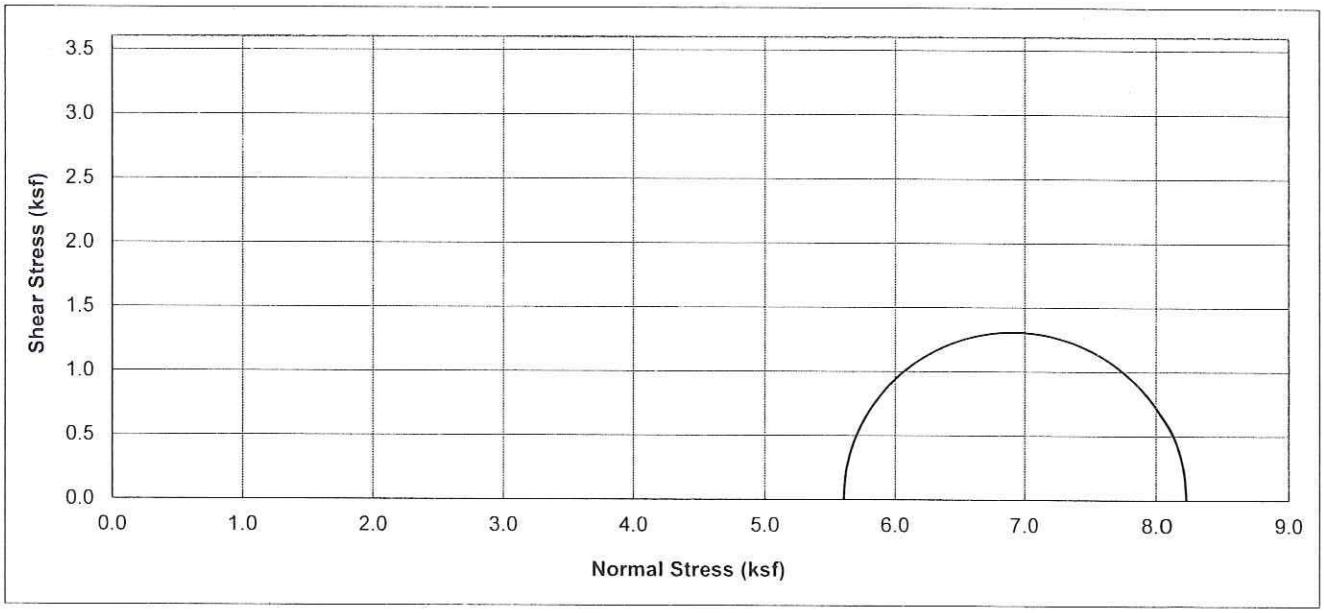




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-222	D-4	20	Dk. Olive-brown to Dk. gray, Elastic SILT (MH)	83.0	33.70	1.57	8.63	88.4

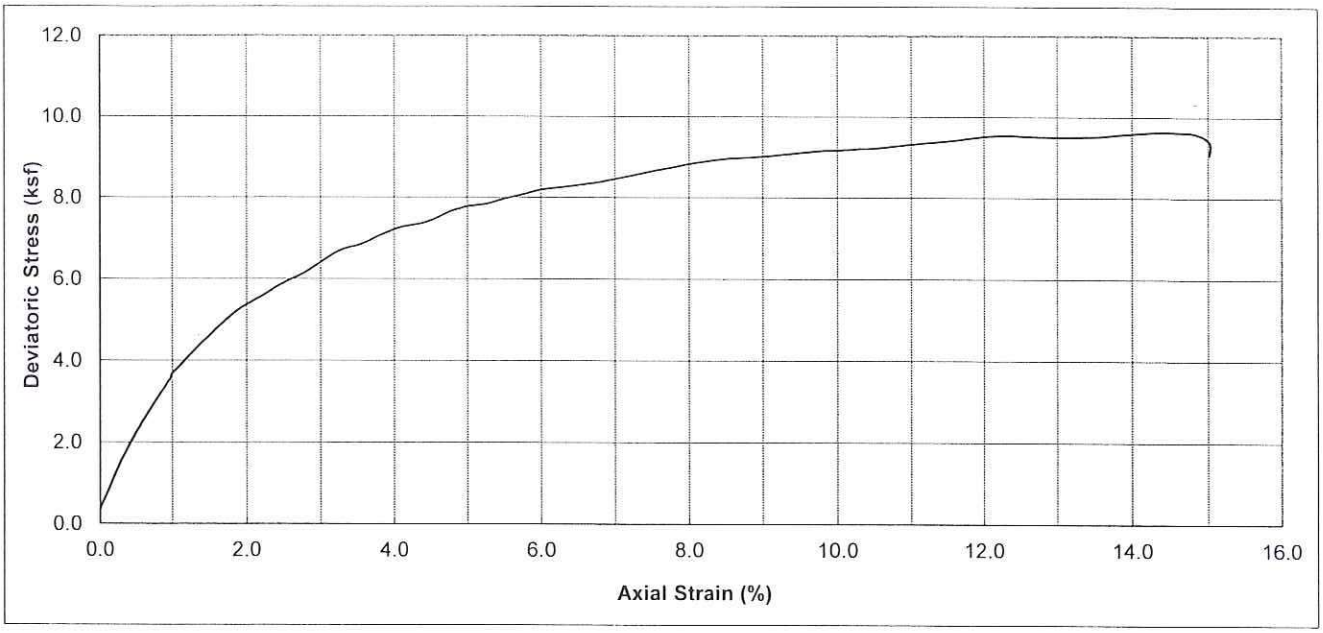
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 / Date : 11/07/11	Figure No. :

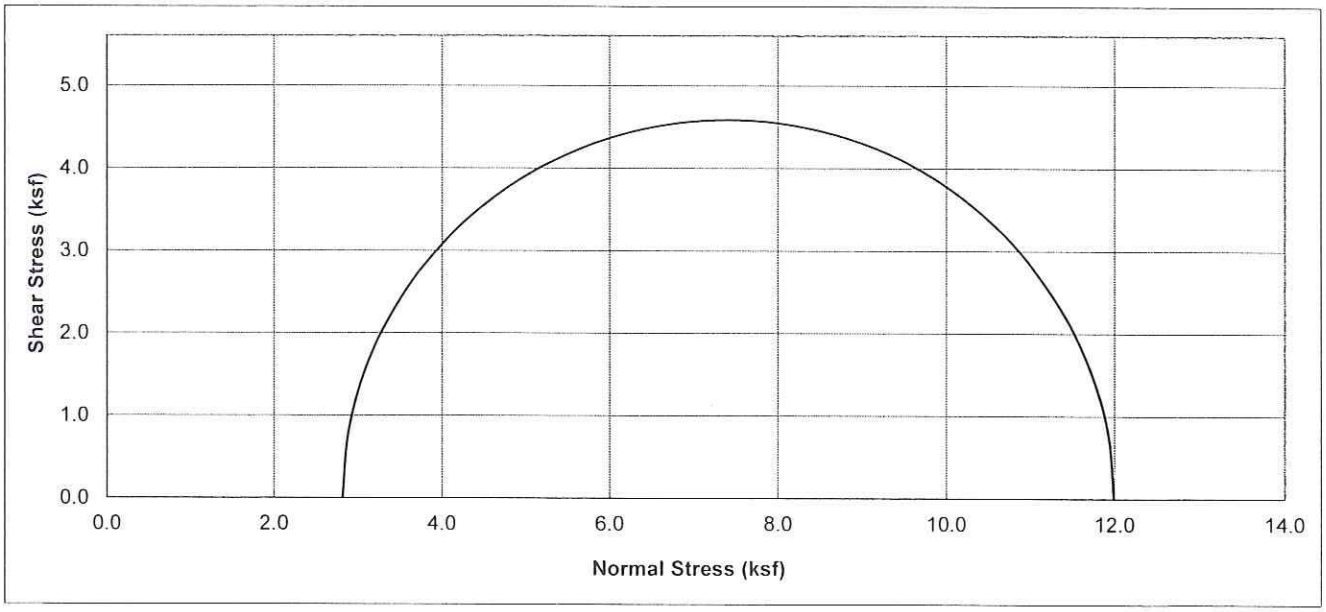




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-222	D-14	70	Olive-brown , Lean CLAY(CL)	99.8	24.54	5.60	2.61	96.2

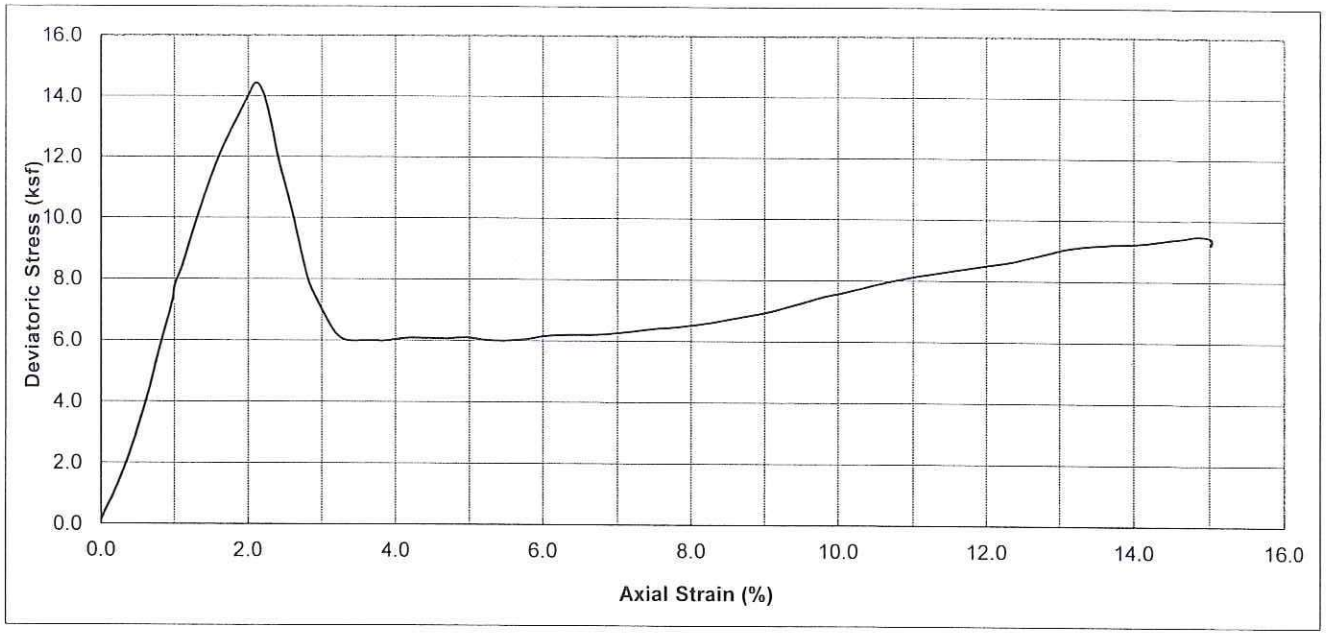
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-136 / Date : 11/07/11	Figure No. :

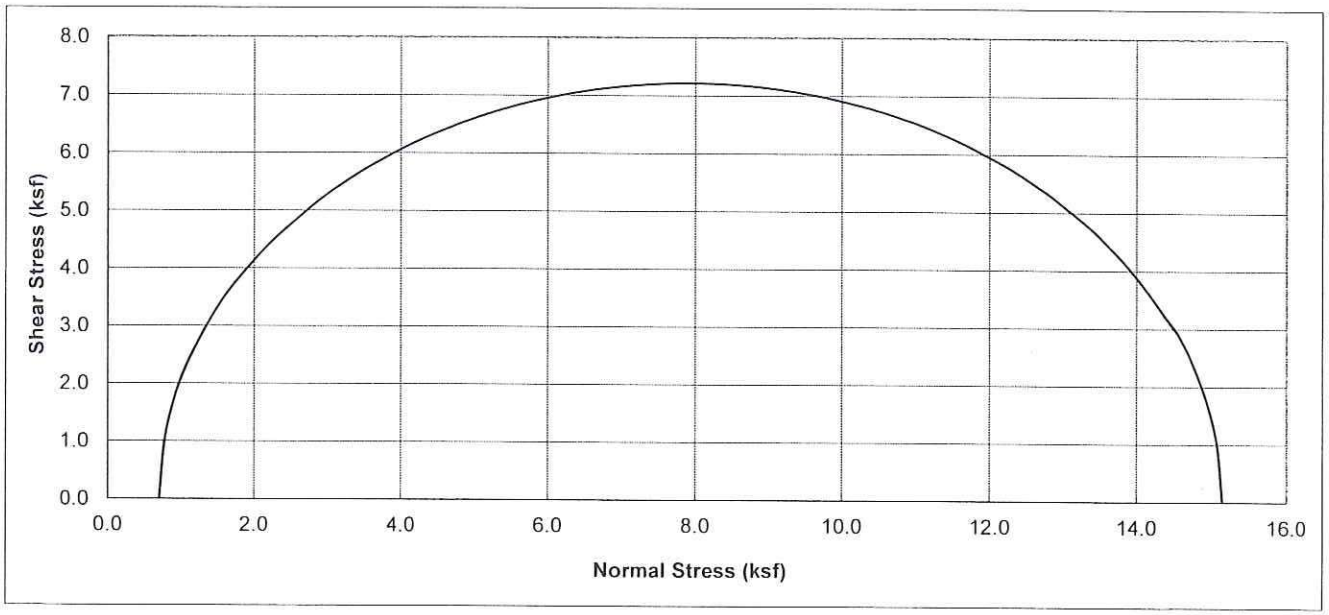




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-224	D-7	35	Olive-brown , SANDY lean CLAY (CL)	113.6	11.49	2.82	9.17	64.1

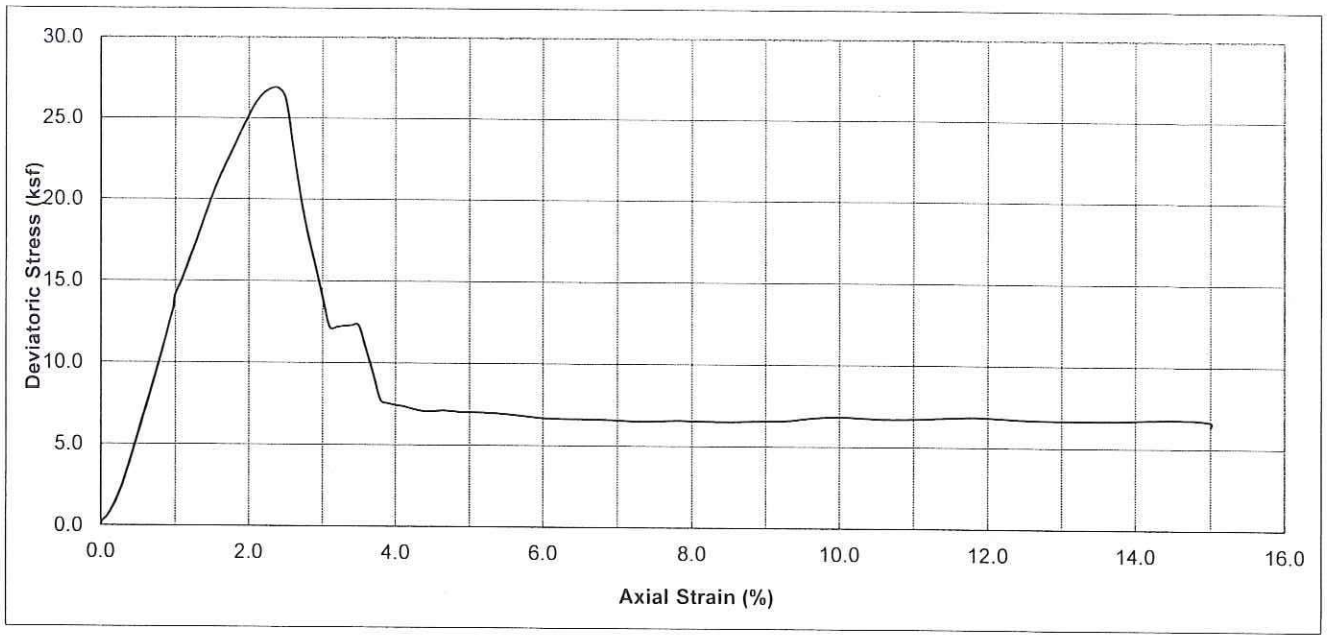
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136	Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

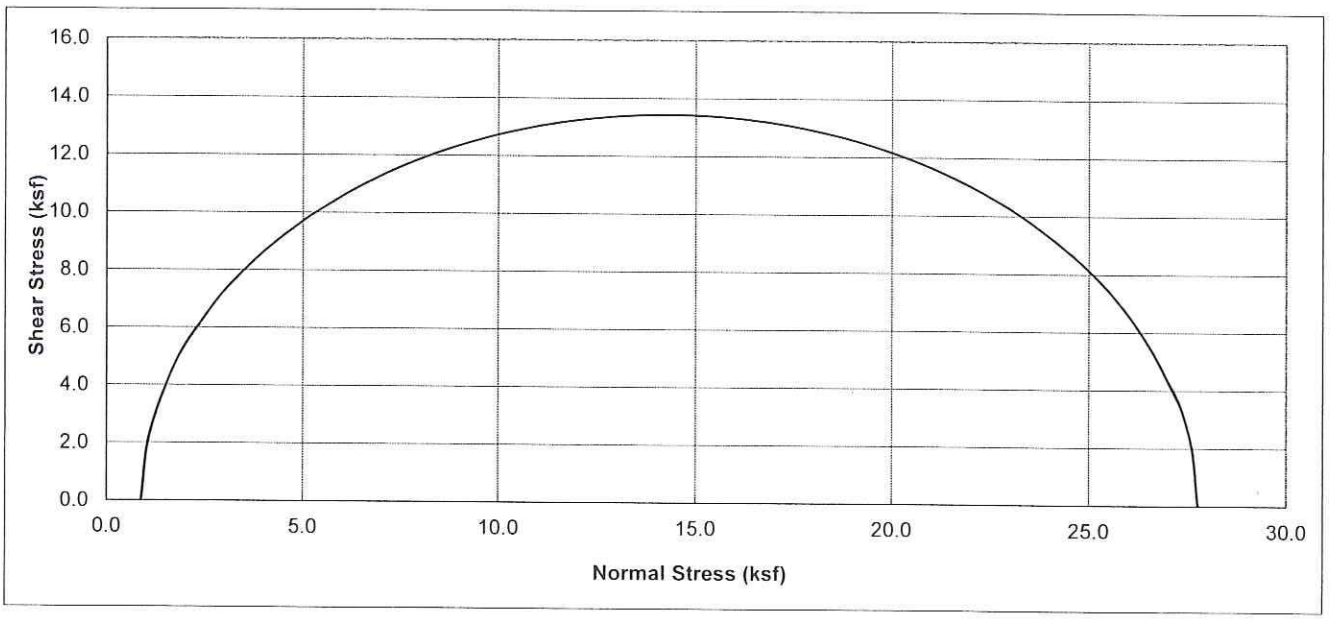




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-225	D-1	5	Olive-brown , Fat CLAY (CH)	79.0	26.21	0.70	14.44	62.6

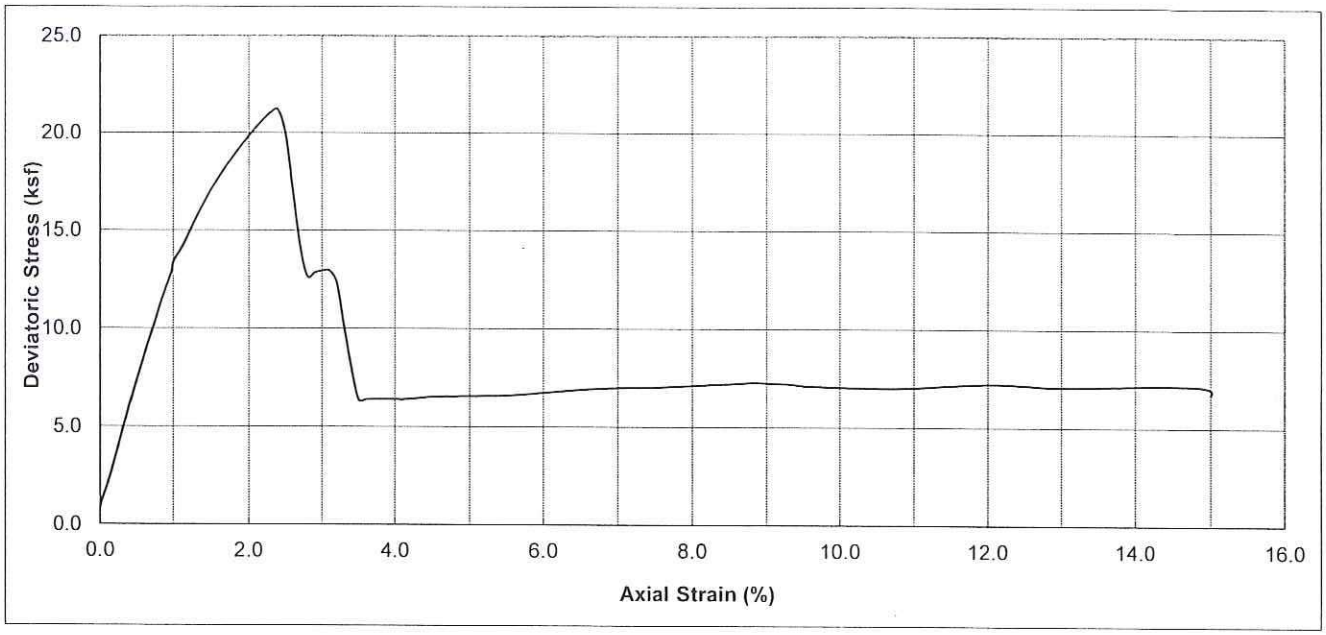
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

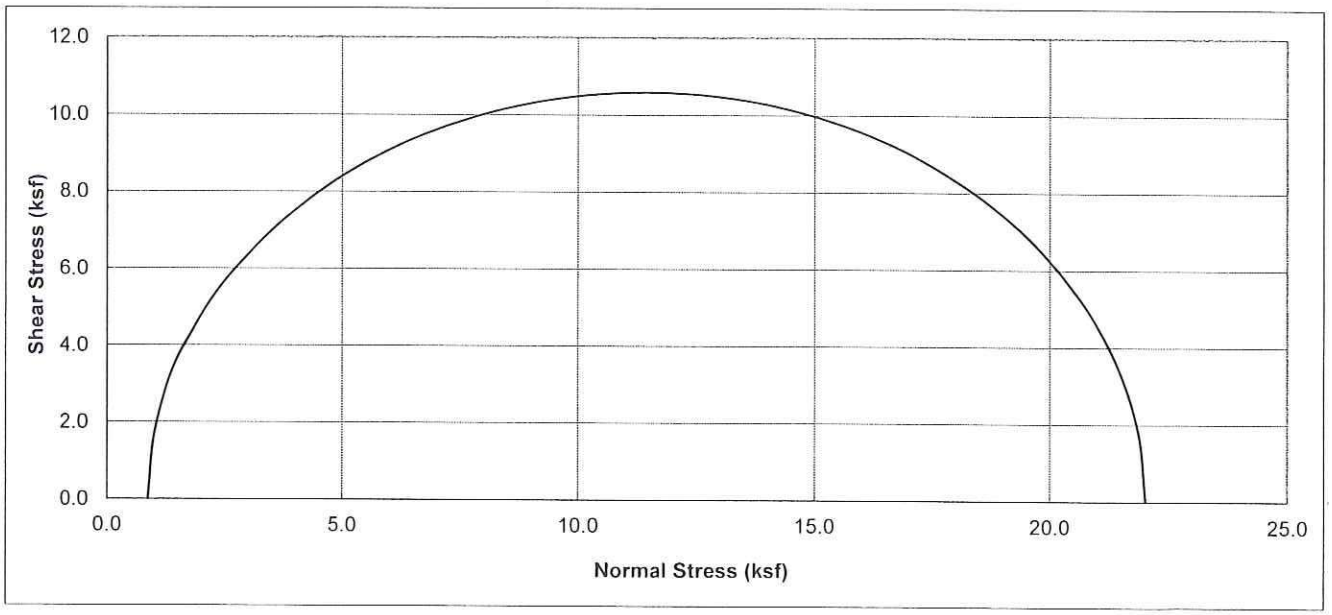




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-226	D-1	2.5	Dk. Greyish Brown, Lean CLAY (CL-CH)	95.6	23.79	0.86	26.88	84.2

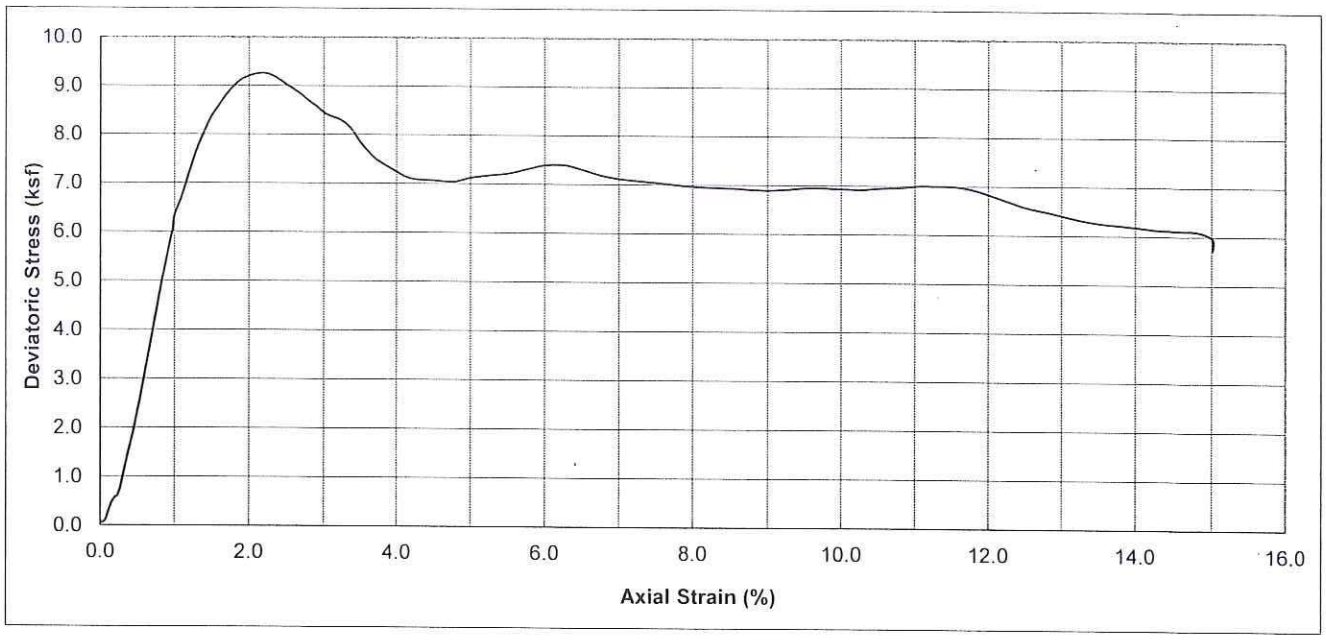
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/23/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

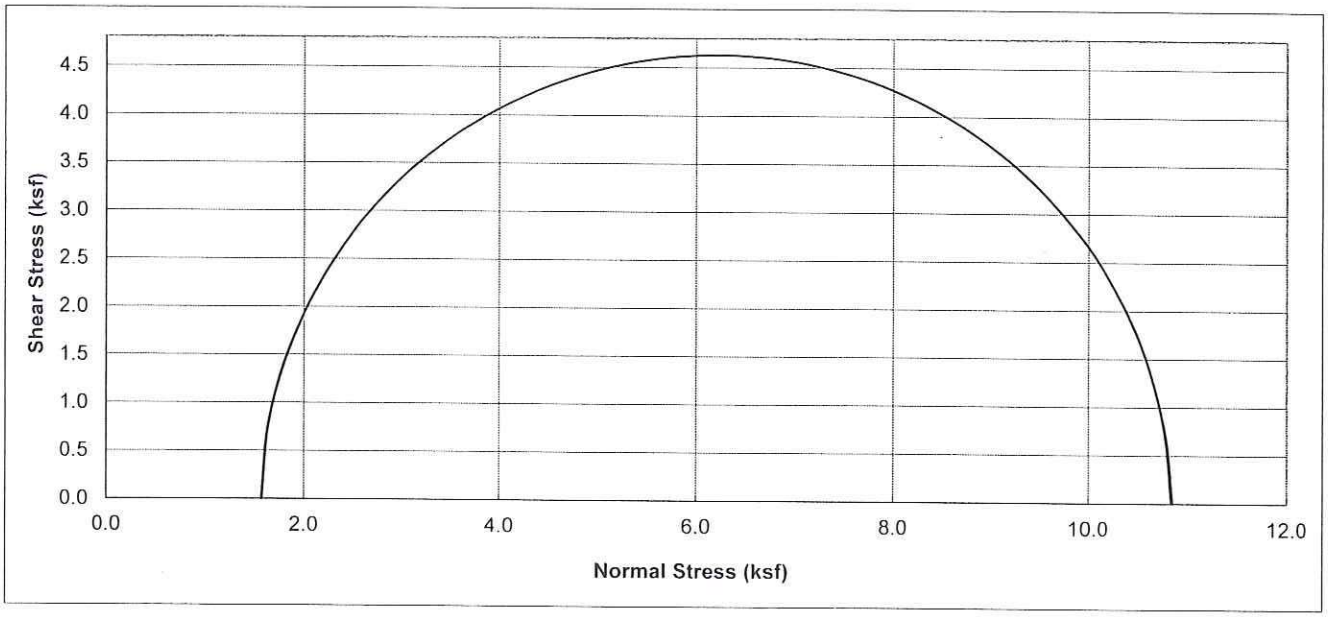




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-230	D-3	10	Very dark gray , Elastic SILT (MH)	95.0	26.83	0.86	21.18	93.7

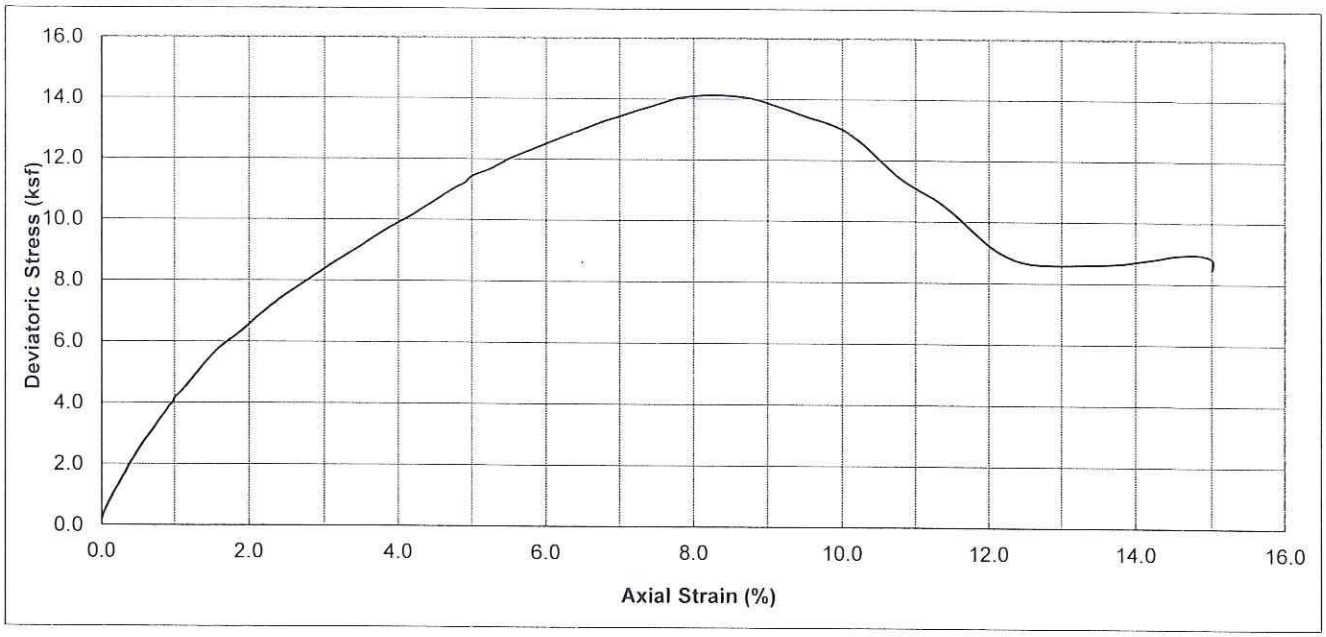
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

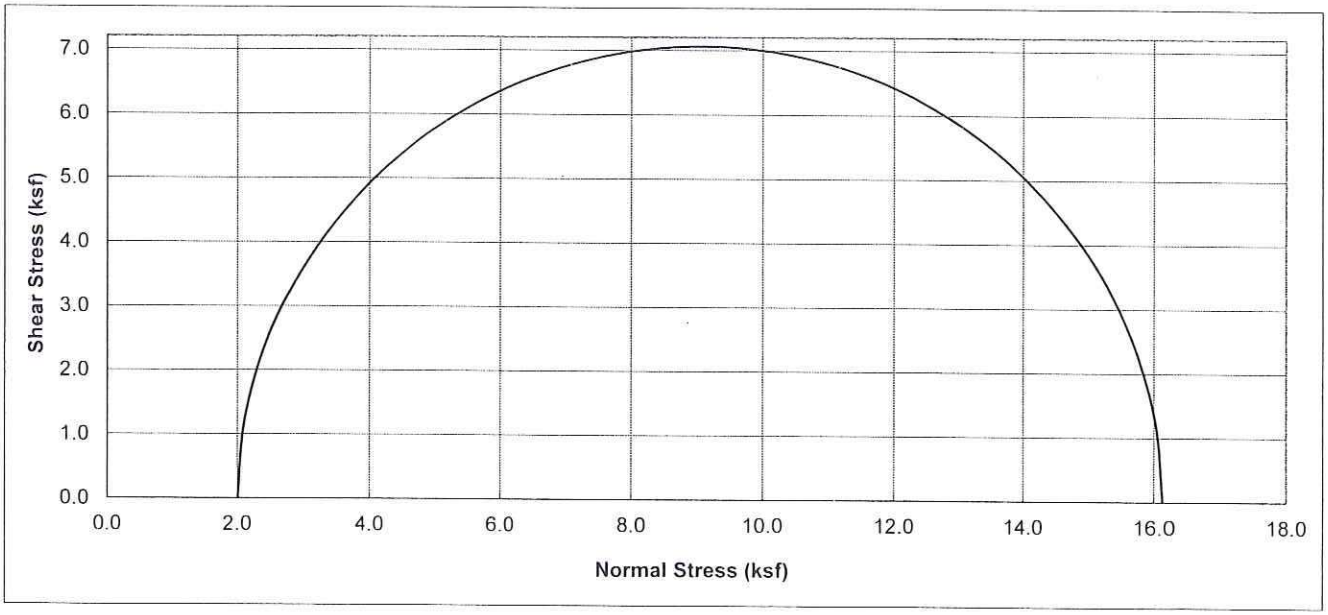




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-232	D-4	20	Olive-brown , Fat CLAY (CH)	85.2	34.95	1.58	9.26	96.4

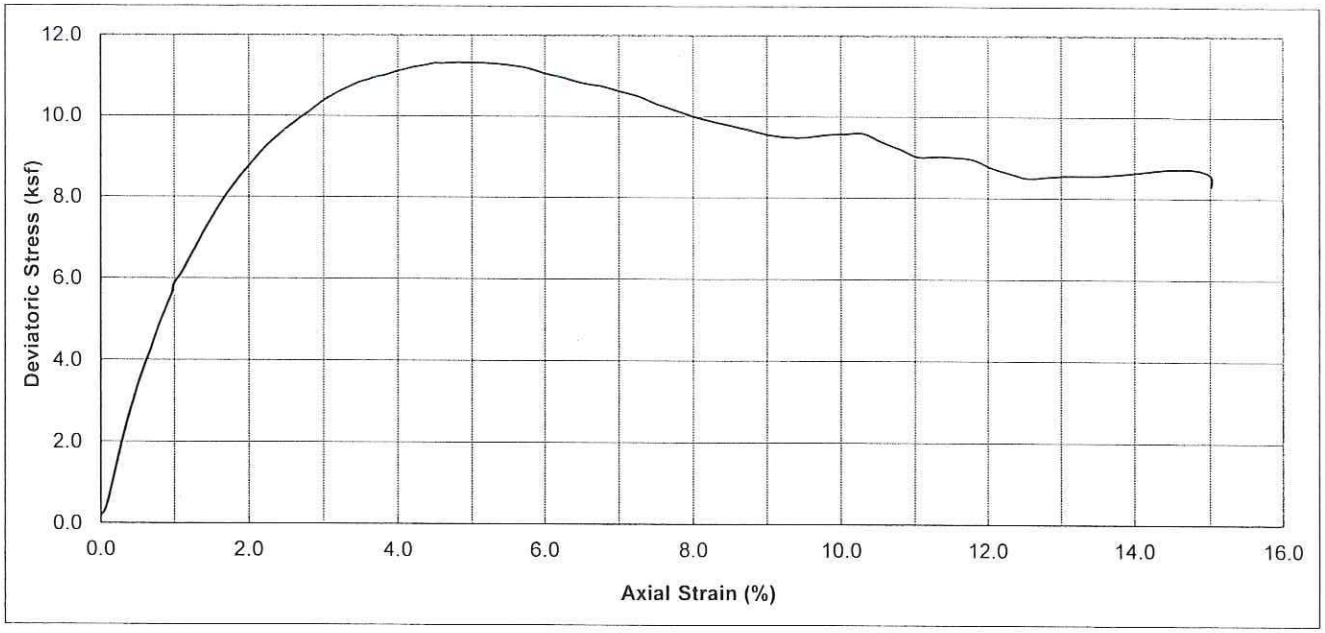
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

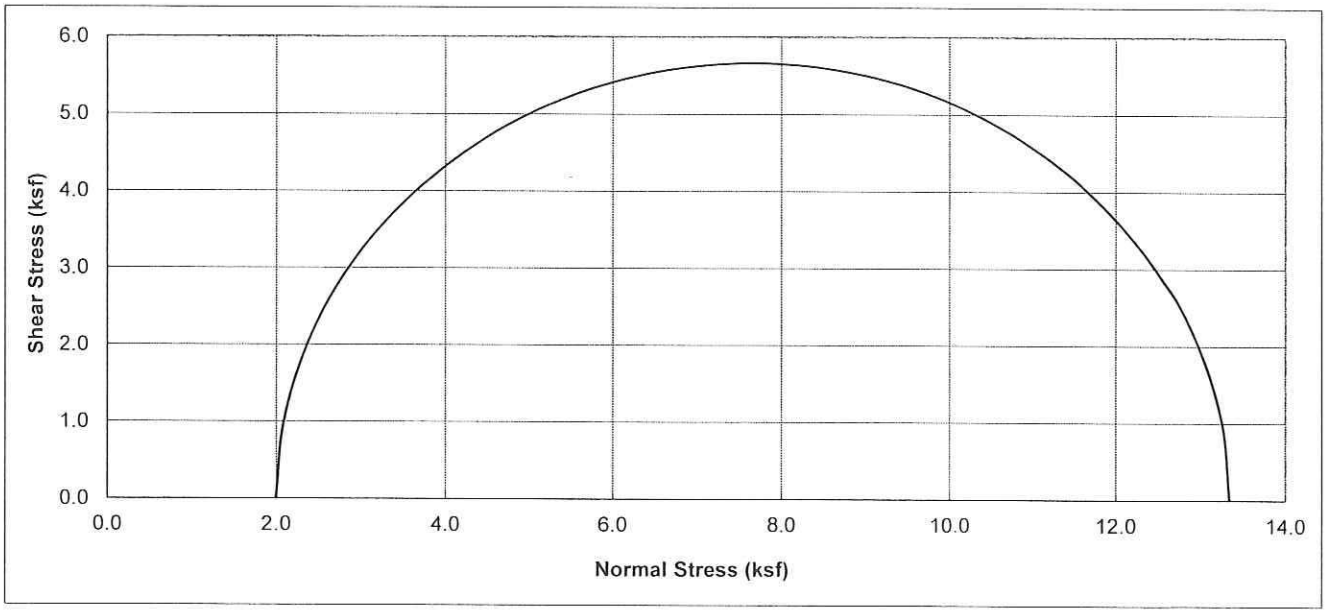




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-233	D-6	25	Dk. brown, Elastic SILT (MH)	91.6	26.32	2.00	14.13	84.7

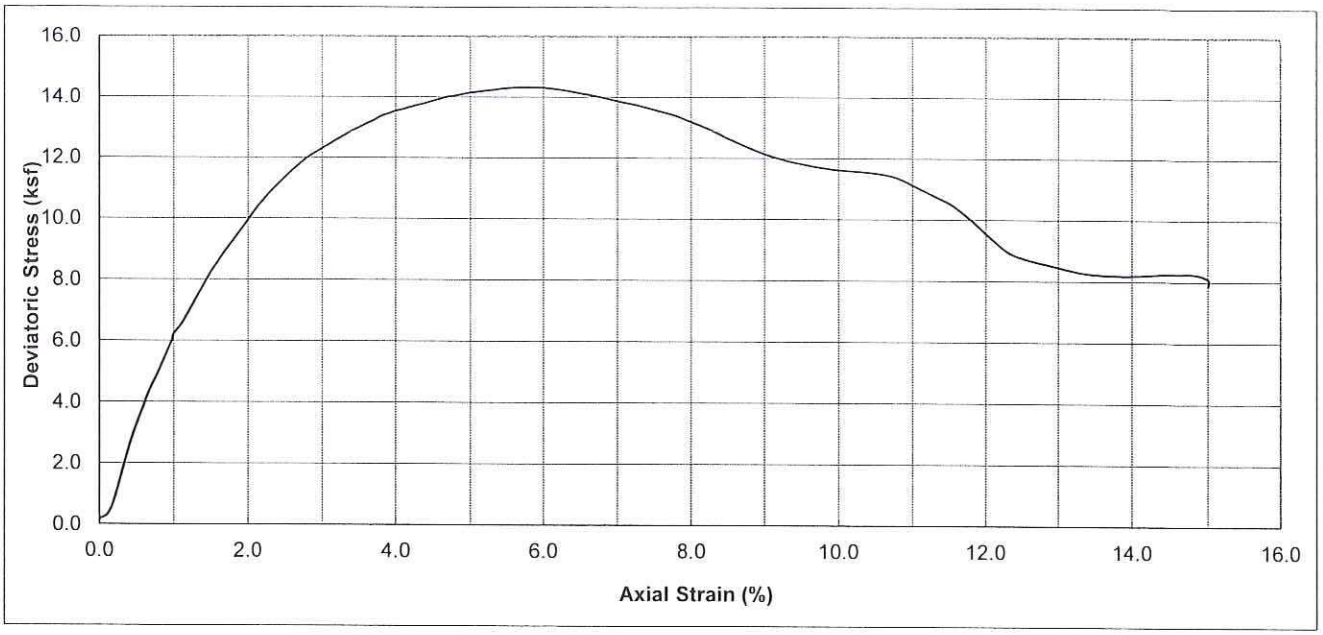
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

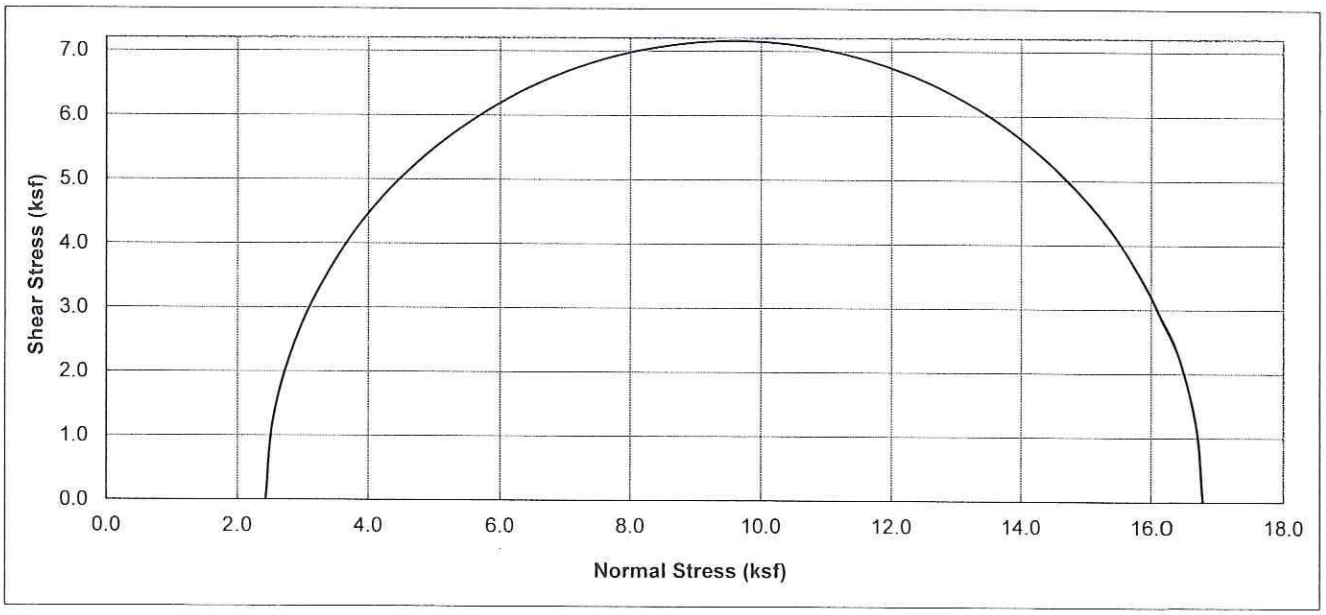




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-235	D-6	25	Very dark gray , Elastic SILT (MH)	83.4	34.27	2.00	11.33	90.8

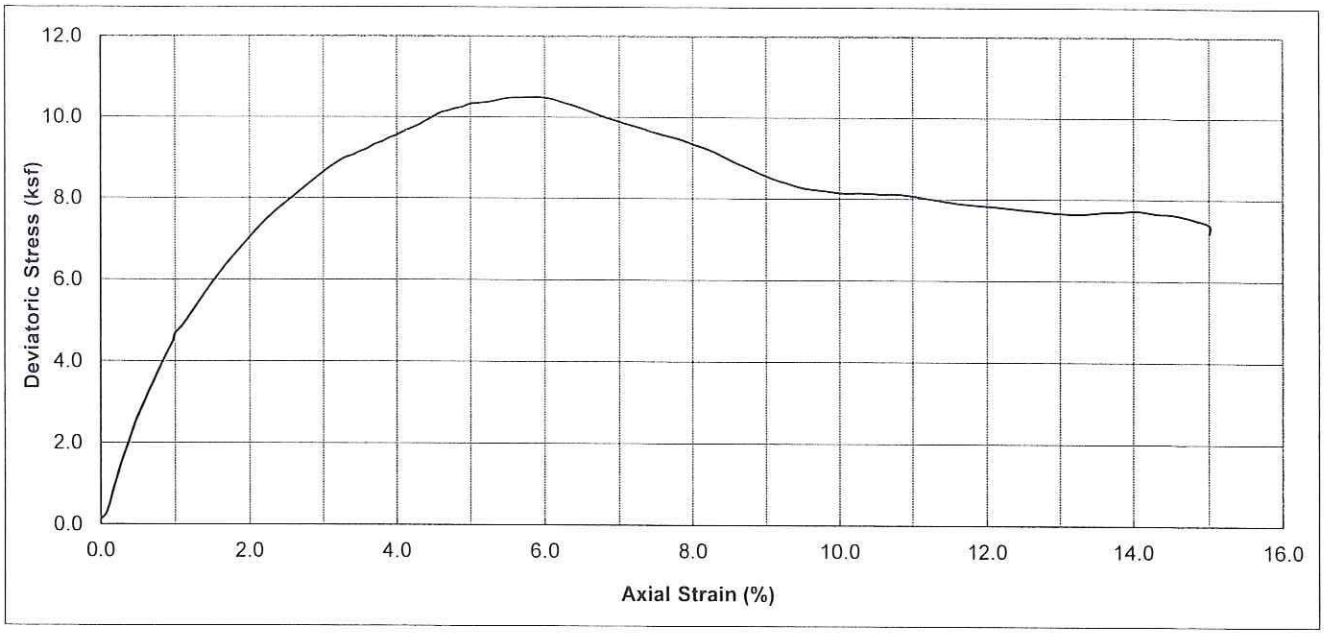
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136	Date : 11/08/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

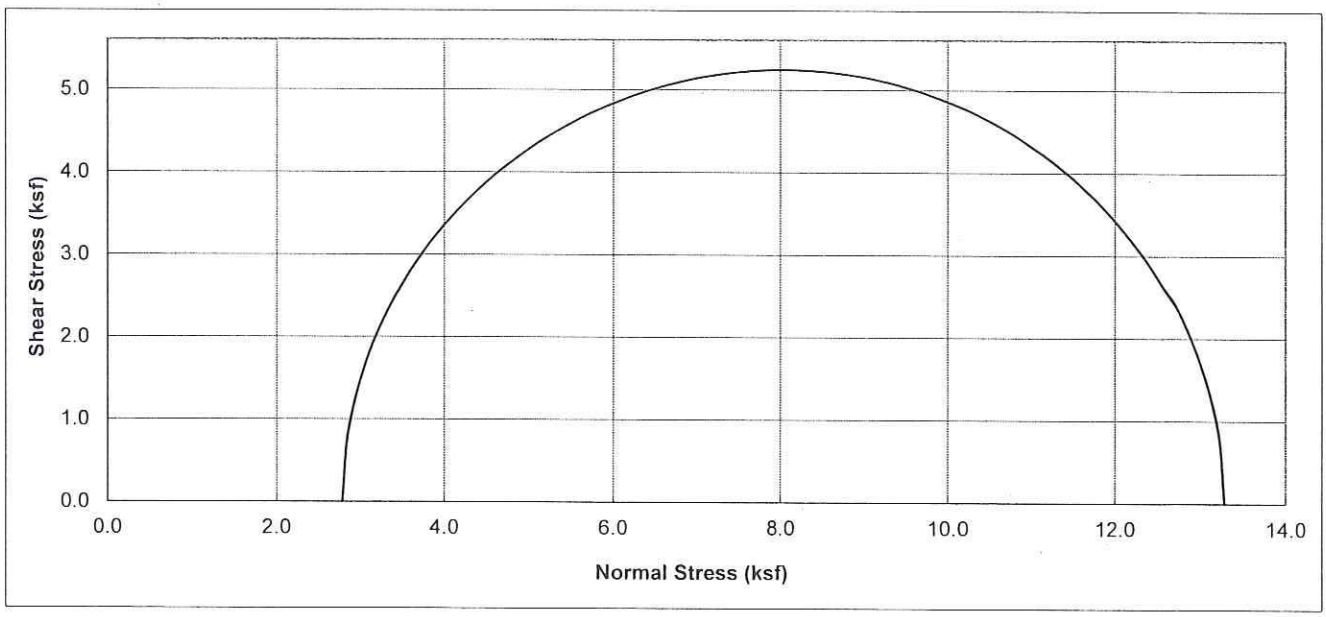




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-244	D-8	30	Very dark gray , Elastic SILT (MH)	92.8	28.48	2.44	14.32	94.3

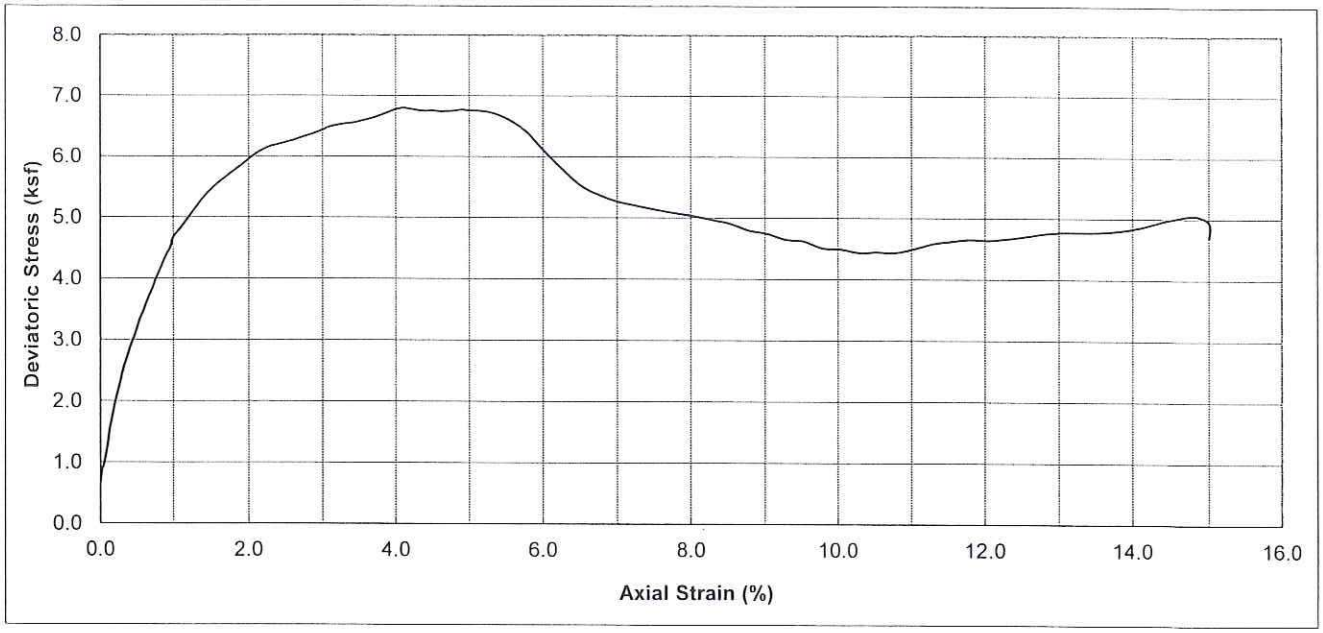
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :
Project No. : 11-136	Date : 11/09/11

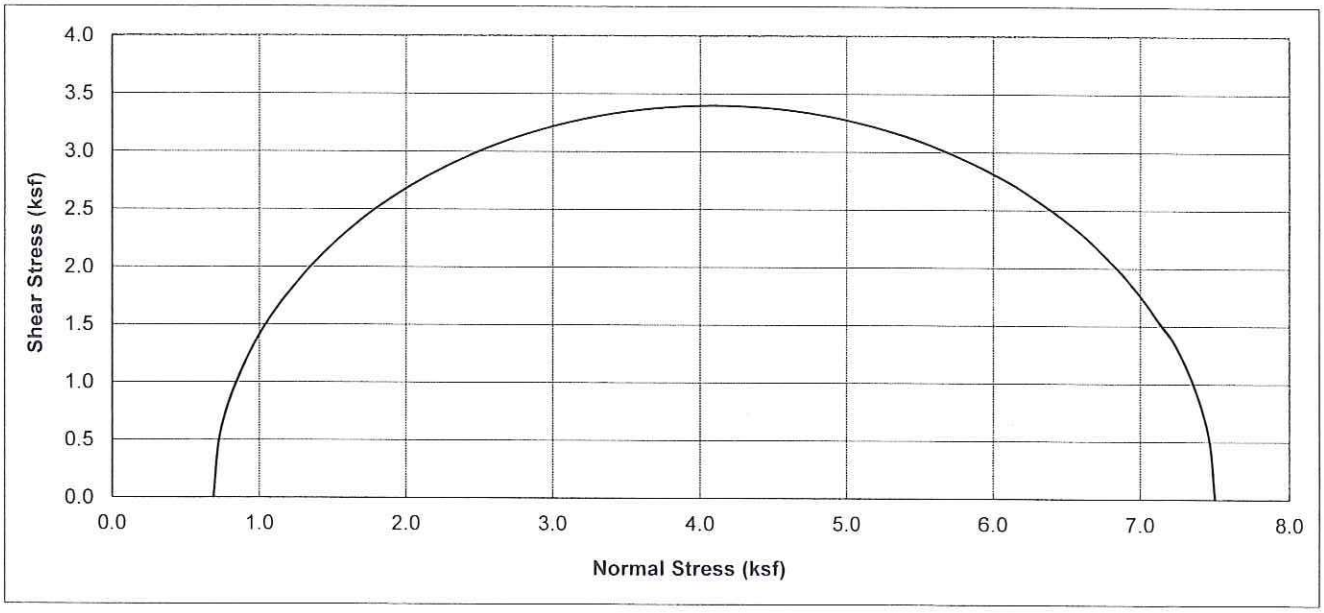




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-253	D-8	35	Very dark gray , Elastic SILT (MH)	88.2	31.54	2.79	10.49	93.5

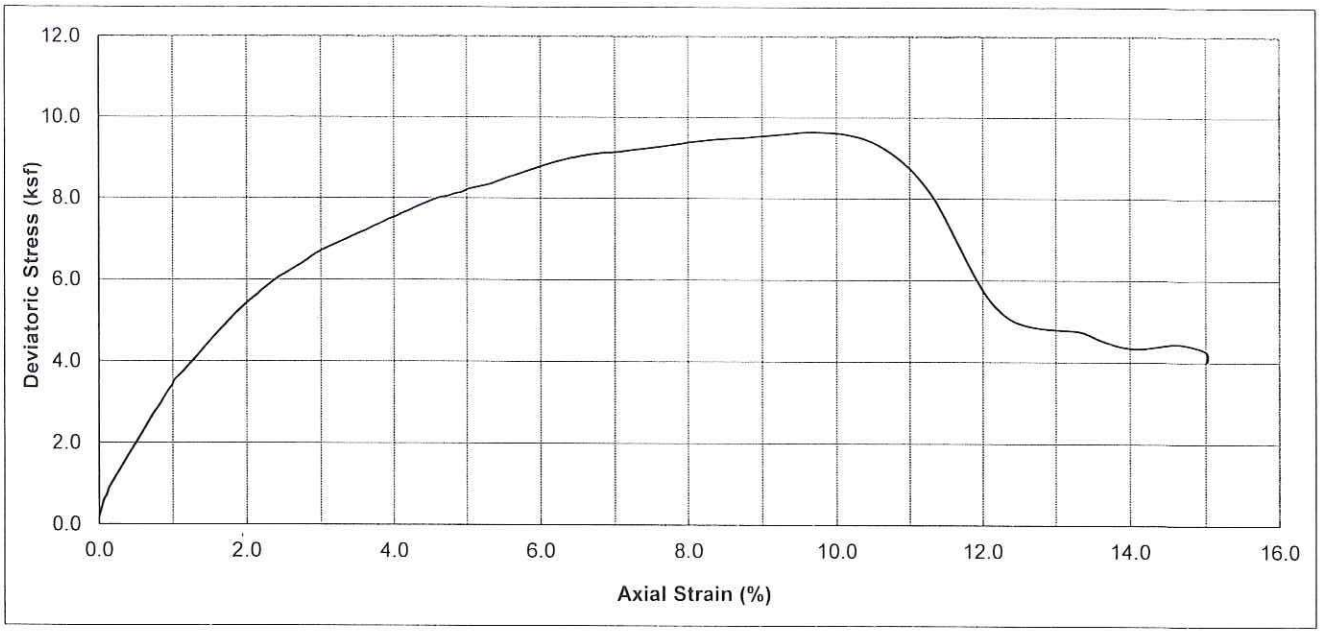
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136	Date : 11/10/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

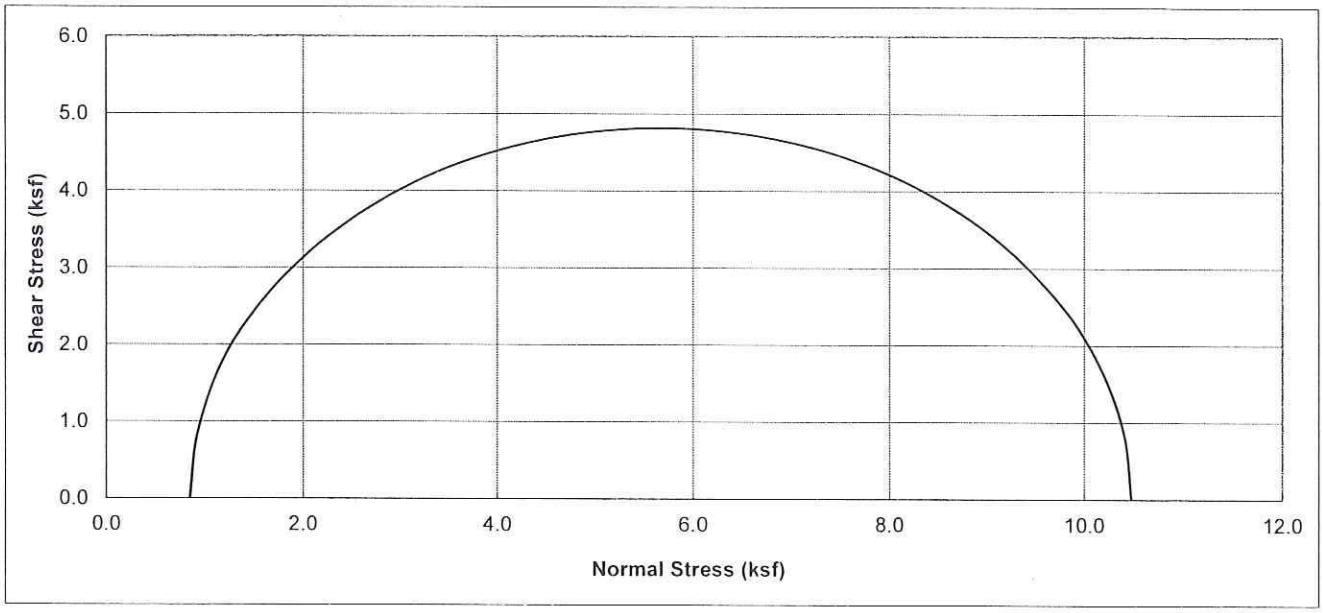




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-254	D-1	2.5	Olive-brown , SANDY lean CLAY (CL)	107.9	15.54	0.69	6.80	74.7

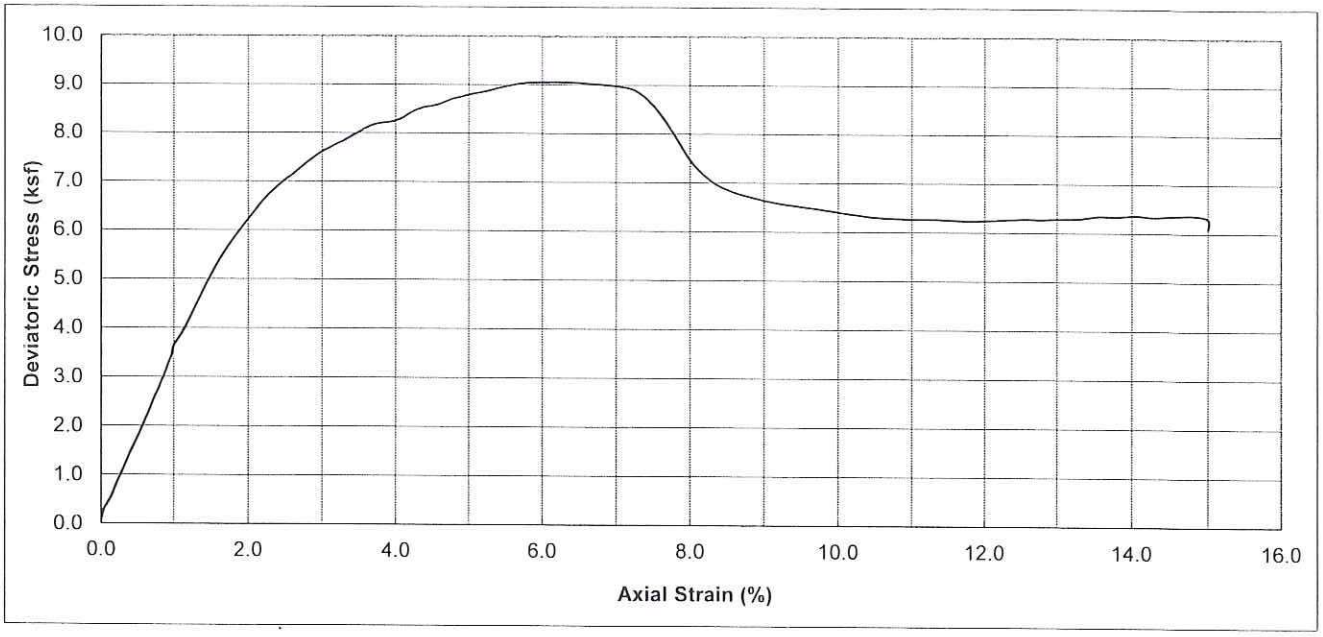
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/10/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

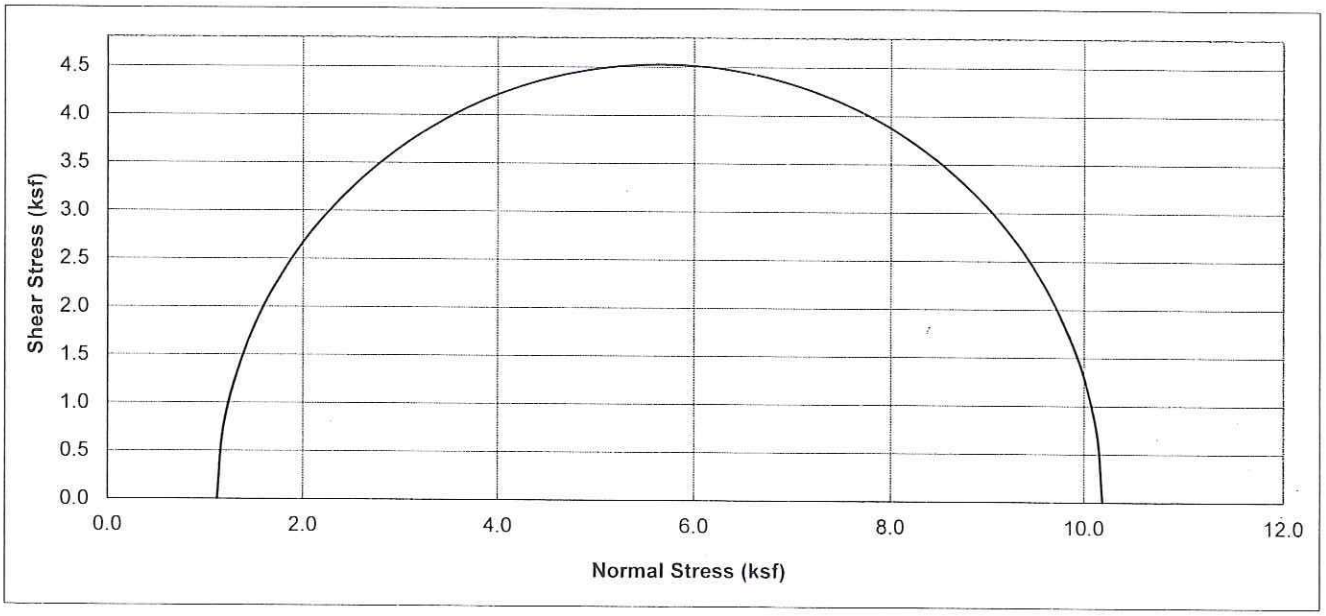




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-255	D-3	10	Olive-brown , Lean CLAY (CL)	104.8	18.54	0.85	9.63	82.4

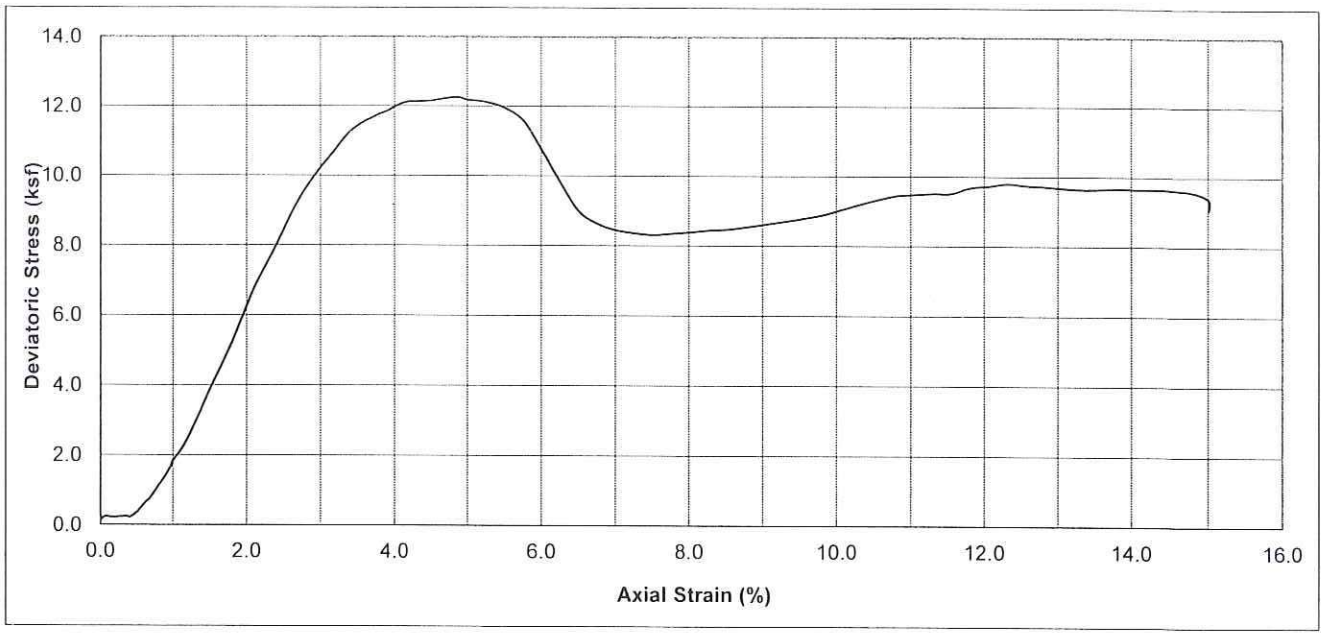
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering		AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136	Date : 11/10/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

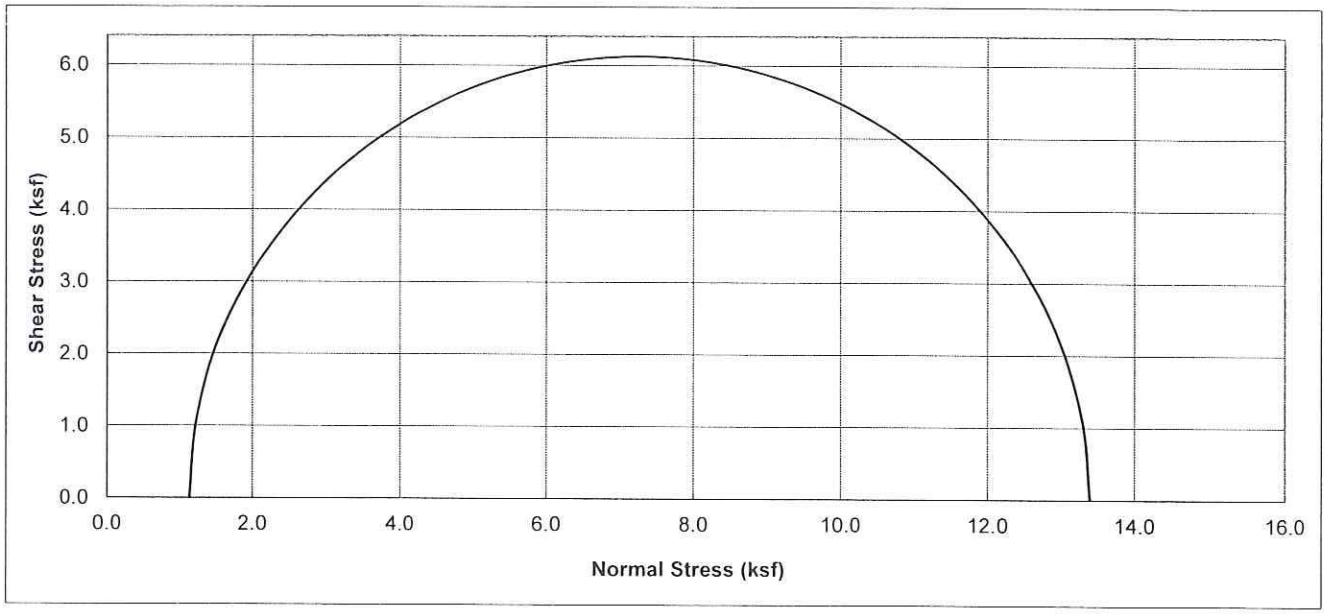




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-258	D-3	15	Olive-brown , SANDY lean CLAY (CL)	105.6	11.26	1.13	9.06	51.1

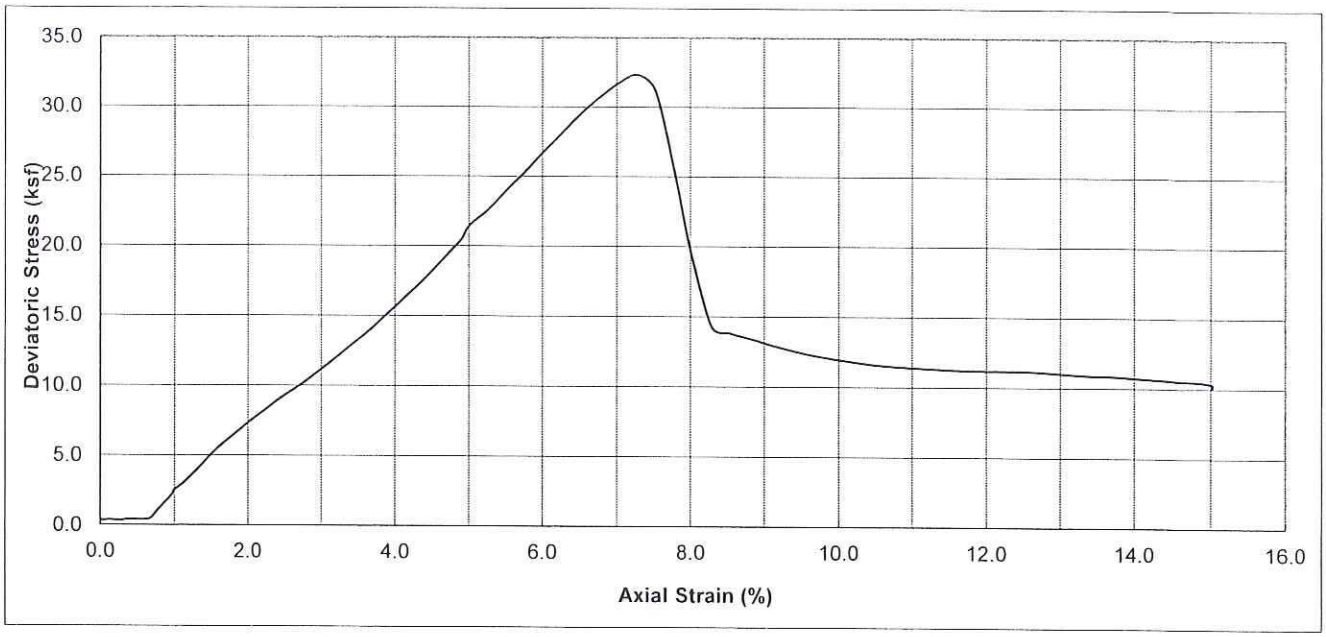
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/10/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

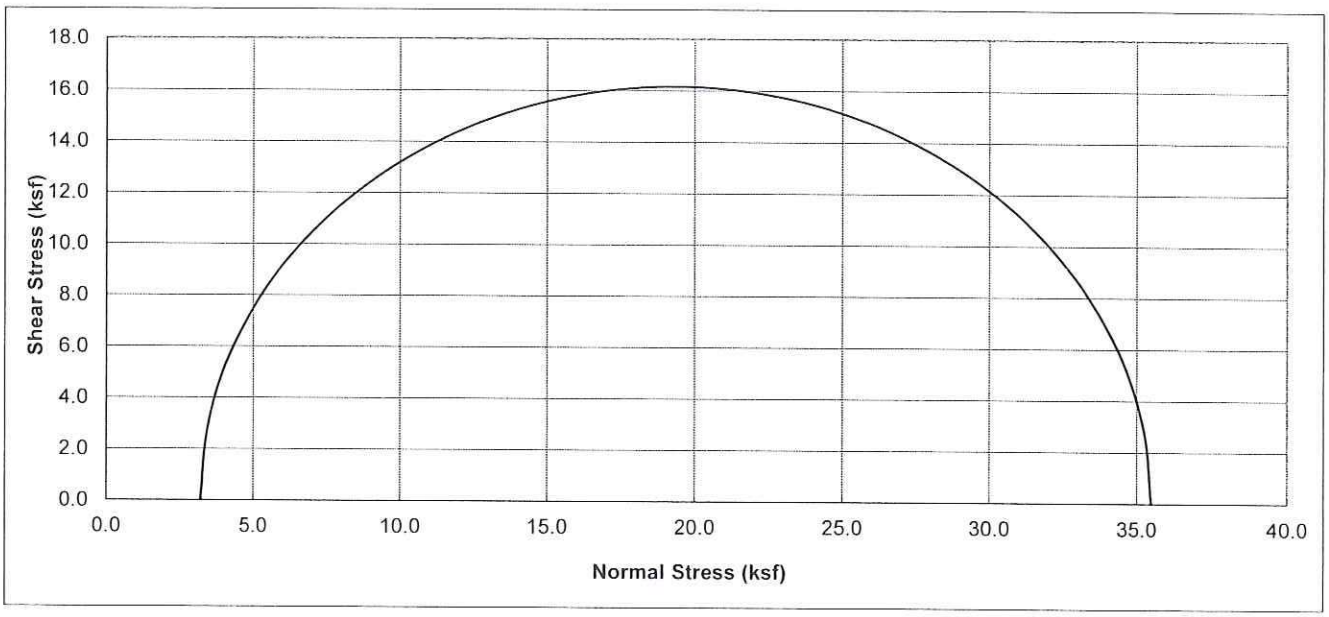




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-262	D-4	15	Olive Brown, SILT With CLAY (ML) to Lean CLAY (CL)	106.2	15.31	1.13	12.25	70.6

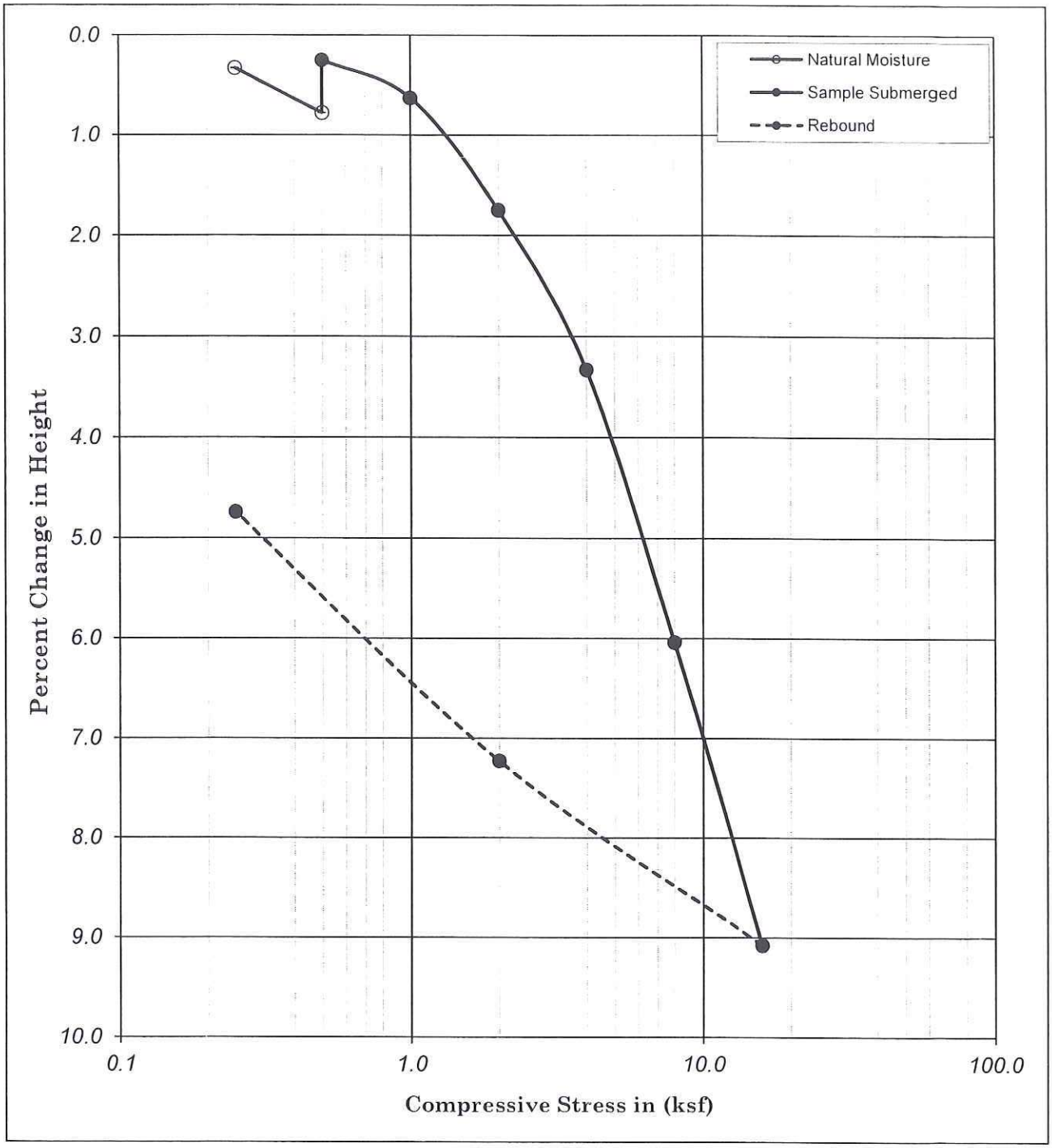
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/23/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :





Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-264	D-7	40	Dk. Grey, Elastic SILT (MH)	92.7	27.71	3.16	32.33	91.5

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2
Project No. : 11-136 Date : 11/23/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :



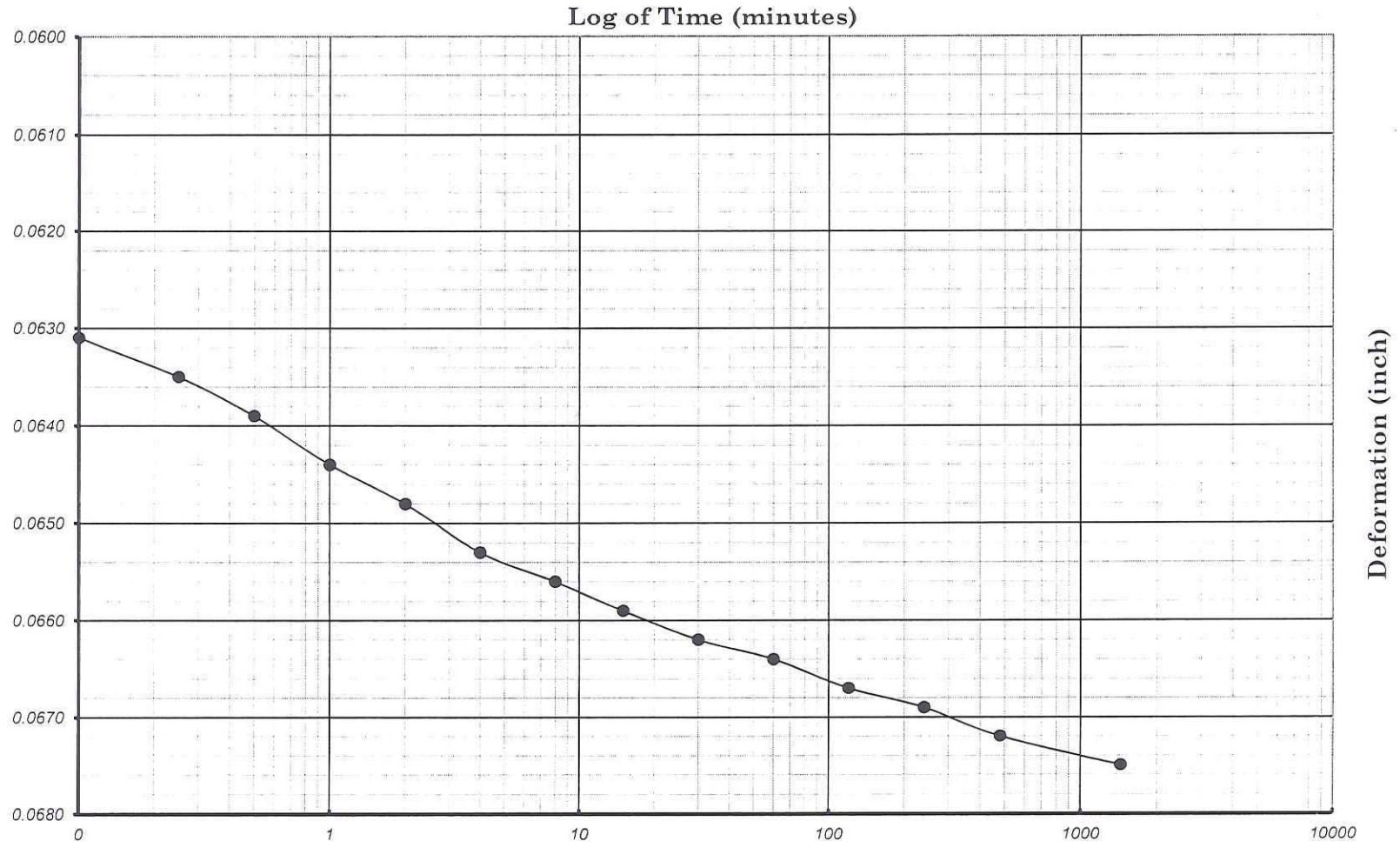
Boring No. : A-11-202			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-2			Plastic Limit :	-						
Depth	(ft) : 10.0	11.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
	(m) : 3.05	3.51	Specific Gravity :	2.70	Final	31.08	91.60	14.42	99.88	0.84
Description : Dark olive-brown with yellowish brown , Lean CLAY (CL)										

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

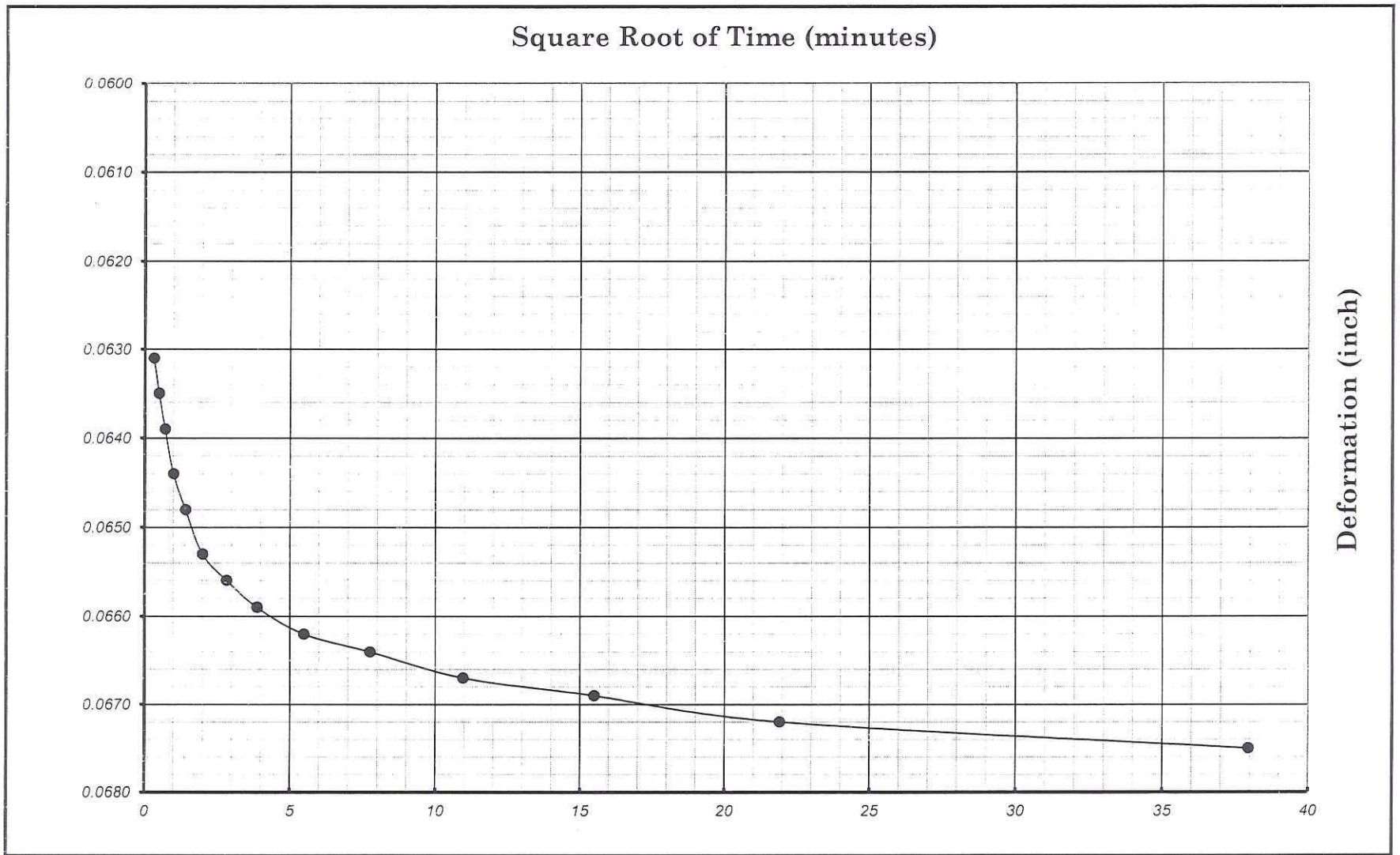
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

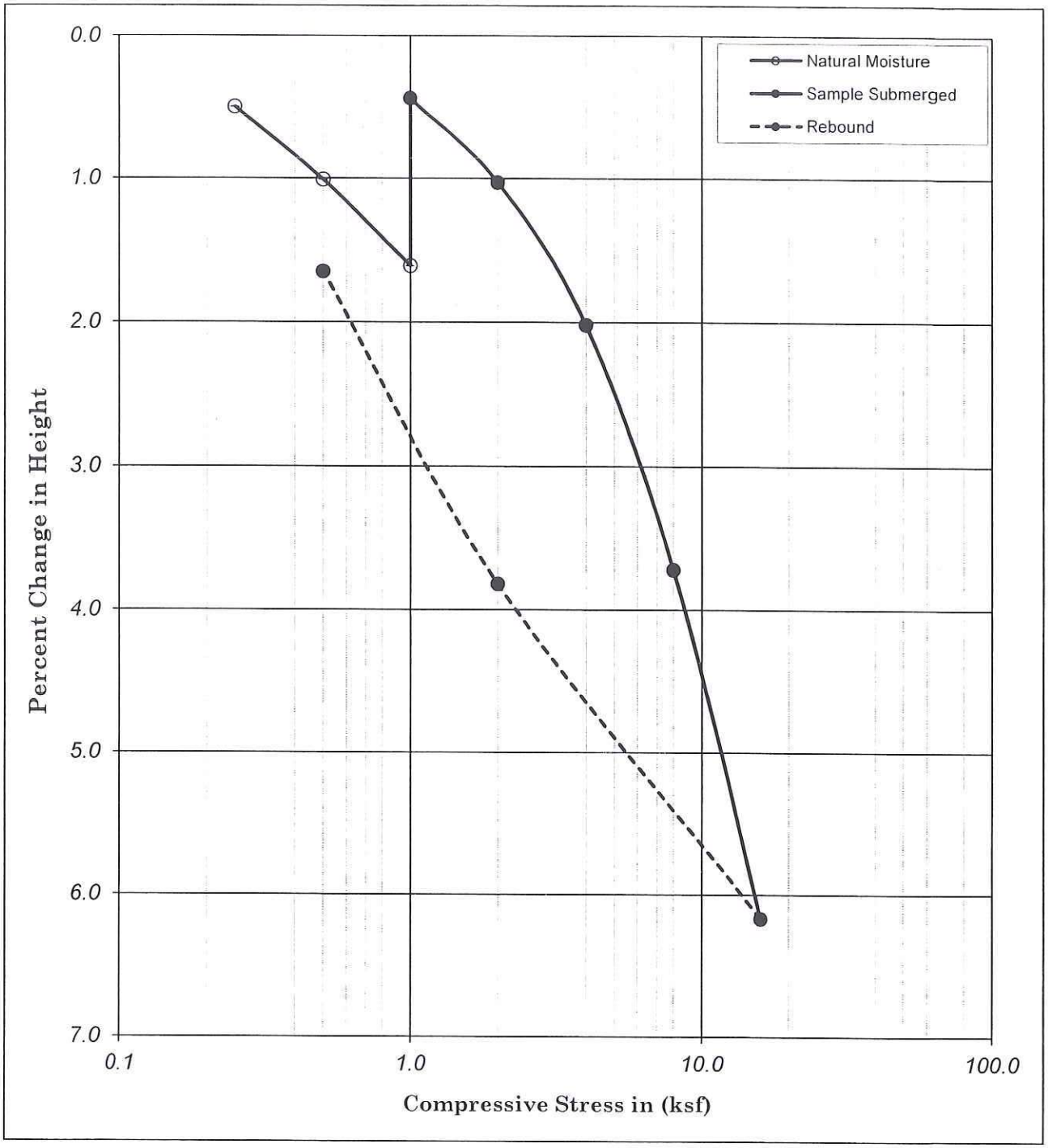
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-202	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-2	
EMI Project No. : 11-136		Depth (ft/m) : 10.0 3.1	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-202*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No.	: A-11-216		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-4		Plastic Limit :	-						
Depth (ft)	: 15.0	16.5	Plastic Index :	-	Initial	28.27	94.25	14.84	96.81	0.79
Depth (m)	: 4.58	5.03	Specific Gravity :	2.70	Final	28.77	95.86	15.09	102.43	0.76

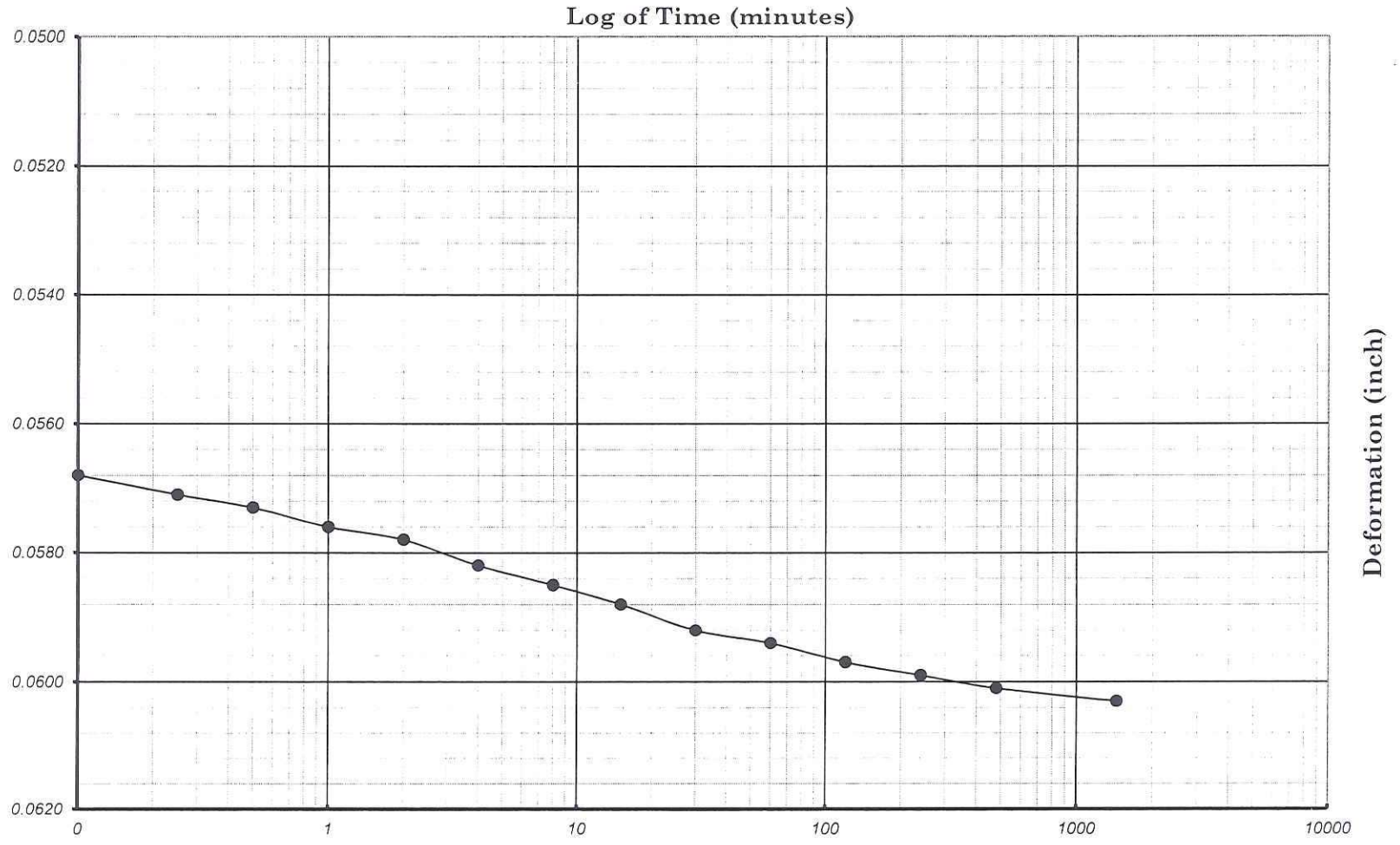
Description : *Mottled very dark brown, yellowish brown, white, olive-gray, Fat CLAY (CH)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

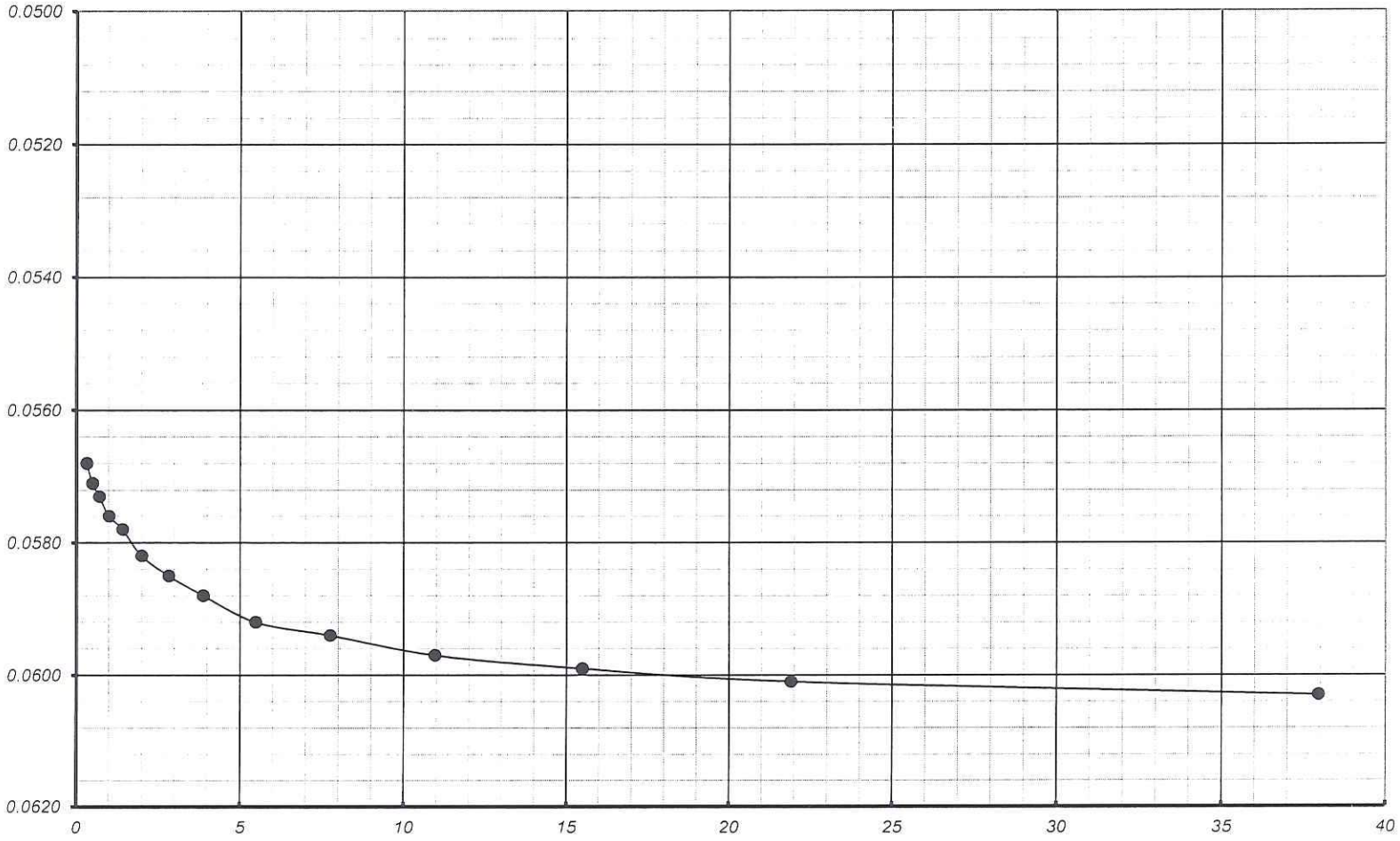
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

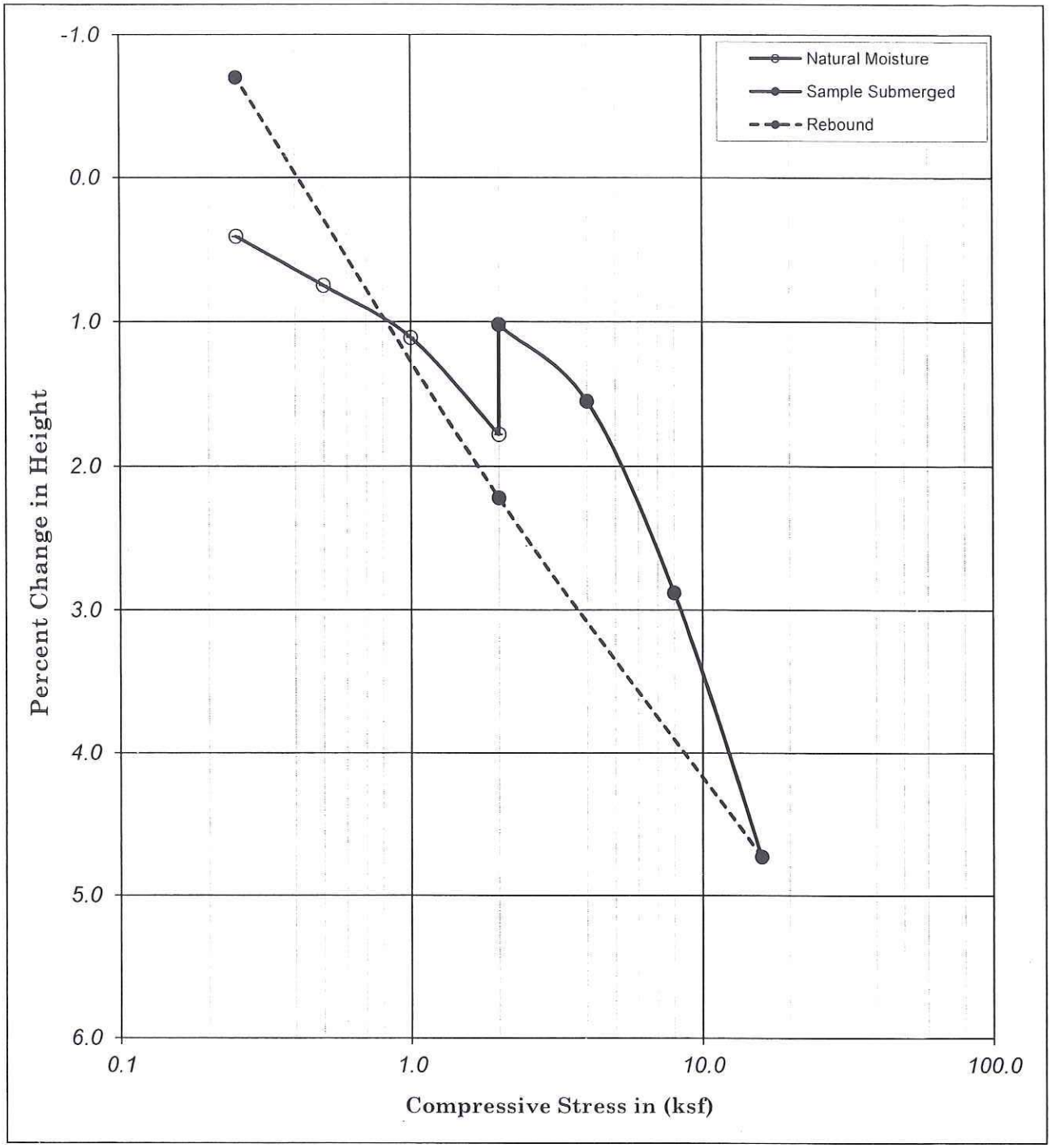
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-216	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-4	
EMI Project No. : 11-136		Depth (ft/m) : 15.0 4.6	Veritcal Load (ksf/kpa) : 2.00 95.8



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-216*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-4*	
EMI Project No. : *11-136*		Depth (ft/m) : *15.0* *4.6*	eritcal Load (ksf/kpa) : *2.0* *95.8*



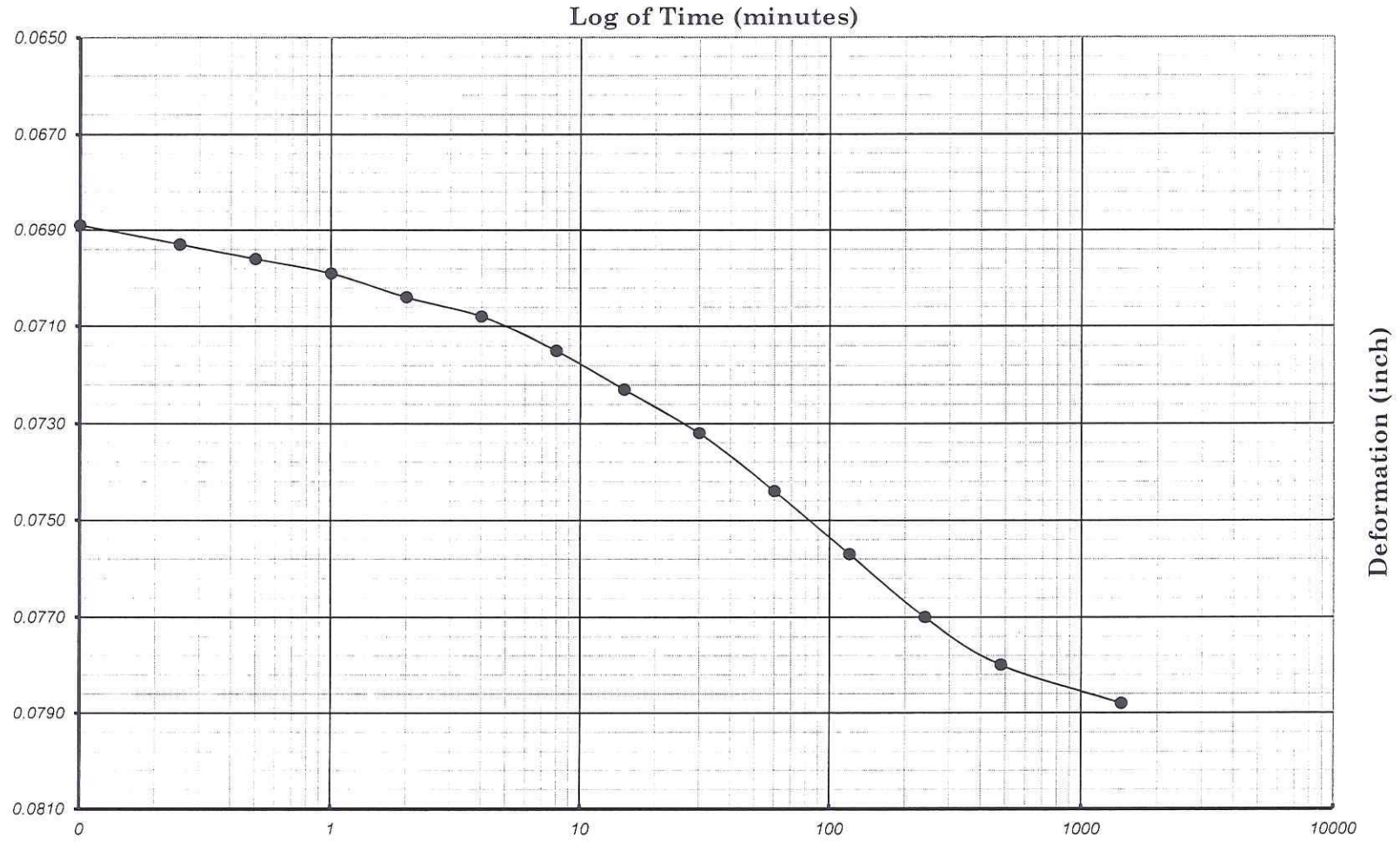
Boring No.	: A-11-221			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-7			Plastic Limit :	-						
Depth (ft)	: 35.0		36.5	Plastic Index :	-	Initial	20.34	107.64	16.94	97.05	0.57
Depth (m)	: 10.68		11.13	Specific Gravity :	2.70	Final	22.15	106.90	16.83	103.69	0.58
Description	: Olive-brown, Fat CLAY (CH)										

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

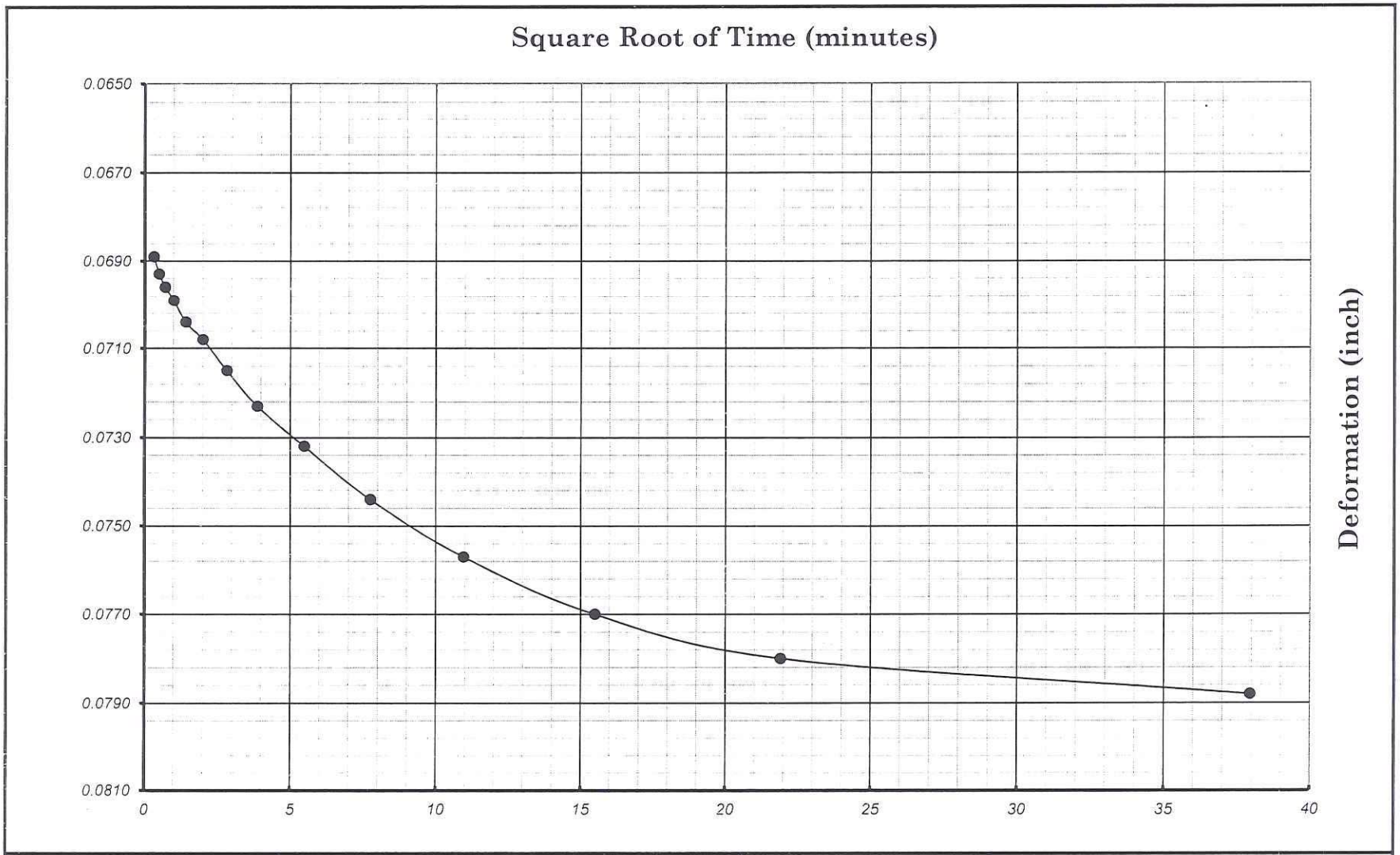
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

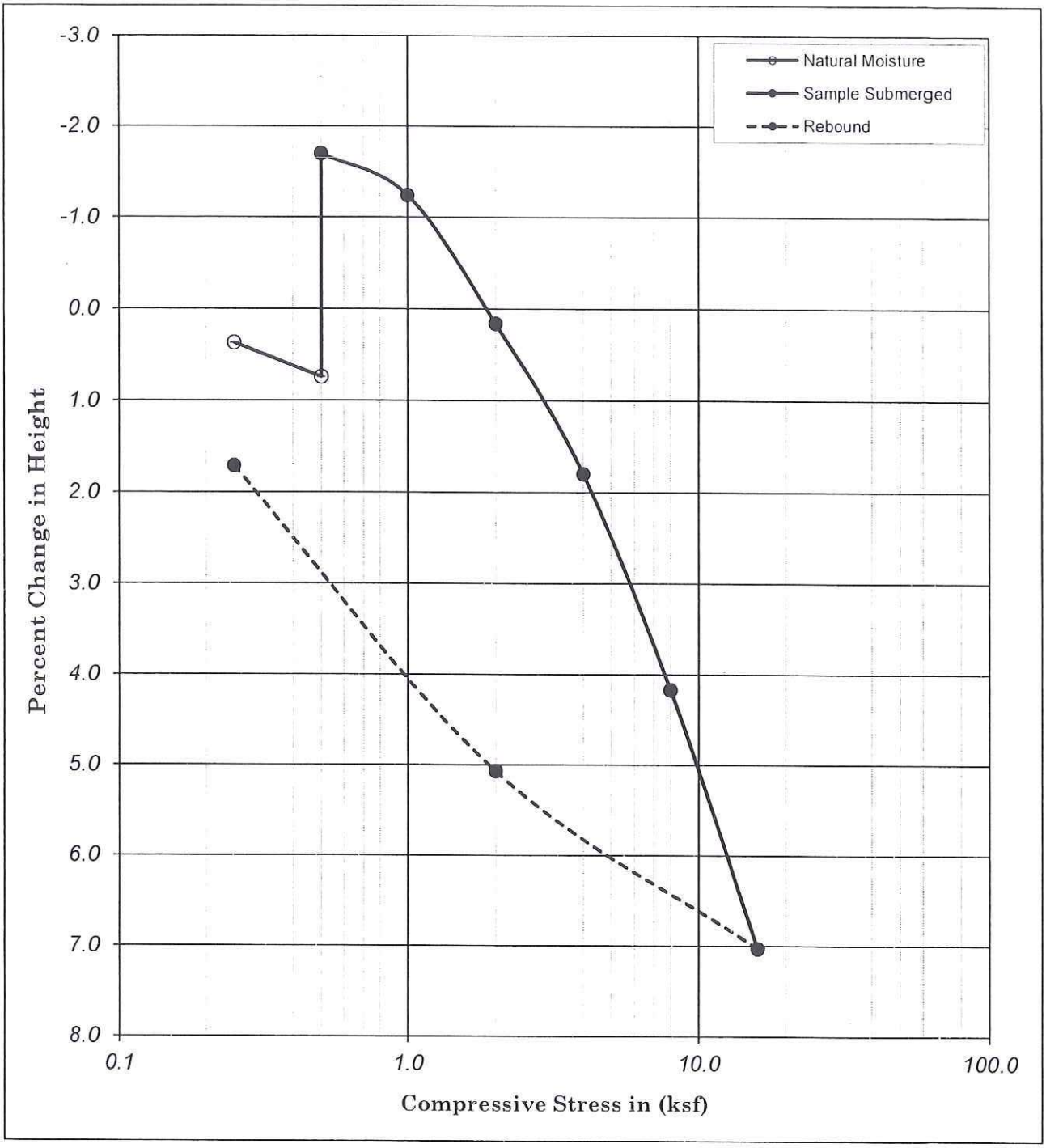
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-221*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-7*	
EMI Project No. : *11-136*		Depth (ft/m) : *35.0* *10.7*	Veritcal Load (ksf/kpa) : *8.00* *383.0*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-221*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-7*	
EMI Project No. : *11-136*		Depth (ft/m) : *35.0* *10.7*	eritcal Load (ksf/kpa) : *8.0* *383.0*



Boring No.	: A-11-222		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-2		Plastic Limit :	-						
Depth (ft)	: 10.0	11.5	Plastic Index :	-	Initial	15.04	102.99	16.21	63.77	0.64
Depth (m)	: 3.05	3.51	Specific Gravity :	2.70	Final	22.36	104.79	16.49	99.19	0.61

Description : *Olive-yellow with olive-brown, Lean CLAY (CL)*

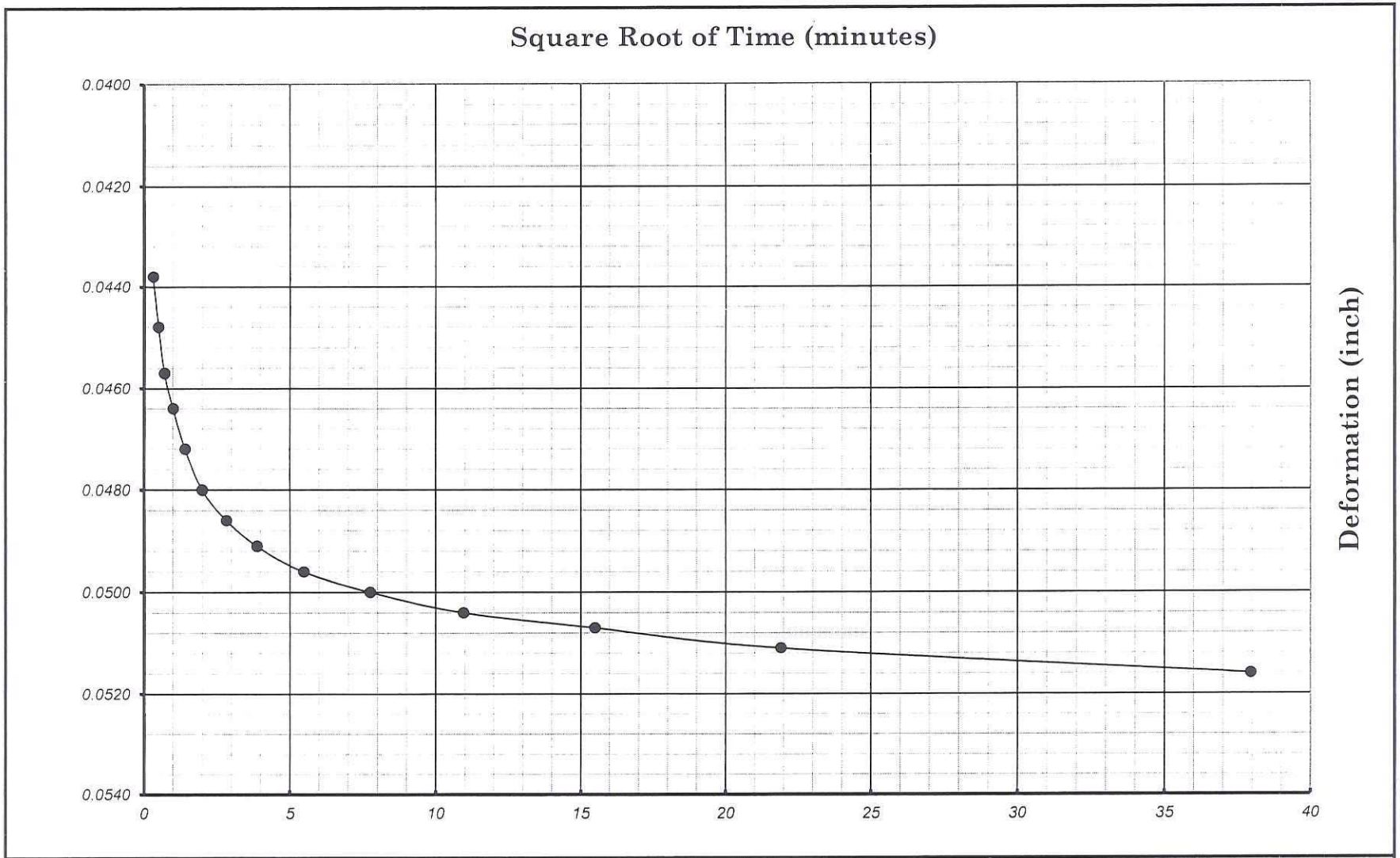
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

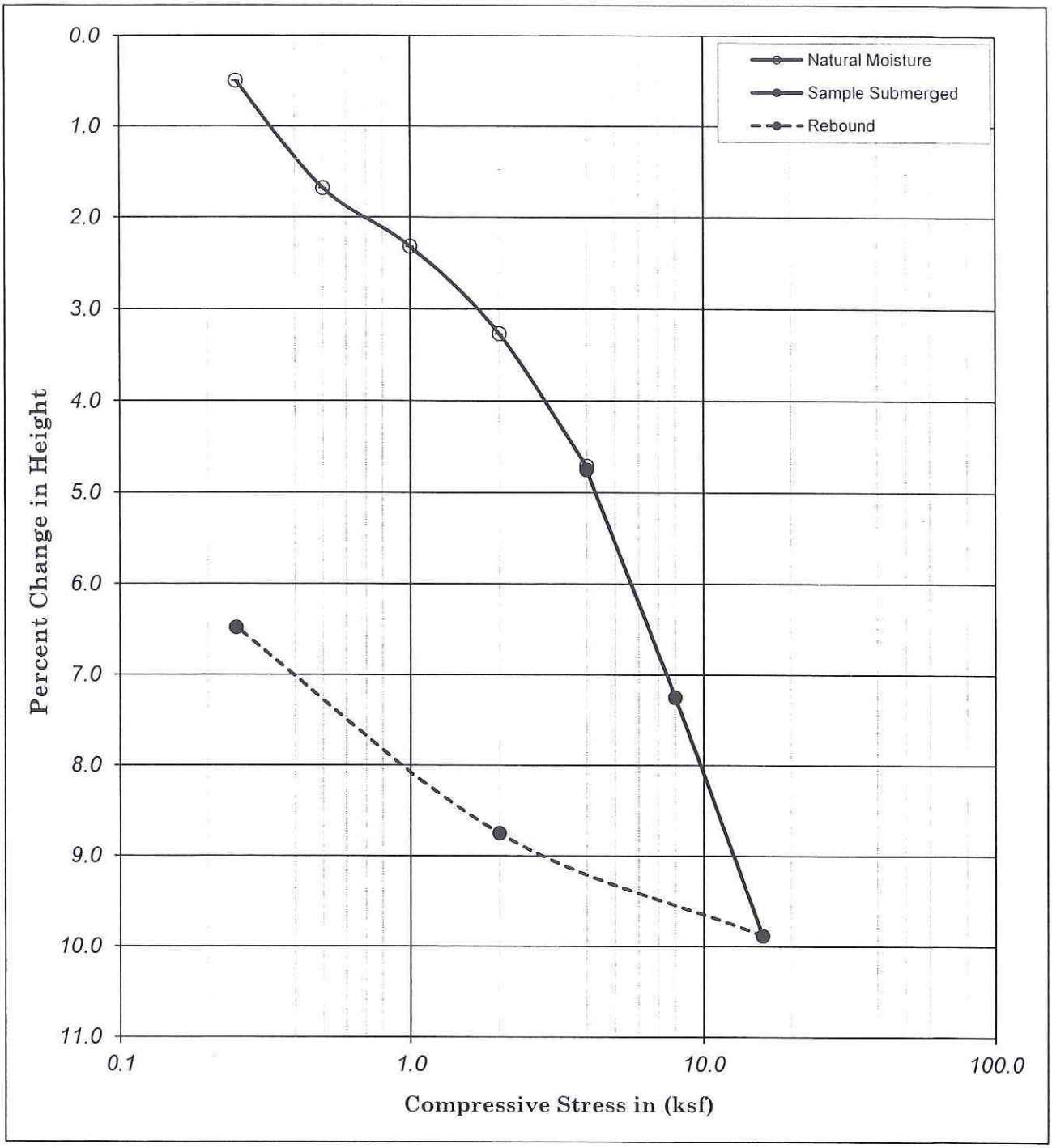
Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-222*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.00* *95.8*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-222	One-Dimensional Consolidation of Soil
		Sample No. : D-2	Time-Deformation Curve (Square Root of Time Method)
EMI Project No. : 11-136		Depth (ft/m) : 10.0 3.1	Veritcal Load (ksf/kpa) : 2.0 95.8



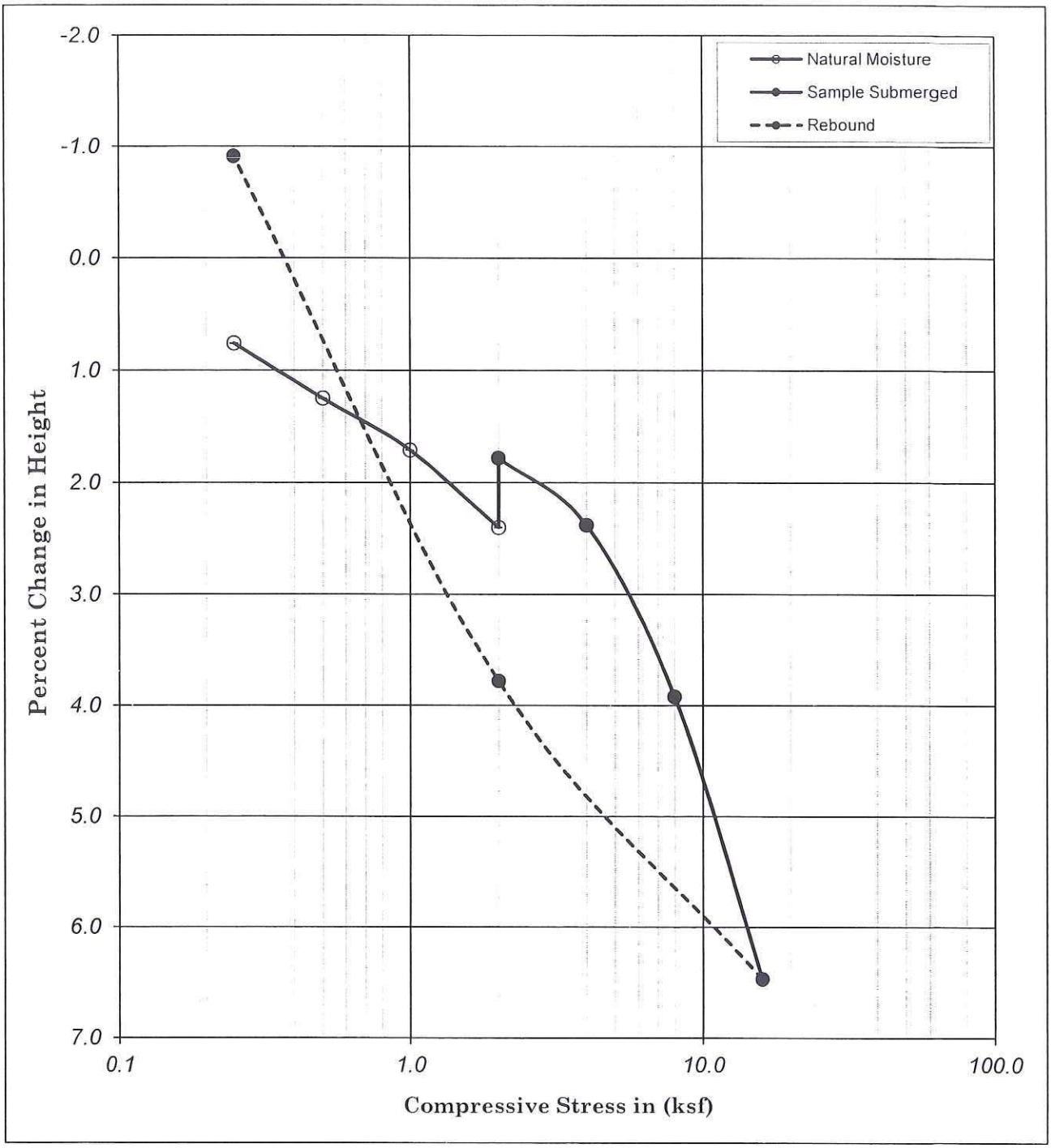
Boring No. : A-11-222			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-12			Plastic Limit :	-						
Depth	(ft) : 60.0	61.5	Plastic Index :	-	Initial	24.48	100.83	15.87	98.39	0.67
	(m) : 18.30	18.76	Specific Gravity :	2.70	Final	21.87	107.83	16.97	104.85	0.56
Description : Olive-brown with white, Lean CLAY with SAND (CL)										

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Boring No.	: A-11-224		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m^3)	Percent Saturation	Void Ratio
Sample No.	: D-5		Plastic Limit :	-						
Depth (ft)	: 25.0	26.5	Plastic Index :	-	Initial	32.66	87.85	13.83	95.97	0.92
Depth (m)	: 7.63	8.08	Specific Gravity :	2.70	Final	34.90	87.08	13.71	100.72	0.94

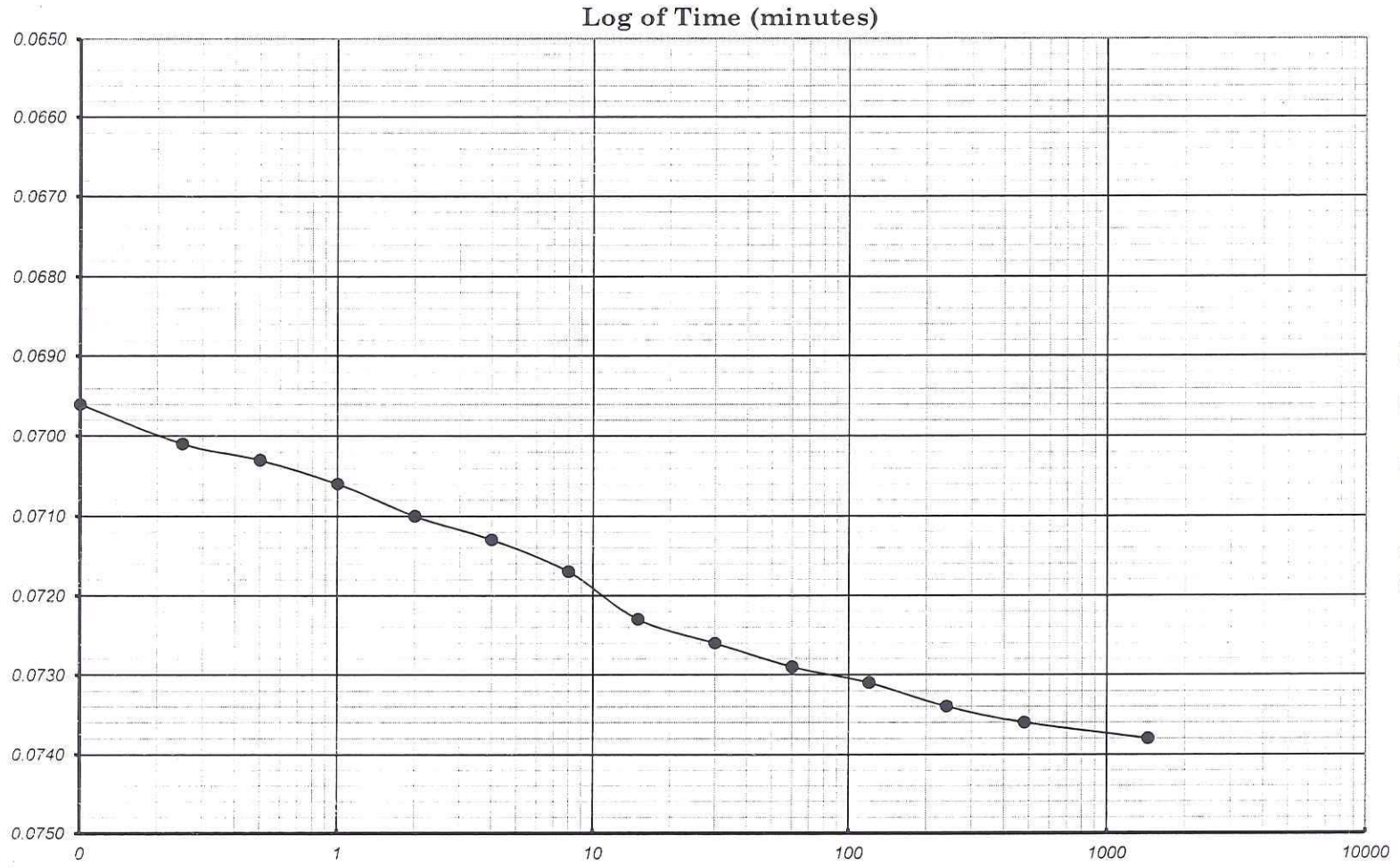
Description : *Olive-yellow with olive-brown, Lean CLAY (CL)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

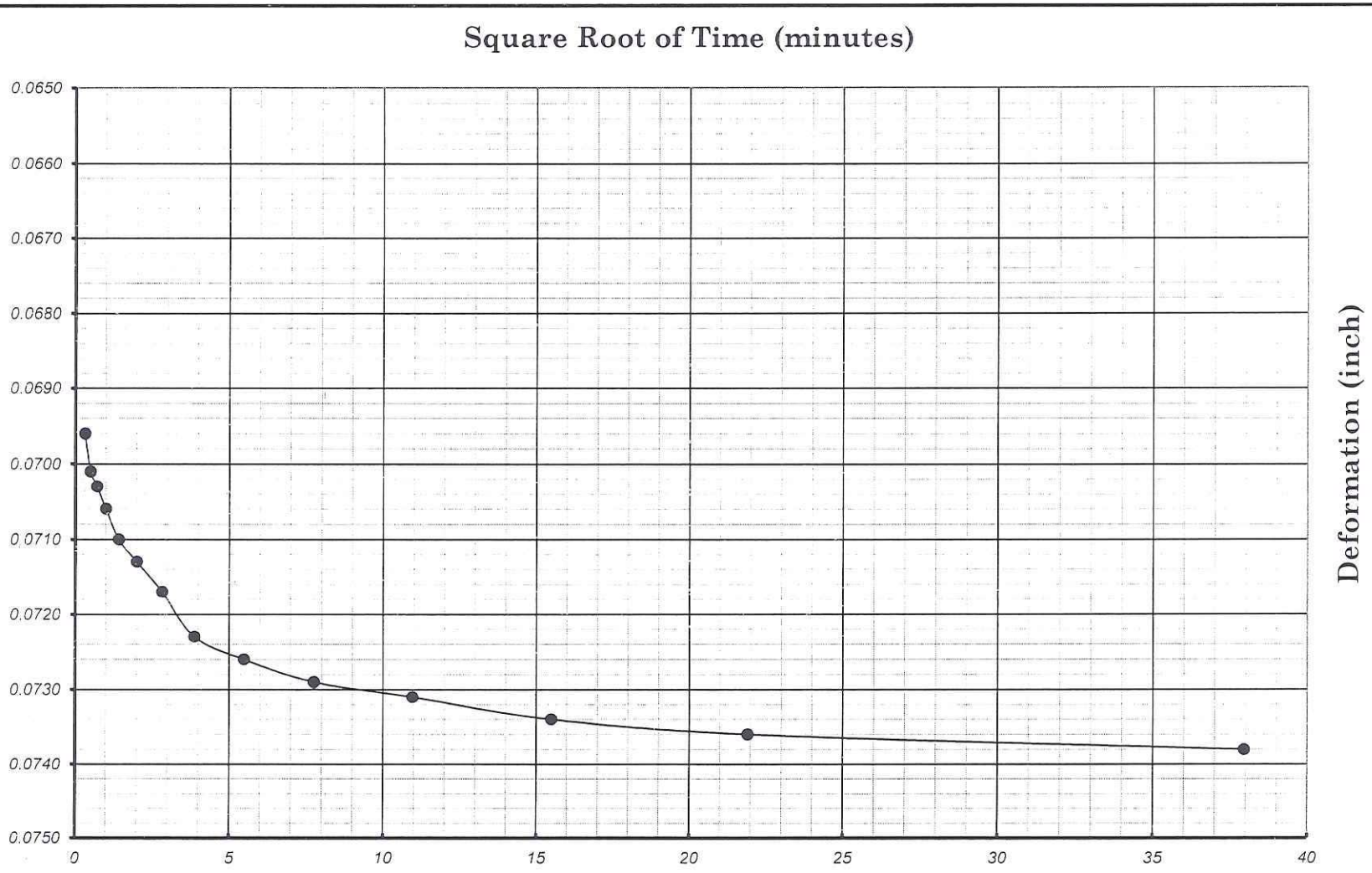
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

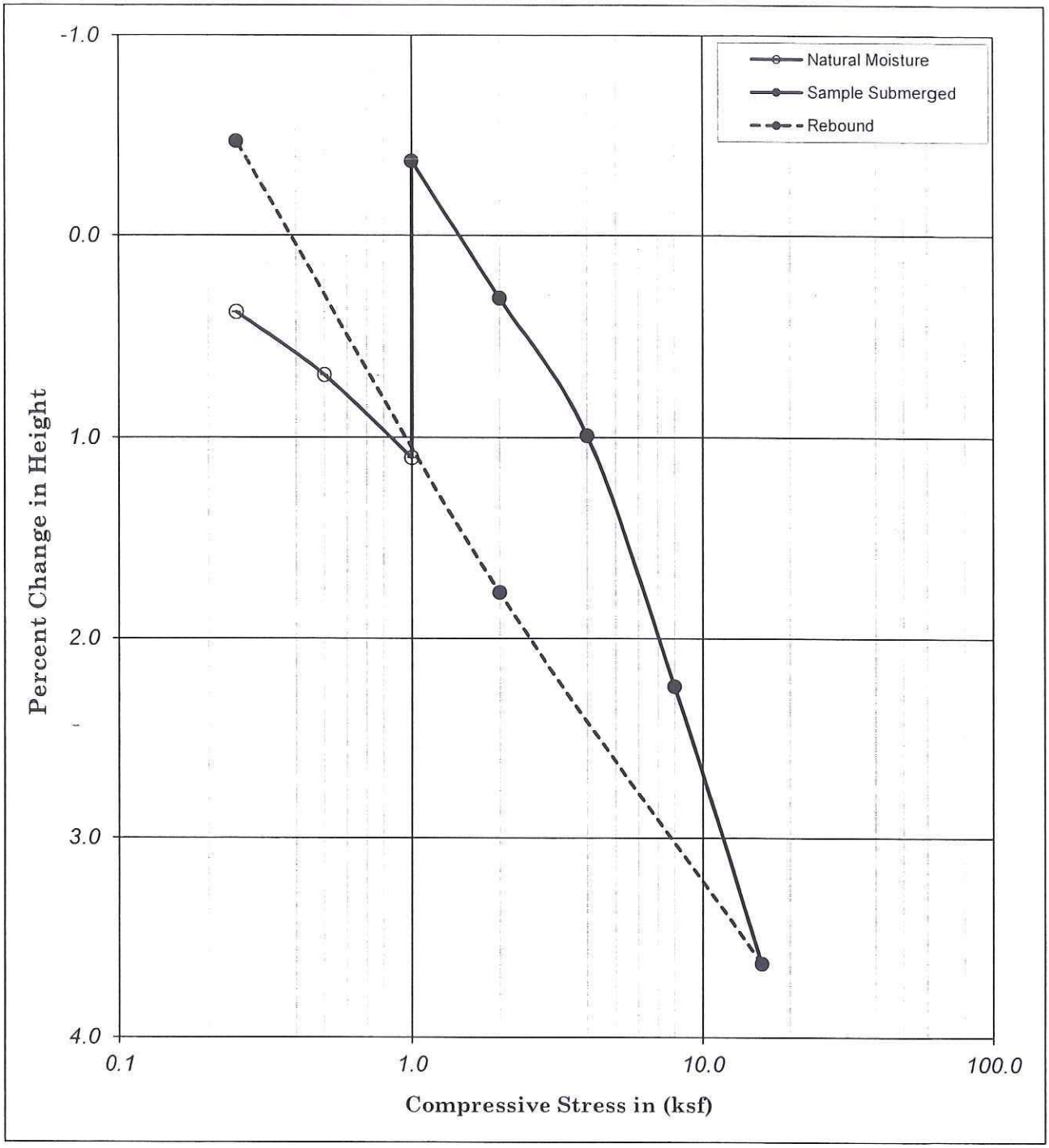
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-224	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-5	
EMI Project No. : 11-136		Depth (ft/m) : 25.0 7.6	Veritcal Load (ksf/kpa) : 4.00 191.5



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-224*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-5*	
EMI Project No. : *11-136*		Depth (ft/m) : *25.0* *7.6*	Veritcal Load (ksf/kpa) : *4.0* *191.5*



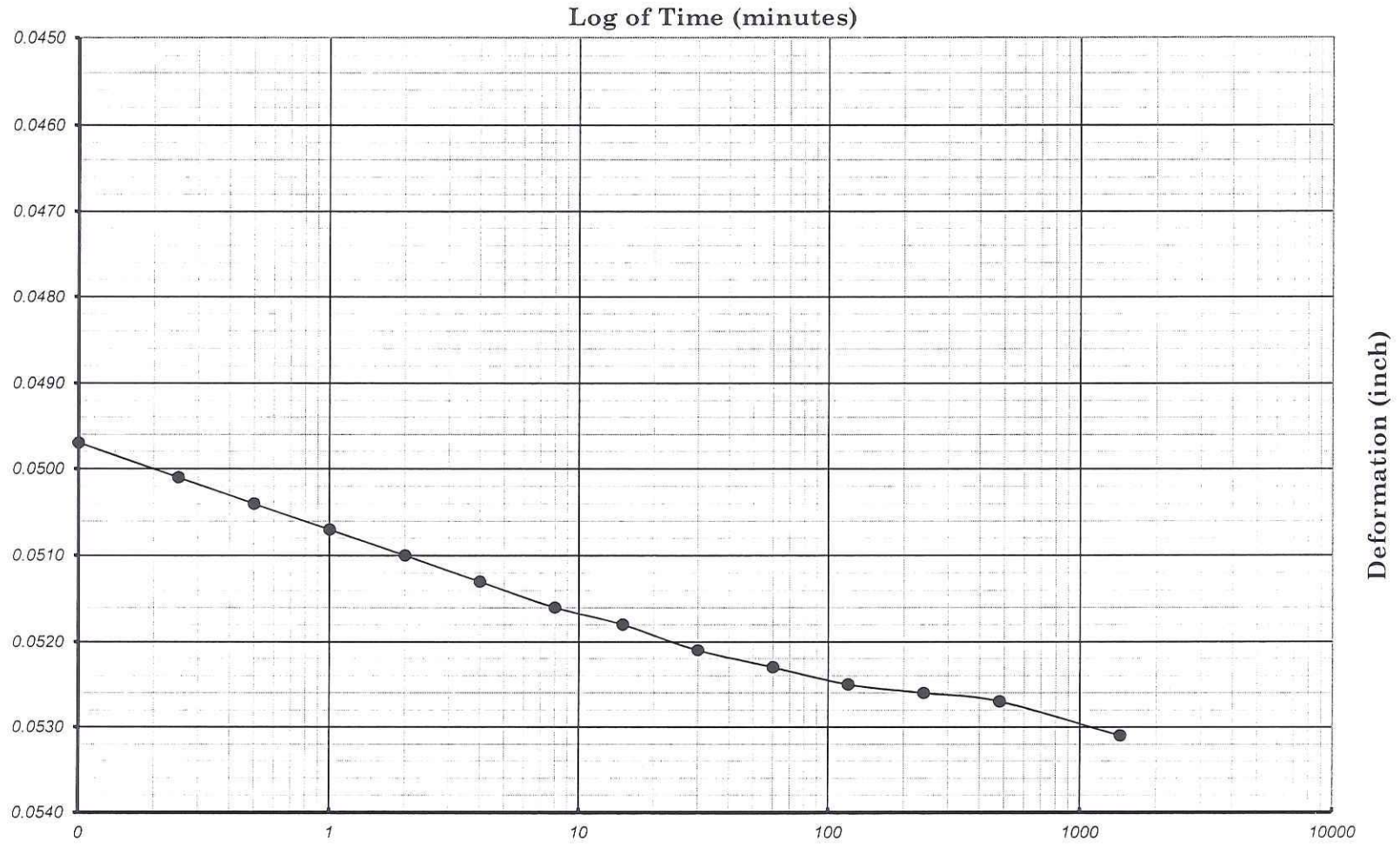
Boring No. : A-11-226				Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-3				Plastic Limit :	-						
Depth	(ft) :	10.0	11.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
	(m) :	3.05	3.51	Specific Gravity :	2.70	Final	31.08	86.87	13.67	89.23	0.94
Description : Dark olive-gray, Elastic SILT (MH)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

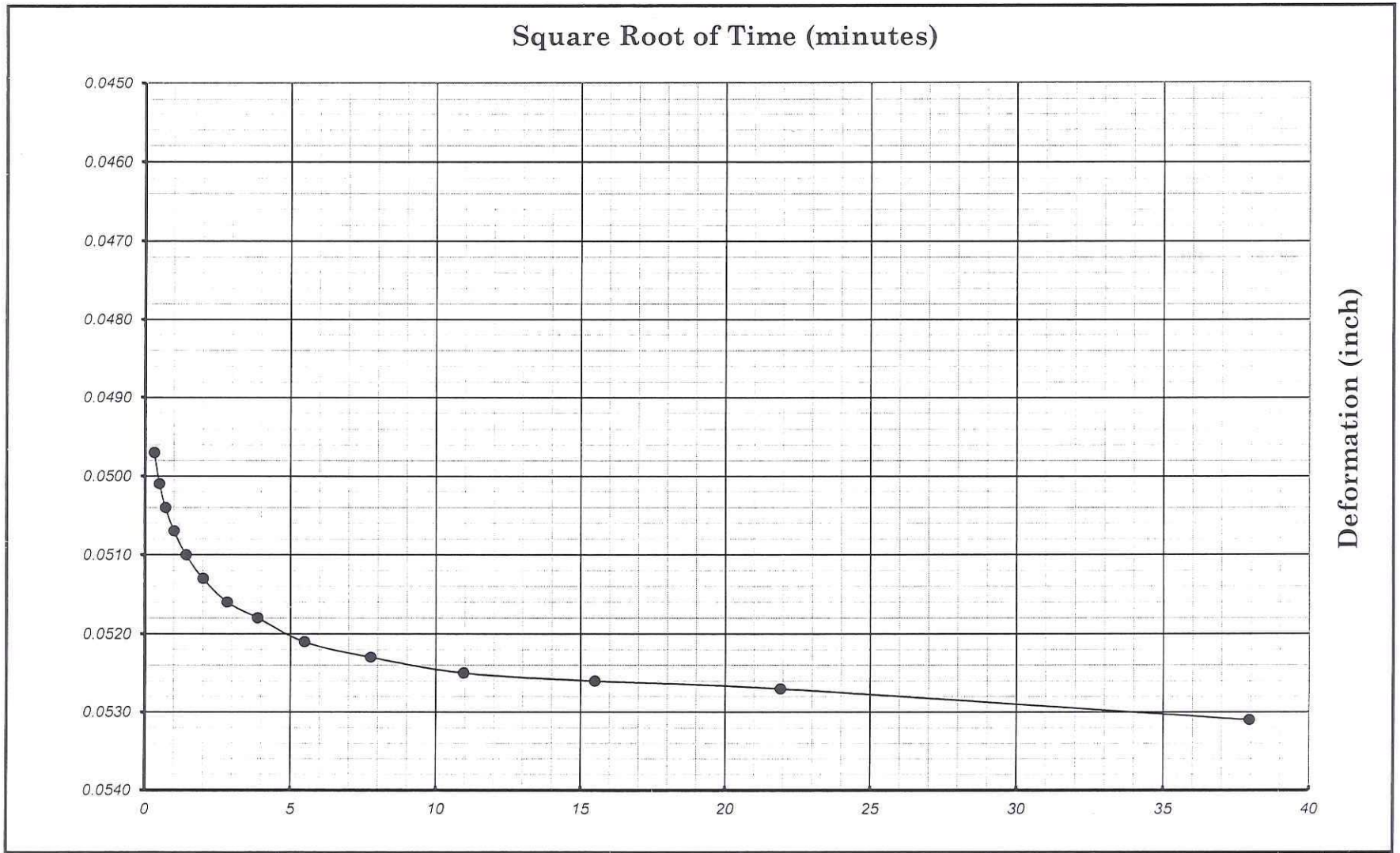
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

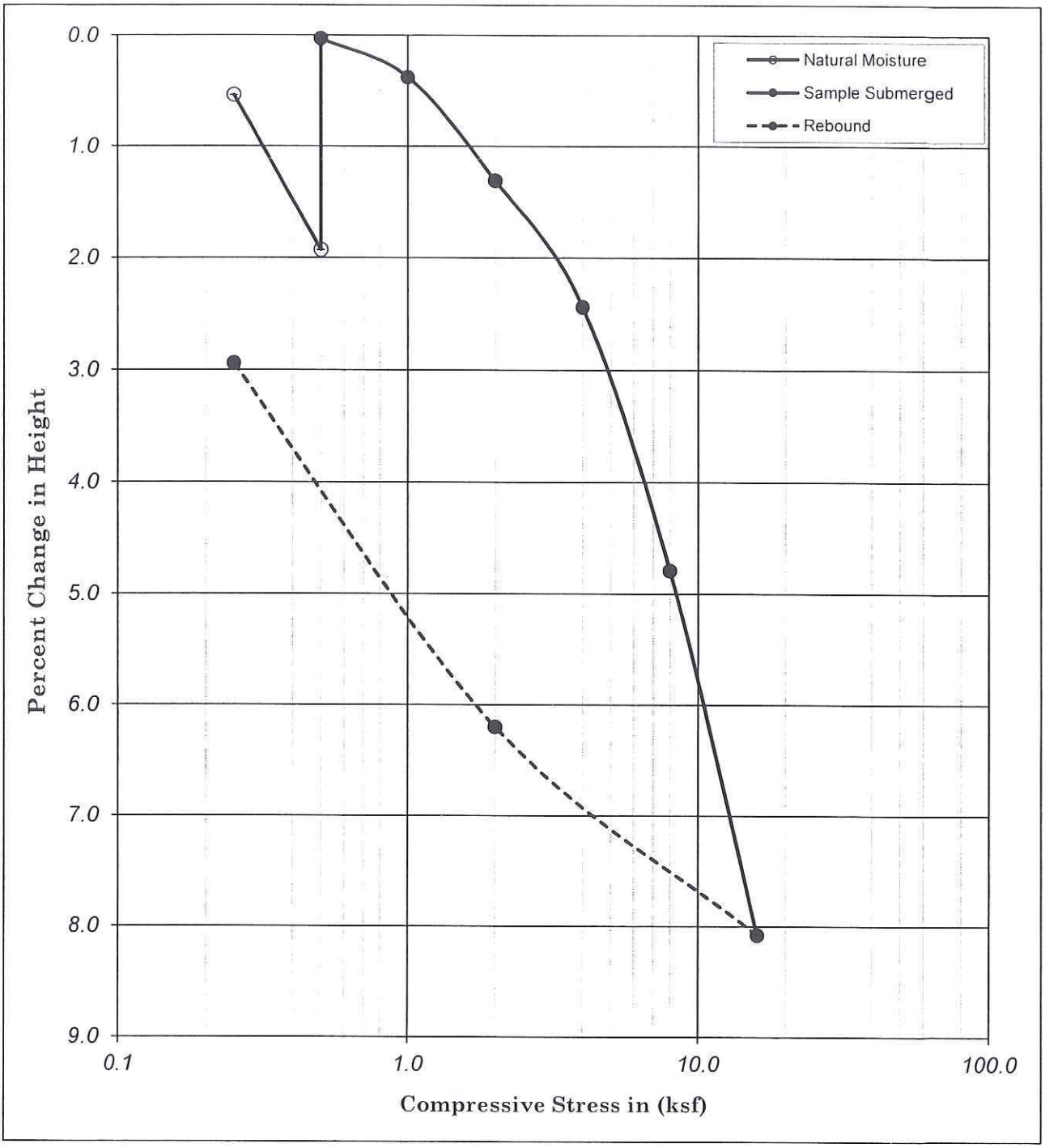
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-226*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-3*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.00* *95.8*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-226*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-3*	
EMI Project No. : *11-136*		Depth (ft/m) : *10.0* *3.1*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No.	: A-11-233		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-2		Plastic Limit :	-						
Depth (ft)	: 5.0	6.5	Plastic Index :	-	Initial	19.80	105.16	16.55	88.67	0.60
Depth (m)	: 1.53	1.98	Specific Gravity :	2.70	Final	21.27	108.45	17.07	103.61	0.55

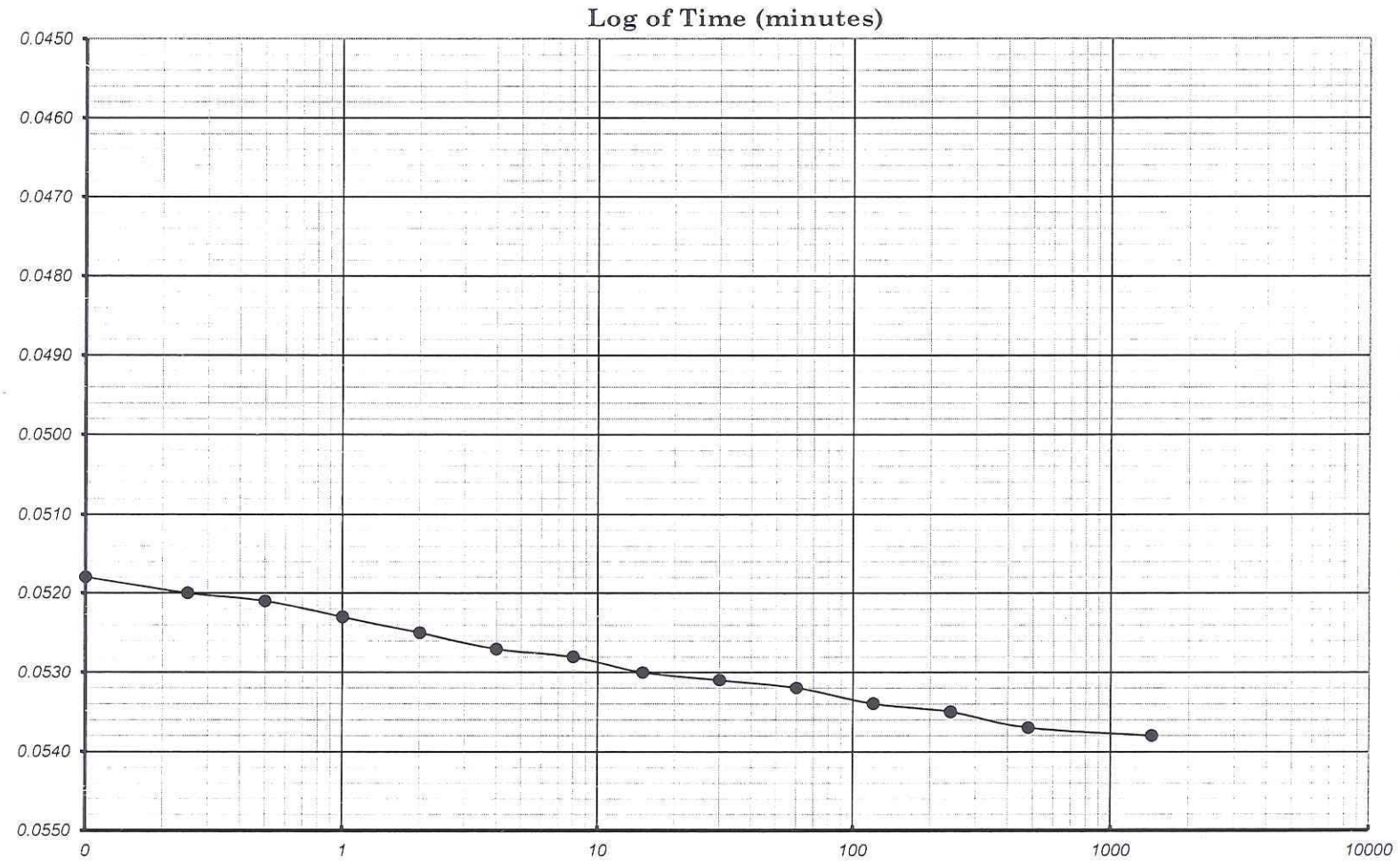
Description : *Olive-brown, Lean CLAY with SAND (CL)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

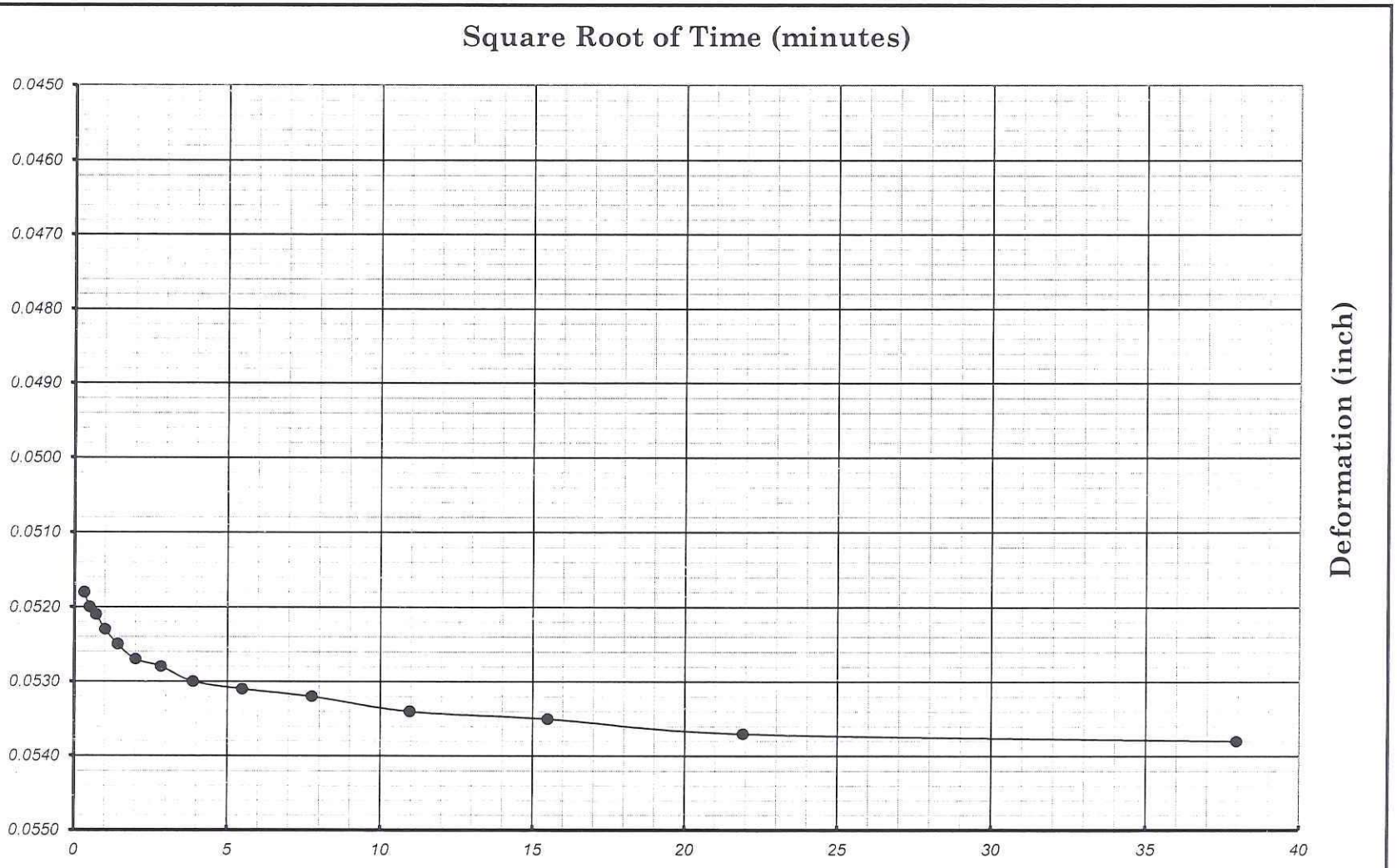
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

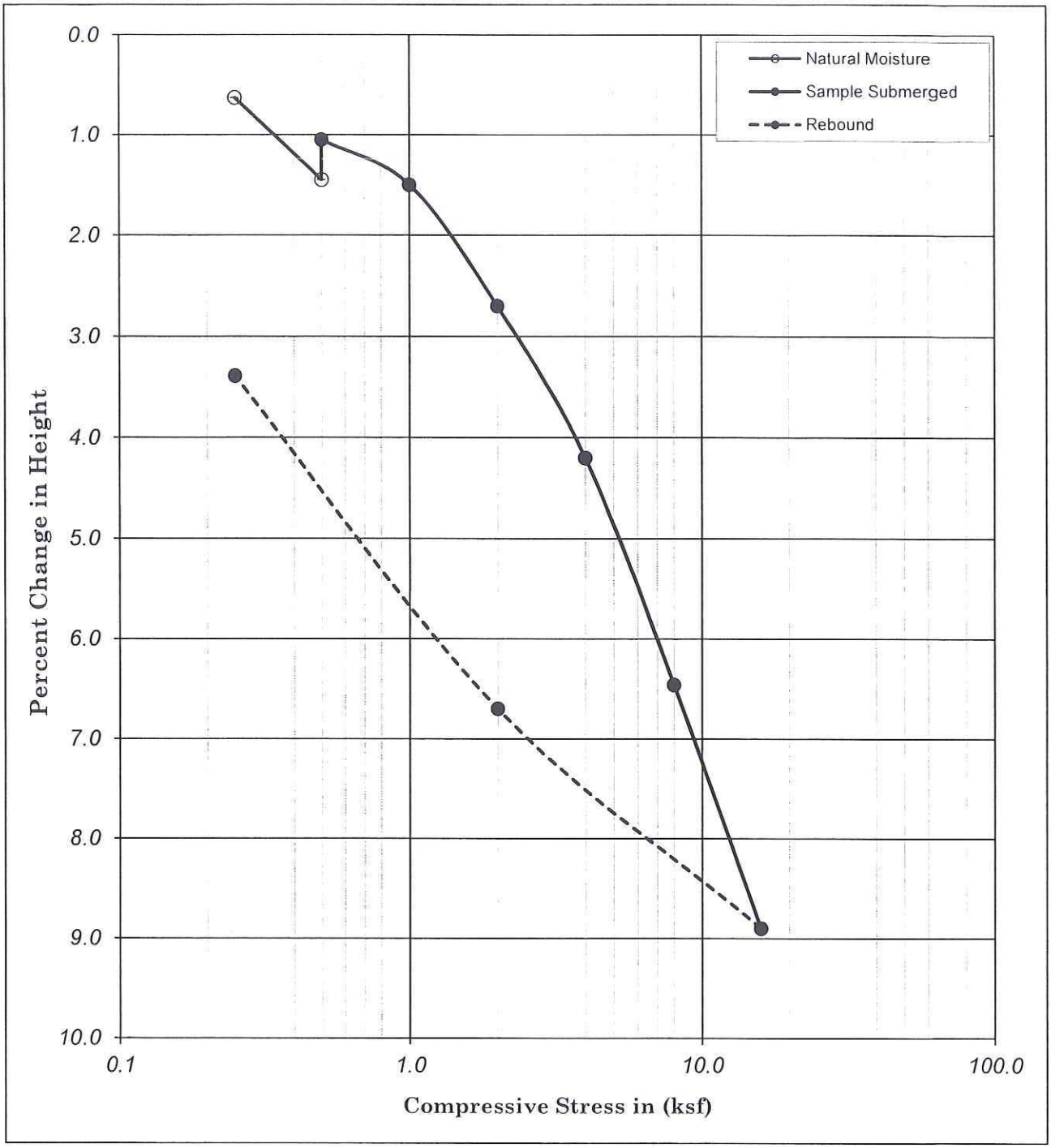
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-233*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *1.00* *47.9*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-233*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *1.0* *47.9*



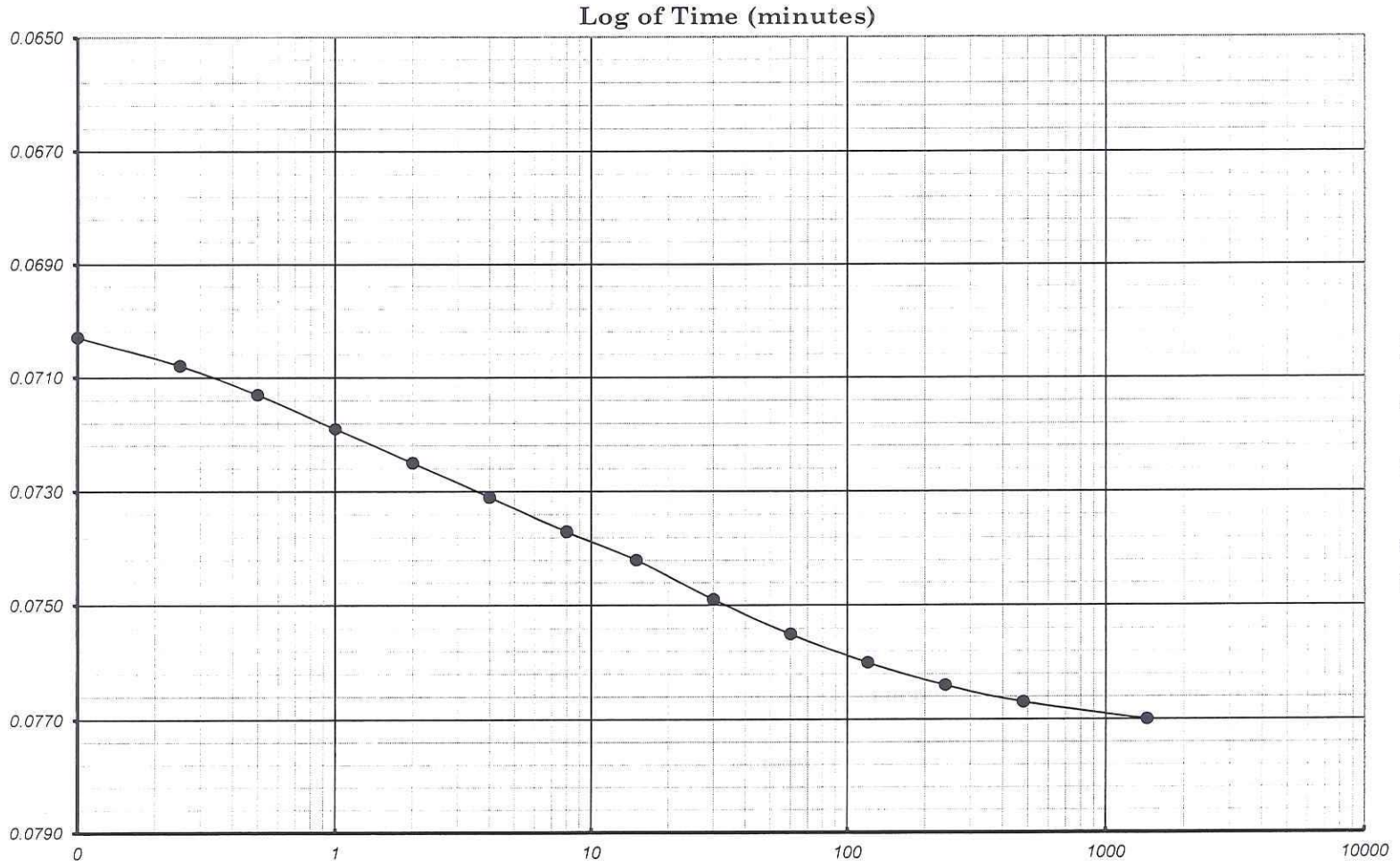
Boring No.	: A-11-244			Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-2			Plastic Limit :	-						
Depth (ft)	: 5.0		6.5	Plastic Index :	-	Initial	22.16	100.26	15.78	87.84	0.68
Depth (m)	: 1.53		1.98	Specific Gravity :	2.70	Final	22.81	103.85	16.35	98.83	0.62
Description : Olive-brown, Lean CLAY with SAND (CL)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

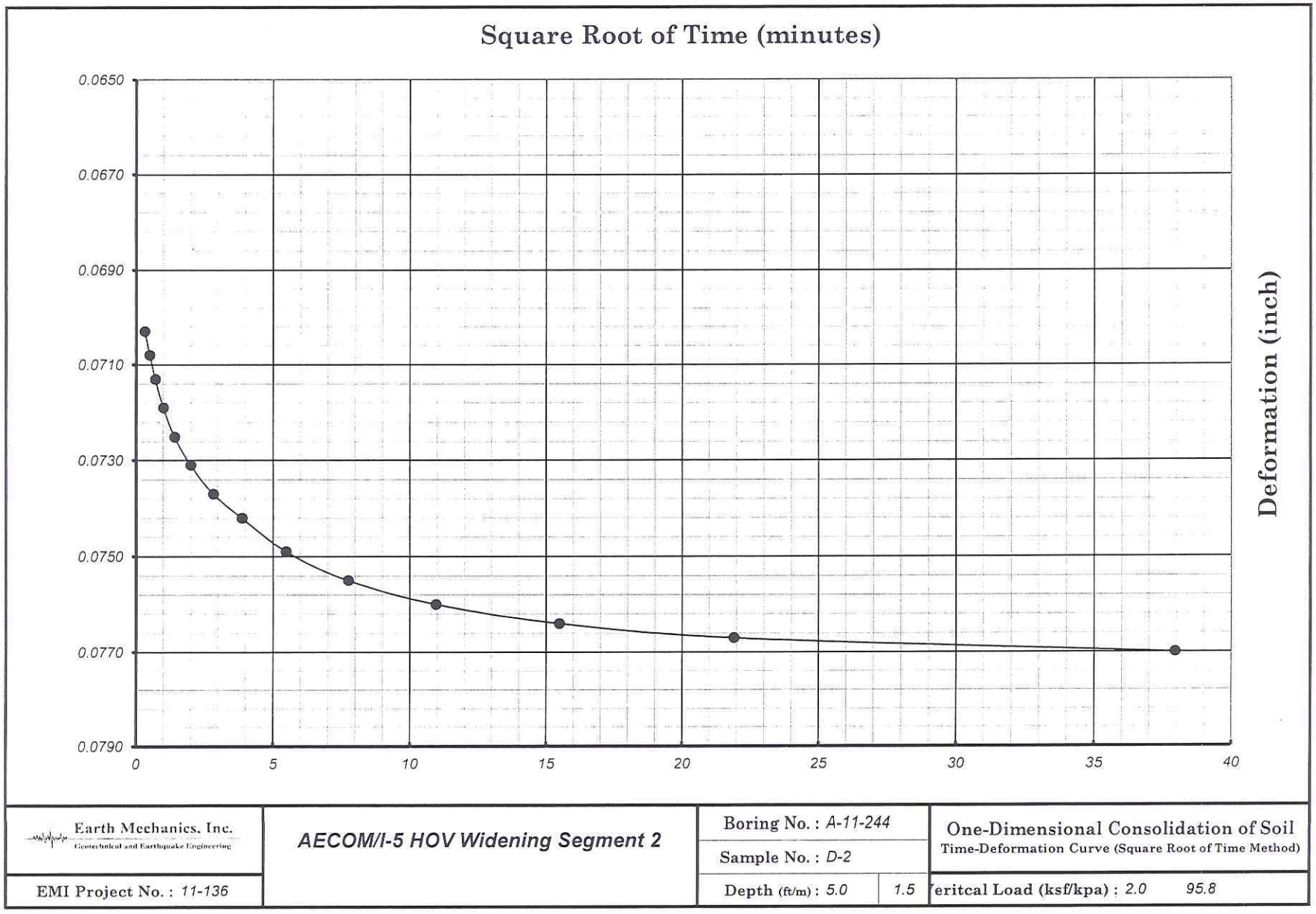
AECOM/I-5 HOV Widening Segment 2

Project No. : 11-136 12/14/11

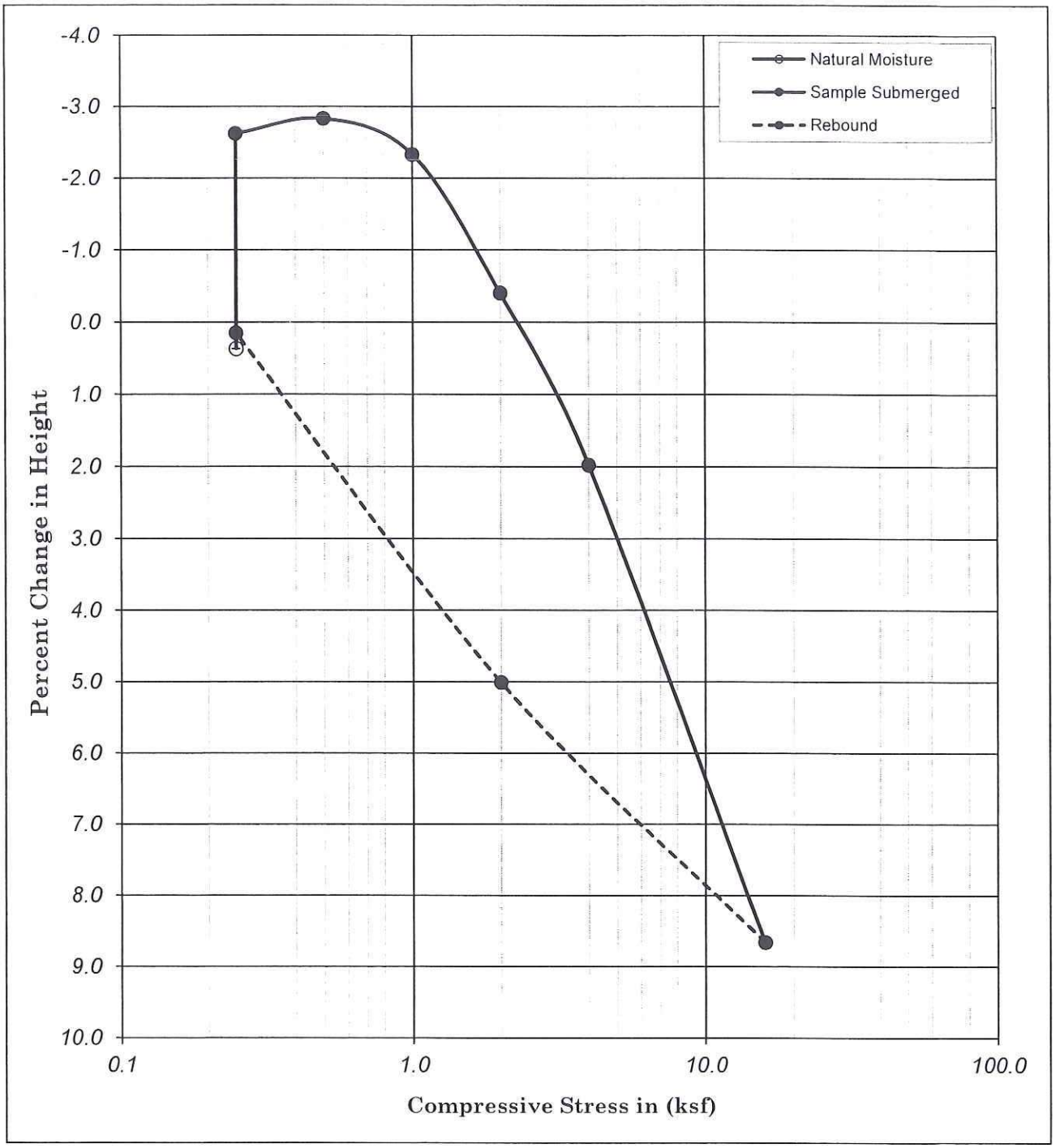
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-244*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *2.00* *95.8*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-244*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No.	: A-11-258		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-1		Plastic Limit :	-						
Depth (ft)	: 5.0	6.5	Plastic Index :	-	Initial	22.02	98.48	15.50	83.54	0.71
Depth (m)	: 1.53	1.98	Specific Gravity :	2.70	Final	28.57	98.69	15.53	108.95	0.71

Description : *Dark olive-brown, Lean CLAY (CL)*

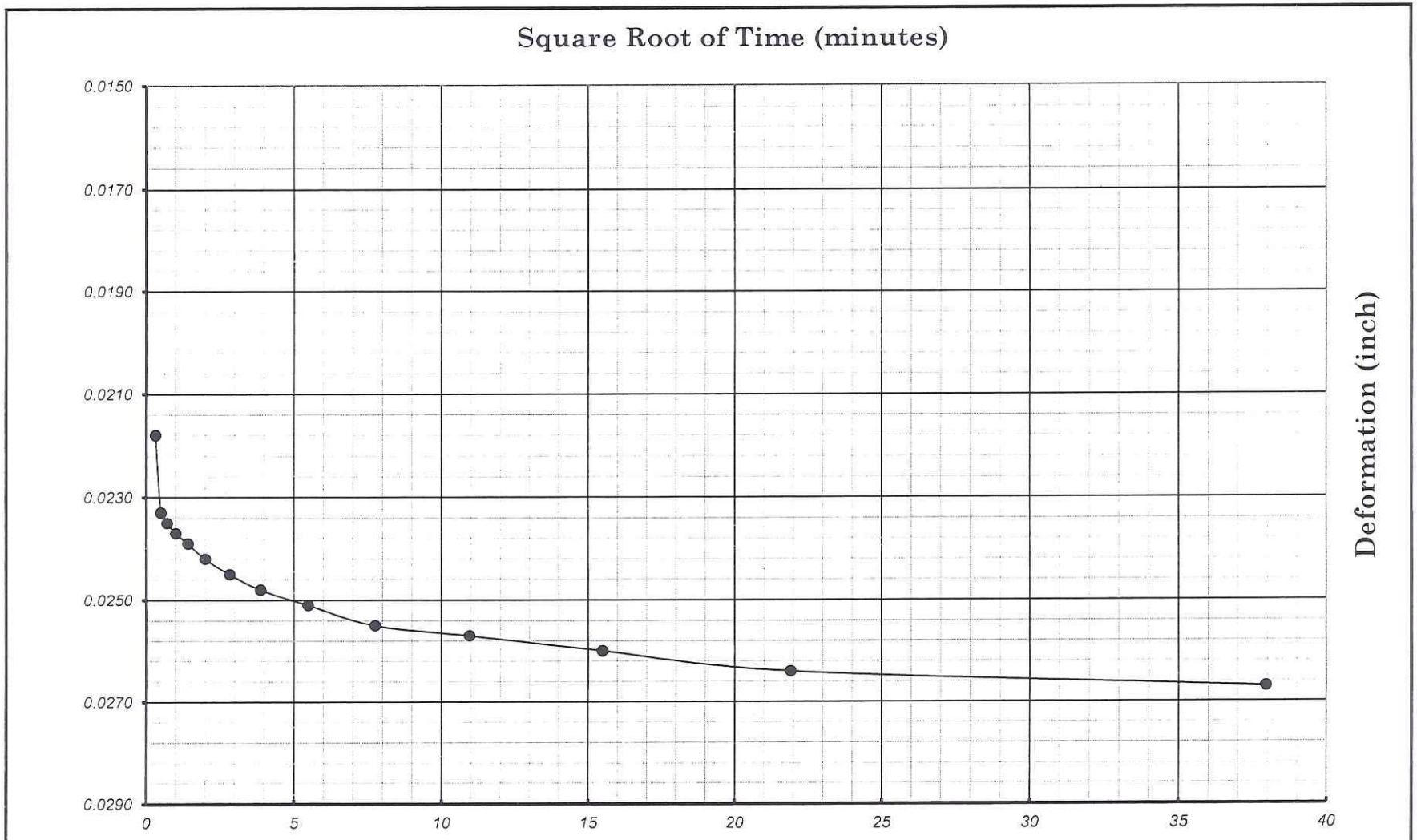
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

AECOM/I-5 HOV Widening Segment 2

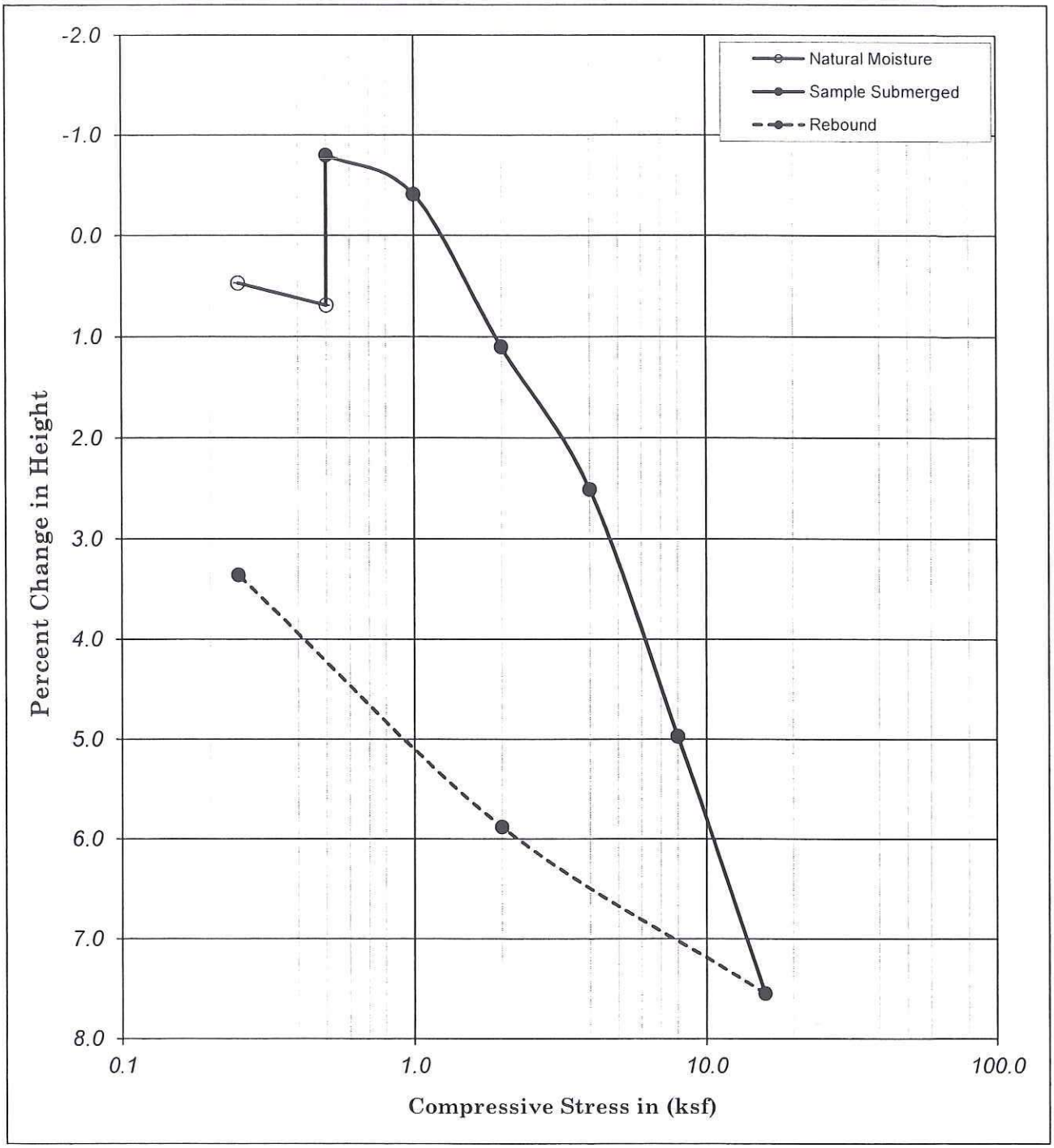
Project No. : *11-136* *12/14/11*

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-258	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-1	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 1.00 47.9



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-258	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : D-1	
EMI Project No. : 11-136		Depth (ft/m) : 5.0 1.5	Veritcal Load (ksf/kpa) : 1.0 47.9



Boring No.	: A-11-262		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-2		Plastic Limit :	-						
Depth (ft)	: 5.0	6.5	Plastic Index :	-	Initial	29.62	87.25	13.73	85.81	0.93
Depth (m)	: 1.53	1.98	Specific Gravity :	2.70	Final	31.08	90.30	14.21	96.81	0.87

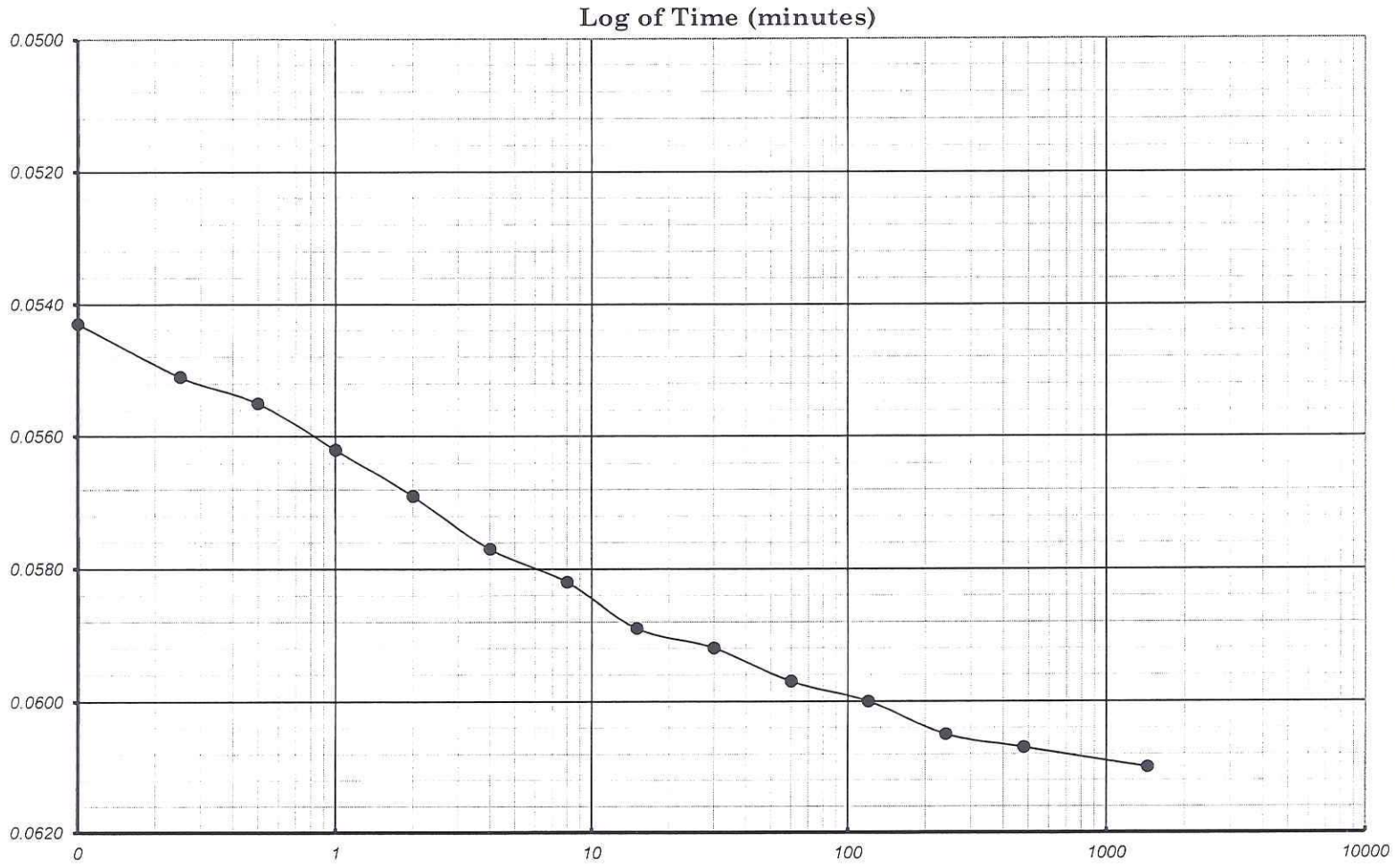
Description : *Olive-brown, Lean CLAY with SAND (CL)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

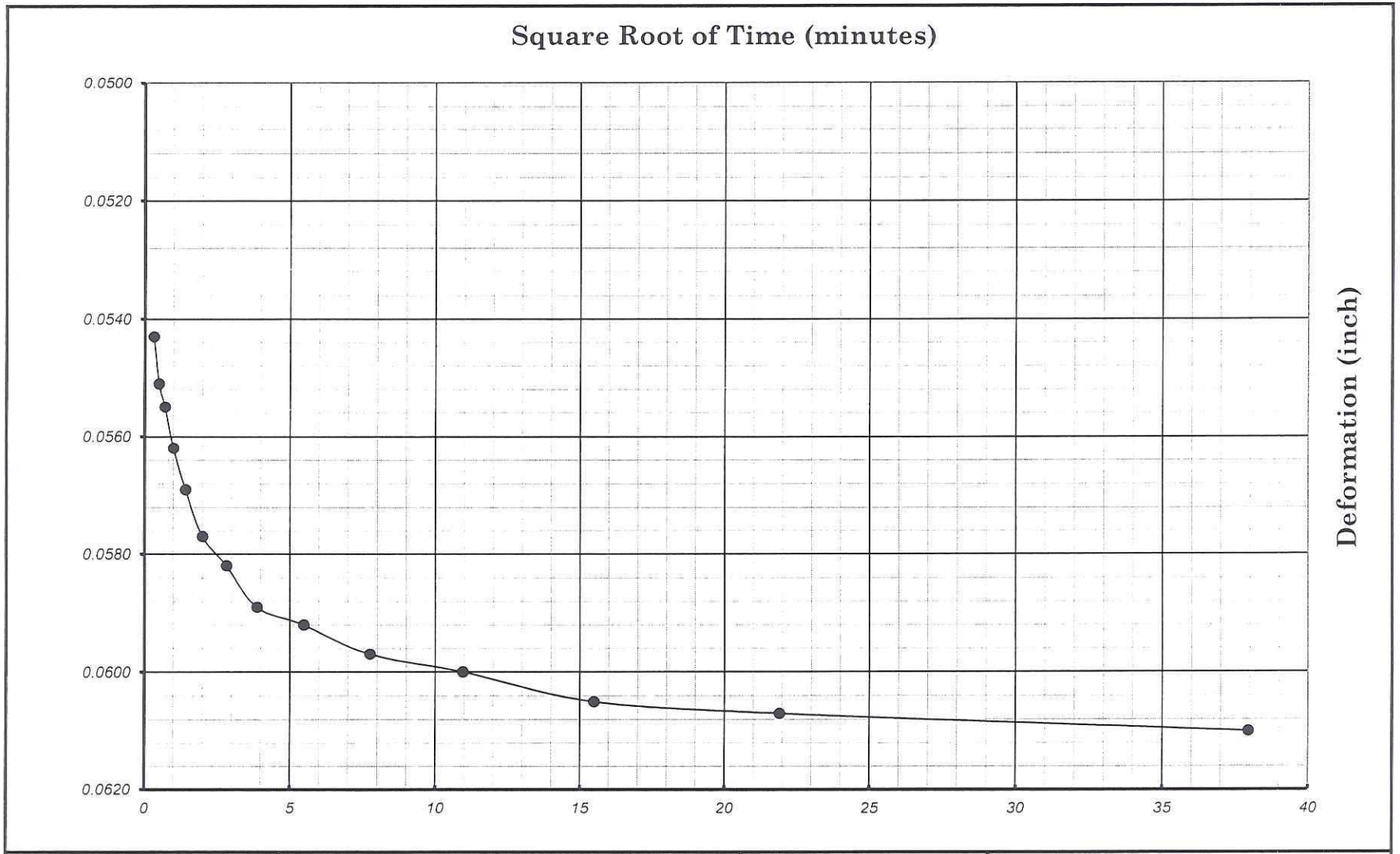
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

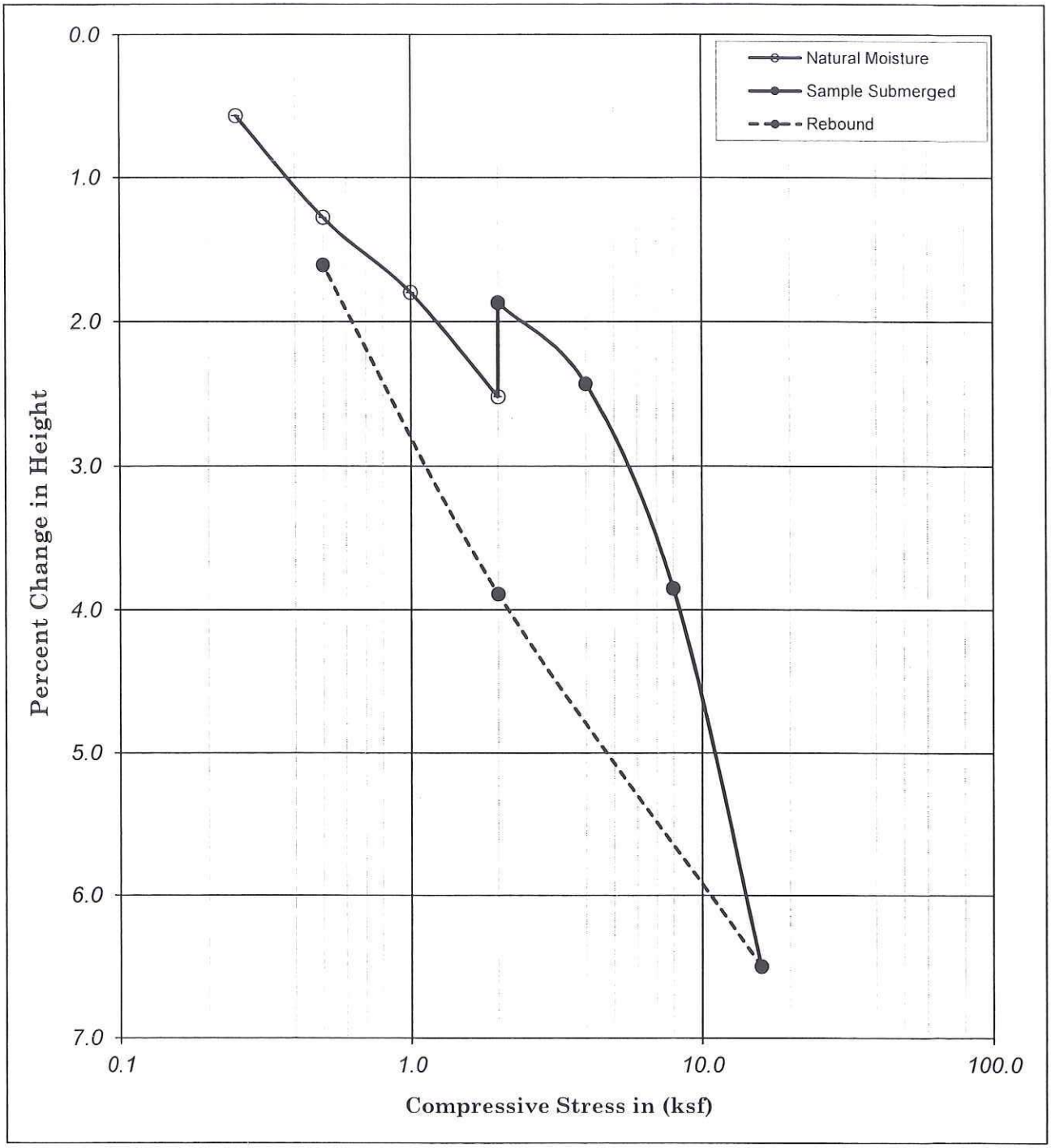
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-262*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *2.00* *95.8*



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-262*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-2*	
EMI Project No. : *11-136*		Depth (ft/m) : *5.0* *1.5*	Veritcal Load (ksf/kpa) : *2.0* *95.8*



Boring No.	: A-11-263		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-7		Plastic Limit :	-						
Depth (ft)	: 30.0	31.5	Plastic Index :	-	Initial	33.60	88.28	13.90	99.75	0.91
Depth (m)	: 9.15	9.61	Specific Gravity :	2.70	Final	34.08	89.78	14.13	104.87	0.88

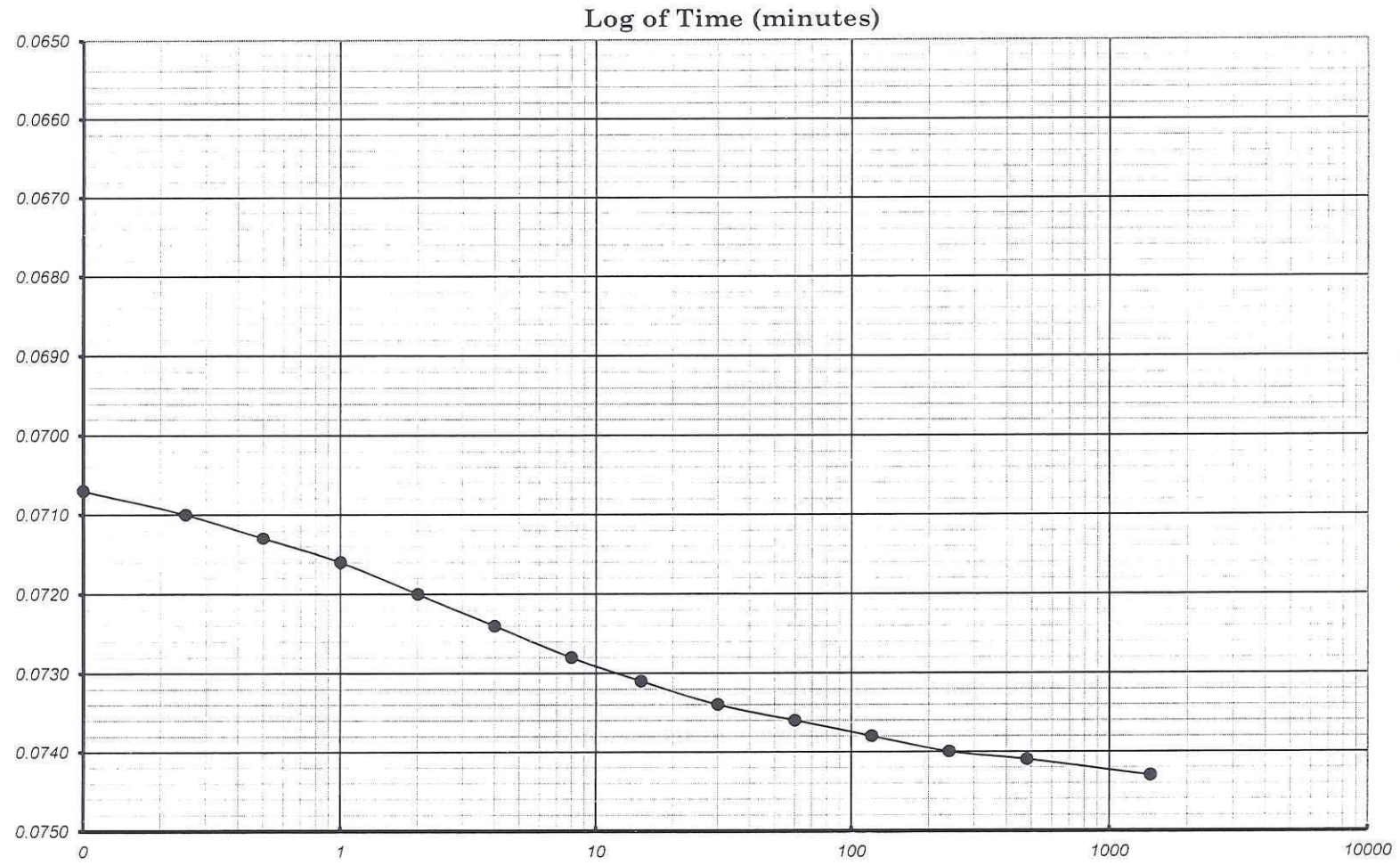
Description : *Gray with yellowish brown, Fat CLAY (CH)*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

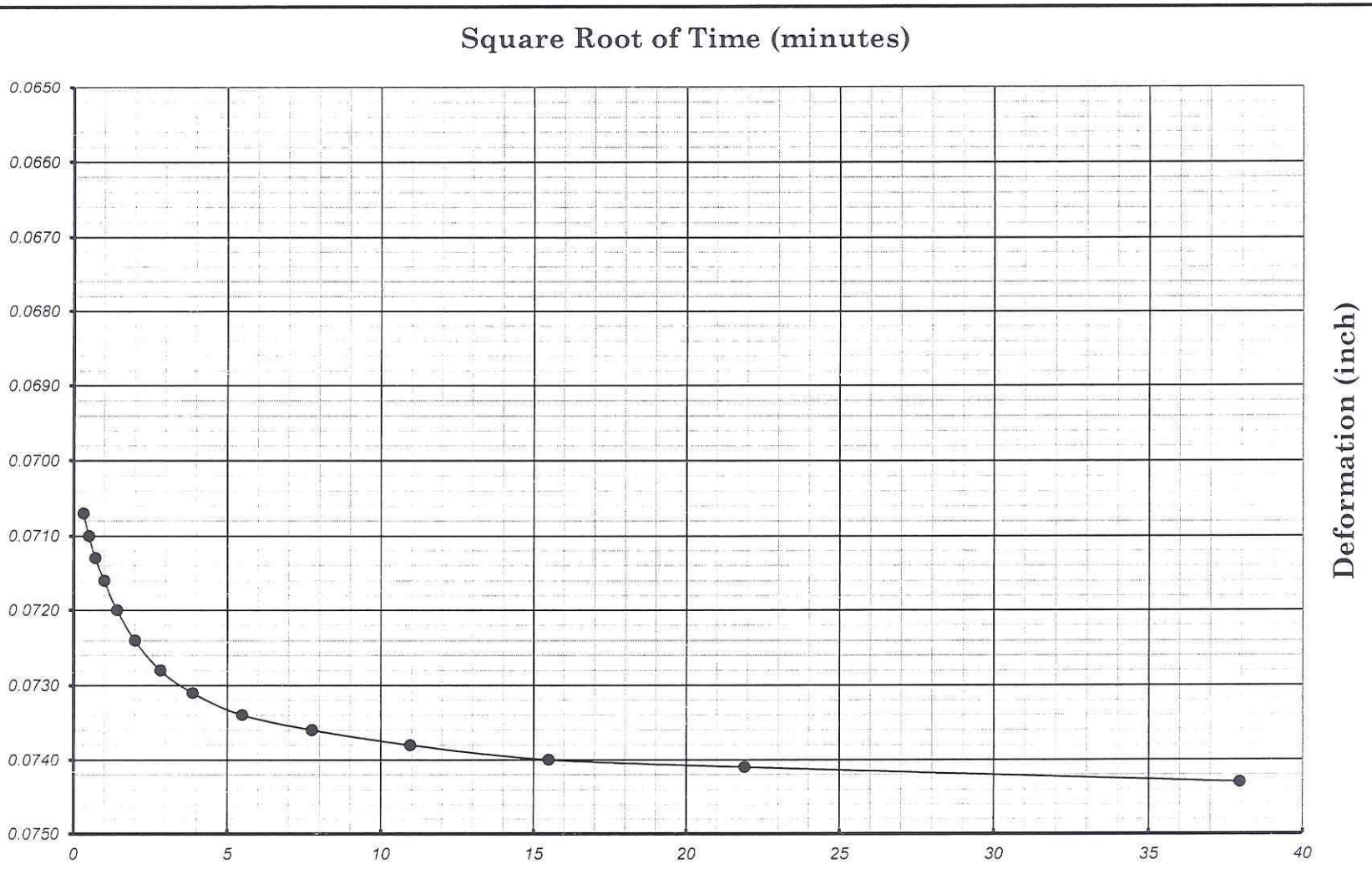
AECOM/I-5 HOV Widening Segment 2

Project No. : *11-136* *12/14/11*

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	AECOM/I-5 HOV Widening Segment 2	Boring No. : A-11-263	One-Dimensional Consolidation of Soil Time-Deformation Curve (Log of Time Method)
		Sample No. : D-7	
EMI Project No. : 11-136		Depth (ft/m) : 30.0 9.2	Veritcal Load (ksf/kpa) : 4.00 191.5



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	*AECOM/I-5 HOV Widening Segment 2*	Boring No. : *A-11-263*	One-Dimensional Consolidation of Soil Time-Deformation Curve (Square Root of Time Method)
		Sample No. : *D-7*	
EMI Project No. : *11-136*		Depth (ft/m) : *30.0* *9.2*	Veritcal Load (ksf/kpa) : *4.0* *191.5*

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils
(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

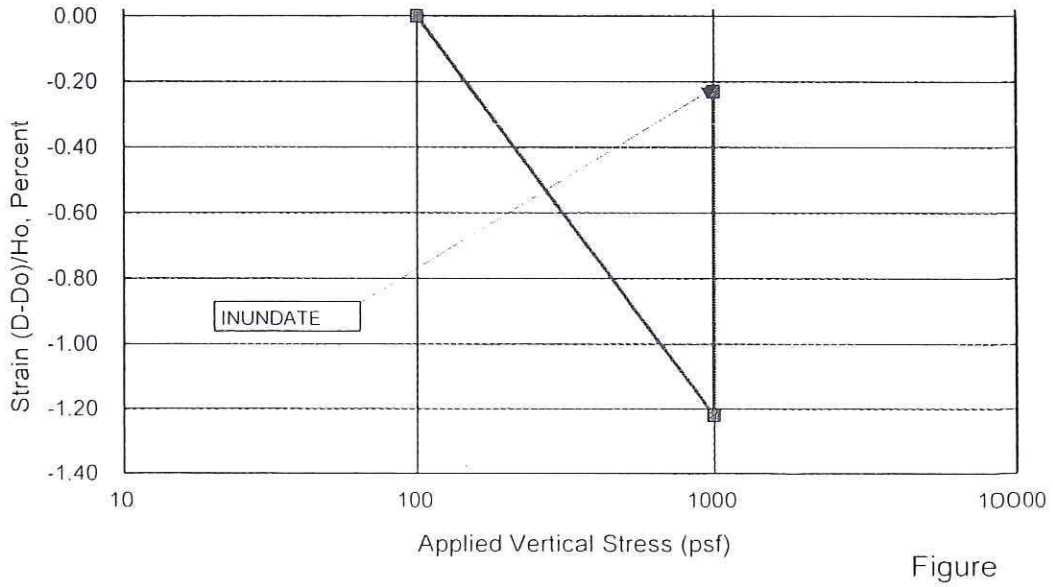
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	28.3	Final Moisture (%) :	33.5
Initial Dry Density (pcf):	89.7	Final Dry Density (pcf) :	92.8
Initial Void Ratio:	0.880	Final Void Ratio:	0.884
Initial Saturation (%)	87	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.880
1000	0.0622	1.0122	-1.22	0.903
H2O	0.0523	1.0023	-0.23	0.884

Percent Swell (+) / Collapse (-) 0.99

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils
(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

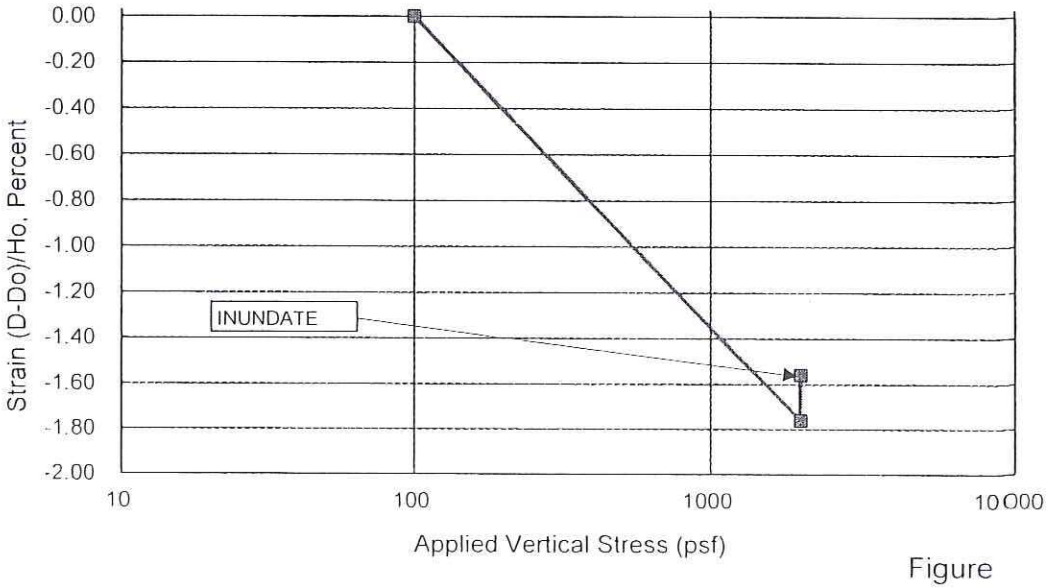
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	28.4	Final Moisture (%) :	33.1
Initial Dry Density (pcf):	88.8	Final Dry Density (pcf) :	91.9
Initial Void Ratio:	0.898	Final Void Ratio:	0.928
Initial Saturation (%)	86	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.898
2000	0.0676	1.0176	-1.76	0.931
H2O	0.0656	1.0156	-1.56	0.928

Percent Swell (+) / Collapse (-) 0.20

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils
(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-260 SAMPLE NO D-6 DEPTH(ft.): 25

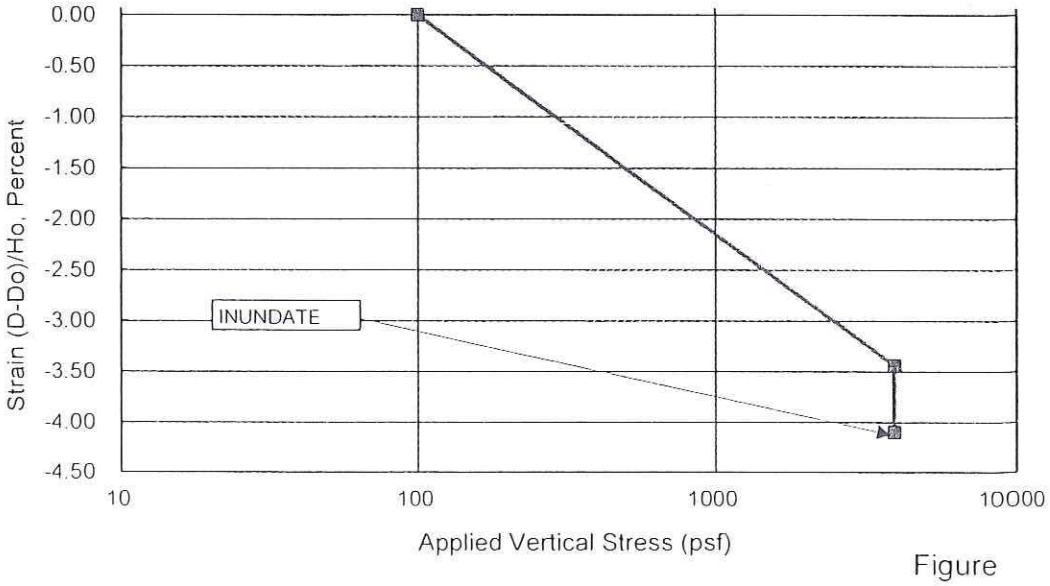
Soil Description : Dark yellowish brown, Elastic SILT trace gypsum (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	26.0	Final Moisture (%) :	33.0
Initial Dry Density (pcf):	88.6	Final Dry Density (pcf) :	91.8
Initial Void Ratio:	0.901	Final Void Ratio:	0.979
Initial Saturation (%)	78	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0500	1.0000	0.00	0.901
4000	0.0844	1.0344	-3.44	0.967
H2O	0.0910	1.0410	-4.10	0.979

Percent Swell (+) / Collapse (-) -0.66

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

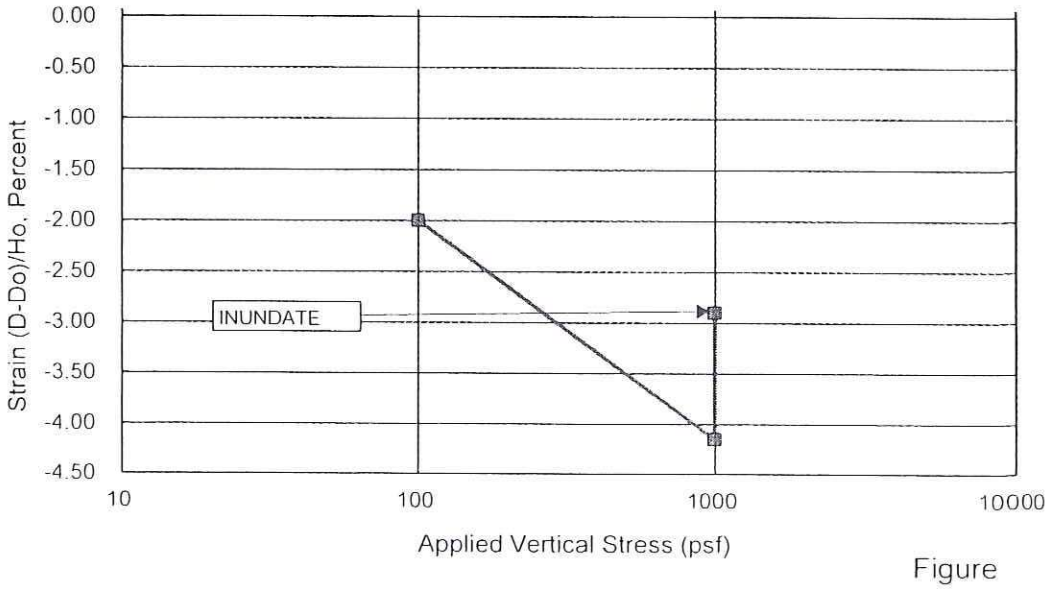
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	25.4	Final Moisture (%) :	34.2
Initial Dry Density (pcf):	85.6	Final Dry Density (pcf) :	88.6
Initial Void Ratio:	0.970	Final Void Ratio:	1.027
Initial Saturation (%)	71	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	1.009
1000	0.0915	1.0415	-4.15	1.051
H2O	0.0790	1.0290	-2.90	1.027

Percent Swell (+) / Collapse (-) 1.25

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

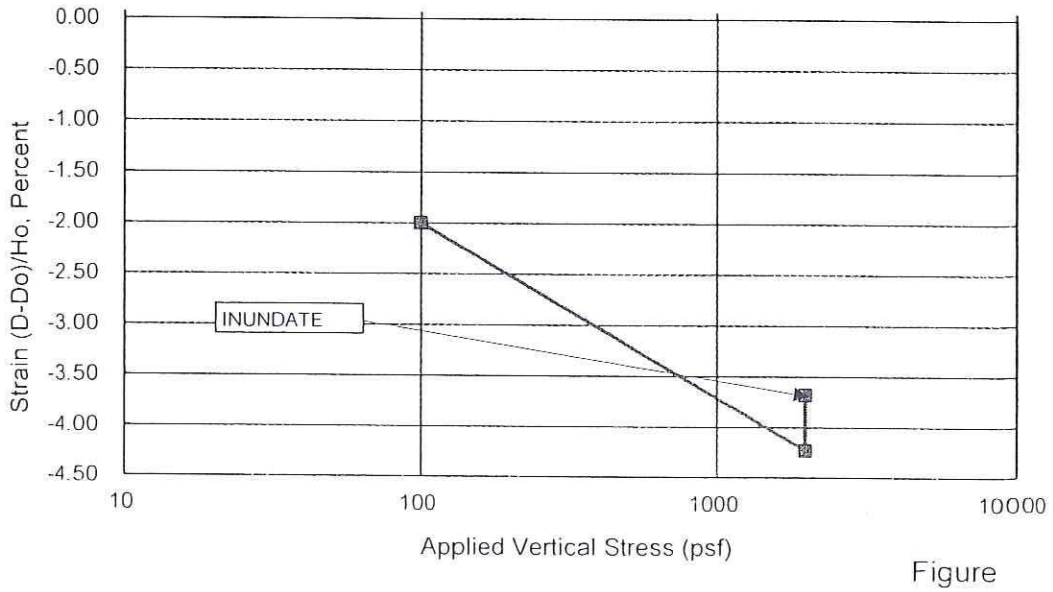
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	25.3	Final Moisture (%) :	32.8
Initial Dry Density (pcf):	89.6	Final Dry Density (pcf) :	92.7
Initial Void Ratio:	0.882	Final Void Ratio:	0.951
Initial Saturation (%)	77	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	0.920
2000	0.0923	1.0423	-4.23	0.961
H2O	0.0868	1.0368	-3.68	0.951

Percent Swell (+) / Collapse (-) 0.55

Compression Curve of the Swell Potential



Figure

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

One-Dimensional Swell or Settlement

Potential of Cohesive Soils

(ASTM D 4546-03)

PROJECT NAME: AECOM/I-5 HOV Widening Segment 2 LOCATION :

PROJECT NO.: 11-155

DATE : 01/25/12

BORING NO.: A-11-261 SAMPLE NO D-6 DEPTH(ft.): 25

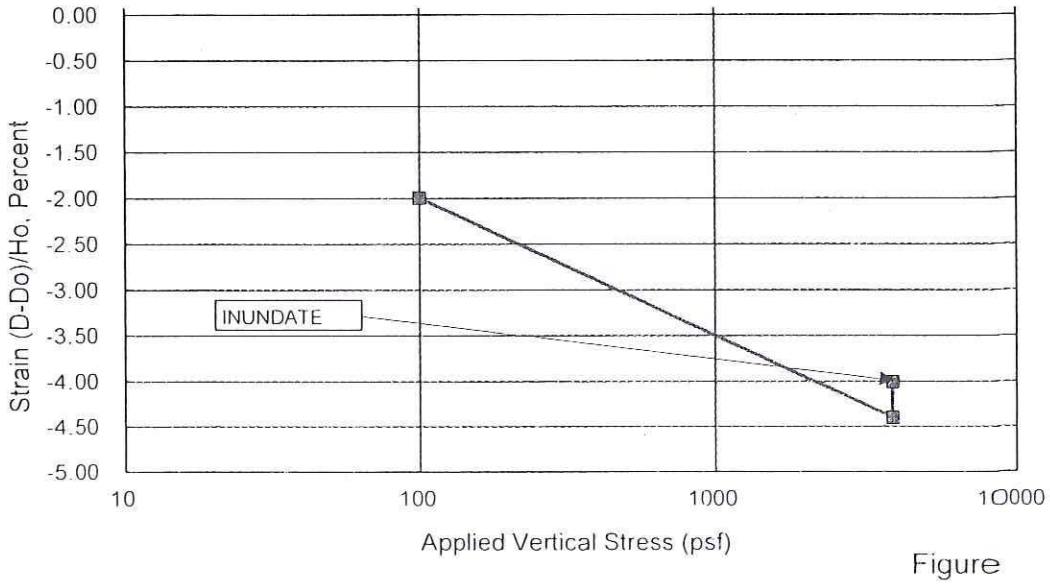
Soil Description : Very dark grayish brown, Elastic SILT (MH)

Initial Height (in.):	1.0000	Diameter(in):	2.416
Initial Dial Reading:	0.0500	Specific Gravity : (assumec	2.70
Initial Moisture (%):	24.7	Final Moisture (%) :	31.4
Initial Dry Density (pcf):	88.8	Final Dry Density (pcf) :	92.0
Initial Void Ratio:	0.897	Final Void Ratio:	0.973
Initial Saturation (%)	74	Final Saturation (%) :	100

PRESSURE (p) (psf)	FINAL READING (in)	APPARENT THICKNESS (in)	SETTLEMENT % OF SAMPLE THICKNESS	VOID RATIO
100	0.0700	1.0200	-2.00	0.935
4000	0.0940	1.0440	-4.40	0.981
H2O	0.0901	1.0401	-4.01	0.973

Percent Swell (+) / Collapse (-) 0.39

Compression Curve of the Swell Potential



Figure

Appendix C. California Department of Transportation Comments and Recommendations

State of California Business, Transportation and Housing Agency

Memorandum

To: Kamran Mazhar, Chief
Design Branch F

Date: July 5, 2012

File: Ora-5, PM 3.7/6.2
Segment 2
EA: 12-0F96C1

From: DEPARTMENT OF TRANSPORTATION
District 12
Materials and Research Branch

Subject: **Review of 65% PS&E submittals- Segment 2**

The District Materials & Research (M&R) Branch has received the 65% PS&E submittals prepared by Parsons for Orange County Transportation Authority.

The project scope for the entire project is to widen the mainline and reconstruct ramps along the interstate 5 between PM 3.0 /8.7. The project is divided into three segments. This review is for segment 2 from PM 3.7/6.2.

Our comments:

1) The MR prepared by Earth Mechanics for this segment indicates that the subgrade soil is expansive and requires removal to 4 ft below the grading plane. The soil Boring No's and soil Boring locations do not correspond, some Boring No's are missing.

2) Typical cross section show Class 3 used as imported borrow with R= 40 and PI< 12. Please show the over excavation limits on all typical sections.

3) If lime treatment of subgrade is considered in lieu of deeper excavation, It shall be shown on pavement typical cross sections.

4) Typical X sections X 10, X11and X12 show existing lanes outside the existing travel lane to remain and be converted to travel lane. The Typical cross section provided is only capable to carry the 20 years design. This segment needs to be modified for 40 years design or design exception would be required to leave the lane as is.

5) Typical Cross sections for ramps show reconstruction. Please call the existing pavement to be removed entirely. Also the new HMA section shall be modified per HDM for 40 years design life.

6) If RSC is recommended as an alternative to JPCP pavement due to working window closure restriction imposed by TMC, it shall be quantified and shown on the plans. Be advised that JPCP will require a minimum of 10 days for cure time. Type 3 Portland cement (with accelerators) can be used with a minimum 3 days cure time.

7) Please be advised that at 65% of PS&E phase, we assume grading shown on plans are final.

If you have any questions, please call Bahman J. Panah at 724-2180.

Prepared by:

Bahman J. Panah, P.E.
Materials & Research Branch
Division of Project Delivery

Concurred by:

Behdad Bagheri, Ph.D., P.E., G.E., PMP
Chief, Materials & Research Branch
Division of Project Delivery

Cc: Frank Lin, Mohammad Sadiq, File

Andrew Korkos

From: Bahman Panah <bahman_panah@dot.ca.gov>
Sent: Monday, June 11, 2012 10:47 AM
To: Montes, Mario
Cc: Bob Bazargan; Carlos Cadena (carlos.cadena@parsons.com); Ross Lew (rlew@trcsolutions.com); Lew, David; Andrew Korkos; Lino Cheang; Crull, Michael; Behdad.Baseghi@dot.ca.gov; Majid.Movahed@dot.ca.gov; Hamid Torkamanha (htorkamanha@octa.net); Kamran Mazhar; Alma Olguin; Pao, Terence; Ting, Janson
Subject: RE: I-5 HOV Seg 2 Pavement, PM 3.7 to 6.2, EA12-0F96C1, ID 1200020278

In cut ares and perhaps at grade areas underdrain may be required with the recommeded minmum treatment. Also, the lime treatment application shall be determined per CTM 373 by a qualified technician. In some intervals cement tretmentment may be more applicable than lime. The application rates shall be specified prior to construction.

Bahman J. Panah, M.S., P.E.
Materials Branch
(949) 724-2180

"Montes, Mario" <Mario.Montes@aecom.com> 06/06/2012 09:56 PM

To: Bahman Panah <bahman_panah@dot.ca.gov>

cc: Bob Bazargan <bob_bazargan@dot.ca.gov>, "Carlos Cadena (carlos.cadena@parsons.com)" <carlos.cadena@parsons.com>, "Ross Lew (rlew@trcsolutions.com)" <rlew@trcsolutions.com>, "Lew, David" <David.Lew@parsons.com>, Andrew Korkos <A.Korkos@earthmech.com>, Lino Cheang <L.Cheang@earthmech.com>, "Crull, Michael" <Michael.Crull@aecom.com>, "Behdad.Baseghi@dot.ca.gov" <Behdad.Baseghi@dot.ca.gov>, "Majid.Movahed@dot.ca.gov" <Majid.Movahed@dot.ca.gov>, "Hamid Torkamanha (htorkamanha@octa.net)" <htorkamanha@octa.net>, Kamran Mazhar <kamran_mazhar@dot.ca.gov>, Alma Olguin <alma_olguin@dot.ca.gov>, "Pao, Terence" <Terence.Pao@aecom.com>,

"Ting, Janson"
<Janson.Ting@aecom.com>

Subject
RE: I-5 HOV Seg 2 Pavement, PM 3.7 to 6.2, EA12-0F96C1, ID 1200020278 and Segment 3, 1200020279

Ok, we are going to proceed with underdrains in the cut sections plus 8" of lime treatment.

Mario A. Montes, P.E.
Vice President, AECOM Transportation
Mobile: (714) 336-5191

-----Original Message-----
From: Bahman Panah [mailto:bahman_panah@dot.ca.gov]
Sent: Tuesday, June 05, 2012 10:13 AM
To: Montes, Mario
Cc: Bob Bazargan; Carlos Cadena (carlos.cadena@parsons.com); Ross Lew (rlew@trcsolutions.com); Lew, David; Andrew Korkos; Lino Cheang; Crull, Michael; Behdad.Baseghi@dot.ca.gov; Majid.Movahed@dot.ca.gov; Hamid Torkamanha (htorkamanha@octa.net); Kamran Mazhar; Alma Olguin
Subject: Re: I-5 HOV Seg 2 Pavement, PM 3.7 to 6.2, EA12-0F96C1, ID 1200020278 and Segment 3, 1200020279

We have had poor performance with underdarins and edge drains systems due to plug up over the years. Therefore, we recommend providing uderdrains with the lime treatment (at least 8 inches). The alternatives provided under HDM to overcome the expansive soil are not necessary independent of each others.

Bahman J. Panah, M.S., P.E.
Materials Branch
(949) 724-2180

"Montes, Mario"
<Mario.Montes@aecom.com>
05/29/2012 04:35 PM

To
Mohammad Sadiq <mohammad_sadiq@dot.ca.gov>, Kamran Mazhar <kamran_mazhar@dot.ca.gov>

cc
Bob Bazargan <bob_bazargan@dot.ca.gov>, "Carlos Cadena (carlos.cadena@parsons.com)" <carlos.cadena@parsons.com>, "Ross Lew (rlew@trcsolutions.com)"

<rlew@trcsolutions.com>, "Lew, David" <David.Lew@parsons.com>, Andrew Korkos <A.Korkos@earthmech.com>, Lino Cheang <L.Cheang@earthmech.com>, "Crull, Michael" <Michael.Crull@aecom.com>, "Bahman.Panah@dot.ca.gov" <Bahman.Panah@dot.ca.gov>, "Behdad.Baseghi@dot.ca.gov" <Behdad.Baseghi@dot.ca.gov>, "Majid.Movahed@dot.ca.gov" <Majid.Movahed@dot.ca.gov>, "Hamid Torkamanha (htorkamanha@octa.net)" <htorkamanha@octa.net>

Subject

I-5 HOV Seg 2 Pavement, PM 3.7 to 6.2, EA12-0F96C1, ID 1200020278

Mohammad,

Thanks for your comments below; we will address them in the next MR submittal.

Attached is an updated letter with EMI's recommendations. We are planning on selecting the pavement sections that include 2' of over-ex with Aggregate Subbase (AS) PLUS the under-drains. This is a two pronged approach to dealing with the expansive soil.

Mario A. Montes, P.E.
Vice President, AECOM Transportation
Office: (714) 567-2785
Mobile: (714) 336-5191

AECOM
999 W. Town & Country Rd
Orange, CA 92868

-----Original Message-----
From: Mohammad Sadiq [mailto:mohammad_sadiq@dot.ca.gov]
Sent: Tuesday, May 29, 2012 4:04 PM
To: Montes, Mario
Cc: Kamran Mazhar
Subject: Re: I-5 HOV Widening, Segment 2, PM 3.7 to 6.2, EA12-0F96C1, ID 1200020278

Mario,
Materials reviewed the MR for segment 2 . It was decided that the MR be revaluated by the Earth Mechanics and they will offer other Alternatives.

The limits of excavation should be shown on the typical pavement cross sections on the project plans.

The soils needs to be classified per Unified Soil Classifications. Test results for gradation and swell test should be provided in the report. Soil Boring show some sandy materails which is not expansive. The limits of expansive soils should be determined.

Also in the MR, the Boring locations shown on the plans do not match with Boring Numbers on the Boring Logs. Earth Mechanics to clarify.

regards,

Mohammad Sadiq, ASCE
Transportation Engineer
Project Engineer
Project Delivery
Caltrans, District 12
Irvine, CA 92612
(949) 724-2840

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Attached are our comments which Bobi emailed to you on 4-18-2012.

(See attached file: Pavement ALTERNATIVES MEMO 5-21-12.pdf)

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

TECHNICAL MEMORANDUM

EMI Project No: 11-136

DATE: May 21, 2012

TO: Mr. Mario Montes, P.E., AECOM

FROM: Andrew Korkos, Earth Mechanics, Inc.

SUBJECT: **Alternative Pavement Structural Sections and Exemption Request**
I-5 HOV Widening, Segment 2 Project
San Clemente and Dana Point, Orange County, California
12-Ora-5, PM 3.8/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

In accordance with your request, alternative pavement recommendations are provided in the tables shown herein. The pavement sections provided in Tables 1 and 2 are alternatives to the previously recommended 4-ft overexcavation (below the grading plane) and material replacement. The purpose of the original 4-ft overexcavation was to remove highly expansive materials from directly beneath the pavement section and to place non-expansive material to counteract upward swell pressure.

Table 1 shows pavement alternatives incorporating less select material and adding Lime Treated Subgrade (LTS). The overexcavation depth was reduced from 4.0 feet below the grading plane to 4.0 feet below finished grade. The pavement sections include treating 12 inches of in-situ subgrade material with lime. The pavement section thicknesses (JPCP, AB, and LCB) are the same as those originally recommended.

Table 2 shows pavement alternatives that include: 1.3 feet of overexcavation (below the grading plane) and replacement with Aggregate Subbase (AS); and, 0.7-foot of AS due to Caltrans rigid pavement requirements. The 1.3 feet of AS is recommended for the following reasons: improving the R-value of the near-surface soils (in order to use a design R-value of 10); providing a filter layer between the AB (or LCB) and the native subgrade; and, providing a working table in order to improve compaction efforts for the overlying pavement materials. Since native earth materials will be left closer to the grading plane (and new pavement sections), there is potential for heaving of the pavement sections due to swelling of the highly expansive subgrade materials. Consequently, use of these pavement sections should be combined with installing underdrains (french drains) in the proposed unpaved outside shoulders, parallel with the new pavement sections. The purpose of the underdrains is to intercept surface water, coming from adjacent slopes or sheet flowing across the freeway, which would enter the subsurface from the unpaved areas adjacent to the pavement. Underdrains should consist of 8-inch diameter perforated plastic pipe surrounded by permeable material wrapped in filter fabric. If the future paved lane, adjacent to the unpaved shoulder, is a drained pavement section, the top of the underdrain pipe should be placed below the bottom of the ATPB layer. The underdrains should be constructed in accordance with Caltrans Standard Plan D102 and requirements in Section 68-2 of the Caltrans Standard Specifications (2010), and, should outlet to approved surface or subsurface drainage devices.

The vast majority of soils, terrace deposits, and Capistrano formation bedrock, in Segment 2, are highly expansive and are susceptible to swelling when water enters these materials. Laboratory index tests and swell tests verify that the materials are highly expansive. Also, based on discussions with Caltrans representatives, this portion of the I-5 freeway pavement has experienced heaving and settlement in the past and has been periodically rehabilitated to repair and smooth the roadway.

Based on the history of the area, EMI recommends using the alternative that includes installing the underdrains along the proposed unpaved outside shoulders of the mainline and ramps. Underdrains will help minimize the potential for swelling of earth materials below the new pavement sections. In should be noted that water can enter the subgrade materials by various paths including rainfall entering the cracks and joints in the pavement, rainfall infiltrating through unpaved ground, and rainfall or water from broken or leaking water or irrigation lines transmitted along geologic contacts. By installing the recommended underdrains, and maintaining surface drainage over the design life of the pavement, heaving of the future pavement is expected to be zero to negligible.

TABLE 1. PAVEMENT STRUCTURAL SECTION ALTERNATIVES WITH LIME TREATMENT

Design R-value	*Traffic Index*	*Undrained Pavement Structural Sections* [1, 2]	
		Flexible Sections [4]	*Rigid Sections* [3]
41	10.0	0.10' RHMA-O / 0.20' RHMA-G / 0.75' HMA-A / 0.50' AB / 2.45' SM / 1.00' LTS *(Mainline Outside Shoulders)*	
	12.0	1.15' HMA-A / 0.50' AB / 2.35' SM / 1.00' LTS *(Ramp Lanes)*	
	16.0		0.10' RHMA-O / 0.20' RHMA-G / 0.95' JPCP / 0.35' LCB / 2.40' SM / 1.00' LTS *(Mainline Outside Lanes)*
		Drained Pavement Structural Sections [1, 2]	
		Flexible Sections [4]	*Rigid Sections* [3]
	10.0	0.10' RHMA-O / 0.20' RHMA-G / 0.95' HMA-A / 0.25' ATPB / 0.50' AB / 2.00' SM / 1.00' LTS *(Mainline Outside Shoulders – AVH)*	
	12.0	1.00' HMA-A / 0.25' ATPB / 0.50' AB / 2.25' SM / 1.00' LTS *(Ramp Lanes – AVH)*	
	16.0		0.10' RHMA-O / 0.20' RHMA-G / 0.95' JPCP / 0.25' ATPB / 0.35' LCB / 2.15' SM / 1.00' LTS *(Mainline Outside Lanes – AVH)*

Notes:

1. *HMA-A = Hot-Mix Asphalt (Type A); AB = Aggregate Base (Class 2); JPCP = Jointed Plain Concrete Pavement; LCB = Lean Concrete Base; RHMA-O = Rubberized Hot Mix Asphalt-Open Graded (0.10' maximum thickness); RHMA-G = Rubberized Hot Mix Asphalt-Gap Graded (0.20' maximum thickness); SM = Select Material (minimum R-value of 41 and PI < 12%); and, LTS = Lime Treated Subgrade.*
2. *Refer to Topic 626 of the Caltrans HDM (2008) for additional recommendations for ramps.*
3. *Based on "South Coast" climate region and lateral support for JPCP (refer to HDM for conditions that satisfy lateral support). Rapid Strength Concrete (RSC) and "Rapid Setting" LCB may be used in lieu of standard JPCP and standard mix LCB, respectively. A polyethylene film bond breaker should be used between the RSC and Rapid Setting LCB layers.*
4. *For flexible pavement sections: the 0.10' RHMA-O may be eliminated if existing pavement does not include RHMA-O, and, the 0.20' RHMA-G may be added to the HMA-A to obtain a full-depth HMA-A thickness.*

TABLE 2. PAVEMENT STRUCTURAL SECTION ALTERNATIVES WITH UNDERDRAINS

Design R-value	*Traffic Index*	*Undrained Pavement Structural Sections* [1, 2, 5]	
		Flexible Sections [4]	*Rigid Sections* [3]
10	10.0	0.10' RHMA-O / 0.20' RHMA-G / 1.05' HMA-A / 0.50' AB / 1.00' AS *(Mainline Outside Shoulders)*	
	12.0	1.55' HMA-A / 0.50' AB / 1.00' AS *(Ramp Lanes)*	
	16.0		0.10' RHMA-O / 0.20' RHMA-G / 0.95' JPCP / 0.35' LCB / 2.00' AS *(Mainline Outside Lanes)*
		Drained Pavement Structural Sections [1, 2, 5]	
		Flexible Sections [4]	*Rigid Sections* [3]
	10.0	0.10' RHMA-O / 0.20' RHMA-G / 0.95' HMA-A / 0.25' ATPB / 0.50' AB / 1.00' AS *(Mainline Outside Shoulders – AVH)*	
	12.0	1.40' HMA-A / 0.25' ATPB / 0.50' AB / 1.00' AS *(Ramp Lanes – AVH)*	
	16.0		0.10' RHMA-O / 0.20' RHMA-G / 0.95' JPCP / 0.25' ATPB / 0.35' LCB / 2.00' AS *(Mainline Outside Lanes – AVH)*

Notes:

1. *HMA-A = Hot-Mix Asphalt (Type A); AB = Aggregate Base (Class 2); JPCP = Jointed Plain Concrete Pavement; LCB = Lean Concrete Base; RHMA-O = Rubberized Hot Mix Asphalt-Open Graded (0.10' maximum thickness); RHMA-G = Rubberized Hot Mix Asphalt-Gap Graded (0.20' maximum thickness); and AS = Aggregate Subbase (Class 2).*
2. *Refer to Topic 626 of the Caltrans HDM (2008) for additional recommendations for ramps.*
3. *Based on "South Coast" climate region and lateral support for JPCP (refer to HDM for conditions that satisfy lateral support). Rapid Strength Concrete (RSC) and "Rapid Setting" LCB may be used in lieu of standard JPCP and standard mix LCB, respectively. A polyethylene film bond breaker should be used between the RSC and Rapid Setting LCB layers.*
4. *For flexible pavement sections: the 0.10' RHMA-O may be eliminated if existing pavement does not include RHMA-O, and, the 0.20' RHMA-G may be added to the HMA-A to obtain a full-depth HMA-A thickness.*
5. *Underdrains are recommended to be installed along the outside unpaved shoulder of the mainline and ramps. The underdrains should consist of 8-inch diameter perforated pipe surrounded by permeable material wrapped in filter fabric in accordance with Caltrans Standard Plan D102 and Section 68-2 of the Caltrans Standard Specifications (2010). If the adjacent paved lane is a drained pavement section, the top of the pipe should be placed below the bottom of the ATPB layer. Underdrains should outlet to approved drainage devices.*

Request for Exception for Relative Compaction

Section 19-5.03B of the Caltrans Standard Specifications (2010) requires that the upper 0.50-ft of the subgrade be compacted to a minimum of 95% relative compaction. Because the plasticity of the in-situ native materials is relatively high, achieving 95% relative compaction will require more effort as compared to granular soils. In addition, if moisture contents in the native soils increase (relative to the moisture contents encountered during our field investigation) and become too wet, the materials can exhibit pumping which will further complicate earthwork and make achieving 95% more difficult. Pumping subgrades would need to be stabilized in order to achieve a firm and unyielding subgrade on which fills may be placed and compacted.

Furthermore, since in-situ native materials are highly expansive, compacting the materials to higher densities can result in greater swell (volume increases with the introduction of water). Studies have shown that compacting expansive soils to higher densities generally result in greater swell, and conversely, compacting these same soils to lower densities results in lower swell. Also, compacting expansive soils on the dry side of optimum moisture content can result in higher swell. Therefore, compacting expansive materials to lower densities and with higher moisture contents reduces the swell potential.

Based on the above information, EMI recommends that the top 0.50-ft of the subgrade be compacted to relative compactions ranging between 90% and 92% (instead of requiring a minimum relative compaction of 95%). In addition, the native subgrade materials should be compacted at moisture contents ranging between optimum and 2% above optimum moisture content. The contractor should use caution in adjusting moisture content – moisture should not increase to the point of causing pumping conditions.

EMI is requesting the above exception to the Caltrans relative compaction requirement. The lower relative compaction (for the upper 0.50-ft of the subgrade) will not adversely affect the proposed pavement structural sections.

References

California Department of Transportation, 2010. Standard Specifications.

California Department of Transportation, 2010. Standard Plans.

Earth Mechanics, Inc., 2012. Materials Report, Interstate 5 HOV Widening, Segment 2, Cities of San Clemente and Dana Point, Orange County, California, 12-Ora-5, PM 3.8/6.2; Caltrans Project No. 1200020278 (EA No. 12-0F96C01); March 28.

If you have any questions or require additional information please call us.

AVK:ak

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

May 1, 2013

EMI Project No. 11-136

AECOM
999 Town & Country Road
Orange, California 92868

Attention: Mr. Mario Montes, P.E.

Subject: ***Addendum No. 1 for Final Materials Report***
Interstate 5 HOV Widening, Segment 2 Project
Cities of San Clemente and Dana Point, Orange County, California
12-Ora-05, PM 3.8/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C01)

Dear Mr. Montes:

This addendum (Addendum No. 1) is intended to respond to a Caltrans review comment and supplement the published Final Materials Report (reference report) for the Interstate 5 HOV Widening Segment 2 Project. The Caltrans review comment (shown in italics) and our response is presented below.

Comment: *The new pavement section 8, shall be included in the Material Report. Deflection study was recommended but, due to time constrain, it has not been performed yet. It is assumed that the existing pavement is constructed on imported borrow (R>40 and PI<12).*

Response: Typical Structural Section No. 8, shown on the project plan, which consists of

0.10' HMA-O / 0.20' RHMA-G / 0.95' JPCP / 0.35' LCB

may be used within the project limits for outside lanes along the mainline having a TI of 16.0 when the existing soil subgrade possesses an R-value greater than 40 and Plasticity Index (PI) less than 12.

REFERENCE: Earth Mechanics, Inc., 2012. Final Materials Report; Interstate 5 HOV Widening, Segment 2 Project; Cities of San Clemente and Dana Point, Orange County, California; 12-Ora-05, PM 3.8/6.2, Caltrans Project No. 1200020278 (EA No. 12-0F96C1); August 30.

If you have any questions regarding the above information, please call our office.

Sincerely,
EARTH MECHANICS, INC.

REGISTERED PROFESSIONAL ENGINEER
GNANAPRAGASAM J. GUNARANJAN
No. GE2970
Exp: 12-31-13
GEOTECHNICAL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ANDREW V. KORKOS
NO. 2357
EXP. 3/31/14
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(Ranjan) G. J. Gunaranjan, GE 2970
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Andrew Korkos, GE 2357
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Major Annual Events
Dana Point, San Clemente and San Juan Capistrano

Updated- 2/14/13

Dana Point

Month	Event	Info	2013	2014	2015	2016
March	Festival of Whales	Every weekend in March; about 12,000 attendees each weekend	March	March	March	March
May	Dana Point Grand Prix of Cycling Town Center Area	www.danapointgrandprix.com	May 5	Target is 1st weekend in May	Target is 1st weekend in May	Target is 1st weekend in May
May	Doheny Blues Festival, Doheny State Beach	About 30,000 attendees. www.omegaevents.com/dohenyblues	5-18/ 5-19	Target 3rd weekend in May	Target 3rd weekend in May	Target 3rd weekend in May
July 4	Fireworks at Dana Point Harbor	No freeway work on holidays	July 4	July 4	July 4	July 4
June	Dana Hills High School graduation, 4 p.m.					
June	Concourse De Elegance Car Show					
Sept.	Tall Ships Festival, Harbor	www.tallshipsfestival.com	9/8-9/9	Target 2nd weekend in September	Target 2nd weekend in September	Target 2nd weekend in September
Sept.	Doheny Days Music Concert, Doheny State Beach	http://dohenydays.com	Target 2nd weekend in September	Target 2nd weekend in September	Target 2nd weekend in September	Target 2nd weekend in September
Sept.	Dana Point BBQ Championship, Sea Terrace Park	www.kcbs.us	Last weekend in September	Last weekend in September	Last weekend in September	Last weekend in September
Nov.	Turkey Trot, Dana Point Harbor	No closures as its held on Thanksgiving morning www.turkeytrot.com	Thanks-giving	Thanks-giving	Thanks-giving	Thanks-giving

**City processes permits for other events not noted specifically herein. City runs summer concert series in various parks throughout summer*

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Major Annual Events
Dana Point, San Clemente and San Juan Capistrano

San Clemente

Month	Event	Notes	2013	2014	2015	2016
January	SCHS Junior Varsity/Varsity Wrestling tournament	Typically 1st and 3rd weekend in January				
June	Downtown San Clemente Car Show	Second Sunday in June	June 9	June 8	June 14	June 12
June	San Clemente High School Graduation	On campus, 4 p.m. Last Day of School (varies)	June 11	Last Day of School	Last Day of School	Last Day of School
July 4	Fireworks at Pier	No closures	July 4	July 4	July 4	July 4
July	Ocean Festival, Pier area	www.oceanfestival.org				
August	Street Faire/Fiesta Street Festival	25,000 attendees. Held on second Sunday, partial closure of Avenida Del Mar. http://www.scchamber.com/	August 11	August 10	August 9	August 14
October	Seafest, San Clemente Pier	5,000 attendees. www.scchamber.com Sunday, following the first Wednesday in October.	October 6	October 5	October 11	October 9

**City has beach concerts in summer months*

San Juan Capistrano

Month	Event	Notes	2013	2014	2015	2016
March	St. Joseph's Day (Swallows Day) at Mission San Juan Capistrano;	www.missionsjc.com	March 19	March 19	March 19	March 19
March	Swallows Day Parade	www.swallowsparade.com First Saturday after St. Joseph's Day	March 23	March 22	March 21	March 26
June	Swallows Classic Tournament	huge youth soccer tournament Usually 4th weekend in June http://www.ayso87.org/	June 22-23	June 28-29	June 27-28	June 25-26
July 4	Fireworks at Sports Park, Camino Del Avion	www.sanjuancapistrano.org	July 4	July 4	July 4	July 4
August	Ferragosto Italian Summer Festival	Historic Town Center Park, 10 a.m. to 9 p.m.	On Hold	On Hold	On Hold	On Hold

Major Annual Events
Dana Point, San Clemente and San Juan Capistrano

		www.sanjuanchamber.org				
August	West Coast Film Festival, various locations in SJC/DP	www.westcoastfilmfest.com Week before the Rodeo	August 26-30	August 25-29	August 17-21	August 22-26
August	Rancho Mission Viejo Rodeo	Antonio/Ortega www.rmvrodeo.com Last weekend in August	August 30-31	August 29-30	August 28-29	August 26-27
Oct.	Ridge Walk/Run/Bike, Camino Las Ramblas	www.sanjuantrailrun.org www.sanjuantrailrun.org First Saturday in October	October 5	October 4	October 10	October 1
Oct.	Chamber of Commerce Vintage	1,000 visitors to the Mission www.sanjuanchamber.com First Saturday of October	October 5	October 4	October 10	October 1
Dec.	Tree Lighting Festival/downtown open house	www.sanjuanchamber.org First Saturday in December	Dec. 7	Dec. 6	Dec. 5	Dec. 3

**City has beach concerts in summer months*
**City runs Wednesday event concerts in Town Center Park throughout summer*
**Mission runs Saturday night concert series throughout summer*
** San Juan Hills High School graduation held off campus*

Area Events

Month	Event	Info	2013	2014	2015	2016
Sept.	Orangeman Triathlon, Salt Creek Beach, Dana Point, San Juan Capistrano	http://orangemantriathlon.com/ Route requires closure of Ortega Highway in San Juan Capistrano and east of Avenida La Pata/Antonio) New event; information unavailable.				
Sept.	Hurley Pro Surf Contest	At Trestles, south of San Clemente. Usually 3rd week in September, but can vary. http://www.hurley.com/hurleypro/02124289 5106890				

Major Annual Events
Dana Point, San Clemente and San Juan Capistrano

Special Days

No I-5 mainline closures are allowed during the last two weeks in March, Thanksgiving week and the last two weeks in December.