FOR CONTRACT NO.: 12-0K3704

INFORMATION HANDOUT

PERMITS
COASTAL DEVELOPMENT PERMIT

MATERIALS INFORMATION
GEOTECHNICAL DESIGN REPORT

ROUTE: 12-Ora-1-11.6/11.7

CALIFORNIA COASTAL COMMISSION
South Coast Area Office
200 Oceangate, Suite 1000
Long Beach, CA 90802-4302
(562) 590-5071

Date: June 10, 2010
Permit No: **5-09-163**

COASTAL DEVELOPMENT PERMIT

On **May 13, 2010**, the California Coastal Commission granted to **the California Department of Transportation, District 12, Attn: Scott Shelley** Coastal Development Permit **5-09-163**, subject to the attached Standard and Special Conditions, for development consisting of: **Construction of two retaining walls to stabilize a coastal bluff slope adjacent to State Route 1 (aka Pacific Coast Hwy); one retaining wall located at PM 11.61 is proposed to be 45-feet high and 40-feet long at a 5-foot offset from the edge of the road pavement, the second retaining wall located at PM 11.65 is proposed to be 20-feet high and 40-feet long at a 5-foot off-set from the edge of the road pavement, approximately 74 cu. yds. of imported fill, new cable railing fencing, retaining wall aesthetic treatment and bluff slope re-vegetation**...More specifically described in the application file in the Commission offices.

The development is within the coastal zone at State Route 1 (aka Pacific Coast Hwy) between El Moro Beach and Moro Ridge Road, Orange County, near the border of Laguna Beach.

Issued on behalf of the California Coastal Commission on 6/10/2010.

PETER DOUGLAS
Executive Director

By: _____
Title: Coastal Program Analyst III

ACKNOWLEDGMENT

The undersigned permittee acknowledges receipt of this permit and agrees to abide by all terms and conditions thereof.

The undersigned permittee acknowledges that Government Code Section 818.4 which states in pertinent part, that: "A public entity is not liable for injury caused by the issuance . . . of any permit . . ." applies to the issuance of this permit.

IMPORTANT: THIS PERMIT IS NOT VALID UNLESS AND UNTIL A COPY OF THE PERMIT WITH THE SIGNED ACKNOWLEDGMENT HAS BEEN RETURNED TO THE COMMISSION OFFICE. 14 CAL. ADMIN. CODE SECTION 13158(a).

6/14/2010
Date

Signature of Permittee

Please sign and return one copy of this form to the Commission office at the above address.

STANDARD CONDITIONS

1. **Notice of Receipt and Acknowledgment.** The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.

2. **Expiration.** If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.

3. **Interpretation.** Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.

4. **Assignment.** The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

5. **Terms and Conditions Run with the Land.** These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

SPECIAL CONDITIONS:

1. **CONSTRUCTION RESPONSIBILITIES AND DEBRIS REMOVAL**

The permittee shall comply with the following construction-related requirements:

(a) No construction materials, debris, or waste shall be placed or stored where it may be subject to wave/wind erosion and dispersion;

(b) Any and all debris resulting from construction activities shall be removed from the project site within 24 hours of completion of construction;

(c) Erosion control/sedimentation Best Management Practices (BMP's) shall be used to control sedimentation impacts to coastal waters during construction. BMPs shall include, but are not limited to: placement of sand bags around drainage inlets to prevent runoff/sediment transport into the storm drain system and the Pacific Ocean, use of debris fences as appropriate and no stockpiling of materials in the project area.

(d) Construction debris and sediment shall be removed from construction areas each day that construction occurs to prevent the accumulation of sediment and other debris which may be discharged to coastal waters.

(e) The applicant shall dispose of all demolition and construction debris resulting from the proposed project at an appropriate location. If the disposal site is located within the coastal zone, a coastal development permit or an amendment to this permit shall be required before disposal can take place.

2. CONFORMANCE OF DESIGN/CONSTRUCTION PLANS TO GEOTECHNICAL REPORT

A. All final design and construction plans, including foundations, grading and drainage plans, shall be consistent with all recommendations contained in the *Geotechnical Design Report for Slope Erosion on Pacific Coast Highway, City of Laguna Beach, Orange County, PM 11.61 and PM 11.65* report prepared by the Department of Transportation Division of Engineering Services, Office of Geotechnical Design – South 1, Branch B and dated February 10, 2009. **PRIOR TO THE ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT**, the applicant shall submit, for the Executive Director's review and approval, evidence that an appropriate licensed professional has reviewed and approved all final design and construction plans and certified that each of those final plans is consistent with all of the recommendations specified in the above-referenced geologic evaluation approved by the California Coastal Commission for the project site.

B. The permittee shall undertake development in accordance with the approved final plans. Any proposed changes to the approved final plans shall be reported to the Executive Director. No changes to the approved final plans shall occur without a Commission amendment to this coastal development permit unless the Executive Director determines that no amendment is legally required.

3. ASSUMPTION OF RISK, WAIVER OF LIABILITY AND INDEMNITY

A. By acceptance of this permit, the applicant acknowledges and agrees (i) that the site may be subject to hazards from erosion, landslide, bluff retreat, earth movement, waves, storm waves and sea level rise; (ii) to assume the risks to the applicant and the property that is the subject of this permit of injury and damage from such hazards in connection with this permitted development; (iii) to unconditionally waive any claim of damage or liability against the Commission, its officers, agents, and employees for injury or damage from such hazards; and (iv) to indemnify and hold harmless the Commission, its officers, agents, and employees with respect to the Commission's approval of the project against any and all liability, claims, demands, damages, costs (including costs and fees incurred in defense of such claims), expenses, and amounts paid in settlement arising from any injury or damage due to such hazards.

4. COMPLIANCE WITH COASTAL BLUFF RE-VEGETATION IMPLEMENTATION/ MONITORING PLAN and PROPOSED PLANTING PLAN

The applicant shall conform to the proposed restoration and monitoring plan titled *El Moro Emergency Slope Repair Preliminary Restoration Plan* prepared by Maggi Elgeziry, CA Dept of Transportation, District 12 dated January 2010 and the Plant List and Planting Specifications in the Planting Plan submitted to this office on April 26, 2010. The bluff restoration plan includes the installation of erosion control blankets with native seeds and planting of native California Sagebrush, Coyote Brush, and California Encelia container plants. Both seeds and container

plants are to be from a genetic source within five miles of the coast within Orange County. The planting plan shall not contain any non-native plants. Only temporary irrigation for plant establishment is allowed with a minimum of two years watering, weeding, plant replacement and monitoring.

5. RETAINING WALL COLOR AND TEXTURE PLAN

A. **PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT**, the applicant shall submit, for the review and approval of the Executive Director, a plan demonstrating that the color and texture of the structure will be compatible with the adjacent bluff. The plan shall demonstrate that:

1. the entire face of the proposed shotcrete wall structure (both above and below finished grades) will receive the architectural/sculpted treatment should the underground components become exposed by future erosion,
2. the shotcrete wall structure will be colored/constructed with concrete that has been colored with earth tones that are compatible with the adjacent bluff,
3. white and black tones will not be used,
4. the color will be maintained through-out the life of the structure,
5. the structure will be textured for a natural look that better blends with the bluff face
6. native vegetation appropriate to the habitat type may also be used if feasible to cover and camouflage the structure.

B. The permittee shall undertake development in accordance with the approved final color and texture plan. Any proposed changes to the approved final plan shall be reported to the Executive Director. No changes to the approved final plan shall occur without a Commission amendment to this coastal development permit unless the Executive Director determines that no amendment is legally required.

6. FUTURE SOLDIER PILE/GRADE BEAM EXPOSURE PLANS

In the event any subsurface project features subsequently become exposed to public view from the public beach below the site, the applicant shall submit plans to the Executive Director, for his review and concurrence, that provide for visual and aesthetic treatment plans similar to those required in conjunction with this coastal development permit. The aesthetic treatment shall provide that exposed materials match the surrounding terrain to the extent feasible and minimize visual impact of the exposed features. The applicant shall identify proposed materials, colors, monitoring, and maintenance plans, in conjunction with their submittal. The Executive Director shall determine whether the proposed work will require an amendment to this coastal development permit, a new coastal development permit, or whether no amendment or new permit is legally required.

7. COMPLIANCE WITH PROPOSED EROSION CONTROL PLAN

The applicant shall conform to the proposed Erosion Control Plan submitted on January 2010.

The permittee shall undertake development in accordance with the approved final plans. Any proposed changes to the approved final plans shall be reported to the Executive Director. No changes to the approved final plans shall occur without a Commission amendment to this coastal development permit unless the Executive Director determines that no amendment is legally required.

8. COMPLIANCE WITH PROPOSED CONSTRUCTION STAGING PLAN

The applicant shall conform to the proposed Construction Staging Plan submitted on January 2010.

The permittee shall undertake development in accordance with the approved final plans. Any proposed changes to the approved final plans shall be reported to the Executive Director. No changes to the approved final plans shall occur without a Commission amendment to this coastal development permit unless the Executive Director determines that no amendment is legally required.

9. FUTURE IMPROVEMENTS

This permit is only for the development described in coastal development permit 5-09-163. Except as provided in Public Resources Code section 30610 and applicable regulations, any future development as defined in PRC section 30106, including, but not limited to, a change in the density or intensity of use land, shall require an amendment to coastal development permit 5-09-163 from the California Coastal Commission or shall require an additional coastal development permit from the California Coastal Commission or from the applicable certified local government.

State of California | Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MASSOUD TAJIK, CHIEF
District 12 – Maintenance Engineering

Date: June 18, 2009

File: 12-ORA-1-11.61/11.65
12-0K3701
PCH Slope Erosion

Attention: Jason Yeung

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

Subject: Revised Geotechnical Design Report For Slope Erosion on Pacific Coast Highway, City of Laguna Beach, Orange County. PM 11.61 and 11.65

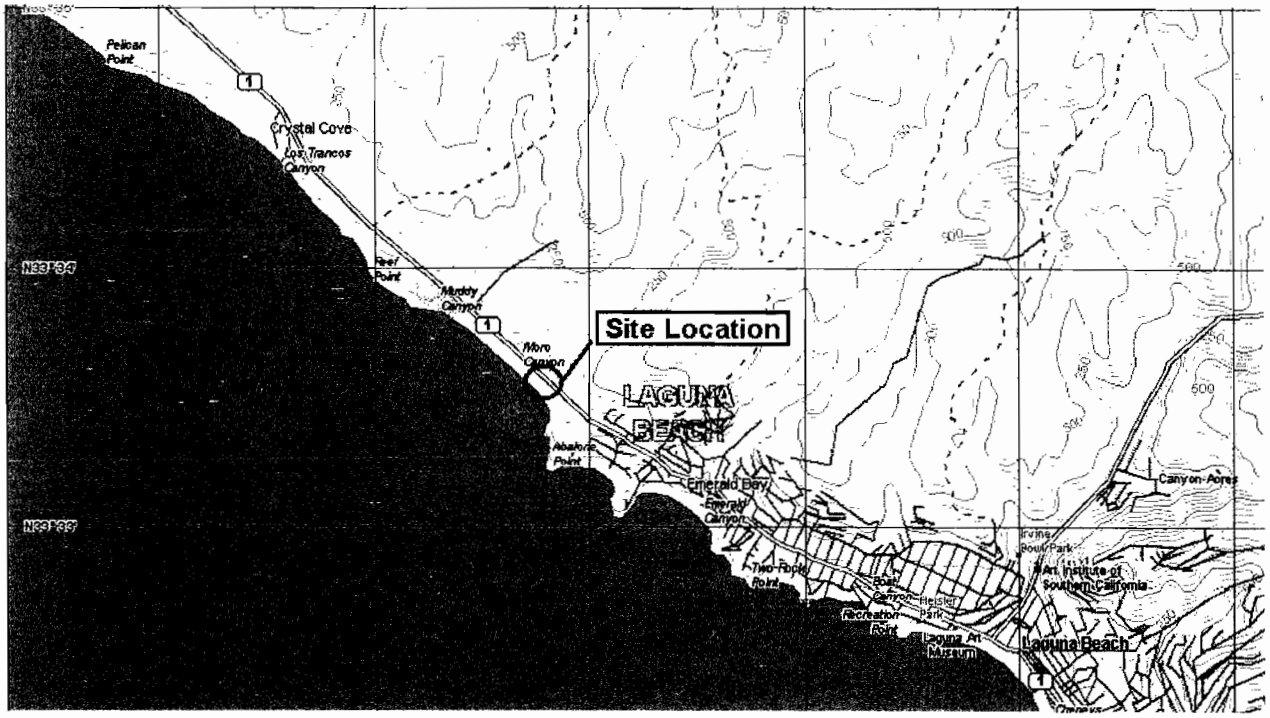
Per your request of July 17, 2008, Geotechnical Design South 1 - Branch B performed a geotechnical investigation for the above referenced project. A GDR was submitted on February 10, 2009 to provide recommendations for the repair of two erosional slope failures adjacent to Pacific Coast Highway (PCH).

Per the request of Mr. Howard Ng of Structures Design this report is revised herein. The revision includes an additional option for slope erosion remediation at the location identified by " PM 11.65". Our office had previously recommended the instillation of a sheet-pile wall as described as Option A. This revised report provides additional recommendations for a Solder Pile retaining wall system with wood lagging system described as Option B.

1.0 Introduction

The eroded slopes located at approximately 11.61 and 11.65 designated as such, are located in Orange County, on the southwestern side of State Route 1, within Crystal Cove State Park, near the border between Newport Beach and Laguna Beach, in a cut slope made during the original construction of the roadway as shown in Figure 1, below. The scarps of the slope failures have eroded up to the edge of pavement at the top of the slope (Appendix A). The gullies extend to the bottom of the embankment. The approximate size of the failures is 25 feet wide by 5 feet deep at the northern area and 30 feet wide by 15 feet deep at the southern area.

Figure 1 – Vicinity Map



1.1 Proposed Repair recommendations

It is recommended that two (2) 40-foot walls be constructed adjacent to the impacted areas and positioned at five (5) foot offsets from the edge of pavement. The first wall at PM 11.61, recommends the construction of a soldier pile wall to retain the upper 15 feet of soil beneath PCH, above an existing drainage conduit (Appendix B, Fig 1). The second at PM 11.65 involves the instillation of a driven Sheet Pile Wall to control erosion at the subject location (Appendix B, Fig 3). Wall specifications and construction recommendations are discussed subsequently within the body of this report.

2.0 Geologic Considerations

2.1 Regional Geology

The subject site is located in the San Joaquin Hills, at the southern end of the Los Angeles Basin. The San Joaquin Hills are composed of marine and non-marine sedimentary rocks of Tertiary age.

The Los Angeles Basin and San Joaquin Hills are located within the Peninsular Ranges Geomorphic Province. Northwest trending mountain ranges and valleys associated with faults that are similar in nature to and associated with the San Andreas Fault characterize the Peninsular Ranges.

2.2 Site Geology

The subject site is in hilly terrain. The material at the site is bedrock consisting of the siltstone member of the Tertiary-age Capistrano Formation. Bedding is very thin to laminated with slaty cleavage present. It was not possible to measure bedding angles in the field due to the extremely weathered outcropping of rock. The northernmost erosion area is at the cut/fill transition. It is likely that the fill was not benched into the underlying bedrock.

2.3 Excavation Characteristics

Excavation can be done with conventional earth moving equipment. The exposed bedrock at the site is easily rippable.

2.4 Erosion

The bedrock at the site is prone to erosion. The face of the slope should be hydroseeded or other erosion control measures should be taken after construction is completed. Native vegetation is observed to quickly fill in bare areas on slopes after periods of moderate rainfall.

3.0 Ground Water

The depth to ground water was not measured during the field investigation. No seeps or artesian conditions were noted. However, the possibility of perched or even partially saturated conditions may exist due to runoff and drainage systems at the top of the slope.

4.0 Seismicity

The site is located in a seismically active area. The controlling fault for the subject site is the Newport-Inglewood-Rose Canyon/E with a magnitude of M_W=7.00. The fault is approximately 1 mile from the site. A moment magnitude 7.00 event at a distance of 1 mile would produce an acceleration of 0.7g based on the attenuation calculation by Sadigh (1997). The project is not located within the confines of an APEFZA, and no well-defined fault traces have been mapped within the project limits. Therefore, the possibility of fault rupture is considered to be low.

5.0 Liquefaction

Liquefaction may occur when loose sands and non-plastic silts are located below the water table and subjected to earthquake shaking. The water can also be perched ground water. At the subject site, liquefaction is not considered to be likely due to the shallow depth to bedrock, and the high fine content of the material.

6.0 Geotechnical Investigation Program

The exploration program consisted of field reconnaissance and geotechnical boring and sampling performed during November 2008. The boring details are summarized below in Table 1. District 12 Surveys generated detailed topographic maps of the two locations as well. A slope inclinometer was installed in boring R-002 since some cracking was noticed along the southbound roadway in the # 2 lane.

Table 1 – Summary of Borings

Boring No.	Type[1]	Date Drilled	Surface Elevation (ft)	Total Depth (ft)	Ground water Depth (ft)	Ground water Elevation (ft)
R-001	RW	11/15/08	90.035	64.0	NA	NA
R-002	RW	11/17/08	80.997	67.0	NA	NA

1. HS: Hollow Stem Auger drilling Method, RW: Rotary Wash drilling method, CPT: Cone Penetrometer Test

6.1 Subsurface Conditions

The borings were used to develop continuous soil profiles with depth. At boring R-001, soil encountered was artificial fill consisting of silty sand and sandy clay to a depth of about 11 feet. The fill is expected to be at a depth of approximately 15 feet at the bottom of the pipe outlet. Below that depth, claystone of the Capistrano formation was encountered to a depth of about 34 feet. A shale underlies the siltstone to the bottom of the hole at 64 feet below the roadway.

The fill soils at boring R-002 were the same as in boring R-001, but they extended to only 5 feet below roadway elevation. Below that, siltstone and claystone of the Capistrano Formation were encountered to a depth of 36 feet. Underlying the claystone, was the same shale observed in boring B-001 to a depth of 67 feet.

The boring logs are included as appendix C. Log of Test Borings (LOTBs) will be provided at a latter date.

6.2 Instrumentation

Roadway cracking and settlement was observed within the immediate vicinity of the northernmost erosion area. The roadway distress is evidenced by slight cracking along lane # 2 of the southbound traveled way. One Slope Inclinometer (SI) was installed in boring R-002 to monitor for movements within the pavement subsurface.

Approximately 1/20th inch of movement was detected in the upper 5 feet below the pavement between the first and second readings. There was no movement between the second and third readings. The site will be monitored semi annually to determine if the movement is ongoing, or was caused by settlement of the newly installed SI. Results of the SI readings are included in

Appendix D. If movement is shown in the slope inclinometer, it will not affect the conclusions and recommendations of this report. Any movement would be a separate issue unrelated to the erosion that affected the two locations addressed in this report.

7.0 Laboratory Testing

Laboratory testing was performed on samples collected at the site. Laboratory testing included mechanical analysis, plasticity index, corrosion, moisture content, and unconfined compression tests. Three samples were sent to the District 7 lab for corrosion test preparation. After the corrosion test sample was prepared, it was sent on to the Sacramento Translab. Testing was performed in accordance with California Test Methods and/or ASTM procedures (See Table 2 below). Laboratory test results are presented in Appendix E.

Table 2 – Laboratory Test Methods

Test	Standard
Mechanical Analysis of Soils	CTM 202, 203
Plasticity Index of Soils	CTM 204
Corrosion – Sulfate Content	CTM 417
Corrosion – Chloride content	CTM 422
Corrosion – Resistivity, pH	CTM 643
Unconfined Compression	CTM 221
Determination of Moisture Content	CTM 226

7.1 Corrosion

Bulk samples of the soil were sent to the Sacramento Translab to be tested for corrosion potential. The testing results are presented in Table 3 below. The results show that subsurface soils at the project site are considered potentially corrosive to metal and reinforced concrete (positive results are in bold print). Therefore corrosion resistant design and construction materials are necessary (Corrosion Guidelines, 1996). Caltrans currently defines a corrosive area as an area where the soil and/or water contains more than 500 PPM of chlorides, more than 2000 PPM of sulfates, and a minimum resistivity of less than 1000 ohm-centimeters or has a pH of 5.5 or less.

Table 3 – Corrosion Test Summary

Boring	Sample Depth	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (PPM)	Chloride Content (PPM)
R-001	15-21 ft.	6.39	**192**	**930**	**3600**
R-001	25-35 ft.	**3.91**	2256	-	-
R-001	39-50 ft.	**3.86**	**262**	3135	**1065**
Caltrans Corrosive Guidelines		<5.5	<1000	>2000	>500

8.0 Foundation Analysis and Recommendations

PM 11.61

Erosion within this area surrounds a drainage pipe, positioned approximately 15 feet below the street grade. The width of the erosion area is between 25 and 30 feet and is approximately 15 feet below the adjacent Roadway elevation (Appendix A). This drainage slopes west over the bluffs toward the ocean. The erosion currently is at the edge of pavement, thus the need for this study.

A **Soldier Pile Retaining wall system with treated wood or pre-cast concrete lagging** is recommended to retain the top 15 feet of soil at areas of maximum erosion. The approximate length of the wall to stabilize this roadway section is 40 feet. Two (2) foot Diameter CIDH piles with an eight-foot spacing is recommended, the piles should extend approximately 45 feet below street grade. Same pile lengths should be consistently 45 feet long, along the entire length of the soldier pile wall alignment. A total of 6 piles (5 sections) are required. The lagging for mid three sections of the wall should extend to approximately 15 feet below street grade (to the pipe level). The outer sections of the wall should retain the upper 5 feet below the street grade; this height could be adjusted in the field as needed.

The Soldier Pile Wall is designed to be constructed at a five (5) foot offset from the edge of the pavement. Since the maximum depth of lagging is 15 feet, the lower 30 feet of all piles should be poured using structural concrete, while the zones above structural concrete should be poured as needed, using a lean concrete mix, this will allow for the chipping of the lean concrete and placement of the lagging where needed. No caving is anticipated during the CIDH drilling operations, however it is recommended that all piles be pored immediately following excavation cleaning of bottoms and placement of the I-beams.

The wall can be designed based on the simplified lateral earth pressure diagram as shown in Fig. 5.5.5.6-2 of the Caltrans Bridge Design Specifications (BDS) and (Appendix B, Fig 2). The traffic surcharge is included in the triangular driving force diagram. All piles should extend at least 7 feet into a fair quality rock mass first encountered in R-002 at elevation 52. The active lateral earth pressure does not include hydrostatic forces. It is therefore imperative that free draining backfill be used to dissipate any water build up behind the wall. Additionally, after the construction of the wall, an 8-inch AC dike should be constructed at the edge of pavement to intercept run off water intrusion into the backfill behind the wall.

Structural backfill will be required at areas to fill the voids between the lagging and eroded areas along PCH see (Appendix B, Fig-1). It is recommended that the backfill be composed of pervious material such as crushed rock or gravel (1/2 or ¾ inch) with little or no fines. This type of backfill is considered self-compacting and should not require compaction or testing. A non-woven filter fabric (Mirafi N-Series, 1160 N or equivalent) shall be placed against the native soil, beneath the structural section and against the lagging. The gravelly backfill should be totally wrapped with the filter fabric in a "burrito wrap" to avoid piping. Samples of the backfill and filter fabric should be submitted for approval prior to import to the site.

However, if another type of backfill is used, it shall conform to section 19-3.065 of the May 2006 Standard Specifications. The above mentioned filter fabric shall also be used as described above. No vibratory or tamping equipment is allowed to achieve compaction.

All loose soil on which the backfill will rest on or against, should be removed to competent ground and approved by the Resident Engineer, prior to the placement of any backfill material.

Sheet Pile Wall (PM 11.65)

(Option A)

Erosion within this area appears to be a result of the run off water spilling over the slope and eroding fill material that was not properly benched into the bedrock. The depth of erosion is approximately 2-5 feet below the original slope grade. The impacted area begins at the edge of pavement and extends west about 35 feet; the width is approximately 25 feet, thus the need for this study, see Appendix A.

A **Sheet Piling Wall system** is recommended to retain the top 5-10 feet of soil at areas of maximum erosion. The approximate length of the wall to stabilize this roadway section is 40 feet. Steel Sheet Piling shall be interlocking marine grade steel sheet piling, and should extend to 20 feet below street grade. The top sheet piles should be driven to adjacent street grade, along the entire length of the wall. The layout and earth pressure diagram are shown in Appendix B Figures 3 and 4.

The Sheet Pile Wall is designed to be constructed at a five (5) foot offset from the edge of the pavement. Structural backfill will be required to bring the soil to match roadway elevations. The structural backfill should conform to Section 19-3.06 of the Standard Specifications (May 2006).

Soldier Pile Wall (PM 11.65)

(Option B)

A **Soldier Pile Retaining wall system with treated wood or pre-cast concrete lagging** could be utilized to retain the top 10 feet of soil at areas of maximum erosion. The maximum depth of erosion at this area at the time of drilling was approximately 5 feet below the ground surface, however the design as presented will have the capacity to retain 10 feet, should future erosion occur. The approximate length of the wall to stabilize this roadway section is 40 feet. Two and one half (2.5) foot Diameter CIDH piles with a ten-foot spacing was requested. The piles should extend approximately 30 feet below street grade. A total of 5 piles (4 sections) are required. The lagging for the wall should extend to a depth as specified by the Structural Engineer; this height could be adjusted in the field as needed. The lower 20 feet of all piles should be poured using structural concrete, while the zones above structural concrete may be poured as needed, using a (2-sack) lean concrete mix.

Structural backfill operations as well as quality and type of backfill material should be implemented in a manner as described earlier for the "PM 11.61" section. Figure 5 shows the Earth-Pressure diagram for the soldier pile wall system.

9.0 Recommendations

OGDS-1 recommends inspection activities of the project during and post construction as outlined below:

- It is recommended that our office be notified during drilling and construction of the CIDH piles, in addition to placement of the filter fabric and backfill behind the soldier pile wall.

- It is imperative that a dike be constructed at the edge of pavement and inspected occasionally to retard the flow of runoff water over the slope.

- We recommended that the Slope Inclinometer readings be conducted quarterly. The monitoring episodes can be suspended after three consecutive readings showing no movement. The SI could be left in place should any future surface distress be evident.

- All drainage facilities within the vicinity of the distressed areas should be inspected for blockage and or leakage.

- If the sheet pile option is selected, it is expected that the material to be encountered during driving the, consists of siltstone and claystone of the Capistrano Formation. The contractor should anticipate these kinds of materials during the sheet pile installation.

- As discussed in Section 6.1 of this report, bedrock material of the Capistrano Formation with unconfined compression test results up to about 65 psi should be expected from the ground surface to the pile tips. The drilling contractor should have the correct drilling equipment to effectively penetrate these materials.

- Any aesthetic panels covering the retaining wall systems (particularly, the Soldier-Pile Systems) should provide for drainage of any water build up behind the wall.

- A minimum two (2) foot wide earthen bench should be left in place in front of the retaining walls to be located about two (2) feet above the bottom of the lagging.

If you have any questions or comments, please call Kristopher Barker at (213) 620-2334 or Nadeem Srour at (213) 620-2377.

Prepared by: Date: 6/18/09

Supervised by: Date: 6/18/09

REGISTERED PROFESSIONAL ENGINEER
NADEEM SROUR
No. 2801
Exp. 12/31/09
GEOTECHNICAL
STATE OF CALIFORNIA

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for Kris Barker

KRISTOPHER BARKER, C.E.G.
Engineering Geologist
Geotechnical Design – South 1
Branch B

Attachments:
Appendix A – Photos
Appendix B – Figures 1 through 5
Appendix C – Boring Logs
Appendix D – Slope Inclinometer Data
Appendix E – Laboratory test results

cc: OGDS1 – Los Angeles File
OGDS1 – SAC File (MS-5)
GS – SAC File (MS-5)
Nooshin Yoosefi (D-12 project management)
Jason Yeung (D-12 Maintenance Engineering)
Howard Ng (Structural Design Diamond bar)
Carl Duan (Structural Design Diamond bar)

7.0 References

California Division of Mines and Geology, **State of California Seismic Hazard Zones, Laguna Beach Quadrangle,** 1998.

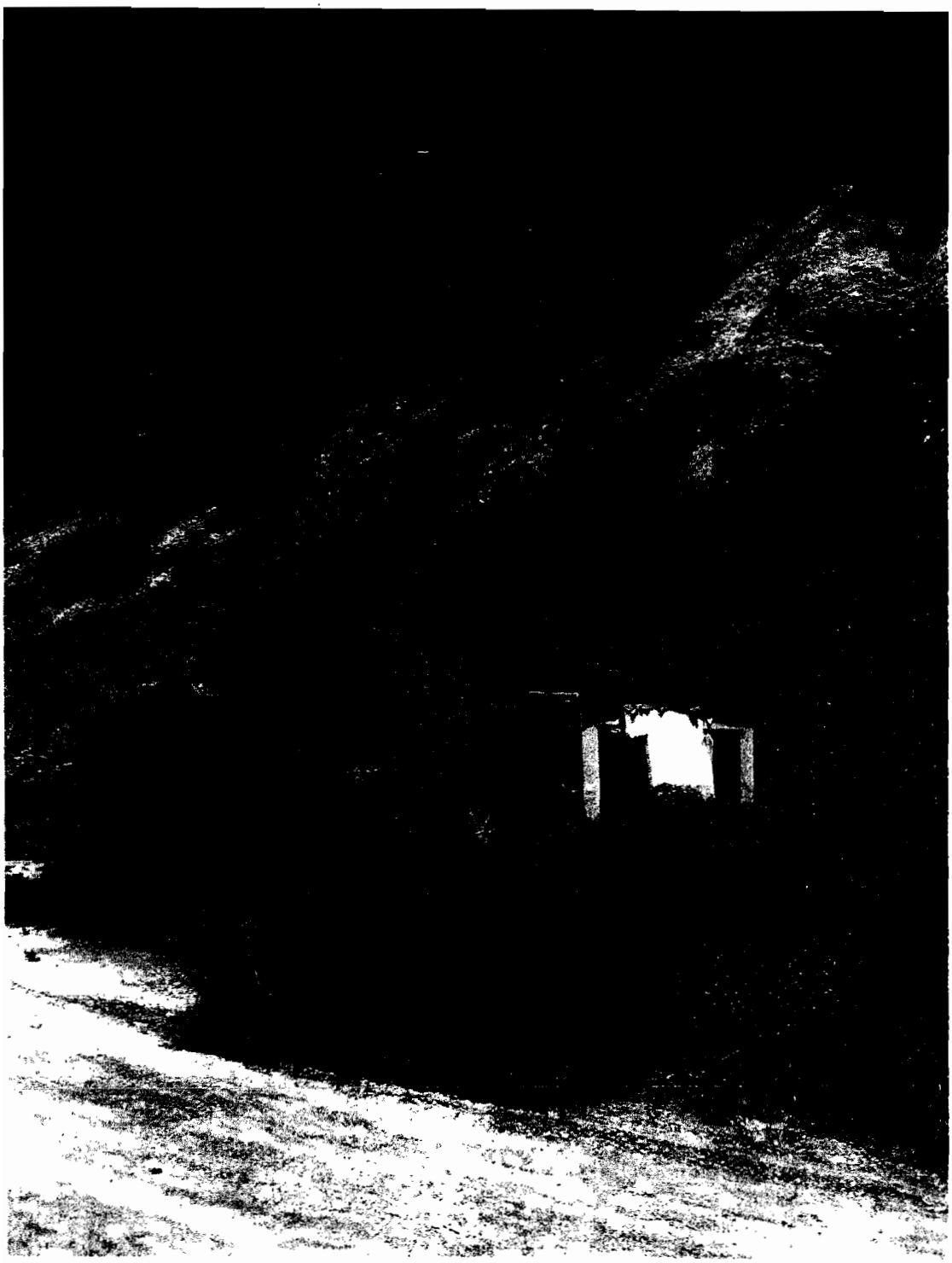
California Division of Mines and Geology, **Geologic Map of Orange County, California, Showing Mines and Mineral Deposits,** 1981.

Mualchin, L., **A Technical Report to Accompany the Caltrans California Seismic Hazard Map 1996: Based on Maximum Credible Earthquakes (MCE),** 1996.

Mualchin, L., **California Seismic Hazard Map 1996: Based on Maximum Credible Earthquakes (MCE)**, 1996.

Appendix A
Photos

Postmile 11.61



Postmile 11.65

Appendix B:
Figures 1 to 5

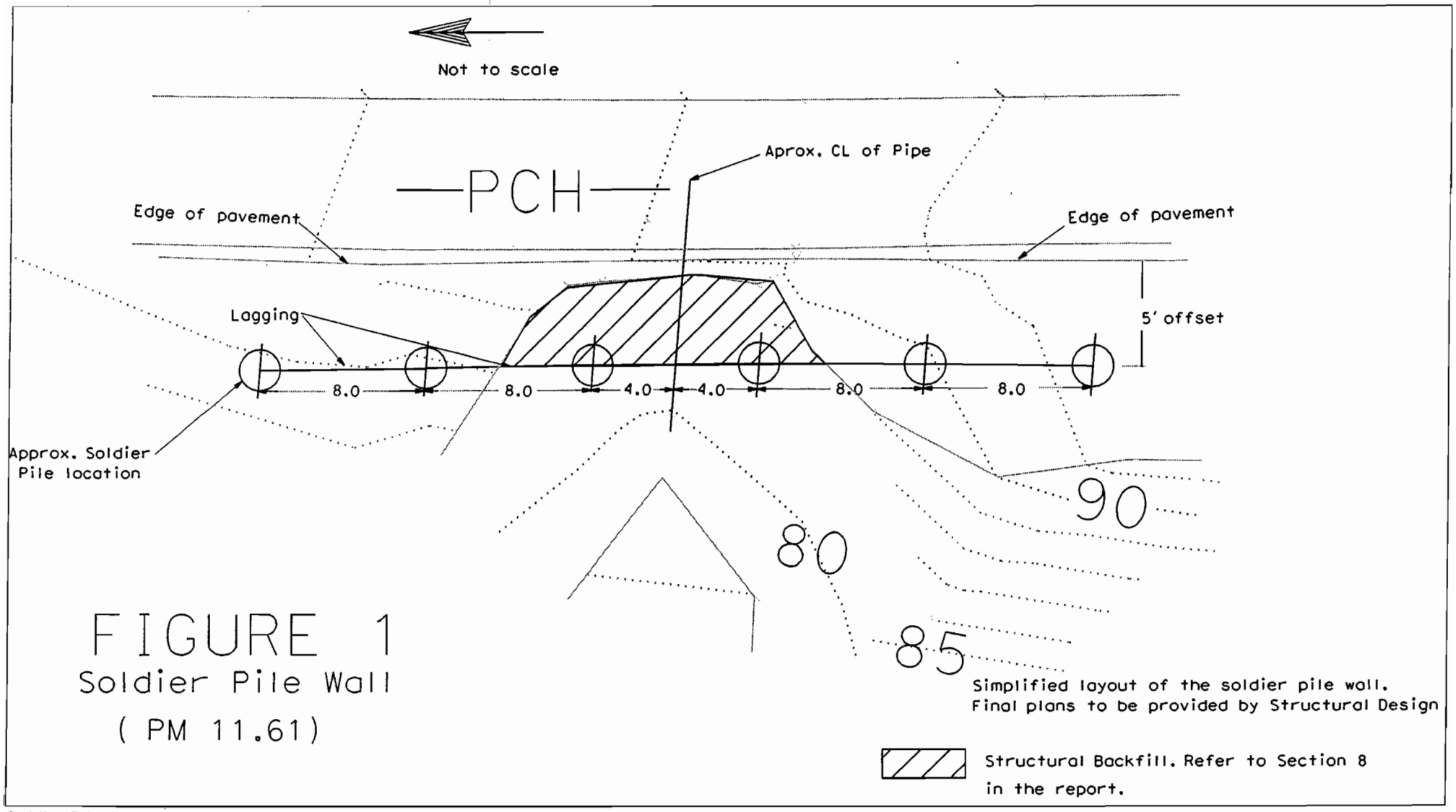
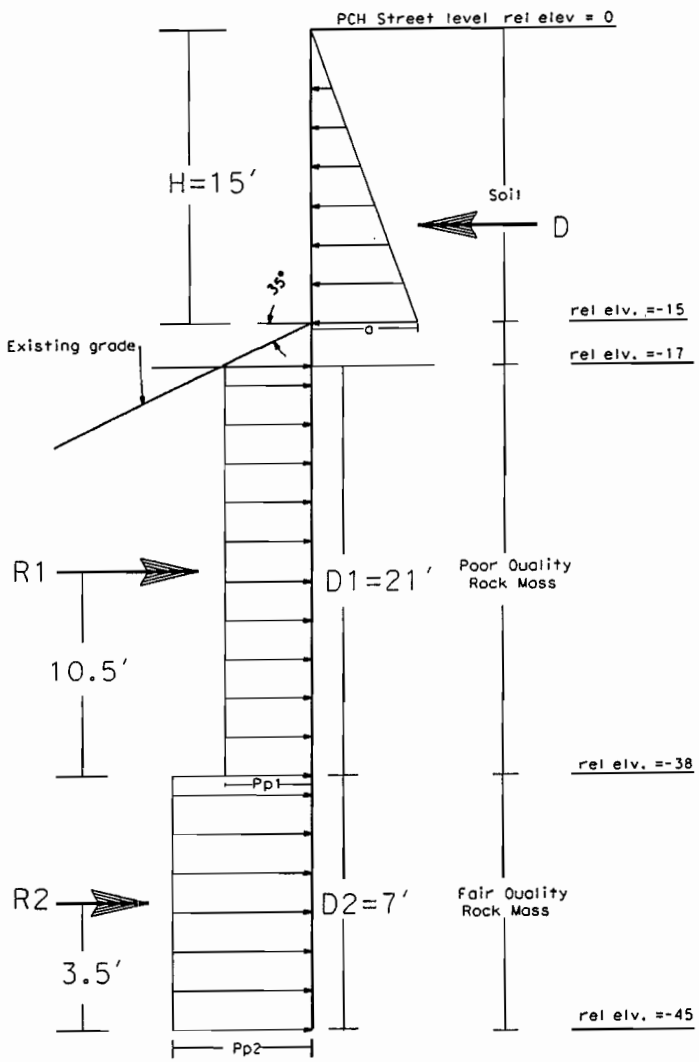


FIGURE 1
Soldier Pile Wall
(PM 11.61)

Soldier Pile.dgn 2/4/2009 3:35:34 PM



Driving Force (active)

Driving force D per 8 foot wide section 54.72 Kips
(a= 0.912 kips/sq. ft.)

Passive Resistance

Pp1= 8 Kips/foot
R1= 8x21=168 kips

Pp2=10.64 Kips/foot
R2= 10x7=74.5 Kips

Figure 2
Not to scale

Earth Pressure Diagram

Soldier Pile wall

Soldier Pile.dgn 2/11/2009 6:33:37 AM

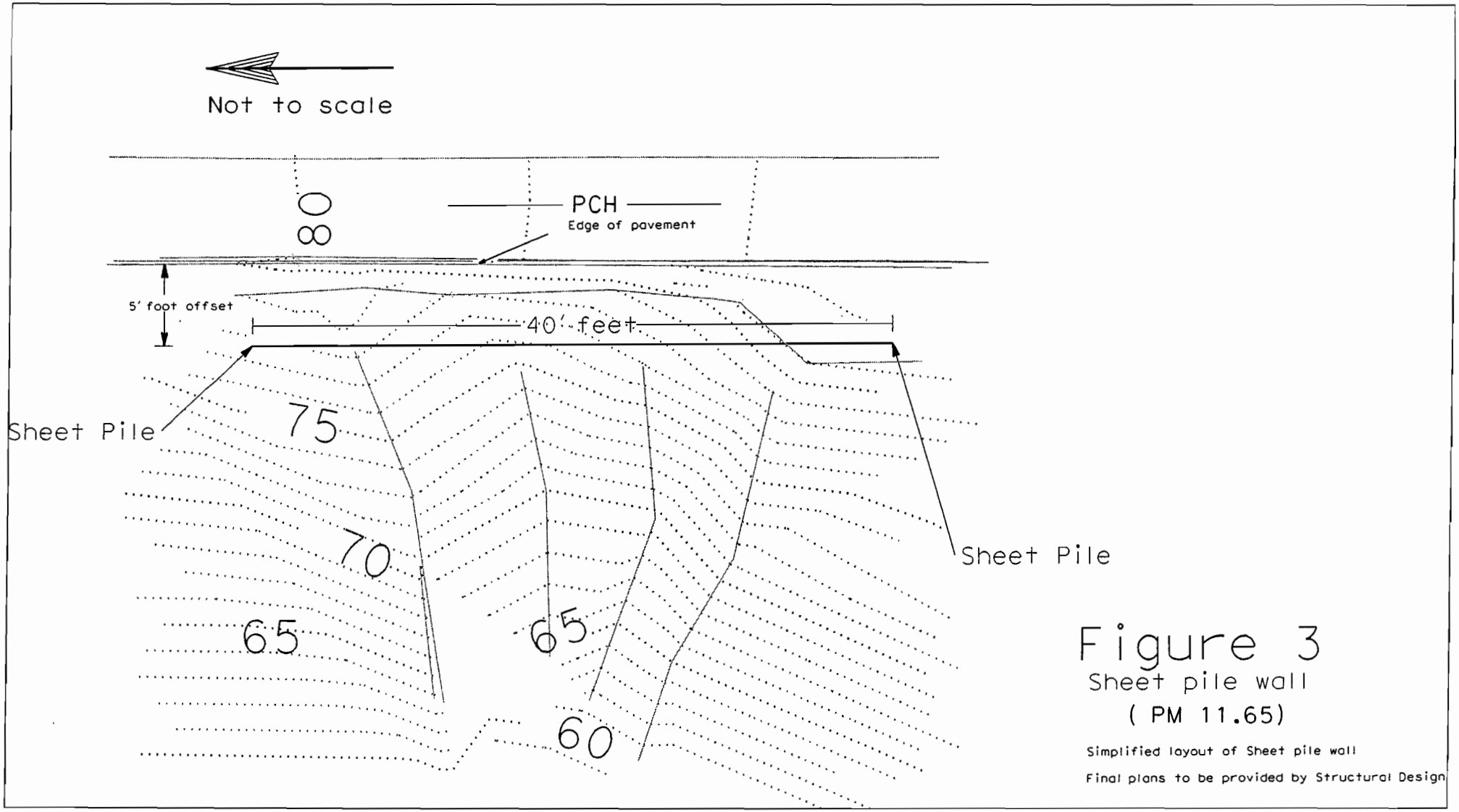


Figure 3

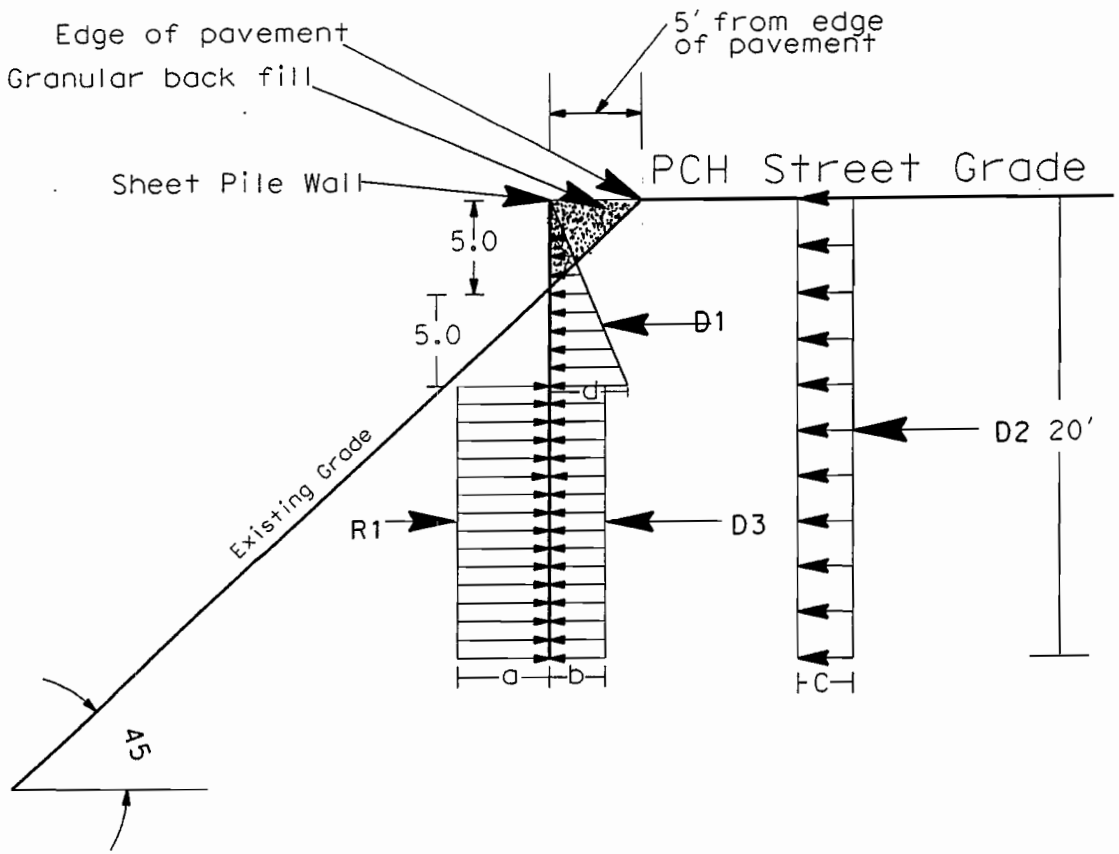
Sheet pile wall

(PM 11.65)

Simplified layout of Sheet pile wall

Final plans to be provided by Structural Design

Sheet Pile.dgn 2/4/2009 3:29:48 PM



Driving force D1 =1.93 Kips
(d= .387 Kips/ sq. ft)

b=0 D3=0

C=0.08 kips/foot

D2= .08x20 =1.6 kips

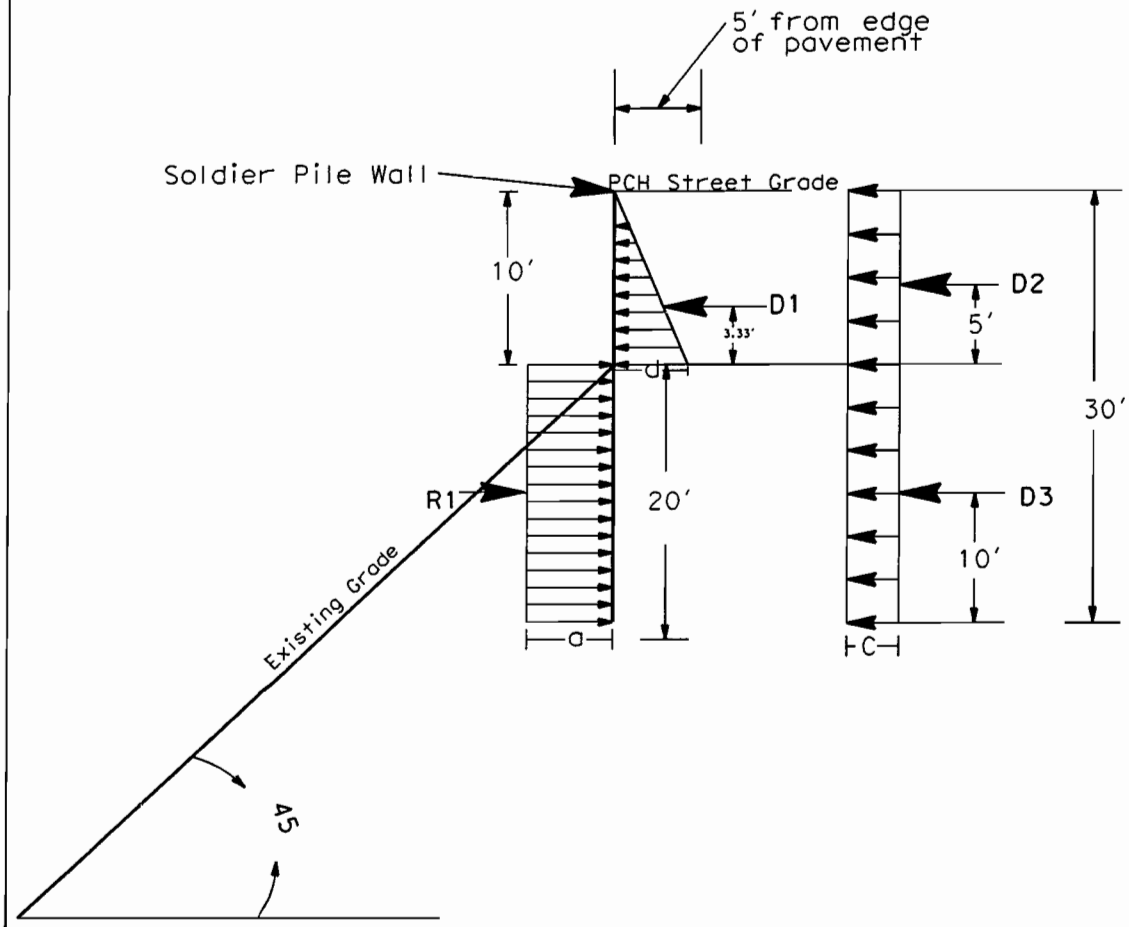
Passive Resistance

a = 1.78 kips/ foot

R1=1.78x10 =17.8 kips

Figure 4
Earth Pressure Diagram
Sheet Pile Wall

Sheet Pile.dgn 2/11/2009 6:27:54 AM



(d= .387 Kips/ sq. ft)

Driving force D1 =19.35 Kips

C= 0.074 kips/ Square foot

D2= (.074x10x10)/1000 =7.4 kips

D3= (.074x20x2.5)/1000 =3.7 kips

Passive Resistance

a = (2Su/1-Tan 45) =1.78 kips/ square foot

R1=20x2.5x1.78 =89 kips

Figure 5

Earth Pressure Diagram

Soldier pile / lagging Wall

Sheet Pile.dgn 6/17/2009 8:05:39 AM

Appendix C:
Boring Logs

0.003" line thickness
0.007" line thickness
0.014" line thickness
0.020" line thickness

Lt Sta

R-08-001

EL.

4"

Depth, feet | Elevation, feet

Depth, feet	Elevation, feet
0	
5	
10	
15	
20	
25	
30	
35	
40	
45	
50	
55	
60	

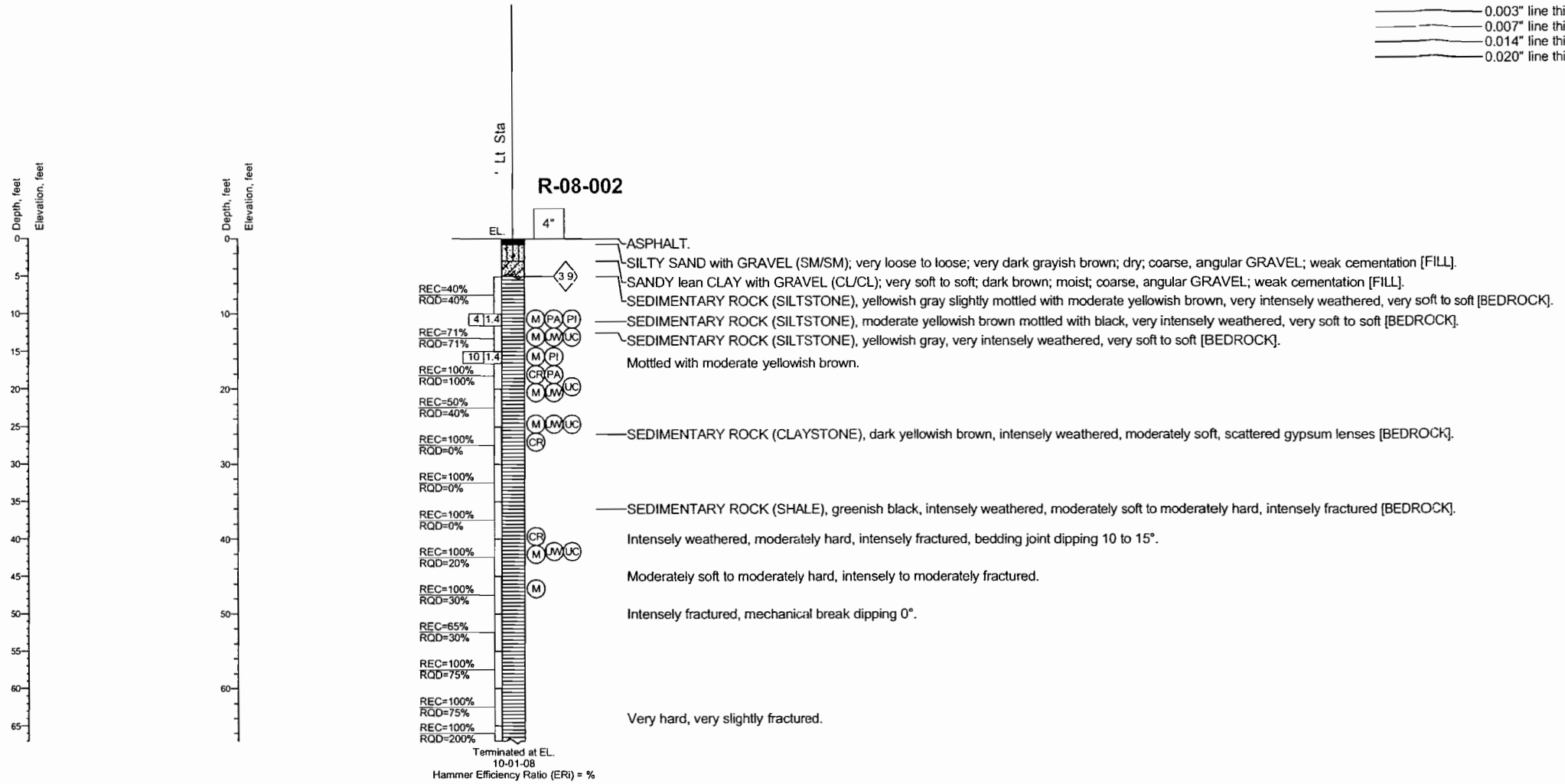
			ASPHALT.
			SILTY SAND with GRAVEL (SM/SM); very loose to loose; very dark grayish brown; dry to moist; angular GRAVEL; medium SAND; weak cementation [FILL].
			At EL. , grades to (SANDY lean CLAY with GRAVEL) (CL/CL); soft to medium stiff; dark brown; dry to moist; angular GRAVEL; medium SAND; weak to moderate cementation.
4	1.4	M PA (3.9)	SEDIMENTARY ROCK (CLAYSTONE), moderate yellowish brown slightly mottled with black, intensely weathered, very soft [BEDROCK].
19	1.4	M PA PI	At EL. , becomes mottled with yellowish gray, soft.
		M MW UC	SEDIMENTARY ROCK (CLAYSTONE), moderate yellowish brown mottled with yellowish gray, moderately weathered, hard [BEDROCK].
		M	At EL. , grades to intensely to moderately weathered, moderately soft.
		M UW UC	SEDIMENTARY ROCK (SHALE), laminated to very thinly bedded, olive black, intensely to moderately weathered, moderately soft to moderately hard [BEDROCK].
		M	Intensely to moderately fractured, bedding plane separation dipping 10 to 15°.
			Moderately fractured, incipient fracture dipping 30 to 45°.
			Intensely to moderately fractured.
		M	Intensely fractured.

REC=0%	RQD=0%
REC=86%	RQD=119%
REC=40%	RQD=0%
REC=100%	RQD=95%
REC=100%	RQD=80%
REC=100%	RQD=90%
REC=100%	RQD=0%
REC=70%	RQD=60%
REC=100%	RQD=30%
REC=100%	RQD=0%
REC=100%	RQD=25%

Terminated at EL.
09-30-08
Hammer Efficiency Ratio (ERI) = %

CALTRANS RD1/ART1 GTB MET ENG 12/R2700.GPJ | CALTRANS LIBRARY 04/09/09,GLB 2/2/09

0.003" line thickness
0.007" line thickness
0.014" line thickness
0.020" line thickness



ASPHALT.

SILTY SAND with GRAVEL (SM/SM); very loose to loose; very dark grayish brown; dry; coarse, angular GRAVEL; weak cementation [FILL].

SANDY lean CLAY with GRAVEL (CL/CL); very soft to soft; dark brown; moist; coarse, angular GRAVEL; weak cementation [FILL].

SEDIMENTARY ROCK (SILTSTONE), yellowish gray slightly mottled with moderate yellowish brown, very intensely weathered, very soft to soft [BEDROCK].

SEDIMENTARY ROCK (SILTSTONE), moderate yellowish brown mottled with black, very intensely weathered, very soft to soft [BEDROCK].

SEDIMENTARY ROCK (SILTSTONE), yellowish gray, very intensely weathered, very soft to soft [BEDROCK].

Mottled with moderate yellowish brown.

SEDIMENTARY ROCK (CLAYSTONE), dark yellowish brown, intensely weathered, moderately soft, scattered gypsum lenses [BEDROCK].

SEDIMENTARY ROCK (SHALE), greenish black, intensely weathered, moderately soft to moderately hard, intensely fractured [BEDROCK].

Intensely weathered, moderately hard, intensely fractured, bedding joint dipping 10 to 15°.

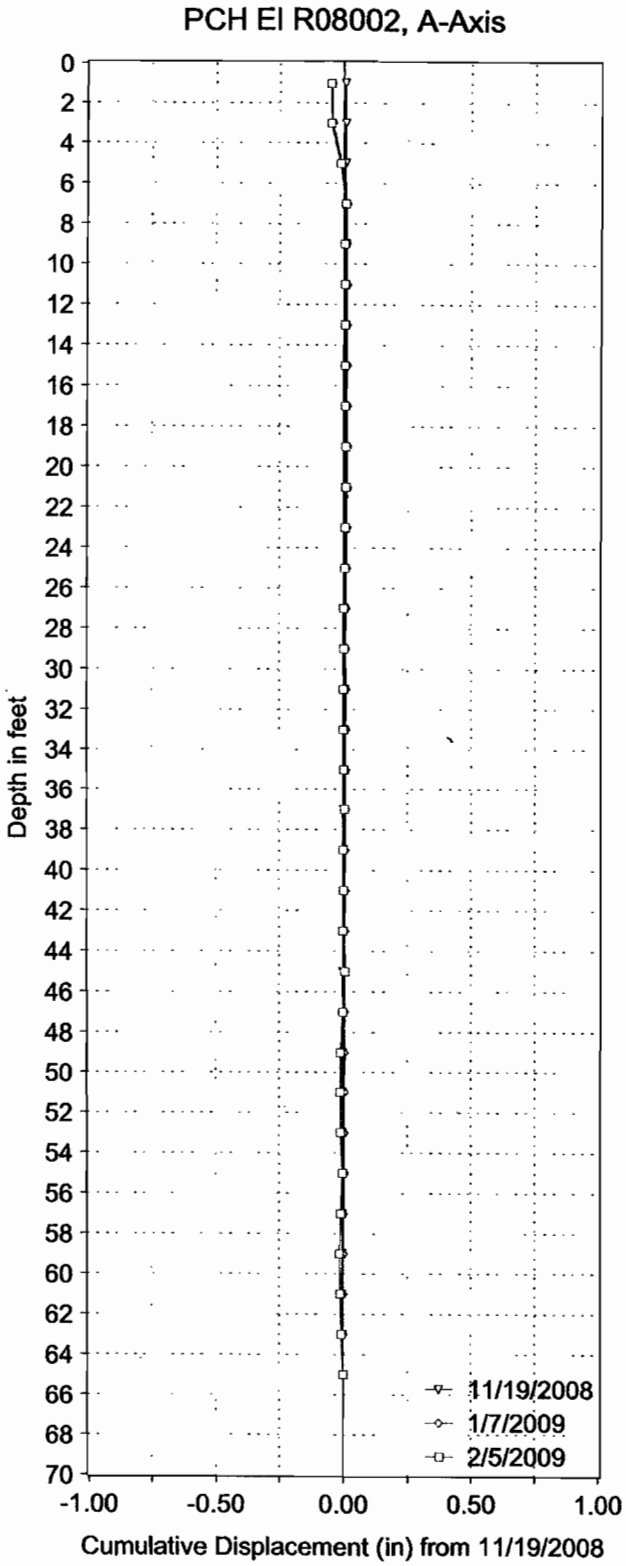
Moderately soft to moderately hard, intensely to moderately fractured.

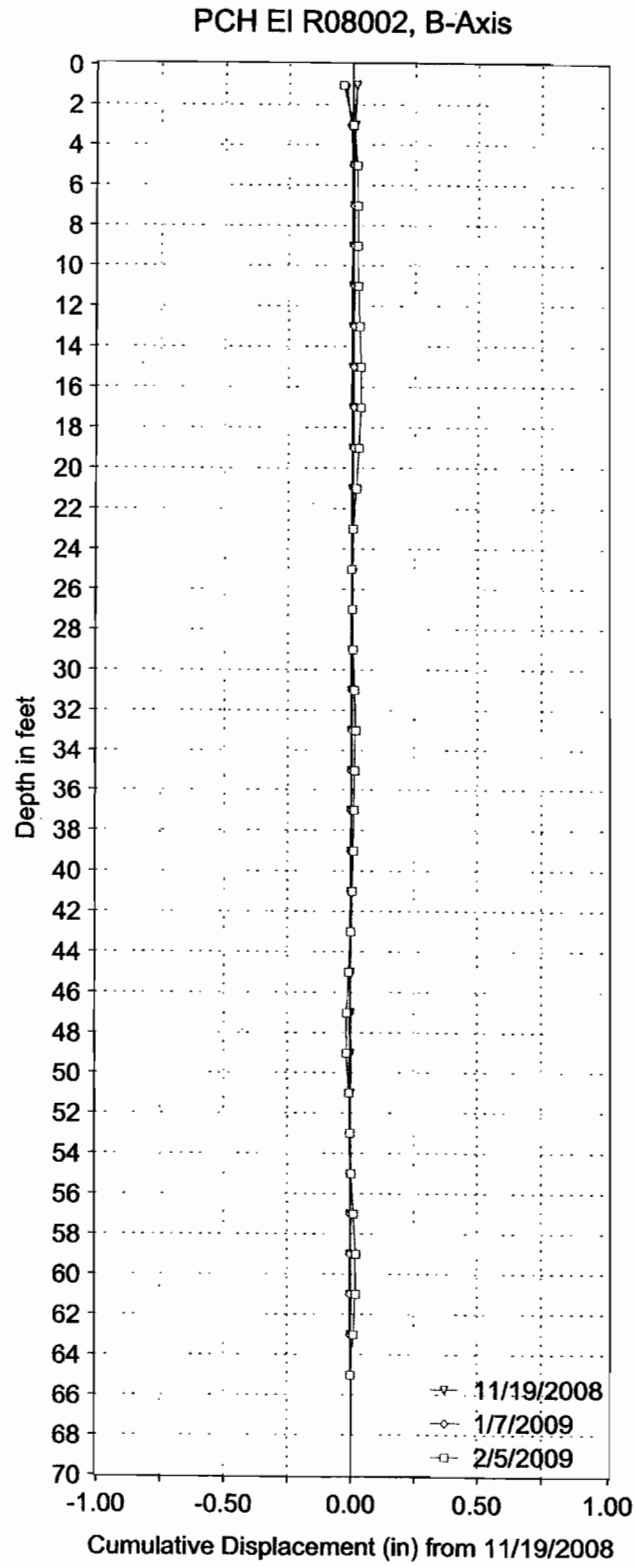
Intensely fractured, mechanical break dipping 0°.

Very hard, very slightly fractured.

CALTRANS HISTORY LOTUS NOTES ENG 12-OKJ701.CP2 CALTRANS LIBRARY 04/09/08 GLB 2/3/09

Appendix D
Slope Inclinometer Data





INCLINOMETER MONITORING RESULTS

12-ORA-001-PM 11.50 / 12.03
PCH / EL MORO SLOPE EROSION
E.A. No.: 12-0k3700

Depth of Inclinometer Casing: 65 feet
Ao Direction: 140° (Magnetic North)
Location (WGS-84) : N/A

Appendix E
Laboratory Test Results

RECEIVED 01/22/09

DIVISION OF
ENGINEERING SERVICES
OFFICE OF ENGINEERING SUPPORT
GEOTECHNICAL LABORATORY
5900 Folsom Boulevard
Sacramento, CA 95819

Date: 1/16/2009

To: Kristopher Barker / GDS-1

From: Lilibeth C. Purta / (916) 227-5434

RE: Laboratory Test Report -- EA: 12-0K3700
GL 08-169

Final test results.

Note: All remaining test specimens will be disposed of in 30 calendar days from the release date of the final test results.

AASHTO R18

RECEIVED 01/22/09

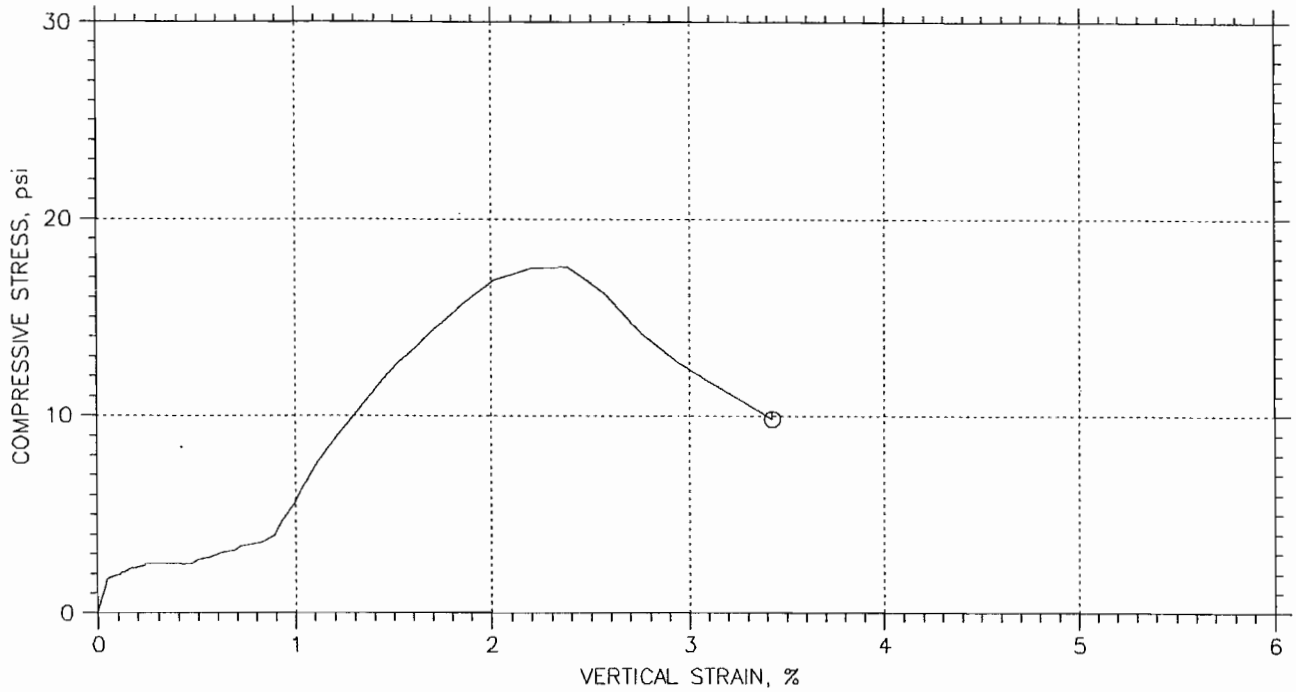
CALIFORNIA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL LABORATORY

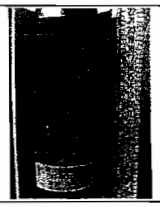
GL TRACKING NO : 08-169
Dist - EA: 12-0K3700
Report Date: January 16, 2009
Page: 1/1

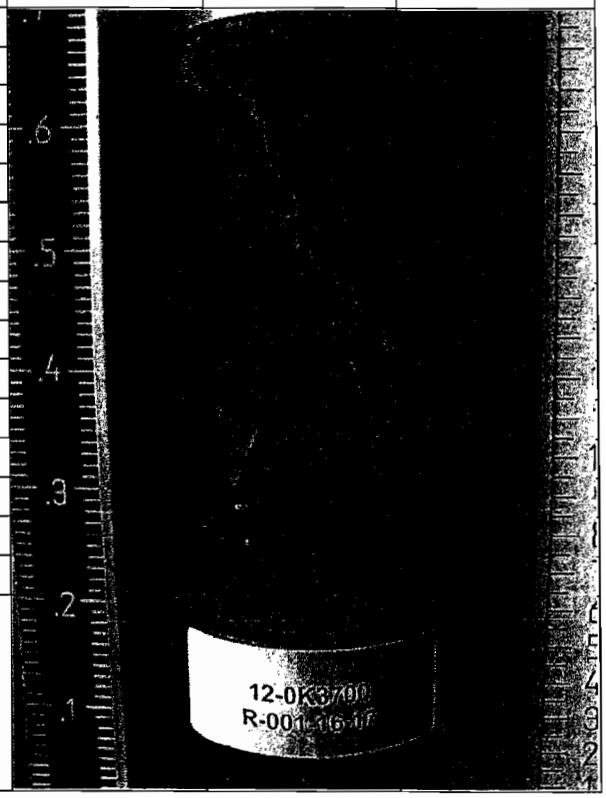
CLASSIFICATION TEST SUMMARY

SAMPLE ID	% FINER THAN																	ATTERBERG LIMITS		AS RECEIVED		Gs
	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	5μ	1μ	LL	PI	γd (pcf)	%m	
R-001_16-17'																					26.5	
R-001_27-28'																					31.3	
R-001_35-35.5'																					29.8	
R-001_40-40.5'																					24.8	
R-001_52-52.5'																					24.5	
R-001_S-1										100	99	97	73	62	59	28	16	38	21		29.1	
R-001_S-2					100	89	89	89	78	73	69	67	65	64	61	29	18	48	24		20.9	
R-002_10-11'																					44.6	
R-002_15-21'																						
R-002_19-19.5'																					33.4	
R-002_24-25'																					30.8	
R-002_25-35'																						
R-002_39-50'																						
R-002_41-42'																					16.0	
R-002_46-47'																					22.0	
R-002_S-1										100	99	98	95	91	86	61	40	79	49		59.6	
R-002_S-2										100	99	97	95	91	85	49	27	62	32		36.0	

UNCONFINED COMPRESSION TEST REPORT



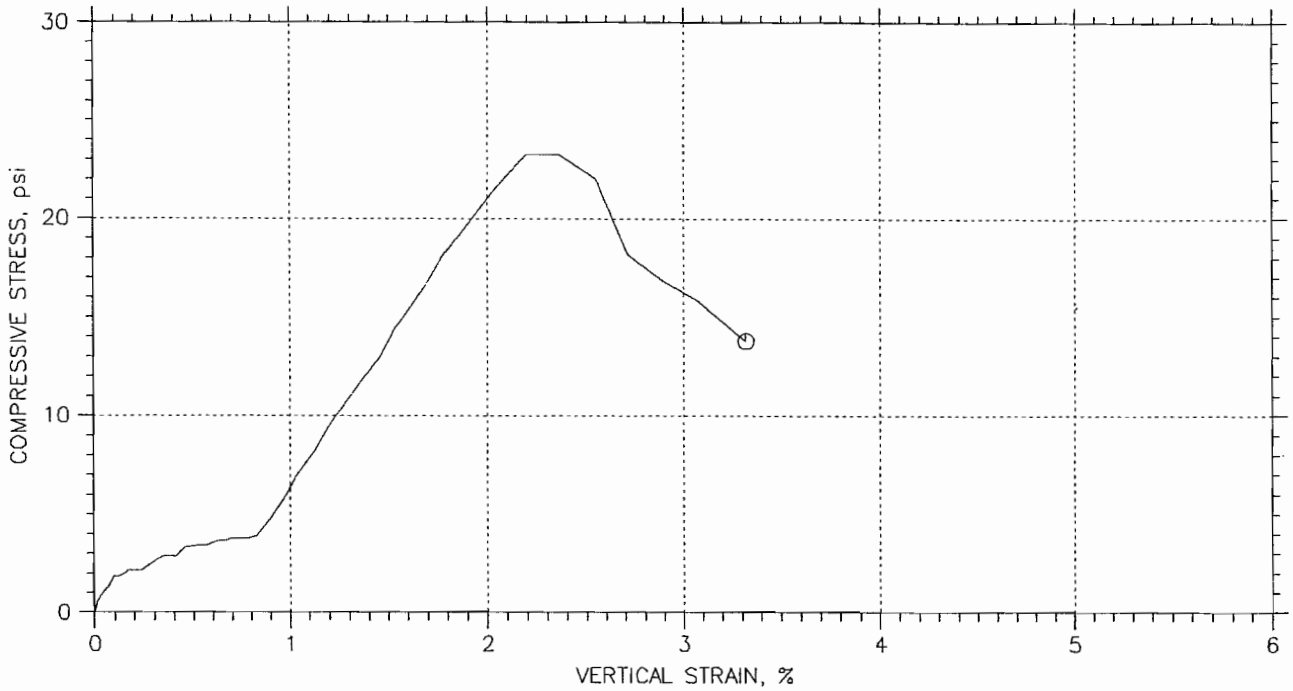
Symbol		⊙
Test No.		Q08-420
Initial	Diameter, in	2.46
	Height, in	5.3
	Water Content, %	26.52
	Dry Density, pcf	98.86
	Saturation, %	
	Void Ratio	
Unconfined Compressive Strength, psi		17.57
Undrained Shear Strength, psi		
Time to Failure, min		
Strain Rate, %/min		1
Implied Specific Gravity		
Liquid Limit		---
Plastic Limit		---
Plasticity Index		---
Failure Sketch		

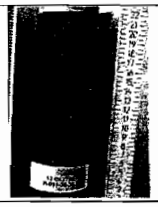


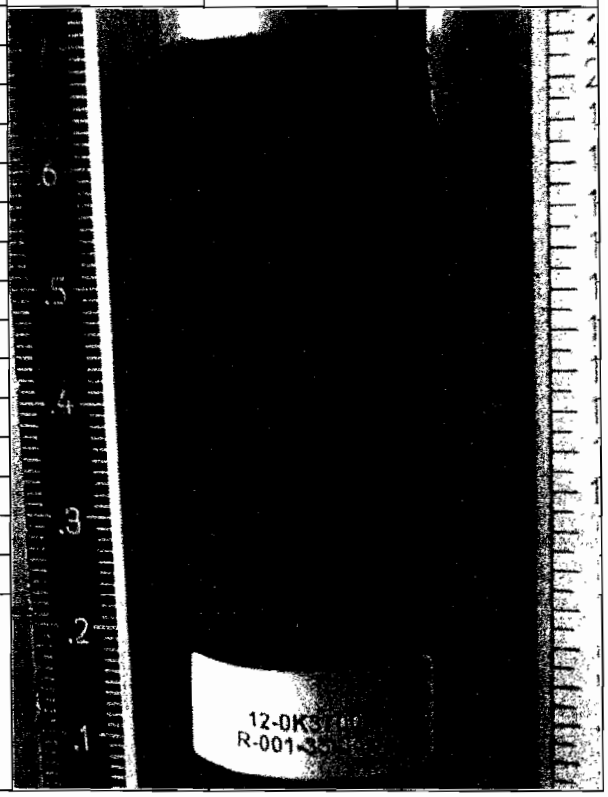
Caltrans	Project: PCH/El MORO SLOPE
	Location: 12-ORA-1-11.5-12.03
	Project No.: 12-0K3700
	Boring No.: R-001
	Sample No. : 16-17
	Description: DAMP, MOIST, TAN SILTY CLAY
	Remarks: ASTM D 2166. WP 1/16

Thu, 15-JAN-2009 15:39:21

UNCONFINED COMPRESSION TEST REPORT



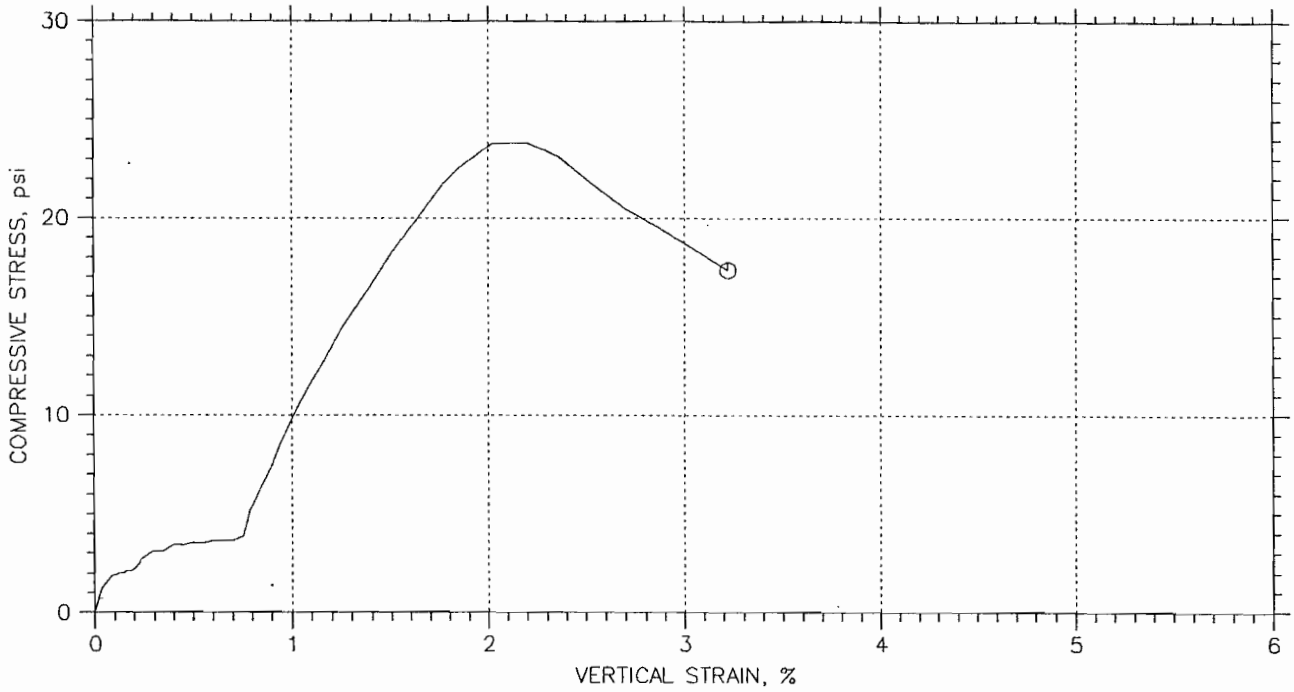
Symbol		⦶
Test No.		Q08-422
Initial	Diameter, in	2.4
	Height, in	5.61
	Water Content, %	29.79
	Dry Density, pcf	87.88
	Saturation, %	
	Void Ratio	
Unconfined Compressive Strength, psi		23.26
Undrained Shear Strength, psi		
Time to Failure, min		
Strain Rate, %/min		1
Implied Specific Gravity		
Liquid Limit		---
Plastic Limit		---
Plasticity Index		---
Failure Sketch		

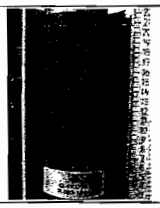
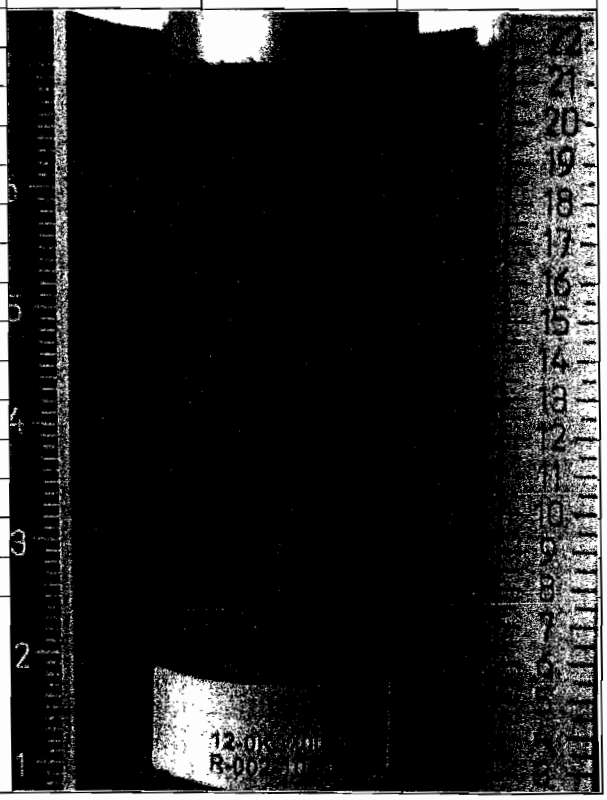


Caltrans	Project: PCH/El MORO SLOPE
	Location: 12-ORA-1-11.5-12.03
	Project No.: 12-0K3700
	Boring No.: R-001
	Sample No. : 35-35.5
	Description: DAMP, MOIST, BROWN SILTY CLAY
	Remarks: ASTM D 2166.

Thu, 15-JAN-2009 15:52:13

UNCONFINED COMPRESSION TEST REPORT



Symbol		⏲		
Test No.		Q08-425		
Initial	Diameter, in	2.41		
	Height, in	5.67		
	Water Content, %	44.58		
	Dry Density, pcf	81.36		
	Saturation, %			
	Void Ratio			
Unconfined Compressive Strength, psi		23.87		
Undrained Shear Strength, psi				
Time to Failure, min				
Strain Rate, %/min		1		
Implied Specific Gravity				
Liquid Limit		---		
Plastic Limit		---		
Plasticity Index		---		
Failure Sketch				

Caltrans	Project: PCH/El MORO SLOPE
	Location: 12-ORA-1-11.5-12.03
	Project No.: 12-0K3700
	Boring No.: R-002
	Sample No. : 10-11'
	Description: DAMP, MOIST, TAN SILTY CLAY
	Remarks: ASTM D 2166. WP 1/16

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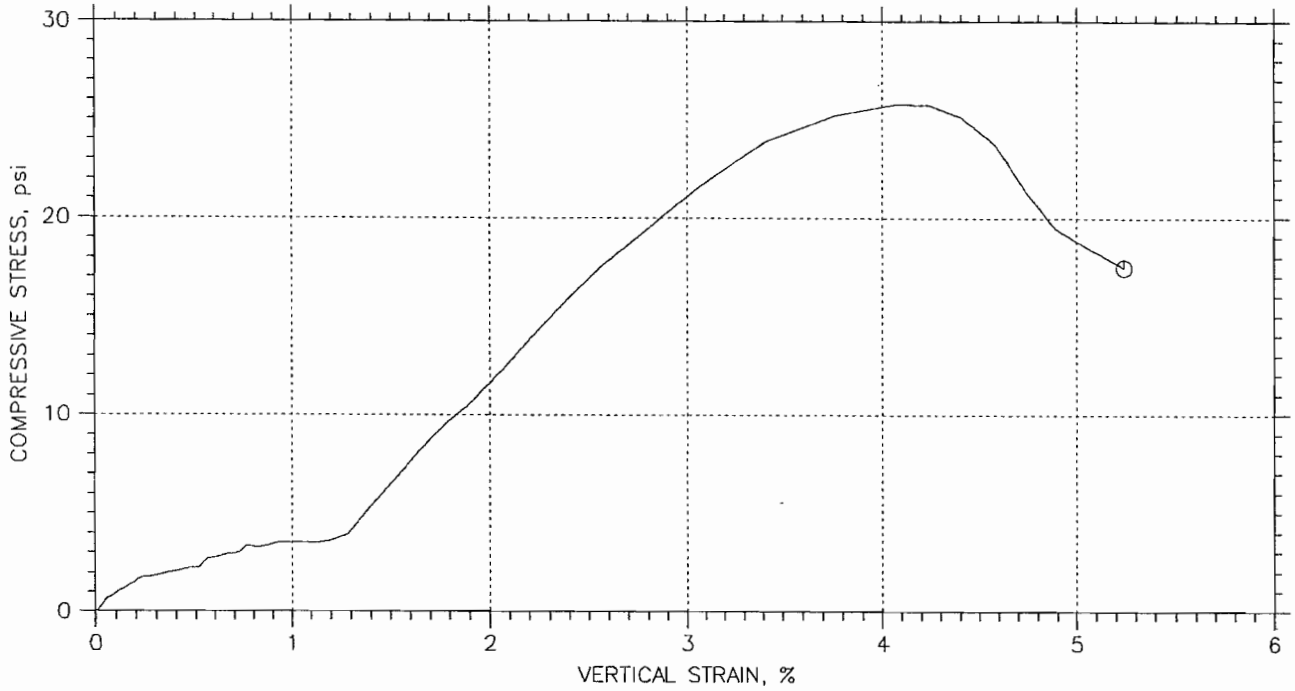
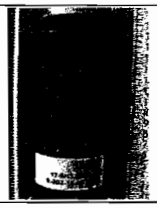
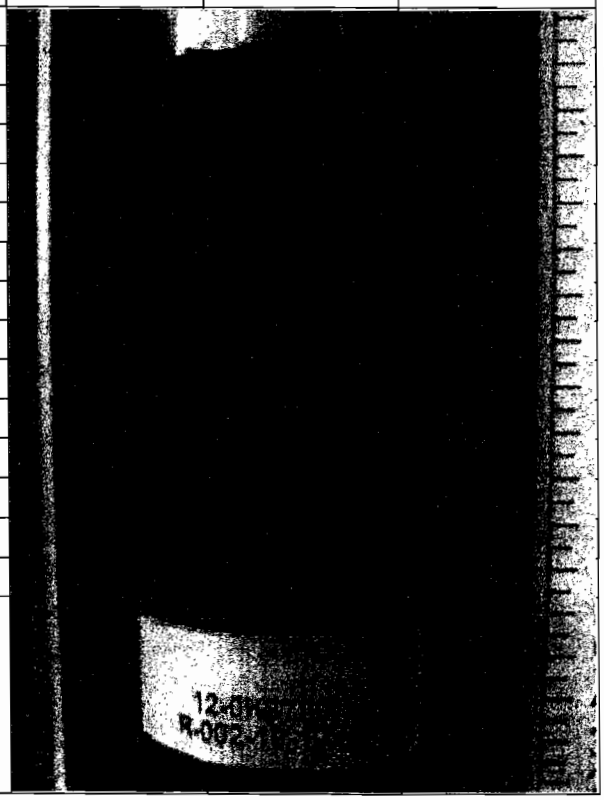
UNCONFINED COMPRESSION TEST REPORT



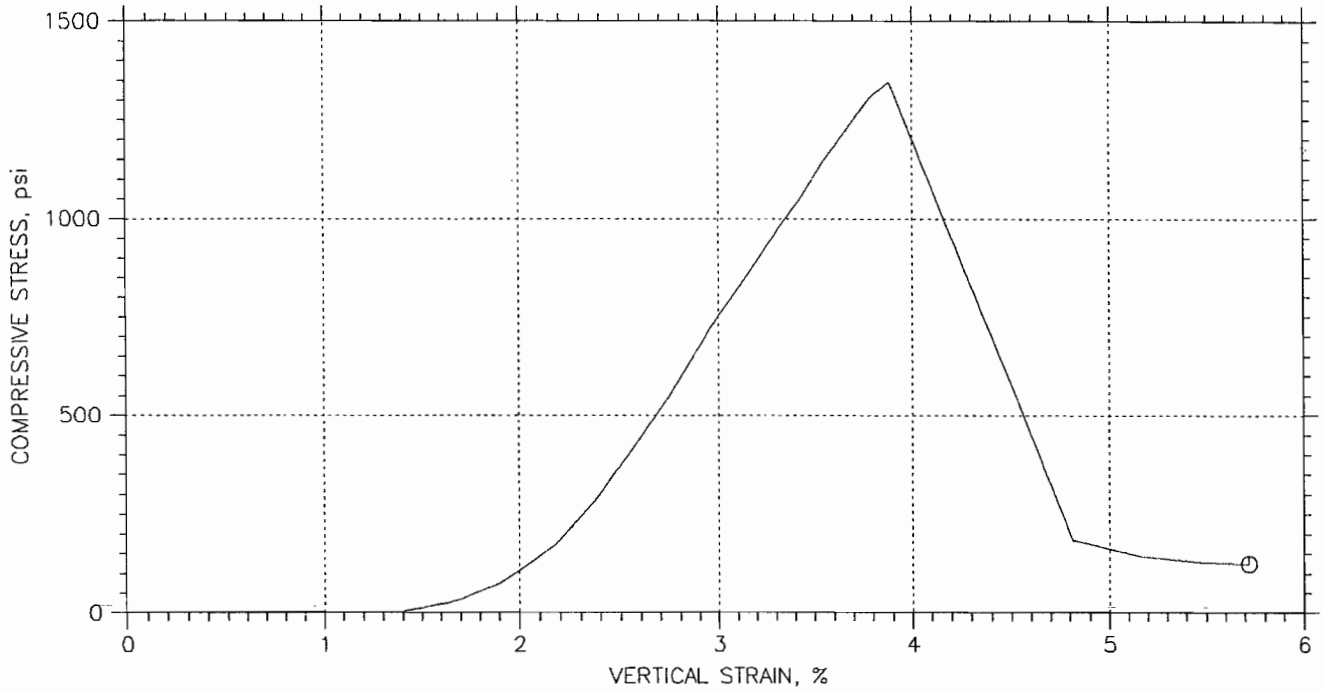
Symbol		⏲
Test No.		Q08-426
Initial	Diameter, in	2.42
	Height, in	4.32
	Water Content, %	33.40
	Dry Density, pcf	86.55
	Saturation, %	
	Void Ratio	
Unconfined Compressive Strength, psi		25.8
Undrained Shear Strength, psi		
Time to Failure, min		
Strain Rate, %/min		1
Implied Specific Gravity		
Liquid Limit		---
Plastic Limit		---
Plasticity Index		---
Failure Sketch		

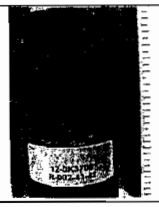


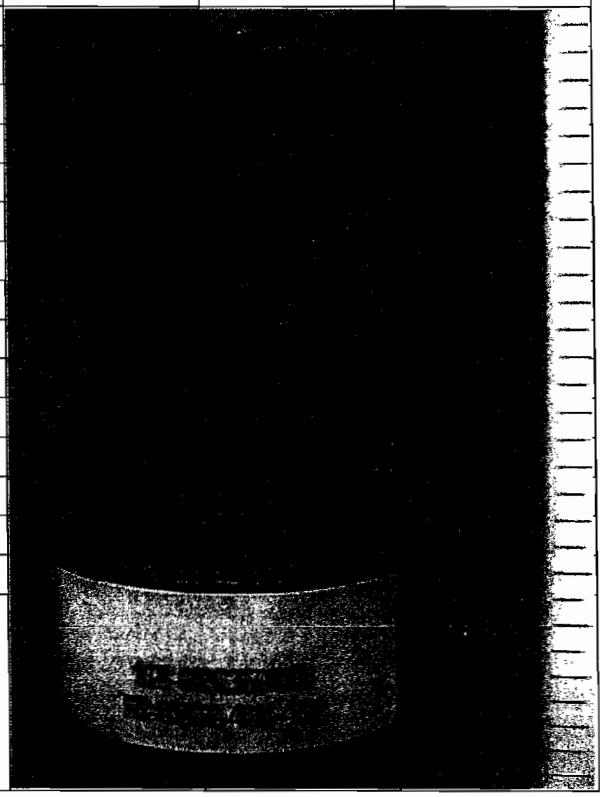
Caltrans	Project: PCH/El MORO SLOPE
	Location: 12-ORA-1-11.5-12.03
	Project No.: 12-0K3700
	Boring No.: R-002
	Sample Type: 19-19.5'
	Description: DAMP, MOIST, TAN SILTY CLAY
	Remarks: ASTM D 2166.

Thu, 15-JAN-2009 16:31:44

UNCONFINED COMPRESSION TEST REPORT



Symbol		⦶
Test No.		Q08-428
Initial	Diameter, in	2.38
	Height, in	3.23
	Water Content, %	15.98
	Dry Density, pcf	110.5
	Saturation, %	
	Void Ratio	
Unconfined Compressive Strength, psi		1346
Undrained Shear Strength, psi		
Time to Failure, min		
Strain Rate, %/min		1
Implied Specific Gravity		
Liquid Limit		---
Plastic Limit		---
Plasticity Index		---
Failure Sketch		



Caltrans	Project: PCH/El MORO SLOPE
	Location: 12-ORA-1-11.5-12.03
	Project No.: 12-0K3700
	Boring No.: R-002
	Sample No. : 41-42'
	Description: DAMP, MOIST,DARK BROWN MUDSTONE ; L/D < 2.0
	Remarks: ASTM D 2166. WP 1/16

Thu, 15-JAN-2009 16:45:46