

INTERIM REPORT  
SLOPE INCLINOMETER INSTALLATION AND  
MONITORING PROGRAM  
OPEN SPACE SLOPE BELOW LOTS 59 THROUGH 61  
PEBBLE BEACH DRIVE  
CLAYTON, CALIFORNIA

FOR  
OAKHURST GEOLOGIC HAZARD  
ABATEMENT DISTRICT  
August 10, 2007

Job No. 2947.100

## Via E-Mail and Mail

August 10, 2007  
Job No. 2947.100



Oakhurst Geologic Hazard Abatement District  
C/o Permco Engineering  
1005 Oak Street  
Clayton, California 94517

Attention: Mr. Rick Angrisani

Subject: Interim Report  
Slope Inclinometer Installation and Monitoring Program  
Open Space Slope Below Lots 59 through 61  
Pebble Beach Drive  
Clayton, California

Gentlemen:

### **INTRODUCTION**

This report presents the interim results of our slope inclinometer installation and monitoring program for the open space slope located on the north side of Pebble Beach Drive below Lots 59 through 61 of the Peacock Ridge subdivision portion of the Oakhurst development in Clayton, California. The open space slope is up to about 220 feet tall the upper 95 feet of which is a fill slope at a gradient of 2 horizontal to 1 vertical (2H:1V) and slopes to the north. The slope includes a bench with a concrete lined v-ditch. Occupied residential lots are located along the top of slope, on the north side of Pebble Beach Drive. Based on our discussion with you, as well as our site reconnaissance, horizontal separations up to about 2½ inches wide have been observed at the interface between the driveway and sidewalk in front of Lots 59 through 61.

We have been provided with the geotechnical reports prepared for the development by Hallenbeck & Associates including the Geotechnical Engineering Investigation report dated August 3, 1987 (2 volumes) and the Supplemental Geotechnical Engineering Investigations (Phase 1 dated April 1, 1988 and Phase 2 dated January 17, 1989). We also received a copy of the record [grading] plans prepared by UDI-TETRAD Consulting Engineers Inc., signed and dated on October 9, 1996.

### **PURPOSE AND SCOPE OF SERVICES**

The purpose of this project was to install two slope inclinometers at the site in order to monitor suspected subsurface movements underlying the open space slope below Lots 59 through 61 of the Peacock Ridge portion of the Oakhurst development. Our scope of services included review of published geologic maps and literature covering the site, review of stereo-paired aerial photographs covering the site vicinity, review of previous geotechnical reports for the site, installation of two slope inclinometers, and taking quarterly readings from the two slope inclinometers installed as part of this project for a period of three years (on-going), and preparation of this report.



## **SLOPE INCLINOMETER INSTALLATION AND LABORATORY TESTING PROGRAM**

The slope inclinometers for the project were installed between January 13 and February 5, 2007 and included drilling and logging of two borings (SI-1 and SI-2) and installation of slope inclinometer casings in the two bore holes. Boring SI-1 was drilled with a truck-mounted drill rig equipped with a solid flight auger to a depth of about 63 feet. Boring SI-2 was drilled with a track-mounted rotary wash drill rig to a depth of about 130 feet. Drive samples were collected at roughly 5-foot vertical intervals as drilling advanced. Slope inclinometer casings were installed and grouted into each boring, SI-1 and SI-2 respectively. A representative from Contra Costa County Environmental Health observed the grouting operations in accordance with agency requirements.

Our laboratory-testing program for this project included testing for moisture content and dry density, Atterberg limits, single-point consolidation and direct shear tests. The results of the moisture content and dry density tests are included on the respective boring logs. The Atterberg limits, single-point consolidation and direct shear tests results are presented on Plates 6, 7 and 8 respectively.

### **FINDINGS**

#### **SITE DESCRIPTION**

The area of this project included the open space slope below Lots 59 through 61 (the site) of the Peacock Ridge portion of the Oakhurst development. The site is an occupied residential development. Residential lots are located along the top of a roughly 95-foot-tall north-facing 2H:1V fill slope. The toe of the fill slope was placed on a broad level bench that extends from the drainage swale on the east side of Lot 59 to the drainage swale on the west side of Lot 65. From the toe of the fill slope, the bench extends about 120 feet to the north and then the ground slopes down to Peacock Creek at a gradient of about 1½ H:IV.

A bench including a concrete lined v-ditch traverses the fill slope. We observed horizontal separations in the concrete lined v-ditch on the open space slope that were up to about 3 inches wide below the subject lots. The separations in the v-ditch have since been sealed based on our recommendations.

#### **PREVIOUS SITE GRADING**

Based on the as-built conditions depicted on the record plans with the title *Rough Grading Plan – Tract 7249 and 7255* prepared by UDI-TETRAD Consulting Engineers Inc., signed and dated on October 9, 1996, we understand that the subject slope and lots along the top of slope are underlain by engineered fill materials. Based on the subdrain locations and elevations depicted on the record plans, a keyway up to about 28 feet deep was excavated along the toe of the fill slope and subdrains were installed at roughly 30-foot vertical intervals. Based on the elevation of subdrains depicted on the record plans, it appears that only minor amounts of original ground surface were removed. The earth materials encountered during keyway excavation are not depicted on the record plans. The subdrain elevations shown on the record plans are shown on the Cross Section provided on Plate 3.



## **GENERAL PRE-GRADING GEOLOGY**

Regional geologic maps prepared by the U. S. Geologic Survey (Brabb et al, 1971; Dibblee, 1980) show the site to be underlain by sandstone and siltstone of the late Cretaceous aged (roughly 66.4 to 97.5 million years before present) Panoche formation. Bedrock structure is shown striking to the northeast and dipping to the northwest at inclinations between about 30 and 60 degrees.

Regional landslide maps prepared by the U.S. Geological Survey (Nilsen 1971 and 1975) show landslide deposits underlying the entire north and west flanks of the ridgeline that the Peacock Ridge subdivision was constructed upon. The area studied for this project (Lots 59 through 61) is located within the limits of landsliding shown by Nilsen. The landslide maps provided in the Hallenbeck & Associates reports for the development do not show or discuss the Nilsen landslide mapping. Based on our review of stereo-paired aerial photographs of the area taken prior to site development, the 1973 aerial photographs can be interpreted as being suggestive of pre-existing landslide deposits in the vicinity of Lots 59 through 61.

## **SUBSURFACE CONDITIONS**

Based on the findings from the borings drilled at the site (SI-1 and SI-2) as well as review of the project grading plans, the north-facing slope on the downhill side of the subject lots is composed of engineered fill materials. We encountered engineered fill to depths of about 13½ feet in SI-1 and about 28 feet in SI-2. In both borings, the engineered fill consisted of stiff to very stiff silty clay with trace rock fragments. The subdrain elevations shown on the project grading plans by UDI-TETRAD generally coincide with the interpreted base of fill encountered in the borings. Underlying the engineered fill, we interpreted a thin zone of deeply weathered bedrock in SI-1 between about 13½ and 22 feet and in SI-2 between about 28 to 34 feet. Underlying these materials, sandstone and clayey to sandy siltstone bedrock was encountered. The bedrock was tan-brown and friable to weak.

## **SLOPE INCLINOMETER READINGS**

In accordance with our proposal for the project dated October 25, 2006 we have began a three year monitoring program in which quarterly readings will be taken from the slope inclinometers SI-1 and SI-2 that were installed at the site as part of this project. Baseline readings of the two slope inclinometers were taken on February 20, 2007 and subsequent readings have been taken on March 29, 2007 and on July 25, 2007. The plots are provided on Plates 4 and 5.

## **CONCLUSIONS**

To date, we have taken two readings after the baseline for the slope inclinometers we installed at the site. The readings indicate a deflection of the slope inclinometer casing at a depth of about 72 feet in SI-2. The casing has deflected about ½ inch since installation (about 5 months).

Based on the depth and apparent rate of movement observed in SI-2, our aerial photograph interpretation and experience in the area, we recommend expanding the area of slope monitoring

by installing additional slope inclinometers. In order to correlate the subsurface conditions with slope inclinometer readings, the additional boreholes needed for slope inclinometer installation should be drilled and continuously sampled with a bedrock-coring rig. On a preliminary basis, we recommend the addition of three slope inclinometers at the following locations:

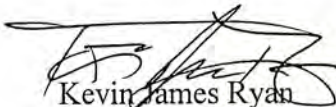
- One along the midslope bench about 175 feet north of SI-2, below Lot 63, to an approximate depth of 125 feet.
- One along the midslope bench about 175 feet south of SI-2, below Pebble Beach Drive, to an approximate depth of 125 feet.
- One along the toe of slope below SI-2, to an approximate depth of 150 feet.

### LIMITATIONS


This project has been conducted in accordance with currently accepted engineering geology and geotechnical engineering standards; no other warranty is expressed or implied. The locations of slope inclinometers and other features discussed herein are those depicted on the record plans prepared by UDI-TETRAD Consulting Engineers, Inc. and should be considered approximate.

Respectfully submitted,

### **BERLOGAR GEOTECHNICAL CONSULTANTS**

  
Kevin James Ryan  
Senior Geologist  
CEG 2404



  
Frank Berlogar  
RCE 20383, Exp. 9/30/07



KJR/FB:jmb

#### Attachments:

- References
- Plate 1 – Vicinity Map
- Plate 2 – Site Plan
- Plate 3 – Cross Section
- Plate 4 and 5 – Slope Inclinometer Plots
- Plate 6 – Atterberg limits Test Results
- Plate 7 – Single Point Consolidation/Swell Test Results
- Plate 8 – Direct Shear Test Results
- Appendix – Boring Logs and Key to Boring Log Symbols

Copies: Addressee (6)

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## REFERENCES

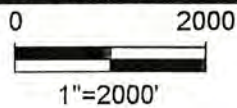
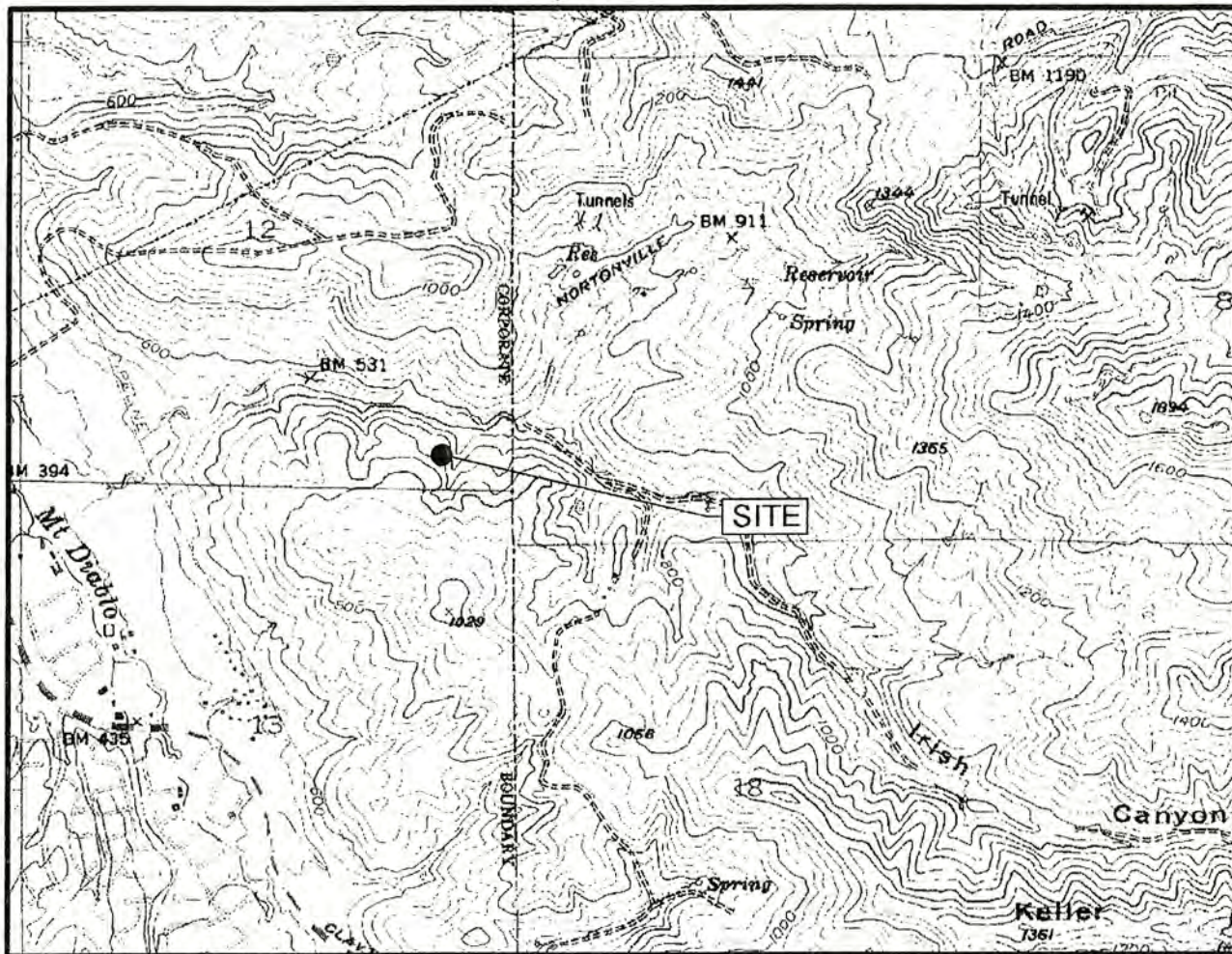
- Brabb, E.E, Sonneman, H.S. and Switzer, J.S., 1971, Preliminary geologic map of the Mount Diablo-Byron area, Contra Costa, Alameda, and San Joaquin Counties, California: United States Geological Survey Basic Data Contribution 28.
- Dibblee, T.W., 1980, Preliminary geologic map of the Clayton Quadrangle, Contra Costa County, California; United States Geological Survey Open-File Report 80-547.
- Graymer, R.W., Jones, D.L., and Brabb, E.E.; 1994; Preliminary geologic map emphasizing bedrock formations in Contra Costa County, California; U.S. Geological Survey Open-File Report 94-622.
- Hallenbeck & Associates, August 3, 1987, Geotechnical Engineering Investigation, Oakhurst Project, Clayton, California 2 volumes.
- Hallenbeck & Associates, April 1, 1988, Supplemental Geotechnical Engineering Investigation, Phase I, Oakhurst Project, Clayton, California.
- Hallenbeck & Associates, January 17, 1989, Supplemental Geotechnical Engineering Investigation, Phase II, Oakhurst Project, Clayton, California.
- Nilsen, T.H., 1975, Preliminary photointerpretation map of landslide and other surficial deposits of the Clayton 7½-Minute Quadrangle, Contra Costa County, California; United States Geological Survey Open-File Report 75-277-2.
- Nilsen, T.H., 1971, Preliminary photointerpretation map of landslide and other surficial deposits of the Mount Diablo Area, Contra Costa and Alameda Counties, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-310.

## **AERIAL PHOTOGRAPHS**

Date	Source	Project, flight line, frames	Type of image	Nominal scale
10/03/1973	U.S. Geological Survey	4, 54-55	Color	1:24,000
6/2/1994	Pacific Aerial Surveys	KAV 4664, 11, 5-6	Color	1:36,000
5/17/1999	Pacific Aerial Surveys	AV 6100, 26, 10-11	Black and White	1:12,000



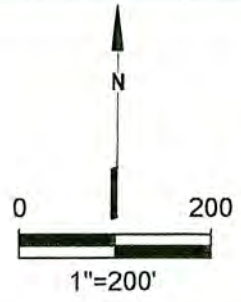
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**VICINITY MAP**  
OPEN SPACE SLOPE BELOW LOTS  
59 THROUGH 61  
PEBBLE BEACH DRIVE  
CLAYTON, CALIFORNIA  
FOR  
OAKHURST GEOLOGIC HAZARD  
ABATEMENT DISTRICT

BASE: PORTION OF U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, CLAYTON, CALIFORNIA, PHOTOREVISED 1983, AT A SCALE OF 1:24,000.








PEACOCK CREEK

CKE1  
BY:  
D  
: 8-8  
294;  
J NUT



**EXPLANATION**

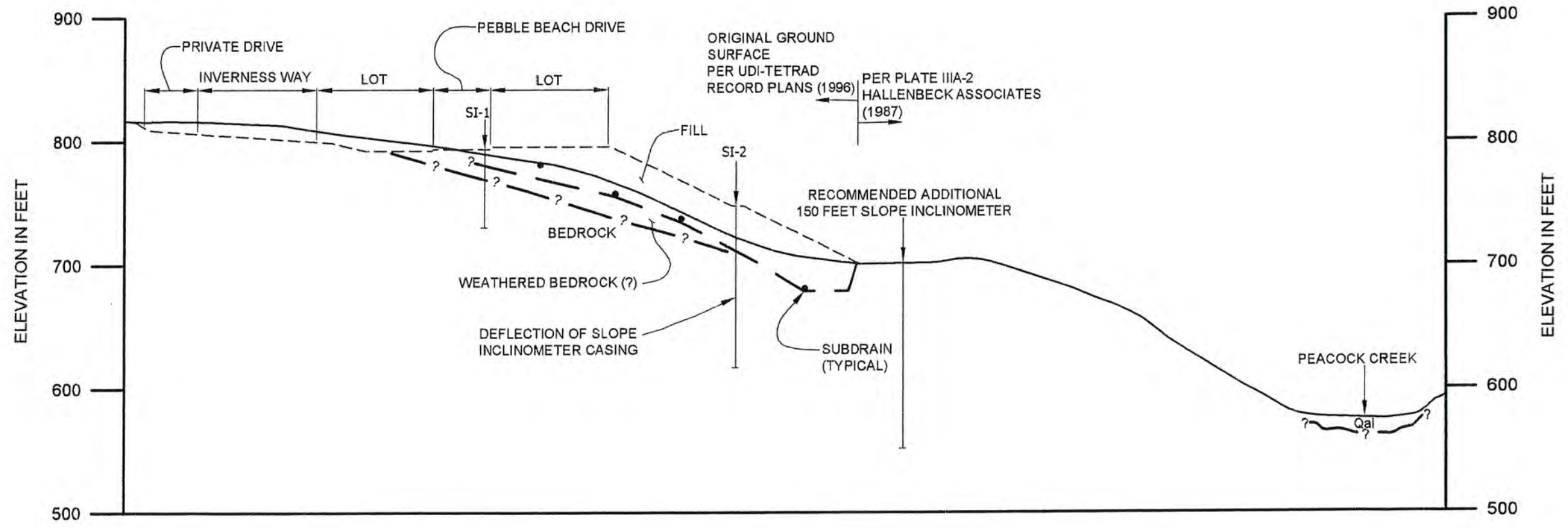
-  CROSS SECTION LOCATION
-  SI-2  
SLOPE INCLINOMETER LOCATION
-  65  
LOT NUMBERING  
UDI-TETRAD CONSULTING  
ENGINEERS INC. (1996)

**SITE PLAN**

OPEN SPACE SLOPE  
BELOW LOTS 59 THROUGH 61  
PEBBLE BEACH DRIVE  
CLAYTON, CALIFORNIA  
FOR  
OAKHURST GEOLOGIC HAZARD  
ABATEMENT DISTRICT  
Berlogar Geotechnical Consultants  
SOIL ENGINEERS \* ENGINEERING GEOLOGISTS



SCALE  
1" = 100'



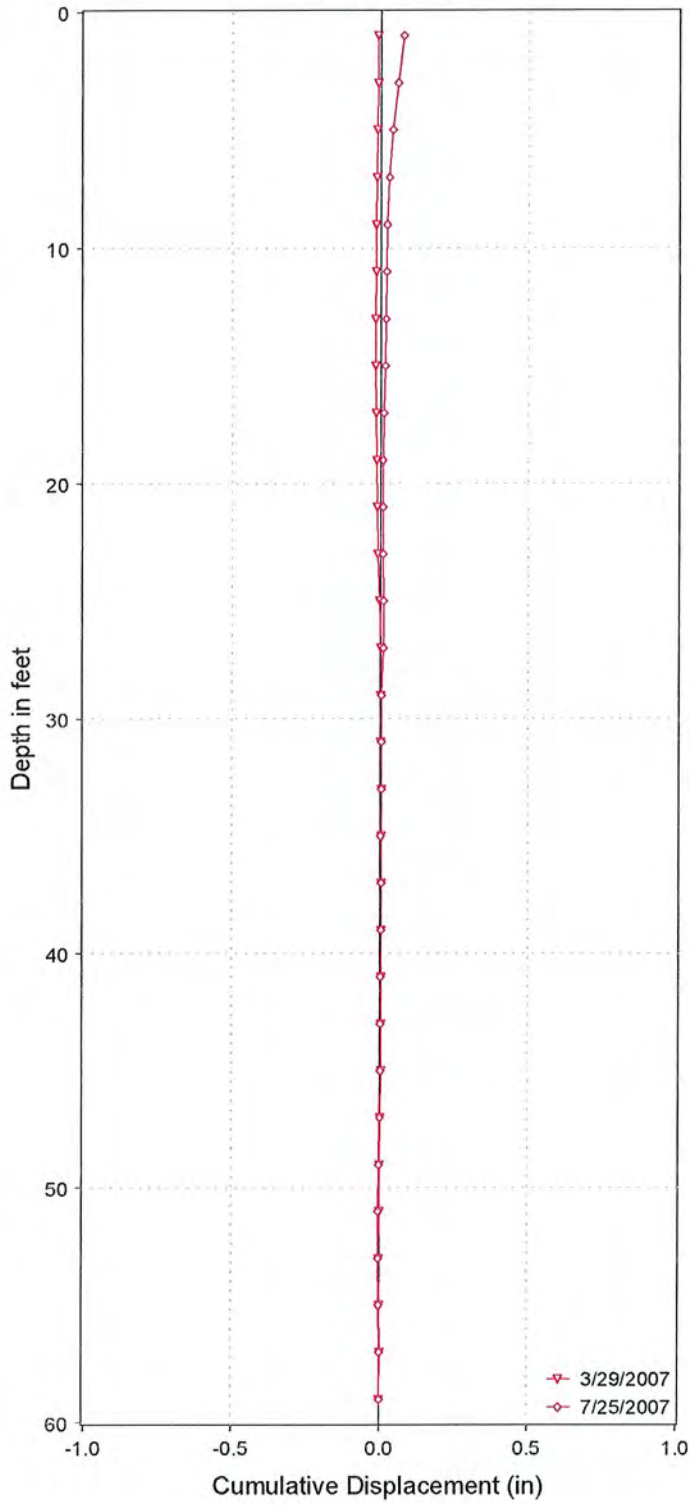
**EXPLANATION**

- ORIGINAL GROUND SURFACE
- - - - - DESIGN (EXISTING) GRADE PER UDI-TETRAD RECORD PLANS
- — — — — GEOLOGIC CONTACT, DASHED WHERE APPROXIMATE, QUIERED WHERE UNCERTAIN
- SI-2  
↓  
SLOPE INCLINOMETER LOCATION
- SUBDRAIN LOCATION PER UDI-TETRAD RECORD DRAWINGS (1996)

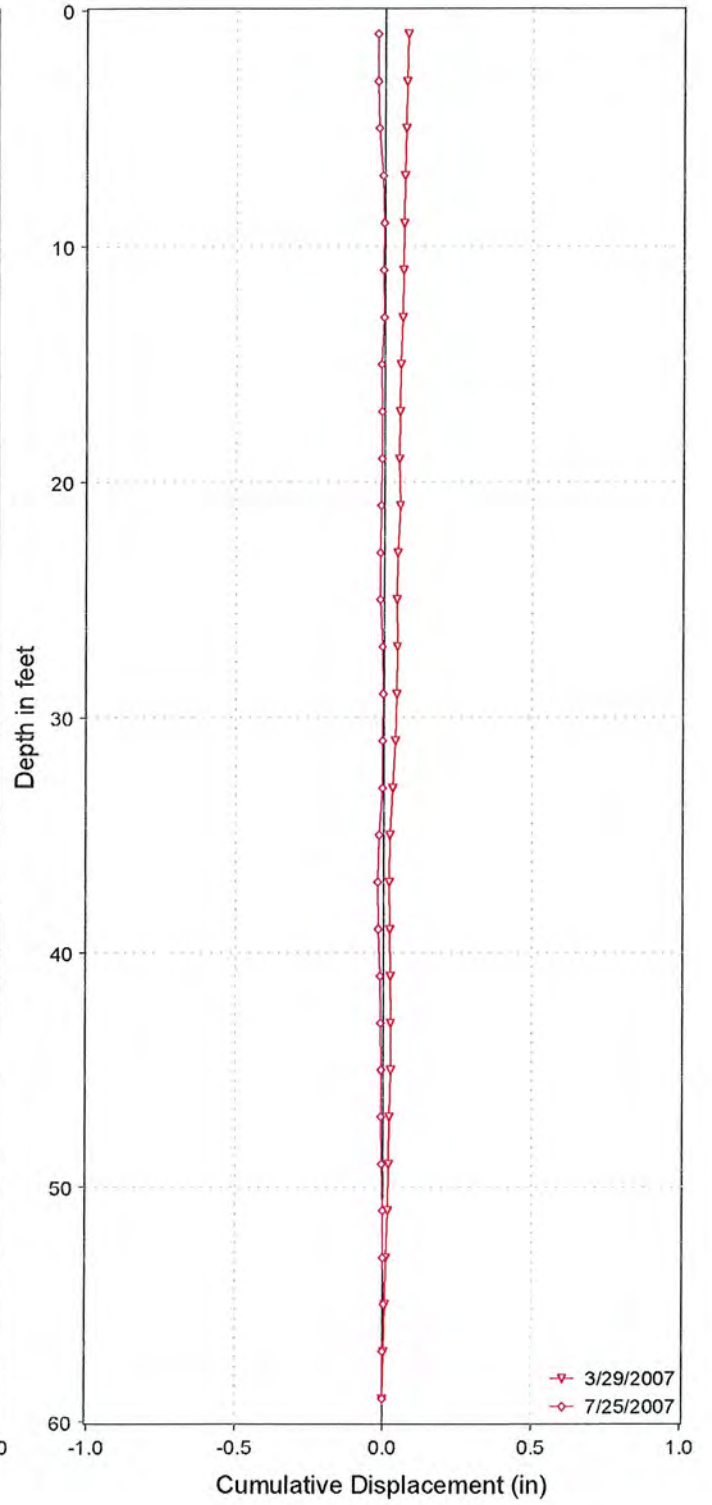
**CROSS SECTION**  
 OPEN SPACE SLOPE  
 BELOW LOTS 59 THROUGH 61  
 PEBBLE BEACH DRIVE  
 CLAYTON, CALIFORNIA  
 FOR  
 OAKHURST GEOLOGIC HAZARD  
 ABATEMENT DISTRICT  
 Berlogar Geotechnical Consultants  
 SOIL ENGINEERS \* ENGINEERING GEOLOGISTS

C-11-ED  
 DJ-1-JBY  
 37  
 DATE 11-17-10  
 MBE 47.10

SI-1, A-Axis



SI-1, B-Axis

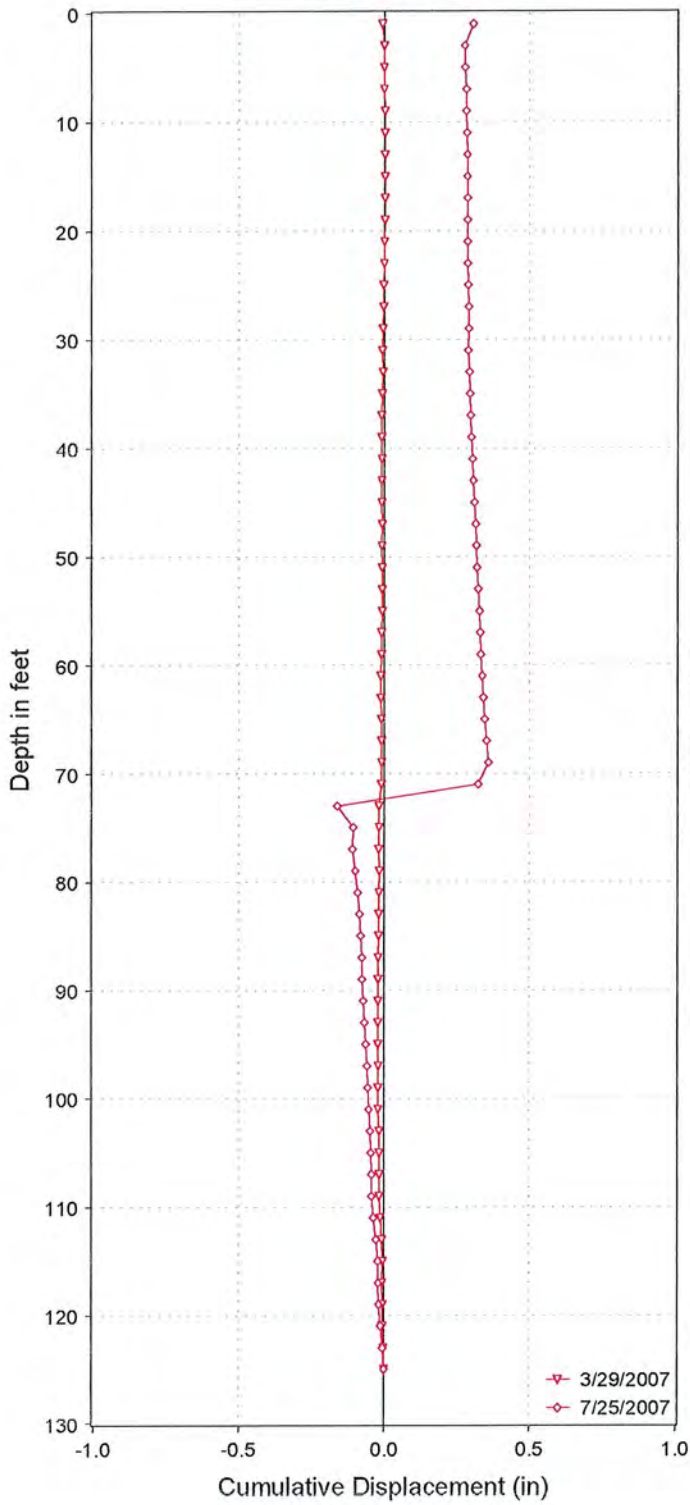


BGC

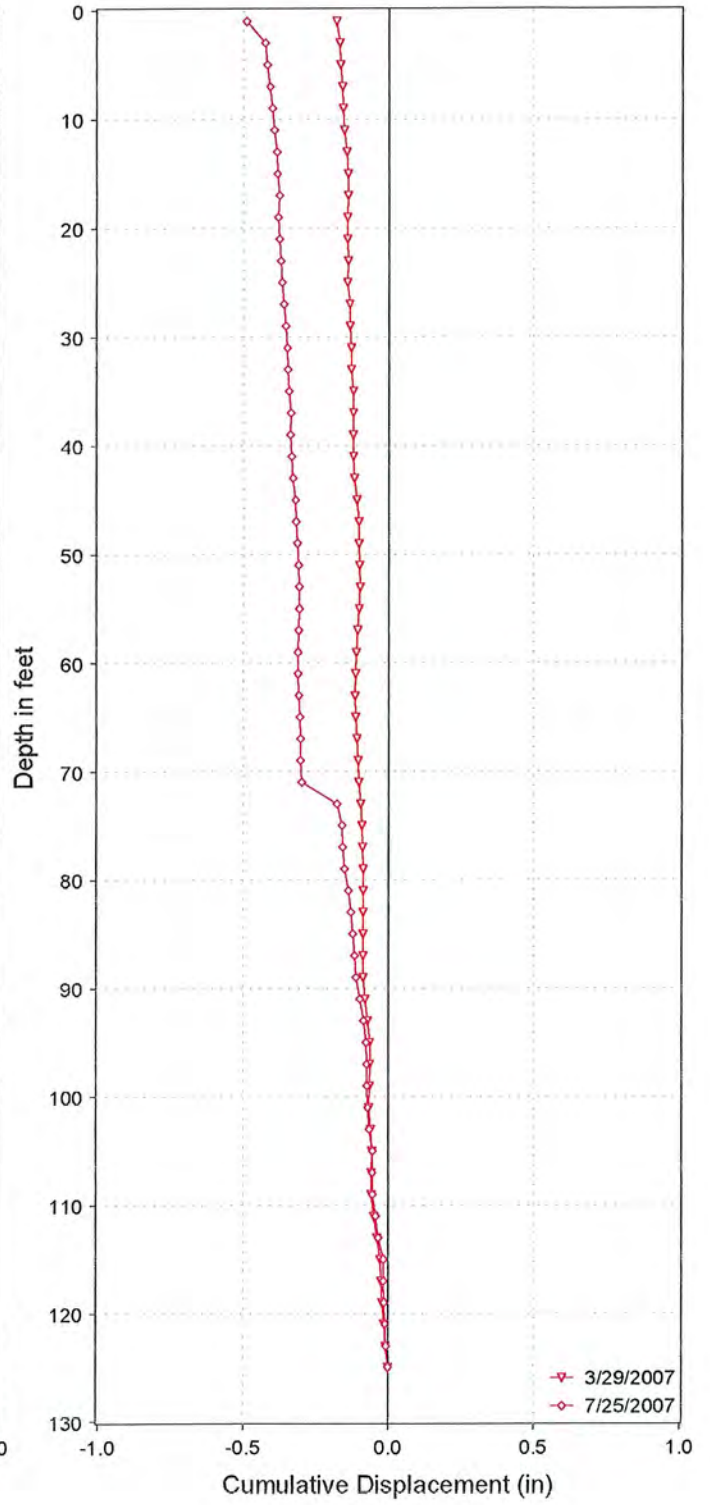
2947.100 - Open space slope below  
lots 59 through 61  
Base Line Reading Date: 2/20/07  
A+= B+=



SI-2, A-Axis



SI-2, B-Axis



BGC

2947.100 - Open space slope below  
lots 59 through 61  
Base Line Reading Date: 2/20/07  
A+= B+=